INLAND PORT FEASIBILITY STUDY

Final Report

The Tioga Group, Inc.

Railroad Industries, Inc.

Cambridge Systematics, Inc.

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288 Rheem Blvd., Moraga, CA 94556
(925) 631-0742 fax (925) 631-7936 www.tiogagroup.com

Contents

Executive Summary

Introduction

Seaports encompass both marine terminals that need access to deep water and numerous ancillary facilities and functions that have greater locational flexibility. The "inland port" concept refers to the idea that some seaport facilities could be duplicated or complemented at inland locations, thus reducing the need for scarce space at the seaport. For several years the Northern California port and shipping community has speculated about the potential for a rail container shuttle connecting the Central Valley and the Port of Oakland. The conceptual operation of a rail shuttle has been referred to as the California Inter-Regional Intermodal Service, or CIRIS. With new federal funding becoming available for intermodal projects, new interest in freight issues on the part of California state government, and ongoing debate over the designation of port lands in the Bay Area, the time is right to take the inland port/rail shuttle concept to the next level of analysis and potential implementation.

This study was sponsored by the San Joaquin Council of Governments (SJCOG) and undertaken by a study team consisting of The Tioga Group, Inc. (prime consultant), Railroad Industries, Inc. (rail costing subcontractor), and Cambridge Systematics, Inc. (impact analysis subcontractor). The findings and conclusions presented herein reflect the opinions of the study team, who likewise accept responsibility for any inaccuracies or need for corrections.

Inland Port Opportunities

A significant potential benefit to San Joaquin Valley communities lies in the ancillary functions that ordinarily cluster around deep-water ports, but which might locate inland with an efficient link to Oakland. Facilities in the San Joaquin Valley could function as an "inland port" in the sense that shippers and consignees might tender international traffic there, and move it by rail to Oakland, just as if they trucked it to the Oakland terminal. The Port of Stockton has been a central focus for speculation regarding inland port functions, especially with the additional space and facilities available on Rough and Ready Island. The broader potential for ancillary port services at inland locations includes transloading and consolidation facilities, dry and refrigerated container depots, container chassis pools, cold storage, and related facilities and operations.

Transloading and Consolidation. For containerized trade, "transloading" usually implies that shipments are transferred more or less intact between ISO containers and domestic vehicles. "Consolidation" usually implies that multiple domestic shipments become a single international container load, or vice versa. The Port of Stockton has several existing tenants engaged in transloading. As land costs, labor cost, and trucking costs all rise, there may be significant opportunities to locate more such operations inland. Informal contacts with shippers, transloaders, and truckers of transloaded commodities suggest that concrete opportunities exist for development of such traffic in the San Joaquin Valley.

"Overweights" A major reason for transloading is the opportunity to load an international container with more net weight than can be legally handled in a highway trailer. Since ocean rates are typically based on the containerload rather than the cargo weight, customers have an incentive to maximize the amount of heavy cargoes they can pack into each box. As rail costs (including drayage and lift) decline with volume, and consolidation ratios increase, the truck cost advantage declines, and can be offset by lower real estate and operating costs in the San Joaquin Valley.

The limiting factor on the handling of overweight loads in the San Joaquin Valley is the road network. Rough and Ready Island is entirely Port of Stockton property and the highway load limits do not apply. It would thus be possible for a shipper to bring in legal highway truckloads to a Rough and Ready facility, transload the cargo to a small number of ISO boxes, and position the "overweight" containers for rail loading. This would, however, require separate rail intermodal service to Rough and Ready Island.

Empty Container Supply. Rail costing for this study was conducted assuming that each export load required an empty container from Oakland and each import load generated an empty to be returned to Oakland. The rail costs used in the comparisons are therefore all round-trip. If the need for empty movements can be reduced or rationalized, the rail cost can be reduced. There are at least three possibilities for rationalizing empty container flows.

- Using low-priority manifest rail service to position empties at inland depots.
- Reusing import empties for export loads.
- Reusing westbound "backhaul" boxes.

Each of these possibilities is an opportunity to reduce the total costs of moving containers by rail between the Central Valley and Oakland, and an opportunity to improve Central Valley container supply.

The latter consideration is particularly important for many potential new San Joaquin Valley businesses. Empty container supply is a key factor in encouraging "urban ore" export businesses such as waste paper, recycled plastic, and scrap metal. In the course of interviews with Northern California businesses of these kinds, it became apparent to the Tioga team that the ready availability of suitable ISO boxes is a major consideration in locating these businesses and in turning a local supply of waste products into containerized exports.

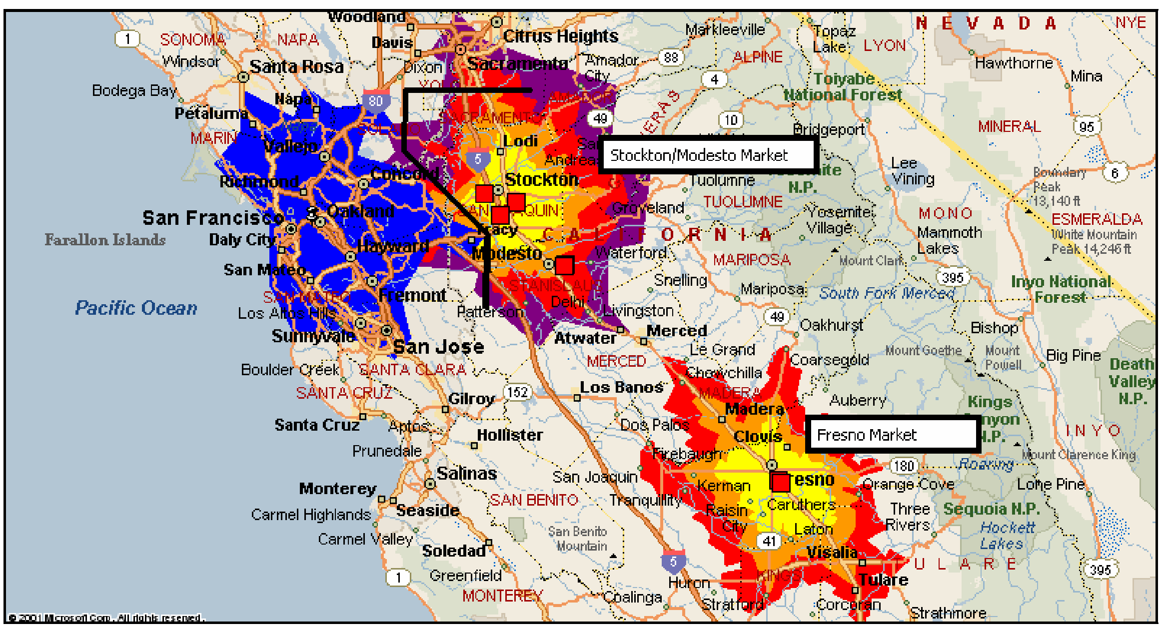
Container Depots. Container depots have three major functions: storing containers that are currently surplus, acting as a supply point for empty containers, and servicing/repairing containers under contract. Container depots need inexpensive space away from sensitive residential and commercial development, where the Central Valley has an advantage. The availability of a container depot could be major step in encouraging reuse of empty containers, as discussed above.

Trucking Costs and Market Access

All loaded international container traffic between the Port of Oakland and the Central Valley is currently moved by truck over the highway. Because of its importance to market access and service economics, drayage (local or regional movement of containers by truck) was given extensive analysis by itself. *Drayage costs are determined primarily by the time required and how many productive trips a driver can make in a working day, with distance a secondary consideration.* The cost of drayage is a key determinant of overall rail shuttle operating cost. As volume rises, unit rail linehaul costs decline due to economies of scale. Drayage has no appreciable economies of scale, and becomes a larger portion of total cost as unit rail costs decline. *The cost of drayage will therefore determine the size of the market accessible for any given overall cost.*

The study team compared driving times and drayage costs to define the market areas accessible from intermodal facilities in Stockton and Fresno. (Exhibit 1) The Port of Oakland has a long reach along Interstate 205, with areas west of Tracy being effectively equidistant to Oakland and Stockton. Experience with customers in the Interstate 205/580/5 triangle east of Tracy indicates that traffic from this area would be virtually impossible to divert to rail. Sacramento traffic is trucked down I-80 to Oakland, and would require a non-competitive triangular movement through Stockton. The heavy line shown in Exhibit 1 thus forms the western and northern boundaries of the Stockton-Modesto and Fresno market areas for potential rail traffic.

Exhibit 1: Regional Rail Shuttle Market Boundaries



Any rail shuttle operation will require drayage between an Oakland intermodal facility (BNSF or UP) and the port marine terminal. According to Port of Oakland sources, this cost is typically about $70 round-trip. As noted earlier, drayage costs are determined primarily by time. As the distance between the port-area facilities in Oakland is minimal, the intra-Oakland drayage cost is driven almost exclusively by the time spent in marine and rail terminals. Some sources suggest that drayage costs in Oakland can be driven down lower – as low as $35 per round trip – under the most favorable circumstances, including expedited treatment at marine terminal gates.

Market Analysis

Shipment volume is the key to the economics of a rail shuttle, its attractiveness to the railroads, and its potential public benefits. The team's market analysis supplemented available market data with interviews. The Central and Southern San Joaquin Valley market for containerized cargo is grouped around the major population centers. San Joaquin and Stanislaus Counties together form a distinct market, which in this report is referred to as "Stockton/Modesto". There is very little cargo *shipped or received* in Merced County, despite the existence of underlying production there, leaving a gap between the two larger markets. Likewise, there is a second market cluster around Fresno including much of Madera and Tulare Counties. A third, smaller cluster is centered in Bakersfield.

This market analysis and the rail costing scenarios in this report follow this general grouping. The Stockton/Modesto and Fresno markets are the major focus. The Sacramento market is estimated and analyzed, but was found to be largely inaccessible to a rail service operating from the Stockton area. The Bakersfield market was likewise estimated, but found to be relatively small and eliminated from near-term consideration by the lack of an active intermodal terminal.

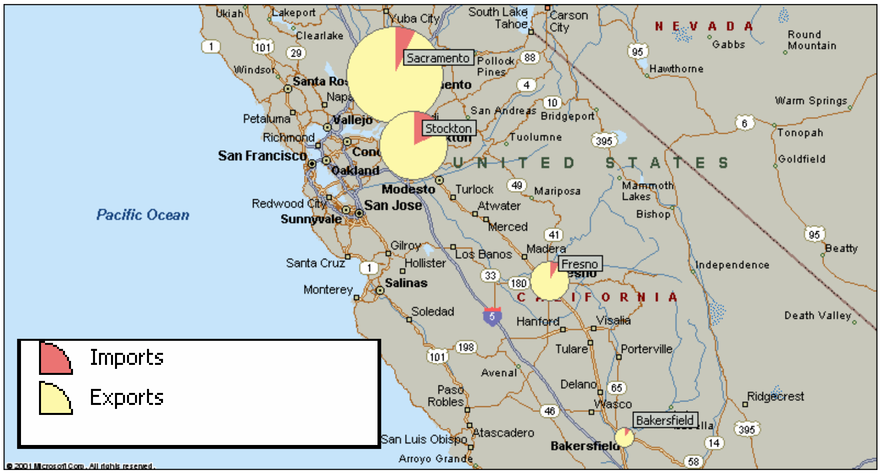
Containerized cargo is commonly measured in Twenty-Foot Equivalent Units (TEU – the equivalent cargo capacity of a 20' container). The study team adjusted the available data (Port Import Export Reporting Service - PIERS) to more accurately reflect the Central Valley cargo, as shown in Exhibit 2.

Exhibit 2: Estimated Market Volumes, Annual Containers (at 1.6 TEU/Container)

	2003			2020		
Market	Exports Adjusted	Imports Adjusted	Total Adjusted	Exports Adjusted	Imports Adjusted	Total Adjusted
Stockton-Modesto						
Perishable Food/Farm	16,895	369	17,264	38,723	846	39,569
Non-Perishable Food/Farm	33,852	1,369	35,221	77,589	3,137	80,726
Other	6,043	11,055	17,098	13,852	25,337	39,189
Subtotal	56,790	12,793	69,582	130,163	29,321	159,484
Fresno						
Perishable Food/Farm	22,352	72	22,424	51,230	165	51,395
Non-Perishable Food/Farm	19,554	756	20,310	44,818	1,734	46,552
Other	15,311	4,381	19,692	35,092	10,042	45,134
Subtotal	57,216	5,210	62,426	131,140	11,941	143,081
Accessible Rail Shuttle Market	**114,006**	**18,002**	**132,008**	**261,304**	**41,262**	**302,565**

The geographic distribution of the market is shown in Exhibit 3. The Sacramento market has the largest total, but is not practically accessible. The Bakersfield market, as indicated, is relatively small and distant. The marked import/export imbalance is also apparent in Exhibit 3. This imbalance leads to the need for more round-trip container movements.

Exhibit 3: Geographic Market Spread



Market conditions and preferences dictate rail shuttle service requirements and the potential penetration of the market defined above. The current service standard for trucking is effectively "next-day" for much of the market. Findings from interviews conducted by Cambridge Systematics in the San Joaquin CIRIS Study indicate that a majority of the respondents would be interested in a next-day service. These considerations dictate a next-day standard for a CIRIS operation, which would be met by offering an overnight service.

Estimates of potential market penetration necessarily involve informed judgments. Rule-of-thumb intermodal market shares are about 15% overall, with 40% an ambitious goal. When applied to the market size estimates, these market penetration figures yield the annual loaded container volumes shown in Exhibit 4. Six scenarios are shown: startup and mature phases for three different market service combinations.

Exhibit 4: Potential Annual CIRIS Loaded Container Volumes

Scenario	Stops in			Potential CIRIS Annual Container Volume				
	Stockton	Fresno	Bakersfield*	Service Phase	Perishable Food/Farm	Non-Perishable Food/Farm	Other	Total
1	x	x	x	Startup	3,063	5,620	6,778	15,461
2	x	x	x	Mature	18,377	25,289	22,595	66,261
3	x	x		Startup	1,984	5,553	5,518	13,056
4	x	x		Mature	11,906	24,989	18,395	55,290
5	x			Startup	863	3,522	2,565	6,950
6	x			Mature	5,179	15,849	8,549	29,577

* conceptual only, no current Barkersfield terminal

The PIERS data analyzed earlier cover only loaded containers. Given operational realities, the study team assumed for rail costing and impact analysis that each container will make a round trip, one way loaded and one way empty. The equivalent daily round-trip container counts for a 250-day-per-year CIRIS service (i.e. 5 days per week, less holidays) are shown in Exhibit 5.

Exhibit 5: Potential Daily CIRIS Round Trip Containers

Scenario	Stops in			Potential CIRIS Daily Round Trips				
	Stockton	Fresno	Bakersfield*	Service Phase	Perishable Food/Farm	Non-Perishable Food/Farm	Other	Total
1	x	x	x	Startup	12	22	27	62
2	x	x	x	Mature	74	101	90	265
3	x	x		Startup	8	22	22	52
4	x	x		Mature	48	100	74	221
5	x			Startup	3	14	10	28
6	x			Mature	21	63	34	118

* conceptual only, no current Barkersfield terminal

To build sufficient volume and maximize beneficial traffic and emissions impacts, it appears desirable to serve both the Fresno and Stockton/Modesto markets.

Rail Operating Scenarios & Costing

A significant challenge in this study was to analyze the wide range of possible options and concepts. Railroads offer favorable economics when their higher terminal and train-start costs can be spread over long distances. The rail distance from Stockton to Oakland, however, is only 75-80 miles, compared to typical intermodal markets of 1,000 miles or more. Obtaining favorable rail economics on such a short haul is inherently difficult.

Routes. The BNSF and UP rail routes through Central California (Exhibit 6) carry both Amtrak and freight traffic, and have varying levels of reserve capacity to handle CIRIS traffic. Optimal operation on a route is between 70% and 80% of capacity; at over 80% trains can expect delays.

Exhibit 6: Central Valley Rail Routes

The BNSF route reaches 75% of capacity between Stege (Richmond) and Port Chicago. Between Stockton and Bakersfield the traffic approaches 90% of capacity due to the frequent Amtrak trains. Adding separate rail shuttle trains to this route will require careful planning, although nighttime operating windows may be easier to find. The UP route is at about 75% of capacity southeast of Oakland between Elmhurst and Newark, but has ample capacity elsewhere.

Facilities. As Exhibit 7 shows, there are three active rail intermodal facilities, one dormant facility, and a handful of "paper ramps" serving the Central Valley. To keep the study flexible in its outlook, the market analysis and rail costing estimates included points that are not currently served.

Exhibit 7: Central Valley Intermodal Facilities

BNSF has an active, recently developed facility ("Mariposa") south of Stockton. The UP Lathrop facility (technically in French Camp) is immediately adjacent to the Sharp Army Depot. The rail shuttle feasibility study for the Port of Stockton also considered a potential intermodal facility on Rough & Ready Island. In Modesto, UP maintains a "paper ramp" – a point where customers can pick up and drop off trailers or containers on chassis for later rail-sponsored drayage to actual terminals. Until BNSF opened its own facility at Stockton, BNSF served the Modesto & Empire Traction (M&ET) "Valley Lift" terminal east of Modesto in Empire. This facility is now dormant. BNSF maintains an active terminal in Fresno; UP maintains a nearby "paper ramp". Although there have been proposals from time to time to establish intermodal facilities in the Bakersfield area, there are neither active terminals nor paper ramps serving the area. The market analysis and rail costing scenarios nonetheless included Bakersfield.

Rail Costing. Railroad Industries used the Uniform Railroad Costing System (URCS), developed by the Surface Transportation Board (STB), a program designed to compute the estimated variable costs of a railroad linehaul service. The data used in URCS reflect 2001 actual carrier costs. Multiple scenarios were considered:

- **Manifest Trains.** Under this scenario CIRIS traffic would be moved in existing conventional freight ("manifest") trains to and from a yard near Oakland, and then shuttled to the Port of Oakland. This service would be non-expedited, with two-day service at best.

- **"Shuttle" Service.** The common conception of a rail shuttle service is a dedicated train that moves back and forth between the two endpoints. Two variations on the shuttle intermodal service were analyzed.

- **"Regional" Service.** The CIRIS white paper discussed the concept of an inter-regional system linking multiple Central Valley markets to the Port of Oakland. Short-haul, multi-stop intermodal service would cover the Port of Oakland hinterland, including Stockton, Modesto, Fresno, and potentially as far south as Bakersfield.

The resulting linehaul cost estimates are summarized in Exhibit 8.

Exhibit 8: Line-Haul Rail Cost Summary (low costs highlighted)

Manifest Trains - Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
UP						
10	$ 207	$ 222	$ 280	$ 358	$ 280	$ 280
20	$ 207	$ 222	$ 279	$ 329	$ 279	$ 279
50	$ 178	$ 192	$ 250	$ 329	$ 250	$ 250
100	$ 178	$ 192	$ 252	$ 332	$ 252	$ 252
BNSF						
10	$ 163	$ 181	$ 251	$ 337	$ 251	$ 251
20	$ 163	$ 181	$ 251	$ 336	$ 251	$ 251
50	$ 146	$ 163	$ 233	$ 319	$ 233	$ 233
100	$ 143	$ 160	$ 228	$ 312	$ 228	$ 228

Class 1 Shuttle - Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
UP						
10	$ 944	$ 1,020	$ 1,314	$ 1,731	$ 1,321	$ 2,086
20	$ 514	$ 554	$ 714	$ 932	$ 714	$ 1,099
50	$ 262	$ 280	$ 356	$ 458	$ 356	$ 513
100	$ 173	$ 184	$ 232	$ 295	$ 232	$ 312
BNSF						
10	$ 524	$ 604	$ 913	$ 1,300	$ 913	$ 2,070
20	$ 308	$ 350	$ 518	$ 726	$ 518	$ 1,091
50	$ 184	$ 204	$ 287	$ 388	$ 287	$ 509
100	$ 138	$ 151	$ 205	$ 270	$ 205	$ 290

CIRIS Shuttle - Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
UP						
10	$ 952	$ 1,024	$ 1,296	$ 1,683	$ 1,303	$ 2,050
20	$ 533	$ 571	$ 720	$ 923	$ 720	$ 1,111
50	$ 263	$ 279	$ 344	$ 431	$ 344	$ 489
100	$ 168	$ 177	$ 214	$ 262	$ 214	$ 276
BNSF						
10	$ 534	$ 608	$ 889	$ 1,244	$ 889	$ 2,022
20	$ 328	$ 367	$ 521	$ 713	$ 521	$ 1,097
50	$ 186	$ 203	$ 272	$ 357	$ 272	$ 482
100	$ 134	$ 144	$ 184	$ 233	$ 184	$ 248

A number of findings are apparent.

- Manifest trains – adding new traffic to existing train schedules – are much more cost-effective at lower volumes, up to about 50 units per day.

- In the range of 50-100 units per day a separate intermodal shuttle becomes more cost-effective.

- Rail *linehaul* costs compare favorably with trucking for the cost-effective alternatives.

- Estimated BNSF costs are lower than estimated UP costs across the board due primarily to route differences. The costs are close, however, and subject to refinement by the railroads themselves.

By tapping both the Fresno and Stockton/Modesto markets, a Fresno shuttle with a Stockton/Lathrop stop may be able to generate linehaul scale economies. By serving both markets, such a service is more likely to reach 100 units per day (at $248/unit), rather than attaining only 50 units per day (at $272 per unit).

Total Intermodal Costs. Complete intermodal service requires round trip drayage and lift-on/lift-off at both ends of the trip. The complexity of the intermodal move usually also entails third party management and administrative costs. Exhibit 9 shows minimum, typical, and maximum costs for these additional intermodal functions. These costs add between $245 and $345 per round trip to the rail linehaul costs.

Exhibit 9: Additional Intermodal Costs

	Minimum	Typical	Maximum
Valley RT Drayage Costs	$ 75	$ 75	$ 100
Valley Lift Costs (on and off)	$ 50	$ 60	$ 70
Oakland Lift Costs (on and off)	$ 60	$ 70	$ 80
Oakland RT Drayage Costs	$ 35	$ 70	$ 70
Third Party/Admin Costs	$ 25	$ 25	$ 25
Additonal Intermodal Total	**$ 245**	**$ 300**	**$ 345**

Adding the additional intermodal costs in Exhibit 9 to the rail linehaul costs in Exhibit 8 yields the tables of typical intermodal costs in Exhibit 10 (BNSF costs shown for Manifest and CIRIS Shuttle options). The study also analyzed minimum and maximum costs.

Exhibit 10: Total Intermodal Costs, Typical Dray and Lift

Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
Manifest						
10	$ 463	$ 481	$ 551	$ 637	$ 551	$ 551
20	$ 463	$ 481	$ 551	$ 636	$ 551	$ 551
50	$ 446	$ 463	$ 533	$ 619	$ 533	$ 533
100	$ 443	$ 460	$ 528	$ 612	$ 528	$ 528
CIRIS Shuttle						
10	$ 834	$ 908	$ 1,189	$ 1,544	$ 1,189	$ 2,322
20	$ 628	$ 667	$ 821	$ 1,013	$ 821	$ 1,397
50	$ 486	$ 503	$ 572	$ 657	$ 572	$ 782
100	$ 434	$ 444	$ 484	$ 533	$ 484	$ 548

These costs are all higher than the corresponding over-the-highway costs, implying a need for subsidy. The need for subsidy will increase if, as implied by the market interviews, intermodal shuttle costs will have to be roughly 10% below trucking costs to attract traffic. The implications of these findings for overall shuttle economics are discussed in a later section.

Economics and Funding

Cost “Gaps”

It is widely presumed that a rail shuttle operation between the Central Valley and the Bay Area will require subsidy or some other form of financial support. If so, the likelihood of support will be much greater if public decision makers are convinced that the costs have been minimized through creative service design and efficient operations. Existing and expected trucking costs set the competitive threshold for total costs. All the economic factors must be brought together to determine the cost “gap” between trucking and intermodal costs.

Stockton Market. Exhibit 11 gives the overall cost comparisons for the Stockton market. (BNSF costs were used for all comparisons). With a pricing goal of 10% below the trucking rate, the rail shuttle service would have to be priced at about $225 to attract business. At startup (10-20 units per daily), typical dray and lift costs combined with a manifest train operation would yield total costs of about $463, leaving a gap to be subsidized or otherwise addressed of $238 per unit round trip.

Exhibit 11: Stockton Market

	Stockton					
Scenario	Min	Typical	Max	Goal	Truck	Typ. Gap
Manifest 10-20	$ 408	$ 463	$ 508	$ 225	$ 250	$ 238
Manifest 50	$ 391	$ 446	$ 491	$ 225	$ 250	$ 221
Shuttle 100	$ 379	$ 434	$ 479	$ 225	$ 250	$ 209

At maturity (100 units daily) typical costs would drop to $434 per unit round trip, and the pricing gap would decline to $209 per unit. The cost figures clearly indicate the critical importance of dray and terminal lift costs, as the differences between minimum, typical, and maximum costs in these categories outweigh the differences in rail operating costs.

Modesto Market. As the exhibit indicates (Exhibit 12), the gap between rail shuttle costs and the pricing goal increases at Modesto because rail linehaul costs rise somewhat while trucking rates remain at $250 per unit. The typical gap narrows from $256 at startup to $219 at maturity.

Exhibit 12: Modesto Market

	Modesto					
Scenario	Min	Typical	Max	Goal	Truck	Typ. Gap
Manifest 10-20	$ 426	$ 481	$ 526	$ 225	$ 250	$ 256
Manifest 50	$ 408	$ 463	$ 508	$ 225	$ 250	$ 238
Shuttle 100	$ 389	$ 444	$ 489	$ 225	$ 250	$ 219

Fresno Market. As a stand-alone market, the Fresno area is the best prospect for a rail shuttle (Exhibit 13). With drayage prices rising to about $450, the total intermodal costs can come much closer than in Stockton or Modesto. The gap narrows from $146 for typical startup costs to $79 at maturity, and could be as little as $24 under the moist favorable circumstances.

Exhibit 13: Fresno Market

	Fresno					
Scenario	Min	Typical	Max	Goal	Truck	Typ. Gap
Manifest 10-20	$ 496	$ 551	$ 596	$ 405	$ 450	$ 146
Manifest 50	$ 478	$ 533	$ 578	$ 405	$ 450	$ 128
Shuttle 100	$ 429	$ 484	$ 529	$ 405	$ 450	$ 79

Bakersfield Market. The Bakersfield market (Exhibit 14) shows the smallest gap between total intermodal costs and current trucking rates. Against that potential economic balance, however, must be set that fact that Bakersfield currently has no intermodal facilities.

Exhibit 14: Bakersfield Market

	Bakersfield					
Scenario	Min	Typical	Max	Goal	Truck	Typ. Gap
Manifest 10-20	$ 581	$ 636	$ 681	$ 495	$ 550	$ 141
Manifest 50	$ 564	$ 619	$ 664	$ 495	$ 550	$ 124
Shuttle 100	$ 478	$ 533	$ 578	$ 495	$ 550	$ 38

Stockton-Fresno Market Combination

Serving both the Stockton-Modesto and Fresno markets introduces some complexity to the service and to the cost estimates. The major reason to serve both points is to maximize the potential volume, thereby attaining scale economies in rail operations and diverting as much truck traffic as possible. As Exhibit 89 and Exhibit 90 show, attaining the higher service standard of rail shuttle operations raises the costs compared to the lower-service manifest train scenarios.

Exhibit 15: Stockton-Fresno Cost Estimates

Scenario	Stockton/Fresno Two-Train Option Min	Typical	Max	Goal	Avg. Truck	Typ. Gap
Manifest 10-20	$496	$ 551	$596	$315	$350	$ 236
Manifest 50	$478	$ 533	$578	$315	$350	$ 218
Shuttle 100	$493	$ 548	$593	$315	$350	$ 233

Subsidy Requirements

There is an implicit relationship between the amount of subsidy and the public benefits of diverting trucks from the highways. Operating subsidies would ideally be set at an amount calculated to attract sufficient business from the highway to justify the public expenditure. The Cambridge Systematics CIRIS study found that the key factor in customer interest in a rail shuttle was the prospect of cost savings, and that customers expressed willingness to try a rail shuttle at prices 10% below truck rates for comparable services. (If truck rates rise due to increased future congestion, the necessary discount would decrease.) This discount would yield target round-trip door-to-door prices of about $225 round trip from Stockton , $405 from Fresno, or $495 from Bakersfield.

Exhibit 16 applies the typical door-to-door costs and scale economies to generate daily cost figures for each scenario, and the target discounts below truck rates to generate average daily revenue (the Stockton/Fresno option assumes that half the volume will come from each market). The difference is the daily subsidy, and a 250-day year yields the annual equivalent subsidy required to offer the service at the target rate. Since even at maturity the revenue per move does not cover the costs, the annual subsidy requirement rises with volume.

Exhibit 16: Scenario Volumes and Subsidies

Scenario	Stops in Stockton	Fresno	Bakersfield	Phase	Average Daily Loads	Average Typical Daily Cost	Daily Revenue	Average Daily Subsidy	Annual Typical Subsidy
1	x	x	x	Startup	62	$ 38,282	$ 23,192	$ 15,090	$ 3,772,505
2	x	x	x	Mature	265	$ 141,312	$ 99,391	$ 41,921	$ 10,480,286
3	x	x		Startup	52	$ 27,835	$ 16,451	$ 11,385	$ 2,846,198
4	x	x		Mature	221	$ 121,144	$ 69,666	$ 51,479	$ 12,869,661
5	x			Startup	28	$ 12,871	$ 6,255	$ 6,616	$ 1,654,088
6	x			Mature	118	$ 51,308	$ 26,620	$ 24,688	$ 6,171,990

Closing the Gap

The analysis above indicates that even under favorable operating conditions there will likely be a significant need for subsidy. The study team investigated potential means for closing or reducing the gap.

Minimizing drayage costs. As noted earlier, drayage is a major factor in total operating costs. Drayage rates are primarily a function of time. The rate is determined by the number of trips a driver can make in an ordinary 10-11 hour driving day. Typical drayage costs in the Central Valley are about $75 per round trip, implying that drivers can ordinarily make 6-7 trip per day. Raising the average to 10 trips per day could cut the rate to $50 per trip. Typical Oakland drayage rates between rail and marine intermodal terminals are $70 per round trip, corresponding to about 7 trips per working day, or about 80-90 minutes for a round trip that covers less than five miles. The minimum cost scenario drops that cost to $35.

Balanced Container Loads. As the cargo statistics indicate, the export containers from the Central Valley greatly outnumber the import containers coming from Oakland. Every container that could be reused, however, would reduce two round trips to one and this reduce system costs. There are two opportunities to reuse empty containers, balance some of the rail shuttle movements, and remove additional container trips for the highway.

Transloading/Consolidation. Consolidation of multiple truck loads into fewer container loads at inland points would allow a CIRIS service to charge rates closer to the truck competition and reduce the subsidy gap.

Public Equipment Investment. Potential targets for public investment could include locomotives, rail cars, and terminal lift equipment.

Extension to Bakersfield Market. Bakersfield business would require significantly less subsidy that the other markets because of the higher truck rate ceiling. A minimum cost operation may actually yield net revenue. To serve the Bakersfield market, however, requires building an intermodal terminal, a multi-million dollar investment. There have been several private industry plans to build an intermodal facility in Bakersfield, but none has yet come to fruition.

Rail Investment Tradeoffs/ Statewide Initiatives. The scope for direct public investment in CIRIS service is limited because neither railroad is in clear need of additional capacity. Both railroads, however, do have significant capital investment and capacity needs elsewhere in California. A multi-jurisdictional or comprehensive public-private agreement for rail freight projects in California, however, could have great advantages to both parties and facilitate progress on many pending issues.

Incremental Rail Costing/Pricing. Where railroads are attempting to secure highly completive business, they may choose to exclude broader system costs from their calculations, price on an "incremental" basis, or accept lower margin contribution. They may also offer lower rates on some portion of a large customers' business in order to secure the whole volume. Railroads may also choose to price new business aggressively where they see it as a good "fit" with existing operations and flows.

"Short Line" Economics. In the course of this and other studies of short-haul rail economics and service potential the issue of "short line" operations and economics is often raised. The proposed CIRIS operation, however, does not appear to be a good candidate for short line operations. Absent public purchase of right of way and/or facilities, short line or independent operations do not appear to be a realistic option.

Public Line Purchase. This study did not explore the complex economics and politics of line purchase. There are numerous precedents for public purchase to protect freight service to major shippers and employers, or for commuter rail service. As ACE is already using the line and expanding service, there may be a common public interest rationale for line purchase.

Subsidy Options

Public financial support will be required for either a demonstration/pilot project or a long-term operation. This support might entail:

- Funding for facilities, improvements, or equipment
- Operating funds for a start-up or pilot period, and ongoing operations
- Tax credits or other indirect support for potential users

The final subsidy method and arrangement will probably depend on the source of the subsidy. The observations below address the more obvious subsidy issues.

Should there be operating subsidies, capital subsides, or both? Most likely, the best policy would be to use both methods in combination. Capital funding or in-kind support would be used for developing facilities, buying rail or lift equipment, or other non-operating uses. Operating subsidies would be required, regardless of how much capital was provided through public funds. The rail intermodal costs have a large and relatively fixed component of drayage and terminal expenses that would have to be offset by operating subsidies.

How should an operating subsidy work? There are two distinct ways of providing an operating subsidy: a block grant covering the provision of a rail shuttle service at a highway-competitive price for a fixed period, or a per-trip subsidy for each container movement diverted from the highway.

How should the subsidy be administered and processed? In either approach, there must be some method of accountability for container trips, loaded and empty, actually diverted from the highway.

Funding

There are a few current and pending examples of major public-private partnerships in freight rail transportation.

- The Mid-Atlantic Rail Operations Study (MAROPS) initiative is a public-private partnership involving three railroads (CSX, NS, Amtrak); five states (Maryland, Pennsylvania, New Jersey, Delaware, and Virginia); and the I-95 Coalition.
- The $2.4 billion Alameda Corridor rail project connects the ports of Los Angeles and Long Beach to the transcontinental rail network east of Los Angeles.

- The Chicago rail study now underway will likely recommend a $1+ billion public-private program to help solve critical rail constraints and community impacts in this major cargo hub.

The CIRIS project is not of the same scale as these examples, and entails operating subsidies more than infrastructure development. There are a number of other precedents for public-private freight cooperation with features related to the CIRIS proposal.

Federal Support. The Federal outlook is mixed, but appears to be improving.

- Freight rail intermodal projects are not currently eligible under the regular Federal-aid Highway programs (i.e. the National Highway System Program or the Surface Transportation Program).
- Rail intermodal freight projects are currently eligible under the CMAQ program if they demonstrate an air quality benefit. The CMAQ program allows capital grants or loans and operating subsidy for up to three years for public or private projects, but has rarely been used for rail intermodal freight projects.
- CIRIS operations would apparently not qualify for the High-Priority Projects Program in the TEA-21 reauthorization process.

State and Local Support. The State of California prohibits use of gas tax or CMAQ monies for non-highway projects, including a CIRIS operation. Local agencies in California have more discretion, but a CIRIS program would have to compete with passenger-oriented projects. Caltrans and other cooperating agencies were requested to develop a proposal for the Global Gateways Development Program. Goods movement projects such as CIRIS that provide significant mobility, economic, community, and environmental benefits could be eligible for loans. An option for local funding of CIRIS includes using the discretionary funds of the San Joaquin Valley Air Pollution Control District. CIRIS could qualify for funding with the discretionary funds of this agency based on the emissions effects of reducing truck vehicle miles traveled.

Port of Oakland Role. The Port of Oakland has been active in proposing funding for projects in the current reauthorization effort. The Port's proposals include two portions focused on the CIRIS concept, including an $8 million request for a pilot program.

Impact Analysis

The objective of the impact analysis was to relate the operating scenarios and volume estimates for pilot and long-term rail shuttle operations to expected impacts on traffic congestion and emissions in the affected regions. The primary focus is San Joaquin County and the connector routes to Alameda County. In order to conduct the impact analysis, Cambridge Systematics adapted the San Joaquin Valley Truck Model and Performance Measure Tools developed in Phase II of the San Joaquin Valley Goods Movement Study. Results of the impact modeling conducted by Cambridge Systematics indicate the potential for favorable impacts on emissions and delay. The diversion of heavy truck traffic results in freer vehicle flow, benefiting all vehicle classes. Auto traffic typically shows the greatest delay improvements due to the larger number of autos on the highways.

