

# Operational Development of Marine Highways to Serve the Pacific Coast

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*Ferry Transportation Committee (AP085)*

*Ports and Channels Committee (AW010)*

# Contents

- **CCDOTT Project Overview**
- **Market Analysis**
- **Logistic Company Perceptions**
- **Simulation Model and Required Vessel Speed**
- **Vessel Characteristics**
- **SSS Economics**
- **Conclusions and Challenges**

# CCDoTT Project

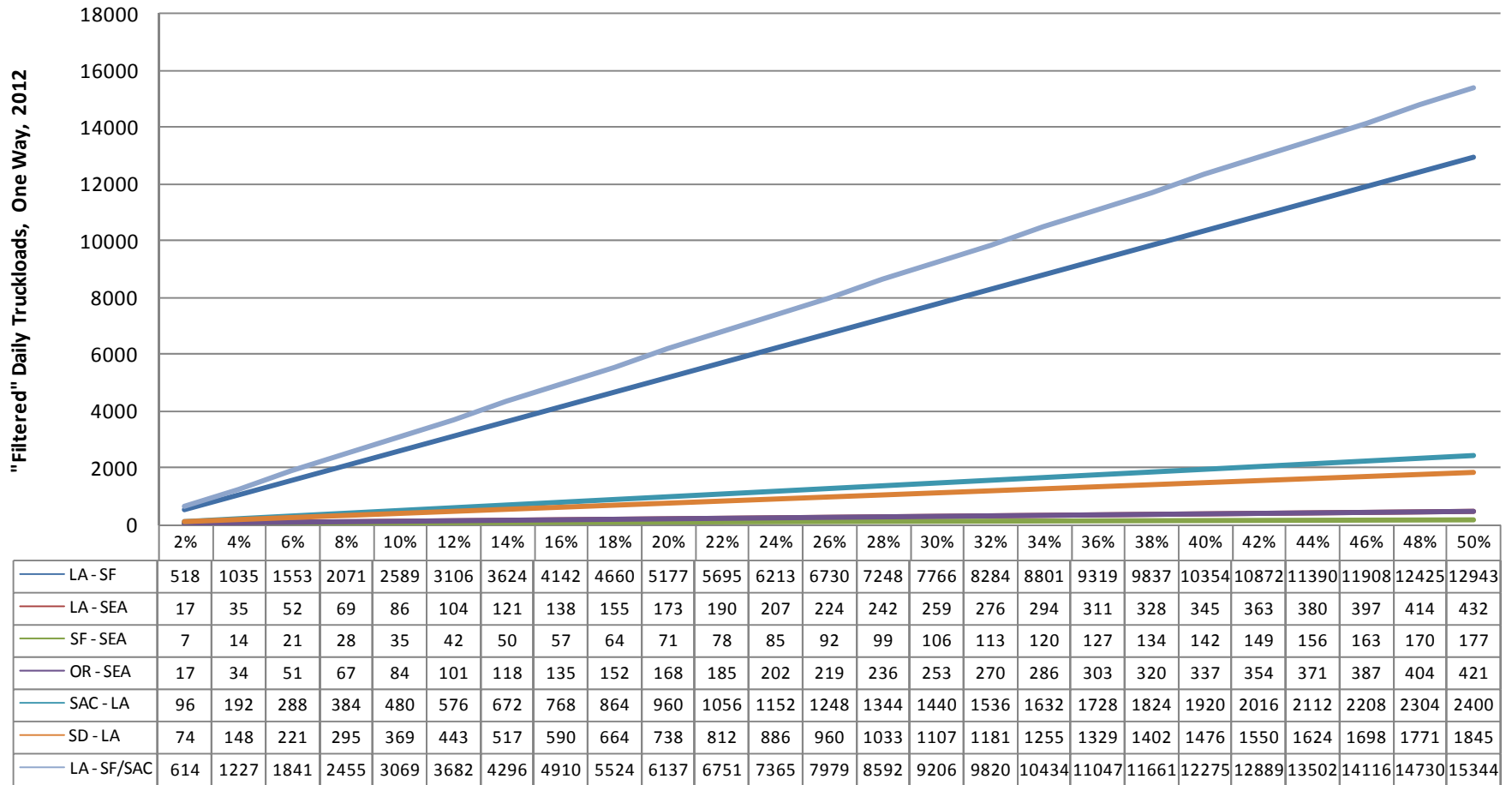


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- **Initial question from Westar Transport**
  - How big and fast can we go?
- **The Center for the Commercial Deployment of Transportation Technologies (CCDoTT)**
  - Completed FY-05 Phase I at end FY-06
    - » Preliminary market analysis
    - » Assessed feasibility
  - Phase II Final Report – In review cycle
    - » Updated market assessment
    - » Improved fidelity of door to door systems model
    - » Refinement of vessel requirements
    - » Improved fidelity of economic model

