The Potential Implications of the Expanded Panama Canal on Western Hemisphere Trade

American Association of Port Authorities & the European Sea Ports Organisation

Transatlantic Exchange on Ports and Transportation Logistics Policy

March 23, 2011
Today’s Objectives

Provide a brief synopsis of the potential effects of the expanded Panama Canal on Hemispheric trade patterns:

- Overview of the Panama Canal
- The Asia-US Container Trades
- The Hemispheric Bulk Trades
Panama Canal Overview
Panama Canal Overview

✓ Major businesses

✓ The expansion

✓ Potential market implications
Container, grain and petroleum products are the Panama Canal’s largest trades

Panama Canal Traffic by Commodity

2009

- Container: 27%
- Grains: 6%
- Petroleum & Petroleum Products: 6%
- Ore & Metals: 4%
- Chemicals and Petrochemicals: 3%
- Cole & Coke: 3%
- Minerals: 3%
- Nitrates, Phosphates & Potash: 6%
- Miscellaneous: 6%
- Iron & Steel Products: 6%
- Other Commodities: 19%

Total Long Tons: 198,000

2010

- Container: 26%
- Grains: 6%
- Petroleum & Petroleum Products: 3%
- Ore & Metals: 4%
- Chemicals and Petrochemicals: 3%
- Cole & Coke: 3%
- Minerals: 3%
- Nitrates, Phosphates & Potash: 6%
- Miscellaneous: 6%
- Iron & Steel Products: 18%
- Other Commodities: 20%

Total Long Tons: 205,000

Source: ACP (Panama Canal Authority); Norbridge research and analysis
The Asia-US East Coast trade lane accounts for about half of the Panama Canal’s total trade.

Panama Canal Traffic by Trade Lane

**2009**
- East Coast U.S. - Asia: 39%
- East Coast U.S. - W.C. South America: 22%
- Europe - West Coast South America: 5%
- South America Intercoastal: 4%
- East Coast U.S. - W.C. Central America: 3%
- Europe - West Coast U.S./Canada: 5%
- U.S. Intercoastal (including Alaska and Hawaii): 6%
- E.C. South America - West Coast U.S./Canada: 2%
- Europe - Asia: 12%

Total Long Tons: 198,000

**2010**
- East Coast U.S. - Asia: 40%
- East Coast U.S. - W.C. South America: 21%
- Europe - West Coast South America: 4%
- South America Intercoastal: 5%
- East Coast U.S. - W.C. Central America: 1%
- Europe - West Coast U.S./Canada: 6%
- U.S. Intercoastal (including Alaska and Hawaii): 6%
- E.C. South America - West Coast U.S./Canada: 12%
- Europe - Asia: 6%

Total Long Tons: 205,000

Source: ACP (Panama Canal Authority); Norbridge research and analysis
The Asia-US East container trade accounts for nearly half the Panama Canal’s total container trade

Panama Canal Container Traffic by Trade Lane

**2009**

- Asia to East Coast US: 26%
- East Coast US to Asia: 31%
- West Coast South America to Europe: 7%
- Asia to West Indies: 3%
- Europe to West Coast US: 20%
- West Coast South America to East Coast US: 3%
- Europe to West Coast South America: 4%
- East Coast US to West Coast South America: 4%
- Other Trade Lanes: 2%

**Total Long Tons:** 50,954

**2010**

- Asia to East Coast US: 26%
- East Coast US to Asia: 33%
- West Coast South America to Europe: 8%
- Asia to West Indies: 3%
- Europe to West Coast US: 2%
- West Coast South America to East Coast US: 2%
- Europe to West Coast South America: 4%
- East Coast US to West Coast South America: 3%
- Other Trade Lanes: 18%

**Total Long Tons:** 51,494

Source: ACP (Panama Canal Authority); Norbridge research and analysis
Dry bulk, container and tankers account for more than half of the Panama Canal vessel transits

Panama Canal Traffic by Vessel Type

Source: ACP (Panama Canal Authority); Norbridge research and analysis
While container vessels generate the most revenue per transit

<table>
<thead>
<tr>
<th>Mode</th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container</td>
<td>$252</td>
<td>$196</td>
</tr>
<tr>
<td>Vehicle Carriers</td>
<td>$236</td>
<td>$181</td>
</tr>
<tr>
<td>Passengers</td>
<td>$181</td>
<td>$165</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>$82</td>
<td>$75</td>
</tr>
<tr>
<td>Tankers</td>
<td>$77</td>
<td>$74</td>
</tr>
<tr>
<td>Others</td>
<td>$47</td>
<td>$49</td>
</tr>
<tr>
<td>GC</td>
<td>$37</td>
<td>$34</td>
</tr>
<tr>
<td>Refrigerated</td>
<td>$36</td>
<td>$35</td>
</tr>
</tbody>
</table>