Four performance measures were used to evaluate different CIRIS configurations:

- Congestion (recurrent delay
- Reliability (non-recurrent delay)
- Safety (fatalities, injuries, and property damage)
- Emissions

Description of CIRIS Scenarios

Six scenarios were analyzed using the model. The following three CIRIS configurations were analyzed:

- CIRIS stops in Bakersfield, Fresno and Stockton
- CIRIS stops in Stockton and Fresno only
- CIRIS stops in Stockton only.

Each of these scenarios were analyzed under two usage conditions.

- A startup scenario was used to reflect CIRIS usage in the early phases of deployment of the rail shuttle.
- A mature scenario was used to reflect CIRIS usage once scale economies were reached.

There were thus a total of six scenarios. For the startup and mature scenarios, the percentage of the shippers assumed to use CIRIS was estimated by the commodity group. The three commodity groups are perishable food/farm products, non-perishable food/farm products and other products. Exhibit 17 shows the six scenarios and the percent market penetration by commodity group that were assumed for the model.

For each of the six scenarios, the truck trip table was altered to adjust for the headquarters bias that was present in the PIERS data, the truck trips removed due to CIRIS usage, and the truck trips added to the system due to drayage to the local intermodal hub.

Exhibit 17: CIRIS Scenarios Used for Model Runs

Scenario	Stops in			Deployment Scenario			
	Stockton	Fresno	Bakersfield	Phase	% Perishable	% Non-Perishable	% Other
1	X	X	X	Startup	5%	10%	15%
2	X	X	X	Mature	30%	45%	50%
3	X			Startup	5%	10%	15%
4	X			Mature	30%	45%	50%
5	X	X		Startup	5%	10%	15%
6	X	X		Mature	30%	45%	50%

Truck Trip Diversions

A major goal of the CIRIS concept is to divert truck trips from congested freeways. The exhibits below indicate that these diversions could be substantial in the mature scenarios.

Exhibit 18: 2003 Truck Trip Diversions

2003 Scenario	Stops in			Potential CIRIS Annual Container Volumes					
	Stockton	Fresno	Bakersfield	Phase	Perishable	Non-Perishable	Other	Total	Truck Trips
1	x	x	x	Startup	3,063	5,620	6,778	15,461	30,922
2	x	x	x	Mature	18,377	25,289	22,595	66,261	**132,522**
3	x	x		Startup	1,984	5,553	5,518	13,056	26,112
4	x	x		Mature	11,906	24,989	18,395	55,290	**110,580**
5	x			Startup	863	3,522	2,565	6,950	13,900
6	x			Mature	5,179	15,849	8,549	29,577	**59,155**

With continued cargo growth, the truck trips diverted could grow to 253,452 per year by 2020 (Exhibit 19), or just over 1000 truck trips (500 round trips) per weekday. The study team knows of no other proposal that would have this large an impact of truck traffic.

Exhibit 19: 2020 Truck Trip Diversions

2020 Scenario	Stops in			Potential CIRIS Annual Container Volumes					
	Stockton	Fresno	Bakersfield	Phase	Perishable	Non-Perishable	Other	Total	Truck Trips
1	x	x	x	Startup	7,020	12,881	15,536	35,437	70,874
2	x	x	x	Mature	42,120	57,963	51,788	151,871	**303,742**
3	x	x		Startup	4,548	12,728	12,648	29,924	59,849
4	x	x		Mature	27,289	57,275	42,162	126,726	**253,452**
5	x			Startup	1,978	8,073	5,878	15,929	31,859
6	x			Mature	11,871	36,327	19,594	67,792	**135,584**

Relative Performance of Each Scenario

The exhibits below summarize the impacts for the mature scenarios in 2003 and 2020. The tables show that there is a measurable difference between the performance of the entire system with and without the CIRIS alternatives.

Exhibit 20: 2003 Summary Mature Scenario Impacts

Market	Congestion (hours/day)	Reliability (hours/day)	Emissions ROG+CO+NOx (Tons/day)
Stockton-only	-734	845	-0.464
Stockton/Fresno	**-1346**	**2147**	**-0.715**
Stockton/Fresno/Bak	-1797	2964	-0.995

Exhibit 21: 2020 Summary Mature Scenario Impacts

Market	Congestion (recurrent delay)	Reliability (non-recurrent delay)	Emissions (ROG+CO+NOx)
Stockton-only	-1682	1937	-1.063
Stockton/Fresno	**-3085**	**4921**	**-1.639**
Stockton/Fresno/Bak	-4119	6794	-2.281

Implications. That the small volumes diverted at startup would have minimal impact is not surprising. The impacts of the mature scenarios are more encouraging.

- Measurable improvements would be expected in congestion (recurrent delay) and reliability (non-recurrent delay). The percentage improvements are small because port-related truck traffic is a small percentage of the relevant highway traffic to begin with. Improvements in emissions (Exhibit 105) should also be measurable. Again, percentage changes are small.
- Safety impacts would be positive, but small.

Net changes in emissions and safety are modest in part because the truck trips do not disappear from the system. Each round trip between a San Joaquin Valley location and the Port of Oakland is replaced by a round trip truck drayage move within the Valley, a 160+ mile rail round trip, and a round trip truck drayage move in Oakland. The net roundtrip reduction in truck mileage may be on the order of 100 miles. The favorable congestion and reliability impacts, however, result from taking those 100 truck miles off heavily congested freeways.

The impacts model highlights the advantages of serving both the Stockton/Modesto and Fresno markets.

Implementation Issues

The complexity of the roles and functions within intermodal transportation will pose a significant implementation challenge to the sponsors of a subsidized rail shuttle serving Central Valley markets.

Control Over Container Movements. Implementation issues are intrinsically tied to the question of control: Container shipments moved locally or regionally by truck are usually controlled by the customer (shipper, consignee, or third party), who chooses the drayman. Port-rail drayage is typically controlled by the ocean carriers, who choose the draymen, the rail option, and the railroad for those moves.

Risk and Commitment. While potential customers have expressed a willingness to try a shuttle service at rates 10% below existing drayage rates, none have committed to doing so and few control enough volume to justify a service by themselves (unlike long-haul double-sack services, where a single vessel call can fill a train). Above all, few potential customers are willing to accept additional risk or management responsibilities for a relatively small savings. The key to overcoming the risk barrier may be to secure base or threshold volumes from a combination of major customers.

Roles and Participants

Exhibit 22 displays the chief roles to be performed in a rail container shuttle service. Note that the roles are defined in terms of functions performed, and that many of the roles could be fulfilled by different participants depending on how the system was organized. In practice some of the roles may be combined. For example, if the sponsoring agency chooses to perform day-to-day management and customer service, then the "rail shuttle sponsor", "manager", and "intermodal marketing company" roles would be combined. If a drayage firm or terminal operator chose to manage the system, still other simplifications would be possible.

Exhibit 22: Rail Shuttle System Roles and Potential Participants

Role	Description	Potential Participants
"Rail Shuttle Sponsor"	Public, private, or public-private organization that develops, oversees, and subsidizes the shuttle system.	Caltrans, joint powers authority, council of governments
"Rail Shuttle Customer"	Tenders container to railroad for line-haul movement, pays rail invoice	Shipper, consignee, ocean carrier, drayman, IMC
"Manager"	Supervises door-to-door service, handles problems, resolves disputes	Shuttle sponsor, shipper, consignee, ocean carrier, drayman, IMC, terminal operator
"Terminal Operator"	Receives containers, loads and unloads rail cars, and chassis, interchanges equipment	Container depot operator, rail terminal contractor
"Railroad"	Operates trains, receives containers in interchange	Railroad (BNSF or UP)
"Intermodal Marketing Company"	"IMC" – provides marketing, sales, and customer service	Existing IMC, railroad, drayman
"Drayman"	Provides over-the-road trucking to/from intermodal terminals, interchanges containers	Drayman, rail terminal contractor
"Ocean Carrier"	Provides ocean container transport, interchanges containers	Steamship line, NVOCC

Incentives. A key issue throughout the implementation planning will be the incentives of the major parties. If the proposed pilot program or long-term operation is aligned with these incentives, the chances of success are much higher. Every party involved in intermodal transportation is interested in minimizing cost as long as the service meets their standards for transit time and reliability.

- Exporters can be roughly divided into shippers of low-value, cost-sensitive cargo (e.g. waste paper) and shippers of high-value, service-sensitive cargo (e.g. perishables). One group would be interested in a rail shuttle to save money; the other more concerned about transit time and cargo condition.

- Importers are typically more service sensitive, and are particular about the order and timing of deliveries.

- Truckers are under intense cost pressure and have difficulty recruiting drivers. Truckers contacted by Tioga are interested in a rail shuttle to control costs and keep drivers in the Valley. Truckers will not, however, jeopardize customer relationships.

- Ocean carriers reportedly subsidize trucking to and from the Valley, and would be interested in a rail shuttle if it saves them money without alienating the customer.

- Railroads are interested in new traffic and in public support, but also want to use their capacity to maximize long-haul traffic and revenue.

Pilot or Demonstration Programs. Most of the stakeholder acquainted with the CIRIS concept have envisioned a pilot or demonstration phase. The Port of Oakland has proposed $8 million in Surface Transportation Act funding for such a program beginning in 2004. Given the lack of experience with short-haul intermodal service and the implementation complexities cited above, a pilot or demonstration phase seems like a prudent course of action.

The purpose of a pilot program would be to:

- Verify the ability of the railroad and its terminal operators to maintain competitive service and reliability standards.
- Determine actual operating costs and explore system efficiencies.
- Test market acceptance without long-term funding.
- Enable drayage firms, customers, ocean carriers, and other participants to adjust to new operating methods.
- Establish a performance record and seek long-term volume commitments.
- Measure potential impact and evaluate the case for long-term subsidies.

Conventional manifest or intermodal service from existing facilities could be started quickly, but significant lead time will be required for a subsidized operation.

- There are few if any precedents for a freight operating subsidy, and no readily available mechanisms that could be easily adapted.
- Creation of a sponsoring organization, especially a joint powers authority, will require months of planning and negotiation.
- Railroads can move very quickly to establish new services when motivated, but may take much longer to implement new services in these uncommon circumstances. Railroads will be looking for a significant volume commitment that may be hard to secure.

A multi-year demonstration project would be ideal, but would entail substantial financial resources. A shorter period would probably be sufficient to establish a performance record and evaluate results. The seasonality of agricultural exports and holiday-driven imports, however, will affect short-term traffic levels depending on where the pilot starts and ends within the twelve-month shipping cycle. A key difference between a pilot program and a long-term operation is in the funding of capital items, notably rail equipment.

Scenario Evaluation

Although the analysis of detailed options is complex, the criteria for comparison and evaluation are fairly straightforward.

- The overall objective of the CIRIS concept is to take trucks off the freeways, with expected improvements in congestion, reliability, and emissions.
- The CIRIS concept is inherently regional, and both favorable impacts and the chances for broad support are increased in a regional approach.
- The most cost-effective means of achieving these goals is preferable.

A long-term perspective suggests evaluating the mature system options first, then choosing the best development path to reach the chosen end point.

Mature Scenarios

Exhibit 23 summarizes the cost, volume, and impacts of the three mature scenarios.

- The Stockton-only scenario minimizes the annual subsidy, but diverts lower volumes of truck traffic and offers relatively small improvements in congestion, reliability, and emissions.
- The Stockton-Fresno option costs more, due to the additional cost of serving Fresno and the much greater volume of traffic to be handled. The higher cost, however, yields much more favorable impacts due to the higher volume and the greater distance involved in the Fresno diversions.
- The three-market scenario has the most attractive potential economics, but cannot be regarded as a realistic near-term option. The Bakersfield market adds to the volume of truck that might be diverted, and adds to the potential revenue at the same time. The longer linehaul for the Bakersfield-Oakland route achieves more of the economies of scale inherent in intermodal transportation. Without existing facilities, however, it remains an theoretical alternative.

Exhibit 23: Scenario Cost-Effectiveness Comparisons

Mature Scenario	Minimum Annual Subsidy	Annual Volume	Unit Subsidy	Congestion (recurrent delay)	Emissions (ROG+CO+NOx)
Stockton-only	$ 4,545,232	29,577	$ 154	-0.06%	-0.06%
Stockton/Fresno	**$ 9,828,705**	**55,290**	**$ 178**	**-0.11%**	**-0.10%**
Stockton/Fresno/Bak	$ 6,835,939	66,261	$ 103	-0.14%	-0.13%

Accordingly, the Stockton/Fresno combination is the best practical option for a mature system within the limits of existing facilities. Eventual extension of the system to Bakersfield would be desirable should facilities be developed there.

Startup and Development

With the goal of developing mature Stockton-Fresno system, there are three routing options at startup:

- Stockton-only, with subsequent extension to Fresno
- Fresno-only, with a subsequent stop added in Stockton
- Stockton/Fresno, with the full route operating from the beginning

Exhibit 24 compares the startup phases. While the Fresno-only option appears cost-effective, it does not offer a regional solution.

Exhibit 24: Startup Phase Comparisons

Startup Scenario	Minimum Annual Subsidy	Annual Volume	Unit Subsidy	Congestion (recurrent delay)	Emissions (ROG+CO+NOx)
Stockton-only	$ 1,271,841	6,950	$ 183	0.00%	-0.02%
Stockton/Fresno	**$ 2,128,120**	**13,056**	**$ 163**	**0.00%**	**-0.05%**
*Fresno-only**	$ 2,922,145	6,106	$ 479	-0.01%	-0.05%

** Interpolated, no model run*

Operating the full route from the beginning offers several advantages, and is the recommended approach.

- Serving both markets from the beginning encourages joint sponsorship by agencies in both the Stockton/Modesto and Fresno regions.
- The two-market combination will begin generating measurable public benefits much sooner.
- The higher revenue from the Fresno traffic helps reduce the average subsidy
- The larger market potential will assist in evening-out seasonal and monthly traffic peaks.
- The additional volume will assist in reaching an economic scale and shortening the phase-in period.

I. Introduction

Seaports have always been more than simply locations where ships were loaded and unloaded. The commerce passing through seaports attracts a wide variety of warehousing, processing facilities, and ancillary services. As modern shipping and logistics practices have evolved, so have the functions associated with seaports. Modern seaport areas are home to facilities and functions ranging from small container repair yards to large sophisticated distribution centers and office buildings.

The "inland port" concept refers to the idea that some seaport facilities could be duplicated or complemented at inland locations, thus promoting economic development and logistics integration inland while reducing the demands on scarce space at the seaport. The concept is intuitively attractive as Oakland-area land values have risen, and warehousing and distribution facilities have sprung up in the Central Valley. San Joaquin County has become a focus for developments of this kind.

For several years the Northern California port and shipping community has speculated about the potential for a "rail shuttle" operation, a railroad train routinely moving containers back and forth between the Central Valley and the Port of Oakland. The idea of a rail shuttle has received favorable attention from transportation planners and legislators, but has not otherwise progressed beyond the concept stage. The rail service issue has become associated with the "inland port" concept, as a rail link is an intuitively attractive means of linking inland port facilities and functions with seaports, especially as highway congestion has increased.

Previous analysis of both the inland port and rail shuttle concepts has been mostly informal, although the Port of Oakland did commission a white paper from The Tioga Group on the broader topic of a *California Inter-Regional Intermodal System* ("CIRIS"). A second study sponsored by the Port of Stockton focused on the specific opportunities to utilize space at Rough and Ready Island for a rail shuttle or inland port facilities. A concurrent study sponsored by Caltrans has focused on the overall market potential for a Central Valley shuttle without delving into rail operating costs or related issues.

With new federal funding becoming available for intermodal projects, new interest in freight issues on the part of California state government, and ongoing debate over the designation of port lands in the Bay Area, the time is right to take the inland port/rail shuttle concept to the next level of analysis and potential implementation.

This study was sponsored by the San Joaquin Council of Governments (SJCOG) and undertaken by a study team consisting of The Tioga Group, Inc. (prime consultant), Railroad Industries, Inc. (rail costing subcontractor), and Cambridge Systematics, Inc. (impact analysis subcontractor). The findings and conclusions presented herein reflect the opinions of the study team, who likewise accept responsibility for any inaccuracies or need for corrections.

II. Inland Port Opportunities

Objective

The potential for development of "inland port" facilities and functions is major focus of this study. This chapter draws heavily on previous studies completed for the Port of Oakland and others to assemble a broad picture of inland port concepts and their applicability to San Joaquin Valley locations.

Containerized Shipping

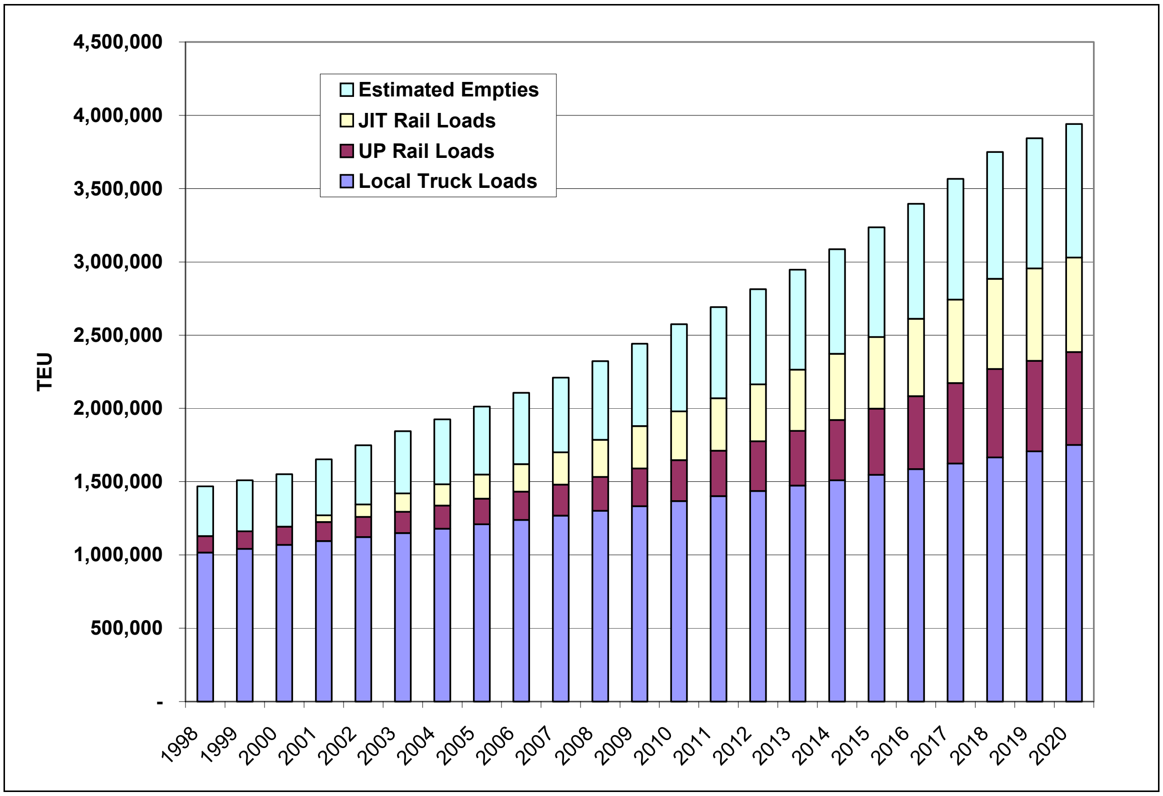
Until the late 1950s, general maritime cargo – merchandise and other goods not handled in bulk – was transported aboard ship in crates, barrels, boxes, pallets, and a variety of other packing methods largely unchanged from previous centuries. Cargo was loaded and unloaded using a mix of manual labor, ship's cranes, and dockside equipment. Longshoremen were primarily manual laborers, handling costs were high, damage and loss were frequent, and loading and unloading were slow.

"Containerized" marine cargo moves in sealed, standardized containers 20', 40', or 45' long. The standards for containers are set by the International Standards Organization (ISO), and marine containers are often referred to as "ISO" containers (or "boxes"). Interchangeability created through these standards allows cargo in containers to move from origin to destination via a mixture of road, rail, and marine movements ("intermodal" transportation).

There are also containers for domestic use, either 48' or 53' long, which are not ISO standard sizes. Domestic containers do not normally travel overseas, as they do not fit on standard container vessels. Marine (ISO) containers, however, are frequently used for domestic North American shipments, especially for "backhaul" traffic between Midwestern and eastern locations and the West Coast. Such shipments take advantage of the ocean carriers' need to return empty import containers to the West Coast. A significant volume of such shipments arrive in the San Joaquin Valley for unloading before the empty containers are returned to the Port of Oakland.

Exhibit 25 gives a recent Port of Oakland forecast for containerized cargo growth, averaging about 5% annually for the near future. The flow is a complex mixture of import and export loads and empty containers moving by rail and truck.

Exhibit 25: Port of Oakland Containerized Cargo Growth Forecast



Long-term cargo growth has put pressure on port facilities:

- Terminals are becoming space-constrained
- Gate queues are increasing
- Empty containers are clogging terminals
- Chassis logistics consume time and space

These conditions are prevalent at all West Coast ports. Existing terminals are primarily "wheeled" operations (containers parked on chassis) wherever possible, with empty containers and excess chassis stored on-dock. Where land is readily available and relatively inexpensive, this is a low-cost, high-performance system. As land becomes scarce and expensive, terminals will eventually have to shift non-essential functions off terminal – potentially to inland locations.

As marine container terminals have become busier and more crowded, they have outsourced more functions to off-terminal facilities. The refrigerated container depots in and near Oakland are a prime example. Preparing, maintaining, and repairing refrigerated containers was formerly done in the marine terminal. Steamship lines have found it more cost effective to shift this work to independent specialists. Once outsourced, it is unlikely that this work will be shifted back to the terminals, even if the terminals are expanded.

Inland Port Concepts

The idea of inland facilities linked to seaports has many potential interpretations. There are three basic parts to a marine container terminal:

- A quay/wharf/dock where containers are actually transferred by crane between vessel and shore.
- A container yard for storing, sorting, and staging containers.
- An entrance gate complex.

Of the three, only the working wharf with its cranes actually needs water access. The container yard occupies most of the actual terminal acreage of the terminal and is essentially a parking lot, and the gate controls the flow of containers on chassis into and out of this parking lot.

Containerization was a major breakthrough in marine transportation, enabling inland importers and exporters to operate independently of traditional dockside warehouses and handling. Information and communications advances, beginning with fax and progressing through electronic data interchange and web-based solutions, have liberated inland facilities and their managers from the slow flow of paperwork. Now, a Central Valley exporter can order, load, and seal a container of merchandise, book it on a specific vessel and voyage, and track it through to its ultimate foreign destination without leaving the local office.

The inland port concept covers a range of facility and functional possibilities for the San Joaquin Valley. For example:

- Facilities in the San Joaquin Valley could function as an inland port in the sense that shippers and consignees (receivers) might tender international traffic there, and move it by rail to Oakland, just as if they trucked it to an Oakland marine terminal. This approach would involve duplicating or complementing some of the basic seaport functions of receiving and delivering marine cargo.
- At a minimum, an inland port facility could be a dedicated intermodal transfer site – either separate or within and existing terminal – with regular, efficient shuttle service to and from the Port of Oakland
- Significant potential benefits to San Joaquin Valley communities from the inland port concept lies in the ancillary functions that ordinarily cluster around deep-water ports, but which might locate inland with a rail link to Oakland. This approach would leave the basic seaport functions in Oakland, but shift related functions inland.

Regional Development Linkages

The development of inland port functions in San Joaquin County is consistent with overall regional economic development trends.

- Despite the current slow economy, long-term economic growth of Northern California, the Bay Area, and the U.S. as a whole has fueled the demand for imported goods, a demand which is filled by traffic moving through Oakland and increasingly distributed from facilities in the San Joaquin Valley.

- Inland areas of California east of Oakland such as Sacramento, Stockton, Lathrop, and Modesto have traditionally exported large amounts of agricultural products through the Port. In recent years, these areas have emerged as high-growth centers for distribution of manufactured goods, in many cases serving all of Northern California or even the Western states, including imports through Oakland.

- The Port of Stockton has been a central focus for possible inland port functions, especially with the additional space and facilities available on Rough and Ready Island. Being a river port, the Port of Stockton also has US Customs representation, a Free Trade Zone, and other features shared with deep-water ports.

The *Port Services Location Study*, completed for the Port of Oakland by a Tioga Group team in 2001, defined a "hinterland loop" for the Port of Oakland (Exhibit 26) and noted:

- "Almost all of the 'market-based' trucking firms that serve the Port are located in these cities.

- Average asking rents are significantly lower in the hinterland, ranging from 64% of the Oakland average in Benicia to 49% in Stockton and Fairfield.

- Hinterland loop locations would likely be candidates for any non-core services that are land-sensitive rather than distance sensitive, including facilities served by rail shuttles."

The hinterland loop includes the Stockton/Modesto market defined in subsequent report sections. Asking prices for industrial space in the Stockton/Modesto area are 49% to 54% of typical Oakland figures, making the San Joaquin Valley an attractive alternative for businesses that require inexpensive space and that can be efficiently connected to the Port of Oakland.

Exhibit 26: Port of Oakland "Hinterland Loop"*

*Percentages shown are land rents relative to Oakland area

Exhibit 27 provides ranges of adjusted, location-specific construction costs from the Port Services Location Study.

Exhibit 27: Adjusted Site and Construction Costs

Corridor or General Area	Potential Location	Adjusted Cost/Sq ft
I-880 corridor south of Oakland	San Leandro, Hayward	**$65.92 - $81.17**
I-80 corridor north of Oakland	Vallejo, Fairfield	**$63.94 -$ 78.73**
238/680 corridor east of Oakland	Fremont, Milpitas	**$65.92 - $81.17**
I-5/Central Valley	Modesto, Stockton, Tracy	**$61.31 - $75.49**

Transloading and Consolidation

Ocean carrier rates typically apply to a full container, creating incentives for customers to maximize their use of container carrying capacity. This incentive creates opportunities for ancillary port functions.

The terms "transloading" and "consolidation" cover a wide range of cargo handling and logistics practices that have in common a reason to build up or break down full container loads of imports or exports. "Transloading" usually implies that shipments are transferred more or less intact between ISO containers and domestic vehicles. "Consolidation" usually implies that multiple domestic shipments become a single international container load, or vice versa.

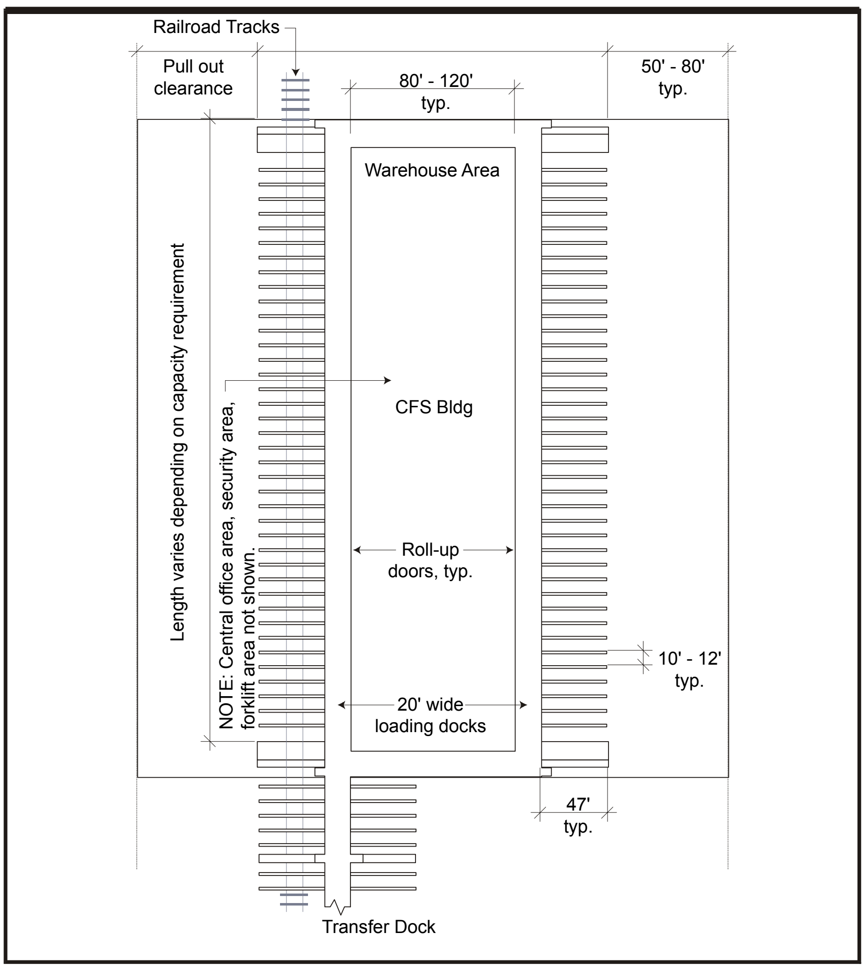
In fact, both practices blend into myriad variations to suit the individual circumstances of shippers and consignees. For example:

- Wal-Mart has, for many years, relied heavily on transloading to allocate inbound container loads of merchandise among multiple distribution centers.
- Imported frozen beef and exported frozen chicken are frequently transloaded to avoid the cost and complexity of moving refrigerated containers inland.
- New steamship lines in the US-Asia s have encouraged transloading to unload their containers faster on the West Coast rather than moving them to inland points, and because they typically have no inland rates or inland transport capabilities.

Transloaders often specialize in one or more major commodities. Specialized transloading operations in the Oakland area handle inbound frozen meet from Australia/New Zealand, outbound frozen poultry from Arkansas, export cotton from the Southwest, and export scrap paper from regional recycling collections.

A typical facility configuration is shown in Exhibit 28. The floor space typically ranges from 40,000 to 200,000 square feet.

Exhibit 28: Typical Consolidator or Transloader Facility



Transloaders and consolidators can also include:

Container Freight Stations. A Container Freight Station (CFS) typically stores cargo for a short period as its purpose is to transfer individual shipments between marine containers and domestic trucks. In the past, Container Freight Stations were often located within the marine container terminal and operated by Longshore labor. In the 1980s CFS facilities relocated nearer the port (Exhibit 29)while those within marine terminals were gradually phased out.

Exhibit 29: Independent Container Freight Station

Bonded Customs Warehouses. Imported goods must be "cleared" by Customs before the consignee can take possession. To be "cleared", the consignee or his agent (a Customs Broker) must complete electronic or paper forms, pay any applicable duties, and make the cargo available for inspection if required. Import shipments can be "bonded" and move "in bond" if a Customs Broker has posted a bond sufficient to cover any applicable duties. Once "bonded" a shipment can be moved inland or to a Customs Bonded Warehouse to await final clearance.

There are several other varieties of cargo-handling services, and few of the operators have single-purpose facilities. Most commonly, an operator starts out in one line of business and expands to others as opportunities arise. Some of the larger operators offer all of the above services, plus domestic warehousing, packing and crating, Customs brokerage, etc. Informal contacts with shippers, transloaders, and truckers of transloaded commodities suggest that concrete opportunities exist for development of such traffic in the San Joaquin Valley. There are numerous details involved, such as the availability of Customs inspectors for imports and USDA inspectors for food products. Rough and Ready Island at the Port of Stockton has many of the features such businesses will look for: existing low-cost facilities, rail carload access, a Free Trade Zone, and Customs representatives.

The Port of Oakland estimates that about 16% of its total volume is transloaded, consolidated, or otherwise undergoes intermediate handling. Based on the adjusted PIERS market data analyzed in detail later in this report, there would be roughly 21,121 annual transloaded containers in the relevant Stockton/Modesto and Fresno markets (Exhibit 30).

Exhibit 30: Estimated Transload Share of Rail Shuttle Market – Annual Loads

Market	Imports	Exports	Total	Transload Potential
Stockton	12,793	56,790	69,582	11,133
Fresno	5,210	57,216	62,426	9,988
Total	**18,002**	**114,006**	**132,008**	**21,121**

The Port of Stockton has several existing tenants engaged in transloading on Port property (e.g. *Keep On Trucking* and *Stockton Transmodal*). Most of these firms transfer freight between bulk and packaged modes, or between railcars and trucks. As land costs, labor cost, and trucking costs all rise, there may be significant opportunities to locate more such operations on Rough and Ready Island, and link them to the Port of Oakland by rail. In particular, lower transloading costs in the Stockton area could provide economic leverage to rail service that might otherwise be too costly compared to trucking.

As discussed elsewhere, "drayage" firms and drivers that provides local and regional trucking service for containers are typically paid by the trip, and have been unable to raise rates commensurate with the delays caused by increase congestion and marine terminal queues. As the productivity of Oakland trips has declined, drayage firms have had a harder time recruiting and retaining drivers for such business. Relocation of transloaders and consolidators to the San Joaquin Valley with a rail link to Oakland would free up driver and tractor time and increase driver productivity. This would be a hard-to-measure but nonetheless tangible reason for drayage firms to support inland port developments in San Joaquin County and a rail service to Oakland.

Heavy Commodities and "Overweights"

A major reason for transloading or consolidation is the opportunity to load an international container with more net weight than can be legally handled over the highway.

- Nominal highway gross weight limit in California is 80,000 lbs. To determine the weight of cargo or freight that can be carried without special permits or equipment, the "tare" weight of the truck tractor and container/chassis combination itself must be deducted from the overall limit. Typical tare weights for highway equipment are 32,000 to 35,000 lbs, leaving 45,000 to 48,000 lbs. of cargo capacity.

- Ocean-going containers have weight capacities based on their structural strength and tare weight. One the ocean, larger containers can carry greater weight, as shown in Exhibit 31, but their higher tare weight leads to lower highway capacities. The gap between ocean and highway carrying capacities creates the opportunity for efficiency through transloading and consolidation.

Exhibit 31: Container Ocean and Highway Capacities

ISO Container Size	Typical Tare Weight (Lbs.)	Typical Ocean Net Weight Capacity (Lbs.)	Typical Highway Net Weight Capacity (Lbs.)
Dry Cargo 20'x8'6"	5,030-5,490	39,380-47,880	51,500
Dry Cargo 40'x8'6"	6,460-8,380	58,820-60,070	48,000
Dry Cargo 45'x9'6"	8,550-9,280	63,520-64,2450	46,700

Since ocean rates are typically based on the containerload rather than the cargo weight, customers have an incentive to maximize the amount of heavy cargo they can pack into each container.

- For example, bagged export rice from northern Sacramento Valley can be loaded to a maximum of about 48,000 pounds in a 40' container or highway trailer (depending on highway equipment tare weight) and be highway legal (Exhibit 31). The container itself has a capacity of about 60,000 lbs. To obtain the advantage of the difference (roughly 12,000 pounds per unit), a transloader would transfer five highway truckloads (240,000 lbs in five 48,000 lb loads) into four ISO boxes (capacity 240,000 lbs), for a 5:4 ratio. The advantage is that the shipper pays for five highway trailers from origin to the port, but only four loads in international containers to overseas destination. Typical Central Valley export commodities consolidated in this fashion include wine, canned goods, animal feeds, and other agricultural products.

- For import shipments, the reverse can be true. For example, four import containers each loaded with up to 60,000 lbs of marble tile must be opened and their cargo split among five or more loads to be highway legal. The resulting loads may remain in ISO boxes or be shifted to domestic trailers.

Often the ratio of highway trailers to international containers is better than 5:4. It can be 4:3 or even 3:2 in some circumstances. Reaching a 3:2 ratio usually involves loading the international container over its rated gross capacity of 60,000 pounds. This is possible if the commodity has sufficient density (pounds per cubic foot) and the transloader violates the 60,000-pound maximum. Enforcement of the 60,000-pound maximum is nearly non-existent; hence, the practice of loading the containers in excess of 60,000 pounds is common.

As Exhibit 32 shows, the heavy commodities are overwhelmingly exports, and interviews confirm that about 70% of the transloading business is export commodities. The list reflects major Northern California agricultural production as well as frozen meat and poultry produced inland. There are firms that specialize in "legalizing" individual import loads (e.g. Italian marble tile, or steel manhole covers) which have been loaded too heavily for U.S. highway limits. These loads are typically "legalized" by splitting them into to two or more shipments.

Exhibit 32: Major Port of Oakland Heavy Commodities

Imports	Exports
Frozen meats	Frozen chicken, pork and beef
“Legalized” individual loads	Fresh vegetables (e.g. broccoli)
	Canned foods
	Wine
	Animal feeds (e.g. compressed hay cubes)
	Lumber & paperboard

Regulatory agencies can designate highway and surface street routes with higher weight capacities, so-called “overweight” routes. In the vicinity of the Port of Oakland, a network of such routes connects transloading and consolidation facilities to the marine terminals allowing legal movement of “overweight” containers.

The potential economic leverage of consolidation is illustrated in Exhibit 33. As rail costs (including drayage and lift) decline with volume, and consolidation ratios increase, the truck cost advantage declines, and can be offset by lower real estate and operating costs in the San Joaquin Valley.