# West Coast Market Potential Domestic Freight

## With Alternative Levels of Market Penetration



# Estimated Daily Sailings

## 700 Trailer Vessel

Market Share	LA - SF	LA - SEA	SF - SEA	OR - SEA	SAC - LA	SD - LA	LA - SF/SAC
2%	1	0	0	0	0	0	1
4%	2	0	0	0	0	0	2
6%	3	0	0	0	0	0	4
8%	4	0	0	0	0	0	5
10%	5	0	0	0	1	0	6
12%	6	0	0	0	1	0	8
14%	8	0	0	0	1	1	9
16%	9	0	0	0	1	1	10
18%	10	0	0	0	1	1	12
20%	11	0	0	0	2	1	13
22%	12	0	0	0	2	1	15
24%	13	0	0	0	2	1	16
26%	14	0	0	0	2	2	17
28%	16	0	0	0	2	2	19
30%	17	0	0	0	3	2	20
32%	18	0	0	0	3	2	21
34%	19	0	0	0	3	2	23
36%	20	0	0	0	3	2	24
38%	21	0	0	0	4	3	25
40%	23	0	0	0	4	3	27
42%	24	0	0	0	4	3	28
44%	25	0	0	0	4	3	30
46%	26	0	0	0	4	3	31
48%	27	0	0	0	5	3	32
50%	28	0	0	0	5	4	34

## 450 Trailer Vessel

Market Share	LA - SF	LA - SEA	SF - SEA	OR - SEA	SAC - LA	SD - LA	LA - SF/SAC
2%	0	0	0	0	0	0	0
4%	1	0	0	0	0	0	1
6%	2	0	0	0	0	0	2
8%	2	0	0	0	0	0	3
10%	3	0	0	0	0	0	4
12%	4	0	0	0	0	0	5
14%	5	0	0	0	0	0	6
16%	5	0	0	0	1	0	7
18%	6	0	0	0	1	0	7
20%	7	0	0	0	1	1	8
22%	8	0	0	0	1	1	9
24%	8	0	0	0	1	1	10
26%	9	0	0	0	1	1	11
28%	10	0	0	0	1	1	12
30%	11	0	0	0	2	1	13
32%	11	0	0	0	2	1	14
34%	12	0	0	0	2	1	14
36%	13	0	0	0	2	1	15
38%	14	0	0	0	2	2	16
40%	14	0	0	0	2	2	17
42%	15	0	0	0	2	2	18
44%	16	0	0	0	3	2	19
46%	17	0	0	0	3	2	20
48%	17	0	0	0	3	2	21
50%	18	0	0	0	3	2	21

## 150 Trailer Vessel

Market Share	LA - SF	LA - SEA	SF - SEA	OR - SEA	SAC - LA	SD - LA	LA - SF/SAC
2%	3	0	0	0	0	0	4
4%	6	0	0	0	1	0	8
6%	10	0	0	0	1	1	12
8%	13	0	0	0	2	1	16
10%	17	0	0	0	3	2	20
12%	20	0	0	0	3	2	24
14%	24	0	0	0	4	3	28
16%	27	0	0	0	5	3	32
18%	31	1	0	1	5	4	36
20%	34	1	0	1	6	4	40
22%	37	1	0	1	7	5	45
24%	41	1	0	1	7	5	49
26%	44	1	0	1	8	6	53
28%	48	1	0	1	8	6	57
30%	51	1	0	1	9	7	61
32%	55	1	0	1	10	7	65
34%	58	1	0	1	10	8	69
36%	62	2	0	2	11	8	73
38%	65	2	0	2	12	9	77
40%	69	2	0	2	12	9	81
42%	72	2	0	2	13	10	85
44%	75	2	1	2	14	10	90
46%	79	2	1	2	14	11	94
48%	82	2	1	2	15	11	98
50%	86	2	1	2	16	12	102