Source: ACP (Panama Canal Authority); Norbridge research and analysis
Canal Expansion Project

Components:

1. Deepening of the Pacific and Atlantic Entrances
2. Deepening and widening of the navigational channels of Gatun Lake and deepening of Culebra cut
3. Construction of the new locks and water-saving basins in the Atlantic and Pacific
4. Raising Gatun Lake to its maximum operational level
Existing Locks Max Vessel: 4,400 TEU’s

Existing Locks:
- Beam: 12.4 m (39.5’)
- Length: 294.1 m (965’)

Current Locks:
- Beam: 12.8 m (42’)
- Length: 304.8 m (1,000’)

New Locks:
- Beam: 49 m (160’)
- Length: 427 m (1,400’)

New Locks Max Vessel: 12,600 TEU’s

Existing Locks Max Vessel: 4,400 TEU’s

New Locks Max Vessel: 12,600 TEU’s
The Expanded Panama Canal will be able to handle vessels 2 to 3 times larger than present.

<table>
<thead>
<tr>
<th></th>
<th>Current Panama Canal</th>
<th>Expanded Panama Canal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Ship Draft</strong></td>
<td>39.5’</td>
<td>50+’</td>
</tr>
<tr>
<td><strong>Maximum Ship Length</strong></td>
<td>965’</td>
<td>1200’</td>
</tr>
<tr>
<td><strong>Estimated Maximum TEU Capacity</strong></td>
<td>5,000 TEUs</td>
<td>12,600 TEUs</td>
</tr>
<tr>
<td><strong>Estimated Maximum Bulk Carrier DWT</strong></td>
<td>52,000</td>
<td>119,000</td>
</tr>
<tr>
<td><strong>Estimated Maximum Tanker DWT</strong></td>
<td>54,000</td>
<td>117,000</td>
</tr>
<tr>
<td><strong>Capacity (Estimated Annual Transits)</strong></td>
<td>13,500-14,000</td>
<td>16,000</td>
</tr>
<tr>
<td><strong>Lock Width</strong></td>
<td>110’</td>
<td>180’</td>
</tr>
<tr>
<td><strong>Lock Length</strong></td>
<td>1,050’</td>
<td>1,400</td>
</tr>
</tbody>
</table>

*Note: Based on analysis of current bulker and tanker fleet

Source: ACP (Panama Canal Authority); Norbridge research and analysis
Some Potential Trade Implications

- **Container**: potential to double or ultimately triple vessel size in the Asia-US East Coast trade
- **Coal & Grain**: potential for Capesize vessels in the US Gulf/NCSA to Asia trades
- **Crude Oil**: potential for Aframax vessels in the Venezuela-China trade
- **Fruit**: potential containerization of the WCSA-Europe banana trades
There are multiple options for Asia (China)-North American container trades

Asia-Americas Routing Options
Popular Perceptions & Market Realities

**Popular Perceptions**
- West Coast ports are out of capacity
- Western railroads have priced themselves out of the market
- East Coast ports will need 50’ of water and 12,000 TEU vessel capability

**Market Realities**
- West Coast ports continue to expand
- Western railroads have not and will not price themselves out of the market
- The USEC trades cannot support 12,000 TEU vessels
### Popular Perceptions

- West Coast ports are out of capacity
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### Market Realities

- West Coast ports continue to expand
- Western railroads have not and will not price themselves out of the market
- The USEC trades cannot support 12,000 TEU vessels
The West Coast Port Industry has significant capacity expansion potential

- Prince Rupert: Phase 1: 500K TEU
- Vancouver: Terminal 2, Lynnterm
- Tacoma: Evergreen Puyallup, NYK
- POLA / POLB Middle Harbor Pier 500 LAXT Conversion Pier S

Densification & automation offer additional, significant upside
Significant expansion opportunities exist on both coasts

<table>
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<td>• LAXT conversion</td>
<td>• Navy Base</td>
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<tr>
<td>• Tacoma: multiple developments</td>
<td>• Jasper County</td>
</tr>
<tr>
<td>• Terminal 2 Deltaport</td>
<td>• Hanjin Jacksonville</td>
</tr>
<tr>
<td>• Prince Rupert Phase II</td>
<td></td>
</tr>
</tbody>
</table>
Asia-West Coast services represented approximately 75% of Asia-North America services and capacity in 2007.