Exhibit 33: Economic Leverage of Overweight Consolidation at Stockton

	Consolidation Ratio			
	1 to 1	5 to 4	4 to 3	3 to 2
Manifest Service, 20 units/trip				
Truck Cost	$250	$1,250	$1,000	$750
Rail Cost	$ 463	$1,852	$1,389	$926
Truck Advantage per Unit	$213	$120	$97	$59
Dedicated Service, 100 units/trip				
Truck Cost	$250	$1,250	$1,000	$750
Rail Cost	$ 434	$1,735	$1,301	$867
Truck Advantage per Unit	$184	$97	$75	$39

Some “overweight” containers are also transloaded to and from boxcars, such as export frozen chickens and import frozen beef and lamb. In these cases ocean carriers have an incentive to minimize inland trips for costly refrigerated containers on top of the rate incentives to shippers.

For actual operations over public roads, California size and weight laws require a special tri-axle chassis. Investment in tri-axle chassis is a limiting factor in the spread of this practice over public roads. The limiting factor on the handling of overweight loads in the San Joaquin Valley is the road network..

- The study team found no legal overweight routes to and from the BNSF and UP intermodal facilities. Options for the future include developing such routes or developing suitable transloading facilities adjacent to the intermodal terminals.

- Rough and Ready Island is entirely Port of Stockton property and the highway load limits do not apply. It would thus be possible for a shipper to bring in legal highway truckloads to a Rough and Ready facility, transload the cargo to a small number of ISO boxes, and use conventional chassis or even terminal "bombcarts" to position the "overweight" containers for rail loading on Rough and Ready Island. Rough and Ready is also ideally suited to transloading between boxcars and containers. This would, however, require separate rail intermodal service to Rough and Ready Island.

Empty Container Supply and "Urban Ore" Businesses

Rail costing for this study was conducted assuming that each export load required an empty container from Oakland and each import load generated an empty container to be returned to Oakland. The rail costs used in the comparisons are therefore all round-trip. If the need for empty movements can be reduced or rationalized, the rail cost can be reduced.

There are at least three possibilities for rationalizing empty container flows.

- **Using rail service to position empties at Stockton-area depots.** Ocean carriers may be able to use their negotiating position with the railroads to obtain favorable rates for moving empties to Stockton supply points.

- **Reusing import empties for export loads.** As the import traffic to Stockton/Lathrop distribution centers grows, an increasing number of international empties are generated in the Stockton area. At present, some truckers hold on to a handful of containers for potential reuse, but the effort is piecemeal and impact is small. If these empties could be turned in to a Stockton location and accumulated in significant numbers, truckers would reduce the need for empty returns to Oakland and gain a local source of supply.

- **Reusing westbound "backhaul" boxes.** Since the advent of double-stack rail service in the late 1980s, ocean carriers have offered empty containers to eastern and Midwestern shippers for "backhaul" westbound movements of domestic freight. The ocean carriers do so to reduce the cost of repositioning these boxes to west coast ports for eventual return to Asia. There is no data on the number of such containers that unload domestic freight and become empty in the Stockton area, but anecdotal evidence suggest the number could be substantial. (Union Pacific, for example, reportedly repositions 400-450 Pacer *domestic* containers from Lathrop each week.) To the extent that these containers could be organized at depots and tapped for export loads, the need to dray empties from Oakland would be reduced.

Each of these possibilities is an opportunity to reduce the total costs of moving containers by rail between the Central Valley and Oakland, and an opportunity to improve Central Valley container supply.

The latter consideration is particularly important for many potential new San Joaquin Valley businesses. Empty container supply is a key factor in encouraging “urban ore” export businesses such as waste paper, recycled plastic, and scrap metal. (Exhibit 34).

Exhibit 34: “Urban Ore” Exports

In the course of interviews with Northern California businesses of these kinds, it became apparent to the Tioga team that the ready availability of suitable ISO boxes is a major consideration in locating these businesses and in turning a local supply of waste products into containerized exports. Moreover, several of these firms expressed an interest in Central Valley locations as alternatives to high-cost Bay Area sites or as business expansion opportunities. To the extent that depots or other arrangements in the San Joaquin Valley can insure a supply of empty containers, such businesses would be more inclined to locate there.

Container Depots

Although empty ISO and domestic containers are parked at a number of locations in the Stockton area ranging from trucking facilities to dirt lots, there are no established container depots in the San Joaquin Valley. Container depots have three major functions: storing containers that are currently surplus, acting as a supply point for empty containers, and servicing/repairing containers under contract.

- Container depots need inexpensive space away from sensitive residential and commercial development, where the Central Valley has an advantage.
- The availability of a container depot could be major step in encouraging reuse of empty containers, as discussed above.
- A local container supply would encourage the development of consolidation and transloading operations, such as waste paper exports.
- Were the container depot to become a source of “pre-tripped” refrigerated containers as well as dry vans, truckers could drastically reduce the need to dray pre-tripped such containers from Oakland.

Refrigerated container depots service, maintain, and store refrigerated (“reefer”) containers. At present, about 18% of Oakland’s tonnage is in refrigerated containers, primarily fruit and vegetables and meat and poultry. Existing reefer depots are centrally located in Oakland and serve multiple freeway corridors and regional markets. There are two sets of truck trips associated with reefer container depots:

- movements between depots and marine terminals, and
- movements between depots and inland or port area customers.

Reefer depots also typically store containers for longer periods (e.g. more than a week and up to several months) between peak season demands, or while awaiting repair or disposition. Longer-term storage does not have the same need for port proximity, and more closely resembles the storage of dry containers without routine servicing or frequent truck trips. While splitting the current business of reefer depots would be awkward and may increase costs slightly, the bulk of the longer-term storage functions could be relocated farther from the Port.

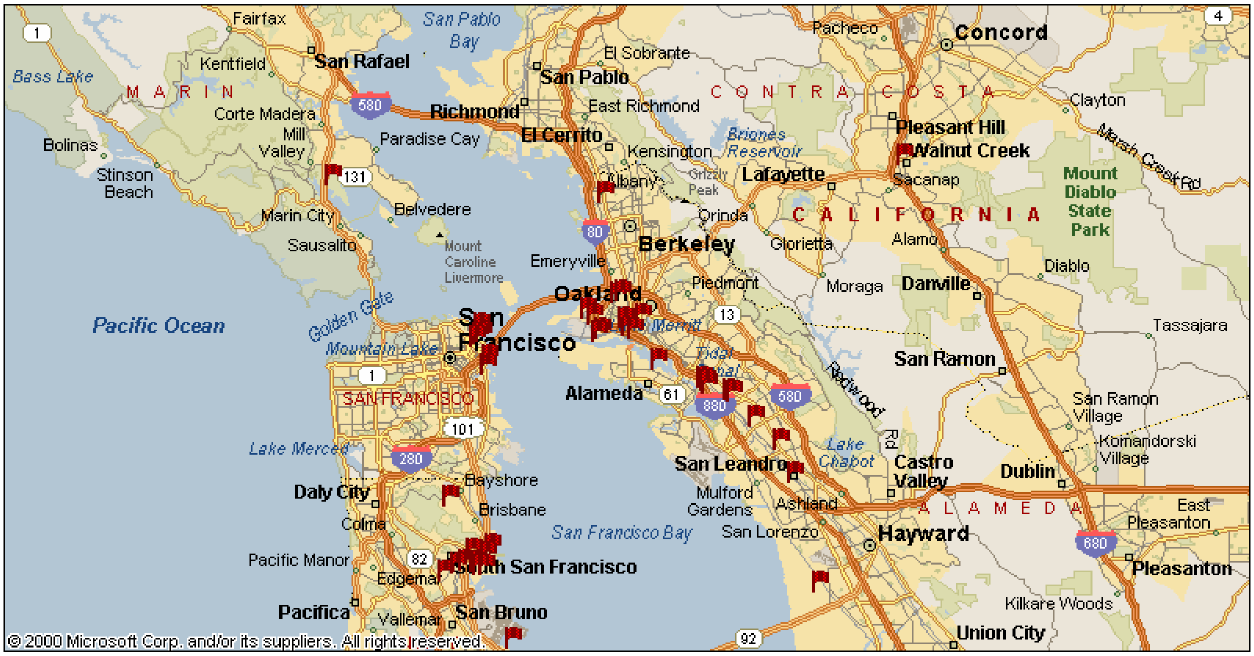
Reefer containers are heavily insulated ocean-going boxes with refrigeration equipment. The power supply for refrigeration is either a portable diesel-powered generator (“genset”) that can travel with the container or electrical power from a fixed outlet in a container yard. Reefer containers are used for produce, meat, dairy products, frozen foods, and other import or export commodities requiring refrigeration or temperature control. These commodities are sensitive, so the containers must be clean, in good operating condition, and often chilled before loading. Collectively, the activities required before loading are called “pre-tripping.” After the container is loaded, the container may be returned to the depot to adjust the operation, make repairs, add controlled-atmosphere gasses (often nitrogen), or maintain the generator set that supplies mobile electrical power.

In the past, all these functions were typically performed in the marine terminal. Off-terminal reefer container depots emerged to perform these functions more efficiently, conserve terminal space, and give truckers more flexible access to reefer services. Existing reefer depots are all centrally located close to the port and serve multiple freeway corridors and regional markets.

Existing Bay Area Cargo Handling Services

For the *Port Services Location Study*, Tioga assembled a database of existing off-port Bay Area cargo handling facilities (Exhibit 36). These include many firms that handle both marine and air cargo, and still others that combine several cargo-related functions under one roof. As the map below shows, these firms are spread throughout the Bay Area, some at significant distances form the port or the airport.

Exhibit 35: Bay Area Cargo Handling Facilities



Each location entails opposing locational tendencies.

- Facilities closest to the Port of Oakland are likely to be under the greatest pressure from rising space costs and restrictive zoning, and may have reasons to relocate. To the extent that such facilities benefit form proximity, however, they may be reluctant to leave.
- Facilities farther from the port may be under less cost pressure, but have already moved part of the way "inland" and distanced themselves from port facilities.

The list in Exhibit 36 therefore most likely represents a mix of good and poor candidates for relocation.

Most of the services identified in this study have relatively little capital investment in their properties or facilities, adding to the ease of relocation inland.

- Drayage firms need only modest office space and parking, and many intentionally operate from portable office buildings to make expected relocations easier.
- Transloaders need generic loading docks and warehouse space, but most of the equipment they use (e.g. forklifts, pallet trucks) is portable.
- Most other cargo handlers are in similar positions, although those requiring refrigerated space are much less flexible.

Exhibit 36: Bay Area Cargo Handling Facilities

Name	Address	City
Pacific Coast Container / Direct Delivery	70 Washington Street	Oakland, CA
Straight Forward Global Corp	302 Toyon Avenue	San Jose, CA
P.W. BELLINGALL, INC.	580 WASHINGTON STREET,	SAN FRANCISCO, CA
Seamodal Transport Corp. - CA	475 14th Street, Suite 220	Oakland, CA
Expeditors International of Washington Inc.	578 Eccles Ave	So. San Francisco,, CA
HOYT SHEPSTON INC	700A DUBUQUE AVE	SO SAN FRANCISCO, CA
Marine Air Land Intl Services	3777 Depot Road Suite 418	hayward, CA
R.S. EXPRESS, INC	1218 B 7TH STREET	BERKELEY, CA
Boland Container Freight Station	Maritime & W.Grand	Oakland, CA
INTERNATIONAL TRIAX, INC.	915 66TH AVENUE	OAKLAND, CA
PACIFIC COAST CONTAINER	2099 SEVENTH STREET	OAKLAND, CA
PACIFIC COMMODITIES	1749 MIDDLE HARBOR RD	OAKLAND, CA
Tighe Drayage Co.	205 Channel Street	San Francisco, CA
West Coast Ship Chandlers Inc	2665 Magnolia St	Oakland, CA
Pacific Coast Storage	6401 San Leandro St	Oakland, CA
DYNASTY FREIGHT CONSOLIDATOR, INC.	400 FORBES BLVD	SO. SAN FRANCISCO, CA
La Xpress Assembly	4909 Tidewater Ave	Oakland, CA
Island Cargo Consolidators Inc	1700 24th St	Oakland, CA
American Pride Consolidators	855 San Leandro Blv	San Leandro, CA
Dynasty Freight Consolidator	400 Forbes Blvd # 4	South San Francisco, CA
Eagle Cargo Consolidators	1 S Linden Ave	South San Francisco, CA
US Group Consolidator Inc	1600 Gilbreth Rd	Burlingame, CA
Fastbreak Consolidators Inc	6550 Goodyear Rd	Benicia, CA
Cobalt Consolidators	21468 8th St E	Sonoma, CA
Southwest Consolidators	2300 Bethards Dr # O	Santa Rosa, CA
Container-Care Alameda	1523 Buena Vista Avenue	Alameda, California
Global Intermodal Systems	400 High Street	Oakland, CA
TRANS PACIFIC CONTAINER SERVICE CORP	2800 7TH ST	Oakland, CA
Triple B Forwarders	2976 Alvarado St # K	San Leandro, CA
Commodity Forwarders	299 Lawrence Ave	South San Francisco, CA
Air-Sea Forwarders Inc	216 Harris Ct	South San Francisco, CA
Hi-Tech Forwarder Network Inc	1801 N California Blvd	Walnut Creek, CA
Endo Freight Forwarders Inc	126 Starlite St	South San Francisco, CA
H C & D Forwarders Intl	1849 Bayshore Hwy # 101	Burlingame, CA
Apollo Forwarders Inc	509 1st St	Rodeo, CA
Holy Spirit Freight Forwarders	87 S Main St	Milpitas, CA
J L Henderson & Co	2533 Peralta St	Oakland, CA
Marine Marketing Of Ca	4721 Tidewater Ave # C	Oakland, CA
P C Tax Free	727 Kennedy St	Oakland, CA
Schou-Gallis Co	2533 Peralta St	Oakland, CA
Cargo One	220 Montgomery Street	San Francisco, CA
Dedola International	343 El Camino Real	So. San Francisco, CA
DEKA ASSOCIATES, INC	ONE CLARENCE PLACE	SAN FRANCISCO, CA
Global Transportation Services, Inc.	255 Harbor Way	South San Francisco
IMPEX SERVICES	50 CALIFORNIA ST	SAN FRANCISCO, CA
KUEHNE & NAGEL, INC.	150 WEST HILL PLACE	BRISBANE, CA
Nissin International Transport U.S.A., Inc.	490 Carlton Court	South San Francisco, CA
R.F. INTERNATIONAL, LTD.	1818 GILBRETH ROAD	BURLINGAME, CA
Topman Express	655 Redwood Highway	Mill Valley, CA
Orient Reefer Services	1749 Middle Harbor Road	Oakland
Reefer Depot #1	1650 32nd St	Oakland
Reefer Depot #2	Wood St.	Oakland
Reefer Depot #3	Poplar & Mandela Pkwy	Oakland
HARBOR REEFER SERVICES	1035 7TH ST	Oakland
CONNLL BROS. CO. LTD.	345 CALIFORNIA ST.	SAN FRANCISCO, CA
AFA SERVICES, INC.	707 2ND STREET	Oakland
Lynn Import/Export Services	707 2nd St	Oakland
Mutual Express Company	1700 West Grand Avenue	Oakland
Pacific Transload Services	737 Bay St	Oakland
Unicold	500 Ferro Street	Oakland
Chipman Freight Svc	1700 Ferro St	Oakland
Container Freight	250 Bataan St	Oakland
Pacific American Svc	9401 San Leandro St	Oakland
RINEHART'S TRUCK STOP #2 SCALE SERVICE	1107 5TH ST	Oakland

III. Trucking Costs and Market Access

Trucking cost factors

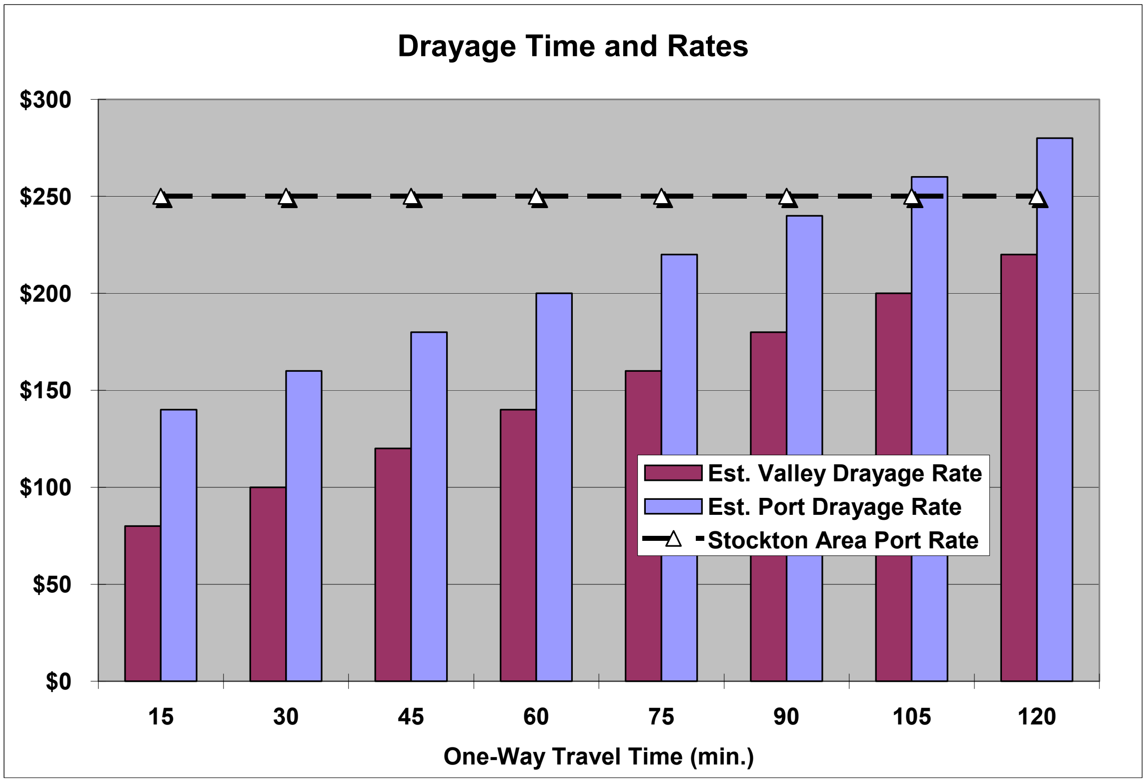
All loaded international container traffic between the Port of Oakland and the Central Valley is currently moved by truck over the highway. Trucking costs and service characteristics set the competitive standard for any future rail shuttle operation. "Drayage" – the movement of containers by truck – is both the competitor to a rail shuttle and an essential part of a door-to-door intermodal service. Because of its importance to market access and service economics, drayage was given extensive analysis by itself. The study team used underlying costs, a simplified drayage rate model, and information from regional drayage firms to estimate drayage rates for Central Valley intermodal terminals versus a truck trip to Oakland.

The vast majority of truck drivers in the drayage industry are independent contractors who own the tractors they drive, with only a few being employees of the drayage companies. Independent contractors are ordinarily paid a share of the drayage fee, usually about 70%. They are paid by the loaded move, not by the mile or the hour, and are usually not paid separately for moving empties. Empties are usually supplied or returned as part of the loaded movement assignment.

Drayage costs are determined primarily by the time required and how many productive trips a driver can make in a working day, with distance a secondary consideration. Exhibit 37 shows estimated rates for driving times from Stockton ("Valley drayage") and Oakland ("Port drayage"). For Stockton, the estimates allow 1 hour at the customer's site and 30 minutes at the Central Valley site. For the Port of Oakland, however, the calculations allow 2 hours at the marine terminal, more typical of current conditions. For any given driving time, it costs roughly $60 more to serve the Oakland marine terminals due to the longer waiting time. All of these times vary widely, with anecdotal reports of port terminal waits ranging from 15 minutes to six hours.

The prevalent current rate between Stockton and Oakland is $250, which on the chart corresponds to a realistic one-way driving time of 90 to 105 minutes.

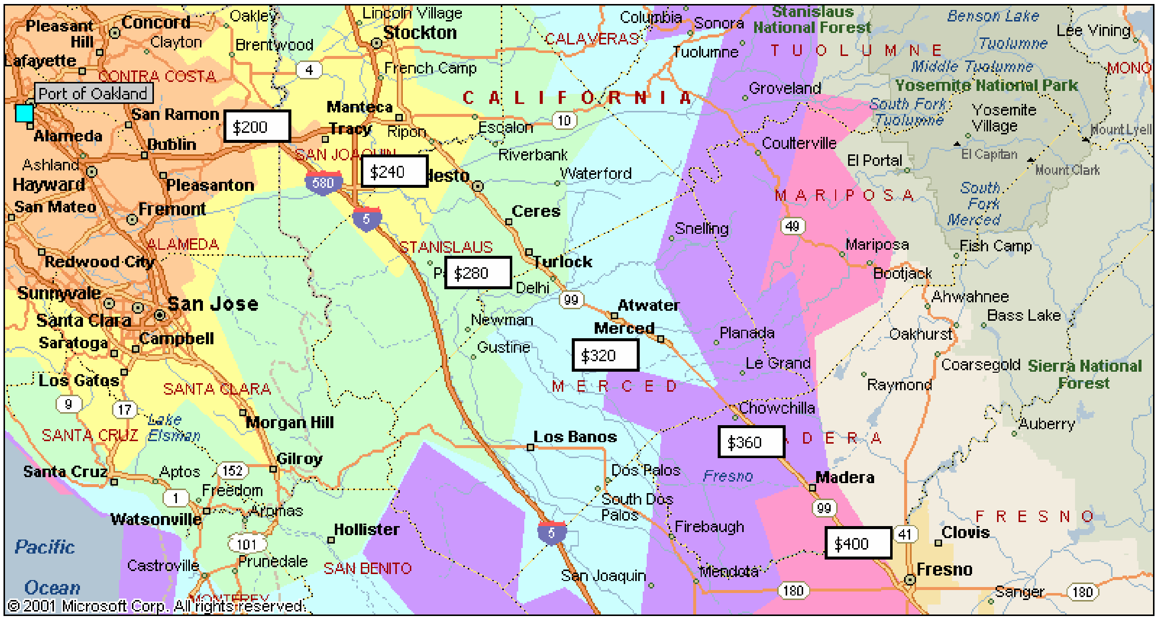
Exhibit 37
Drayage Rates vs. Travel Time



I-580 Corridor

The map below (Exhibit 38) shows estimated drayage rates for progressively longer driving times in the I-580 Corridor. These estimated rates correspond reasonably well to actual rate examples obtained in interviews.

Exhibit 38
Port Drayage in the I-580 Corridor



A comparison of estimated I-580 Corridor drayage rates from the Port of Oakland and Stockton yields the results below (Exhibit 39). Actual drayage rates are typically rounded to the nearest $5 or $10, and often applied to a wide area. Drayage to Stockton is advantageous for the area north of Stockton and south of Sacramento (e.g. Lodi and Galt). Stockton's advantage is minimized at Tracy, since Tracy is between Stockton and Oakland. Moving down US 99, the margin is almost constant until Madera. At Madera and points south, trucks from Oakland can use I-15/SR 152 through Los Banos to minimize the margin.

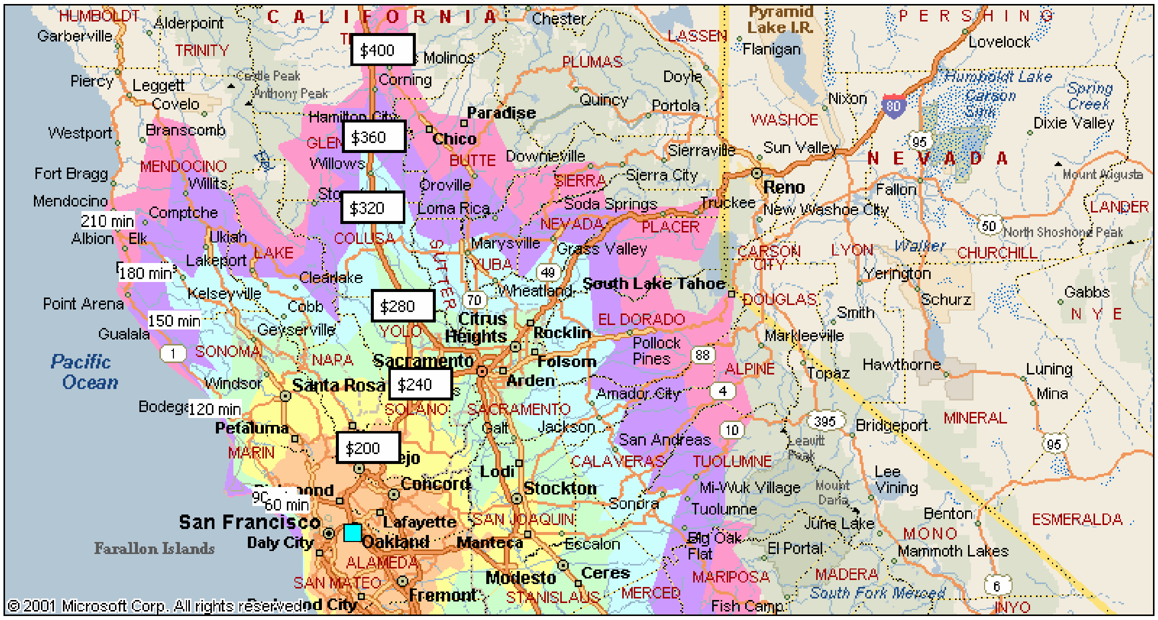
Exhibit 39
I-580 Corridor Drayage Comparison

City	Port of Oakland Est. Minutes	Port of Oakland Est. Rate	Stockton Est. Minutes	Stockton Est. Rate	Stockton Advantage
I-580 Corridor					
Lodi	100	$253	26	$95	$159
Galt	105	$260	31	$101	$159
Stockton	81	$228	na	na	na
Tracy	63	$204	30	$100	$104
Manteca	72	$216	22	$89	$127
Ceres	102	$256	53	$131	$125
Turlock	107	$263	57	$136	$127
Atwater	126	$288	76	$161	$127
Merced	136	$301	86	$175	$127
Madera	181	$361	127	$229	$132
Fresno	203	$391	153	$264	$127
Visalia	234	$432	197	$323	$109
Tulare	237	$436	200	$327	$109

I-80 Corridor

As the map below (Exhibit 40) suggests, the I-80 corridor is less advantageous for Stockton.

Exhibit 40
Port Drayage in the I-80 Corridor



West of Sacramento (e.g. Davis, Vacaville, Fairfield) any advantage diminishes rapidly (Exhibit 41).

Exhibit 41
I-80 Corridor Drayage Comparison

City	Port of Oakland Est. Minutes	Port of Oakland Est. Rate	Stockton Est. Minutes	Stockton Est. Rate	Stockton Advantage
I-80 Corridor					
Vacaville	61	$201	85	$173	$28
Fairfield	54	$192	80	$167	$25
Davis	85	$233	72	$156	$77
Sacramento	94	$245	54	$132	$113
Woodland	91	$241	71	$155	$87
Yuba City	140	$307	103	$197	$109
Chico	197	$383	159	$272	$111
Redding	218	$411	209	$339	$72

Implications

Exhibit 39 and Exhibit 41 show the estimated cost of drayage between a Stockton facility and various points in the Central Valley market, and the differences between the Oakland and

Stockton estimates (the “Stockton Advantage”). These two figures have important implications for the economics and feasibility of a rail shuttle service.

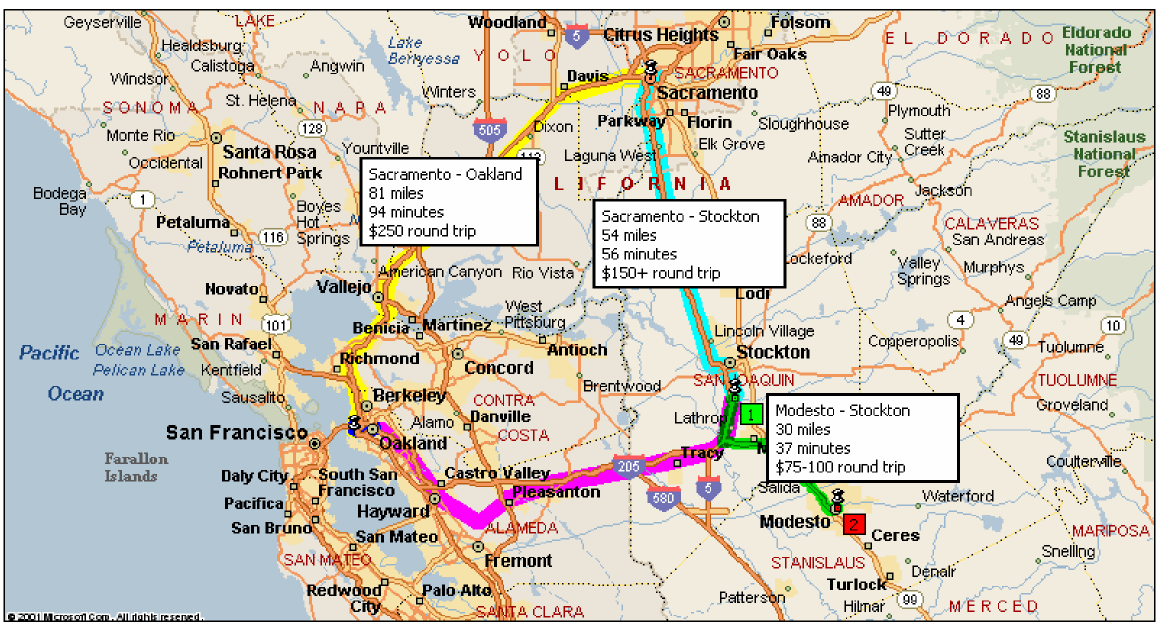
- The cost of drayage is a key determinant of overall rail shuttle operating cost. As volume rises, unit rail linehaul costs decline due to economies of scale. Drayage has no appreciable economies of scale, and becomes a larger portion of total cost as unit rail costs decline. *The cost of drayage will therefore determine the size of the market accessible for any given overall cost.*

- The “Stockton advantage” shown in the tables offsets a portion of the rail shuttle cost and therefore determines in part the level of subsidy necessary to meet or undercut over-the-road drayage rates.

Sacramento Market

Sacramento traffic is trucked down I-80 to Oakland, and would require a non-competitive triangular movement through Stockton (Exhibit 42). The higher cost of drayage between Sacramento and Stockton would give a rail shuttle operation a practically insurmountable handicap. There are no intermodal facilities in the Sacramento market from which to base a rail operation. The Sacramento market was therefore determined to be outside the accessible market boundaries for a Central Valley rail shuttle.

Exhibit 42: Sacramento Market Access

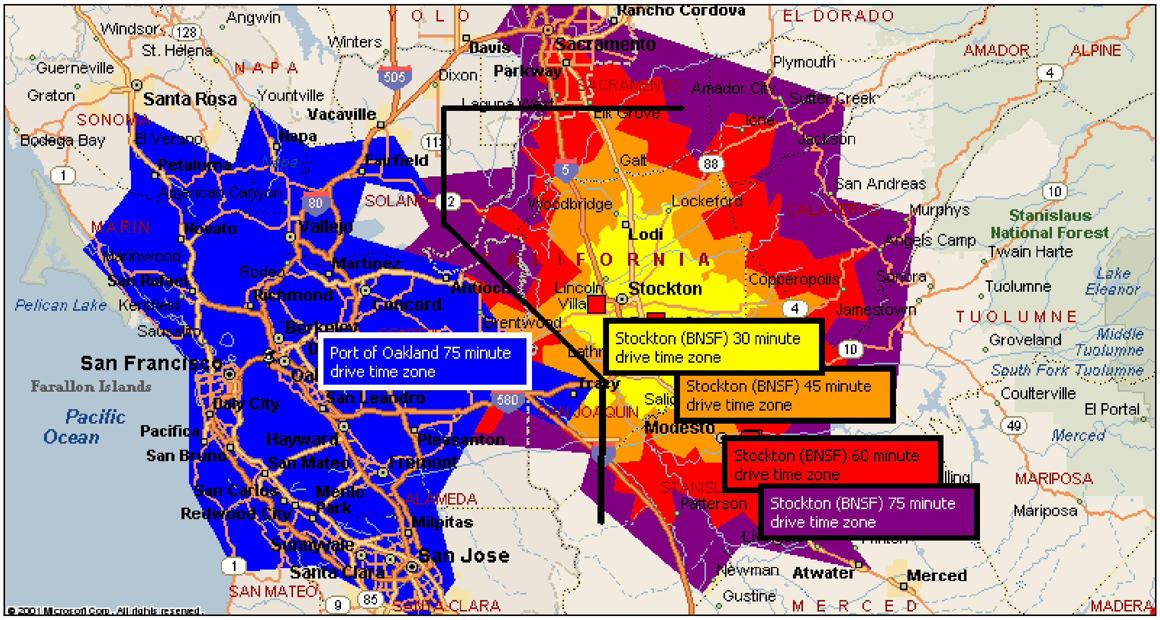


Stockton/Modesto Market

Exhibit 43 compares the 30, 45, and 60-minute drive time limits for the BNSF Stockton intermodal terminal with the 75-minute limit for the Port of Oakland. The Port of Oakland has a long reach along Interstate 205, with areas west of Tracy being effectively equidistant to

Oakland and Stockton. Experience with customers in the Interstate 205/580/5 triangle east of Tracy indicates that traffic from this area would be virtually impossible to divert to rail. The heavy line shown in Exhibit 43 thus forms the western and northern boundaries of the Stockton-Modesto market area for potential rail traffic. In practical terms, these boundaries enclose the primary shipping locations in San Joaquin and Stanislaus Counties.

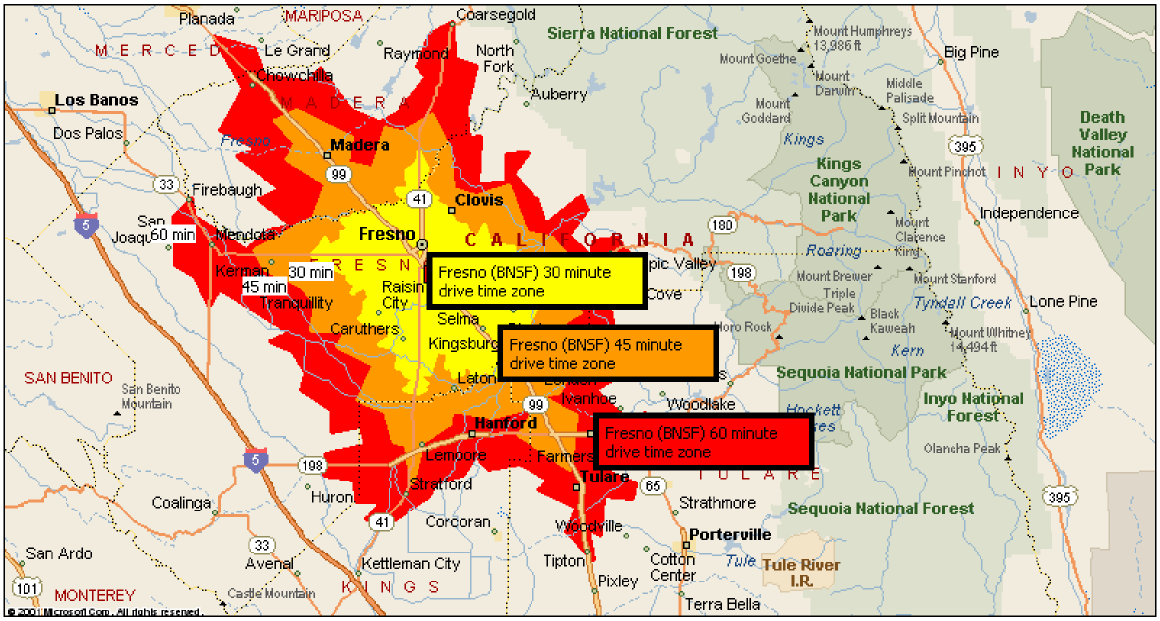
Exhibit 43
Oakland versus Stockton Market Access



Fresno Market

Exhibit 44 shows the 30, 45, and 60-minute driving time rings around the BNSF intermodal terminal in Fresno. (The UP "paper ramp" where customers can drop off or pick up trailers is adjacent, so were it converted to an active loading facility the drive time rings would be largely unchanged.) The boundary covers most of Fresno and Madera Counties, the northern portion of Tulare County, a northeastern corner of Kings County, but very little of Merced County.