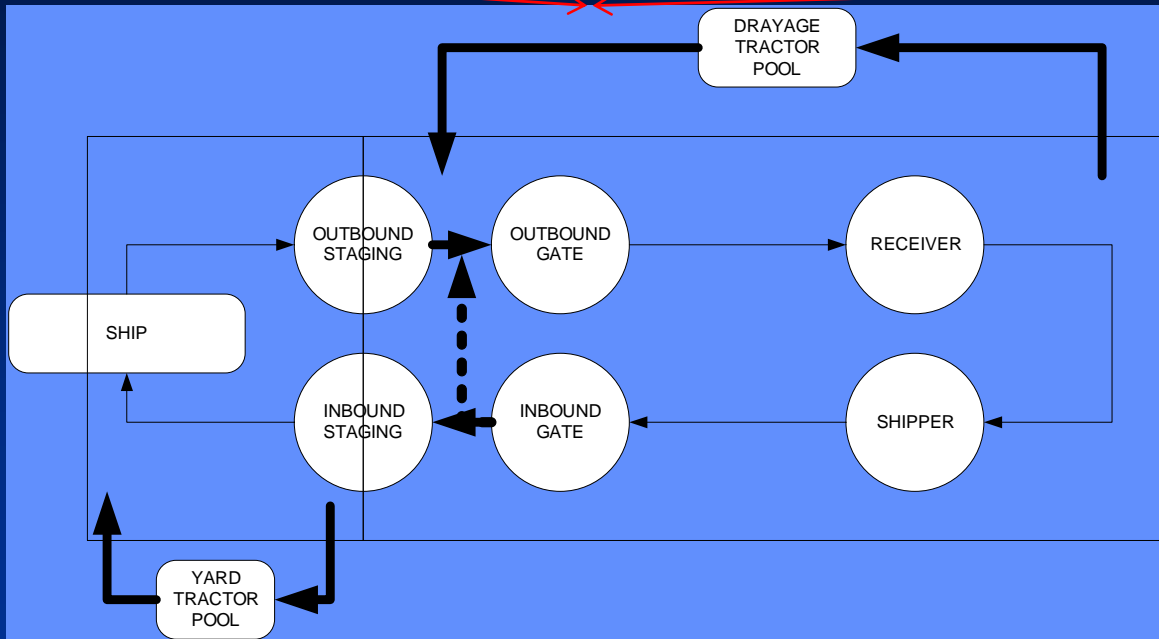
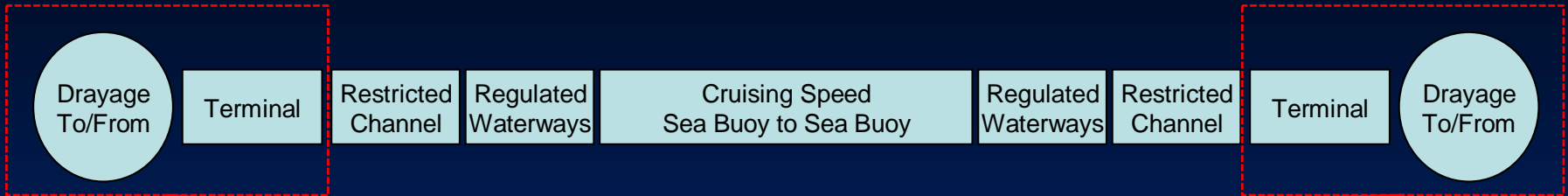
# Logistic Company Perceptions

- **Short sea shipping service more appropriate for distances greater than 700 or 800 miles for non-time-sensitive cargoes**
- **Trucking companies indicated that transits of 1 to 2 days between Los Angeles and San Francisco and 2 to 3 days between Los Angeles and Seattle would be required in most cases**
- **Discounts of 20% to 30% off trucking costs, in general, are considered to be sufficient to compensate for a transit time increase of one day for longer short sea transits, assuming that the coastwise service is reliable**
- **Respondents most often suggested daily sailings to reduce the time spent waiting for the ship to sail**
  - Drayage to the port, plus waiting for vessel sailing times are viewed as incremental time to a coastwise shipping option, and respondents believe that these additional delays can result in transit times that are two to three times longer than truck transit times.
- **Commodity characteristics that might be eligible to shift off-shore are non-time-sensitive, low-value cargoes that are either being used for non-just-in-time (JIT) warehouse replenishment or materials for manufacturing where longer transits have been built into the supply chain**