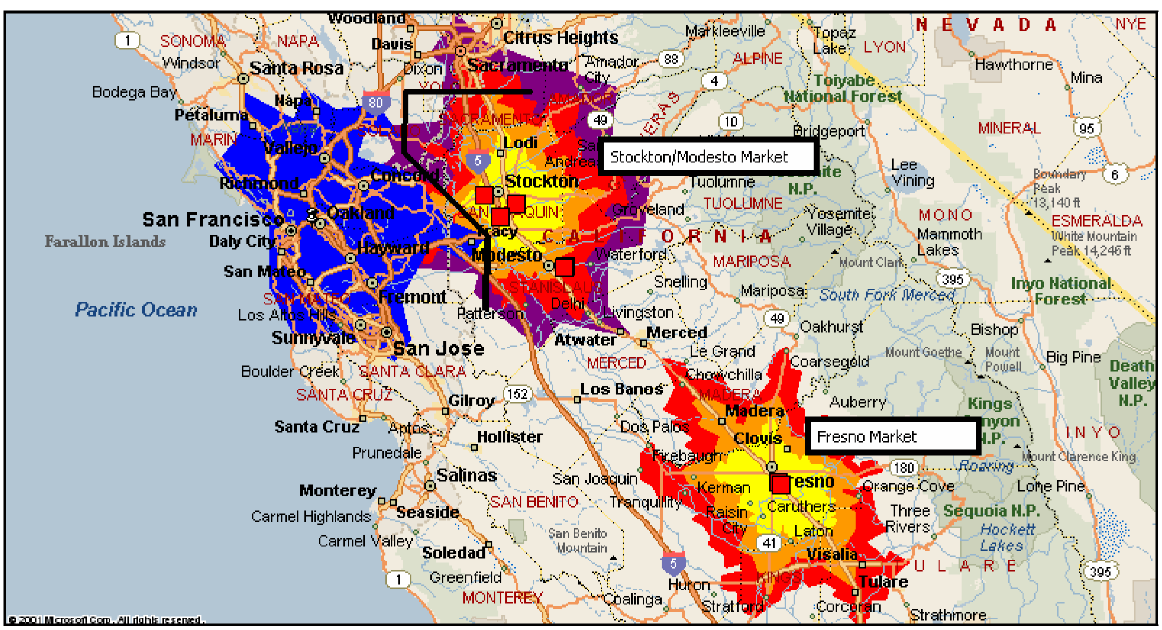
Exhibit 44: Fresno Market Access



Regional Market Access

Exhibit 45 shows the combined Stockton/Modesto and Fresno market boundaries, with the heavy black line indicating the western and northern limits of the accessible Stockton/Modesto territory. These boundaries are converted to county boundary equivalents in the Market Analysis and converted to equivalent Zip Codes for use in the Impact Model.

Exhibit 45: Regional Market Boundaries



Intra-Oakland Drayage

The intra-Oakland drayage cost is part of the intermodal "handicap" that must be overcome by movement economics or subsidy to make rail costs competitive with truck.

Any rail shuttle operation will require drayage between an Oakland intermodal facility (BNSF or UP) and the port marine terminal. According to Port of Oakland sources, this cost is typically about $70 round-trip. As noted earlier, drayage costs are determined primarily by time. As the distance between the port-area facilities in Oakland is minimal, the intra-Oakland drayage cost is driven almost exclusively by the time spent in marine and rail terminals

Some sources suggest that drayage costs in Oakland can be driven down lower – as low as $35 per round trip – under the most favorable circumstances, including expedited treatment at marine terminal gates. Accordingly, the rail cost analysis includes a "low dray" possibility for the Oakland segment.

Drayage Trends

Despite the growth in congestion and the persistent driver shortage, drayage rates have remained almost static over the last 5-10 years. Drayage is a highly competitive business, and has few barriers to entry. Ocean carriers typically buy drayage strictly on the basis of price, with new entrants undercutting existing rates to gain share. Tioga was told by several sources that there was upward pressure on drayage rates between the Central Valley and Oakland, but no near-term rate increase appears to be likely.

There are multiple offsetting trends in drayage.

- Growing highway congestion and marine terminal gate queues have significantly reduced driver productivity on port trips. Drayage firms typically try to generate daily revenue of $400-500 per driver/tractor, so as the number of trips per day declines the rate per trip would rise. Until the last few years, Central Valley drayage firms could rely on drivers making three daily round trips to the Port of Oakland. Currently, however, drivers can make two round trips at best, and frequently wind up with one-and-a-half revenue trips (requiring a non-productive bobtail trip back to the Valley). The alternative is a "long-short" combination, with a driver making one round trip to/from Oakland and a shorter round trip within the Valley or closer to Oakland.

- The Lowenthal Bill restrictions on marine terminal truck queues have resulted in the adoption of terminal appointment systems as an alternative to large terminal fines. The systems will begin implementation in July 2003, and should reduce the delay to drayage drivers serving the Port. In particular, effective appointment systems should reduce the likelihood of unanticipated delays and non-productive bobtail trips.

- Recent changes to Federal hours-of-service regulations will let drayage drivers drive 11 hours per day rather than 10. Although the full scope of change is complex and will require trucking firms to adjust operating practices to take full advantage of the change, the net impact will be slightly greater driver flexibility and reduced upward rate pressure.

- Looming regulations on chassis roadability will likewise reduce the frequency of unanticipated delays, in this case delays due to chassis problems.

The favorable trends will blunt the impact of growing congestion but are unlikely to lead to lower drayage rates. More likely, the favorable trends will help postpone pending rate increases.

Drayage Opportunities

To achieve material reductions in current drayage rates, the rail shuttle system would have to materially increase the productivity of drayage drivers. “In-house” drayage by an ocean carrier or terminal operator subsidiary in Oakland could reduce the need for gate transactions between rail and marine terminals at the Port. The current typical $70 round-trip rate is determined mostly by the time spent in the terminals or the gate queue, since the distance between terminals is less than two miles and takes only a few minutes. To reduce that rate, the system would have to cut the terminal and gate times. As noted earlier, lower rates have reportedly been achieved in favorable circumstances. The barriers to be overcome are primarily institutional rather than technical.

IV. Market Analysis

Approach

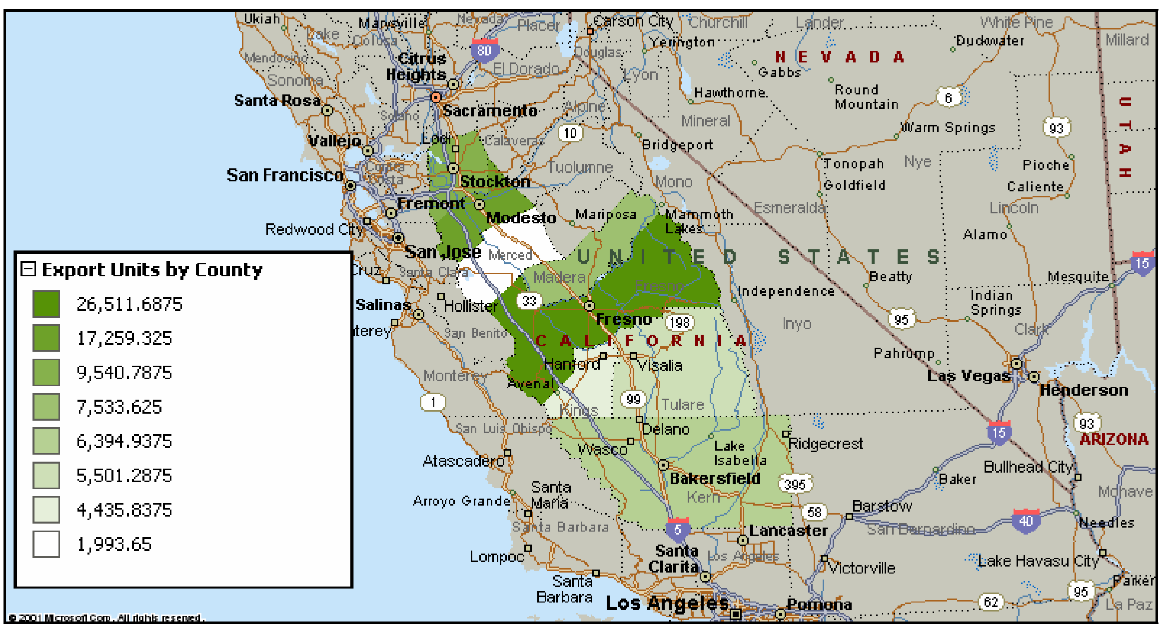
Shipment volume is the key to the economics of a rail shuttle, its attractiveness to the railroads, and its potential public benefits. The team's market analysis supplemented available market data with interviews.

Market Distribution

The Central and Southern San Joaquin Valley market for containerized cargo moving though Oakland is grouped around the major population centers. Although most of the exports are derived from agriculture, the shipping points are in the cities.

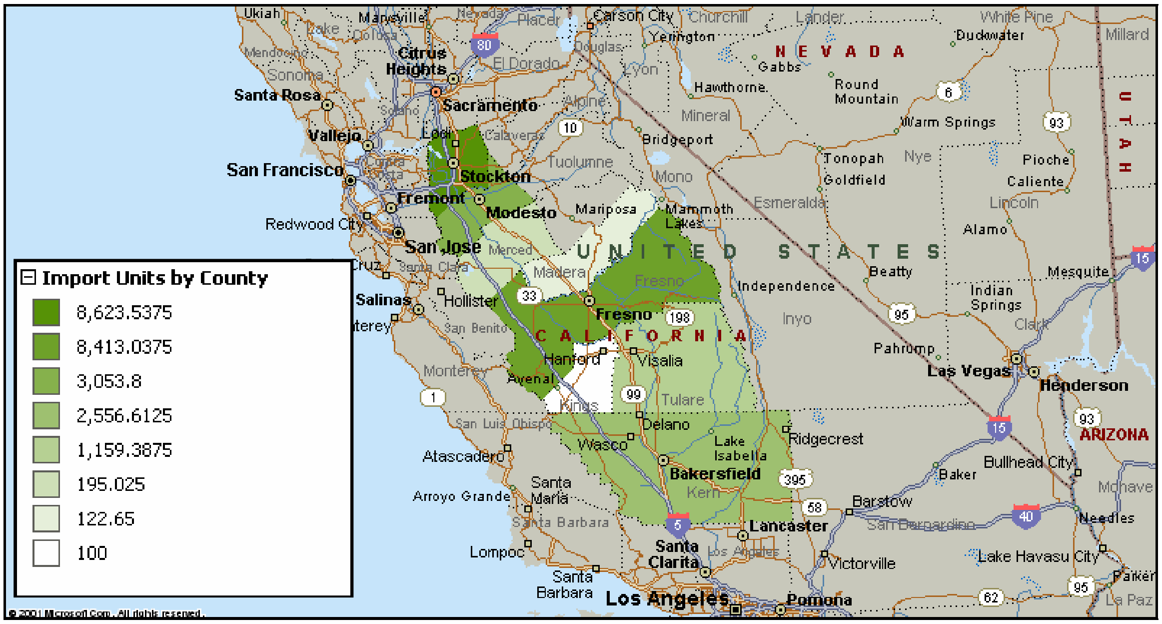
As Exhibit 46 suggests, San Joaquin and Stanislaus Counties together form a distinct market, which in this report is referred to as "Stockton/Modesto". There is reportedly very little cargo *shipped* from Merced County, despite the existence of some underlying production there, leaving a gap between the two larger markets. Likewise, there is a second market cluster around Fresno including much of Madera and Tulare Counties. A third, smaller cluster is centered in Bakersfield.

Exhibit 46: Exports By County



The import pattern is basically the same, although the volumes are much smaller (Exhibit 47). There is a cluster of warehousing and distribution activity in the Stockton/Lathrop areas of San Joaquin County, and a second in the Beard Industrial Tract in Stanislaus County. These facilities serve not only Valley customers, but regional and national customers as well. The next cluster is in Fresno County, serving the San Joaquin Valley itself, with relatively little import activity in Merced, Madera, King, or Tulare. Finally, the southernmost cluster is in Kern County.

Exhibit 47: Imports by County



This market analysis and the rail costing scenarios in this report follow this general grouping. The Stockton/Modesto and Fresno markets are the major focus. The Sacramento market is estimated and analyzed, but was found to be largely inaccessible to a competitive rail shuttle service operating from the Stockton area. The Bakersfield market was likewise estimated, but found to be relatively small and is effectively eliminated from near-term consideration by the lack of an active intermodal terminal in the area.

Correcting for the PIERS "Headquarters Bias"

PIERS (Port Import Export Reporting Service) data are the standard source for information on inland distribution and origins of international containerized cargo. PIERS data, however, are derived from Customs declarations and are biased toward "headquarters" addresses where Customs paperwork originates rather than actual shipping and receiving points. For example, year 2002 PIERS data show 83,488 Twenty-foot Equivalent Units ("TEU") of exports shipped and 12,612 TEU of annual imports received in San Francisco, mostly in the financial district.

To begin correcting for the PIERS headquarters bias, Tioga compiled names and locations for the largest Port of Oakland "headquarters" shippers and obtained contact information from Port of Oakland marketing staff. Extensive telephone interviews were conducted to determine:

- Is this office the actual shipping/receiving location? If not, where do they actually ship and/or receive? If they have more than one location, what approximate share is handled at each?

- Do they import or export under other names or are there multiple firms under one roof?
- What are the major commodities handled? Some are brokers - do they have a specialty? Can they confirm a rough overall annual total volume?
- How does their cargo get to Oakland? Truck, rail? Containerized? Loose?
- Are any of their major commodities routinely transloaded or consolidated? Are any of them "overweights" in the sense of being over normal highway limits and needing either triaxle chassis or special overweight routes to the port?
- Have they ever looked into Central Valley consolidation or transloading facilities? If so, what are their thoughts?
- Do they have any other pertinent insights?

Responses were mixed in the level of cooperation and the useful information. Enough information and insight was gained, however, to reach some overall conclusions.

- Most of the major "headquarters" *exporters* are brokers who either arrange transportation for actual shippers or consignees, or who broker and ship the commodity itself.
  - The largest export commodity is waste paper, which originates all over Northern California, including the Central Valley, but is billed from a few office locations in Marin County. Some is trucked loose to Oakland for transloading.
  - Non-refrigerated fruits and nuts are the second major commodity group, and virtually all originate in the Central Valley despite being billed through San Francisco and Oakland offices.
  - Many perishable exports are billed through San Francisco, the East Bay, and San Jose, but actually originate in growing and processing areas.
  - Animal feeds and hay originate in the Central Valley as well as in nearby states, but are billed through offices in the East Bay. Some is transloaded in Oakland.
  - About half of the exporters contacted would be interested in competitive rail service from the Central valley.
- The "headquarters" *importers* are more often wholesalers, distributors, trading companies, and other intermediaries bringing in processed foods, wine, beer, and other commodities that are warehoused and sorted in the Bay Area before shipping elsewhere.

Accordingly, Tioga adjusted the raw PIERS data as follows:

- Perishable food and farm exports (e.g. fruits and vegetables) reportedly originating in the SF Peninsula, San Jose, and the East Bay were prorated among the remaining California markets.

- Non-perishable food and farm exports (e.g. animal feed, processed foods) reportedly originating in the SF Peninsula and the East Bay were likewise prorated among the remaining California markets.

- Within Other exports, waste paper and forest products shown as originating in Marin County were prorated among the other California markets.

- No changes were made to the import data.

Exhibit 48 shows the original PIERS data (summarized across all commodities) and the impact of the adjustments. With the "headquarters" exports data, the SF Peninsula and the East Bay were the largest exporting markets, and the North Bay (including Corte Madera) ranked with the major Central Valley markets. Most of these exports were redistributed to the inland markets.

Exhibit 48: PIERS "Headquarters" Adjustments

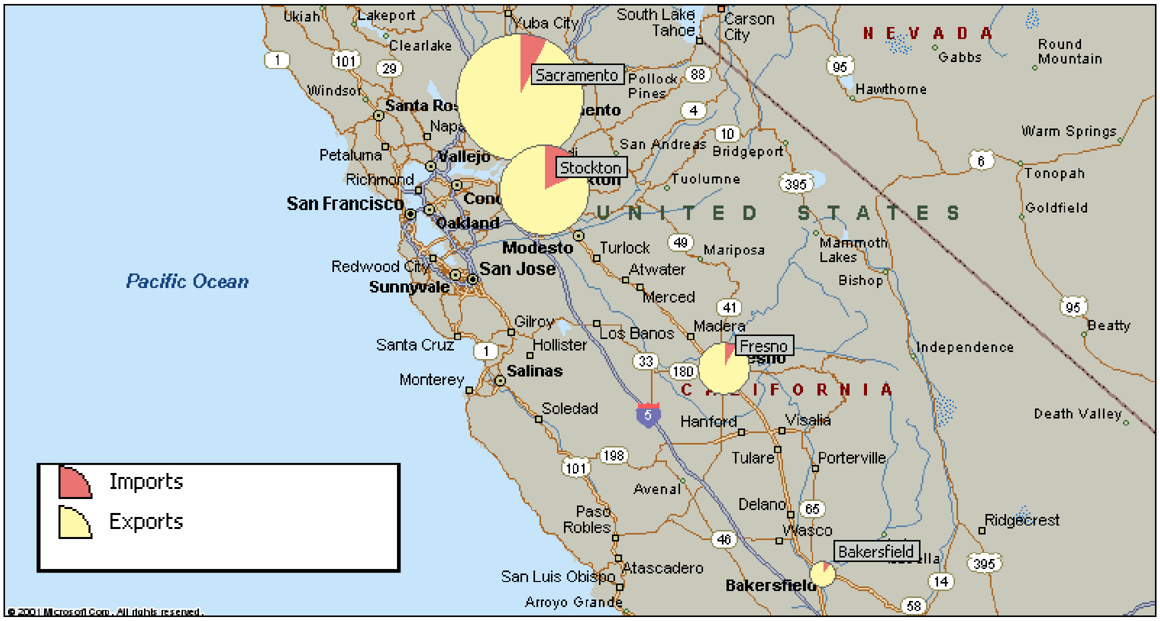
	Exports		Imports		Total		Share of Total	
Market	**PIERS**	**Adjusted**	**PIERS**	**Adjusted**	**PIERS**	**Adjusted**	**PIERS**	**Adjusted**
Bakersfield	16,503	27,054	3,582	3,582	20,085	30,636	3%	4%
Chico	3,859	7,081	2,650	2,650	6,509	9,730	1%	1%
East Bay	104,356	71,611	63,059	63,059	167,415	134,670	23%	19%
Fresno	**34,726**	**57,216**	**5,210**	**5,210**	**39,936**	**62,426**	**6%**	**9%**
Modoc	4	6	314	314	318	320	0%	0%
North Bay	34,240	10,492	15,305	15,305	49,544	25,797	7%	4%
North Coast	3,539	6,365	3,180	3,180	6,719	9,545	1%	1%
Redding	2,125	2,647	187	187	2,312	2,834	0%	0%
Sacramento	36,242	67,920	5,172	5,172	41,414	73,092	6%	10%
Salinas	20,001	36,298	2,608	2,608	22,609	38,906	3%	5%
San Jose	11,410	9,879	14,161	14,161	25,571	24,041	4%	3%
SF Penninsula	107,127	51,162	191,480	191,480	298,607	242,643	41%	33%
Stockton-Modesto	**31,003**	**56,790**	**12,793**	**12,793**	**43,796**	**69,582**	**6%**	**10%**
Tahoe	620	1,229	414	414	1,034	1,643	0%	0%
Total	**405,770**	**405,770**	**320,114**	**320,114**	**725,884**	**725,884**	**100%**	**100%**

This adjustment is only an approximation, as numerous individual exceptions exist to the rules-of-thumb used above. Further refinement would require considerably more time and effort and would only be justified by a need for detailed marketing efforts.

The adjustments that were made did, however, result in substantially higher estimates of the export market for the key market territories, as shown in Exhibit 50. Redistribution of the "headquarters" exports nearly doubled the Stockton-Modesto and Fresno market area container volumes.

The geographic distribution of the market is shown in Exhibit 49. The Sacramento market has the largest total, but is not practically accessible. The Bakersfield market, as indicated, is relatively small and distant.

Exhibit 49: Geographic Market Spread



The marked import/export imbalance is also apparent in Exhibit 49. The vast bulk of Northern California imports are destined for the SF Peninsula or the East Bay, either for local consumption or forward distribution to other markets. Exhibit 50 shows that Stockton/Modesto exports outnumber imports by over 4 to 1. In the Fresno market the ratio is over 10 to 1. As discussed later, this imbalance leads to the need for more round-trip container movements.

Exhibit 50: Estimated Market Volumes, Annual Containers (at 1.6 TEU/Container)

Market	Exports		Imports		Total	
	PIERS	Adjusted	PIERS	Adjusted	PIERS	Adjusted
Stockton-Modesto						
Perishable Food/Farm	9,289	16,895	369	369	9,658	17,264
Non-Perishable Food/Farm	16,655	33,852	1,369	1,369	18,024	35,221
Other	5,059	6,043	11,055	11,055	16,113	17,098
Subtotal	31,003	56,790	12,793	12,793	43,796	69,582
Fresno						
Perishable Food/Farm	12,289	22,352	72	72	12,361	22,424
Non-Perishable Food/Farm	9,621	19,554	756	756	10,377	20,310
Other	12,816	15,311	4,381	4,381	17,197	19,692
Subtotal	34,726	57,216	5,210	5,210	39,936	62,426
Accessible Rail Shuttle Market	**65,729**	**114,006**	**18,002**	**18,002**	**83,731**	**132,008**
Bakersfield						
Perishable Food/Farm	11,597	21,093	475	475	12,073	21,568
Non-Perishable Food/Farm	120	243	424	424	544	667
Other	4,786	5,718	2,682	2,682	7,468	8,400
Subtotal	16,503	27,054	3,582	3,582	20,085	30,636
Sacramento						
Perishable Food/Farm	9,534	17,341	277	277	9,812	17,618
Non-Perishable Food/Farm	22,287	45,299	905	905	23,192	46,204
Other	4,420	5,280	3,990	3,990	8,410	9,271
Subtotal	36,242	67,920	5,172	5,172	41,414	73,092
Other Central Valley Markets	**52,745**	**94,974**	**8,754**	**8,754**	**61,498**	**103,728**

Market Service Requirements and Penetration Scenarios

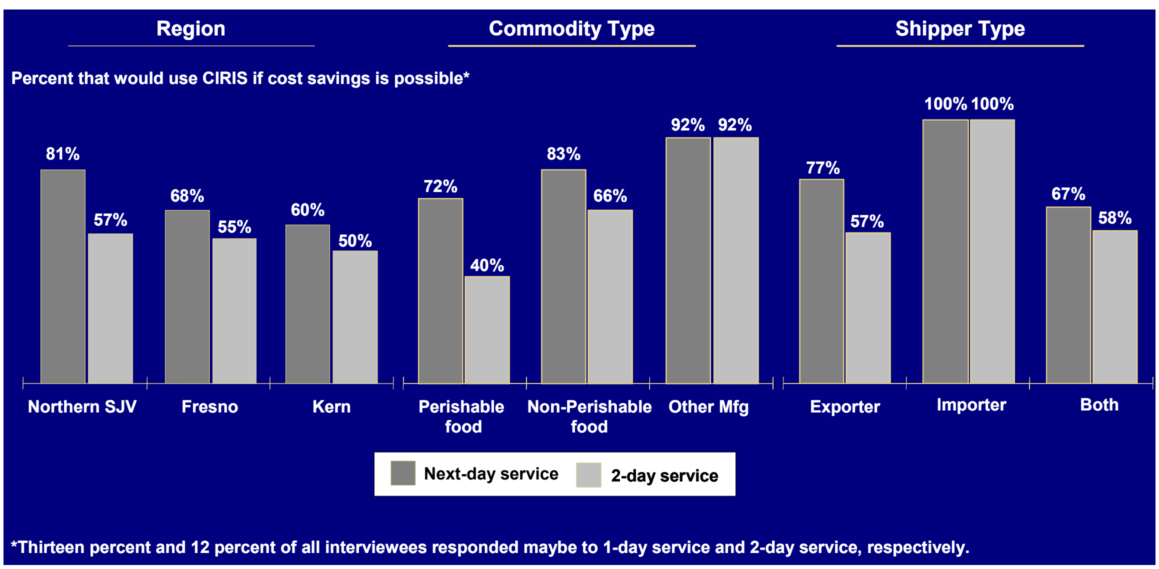
The California Inter-Regional Intermodal Service (CIRIS) rail shuttle concept would link Central Valley marine container cargo markets and inland port facilities with the Port of Oakland. Market conditions and preferences dictate CIRIS rail shuttle service requirements and the potential penetration of the market defined above.

Service Requirements

The governing service requirements for a CIRIS operation are the arrival and departure windows on both ends of the trip, not the transit time in hours or minutes. Exporters are generally concerned about being able to meet a chosen vessel departure schedule and prefer to ship in the afternoon. Importers are interested in getting a specific container from a specific vessel at the chosen time, which may be hours or days from vessel arrival, and usually prefer to receive shipments in the morning.

Findings from interviews conducted by Cambridge Systematics in the San Joaquin CIRIS Study indicate substantial market interest in the CIRIS concept if cost savings are possible, as shown in Exhibit 51. In all cases, a majority of the respondents would be interested in a next-day service, and in most cases (excepting the Other commodities and importers, which are closely correlated) a next-day service would be significantly more attractive than a two-day service.

Exhibit 51: Market Interest Findings



Not surprisingly, the perishable food shippers are the most critical customers while the importers of Other commodities are the easiest to satisfy.

Current service standards for trucking vary depending on market and time window. Driving times to/from Oakland are typically 1.5 to 2 hours at Stockton or Modesto, 3 to 3.5 hours at

Fresno, and 5-6 hours at Bakersfield. Marine terminals are typically open from 7:30 AM to 4:30 PM. These times and circumstances create the following trucking "windows."

- At Stockton and Modesto, the earliest an import container can be delivered on the same day is about 9:30 AM. For earlier deliveries the container must be pulled from the marine terminal on the previous day and stored overnight. Likewise, the latest an export container can be pulled from a Stockton/Modesto location for delivery to the marine terminal the same day is about 2:30 PM. Later export shipments must be held overnight and delivered to the marine terminal the next morning. Thus, for a large part of the business, the trucking service is effectively "next-day."

- At Fresno, the earliest an import container can be delivered on the same day is about 11:00 AM. For earlier deliveries the container must again be pulled from the marine terminal on the previous day and stored overnight. Likewise, the latest an export container can be pulled from a Fresno location for delivery to the marine terminal the same day is about 1:00 PM. Later export shipments must be held overnight and delivered to the marine terminal the next morning. Thus, for much, perhaps most of the Fresno business, the trucking service is effectively "next-day."

- At Bakersfield, the earliest an import container can be delivered on the same day is about 1:00 PM. The latest an export container can be pulled from a Bakersfield location for delivery to the marine terminal the same day is about 10:00 AM. Later export shipments must be held overnight and delivered to the marine terminal the next morning. Thus, for most of the Bakersfield business, the trucking service is effectively "next-day."

These considerations in addition to the strong preferences shown for next-day service dictate a next-day standard for a CIRIS operation. The next-day standard would be met by offering an overnight service.

- For westbound exports, "cutoff' times for Valley departure points would be 6-7 PM, allowing customers to ship up to 5-6 PM in the evening. Actual train departures would be 2-3 hours later. The containers would be available at Oakland intermodal terminals by about 6 AM, allowing ample time for drayman to arrive when marine terminal gates open.

- For eastbound imports, the "cutoff" time at Oakland would also be 6-7 PM, allowing time for truckers to interchange containers that may have been pulled from marine terminals earlier in the day and parked nearby, as well as the last containers being drayed directly from marine terminal gates. Actual train departures would be several hours later if one train was making a round trip, or sooner if there were a train in each direction. Containers would be available by 6 AM at Valley intermodal terminals for early morning delivery.

In addition to suiting shippers and consignee preferences and shipping windows, an overnight schedule has the advantage of avoiding most of the rail passenger operations (Amtrak *Capitals* and *San Joaquins*, or ACE trains over Altamont Pass) the occupy the rail lines during the day.

Market Penetration and Scenario Volumes

Estimates of potential market penetration necessarily involve informed judgments.

The market share attracted by mature intermodal services nationwide ranges from a few percent in shorter, densely traveled corridors to over 50% in long-haul corridors such as Chicago-Los Angeles. Moreover, the larger intermodal market shares are driven by international container flows tendered by large ocean carriers, not by piecemeal traffic tendered by individual shippers and consignees. Rule-of-thumb markets shares are about 15% overall, with 40% an ambitious goal. Within that broad range, the largest shares are achieved in non-perishable traffic for which service standards are less critical and which do not require the on-board or independent power supplies needed for refrigerated containers.

Based on theses conceptual observations, the study team postulated the market shares shown in Exhibit 52 for use in impact modeling scenarios.

Exhibit 52: CIRIS Market Penetration Estimates

Service Phase	Perishable Food/Farm	Non-Perishable Food/Farm	Other
Startup	5%	10%	15%
Mature	30%	45%	50%

When applied to the market size estimates shown in Exhibit 50, these market penetration figures yield the annual loaded container volumes shown in Exhibit 53. Six scenarios are shown: startup and mature phases for three different market service combinations.

Exhibit 53: Potential Annual CIRIS Loaded Container Volumes

Scenario	Stops in			Potential CIRIS Annual Container Volume				
	Stockton	Fresno	Bakersfield*	Service Phase	Perishable Food/Farm	Non-Perishable Food/Farm	Other	Total
1	x	x	x	Startup	3,063	5,620	6,778	15,461
2	x	x	x	Mature	18,377	25,289	22,595	66,261
3	x	x		Startup	1,984	5,553	5,518	13,056
4	x	x		Mature	11,906	24,989	18,395	55,290
5	x			Startup	863	3,522	2,565	6,950
6	x			Mature	5,179	15,849	8,549	29,577

* conceptual only, no current Barkersfield terminal

The PIERS data analyzed earlier cover only loaded containers. While there are exceptions, the majority of containers used for Central Valley exports are drayed empty from Oakland, and the majority of import containers unloaded in the Central Valley are drayed back to Oakland empty. Although this practice appears inefficient, it reflects the commercial and operational realities.

- The import and export volumes are drastically imbalanced. There are nowhere near enough import containers emptied in the Central valley to meet the export need. (Although some are supplied by *westbound* ocean containers that have been reloaded with domestic goods for Central Valley locations.)

- Containers belong to individual ocean carriers, and are rarely interchanged. Even leased containers are ordinarily kept within individual steamship line operations while on lease. Thus, an empty import container from carrier A is of little use to a customer seeking to export goods via carrier B.

- Steamship lines charge *per diem* fees on containers kept past the "free time" allowance. The fees are typically $44 per day for ordinary dry containers. These charges are high enough to discourage truckers from keeping more than a few empty containers on hand for export customers.

- It is institutionally and practically very difficult for two drayage firms to interchange containers, so each firm is ordinarily limited to the container made empty from its own customers.

- Export containers, particularly refrigerated containers for perishables, can have different requirements than import containers. Waste paper shippers, for example, need "high-cube" containers to maximize the load, while inbound imports of wine or beer are unlikely to be carried in such boxes.

The subject of container logistics and empty container reuse received extensive treatment in the *Empty Ocean Container Logistics Study*, completed by Tioga for the Southern California Association of Governments and other agencies in May 2002.

Given these operational realities, the study team assumed for rail costing and impact analysis that each container will make a round trip, one way loaded and one way empty. The equivalent daily round-trip container counts for a 250-day-per-year CIRIS service (i.e. 5 days per week, less holidays) are shown in Exhibit 54.

Exhibit 54: Potential Daily CIRIS Round Trip Containers

Scenario	Stops in			Potential CIRIS Daily Round Trips				
	Stockton	Fresno	Bakersfield*	Service Phase	Perishable Food/Farm	Non-Perishable Food/Farm	Other	Total
1	x	x	x	Startup	12	22	27	62
2	x	x	x	Mature	74	101	90	265
3	x	x		Startup	8	22	22	52
4	x	x		Mature	48	100	74	221
5	x			Startup	3	14	10	28
6	x			Mature	21	63	34	118

* conceptual only, no current Barkersfield terminal

The startup volumes are small, as should be expected, and it could in fact require weeks or months of service to attain this "startup" level. The point at which the service reaches "maturity" will depend on the ability of the railroad and other participants to establish a performance record to instill confidence in potential users, and the smooth operation of administrative details such as subsidy payments where required.

To build sufficient volume and maximize beneficial traffic and emissions impacts, it appears desirable to serve both the Fresno and Stockton/Modesto markets.

- The Stockton-Modesto market by itself (scenarios 5 and 6) may not be sufficient to attain operating economies of scale. In particular, the high levels of subsidy required during a startup period with only an average of 28 containers per train could be difficult to justify. Moreover, it could be a long time before traffic grew to the point where scale economies were reached.

- The combined Stockton/Modesto and Fresno markets could roughly double the train volumes, reducing the levels of subsidy required and reaching the scale required for separate intermodal service sooner.

- Adding the Bakersfield market does not markedly increase the potential traffic volume and is unlikely to justify the construction of intermodal facilities to serve that market. The situation could change if intermodal facilities are developed there for other reasons.

V. Rail Operating Scenarios & Costing

A significant challenge in this study was to analyze the wide range of possible options and concepts. The "rail shuttle" and "inland port" concepts mean different things to different people. The analysis conducted by Tioga and Railroad Industries Inc identified several rail service options for consideration.

Railroads offer favorable economics when their higher terminal and train-start costs can be spread over long distances. The rail distance from Stockton to Oakland, however, is only 75-80 miles, compared to typical intermodal markets of 1,000 miles or more. Obtaining favorable rail economics on such a short haul is inherently difficult.

The operating scenarios for intermodal (rail and truck) service between San Joaquin County and the Bay Area have two basic parts: the facilities and the rail operations that link them. The fundamental options include shuttles and groups of railroad cars moved on existing trains, but there are variations to be explored within these categories.

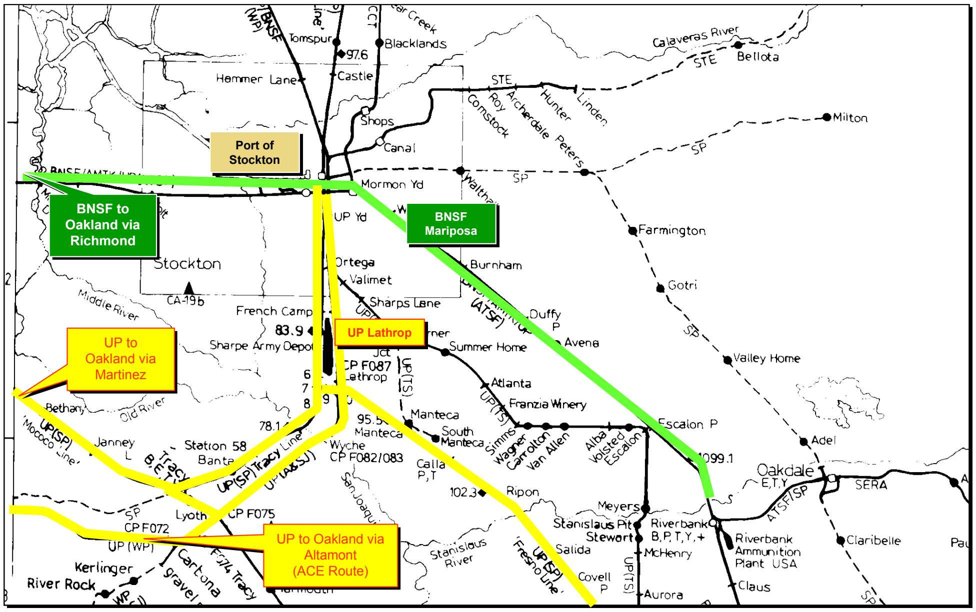
Central Valley Rail Network

The rail network between the Central Valley and Oakland consists primarily of the two roughly parallel routes of Union Pacific (UP) and Burlington Northern Santa Fe (BNSF) shown in Exhibit 55. The most direct of UP's routes is the former Western Pacific route over Altamont Pass, approaching Oakland from the south. BNSF's route passes through the Delta to reach Richmond, and then uses UP tracks to reach Oakland from the north.

Exhibit 55: Central Valley Rail Routes

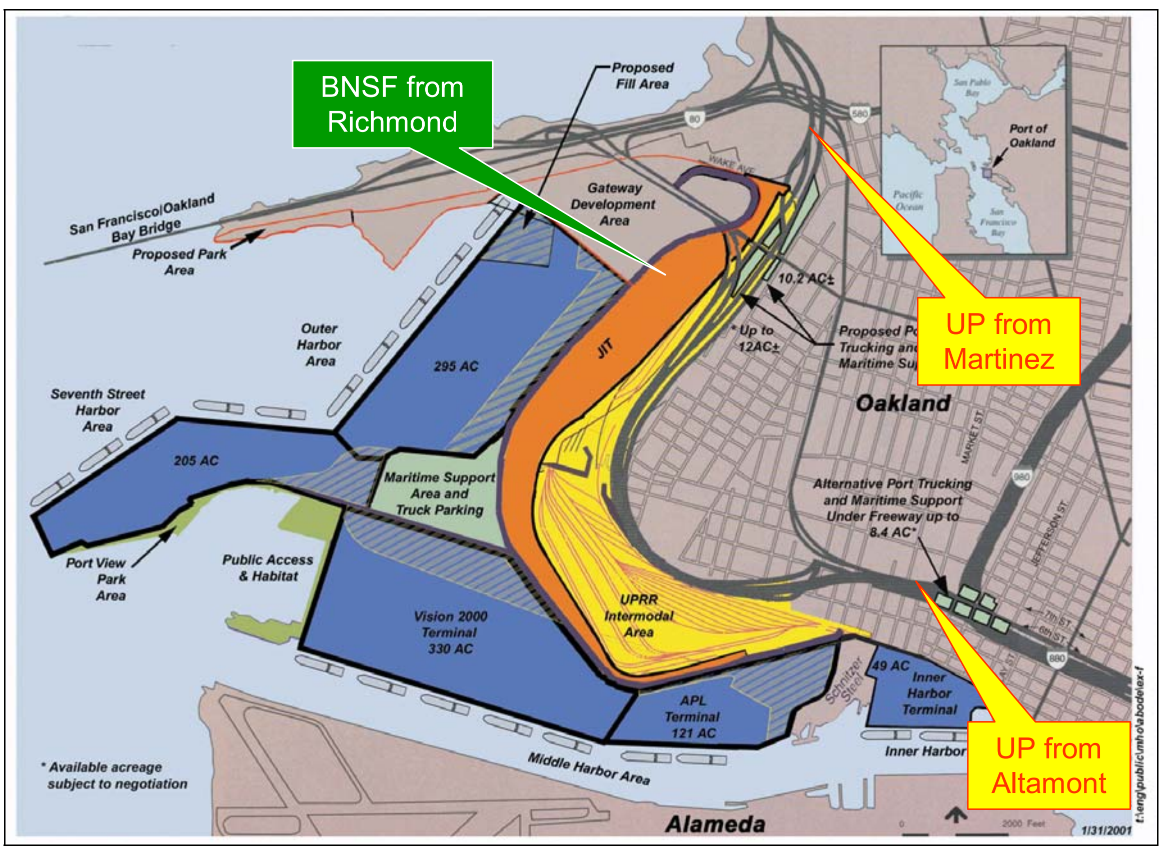
Exhibit 56 shows the rail connections in the Stockton Area.

Exhibit 56: Stockton Area Rail Network



The entrances to Port of Oakland facilities are shown in Exhibit 57.

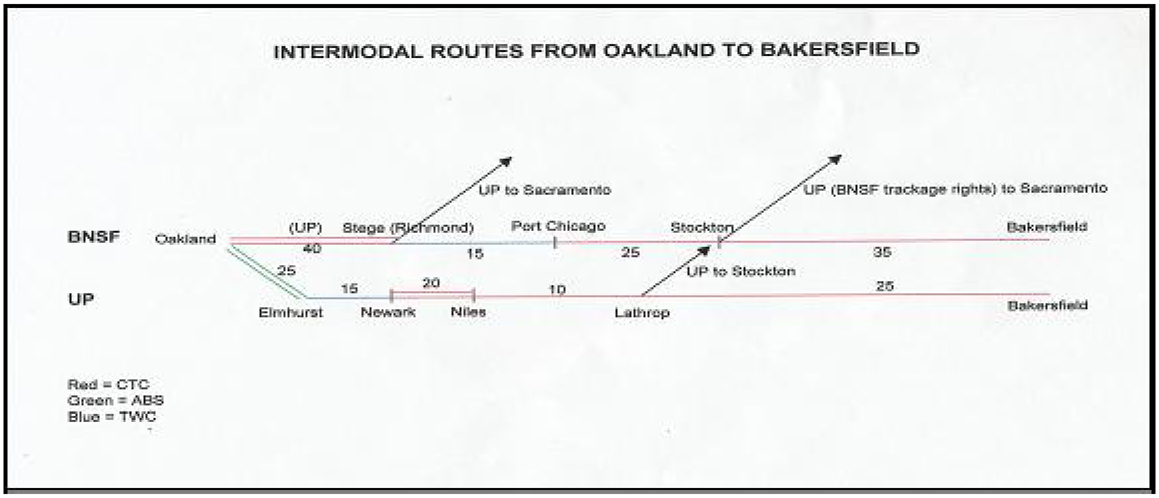
Exhibit 57: Port of Oakland Rail Intermodal Facilities



Rail Route Capacity

The BNSF and UP rail routes through Central California carry both Amtrak and freight traffic, and have varying levels of reserve capacity to handle CIRIS traffic. Rail capacity is a function of the number and condition of tracks, size and spacing of sidings, the type of signaling, and existing traffic levels. Exhibit 58 shows the salient characteristics of each line.

Exhibit 58: Rail Line Characteristics



BNSF Route Segments

Oakland to Richmond. BNSF trains use the UP track from Oakland to Stege (south Richmond area). This line is double-track Centralized Traffic Control ("CTC"), generally the highest capacity combination of track and signals, with 30 or so passenger trains daily.

Richmond to Port Chicago. This section has less elaborate signals, with numerous short sidings (3,400 to 5,300 feet). No passenger trains.

Port Chicago to Stockton. This line is combination of signal and track types. The line carries approximately 12 passenger trains per day and is currently at 50% capacity.

Stockton to Bakersfield. The line is fast single-track CTC with long sidings every 6 to 8 miles. The line is saturated with 35 or so trains daily, including a dozen passenger trains which run between 5 am and midnight.

UP Route Segments

Oakland to Elmhurst. A combination of double track CTC and lower capacity types. The line through Jack London Square is slow and a bottleneck.

Elmhurst to Newark. Lower capacity signals, with two passenger trains per day.

Newark to Niles. A five-mile portion of double-track CTC with up to 20 passenger trains per weekday.

Niles to Lathrop. Relatively slow through Niles Canyon and Altamont Pass, with moderate length sidings at least every 10 miles. The line is used for three or so daily freight trains plus six ACE commuter trains (three west in the morning and three east in the evening).

Lathrop to Bakersfield. Fast CTC with long sidings every 10 miles. No passenger trains.

Capacity Implications

Optimal operation on a route is between 70% and 80% of capacity; at over 80% trains can expect delays. Exhibit 59 summarizes the maximum rail capacity on each of these routes and estimates existing capacity utilization.

- The BNSF route reaches 75% of capacity between Stege (Richmond) and Port Chicago. Between Stockton and Bakersfield the traffic approaches 90% of capacity due to the frequent Amtrak trains. Adding separate CIRIS trains to this route will require careful planning, although nighttime operating windows may be easier to find.

- The UP route is at about 75% of capacity southeast of Oakland between Elmhurst and Newark, but has ample capacity elsewhere. Amtrak trains on UP operate north and east of Oakland to Sacramento.

Exhibit 59: Summary Route Capacities

		Trains per Day	Maximum Capacity	% of Capacity
BNSF- Central Valley				
	Port of Oakland to Stege	40	80	50%
	Stege to Port Chicago	**15**	**20**	**75%**
	Port Chicago to Stockton	20	40	50%
	Stockton to Bakersfield	**35**	**40**	**88%**
UP- Central Valley	Port of Oakland to Elmhurst	25	60	42%
	Elmhurst to Newark	**15**	**20**	**75%**
	Newark to Niles	20	80	25%
	Niles to Lathrop	10	40	25%
	Lathrop to Bakersfield	25	40	63%

The frequency of Amtrak operations on these routes reinforces the need for nighttime operations.

- The *Capitols* use the UP route from Oakland, over which BNSF has trackage rights from Oakland to Stege. *San Joaquins* use the UP between Oakland and Martinez, and the BNSF between Martinez and Bakersfield.

- The first Valley-bound Amtrak trains leave Oakland at 5:25 AM. The last Amtrak trains from the Valley to Oakland arrive at 10:50 PM.

- The first Oakland-bound Amtrak trains leave Bakersfield at 4:55 AM. The last trains from Oakland arrive at Bakersfield at 11:51 PM.

There are thus Amtrak trains moving over portions of the candidate CIRIS routes (chiefly over BNSF) between about 5 AM and midnight.

Central Valley operating points

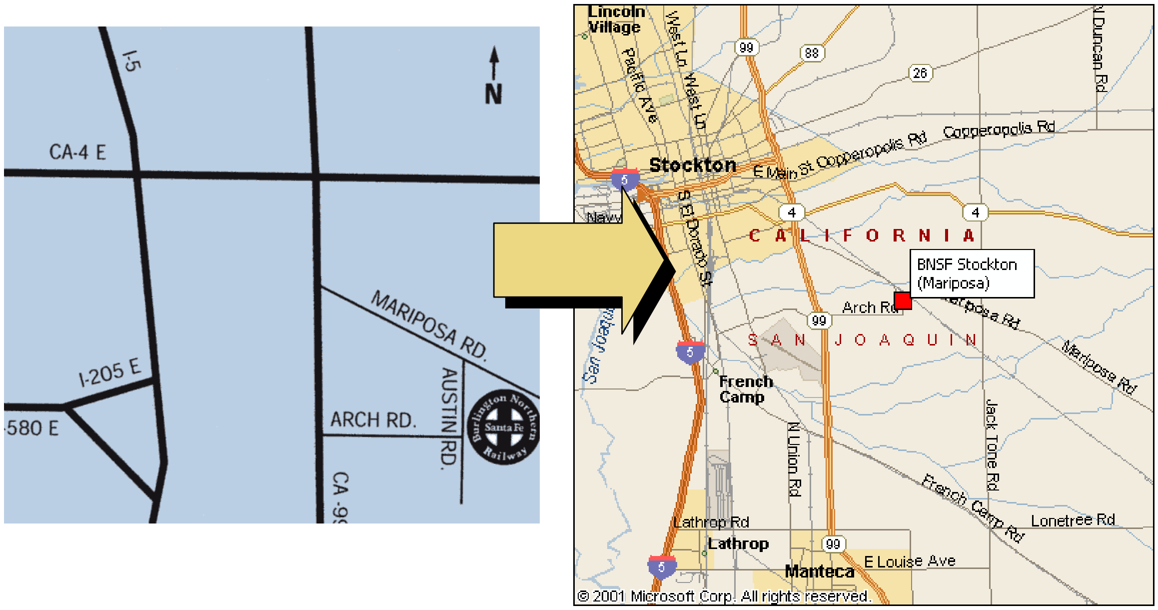
As Exhibit 60 shows, there are three active rail intermodal facilities, one dormant facility, and a handful of "paper ramps" (defined below) serving the Central Valley. To keep the study flexible in its outlook, the market analysis and rail costing estimates included points that are not currently served.

Exhibit 60: Central Valley Intermodal Facilities

Stockton-Modesto Market

BNSF has an active, recently developed facility (known as "Mariposa" for the main access road) about 10 miles southeast of downtown Stockton (Exhibit 61). This facility is very new and has substantial excess capacity. When opened, this facility almost immediately began to handle all the BNSF business formerly handle at the M&ET Valley Lift facility in Empire (Modesto). Any rail shuttle operated by BNSF would serve this facility.

Exhibit 61: BNSF Stockton (Mariposa) Intermodal Terminal

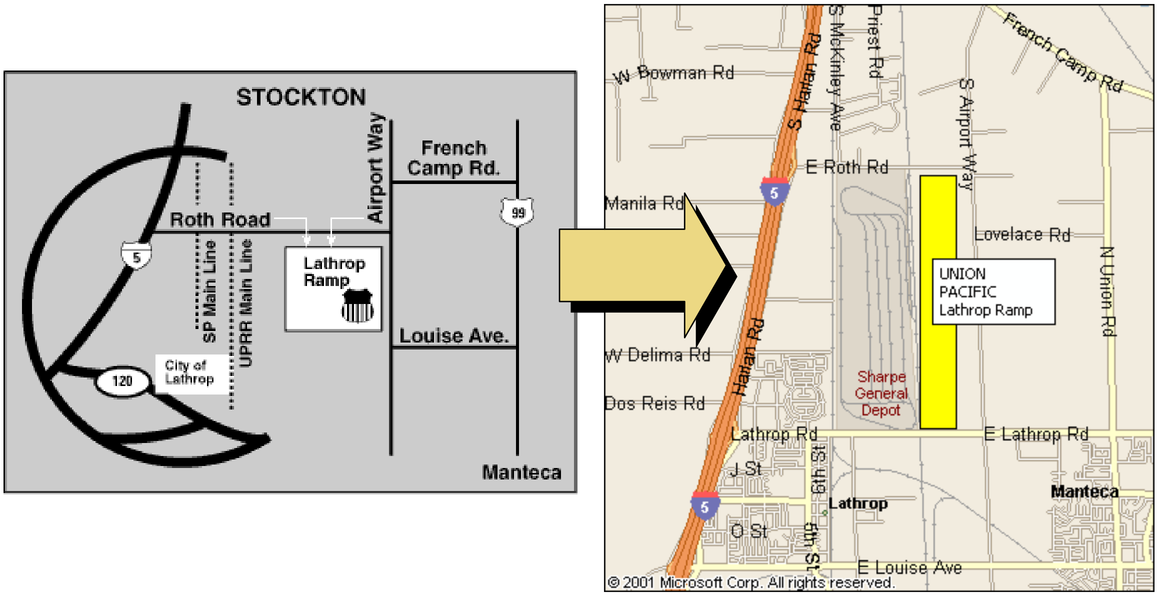


UP's Lathrop facility is also relatively new (Exhibit 62). The UP facility (technically in French Camp) is about 10 miles south of downtown Stockton, and immediately adjacent to the Sharp Army Depot. This facility is relatively new, although reportedly nearing capacity. It is used primarily for domestic intermodal business, although some international movements to and from points to the east may be handled as well. When built, gate facilities and other features of the Lathrop facility were state-of-the art, and the facility should be fully competitive in all cost and service aspects. Ancillary businesses, such as drayage firms and equipment storage lots, have begun to cluster along East Roth Road near the UP facility.

Were UP to actively pursue an Oakland-Stockton shuttle strategy, their first choice would be to handle the business at the existing Lathrop facility. The position of this facility is advantageous for any government shipments moving to or from the Sharp Army Depot, potentially including business from AAFES. In fact, an informal local UP proposal to establish a shuttle to and from the Sharp depot can be credited for generating interest in the overall CIRIS concept.

The downside to the Lathrop facility is the need for expansion in the next few years to handle the growing domestic business. UP reportedly has options on adjacent property, but UP would naturally prefer to avoid the capital expense.

Exhibit 62: UP Lathrop Intermodal Facility



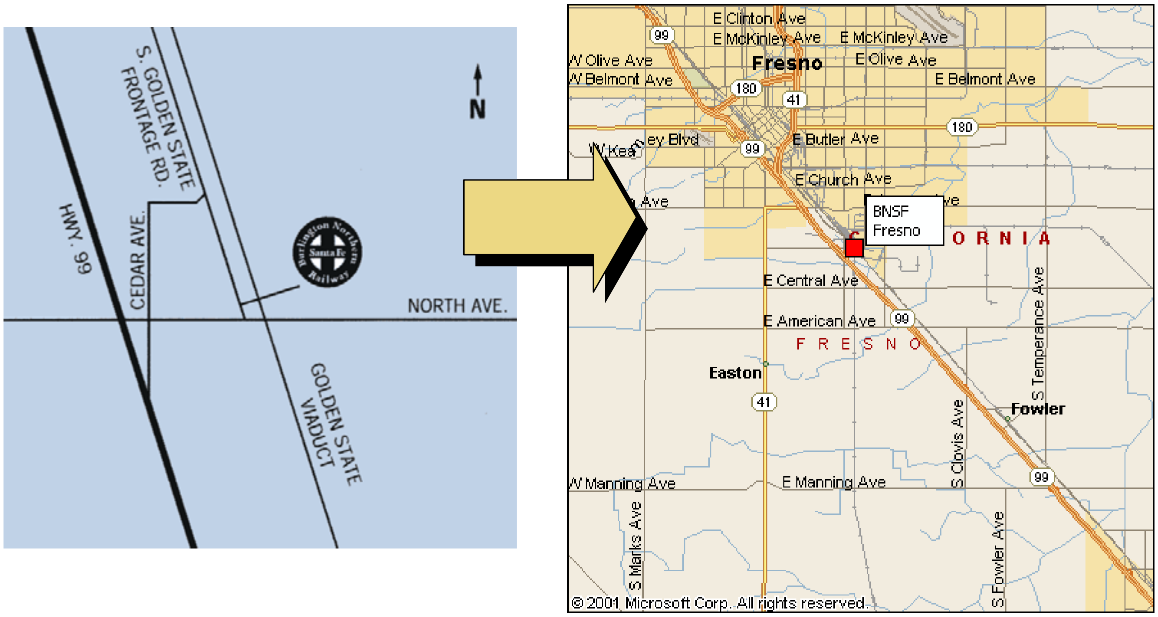
The rail shuttle feasibility study for the Port of Stockton considered a potential intermodal facility on Rough & Ready Island. The operating cost structure for that option (ignoring capital construction costs) is essentially the same as for the BNSF or UP Stockton locations.

In Modesto, UP maintains a “paper ramp”, a point where customers can pick up and drop off trailers or containers on chassis for later rail-sponsored drayage to actual terminals. Until BNSF opened its own facility at Stockton, BNSF served the Modesto & Empire Traction (M&ET) “Valley Lift “ terminal east of Modesto in Empire. This facility is now dormant. (BNSF rail costing estimates use nearby Riverbank as the Modesto endpoint.)

Fresno Market

BNSF maintains a terminal in Fresno (Exhibit 63).This is a former Santa Fe Railway facility and has been active for many years. There are no indications of serious capacity constraints. UP maintains a nearby “paper ramp” where customers can drop off or pick up units that are actually lifted on or off trains at Lathrop (or conceivably elsewhere).

Exhibit 63: BNSF Fresno Intermodal Ramp



Bakersfield Market

Although there have been proposals from time to time to establish ether rail-owned or third-party intermodal facilities in the Bakersfield area, there are neither active terminals nor paper ramps serving the area. The market analysis and rail costing scenarios nonetheless included Bakersfield.

Rail Costing Approach

Railroad Industries used the following assumptions in the development of the rail operating costs.

Costing System

The Uniform Railroad Costing System (URCS), developed by the Surface Transportation Board (STB), is a program designed to compute the estimated variable costs of a railroad linehaul service. The data used in URCS reflects 2001 actual carrier costs.

Routing

The rail route for this costing exercise is based on four origin/destination pairs for the Union Pacific Railroad (UP) and the Burlington Northern Santa Fe Railway (BNSF). As the UP and the BNSF do not serve the same cities in the Central Valley, corresponding points have been identified for each area (Exhibit 64).

Exhibit 64: Rail Costing Points

Central Valley Point	UP Point	BNSF Point
Stockton	Lathrop	Stockton
Modesto	Modesto	Riverbank
Fresno	Fresno	Fresno
Bakersfield	Bakersfield	Bakersfield

Commodity Type and Weight.

The URCS costing data for "Freight All Kinds" was used for this project. This commodity designation is the most common one for intermodal freight, and is representative of the wide variety of commodities that could actually move on CIRIS trains. Total freight tonnage per container is assumed to be 20 tons, excluding tare weight.

Rail Cars

The rail costs assume the use of intermodal "spine" cars provided under a railroad pooling agreement with TTX Company. TTX Company is jointly owned by the major railroad systems and provides the vast majority of rail intermodal cars in North America. By using cars from the TTX pool, a CIRIS shuttle service gains the flexibility of varying train sizes as required by seasonality or day-to-day traffic fluctuations, while enjoying TTX's economies of scale.

The "spine" cars (Exhibit 65) are five-unit articulated cars capable of carrying 20', 40', 45' or 48' containers with or without chassis on each of the five platforms. (They are called "spine" cars because they consist of a linked set of five center sills with platforms for wheels on each sill.) Being able to carry any combination of containers with or without chassis offers maximum flexibility, especially in the startup phases.

Exhibit 65: TTX "Spine" Car

As Exhibit 66 shows, TTX rates include both per diem and mileage factors. The resulting round trip costs thus vary by distance.

Exhibit 66: Rail Car Costs

TTX Rail Car Costs for Round Trip Mileages										
	TTX Rates		Stockton	166	Modesto	206	Fresno	402	Bakersfield	622
	Per Diem	Per Mile	Per 5-Unit Car	Per Container	Per 5-Unit Car	Per Container	Per 5-Unit Car	Per Container	Per 5-Unit Car	Per Container
48' 5-Unit "Spine" Cars	$ 33.36	$ 0.06	$ 43	$ 9	$ 46	$ 9	$ 58	$ 12	$ 71	$ 14
53' 5-Unit "Spine" Cars	$ 34.56	$ 0.08	$ 49	$ 10	$ 52	$ 10	$ 68	$ 14	$ 87	$ 17

The rail car costs are included in the rail costs for the "manifest" trains (trains that would car other freight and rail cars in addition to CIRIS business. For both the Class 1 Shuttle and the CIRIS Shuttle, the rail car costs have been separated from the linehaul rail costs. All containers and chassis would be provided by the steamship lines, and their costs would be the same as for a highway alternative.

Volume Blocks

The rail costs are developed assuming a specific volume of traffic is moved each day. This volume will determine the type of rail service to be provided and the number of locomotives used in the service. Low volumes of 10 to 20 containers per day would not justify the operation of a separate intermodal train.

Locomotive Costs

The "CIRIS Shuttle" options separate out the cost of the locomotives to allow for strategies in which locomotives are provided by a public agency. The 10-unit scenarios include one locomotive per train, while the rest of the scenarios include two per train. This approach assumes that the linehaul railroad or another party will make substitute motive power available at a comparable cost when one or more of the assigned units are idled for maintenance or repair. The cost per locomotive is $300 per day, including maintenance, reflecting prevailing leasing rates on suitable units. Fuel cost is including in the linehaul operations estimate.

Rail operations scenarios

Service Requirements

There are several features in common to all of the rail service scenarios:

- **Daily service.** (Five days per week at start-up, perhaps seven days per week if eventually justified). The ability for customers to meet delivery appointments for imports and sailing schedules for exports is critical. Work by Cambridge Systematics in the San Joaquin Valley study has found noticeably less customer receptivity for second-day service (Exhibit 51).

- **Overnight operations.** Overnight operations can provide late evening cut-off times at origin with early morning availability at destination, in both directions.

- **Variable Train Capacity.** Although the concept of a "rail shuttle" may seem to imply a fixed train set of cars and locomotive moving back and forth, the daily and seasonal fluctuation in import and export volume makes a flexible train make-up more practical.

- **Round Trip Operations and Costing.** All of the scenarios and cost estimates in this study are round-trip (although the two legs of the trip may be separated by days or even weeks). Separate consideration is given to additional economic "leverage" through reuse or other container supply options.

Manifest Trains

Under this scenario CIRIS traffic would be moved in existing conventional freight ("manifest") trains to and from a yard near Oakland, and then shuttled to the Port of Oakland. This service would be non-expedited, with two-day service at best.

"Shuttle" Service

The common conception of a rail shuttle service is a dedicated train that moves back and forth between the two endpoints. A "dedicated" train in railroad parlance means one that serves a single purpose, in this case moving international containers between Stockton and Oakland. Such a dedicated shuttle train would likely have the following features:

- Flexible car assignments, drawn from the TTX pool on UP or BNSF as required. The railroads could choose to keep a set of cars intact for this service, but more likely the train make-up would vary from time to time as volume fluctuated.

- Locomotives provided by the railroad, by a public agency (e.g. Caltrans or the Port of Stockton), or from some other source (e.g. Amtrak, or a third-party operator).

- Either a single train and crew making a round trip every night, or two trains making one-way trips, depending on volume, loading/unloading time, etc.

Two variations on the shuttle intermodal service were analyzed.

Class I Shuttle Trains

The "Class 1 Shuttle Train" option assumes that the Class 1 railroad (BNSF or UP) will operate the intermodal trains between each CIRIS origin/destination pair. The costs are based on the railroad providing crews, locomotives, and maintenance for this service (in addition to the route and operational overhead). A pubic agency is assumed to provide or fund the intermodal cars, which are assumed to be leased or pooled.

CIRIS Shuttle Trains

This option is similar to the Class 1 Shuttle, with the exception that a pubic agency would provide the locomotives and cars (leased, pooled, or owned). The Class 1 carriers would provide the crews, fuel, and continue to maintain the track and structures.

"Regional" Service

The CIRIS white paper discussed the concept of an inter-regional system linking multiple Central Valley markets to the Port of Oakland. Short-haul, multi-stop intermodal service would cover the Port of Oakland hinterland, including Stockton, Modesto, Fresno, and potentially as far south as Bakersfield.

BNSF has called this concept a "sweeper train". An older railroad term for the concept is a "milk run", referring to the practice of collecting milk in cans from rural stations in the early morning and returning the empty cans at night.

The following chart summarizes the projected one-way transit times between each origin and destination pair. The Fresno Shuttle assumes a stop in either Lathrop or Stockton, which requires about one hour for either route. Rail crews can operate a maximum of 12 hours, making round trips to Fresno and beyond impractical for a single crew.

Exhibit 67

Origin	Destination	Route	Miles	Hours
Bakersfield	Port of Oakland	UP	283	7
Fresno	Port of Oakland	UP	175	5
Fresno Shuttle	Port of Oakland	UP	175	6
Modesto	Port of Oakland	UP	96	4
Lathrop	Port of Oakland	UP	76	3
Bakersfield	Port of Oakland	BNSF	319	8
Fresno	Port of Oakland	BNSF	198	6
Fresno Shuttle	Port of Oakland	BNSF	198	7
Riverbank	Port of Oakland	BNSF	100	5
Stockton	Port of Oakland	BNSF	75	4

Railroad Industries developed the rail operating costs for two possible train services originating in Fresno, terminating at the Port of Oakland, and stopping at Stockton/Lathrop. Costs were developed for manifest and shuttle options.

Fresno to Oakland and return

Assumes one train/crew making the round trip on one shift. The results of this costing analysis and operating review indicate that a single round-trip from Fresno to the Port of Oakland and return using one crew will *not* allow for consistent service due to the type of operation, track layout, and transit times. While it may be possible for a single crew to make a round trip within its twelve-hour limit, it cannot be done consistently. Therefore, the costs to operate this round-trip service assume different crews are used to operate each way. The same locomotives and cars operate each direction.

Fresno to Oakland, Oakland to Fresno

This option assumes two trains, one from Oakland and one from Fresno, operate each night. The economics of this operation assume a separate crew, a separate set of locomotives, and a separate set of cars are required for this service.

Rail Linehaul Cost Estimates

The resulting linehaul cost estimates are displayed in Exhibit 68 through Exhibit 73, and summarized in Exhibit 74.

Exhibit 68: Stockton-Oakland Round-Trip Linehaul Cost Estimates

UP Round Trip Costs per Container (from Lathrop via Altamont Pass)

	******* Manifest Trains ********			******Class I Shuttle ********			************ CIRIS Shuttle ************			
Daily Containers	Linehaul & Locomotive	Rail Cars (a)	Total	Linehaul & Locomotive	Rail Cars	Total	Linehaul	Rail Cars	Locomotive	Total
10	$ 207	n/a	$ 207	$ 935	$ 9	$ 944	$ 913	$ 9	$ 30	$ 952
20	$ 207	n/a	$ 207	$ 505	$ 9	$ 514	$ 494	$ 9	$ 30	$ 533
50	$ 178	n/a	$ 178	$ 253	$ 9	$ 262	$ 242	$ 9	$ 12	$ 263
100	$ 178	n/a	$ 178	$ 164	$ 9	$ 173	$ 153	$ 9	$ 6	$ 168

a) included in linehaul and locomotive costs

BNSF Round Trip Costs per Container (from Stockton via Richmond)

	******* Manifest Trains ********			******Class I Shuttle ********			************ CIRIS Shuttle ************			
Daily Containers	Linehaul & Locomotive	Rail Cars (a)	Total	Linehaul & Locomotive	Rail Cars	Total	Linehaul	Rail Cars	Locomotive	Total
10	$ 163	n/a	$ 163	$ 515	$ 9	$ 524	$ 495	$ 9	$ 30	$ 534
20	$ 163	n/a	$ 163	$ 299	$ 9	$ 308	$ 289	$ 9	$ 30	$ 328
50	$ 146	n/a	$ 146	$ 175	$ 9	$ 184	$ 165	$ 9	$ 12	$ 186
100	$ 143	n/a	$ 143	$ 129	$ 9	$ 138	$ 119	$ 9	$ 6	$ 134

a) included in linehaul and locomotive costs

Exhibit 69: Modesto-Oakland Round-Trip Linehaul Cost Estimates

UP Round Trip Costs per Container (from Modesto via Altamont Pass)

Daily Containers	******* Manifest Trains ******** Linehaul & Locomotive	Rail Cars (a)	Total	******Class I Shuttle ******** Linehaul & Locomotive	Rail Cars	Total	************ CIRIS Shuttle ************ Linehaul	Rail Cars	Locomotive	Total
10	$ 222	n/a	$ 222	$ 1,011	$ 9	$ 1,020	$ 985	$ 9	$ 30	$ 1,024
20	$ 222	n/a	$ 222	$ 545	$ 9	$ 554	$ 532	$ 9	$ 30	$ 571
50	$ 192	n/a	$ 192	$ 271	$ 9	$ 280	$ 258	$ 9	$ 12	$ 279
100	$ 192	n/a	$ 192	$ 175	$ 9	$ 184	$ 162	$ 9	$ 6	$ 177

a) included in linehaul and locomotive costs

BNSF Round Trip Costs per Container (from Riverbank via Richmond)

Daily Containers	******* Manifest Trains ******** Linehaul & Locomotive	Rail Cars (a)	Total	******Class I Shuttle ******** Linehaul & Locomotive	Rail Cars	Total	************ CIRIS Shuttle ************ Linehaul	Rail Cars	Locomotive	Total
10	$ 181	n/a	$ 181	$ 595	$ 9	$ 604	$ 569	$ 9	$ 30	$ 608
20	$ 181	n/a	$ 181	$ 341	$ 9	$ 350	$ 328	$ 9	$ 30	$ 367
50	$ 163	n/a	$ 163	$ 195	$ 9	$ 204	$ 182	$ 9	$ 12	$ 203
100	$ 160	n/a	$ 160	$ 142	$ 9	$ 151	$ 129	$ 9	$ 6	$ 144

a) included in linehaul and locomotive costs

Exhibit 70: Fresno-Oakland Round-Trip Linehaul Cost Estimates

UP Round Trip Costs per Container (via Altamont Pass)

Daily Containers	******* Manifest Trains ********			******Class I Shuttle ********			************ CIRIS Shuttle ************			
	Linehaul & Locomotive	Rail Cars (a)	Total	Linehaul & Locomotive	Rail Cars	Total	Linehaul	Rail Cars	Locomotive	Total
10	$ 280	n/a	$ 280	$ 1,302	$ 12	$ 1,314	$ 1,254	$ 12	$ 30	$ 1,296
20	$ 279	n/a	$ 279	$ 702	$ 12	$ 714	$ 678	$ 12	$ 30	$ 720
50	$ 250	n/a	$ 250	$ 344	$ 12	$ 356	$ 320	$ 12	$ 12	$ 344
100	$ 252	n/a	$ 252	$ 220	$ 12	$ 232	$ 196	$ 12	$ 6	$ 214

a) included in linehaul and locomotive costs

BNSF Round Trip Costs per Container (via Richmond)

Daily Containers	******* Manifest Trains ********			******Class I Shuttle ********			************ CIRIS Shuttle ************			
	Linehaul & Locomotive	Rail Cars (a)	Total	Linehaul & Locomotive	Rail Cars	Total	Linehaul	Rail Cars	Locomotive	Total
10	$ 251	n/a	$ 251	$ 901	$ 12	$ 913	$ 847	$ 12	$ 30	$ 889
20	$ 251	n/a	$ 251	$ 506	$ 12	$ 518	$ 479	$ 12	$ 30	$ 521
50	$ 233	n/a	$ 233	$ 275	$ 12	$ 287	$ 248	$ 12	$ 12	$ 272
100	$ 228	n/a	$ 228	$ 193	$ 12	$ 205	$ 166	$ 12	$ 6	$ 184

a) included in linehaul and locomotive costs

Exhibit 71: Bakersfield-Oakland Round-Trip Linehaul Cost Estimates

UP Round Trip Costs per Container (via Altamont Pass)

Daily Containers	******* Manifest Trains ********			******Class I Shuttle ********			************ CIRIS Shuttle ************			
	Linehaul & Locomotive	Rail Cars (a)	Total	Linehaul & Locomotive	Rail Cars	Total	Linehaul	Rail Cars	Locomotive	Total
10	$ 358	n/a	$ 358	$ 1,717	$ 14	$ 1,731	$ 1,639	$ 14	$ 30	$ 1,683
20	$ 329	n/a	$ 329	$ 918	$ 14	$ 932	$ 879	$ 14	$ 30	$ 923
50	$ 329	n/a	$ 329	$ 444	$ 14	$ 458	$ 405	$ 14	$ 12	$ 431
100	$ 332	n/a	$ 332	$ 281	$ 14	$ 295	$ 242	$ 14	$ 6	$ 262

a) included in linehaul and locomotive costs

BNSF Round Trip Costs per Container (via Richmond)

Daily Containers	******* Manifest Trains ********			******Class I Shuttle ********			************ CIRIS Shuttle ************			
	Linehaul & Locomotive	Rail Cars (a)	Total	Linehaul & Locomotive	Rail Cars	Total	Linehaul	Rail Cars	Locomotive	Total
10	$ 337	n/a	$ 337	$ 1,286	$ 14	$ 1,300	$ 1,200	$ 14	$ 30	$ 1,244
20	$ 336	n/a	$ 336	$ 712	$ 14	$ 726	$ 669	$ 14	$ 30	$ 713
50	$ 319	n/a	$ 319	$ 374	$ 14	$ 388	$ 331	$ 14	$ 12	$ 357
100	$ 312	n/a	$ 312	$ 256	$ 14	$ 270	$ 213	$ 14	$ 6	$ 233

a) included in linehaul and locomotive costs

Exhibit 72: Fresno-Oakland Round-Trip Linehaul Cost Estimates, with Stop at Lathrop/Stockton

UP Round Trip Costs per Container (via Altamont Pass)

Daily Containers	******* Manifest Trains ********			******Class I Shuttle ********			************ San Joaquin Shuttle ************			
	Linehaul & Locomotive	Rail Cars (a)	Total	Linehaul & Locomotive	Rail Cars	Total	Linehaul	Rail Cars	Locomotive	Total
10	$ 280	n/a	$ 280	$ 1,309	$ 12	$ 1,321	$ 1,261	$ 12	$ 30	$ 1,303
20	$ 279	n/a	$ 279	$ 702	$ 12	$ 714	$ 678	$ 12	$ 30	$ 720
50	$ 250	n/a	$ 250	$ 344	$ 12	$ 356	$ 320	$ 12	$ 12	$ 344
100	$ 252	n/a	$ 252	$ 220	$ 12	$ 232	$ 196	$ 12	$ 6	$ 214

a) included in linehaul and locomotive costs

b) assumes two crews must operate a roundtrip due to transit times.

BNSF Round Trip Costs per Container (via Richmond)

Daily Containers	******* Manifest Trains ********			******Class I Shuttle ********			************ San Joaquin Shuttle ************			
	Linehaul & Locomotive	Rail Cars (a)	Total	Linehaul & Locomotive	Rail Cars	Total	Linehaul	Rail Cars	Locomotive	Total
10	$ 251	n/a	$ 251	$ 901	$ 12	$ 913	$ 847	$ 12	$ 30	$ 889
20	$ 251	n/a	$ 251	$ 506	$ 12	$ 518	$ 479	$ 12	$ 30	$ 521
50	$ 233	n/a	$ 233	$ 275	$ 12	$ 287	$ 248	$ 12	$ 12	$ 272
100	$ 228	n/a	$ 228	$ 193	$ 12	$ 205	$ 166	$ 12	$ 6	$ 184

a) included in linehaul and locomotive costs

b) assumes two crews must operate a roundtrip due to transit times.