# Logistic Company Perceptions, Cont.

- **Short sea shipping service is more viable for large trucking companies with broad geographic scope, who have tractors in both origin and discharge ports**
  - Owner-operator trucking companies, who typically operate from a single home base, would not receive an advantage from short sea shipping because they typically would not have the ability to arrange for the pick up of cargo at the discharge port.
  - The short-sea shipping program should include an owner-operator network to coordinate owner-operators' hand offs at load and discharge ports. A trailer equipment pool was also recommended that would provide owner-operators with replacement trailers during the duration of the roundtrip voyage
- **The Pacific Northwest freight imbalance may create the need to re-position trailers empty on the lower-demand southbound leg**
- **Additional anticipated short sea shipping benefits, such as reduced traffic congestion, reduced truck pollution, improved working conditions for truck drivers and alleviating the truck driver shortage were acknowledged, but potential cost savings was the key advantage when considering a coastwise service**
- **Responses suggest that diverting over-the-road truck volume into port areas for short sea shipping service use may compound existing traffic congestion issues in and around the ports**

# Short Sea Shipping Simulation Model

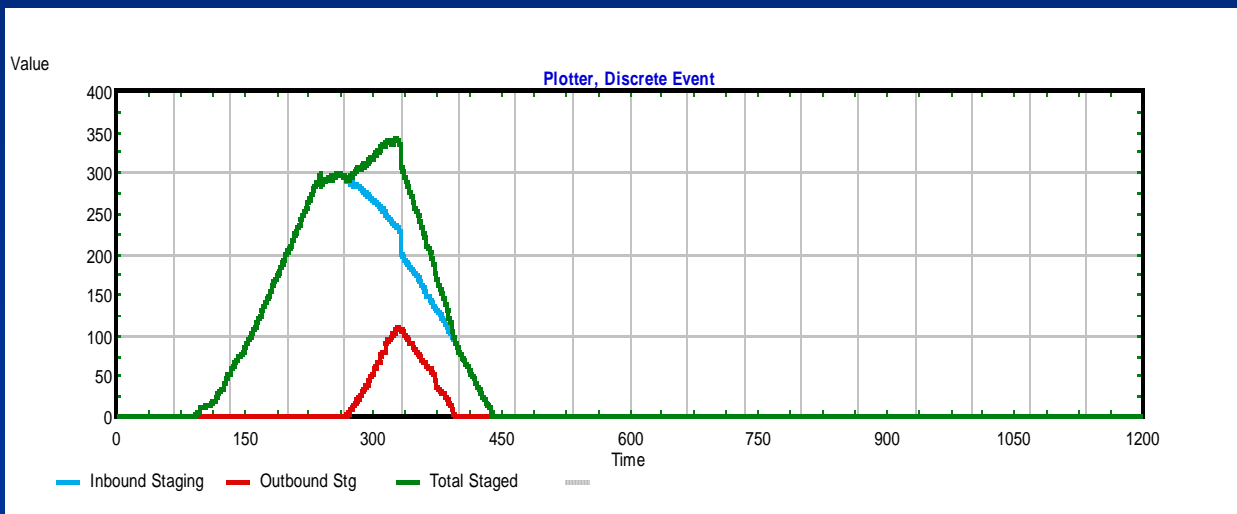
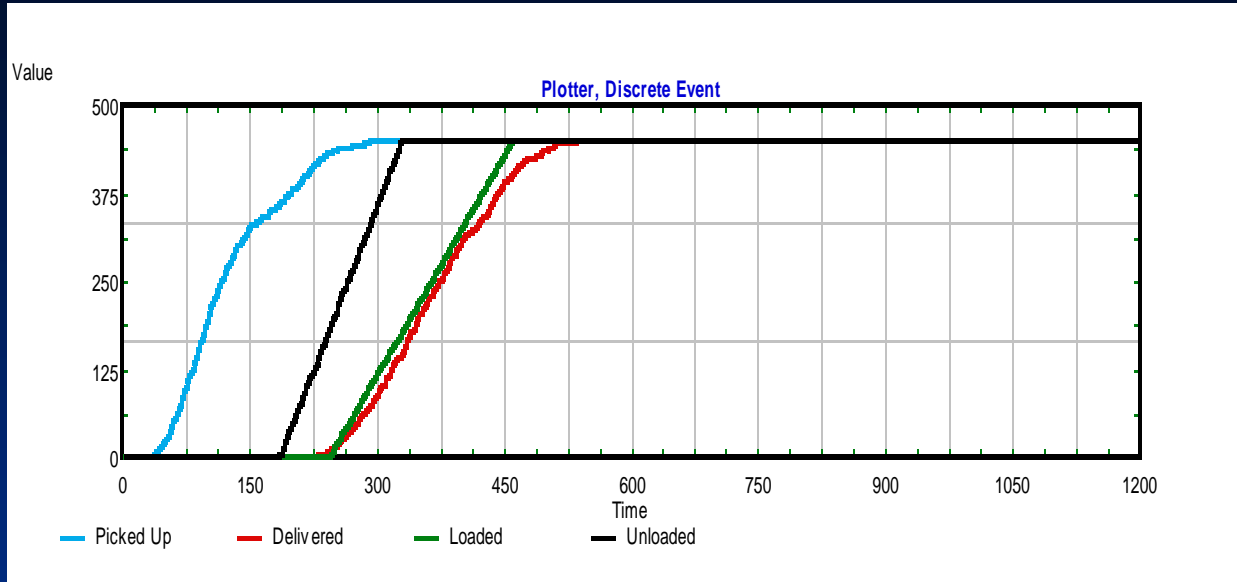