Exhibit 73:Two-Train Fresno-Oakland Round-Trip Linehaul Cost Estimates, with Stop at Lathrop/Stockton

UP Round Trip Costs per Container (via Altamont Pass)

Daily Containers	******* Manifest Trains ******** Linehaul & Locomotive	Rail Cars (a)	Total	******Class I Shuttle ******** Linehaul & Locomotive	Rail Cars	Total	************ San Joaquin Shuttle ************ Linehaul	Rail Cars	Locomotive	Total
10	$ 280	n/a	$ 280	$ 2,070	$ 16	$ 2,086	$ 1,974	$ 16	$ 60	$ 2,050
20	$ 279	n/a	$ 279	$ 1,083	$ 16	$ 1,099	$ 1,035	$ 16	$ 60	$ 1,111
50	$ 250	n/a	$ 250	$ 497	$ 16	$ 513	$ 449	$ 16	$ 24	$ 489
100	$ 252	n/a	$ 252	$ 296	$ 16	$ 312	$ 248	$ 16	$ 12	$ 276

a) included in linehaul and locomotive costs
b) assumes two trains operating daily

BNSF Round Trip Costs per Container (via Richmond)

Daily Containers	******* Manifest Trains ******** Linehaul & Locomotive	Rail Cars (a)	Total	******Class I Shuttle ******** Linehaul & Locomotive	Rail Cars	Total	************ San Joaquin Shuttle ************ Linehaul	Rail Cars	Locomotive	Total
10	$ 251	n/a	$ 251	$ 2,054	$ 16	$ 2,070	$ 1,946	$ 16	$ 60	$ 2,022
20	$ 251	n/a	$ 251	$ 1,075	$ 16	$ 1,091	$ 1,021	$ 16	$ 60	$ 1,097
50	$ 233	n/a	$ 233	$ 493	$ 16	$ 509	$ 442	$ 16	$ 24	$ 482
100	$ 228	n/a	$ 228	$ 274	$ 16	$ 290	$ 220	$ 16	$ 12	$ 248

a) included in linehaul and locomotive costs
b) assumes two trains operating daily

Exhibit 74: Line-Haul Rail Cost Summary (low costs highlighted)

Manifest Trains - Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
UP						
10	$ 207	$ 222	$ 280	$ 358	$ 280	$ 280
20	$ 207	$ 222	$ 279	$ 329	$ 279	$ 279
50	$ 178	$ 192	$ 250	$ 329	$ 250	$ 250
100	$ 178	$ 192	$ 252	$ 332	$ 252	$ 252
BNSF						
10	$ 163	$ 181	$ 251	$ 337	$ 251	$ 251
20	$ 163	$ 181	$ 251	$ 336	$ 251	$ 251
50	$ 146	$ 163	$ 233	$ 319	$ 233	$ 233
100	$ 143	$ 160	$ 228	$ 312	$ 228	$ 228

Class 1 Shuttle - Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
UP						
10	$ 944	$ 1,020	$ 1,314	$ 1,731	$ 1,321	$ 2,086
20	$ 514	$ 554	$ 714	$ 932	$ 714	$ 1,099
50	$ 262	$ 280	$ 356	$ 458	$ 356	$ 513
100	$ 173	$ 184	$ 232	$ 295	$ 232	$ 312
BNSF						
10	$ 524	$ 604	$ 913	$ 1,300	$ 913	$ 2,070
20	$ 308	$ 350	$ 518	$ 726	$ 518	$ 1,091
50	$ 184	$ 204	$ 287	$ 388	$ 287	$ 509
100	$ 138	$ 151	$ 205	$ 270	$ 205	$ 290

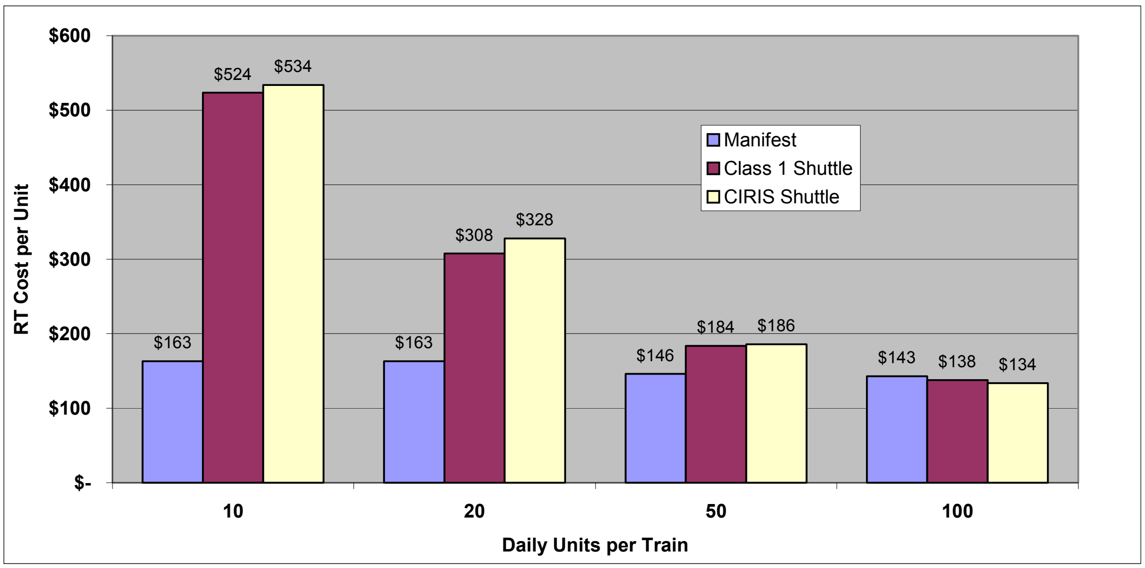
CIRIS Shuttle - Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
UP						
10	$ 952	$ 1,024	$ 1,296	$ 1,683	$ 1,303	$ 2,050
20	$ 533	$ 571	$ 720	$ 923	$ 720	$ 1,111
50	$ 263	$ 279	$ 344	$ 431	$ 344	$ 489
100	$ 168	$ 177	$ 214	$ 262	$ 214	$ 276
BNSF						
10	$ 534	$ 608	$ 889	$ 1,244	$ 889	$ 2,022
20	$ 328	$ 367	$ 521	$ 713	$ 521	$ 1,097
50	$ 186	$ 203	$ 272	$ 357	$ 272	$ 482
100	$ 134	$ 144	$ 184	$ 233	$ 184	$ 248

A number of findings are apparent.

- Manifest trains – adding new traffic to existing train schedules – are much more cost-effective at lower volumes, up to about 50 units per day.
- In the range of 50-100 units per day a separate intermodal shuttle becomes more cost-effective.
- Rail *linehaul* costs compare favorably with trucking for the cost-effective alternatives.
- Estimated BNSF costs are lower than estimated UP costs across the board due primarily to route differences. The costs are close, however, and subject to refinement by the railroads themselves.

Exhibit 75 illustrates the scale economies of rail linehaul service. The unit cost for manifest service is lowest for low-volume operations, but declines only slightly with rising volume. The intermodal shuttle costs, however, decline sharply with volume increases. For a dedicated train, the major cost hurdle is a "train start" – the initial commitment made for a crew, locomotives, and cars – regardless of how far they travel or how much freight they carry. This cost relationship suggest that a startup operation might well begin with manifest service, and transition to a dedicated rail shuttle as volume grows.

Exhibit 75: Stockton Linehaul Costs (BNSF)



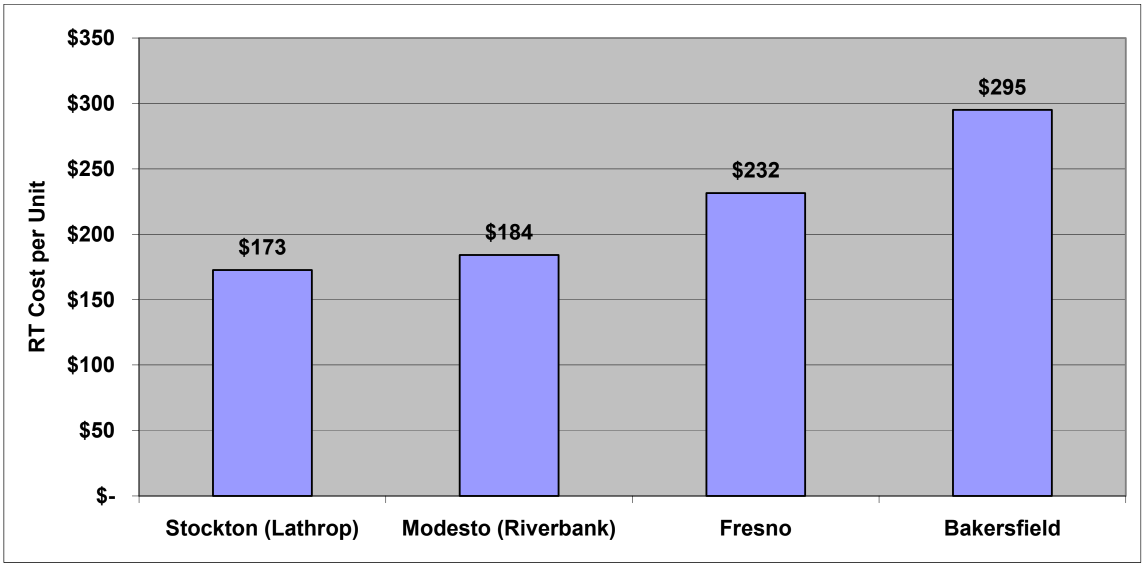
By tapping both the Fresno and Stockton/Modesto markets, a Fresno shuttle with a Stockton/Lathrop stop may be able to generate linehaul scale economies. By serving both markets, such a service is more likely to reach 100 units per day (at $248/unit), rather than attaining only 50 units per day (at $272 per unit).

- Running one daily Fresno/Stockton shuttle (eastbound one day, westbound the next, would provide two-market service at a similar cost to Fresno-only service, but would not be reliable.

- Running two daily Fresno/Stockton shuttles (one eastbound from Oakland and one Westbound from Fresno) would provide daily service, but at increased cost. The costs of a second set of locomotives and cars adds about $64 per unit to the two-train Fresno/Stockton "regional" service option, but supports a reliable two-market service.

The next chart, Exhibit 76, illustrates the impact of distance on rail operating costs. The "train start" is effectively a fixed cost for the duration of the crew assignment. Once that cost has been incurred the operating cost rises slowly with distance. The costs that vary with distance traveled include fuel, rail car mileage fees, maintenance of way, and other costs related to the actual movement.

Exhibit 76: Rail Linehaul Costs (UP) for 100 Unit CIRIS Shuttle



Total Intermodal Costs

Complete intermodal service requires round trip drayage and lift-on/lift-off at both ends of the trip. The complexity of the intermodal move usually also entails third party management and administrative costs.

- Drayage costs were discussed at length in an earlier chapter. These costs vary with time/distance from the ramp, but do not have economies of scale. Drayage costs determine the market reach of the service.
- Lift costs are relatively constant once an efficient scale has been reached. The three facilities operating in the San Joaquin Valley (UP Lathrop, BNSF Stockton, BNSF Fresno) have sufficient volume for scale economies and are reportedly operating efficiently.
- A separate allowance has been made for management/administrative costs. Drayage firms providing over-the-highway service cover the management expense as part of the margin between the rate charged to the customer and the share paid to the driver. The Implementation section discusses the various roles played in door-to-door intermodal transportation, and the options for fulfilling the various responsibilities. Regardless of who performs the function, however, the need for management and the cost of doing so must be recognized.

Exhibit 77 shows minimum, typical, and maximum costs for these additional intermodal functions. These costs add between $245 and $345 per round trip to the rail linehaul costs.

Exhibit 77: Additional Intermodal Costs

	Minimum	Typical	Maximum
Valley RT Drayage Costs	$ 75	$ 75	$ 100
Valley Lift Costs (on and off)	$ 50	$ 60	$ 70
Oakland Lift Costs (on and off)	$ 60	$ 70	$ 80
Oakland RT Drayage Costs	$ 35	$ 70	$ 70
Third Party/Admin Costs	$ 25	$ 25	$ 25
Additonal Intermodal Total	**$ 245**	**$ 300**	**$ 345**

Adding the additional intermodal costs in Exhibit 77 to the rail linehaul costs in Exhibit 68 though Exhibit 73 yields the tables of total intermodal costs in Exhibit 78 through Exhibit 80 (BNSF costs shown for Manifest and CIRIS Shuttle options).

Exhibit 78: Total Intermodal Costs, Minimum Dray and Lift

Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
Manifest						
10	$ 408	$ 426	$ 496	$ 582	$ 496	$ 496
20	$ 408	$ 426	$ 496	$ 581	$ 496	$ 496
50	$ 391	$ 408	$ 478	$ 564	$ 478	$ 478
100	$ 388	$ 405	$ 473	$ 557	$ 473	$ 473
CIRIS Shuttle						
10	$ 779	$ 853	$ 1,134	$ 1,489	$ 1,134	$ 2,267
20	$ 573	$ 612	$ 766	$ 958	$ 766	$ 1,342
50	$ 431	$ 448	$ 517	$ 602	$ 517	$ 727
100	$ 379	$ 389	$ 429	$ 478	$ 429	$ 493

Exhibit 79: Total Intermodal Costs, Typical Dray and Lift

Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
Manifest						
10	$ 463	$ 481	$ 551	$ 637	$ 551	$ 551
20	$ 463	$ 481	$ 551	$ 636	$ 551	$ 551
50	$ 446	$ 463	$ 533	$ 619	$ 533	$ 533
100	$ 443	$ 460	$ 528	$ 612	$ 528	$ 528
CIRIS Shuttle						
10	$ 834	$ 908	$ 1,189	$ 1,544	$ 1,189	$ 2,322
20	$ 628	$ 667	$ 821	$ 1,013	$ 821	$ 1,397
50	$ 486	$ 503	$ 572	$ 657	$ 572	$ 782
100	$ 434	$ 444	$ 484	$ 533	$ 484	$ 548

Exhibit 80: Total Intermodal Costs, Maximum Dray and Lift

Daily Units	Stockton (Lathrop)	Modesto (Riverbank)	Fresno	Bakersfield	Fresno/Stockton One Daily	Fresno/Stockton Two Daily
Manifest						
10	$ 508	$ 526	$ 596	$ 682	$ 596	$ 596
20	$ 508	$ 526	$ 596	$ 681	$ 596	$ 596
50	$ 491	$ 508	$ 578	$ 664	$ 578	$ 578
100	$ 488	$ 505	$ 573	$ 657	$ 573	$ 573
CIRIS Shuttle						
10	$ 879	$ 953	$ 1,234	$ 1,589	$ 1,234	$ 2,367
20	$ 673	$ 712	$ 866	$ 1,058	$ 866	$ 1,442
50	$ 531	$ 548	$ 617	$ 702	$ 617	$ 827
100	$ 479	$ 489	$ 529	$ 578	$ 529	$ 593

These costs are all higher than the corresponding over-the-highway costs, implying a need for subsidy. The need for subsidy will increase if, as implied by the market interviews, intermodal shuttle costs will have to be roughly 10% below trucking costs to attract traffic. The implications of these findings for overall shuttle economics are discussed in a later section.

VI. Economics and Funding

Overall System Economics

It is widely presumed that a rail shuttle operation between the Central Valley and the Bay Area will require subsidy or some other form of financial support. If so, the likelihood of support will be much greater if public decision makers are convinced that the costs have been minimized through creative service design and efficient operations, and that every avenue has been explored to minimize or eliminate the subsidy.

There are precedents for public support of freight operations, but only few. The chances for successful implementation will likewise be increased if the subsidy method is politically acceptable.

Existing and expected trucking costs set the competitive threshold for total costs. All the economic factors must be brought together to determine the cost "gap" between trucking and intermodal costs and the best options for closing that gap.

The analysis below considers the major Central Valley markets individuals, then in combination.

Stockton Market

Exhibit 81 gives the overall cost comparisons for the Stockton market. Exhibit 82 displays the relationships graphically. (BNSF costs were used for all comparisons). With a pricing goal of 10% below the trucking rate, the rail shuttle service would have to be priced at about $225 to attract business. At startup (10-20 units per daily), typical dray and lift costs combined with a manifest train operation would yield total costs of about $463, leaving a gap to be subsidized or otherwise addressed of $238 per unit round trip.

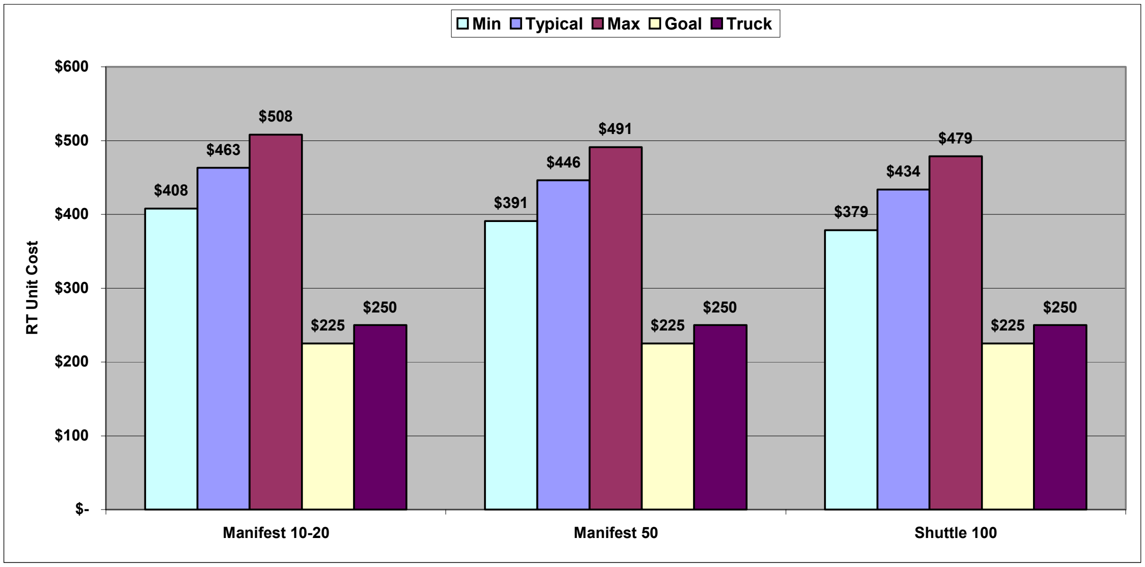
Exhibit 81: Stockton-Only Costs

	Stockton					
Scenario	Min	Typical	Max	Goal	Truck	Typ. Gap
Manifest 10-20	$ 408	$ 463	$ 508	$ 225	$ 250	$ 238
Manifest 50	$ 391	$ 446	$ 491	$ 225	$ 250	$ 221
Shuttle 100	$ 379	$ 434	$ 479	$ 225	$ 250	$ 209

At maturity (100 units daily) typical costs would drop to $434 per unit round trip, and the pricing gap would decline to $209 per unit. Minimum costs would be $379 per unit, and the gap would be $154.

The cost figures clearly indicate the critical importance of dray and terminal lift costs, as the differences between minimum, typical, and maximum costs in these categories outweigh the differences in rail operating costs.

Exhibit 82: Stockton-Only Cost Comparisons



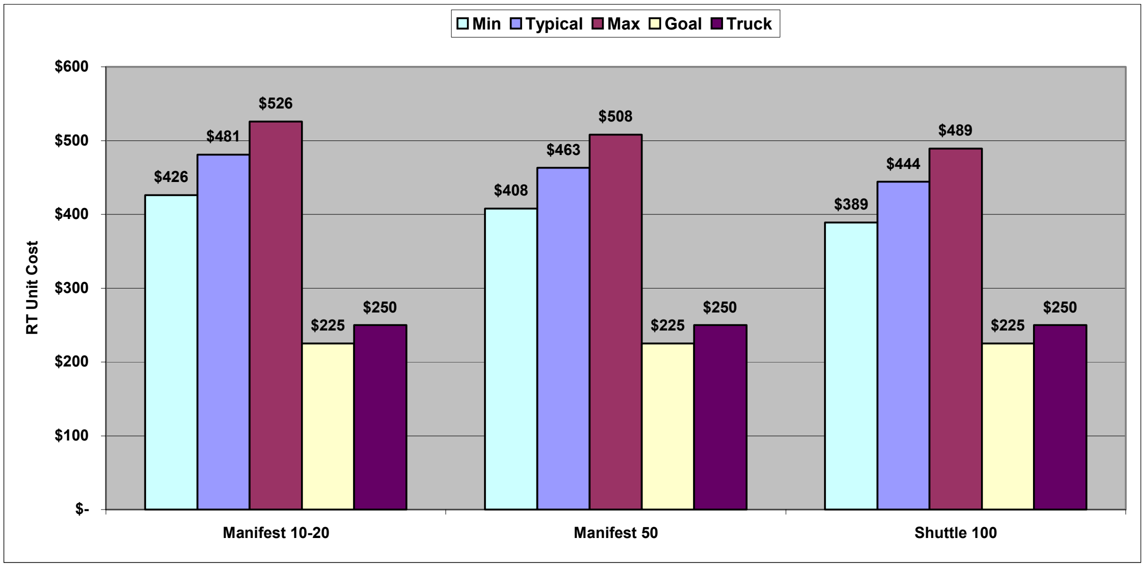
Modesto Market

As the exhibits indicate, the gap between rail shuttle costs and the pricing goal increases at Modesto because rail linehaul costs rise somewhat while trucking rates remain at $250 per unit. The typical gap narrows from $256 at startup to $219 at maturity. At minimum operating cost, the gap would be $164.

Exhibit 83: Modesto Service Costs

	Modesto					
Scenario	Min	Typical	Max	Goal	Truck	Typ. Gap
Manifest 10-20	$ 426	$ 481	$ 526	$ 225	$ 250	$ 256
Manifest 50	$ 408	$ 463	$ 508	$ 225	$ 250	$ 238
Shuttle 100	$ 389	$ 444	$ 489	$ 225	$ 250	$ 219

Exhibit 84: Modesto Cost Comparisons



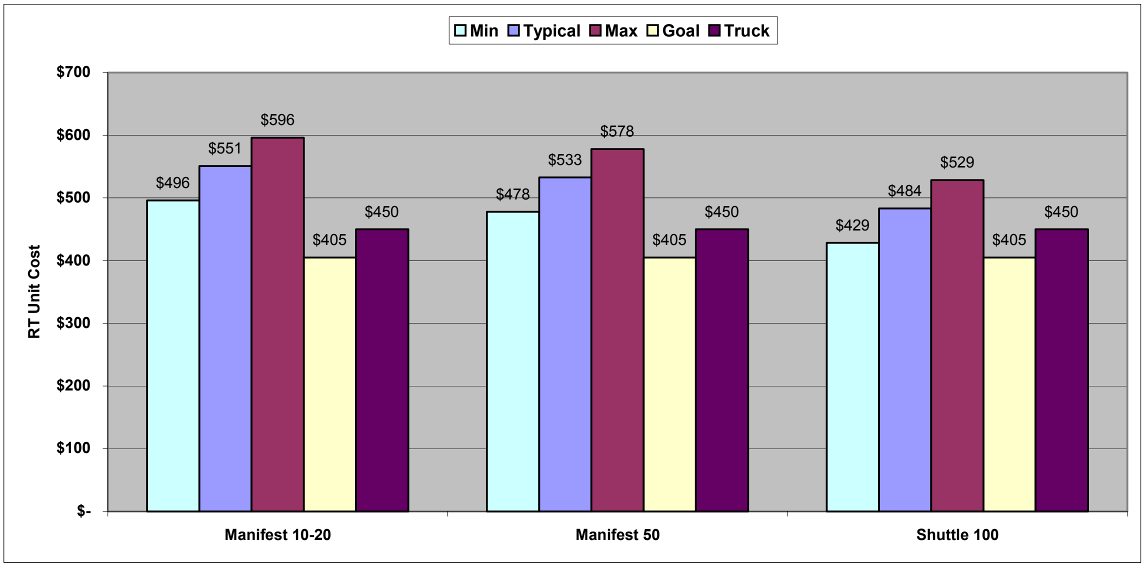
Fresno Market

As a stand-alone market, the Fresno area is the best financial prospect for a rail shuttle. With drayage prices rising to about $450, the total intermodal costs can come much closer than in Stockton or Modesto. The gap narrows from $146 for typical startup costs to $79 at maturity, and could be as little as $24 under the most favorable circumstances.

Exhibit 85: Fresno Market Costs

	Fresno					
Scenario	Min	Typical	Max	Goal	Truck	Typ. Gap
Manifest 10-20	$ 496	$ 551	$ 596	$ 405	$ 450	$ 146
Manifest 50	$ 478	$ 533	$ 578	$ 405	$ 450	$ 128
Shuttle 100	$ 429	$ 484	$ 529	$ 405	$ 450	$ 79

Exhibit 86: Fresno Cost Comparisons



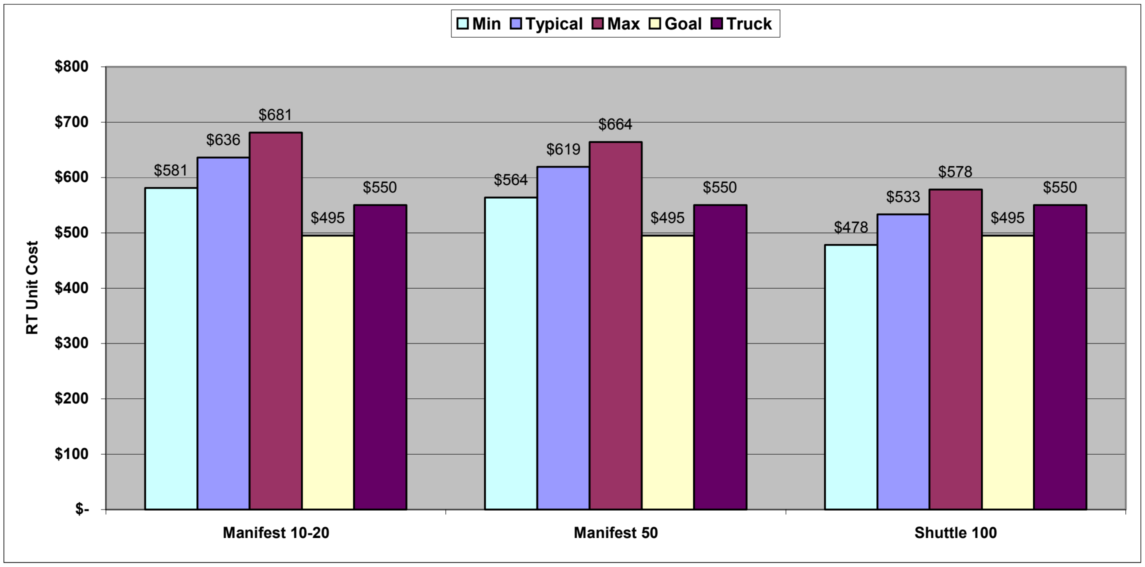
Bakersfield Market

The Bakersfield market shows the smallest gap between total intermodal costs and current trucking rates. If operations could be conducted at minimum cost ($478 per unit), Bakersfield traffic could actually show a profit margin (with a pricing goal of $495). Against that potential economic balance, however, must be set the fact that Bakersfield currently has no intermodal facilities.

Exhibit 87: Bakersfield Cost Estimates

	Bakersfield					
Scenario	Min	Typical	Max	Goal	Truck	Typ. Gap
Manifest 10-20	$ 581	$ 636	$ 681	$ 495	$ 550	$ 141
Manifest 50	$ 564	$ 619	$ 664	$ 495	$ 550	$ 124
Shuttle 100	$ 478	$ 533	$ 578	$ 495	$ 550	$ 38

Exhibit 88: Bakersfield Cost Comparisons



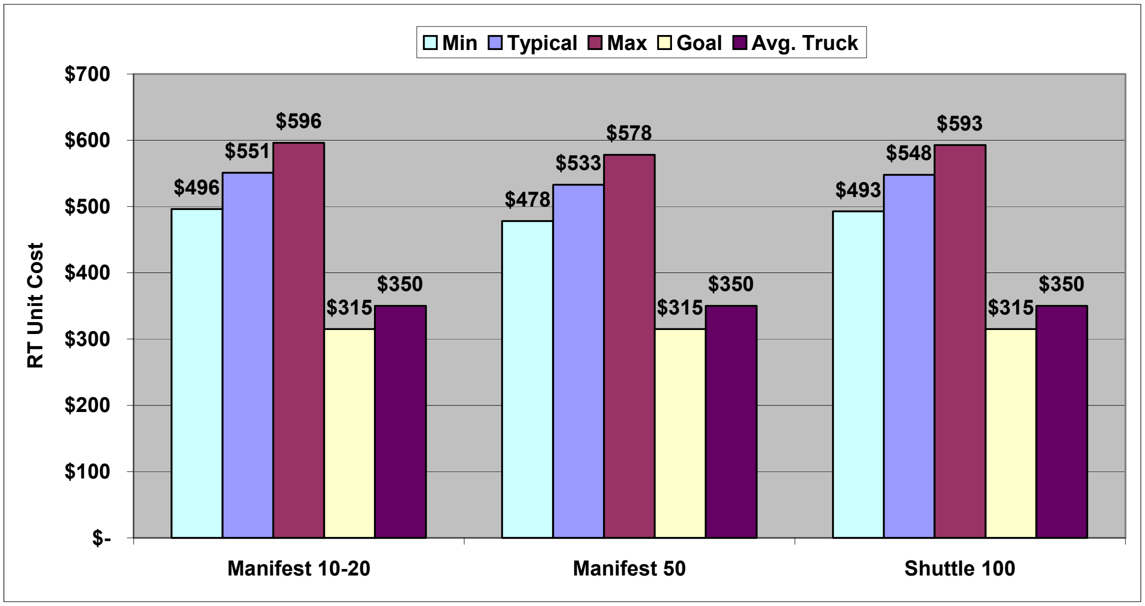
Stockton-Fresno Market Combination

Serving both the Stockton-Modesto and Fresno markets introduces some complexity to the service and to the cost estimates. The major reason to serve both points is to maximize the potential volume, thereby attaining scale economies in rail operations and diverting as much truck traffic as possible. As Exhibit 89 and Exhibit 90 show, attaining the higher service standard of rail shuttle operations raises the costs compared to the lower-service manifest train scenarios.

Exhibit 89: Stockton-Fresno Cost Estimates

	Stockton/Fresno Two-Train Option					
Scenario	Min	Typical	Max	Goal	Avg. Truck	Typ. Gap
Manifest 10-20	$ 496	$ 551	$ 596	$ 315	$ 350	$ 236
Manifest 50	$ 478	$ 533	$ 578	$ 315	$ 350	$ 218
Shuttle 100	$ 493	$ 548	$ 593	$ 315	$ 350	$ 233

Exhibit 90: Stockton-Fresno Combined



Subsidy Requirements

How much should the subsidy be? The short answer is "just enough". There is an implicit relationship between the amount of subsidy and the public benefits of diverting trucks from the highways. Operating subsidies would ideally be set at an amount calculated to attract sufficient business from the highway to justify the public expenditure.

The Cambridge Systematics CIRIS study found that the key factor in customer interest in a rail shuttle was the prospect of cost savings, and that customers expressed willingness to try a rail shuttle at prices 10% below truck rates. This discount would yield target round-trip door-to-door prices of about $225 round trip from Stockton , $405 from Fresno, or $495 from Bakersfield.

Applying the scenario market penetration figures to the estimated market volumes yields the annual and daily load counts shown in Exhibit 91. Note that the Stockton-only scenario yield sonly an average of 28 loads per day in the startup phase whereas the multi-market scenarios pass the 50-load threshold earlier.

Exhibit 91: Annual and Daily Scenario Volumes

	Stops in			Annual Volumes					Average
Scenario	Stockton	Fresno	Bakersfield	Phase	Perishable	Non-Perishable	Other	Total	Daily Loads
1	x	x	x	Startup	3,063	5,620	6,778	15,461	62
2	x	x	x	Mature	18,377	25,289	22,595	66,261	265
3	x	x		Startup	1,984	5,553	5,518	13,056	52
4	x	x		Mature	11,906	24,989	18,395	55,290	221
5	x			Startup	863	3,522	2,565	6,950	28
6	x			Mature	5,179	15,849	8,549	29,577	118

Exhibit 92 applies the typical door-to-door costs and scale economies to generate daily cost figures for each scenario, and the target discounts below truck rates to generate average daily revenue (the Stockton/Fresno option assumes that half the volume will come from each market). The difference is the daily subsidy, and a 250-day year yields the annual equivalent subsidy required to offer the service at the target rate.

Exhibit 92: Scenario Volumes and Subsidies

Scenario	Stops in Stockton	Stops in Fresno	Stops in Bakersfield	Phase	Average Daily Loads	Average Typical Daily Cost	Average Daily Revenue	Average Daily Subsidy	Annual Typical Subsidy
1	x	x	x	Startup	62	$ 38,282	$ 23,192	$ 15,090	$ 3,772,505
2	x	x	x	Mature	265	$ 141,312	$ 99,391	$ 41,921	$ 10,480,286
3	x	x		Startup	52	$ 27,835	$ 16,451	$ 11,385	$ 2,846,198
4	x	x		Mature	221	$ 121,144	$ 69,666	$ 51,479	$ 12,869,661
5	x			Startup	28	$ 12,871	$ 6,255	$ 6,616	$ 1,654,088
6	x			Mature	118	$ 51,308	$ 26,620	$ 24,688	$ 6,171,990

Exhibit 93 shows the range in annual subsidies implied by the minimum, typical, and maximum door-to-door costs. The range is substantial. For the Stockton-Fresno scenario, for example, the difference between the minimum and maximum in the mature phase is about $5.5 million annually.

Exhibit 93: Annual Subsidy Ranges

Scenario	Stops in Stockton	Stops in Fresno	Stops in Bakersfield	Phase	Annual Minimum Subsidy	Annual Typical Subsidy	Annual Maximum Subsidy
1	x	x	x	Startup	$ 2,922,145	$ 3,772,505	$ 4,468,253
2	x	x	x	Mature	$ 6,835,939	$ 10,480,286	$ 13,462,024
3	x	x		Startup	$ 2,128,120	$ 2,846,198	$ 3,433,716
4	x	x		Mature	$ 9,828,705	$ 12,869,661	$ 15,357,716
5	x			Startup	$ 1,271,841	$ 1,654,088	$ 1,966,836
6	x			Mature	$ 4,545,232	$ 6,171,990	$ 7,502,975

Closing the Gap

The analysis above indicates that even under favorable operating conditions there will likely be a significant need for subsidy. The study team investigated potential means for closing or reducing the gap.

Minimizing drayage costs

As noted earlier, drayage is a major factor in total operating costs. Drayage rates are primarily a function of time. Drayage firms need to generate about $500 per day for tractor and driver. The rate is determined by the number of trips a driver can make in an ordinary 10-11 hour driving day.

Typical drayage costs in the Central Valley are about $75 per round trip, implying that drivers can ordinarily make 6-7 trip per day. Raising the average to 10 trips per day could cut the rate to $50 per trip.

- Intensive marketing to the closest customers can minimize the average drayage time.

- Efficient intermodal terminal gate and yard operations can cut the time required for terminal transactions.

- The use of inland chassis pools (for containers moved by rail without chassis) would minimize the trucker time in the terminal and avoid "flip" charges for shifting containers between chassis.

- Tendering larger volumes to fewer trucking companies would improve bargaining leverage and encourage operating efficiencies.

- Some Valley-based drayage firms have expressed interest in managing the shuttle service, which should allow them to maximize efficiency and minimize cost.

Typical Oakland drayage rates between rail and marine intermodal terminals are $70 per round trip, corresponding to about 7 trips per working day, or about 80-90 minutes for a round trip that covers less than five miles. The minimum cost scenario drops that cost to $35.

- The study team was told that drayage rates as low as $35 per round trip were achieved through the implementation of special gates at the marine terminals for designated drayage firms. Besides avoiding lines, the special gates may allow the designated drivers to work earlier or later hours, bypass manual inspections, and otherwise minimize the time required for a marine-to-rail round trip.

- Most of the drayage cost is incurred when drivers and tractors wait in line at either the rail or marine container terminal.

- The development of flexible chassis pools in Oakland may streamline terminal operations. At present, when a matching chassis is not available for a steamship line container, the movement may be delayed and/or a "flip charge" assessed to transfer the unit a second time when the trucker brings the right chassis.

Achieving significant cost reductions will most likely require the participation and initiative of ocean carriers, as the ocean carriers control much of the inland movement and manage or influence the marine terminal operations.