- Number of yard tractors
- Number of drayage tractors
- Trailer capacity
- In/outbound lanes
- Gate delays
- Drayage distances
- Truck speed
- Delays
- Number of inbound trailers pre-staged in the terminal prior to start of unloading/loading
- Maximum vessel throughput in trailers/hour for loading
- Maximum vessel throughput in trailers/hour for unloading

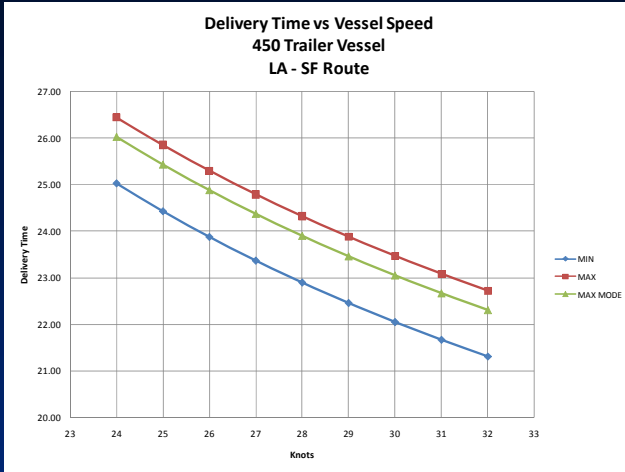
- Improved fidelity of the simulation model
- Use of stochastic variables in lieu of deterministic variables
- Addition of potential delays at shippers, receivers
- Explored impact of dead-head drayage between shippers and receivers

# Simulation Output Example

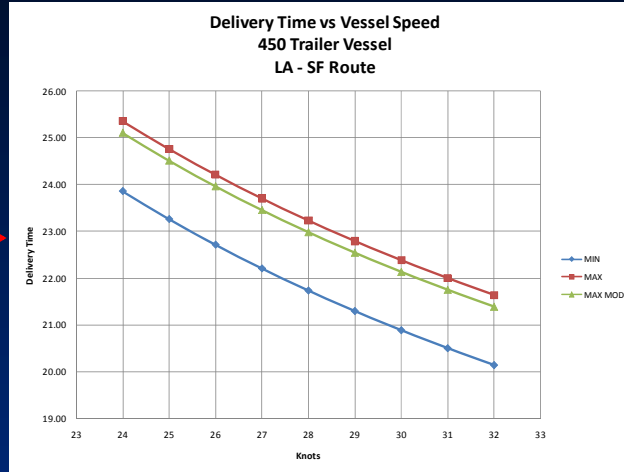
## 450 Trailer Vessel Base Case, LA End



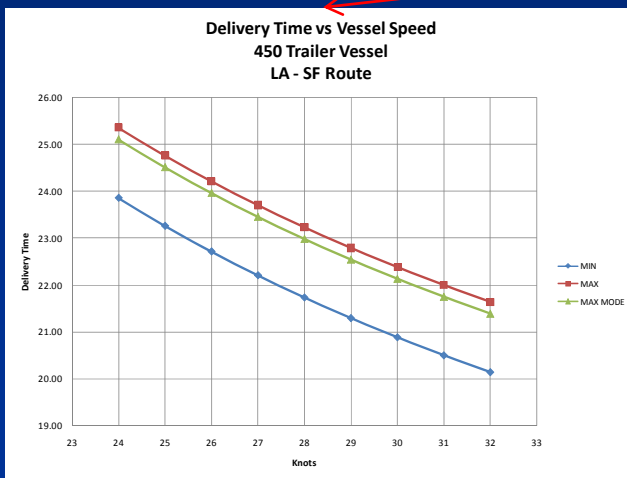
# 450 Trailer Vessel, LA – SF Route



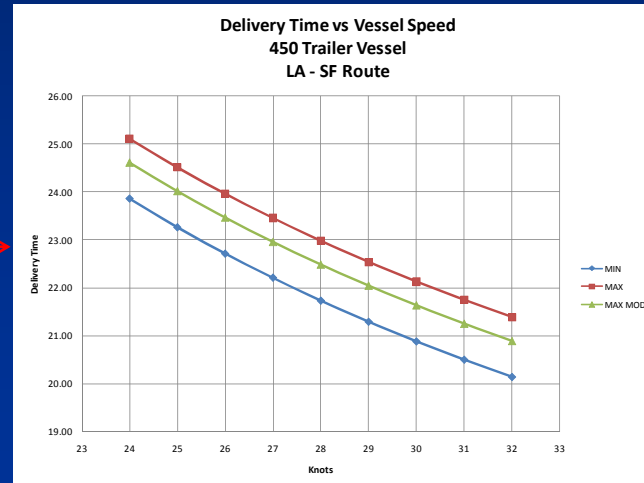
Base Case



Reduced Drayage

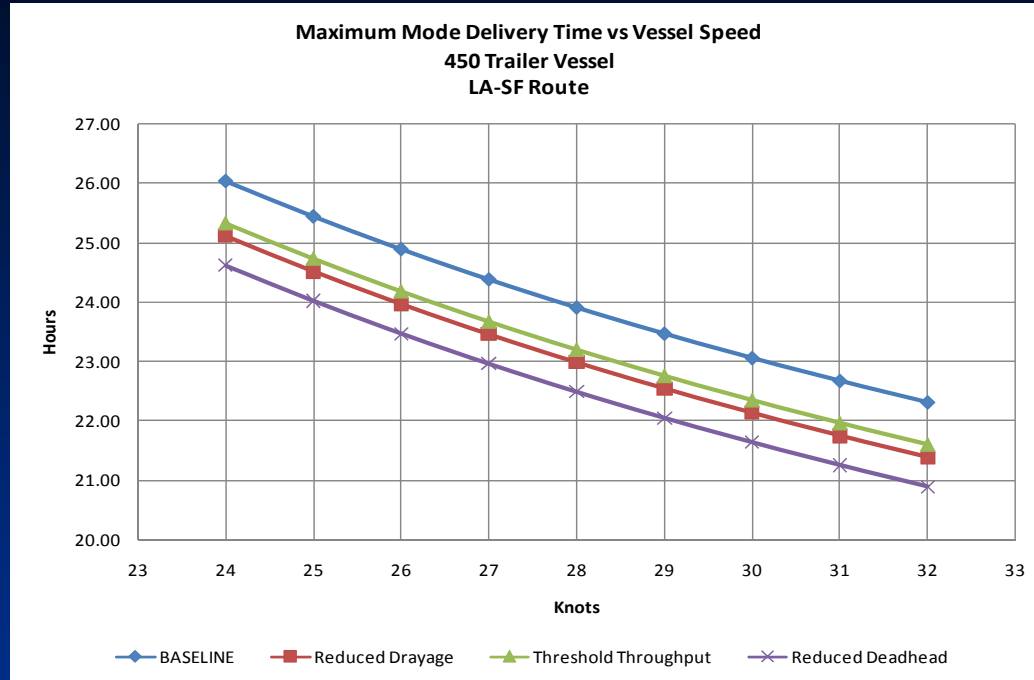


Threshold Throughput



Reduced Dead-Head Distance

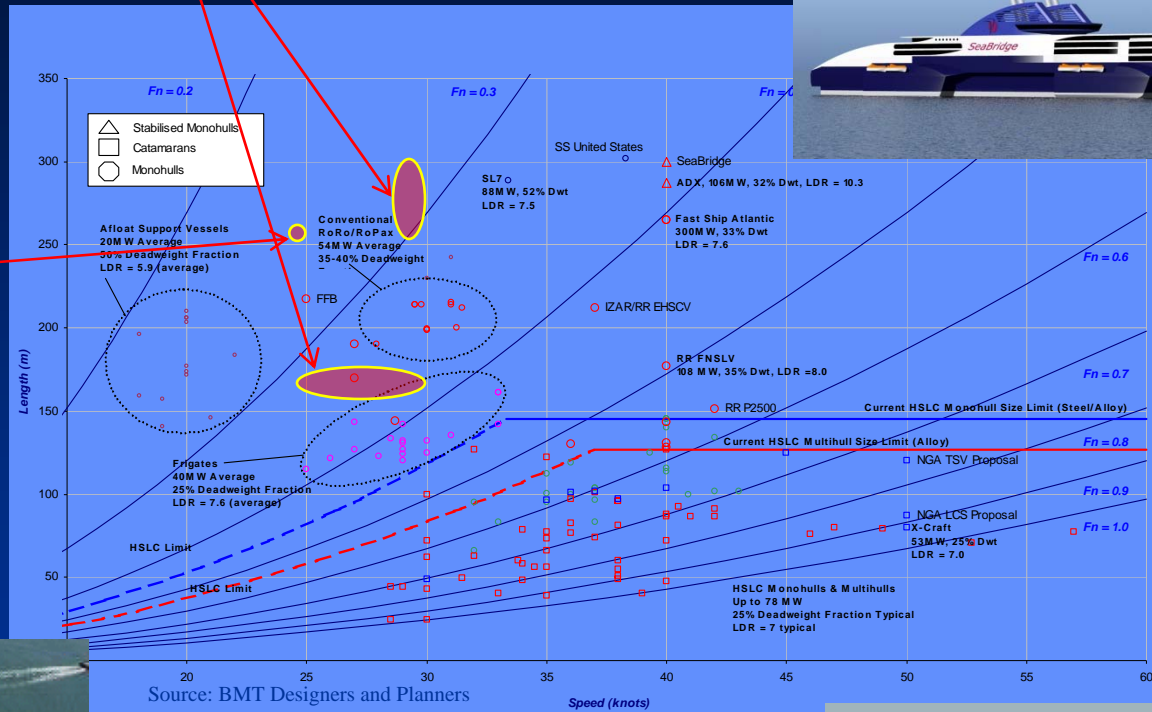