Balanced Container Loads

As the cargo statistics indicate, the exports containers from the Central Valley greatly outnumber the import containers coming from Oakland. The overall movement is markedly imbalanced, and there are numerous instructional barriers to routine reuse of import container for export loads, leading to the costing assumption that each container would have to make a round trip – loaded one way, and empty the other. Every container that could be reused, however, would reduce two round trips to one and this reduce system costs. There are two opportunities to reuse empty containers, balance some of the rail shuttle movements, and remove additional container trips for the highway.

Import Container Reuse. The barriers to using an emptied import container for an export load are largely instructional and logistical, not technical, since all comparable containers are physically interchangeable. The increasing desire to reduce logistics cost and minimize truck traffic has led to new efforts to facilitate reuse. Most pertinent to Northern California, a commercial offering called SynchroMet, with the support of the Port of Oakland, is successfully enabling truckers to increase the reuse of empties. SynchoMet operates as a “Virtual Container Yard”, a web-based environment in which truckers can post the availability of empty containers and other truckers can seek empty containers for their export customers. SynchroMet facilitates the interchange and transfer of responsibility/liability between the truckers while maintaining continuity with the ocean carrier that controls the equipment. As SynchroMet grows and matures, the system should contribute favorably to the overall economics of the rail shuttle.

Reusing an empty container will avoid a full round trip, including the lift and dray at both ends. Reusing an import container will require an additional drayage leg in the Central Valley to reposition the container and the chassis to the exporter, although the cost to do so may be less than the typical $75 intermodal terminal move.

Reusing “Backhaul” Empties. A significant number of marine containers are used for “backhaul” domestic loads arriving in the Central Valley from Midwestern and Eastern US origins. These container carried import loads, and must eventually be repositioned to Asia for future imports. To reduce the repositioning cost, ocean carriers make the capacity available to domestic shippers, often through third parties, at low rates. Once unloaded, these empty containers accumulate in the Central Valley and must be repositioned to the Port of Oakland. The total number is unknown. Many, perhaps most, are trucked. Roughly 400 are moved each weekend by rail via Union Pacific from the Lathrop terminal.

These “backhaul” containers present a unique challenge, and their overall impact of these “backhaul” empties on a rail shuttle system will depend on numerous factors beyond this analysis.

- To the extent that these containers can be used for export loads, they will either be diverted from highway repositioning and avoid the need to bring an empty from Oakland, or displace an import empty that might have be reused (causing *that* empty to be repositioned instead).

- To the extent that these containers are being trucked empty, they might be added to the rail shuttle market, increasing such scale economies as can be achieved, and diverted from the highway.

- To the extent that these containers are moving by rail, they establish an operational precedent for a rail container shuttle. The financial precedent is less clear cut, since the rail move is reportedly conducted as part of a broader agreement between Union Pacific and Pacer International, and may not have stand-alone financial viability.

Transloading/Consolidation

Consolidation of multiple truck loads into fewer container loads at inland points would allow a CIRIS service to charge rates closer to the truck competition and reduce the subsidy gap. As shown in Exhibit 94 (repeated from Exhibit 33), as the consolidation ratio increases the gap narrows.

Exhibit 94: Economic Leverage of Consolidation at Stockton

	Consolidation Ratio			
	1 to 1	5 to 4	4 to 3	3 to 2
Manifest Service, 20 units/trip				
Truck Cost	$250	$1,250	$1,000	$750
Rail Cost	$ 463	$1,852	$1,389	$926
Truck Advantage per Unit	$213	$120	$97	$59
Dedicated Service, 100 units/trip				
Truck Cost	$250	$1,250	$1,000	$750
Rail Cost	$ 434	$1,735	$1,301	$867
Truck Advantage per Unit	$184	$97	$75	$39

Public Equipment Investment

Locomotives. As Exhibit 73 shows for the Stockton-Fresno service, for example, locomotive costs account for about $12 per round trip. Public provision of locomotives would reduce the need for operating subsidy by a similar amount. Coordination with the railroads would be required to minimize resistance to "foreign" equipment. There are multiple options.

- **Public purchase or lease of new or used locomotives dedicated to the service.** New diesel locomotives typically cost in excess of $1.5 million, while suitable used units can be found down to about $300,000. A train of 50 or more containers would use two locomotives; a two-train scenario would require 4 locomotives and perhaps one spare.

- **Locomotives assigned or borrowed from the Caltrans/Amtrak or ACE fleets.** The locomotives used on the Capital and San Joaquin passenger trains or the ACE would be suitable for CIRIS operations. Those assigned to the Capital and San Joaquins (so-called "California engines" are among the quietest units with the lowest emissions of any on the market. The ACE and Capital trains operate over UP and the San Joaquins operate over both UP and BNSF, so the locomotives are known quantities to both railroads. The two passenger services have engines sitting overnight at terminals which conceivable could be used to pull CIRIS trains. Institutional issues would be the major barriers.

Rail Cars. As Exhibit 73 shows for the Stockton-Fresno service, for example, rail cars account for about $16 of the operating cost. The rail costing methodology assumed the use of pool cars form TTX, which supplies the majority of such cars nationwide and enjoys the best scale economies. Moreover, drawing cars as needed from the TTX pool gives the system much-needed flexibility to adjust capacity. It is unlikely that public provision of rail cars would be as efficient. Public investment in rail cars would, however, remove that factor from the rail operating cost.

Intermodal Terminal Equipment. Intermodal terminals typically require two types of specialized equipment: lift machines and yard tractors. Lift machines of various types are used to load and unload the railcars, and yard tractors are used to move and position trailers and containers on chassis.

- Lift machines typically costs anywhere from $500,000 to $1.5 million, and can be purchased new, leased, or purchased in the used equipment market. A small facility may have just one, but at least two is more typical to avoid downtime during maintenance and repair.
- Yard tractors typically cost $50,000 to $75,000. It is common to have at least two yard tractors for each lift machine.
- Minimal equipment investment for a new terminal is thus $600,000 to $1.6 million.

The ability of the terminal operator to "amortize" this equipment investment over a growing lift volumes the major source of scale economics in terminal operation. At start-up, equipment cost can account for over 25% of the total lift cost (e.g. $12 in an overall cost of $45 per lift) while as volume grows this share may decline to about 20% (e.g. $7 in an overall cost of $35 per lift). Public provision of terminal equipment would reduce the lift cost accordingly. Since the round trip cost includes four lifts, a reduction of $7 per lift in a mature service scenario would reduce the need for subsidy by $28 per round trip.

Extension to Bakersfield Market

Exhibit 87 indicates that Bakersfield business would require significantly less subsidy that the other markets because of the higher truck rate ceiling. A minimum cost operation may actually yield net revenue. To serve the Bakersfield market, however, requires building an intermodal terminal, a multi-million dollar investment. There have been several private industry plans to build an intermodal facility in Bakersfield, but none has yet come to fruition.

The are several precedents for public-supported development of an intermodal terminal in a new market, including the Port of Oakland's Joint Intermodal terminal (now served by BNSF). Moreover, intermodal facility development is more typical of public funding than are operating subsidies.

Bakersfield is typically considered an extension of the Southern California market, and most marine cargo originating or terminating in Bakersfield is assumed to move via the ports of Los Angeles and Long Beach. It is possible that developing a new intermodal terminal in Bakersfield could funnel more traffic south instead of adding to CIRIS volume. Viewed in the context of a more comprehensive statewide public-private rail intermodal strategy discussed below, however, this may not be a disadvantage.

Rail Investment Tradeoffs/ Statewide Initiatives

Recent national discussions of public-private partnerships for freight have included the possibility of public investment in necessary rail capacity in return for private rail service and rate commitments on target movements. The scope for direct public investment in CIRIS service, however, is limited because neither railroad is in clear need of additional capacity.

- BNSF already has intermodal terminals in Richmond, Oakland (by agreement with the Port of Oakland), Stockton, and Fresno. All four terminals appear to have adequate capacity for the near future. The affected BNSF rail lines also appear to have sufficient capacity for the near future.
- UP has intermodal terminals in Oakland and Lathrop, although there is no UP terminal in Fresno. The Oakland terminal was rebuilt in recent years with Port of Oakland assistance. The Lathrop facility is reportedly nearing capacity, and UP apparently has options or ownership of adjacent property for expansion purposes. UP ex-SP and ex-WP lines gave UP excess capacity, which it has since rationalized to some extent.

Both railroads, however, do have significant capital investment and capacity needs elsewhere in California. For example, BNSF is seeking a near-dock intermodal terminal to serve the Ports of Los Angeles and Long Beach, and BNSF's San Bernardino intermodal facility is near or at capacity. UP has periodically considered building an intermodal facility in the vicinity of Colton to serve the Inland Empire market. Other possibilities exist.

It is not inconceivable that public investment elsewhere in California could be part of a public-private agreement for lower CIRIS rates and service guarantees. The scope of such discussions could be expanded to include CIRIS-like services being considered in Southern California and potential public investment in Alameda Corridor East. Such an agreement would be an ambitious undertaking and could raise difficult political and institutional issues (for example, the Port of Oakland is unlikely to be enthusiastic about support for competing ports in Southern California). A multi-jurisdictional or comprehensive public-private agreement for rail freight projects in California, however, could have great advantages to both parties and facilitate progress on many pending issues.

Incremental Rail Costing/Pricing

The rail cost estimates in this study were developed using the Uniform Rail Costing System (URCS), which is the Surface Transportation Board standard for the industry. URCS attempts to capture the full cost of a new rail car movement, including contributions to joint and overhead costs incurred in common with many other shipments.

There is, however, both art and science to rail cost estimation. Where railroads are attempting to secure highly completive business, they may choose to exclude broader system costs from their calculations, price on an "incremental" basis, or accept lower margin contribution. They may also offer lower rates on some portion of a large customers' business in order to secure the whole volume. Railroads may also choose to price new business aggressively where they see it as a good “fit” with existing operations and flows.

The public does not have other business to offer as bargaining leverage or motivation, but the major ocean carriers and other intermodal customers do. As an example, UP’s movement of empty containers from Lathrop to Oakland is reportedly viewed as part of a larger customer relationship rather than as a standalone movement. If major ocean carriers find it in their interest to use a CIRIS service, they may be able to negotiate lower rail rates as add-ons to existing contracts.

“Short Line” Economics

In the course of this and other studies of short-haul rail economics and service potential the issue of “short line” operations and economics is often raised. Over the last two decades there have indeed been numerous stories of independent rail operators successfully buying and running short lines or branch lines that major railroads sold off. The successes typically involve aggressive marketing to build volume and lower operating costs than could be achieved with standard railroad work rules and wages. There are, however, many short-line failures that are not as newsworthy. In many cases, anticipated business does not materialize or major customers depart. In other cases, operating costs are higher than anticipated or capital investment needs cannot be met.

There have been rare cases where short-line operators have negotiated the use of short stretches of mainline trackage to connect geographically separated operations, or the use of mainline yards to exchange and sort cars. The Altamont Commuter Express uses UP trackage over Altamont Pass, and Amtrak uses the trackage of both BNSF and UP.

The proposed CIRIS operation, however, does not appear to be a good candidate for short line operations. The rail route uses mainline trackage for the entire length and connects two major railroad intermodal facilities, each of which handles other mainline business. Absent public purchase of right of way and/or facilities, short line or independent operations do not appear to be a realistic option.

Public Line Purchase

There are three railroad routes that could carry the CIRIS operation: the BNSF route between Stockton and Richmond; the UP’s former WP route over Altamont Pass: and the UP’s former SP route from Stockton and Tracey through Martinez. Of the three routes, only the UP route over Altamont Pass could be a candidate for public purchase, as the other two are the major rail routes serving the Bay Area. The UP Altamont Pass route is a secondary mainline and is already being used by the Altamont Commuter Express (ACE).

This study did not explore the complex economics and politics of line purchase. There are numerous precedents for public purchase to protect freight service to major shippers and employers, or for commuter rail service. As ACE is already using the line and expanding service, there may be a common public interest rationale for line purchase.

The primary cost impact of public line purchase would be on the relatively small portion of operating cost that is attributable to line ownership and maintenance. The public agency that purchased the line would still have to maintain it The amount chargeable to a CIRIS intermodal operation could be affected by how much of the cost was assigned to ACE versus CIRIS, and on agency policies towards cost recovery.

Subsidy Options

Public financial support will be required for either a demonstration/pilot project or a long-term operation. This support might entail:

- Funding for facilities, improvements, or equipment
- Operating funds for a start-up or pilot period, and ongoing operations
- Tax credits or other indirect support for potential users

The subsidy system itself raises some critical issues. Moreover, the final subsidy method and arrangement will probably depend on the source of the subsidy. The observations below address the more obvious subsidy issues.

Should there be operating subsidies, capital subsides, or both? Most likely, the best policy would be to use both methods in combination.

- Capital funding or in-kind support would be used for developing facilities, buying rail or lift equipment, or other non-operating uses. By so doing, the public sponsor would reduce the long-term total cost of the service to the operators and customers and thus reduce the need for operating subsidy. In addition, the availability of public capital would reduce the real and perceived risks of the venture to private sector participants.

- Operating subsidies would be required, regardless of how much capital was provided through public funds. The rail intermodal costs have a large and relatively fixed component of drayage and terminal expenses that would have to be offset by operating subsidies.

How should an operating subsidy work? There are two distinct ways of providing an operating subsidy: a block grant covering the provision of a rail shuttle service at a highway-competitive price for a fixed period, or a per-trip subsidy for each container movement diverted from the highway.

- **Block grant alternative.** One conceptually simple approach would be to provide a lump-sum grant to the sponsoring organization or the railroad to provide service at below-highway rates. This approach, however, may not provide sufficient incentives to all involved to maximize the diversion.

- **Per trip alternative.** A per-trip subsidy, working from an annual budget, would be directly linked to the objective of diverting trucks from the highway. The per-trip approach would have the advantage of letting private firms decide on the best combination of participants and functions to accomplish the diversion.

How should the subsidy be administered and processed? In either approach, there must be some method of accountability for container trips, loaded and empty, actually diverted from the highway.

- The block grant approach may make this difficult. Some separate accounting method would be required to track movements actually shifted, perhaps based on existing railroad information systems.

- In the per-trip approach, the simplest method would be to allow private parties to submit monthly evidence of trips diverted (bills of lading or other documentation) in exchange for the subsidy payments. It appears that offing a per-trip subsidy to the drayage firms may be the best way of implementing such an approach. As explained elsewhere, drayage firms are pivotal to controlling container movement. The drayage firms are in the best position to determine whether a given container can be moved on time by rail, to rationalize the empty/load logistics, and to manage the sequencing of delivery and pick-up at rail facilities. It is likely that drayage firms would end up passing on some of the savings to either the ocean carrier or the underlying customer in negotiations. It is possible, however, that some customers or third parties could elect to perform valley drayage with their own equipment, and the subsidy program would have to be flexible enough to accommodate variations.

Funding

Principles and Precedents

TRB Special Report 271, *Freight Capacity for the 21st Century*, provides general principles to guide government freight investments, including privately-oriented projects.

- Economic efficiency should be the primary goal of government freight investment focusing on projects that yield the greatest economic benefit, considering all costs, including frequently omitted social costs.

- Government involvement should be limited to circumstances in which market dictated outcomes may not be economically efficient.

- A government responsibility to provide facilities or leadership in developing a project does not necessarily justify government subsidy.

- Reliance on user fees and local match in Federal grant programs for freight and other projects is encouraged as it tends to impose efficiency.

There are a few current and pending examples of major public-private partnerships in freight rail transportation.

- The Mid-Atlantic Rail Operations Study (MAROPS) initiative is a public-private partnership involving three railroads (CSX, NS, Amtrak); five states (Maryland, Pennsylvania, New Jersey, Delaware, and Virginia); and the I-95 Coalition. The preliminary report identifies a $6 billion program over the next 15 years that will require a shared private sector and governmental role to meet the need for rail service in the northeast corridor. The study group has developed a number of financing options, including a National or Regional Finance Corporation and a new Federal-aid rail program.

- The $2.4 billion Alameda Corridor rail project connects the ports of Los Angeles and Long Beach to the transcontinental rail network east of downtown Los Angeles. This project was funded by $1.2 billion in bond proceeds back by railroad user fees, a $400 million loan from the U.S. DOT and $394 million in grants from the ports of Los Angeles and Long Beach, $347 million administered by the Los Angeles County Metropolitan Transportation Authority, and $154 million in other state and federal sources of interest and income.

- The Chicago rail study now underway will likely recommend a $1+ billion public-private program to help solve critical rail constraints and community impacts in this major cargo hub. Financing options are likely to include the Federal Congestion Mitigation and Air Quality Program (CMAQ), Surface Transportation Program (STP) Sec. 130 rail-grade crossing program, the Federal Transit Administration (FTA) funds for commuter rail portions, state and city funds, railroad funds, Transportation Infrastructure Financing Innovation Act (TIFIA) or Railroad Rehabilitation and Improvement Financing (RRIF), TEA-21 high-priority project funding, and user fees.

The CIRIS project is not of the same scale as these examples, and entails operating subsidies more than infrastructure development.

There are a number of other precedents for public-private freight cooperation with features related to the CIRIS proposal.

- In the Red Hook Barge project at the Port Authority NY/NJ, the Port owns the barge equipment, as required by CMAQ at that time, and leases back to a private sector operator through a contract agreement, which limits use of the equipment to this project. Both capital and operating assistance originally came from CMAQ, but after the three-year CMAQ operating subsidy cutoff, funds for operation have been a continuing challenge for the project.

- The Washington Fruit Express carries Washington's fresh fruit and produce from Wenatchee to eastern states in cars added to existing Amtrak passenger trains. The Washington Department of Transportation (WSDOT) will use sublease revenues generated by the Washington Fruit Express to make lease payments on the high-speed refrigerated rail cars. Additional infrastructure improvements will be needed to expand loading docks and storage tracks at strategic locations across the state. Funding for this expansion has not yet been achieved.

- The State of Delaware funded construction of the Shellpot rail bridge accessing the Port of Wilmington with an agreement that the railroads pay back the public costs through user fees.

- In the case of the Columbia Slough Railroad Bridge improvement serving the Port of Portland in Oregon, the bridge was funded primarily from Federal and state sources with ownership resting with the Port of Portland. The Port leases the trackage to BNSF and UP equally.

- In Maine, rail intermodal terminals have been built by public agencies with CMAQ and other sources, and operate with lease arrangements with the private carriers.

Federal Support

The Federal outlook is mixed, but appears to be improving.

- Freight rail intermodal projects are not currently eligible under the regular Federal-aid Highway programs (i.e. the National Highway System Program or the Surface Transportation Program).

- Rail intermodal freight projects are currently eligible under the CMAQ program if they demonstrate an air quality benefit. The CMAQ program allows capital grants or loans and operating subsidy for up to three years for public or private projects, but has rarely been used for rail intermodal freight projects.

- CMAQ funding currently limits operating assistance to three years, although the recent TRB CMAQ Program Evaluation recommends reconsideration of this restriction. CMAQ projects, such as CIRIS, that reach outside a non-attainment area (even if benefiting the non-attainment area) may not be fully eligible. CIRIS connects two adjacent non-attainment areas, so multi-jurisdictional decisions regarding fair shares of project costs from the respective CMAQ allocations and other program coordination would be needed among the multiple jurisdictions and agencies.

- CIRIS operations would apparently not qualify for the High-Priority Projects Program in the TEA-21 reauthorization process, since operating subsidies are rare with such projects and the minimum is $50 million. Under the innovative finance program, TIFIA, intermodal rail projects are eligible for loans and credit enhancement if they are publicly owned and have dedicated user fees. This funding source may be a better candidate for development of facilities in Bakersfield should a Stockton-Fresno startup prove the CIRIS concept.

- The STP program, for the first time, would be able to fund freight rail facilities if they are publicly owned.

State and Local Support

The State of California prohibits use of gas tax or CMAQ monies for non-highway projects, including a CIRIS operation. The State of California even has a prohibition on CMAQ monies that are deposited in the State Trust Fund. Local agencies in California have more discretion, but a CIRIS program would have to compete with passenger-oriented projects.

- Caltrans and other cooperating agencies were requested to develop a proposal for the Global Gateways Development Program. This program identified priority gateways and improvement needs through the State including the Ports of Oakland and Stockton, and key international trade corridors including Interstates 5, 580, 99, 205 and the main lines of the BNSF and UP. Funding for this program would have to come through additional flexibility in existing programs. Goods movement projects such as CIRIS that provide significant mobility, economic, community, and environmental benefits could be eligible for loans. As with other sources, though, the Global Gateways proposal does not so far encompass operating grants.

- An option for local funding of CIRIS includes using the discretionary funds of the San Joaquin Valley Air Pollution Control District. Federal and state grants from the State of California Air Resources Board and the United States Environmental Protection Agency can be used by the District as discretionary funds available for projects that reduce emissions levels in the Valley. CIRIS could qualify for funding with the discretionary funds of this agency based on the emissions effects of reducing truck vehicle miles traveled.

Port of Oakland Role

The Port of Oakland has been active in proposing funding for projects in the current reauthorization effort. The Port's proposals include two portions focused on the CIRIS concept.

> **"Granting of public funding eligibility to freight rail projects**
>
> Freight rail projects have routinely been ruled ineligible to receive federal funds because there has never been acknowledgment that private rail carriers serve the public good. It is time to realize that railroads move the same goods that government-subsidized ships and trucks move. Funding should be made available for rail line and rail transfer facility capital projects. Additionally, federal funding should be considered for the purpose of supporting freight rail operations, similar to support for transit operations, where the operations contribute to the transportation goals of reducing congestion/improving mobility on the surface transportation network, improving air quality in high density areas and enhancing roadway safety."
>
> **"CIRIS Operating Assistance**
>
> CIRIS is a proposed freight rail shuttle that will run between the Port of Oakland and a point or points in the San Joaquin Valley. The intent of moving containers by rail over

this relatively short distance is to relieve traffic congestion and reduce air emissions in this corridor. Additionally, over time as costs of moving goods by truck increase, shippers may also realize economies by making the modal shift. However, at present, movement over this distance by rail costs more than by truck, and shippers are only willing to pay a portion of that difference. Therefore, a partial operating subsidy is required. We would initially seek operating support for a two-year period, beginning 2004. This amount would not exceed $8 million."

VII. Impact Analysis

Objective

The objective of the impact analysis was to relate the operating scenarios and volume estimates for pilot and long-term rail shuttle operations to expected impacts on traffic congestion and emissions in the affected regions. The primary focus is San Joaquin County and the connector routes to Alameda County.

The impacts were analyzed in two stages. The first stage focused on the number of truck trips diverted as a basic measure of project effects. The second, more complex analysis estimated the actual congestion, safety, and emission changes associated with different project scenarios.

In order to conduct the impact analysis, Cambridge Systematics adapted the San Joaquin Valley Truck Model and Performance Measure Tools developed in Phase II of the San Joaquin Valley Goods Movement Study to accommodate a modal diversion analysis.

Results of the impact modeling conducted by Cambridge Systematics indicate the potential for favorable impacts on emissions and delay. The diversion of heavy truck traffic results in freer vehicle flow, benefiting all vehicle classes. Auto traffic typically shows the greatest delay improvements due to the larger number of autos on the highways.

Model Background

The San Joaquin Valley Truck Model was developed to provide an analytical basis for evaluating the benefits of freight transportation improvements.

The model has two major components:

- Inter-county truck trips are estimated using commodity flow data from the California Department of Transportation Intermodal Transportation Management System (ITMS) database. The ITMS database includes truck movements by tons at the county level of geographic detail for the entire state of California. For regions outside of California, ITMS uses the state level of geographic detail. The ITMS database also provides commodity detail at the 4-digit NAICS level, which allows for hundreds of different commodity types to be incorporated into the model. As examples, the ITMS database provides estimates of the number of tons of agricultural products that are shipped between Fresno County and San Joaquin County, and the number of tons of electronic equipment that are shipped between San Joaquin County and the state of Texas. The inter-county truck tons were converted to truck trips using average payloads calculated based on data from the *Vehicle Inventory and Use Survey* for California. These truck trips were then allocated to traffic analysis zones in the Valley based on local employment data and input-output analysis.

- Socioeconomic data are used to generate the intra-county truck trips for the San Joaquin Valley truck model. The socioeconomic data available at the zone level are stratified into ten industry groups: agriculture/farm/fishing, mining, construction, manufacturing-products, manufacturing-equipment, transportation, wholesale, retail, finance, and education/government. Truck trips are then estimated from each zone based on the number of employees in each industry group and input-output factors for each of the industry groups.

Key model features include:

- Two truck classes: Medium Heavy Duty Truck (MHDT) and Heavy Heavy Duty Truck (HHDT)
- Validation using two "screen lines" (points on the highway system where counts can be compared) in northern San Joaquin Valley
- A Caltrans statewide road network and auto trip table

The standard output performance measures include:

- Congestion (recurrent delay)
- Reliability (non-recurrent delay)
- Safety (fatalities, injuries, and property damage)
- Emissions

To apply the Truck Model to this study, the team identified zip code distribution of truck trips between the Port of Oakland and the San Joaquin Valley affected by the CIRIS alternatives from two sources:

- Adjusted PIERS data
- Caltrans truck survey

The model then redirects the appropriate truck trips from each zip code to the nearest intermodal yard rather than Port of Oakland.

Diagrams in Exhibit 95 and Exhibit 96 display the model structure and linkages. Screen line locations are shown in Exhibit 97.

Exhibit 95: Development of Intercity Truck Trip Table

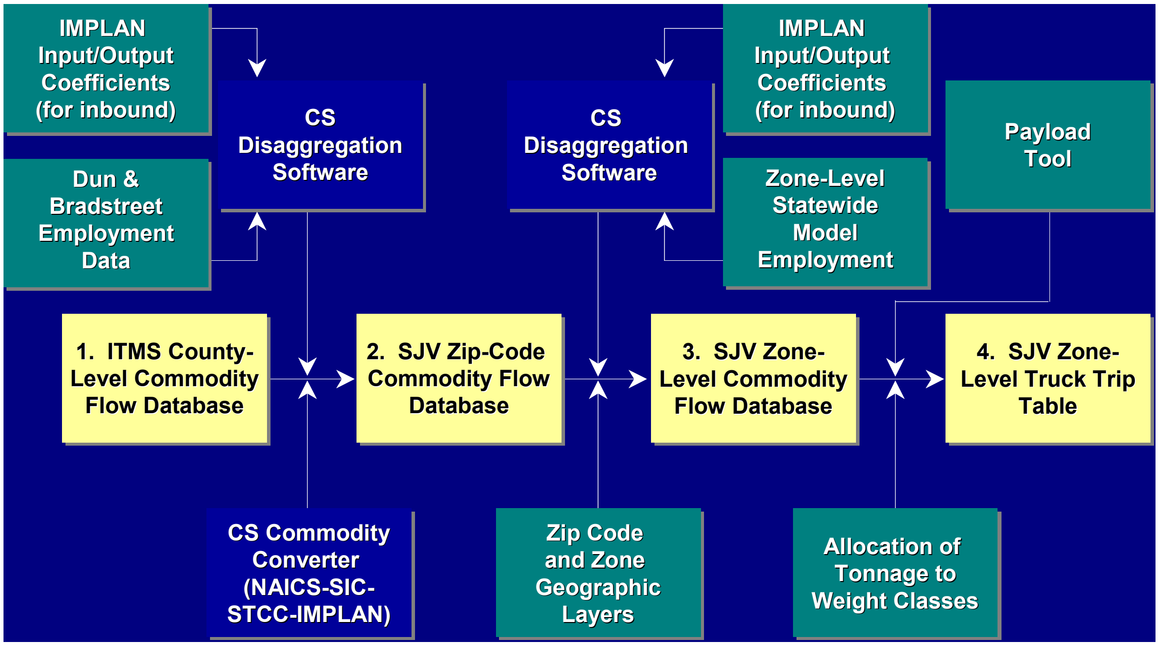


Exhibit 96: Description of Intracity Truck Model Process

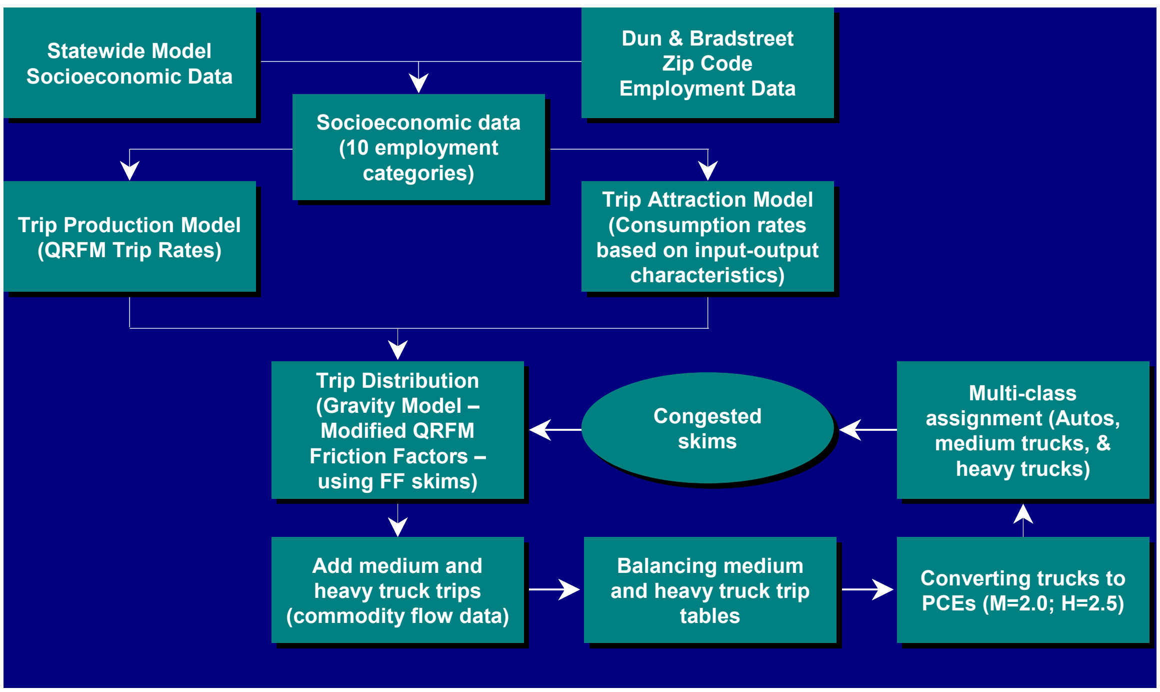
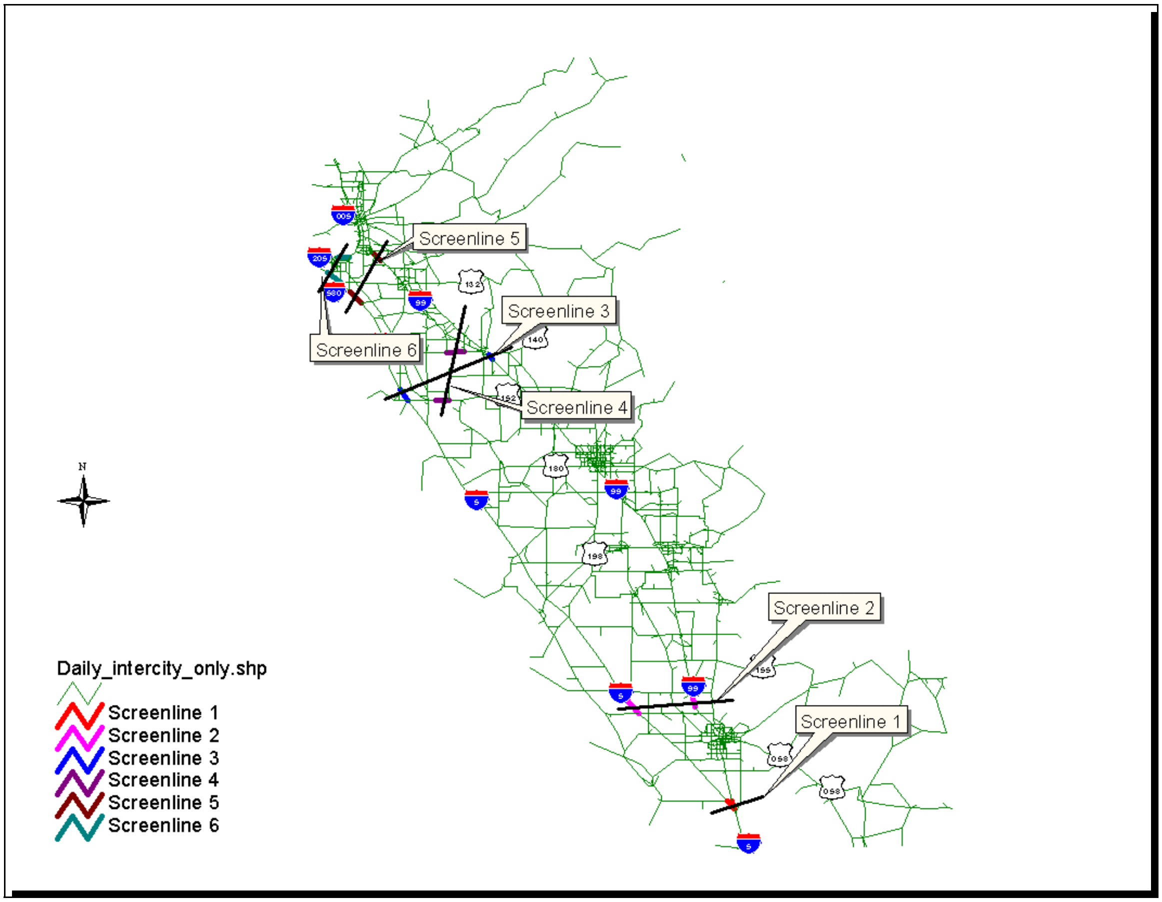


Exhibit 97: Location of Screen Lines



Truck classifications

The focus of the San Joaquin Valley truck model is on those trucks that the California Air Resources Board (CARB) classifies as "heavy-duty" for regulatory purposes. These trucks are further stratified into two classes: medium-heavy duty trucks (MHDT) which have a gross vehicle weight rating between 14,001 pounds and 33,000 pounds and heavy-heavy duty trucks (HHDT) which have gross vehicle weight ratings of 33,001 or more. Since some emissions models classify a portion of the vehicles with a gross vehicle weight rating between 8,500 and 14,000 pounds as light-heavy trucks, these trucks were excluded from the San Joaquin Valley truck model. These light-heavy trucks are ultimately included in the total automobile vehicle miles traveled generated by the Statewide model.

Routing Assignment

An incremental equilibrium assignment was used for the CIRIS model runs. This type of assignment loads a small portion of traffic onto the road network at a time such that the travel times between each origin-destination combination is minimized. This assignment process was found to be more suitable for creating comparative results when small changes in the truck trip origin-destination patterns are being considered as is the case with CIRIS.

Performance Measures

There are four performance measures that were used to evaluate different CIRIS configurations, as follows:

- **Congestion** (recurrent delay). Recurrent delay is measured as the difference between *congested* vehicle hours and *free flow* vehicle hours. The recurrent delay is estimated for the entire transportation network.
- **Reliability** (non-recurrent delay). Non-recurrent congestion is the amount of congestion caused by accidents in the system. It is a measure of the reliability of the system. This performance measure is only calculated for the freeway network.
- **Safety** (fatalities, injuries, and property damage). The accidents performance measure estimates the amount of fatalities, injury, and property damage for each scenario.
- **Emissions.** The emissions performance measure estimates the amount of vehicle-generated emissions for each alternative. The emissions included in this analysis are hydrocarbons and reactive organic gases (ROG), carbon monoxide (CO), and nitrous oxide (NOx) emissions. The emissions factors used for this analysis are based on CARB's emission model and are required for analysis of measures in air quality management plans. EMFAC 2000 is the latest version of this model.

All of these performance measures are available by vehicle class, which includes autos, medium trucks, and heavy trucks. They are presented in summary form for this report.

Description of CIRIS Scenarios

Six scenarios were analyzed using the model. The following three CIRIS configurations were analyzed:

- CIRIS stops in Bakersfield, Fresno and Stockton
- CIRIS stops in Stockton and Fresno only
- CIRIS stops in Stockton only.

Each of these scenarios were analyzed under two usage conditions.

- A startup scenario was used to reflect CIRIS usage in the early phases of deployment of the rail shuttle.
- A mature scenario was used to reflect CIRIS usage once scale economies were reached.

There were thus a total of six scenarios. For the startup and mature scenarios, the percentage of the shippers assumed to use CIRIS was estimated by the commodity group. The three commodity groups are perishable food/farm products, non-perishable food/farm products, and other products. Exhibit 98 shows the six scenarios and the percent market penetration by commodity group that were assumed for the model.