# 450 Trailer Vessel, LA- SF, Summary



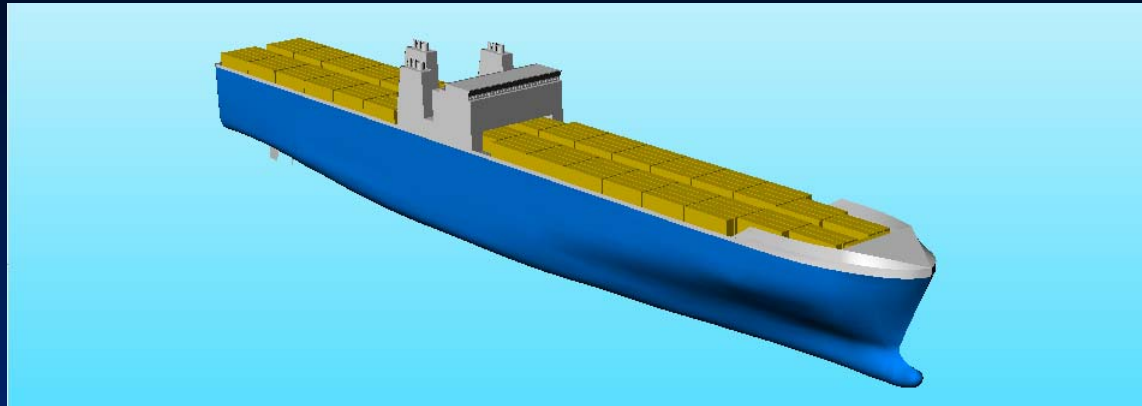
SPEED	BASELINE	Reduced Drayage	Threshold Throughput	Reduced Deadhead
24	26.03	25.11	25.32	24.61
25	25.43	24.51	24.72	24.01
26	24.88	23.96	24.17	23.46
27	24.37	23.46	23.66	22.96
28	23.90	22.98	23.19	22.48
29	23.46	22.54	22.75	22.04
30	23.05	22.13	22.34	21.63
31	22.67	21.75	21.96	21.25
32	22.31	21.39	21.60	20.89

# Short Sea Shipping Vessels

## Current Results



# Notional Design Characteristics



Vessel Parameter	Acronym	Units	450 Trailer Baseline 24 Knots	550 Trailer 27 Knots	700+ Trailer 27 Knots	500 - 600 Trailer SL-7 Variant 32 Knots	150 Trailer 22 Knots	150 Trailer 24 Knots	150 Trailer 26 Knots
Length Overall	LOA	Feet	832.5	837.7	959.6	980.1	484.16	484.16	509.16
Gross Registered Tons	GRT	Long Tons	38050	39068	40600	39068	15875	15875	15875
Breadth Overall	BOA	Feet	118.0	118.0	118.1	105.5	69.85	74.22	71.43
Length (Waterline)	LBP	Feet	794.4	794.4	904.4	900.0	475.0	475.0	500.0
Beam (Waterline)	BWL	Feet	118.0	118.0	118.1	105.5	69.85	74.22	71.43
Draft		Feet	19.84	23.66	26.70	23.41	17.25	17.25	19.92
Depth		Feet	81.40	93.70	102.70	79.91	42.43	42.43	45.1
Displacement, Full Ship		Long Tons	31140	37020	47845	33722	8717	9239	10851
Displacement, Light Ship		Long Tons	20743	24313	26173	21668	5666	4645.63	5830
Design Speed		Knots	24	27	27	32	22	24	26
Power, Installed		SHP	69954	119829	121536	117768	19693	28800	41054
Length over Beam	L/B		6.732	6.732	7.660	8.531	6.800	6.400	7.000
Block Coefficient	Cb		0.691	0.671	0.660	0.577	0.589	0.589	0.589
Payload (Long tons)			10397	12707	16588	12054	3894.44	4128.5	4427.76
Payload (Trailers)			450	550	718	550	150	150	150
Hull Decks			5	6	7	5	2	2	2

# Short Sea Shipping Economics (2008 dollars)

## 450 Trailer Vessel, LA - SF

Cost Component	Cost per Trailer Slot – 2008: Low	Cost per Trailer Slot – 2008: High
Capital (Annual Loan Payment)*	\$183	\$224
Bunker (Fuel)	\$294	\$529
Crew	\$39	\$39
Food and Stores	\$1	\$1
Ship Insurance	\$5	\$5
Repairs and Maintenance	\$4	\$4
Navigation and Port Charges	\$55	\$55
Trailer Stevedoring (2 handles)	\$300	\$400
Dray to/from the Port	\$440	\$500
Other Miscellaneous Expenses**	\$20	\$26
<b>Total</b>	<b>\$1,341</b>	<b>\$1,783</b>
Estimated Average Trucking Cost to Shipper (per Trailer)	\$950	\$950

- Significant contributors are fuel, trailer stevedoring, and drayage
- In the foreseeable future, truck costs may increase relative to short sea shipping costs
- Opportunities to reduce costs:
  - Reduce vessel speed and/or improve fuel consumption
  - Employ own draymen exclusively to pick up/deliver short sea shipping cargo (i.e. door to door service)
  - Load/unload vessel with own labor or negotiate reduced stevedoring rate
  - Negotiate reduced port charges

# Conclusions and Challenges

- **In the LA-SF route, next day service is achievable with vessel speeds of 26 to 28 knots**
- **In a short route such as LA-SF, marine highways may not be cost competitive with current truck rates if strict next day service must be provided**
  - Future of truck rates uncertain – may be more favorable
- **Longer routes such as California to Pacific Northwest may be more cost competitive, however potential market volumes are lower**
  - Higher truck rates
  - Vessel speed may be reduced
- **Opportunities to reduce key cost elements must be explored**
  - Vessel speed and fuel costs
    - » Percentage of less time sensitive freight
    - » Greater frequency of smaller vessels at lower speeds
  - Port charges
  - Stevedoring
  - Drayage
  - Vessel capital costs (although not as significant as the factors above)

# Short Sea Shipping References

- **Documents related to Short Sea Shipping may be found at the NSRP SSS Library:**

<http://advancedmaritimetechnology.aticorp.org/short-sea-shipping>