For each of the six scenarios, the truck trip table was altered to adjust for the headquarters bias that was present in the PIERS data, the truck trips removed due to CIRIS usage, and the truck trips added to the system due to drayage to the local intermodal hub.

Exhibit 98: CIRIS Scenarios Used for Model Runs

Scenario	Stops in			Deployment Scenario			
	Stockton	Fresno	Bakersfield	Phase	% Perishable	% Non-Perishable	% Other
1	X	X	X	Startup	5%	10%	15%
2	X	X	X	Mature	30%	45%	50%
3	X			Startup	5%	10%	15%
4	X			Mature	30%	45%	50%
5	X	X		Startup	5%	10%	15%
6	X	X		Mature	30%	45%	50%

Cargo Growth

To estimate both near-term and long-term CIRIS impacts, it is necessary to consider the likely growth of the cargo being moved.

- Port of Oakland container traffic is expected to grow at about 5% annually through 2020 (Exhibit 25
- The future mix of commodities and container types is expected to remain similar to the current mix.
- Much of the growth is expected to be intermodal, but trucks will continue to move a large share.

Central Valley cargo sources are expected to grow at least as quickly as other local cargo sources (Exhibit 99). This assumption is most likely very conservative, as Central Valley population and commercial/industrial growth has out-stripped central Bay Area areas in recent years.

Exhibit 99: Port of Oakland Container Cargo Growth

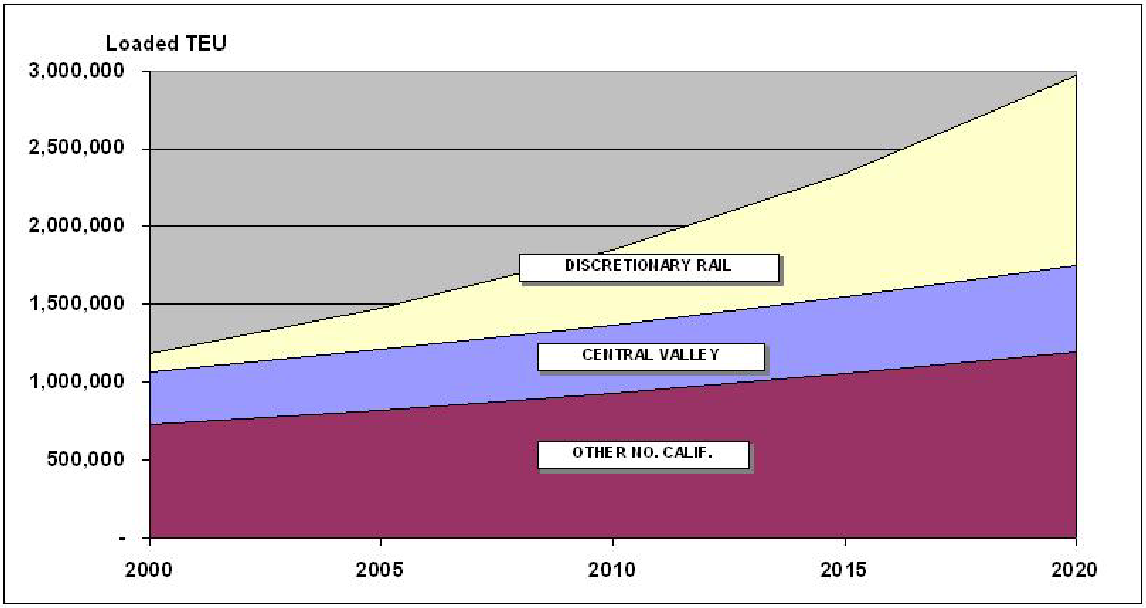


Exhibit 100 shows the impact of expected growth on the market accessible to a CIRIS service. In the course of 17 years, the potential market will nearly triple.

Exhibit 100: Cargo Growth in Accessible Market

	2003			2020		
Market	Exports Adjusted	Imports Adjusted	Total Adjusted	Exports Adjusted	Imports Adjusted	Total Adjusted
Stockton-Modesto						
Perishable Food/Farm	16,895	369	17,264	38,723	846	39,569
Non-Perishable Food/Farm	33,852	1,369	35,221	77,589	3,137	80,726
Other	6,043	11,055	17,098	13,852	25,337	39,189
Subtotal	56,790	12,793	69,582	130,163	29,321	159,484
Fresno						
Perishable Food/Farm	22,352	72	22,424	51,230	165	51,395
Non-Perishable Food/Farm	19,554	756	20,310	44,818	1,734	46,552
Other	15,311	4,381	19,692	35,092	10,042	45,134
Subtotal	57,216	5,210	62,426	131,140	11,941	143,081
Accessible Rail Shuttle Market	**114,006**	**18,002**	**132,008**	**261,304**	**41,262**	**302,565**

Truck Trip Diversion

Among the major objectives of inland port development and rail shuttle operation is the diversion of container-carrying trucks from congested highways – specifically from Altamont Pass. The tables below show the near-term and long-term potential. At 2003 business levels, a successful rail shuttle serving the Stockton-Modesto and Fresno markets could divert an estimated 26,112 annual trucks in the beginning and an estimated 110, 850 trucks at maturity (Exhibit 101).

Exhibit 101: 2003 Truck Trip Diversions

2003 Scenario	Stops in			Potential CIRIS Annual Container Volumes					
	Stockton	Fresno	Bakersfield	Phase	Perishable	Non-Perishable	Other	Total	Truck Trips
1	x	x	x	Startup	3,063	5,620	6,778	15,461	30,922
2	x	x	x	Mature	18,377	25,289	22,595	66,261	**132,522**
3	x	x		Startup	1,984	5,553	5,518	13,056	26,112
4	x	x		Mature	11,906	24,989	18,395	55,290	**110,580**
5	x			Startup	863	3,522	2,565	6,950	13,900
6	x			Mature	5,179	15,849	8,549	29,577	**59,155**

With continued cargo growth, the truck trips diverted could grow to 253,452 per year by 2020 (Exhibit 102), or just over 1000 truck trips (500 round trips) per weekday. The study team knows of no other proposal that would have this large an impact of truck traffic.

Exhibit 102: 2020 Truck Trip Diversions

2020 Scenario	Stops in			Potential CIRIS Annual Container Volumes					
	Stockton	Fresno	Bakersfield	Phase	Perishable	Non-Perishable	Other	Total	Truck Trips
1	x	x	x	Startup	7,020	12,881	15,536	35,437	70,874
2	x	x	x	Mature	42,120	57,963	51,788	151,871	**303,742**
3	x	x		Startup	4,548	12,728	12,648	29,924	59,849
4	x	x		Mature	27,289	57,275	42,162	126,726	**253,452**
5	x			Startup	1,978	8,073	5,878	15,929	31,859
6	x			Mature	11,871	36,327	19,594	67,792	**135,584**

Near-Term Scenario Performance

The performance measures of the six scenarios show that there is a measurable difference between the performance of the entire system with and without the CIRIS alternatives. The most notable of these differences occurs for system-wide delay and emissions. The differences for accidents and reliability are much less significant.

The magnitude of the differences vary for each of the scenarios.

- The improvements of all of the *startup* scenarios are insignificant, as would be expected. This is due to the small percentage of trucks assumed to be using the CIRIS service under this scenario.

- The improvements in the mature scenarios are more noticeable. Generally, the mature scenario that includes stops in Bakersfield, Fresno and Stockton was roughly equivalent to the mature scenario that includes stops in Fresno and Stockton only. This is due to the small market size for shippers in Kern County that use the Port of Oakland. The impact of the Stockton-only mature scenario was much smaller than for the other two configurations. This is a result of the Fresno market (which is roughly the same size as the Stockton market) not being diverted to the CIRIS service under this alternative.

Exhibit 103 through Exhibit 106 show the numerical results of the performance measures for each of the scenarios. The symbols S, F and B describe whether or not the CIRIS scenario includes stops in Stockton, Fresno, or Bakersfield respectively.

Exhibit 103: Congestion (Recurrent Delay) for 2003 CIRIS Scenarios

Scenario	Stops	Phase	Recurrent Delay (hours/day)	Change from Base (hours/day)	Percent Difference from Base
Base	None	n/a	1,244,482	-	n/a
1	S,F,B	Startup	1,244,312	-170	-0.01%
2	S,F,B	Mature	1,242,685	-1,797	-0.14%
3	S	Startup	1,244,474	-8	0.00%
4	S	Mature	1,243,748	-734	-0.06%
5	S,F	Startup	1,244,456	-26	0.00%
6	**S,F**	**Mature**	**1,243,136**	**-1,346**	**-0.11%**

Exhibit 104: Reliability (Non-recurrent Delay) for 2003 CIRIS Scenarios

Scenario	Stops	Phase	Non-recurrent delay	Change from Base (hours/day)	Percent Difference from Base
Base	None	n/a	1,370,740	-	n/a
1	S,F,B	Startup	1,371,304	564	0.04%
2	S,F,B	Mature	1,373,704	2,964	0.22%
3	S	Startup	1,371,007	267	0.02%
4	S	Mature	1,371,585	845	0.06%
5	S,F	Startup	1,371,099	359	0.03%
6	**S,F**	**Mature**	**1,372,887**	**2,147**	**0.16%**

The tables indicate that congestion declines (recurrent hours of delay decrease), but reliability decreases as well (nonrecurrent hours of delay increase). Review of model outputs suggest that this off-setting reliability impact is due to the influx of automobiles that would be expected to take the place of the diverted trucks.

- The reliability actually goes down for each improving alternative, because this performance measure is calculated as a factor of accidents on the freeway. As trucks are removed from the freeways, they are replaced by a higher number of cars, and therefore lead to an increasing number of accidents, and a lower reliability.

- The safety numbers improve, however, because as the percentage of trucks slightly decreases, the severity of the accident (as measured by fatalities, injuries, and PDO) can counteract the effect of the increase in the number of accidents.

It is sometimes said that “congestion is always just barely tolerable”. For a CIRIS system, this means that diversion of trucks may result in added auto trips as marginal drivers respond to the additional opportunities.

Exhibit 105: Emissions Impacts of 2003 CIRIS Scenarios (Trucks Only)

Scenario	Stops	Phase	Fatalities per Million VMT	Percent Change from Base	Injuries per Million VMT	Percent Change from Base	PDO per Million VMT	Percent Change from Base
Base	None	n/a	0.03270	n/a	3.11550	n/a	4.36280	n/a
1	S,F,B	Startup	0.03270	0.00%	3.11546	0.00%	4.36277	0.00%
2	S,F,B	Mature	0.03271	0.03%	3.11592	0.01%	4.36310	0.01%
3	S	Startup	0.03271	0.03%	3.11532	-0.01%	4.36269	0.00%
4	S	Mature	0.03271	0.03%	3.11569	0.01%	4.36280	0.00%
5	S,F	Startup	0.03270	0.00%	3.11544	0.00%	4.36273	0.00%
6	**S,F**	**Mature**	**0.03271**	**0.03%**	**3.11579**	**0.01%**	**4.36288**	**0.00%**

Exhibit 106: Safety Impacts of 2003 CIRIS Scenarios

Scenario	Stops	Phase	ROG (Tons/day)	Percent Change from Base	CO (Tons/day)	Percent Change from Base	NOx (Tons/day)	Percent Change from Base
Base	None	n/a	23.59	n/a	311.36	n/a	414.48	n/a
1	S,F,B	Startup	23.58	-0.06%	311.19	-0.05%	414.25	-0.05%
2	S,F,B	Mature	23.54	-0.22%	310.87	-0.16%	414.02	-0.11%
3	S	Startup	23.59	0.00%	311.27	-0.03%	414.43	-0.01%
4	S	Mature	23.56	-0.13%	311.18	-0.06%	414.22	-0.06%
5	S,F	Startup	23.58	-0.05%	311.21	-0.05%	414.27	-0.05%
6	**S,F**	**Mature**	**23.55**	**-0.18%**	**310.99**	**-0.12%**	**414.17**	**-0.07%**

PDO = property damage, other; VMT = vehicle miles traveled

Implications

That the small volumes diverted at startup would have minimal impact is not surprising. The impacts of the mature scenarios are more encouraging.

- Measurable improvements would be expected in congestion (recurrent delay) and reliability (non-recurrent delay). The percentage improvements are small because port-related truck traffic is a small percentage of the relevant highway traffic to begin with. Improvements in emissions (Exhibit 105) should also be measurable. Again, percentage changes are small.

- Safety impacts would be positive, but not significant.

Net changes in emissions and safety are modest in part because the truck trips do not disappear from the system. Each round trip between a San Joaquin Valley location and the Port of Oakland is replaced by a round trip truck drayage move within the Valley, a 160+ mile rail round trip, and a round trip truck drayage move in Oakland. The net roundtrip reduction in truck mileage may be on the order of 100 miles. The favorable congestion and reliability impacts, however, result from taking those 100 truck miles off heavily congested freeways.

The impacts model highlights the advantages of serving both the Stockton/Modesto and Fresno markets.

Exhibit 107: Summary Mature 2003 Scenario Impacts

Market	Congestion (% Change)	Reliability (% Change)	Emissions ROG+CO+NOx (% Change)
Stockton-only	-0.06%	0.06%	-0.06%
Stockton/Fresno	**-0.11%**	**0.16%**	**-0.10%**
Stockton/Fresno/Bak	-0.14%	0.22%	-0.13%

As Exhibit 107 shows, the Stockton/Fresno option achieves much greater improvements than the Stockton-only option and nearly as much as extending the service to Bakersfield.

Near-Term vs. Long-Term Scenario Performance

Exhibit 108 and Exhibit 109 compare the impacts of 2003 and 2020 CIRIS diversion levels in absolute terms (since the percentage impacts would be obscured by growing auto traffic). The expected cargo growth between 2003 and 2020 will more than double the impacts.

Exhibit 108: 2003 Summary Mature Scenario Impacts

Market	Congestion (hours/day	Reliability (hours/day)	Emissions ROG+CO+NOx (Tons/day)
Stockton-only	-734	845	-0.464
Stockton/Fresno	**-1346**	**2147**	**-0.715**
Stockton/Fresno/Bak	-1797	2964	-0.995

Exhibit 109: 2020 Summary Mature Scenario Impacts

Market	Congestion (recurrent delay)	Reliability (non-recurrent delay)	Emissions (ROG+CO+NOx)
Stockton-only	-1682	1937	-1.063
Stockton/Fresno	**-3085**	**4921**	**-1.639**
Stockton/Fresno/Bak	-4119	6794	-2.281

Efficiency of CIRIS As Congestion Relief Control Measure

Policy initiatives to reduce traffic congestion through diversion of truck trips have been frequently proposed by rarely implemented, leaving few precedents which to compare CIRIS system performance.

CIRIS congestion relief performance does compare favorably with a parallel passenger rail program: the Capital Corridor trains operated by Amtrak between San Jose and Sacramento.

- For a Stockton-Modesto regional CIRIS service, a minimum operating subsidy would be about $178 per round trip. Further subsidy reductions may be possible but have not been quantified.
- The Capital Corridor Joint Powers Authority 2002 budget was for a subsidy of $28 per passenger trip.
- For a round trip at 1.5 passenger per car round trip and 4.0 Passenger Car Equivalents per truck in hilly terrain typical of Altamont Pass, the comparable Capital Corridor subsidy is $336, roughly twice the minimum cost subsidy of the rail shuttle.

Efficiency of CIRIS As an Emissions Control Measure

As a stand-alone emissions control effort a CIRIS-type rail shuttle is relatively costly. As noted above, the actual reductions in truck operating miles are on the order of 100 miles per unit, since some Oakland-Central Valley freeway miles are replaced by mileage within the Central Valley rather than being eliminated outright. As Exhibit 110 shows, the annual subsidy required for each alternative relative to the amount of emissions removed is relatively high.

Exhibit 110: Mature Scenario Dollars per Ton

2003 CIRIS Scenario	Minimum Annual Subsidy	Annual Reduction in Emissions (tons)	$ per ton
Stockton-only	$ 4,545,232	116	$ 39,183
Stockton/Fresno	$ 9,828,705	179	$ 54,986
Stockton/Fresno/Bak	$ 6,835,939	249	$ 27,481

2020 CIRIS Scenario	Minimum Annual Subsidy	Annual Reduction in Emissions (tons)	$ per ton
Stockton-only	$ 10,417,754	266	$ 39,183
Stockton/Fresno	$ 22,527,571	410	$ 54,986
Stockton/Fresno/Bak	$ 15,668,098	570	$ 27,481

VIII. Implementation Issues

Implementation Issues

The complexity of the roles and functions within intermodal transportation will pose a significant implementation challenge to the sponsors of a subsidized rail shuttle serving Central Valley markets.

Control Over Container Movements

Implementation issues are intrinsically tied to the question of control: Who has the power to choose a rail shuttle over highway movement? There are two aspects of control important to this analysis: the choice of draymen (who will move the container), and the choice of rail versus highway movement. Container shipments moved locally or regionally by truck are usually controlled by the customer (shipper, consignee, or third party), who chooses the drayman. Port-rail drayage is typically controlled by the ocean carriers, who choose the draymen, the rail option, and the railroad for those moves.

Containers are billed as either "Local" or "Store-Door".

- For "local" containers, the ocean carrier or stevedore simply notifies the customer (the "notify party" on the bill of lading) of the container's arrival and availability, and the customer makes all delivery arrangements. A "local" steamship bill of lading covers the movement from port to port.

- For "store-door" containers, the ocean carrier theoretically makes arrangements for inland delivery (via truck or rail) and pays the inland carriers. A "store-door" steamship bill of lading covers the movement all the way to the consignee's door.

In both cases, however, the customer/consignee often controls the drayage. Major customers and ocean carriers both typically have a preferred "house drayman" who handles most or all of their drayage business. For local moves, the customers usually call their own house drayman. For store-door shipments, most ocean carriers notify the customer's house drayman of the container's arrival. The drayman then makes the arrangements, with the customer choosing actual pickup and delivery times. A few ocean carriers in niche or specialized trades make delivery appointments directly with customers, but in those cases as well the customer is in control.

Rail intermodal movements are usually treated as store-door shipments, with the ocean carrier arranging and paying for inland rail movement and truck delivery. For port-rail drayage, the ocean carrier chooses the drayman (usually the ocean carrier's house drayman) and effectively controls the movement.

Outbound (export) containers from major shippers are picked up by the customer's house drayman according to the customer's preferences. Intermodal export and empty containers are picked up at the rail ramp by the ocean carrier's house drayman, with the ocean carrier in control.

Ocean carriers generally prefer local over store-door billing. Store-door billing, as discussed below, has been used as a means of offering target customers beneficial rate packages; the ocean carrier can undercut port-to-port tariffs by picking up the drayage, or more than the drayage. The drayage costs incurred under store-door billing are, at best, passed through to the customer. At worst (from the ocean carrier's perspective), ocean carriers pay the shipper's house drayman a higher rate than their own house drayman, and do not recover the difference from the customer.

Risk and Commitment

Despite strong initial interest by many parties and a potentially compelling public interest justification, the success of a rail shuttle initiative is far from certain. Short-haul rail intermodal service would leave little margin for error, and service failures would result in extra cost and diminished credibility.

While potential customers have expressed a willingness to try a shuttle service at rates 10% below existing drayage rates, none have committed to doing so and few control enough volume to justify a service by themselves (unlike long-haul double-sack services, where a single vessel call can fill a train). Above all, few potential customers are willing to accept additional risk or management responsibilities for a relatively small savings.

The key to overcoming the risk barrier may be to secure base or threshold volumes from a combination of major customers:

- Major ocean carriers with store-door accounts
- Large drayage firms with multiple customers
- AFFES/MTMC and GSA
- Major local distribution centers (e.g. Cost Plus, Home Depot)

Roles and Participants

Exhibit 111, on a separate page, displays the chief roles to be performed in a rail container shuttle service. Note that the roles are defined in terms of functions performed, and that many of the roles could be fulfilled by different participants depending on how the system was organized.

- An exhaustive list would be much longer, since major participants have multiple functions within their broader roles (a railroad, for instance, must maintain right-of-way, supply and service locomotives, dispatch trains, etc.) and there are subsidiary roles that would typically be arranged and managed by one of the major participants (a terminal operator, for instance will usually have a subcontractor to maintain and repair lift equipment). For this policy-level analysis, however, these detailed considerations can be left out.

- In practice some of the roles may be combined. For example, if the sponsoring agency chooses to perform day-to-day management and customer service, then the “rail shuttle sponsor”, “manager”, and “intermodal marketing company” roles would be combined. If a drayage firm or terminal operator chose to manage the system, still other simplifications would be possible.

Exhibit 111: Rail Shuttle System Roles and Potential Participants

Role	Description	Potential Participants
"Rail Shuttle Sponsor"	Public, private, or public-private organization that develops, oversees, and subsidizes the shuttle system.	Caltrans, joint powers authority, council of governments
"Rail Shuttle Customer"	Tenders container to railroad for line-haul movement, pays rail invoice	Shipper, consignee, ocean carrier, drayman, IMC
"Manager"	Supervises door-to-door service, handles problems, resolves disputes	Shuttle sponsor, shipper, consignee, ocean carrier, drayman, IMC, terminal operator
"Terminal Operator"	Receives containers, loads and unloads rail cars, and chassis, interchanges equipment	Container depot operator, rail terminal contractor
"Railroad"	Operates trains, receives containers in interchange	Railroad (BNSF or UP)
"Intermodal Marketing Company"	"IMC" – provides marketing, sales, and customer service	Existing IMC, railroad, drayman
"Drayman"	Provides over-the-road trucking to/from intermodal terminals, interchanges containers	Drayman, rail terminal contractor
"Ocean Carrier"	Provides ocean container transport, interchanges containers	Steamship line, NVOCC

Rail Shuttle Sponsor

Role: Public, private, or public-private organization that develops, oversees, and subsidizes the shuttle system.

Potential Participants: Caltrans, joint powers authority, council of governments

Rail intermodal service between two points is ordinarily offered, priced, and managed as part of the widespread service offerings of major line-haul railroads. The special circumstances of the proposed CIRIS shuttle – chiefly the need for subsidy – suggest the need for a sponsoring organization to implement the service and manage the subsidy system. The sponsor would have to work with the railroads involved (BNSF, and/or UP) to set up service schedules and rates, promote the service to potential users, and administer whatever subsidy system emerges.

- Caltrans could be the conduit for pilot or long-term funding, and already is involved in rail operations through the Caltrains commuter system and the Capital Corridor trains.

- The San Joaquin Council of Governments or another regional planning agency would have a keen interest in diverting trucks form the highway and encouraging economic growth, but such agencies are rarely involved in operating programs, much less in quasi-commercial transportation ventures. Regional planning agencies might better participate as part of a joint powers authority.

- Either the Port of Stockton or the Port of Oakland might be a candidate, but neither port authority sees rail operations as part of its charter or mandate. A rail shuttle program would divert management attention, staff resources, etc. from the ports' primary purposes.

California has the legislative authority to create special purpose districts, now used at least twice for rail freight transportation. Joint Powers Authorities were set up for the Intermodal Container Transfer Facility in 1983, and later the Alameda Corridor. These authorities can be set up by local agencies to develop, finance, and implement complex multi-jurisdictional public-private projects. The authorities can take on financing responsibilities, such as bonding authority, and can issue tax exempt debt as a public entity. For CIRIS to become a reality, a similar special purpose entity may be needed to manage the multi-jurisdictional project and collect funds from multiple entities.

Rail Shuttle Customer

Role: Tenders container to railroad for line-haul movement, pays rail invoice.

Potential Participants: Shipper, consignee, ocean carrier, drayman, IMC, terminal operator

Although it is common to casually assume the "shipper" would choose to use the rail shuttle, in most cases it may be another party. The rail shuttle offering and the subsidy system should be flexible enough to accommodate any customer with business to tender. The issue of control over the actual movements is addressed elsewhere. If the drayage firm controls the movement as the result of delegation by the underlying customer, the drayage firm would become the potential rail customer. If the ocean carrier controls the movement as a "store door" shipment, the ocean carrier may choose to use rail rather than truck.

The identity of the "customer" has important implications for the way the service is marketed and managed. Selling the service to an ocean carrier who has multiple customers to serve and hundreds of containers to control would be entirely different than selling the service to individual imports and exporters or local drayage firms.

The primary issues facing potential customers are volume commitment and risk. As noted earlier, intermodal service thrive on volume, and the ability and willingness of large customers to commit significant volumes of traffic would support the establishment of a pilot program and its eventual expansion into an on-going service. Against the willingness of customers to commit stands two kinds of risk: the risk that the total costs will be higher than expected, and the risk of service shortfalls or failures.

All major ocean carriers have existing rail service contracts with BNSF, UP, or both. Smaller ocean carriers may use an intermediary, chiefly Pacer International, who also has contacts with BNSF and UP. The existing contractual relationships provide a stepping stone to the development of a rail shuttle service.

Manager

Role: Supervises door-to-door service, handles problems, resolves disputes.

Potential Participants: Shuttle sponsor, shipper, consignee, ocean carrier, drayman, IMC, terminal operator

Intermodal transportation is too complex to be self-managing. The costs estimates explicitly allow for the expense of managing and administering the shuttle service. Each segment of the business requires someone to take charge and insure that the various roles are performed efficiently and reliably. International long-haul traffic is typically managed either by the large ocean carriers themselves or by a third party such as Pacer for smaller carriers and flows. UPS, Schneider National, and J. B. Hunt each manage their own substantial intermodal traffic. Intermodal Marketing Companies (IMCs) manage intermodal traffic for numerous smaller customers.

It would be possible for different parties to take the lead in managing different traffic segments. Large drayage firms with multiple customers; government agencies such as Army-Air Force Exchange Service ("AAFES"), Military Transport Management Command ("MTMC"), or the General Services Administration ("GSA"); and large ocean carriers with store-door accounts could all manage their share of the business.

Terminal Operator

Role: Receives containers, loads and unloads rail cars, and chassis, interchanges equipment.

Potential Participants: Container depot operator, port, rail terminal contractor

Terminal operators are already in place at the BNSF and UP facilities, typically a rail intermodal terminal contractor such as Pacific Rail Services or Parsec. As noted in the section on intermodal facilities, the key factor is the cost structure of the terminal services at start-up and at maturity.

Railroad

Role: Operates trains, receives containers in interchange.

Potential Participants: Railroad (BNSF or UP)

The railroad perspective is a key factor in assessing the feasibility of various rail shuttle scenarios. In the absence of positive railroad interest and commitment, nothing will happen regardless of how avid other parties might be.

There are three levels of rail participation.

- **"Manifest" intermodal service.** BNSF and UP already offer manifest service between the San Joaquin Valley and Oakland. To provide intermodal service within the manifest framework would require either or both line-haul railroads to offer rates covering intermodal containers moving between a Stockton or Fresno terminal and their intermodal facilities in Oakland. For the most part the railroad would only have to offer a rate and transit time that covered the service. This level of participation would entail little or no risk for the railroads. In the absence of special arrangement, however, service may be slow and inconsistent.

- **Existing intermodal service.** Both line-haul railroads have intermodal trains moving between Stockton or Fresno and Oakland as part of their overall intermodal network. In neither case, however, does the railroad offer routine intermodal service between the two points (UP does reposition empty containers between Stockton and Oakland on the weekends for Pacer). The difference in intermodal and manifest train speeds on the short distance between Stockton or Fresno and Oakland would have little impact on the overall schedule, but intermodal service does not ordinarily entail sorting in Central Valley freight yards with the attendant delay. Use of existing intermodal train schedules may provide more competitive CIRIS service and facilitate a transition between manifest service and a separate CIRIS intermodal train.

- **Dedicated Intermodal Service.** At sufficient intermodal volumes, dedicated service would be justified. This option corresponds most closely to what is popularly imagined as a "rail shuttle". The critical factor is not the train make-up, but the schedule window in which the train travels and the commitment made by the railroad to achieve competitive service standards.

Intermodal Marketing Company – "IMC"

Role: Provides marketing, sales, and customer service.

Potential Participants: Existing IMC, railroad, drayman, shuttle sponsor

IMCs operate as the marketing, sales, and customer service arm of the domestic rail intermodal business, as railroads do not typically perform those functions. These functions are conceptually distinct from service supervision and management, but could be performed by the same organization.

Drayman

Role: Provides over-the-road trucking to/from intermodal terminals, interchanges containers.

Potential Participants: Drayage firm, customer truck fleet

Drayage is a specialized form of trucking, and is given extensive treatment in an earlier chapter. The simplest way to provide drayage within a shuttle system is to rely on existing firms. There are circumstances in which customers may wish to provide drayage with their own truck fleets, or where drayage could be provided as part of a service package by another party.

Ocean Carrier

Role: Provides ocean container transport, interchanges containers.

Potential Participants: Steamship line, NVOCC

The ocean carrier must be considered in planning a rail shuttle system. As explained below under the topic of control, ocean carriers control a significant portion of the traffic and may be instrumental in diverting highway movements to rail.

Central Valley imports and exports are highly competitive, and typically handled as "store-door business" (defined below) with the equivalent of a $200 allowance for drayage over the rate paid for Oakland local business. Since the going rate for Stockton-area drayage is $250, some Central Valley customers are effectively receiving *lower* port-to-port rates than their Bay Area counterparts. Ocean carriers either accept lower margins on Central Valley business or attempt to secure lower drayage rates (with some reported success by at least one carrier).

Ocean carriers facing this situation have strong incentive to seek the lowest cost means of delivering containers to the Central Valley. Ocean carriers will be attracted to any service that reduces their cost without jeopardizing customer satisfaction or adding to their own management burdens.

Non-Vessel Owing Common Carriers (NVOCCs) play an important role in moving Central Valley imports and exports, particularly for agricultural products and smaller shippers. NVOCCs operate by accepting individual containerized shipments and moving them under contract volume rates with steamship lines. These firms generate their profits according to the spread between "retail" and "wholesale" steamship line rates, and would welcome any opportunity to reduce costs and widen that margin.

Incentives

A key issue throughout the implementation planning will be the incentives of the major parties. If the proposed pilot program or long-term operation is aligned with these incentives, the chances of success are much higher. Every party involved in intermodal transportation is interested in minimizing cost as long as the service meets their standards for transit time and reliability.

- Exporters can be roughly divided into shippers of low-value, cost-sensitive cargo (e.g. waste paper) and shippers of high-value, service-sensitive cargo (e.g. perishables). One group would be interested in a rail shuttle to save money; the other more concerned about transit time and cargo condition.

- Importers are typically more service sensitive, and are particular about the order and timing of deliveries.

- Truckers are under intense cost pressure and have difficulty recruiting drivers. Truckers contacted by Tioga are interested in a rail shuttle to control costs and keep drivers in the Valley. Truckers will not, however, jeopardize customer relationships.

- Ocean carriers reportedly subsidize trucking to and from the Valley, and would be interested in a rail shuttle if it saves them money without alienating the customer.

- Railroads are interested in new traffic and in public support, but also want to use their capacity to maximize long-haul traffic and revenue.

Pilot or Demonstration Programs

Most of the stakeholder acquainted with the CIRIS concept have envisioned a pilot or demonstration phase. The Port of Oakland has proposed $8 million in Surface Transportation Act funding for such a program beginning in 2004. Given the lack of experience with short-haul intermodal service and the implementation complexities cited above, a pilot or demonstration phase seems like a prudent course of action.

The purpose of a pilot program would be to:

- Verify the ability of the railroad and its terminal operators to maintain competitive service and reliability standards.

- Determine actual operating costs and explore system efficiencies.

- Test market acceptance without long-term funding.

- Enable drayage firms, customers, ocean carriers, and other participants to adjust to new operating methods.

- Establish a performance record and seek long-term volume commitments.
- Measure potential impact and evaluate the case for long-term subsidies.

Conventional manifest or intermodal service from existing facilities could be started quickly, but significant lead time will be required for a subsidized operation.

- There are few if any precedents for a freight operating subsidy, and no readily available mechanisms that could be easily adapted.
- Creation of a sponsoring organization, especially a joint powers authority, will require months of planning and negotiation.
- Railroads can move very quickly to establish new services when motivated, but may take much longer to implement new services in these uncommon circumstances. Railroads will be looking for a significant volume commitment that may be hard to secure.

A multi-year demonstration project would be ideal, but would entail substantial financial resources. A shorter period would probably be sufficient to establish a performance record and evaluate results. The seasonality of agricultural exports and holiday-driven imports, however, will affect short-term traffic levels depending on where the pilot starts and ends within the twelve-month shipping cycle.

A key difference between a pilot program and a long-term operation is in the funding of capital items, notably rail equipment.

- The rail costing analysis used TTX pool costs for rail cars, and for a pilot program that approach seems particularly appropriate. In the long term, a joint powers agency or another organization could explore outright purchase as a way of reducing operating expenses.
- The rail costing analysis also assumed leased second-hand locomotives for the CIRIS shuttle option. For a pilot program, the most straightforward approach would be for the Class 1 railroad (BNSF or UP) to supply the locomotives. For the long term, sponsoring organization could evaluate multiple options, including purchase of new or used locomotives or pooling arrangements with Amtrak Capital Corridor operations.
- Capital improvements to intermodal terminals were not discussed in the costing analysis, and would not be required in a pilot phase. In the long term, success at attracting new traffic could eventually strain the capacity of existing terminals and require expansion and/or additional lift equipment.

IX. Evaluation

Scenario Evaluation

Although the analysis of detailed options is complex, the criteria for comparison and evaluation are fairly straightforward.

- The overall objective of the CIRIS concept is to take trucks off the freeways, with expected improvements in congestion, reliability, and emissions.
- The CIRIS concept is inherently regional, and both favorable impacts and the chances for broad support are increased in a regional approach.
- The most cost-effective means of achieving these goals is preferable.

A long-term perspective suggests evaluating the mature system options first, then choosing the best development path to reach the chosen end point.

Mature Scenarios

Exhibit 112 summarizes the cost, volume, and impacts of the three mature 2003 scenarios.

- The Stockton-only scenario minimizes the annual subsidy, but diverts lower volumes of truck traffic and offers relatively small improvements in congestion, reliability, and emissions.
- The Stockton-Fresno option costs more, due to the additional cost of serving Fresno and the much greater volume of traffic to be handled. The higher cost, however, yields much more favorable impacts due to the higher volume and the greater distance involved in the Fresno diversions.
- The three-market scenario has the most attractive potential economics, but cannot be regarded as a realistic near-term option. The Bakersfield market adds to the volume of truck that might be diverted, and adds to the potential revenue at the same time. The longer linehaul for the Bakersfield-Oakland route achieves more of the economies of scale inherent in intermodal transportation. Without existing facilities, however, it remains an theoretical alternative.

Exhibit 112: Mature 2003 Scenario Cost-Effectiveness Comparisons

Mature Scenario	Minimum Annual Subsidy	Annual Volume	Unit Subsidy	Congestion (recurrent delay)	Emissions (ROG+CO+NOx)
Stockton-only	$ 4,545,232	29,577	$ 154	-0.06%	-0.06%
Stockton/Fresno	**$ 9,828,705**	**55,290**	**$ 178**	**-0.11%**	**-0.10%**
Stockton/Fresno/Bak	$ 6,835,939	66,261	$ 103	-0.14%	-0.13%

Accordingly, the Stockton/Fresno combination is the best practical option for a mature system within the limits of existing facilities. Eventual extension of the system to Bakersfield would be desirable should facilities be developed there.

Startup and Development

With the goal of developing mature Stockton-Fresno system, there are three routing options at startup:

- Stockton-only, with subsequent extension to Fresno
- Fresno-only, with a subsequent stop added in Stockton
- Stockton/Fresno, with the full route operating from the beginning

Exhibit 113 compares the startup phases. While the Fresno-only option appears cost-effective, it does not offer a regional solution.

Exhibit 113: Startup Phase Comparisons

Startup Scenario	Minimum Annual Subsidy	Annual Volume	Unit Subsidy	Congestion (recurrent delay)	Emissions (ROG+CO+NOx)
Stockton-only	$ 1,271,841	6,950	$ 183	0.00%	-0.02%
Stockton/Fresno	**$ 2,128,120**	**13,056**	**$ 163**	**0.00%**	**-0.05%**
*Fresno-only**	$ 2,922,145	6,106	$ 479	-0.01%	-0.05%

** Interpolated, no model run*

Operating the full route from the beginning offers several advantages, and is the recommended approach.

- Serving both markets from the beginning encourages joint sponsorship by agencies in both the Stockton/Modesto and Fresno regions.
- The two-market combination will begin generating measurable public benefits much sooner.
- The higher revenue from the Fresno traffic helps reduce the average subsidy
- The larger market potential will assist in evening-out seasonal and monthly traffic peaks.
- The additional volume will assist in reaching an economic scale and shortening the phase-in period.