**Asia-North America Deployed Capacity** by Coastal Range (TEU-Thousands)

- PSW: 160
- PNW: 60
- PSW/PNW: 40
- PC-East Coast: 30
- Suez-East Coast: 10
- Gulf/East Coast: 5

**Asia-North America Services by Coastal Range**

- PSW: 33
- PNW: 12
- PSW/PNW: 7
- PC-East Coast: 15
- Suez-East Coast: 2
- Gulf/East Coast: 1

Source: Compair Q3 2007
*Noted: Deployed capacity equal to sum of one-way capacity on all vessels deployed on the trade (all on weekly services)*
Los Angles and Long Beach have more first port of call inbound container services than the remainder of the US.

First Ports of Call on Asia-North America Services
(# of Services)

- POLA/POLB: 35
- Seattle/Tacoma: 11
- NY/NJ: 11
- Savannah: 4
- Vancouver: 3
- Oakland: 3
- Others (3): 3

Source: Compair Q3 2007
<table>
<thead>
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<th>Popular Perceptions</th>
<th>Market Realities</th>
</tr>
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<tbody>
<tr>
<td>• West Coast ports are out of capacity</td>
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<td>• East Coast ports will need 50’ of water and 12,000 TEU vessel capability</td>
<td>• The USEC trades cannot support 12,000 TEU vessels</td>
</tr>
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</table>
The Economics-A Comparison
China to Chicago

Index: Transpac Ocean = 100

WC/8,000  PC-EC/8,000  SC-EC/8,000  PC&TS/10,000

Ocean  Port  Rail  Other
The western railroads have significant scale advantages

Source: ALK
Intermodal business is an important source of revenue, volume, growth and profitability for the North American rail industry

2008 Railroad Revenues and Volumes
2007-2008, Revenue in $M, Volumes in Carloads

Source: Company SEC Filings
*CN and CP revenue figures are in CAN $
**KCS has not yet released full year 08 figures
International traffic is the largest segment of BNSF’s and UP’s intermodal business.

BNSF and UP Intermodal Business Segments
Estimates; Based on 2008 Revenue

- BNSF
  - International: 49%
  - Domestic Standard*: 46%
  - Domestic Premium*: 5%

- UP
  - International: 58%
  - Domestic Standard*: 36%
  - Domestic Premium*: 6%

$5.8B
$3.0B

Source: Company Reports, Norbridge assumptions
Note: UP 2007 business segment distribution applied to 2008 volume
## Popular Perceptions & Market Realities

### Popular Perceptions
- West Coast ports are out of capacity
- Western railroads have priced themselves out of the market
- East Coast ports will need 50’ of water and 12,000 TEU vessel capability

### Market Realities
- West Coast ports continue to expand
- Western railroads have not and will not price themselves out of the market
- The USEC trades cannot support 12,000 TEU vessels
The world’s largest ships continue to be deployed in the Asia-Europe trades

6,000 + TEU Newbuildings by Trade Lane: Percent of Total Number of Vessels (Dec. 2004-Jan. 2010)

Note: Asia-Europe, Asia-Europe/Med, and Asia-Med Trade Lanes can also include stops in the Middle East and India Subcontinent

Note: “Other” Trade Lane is a bucket of Trade Lanes that have less volume than some of the more well traveled ones.

Source: Containerization International Magazine; Dec 2004 – Jan. 2010
Given 6% growth, the largest service vessel size scenario for the Asia-US NATL trade is estimated to approximate 12,000 TEUs in 2020.

Note: US NATL represents ports from Jaxport to Boston
Note: Asia includes SEA, NFE, and China
Source: PIERS data; Norbridge Analysis
Big Ship Draft Requirements: Some Realities

✓ The eastbound trade is the driver
✓ The eastbound trade is a cube, not a weight trade
✓ The expanded Panama Canal will have a draft of 50’ freshwater = about 14.5 meters or 47.5-48 feet salt water
✓ Containerships burn 40-50% of their bunkers in route from Asia to the East Coast of North America
✓ Most large containerships traversing the Panama Canal will likely arrive at vessel drafts significantly less than 14.5 meters or 48 feet
The Asia-US East Coast trade lane accounts for about half of the Panama Canal’s total trade.

Panama Canal Traffic by Trade Lane

<table>
<thead>
<tr>
<th>Route</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Coast U.S. - Asia</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>East Coast U.S. - W.C. South America</td>
<td>39%</td>
<td>40%</td>
</tr>
<tr>
<td>Europe - West Coast South America</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>South America Intercoastal</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>East Coast U.S. - W.C. Central America</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Europe - West Coast U.S./Canada</td>
<td>4%</td>
<td>6%</td>
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<td>U.S. Intercoastal (including Alaska and Hawaii)</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>E.C. South America - West Coast</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Europe - Asia</td>
<td>6%</td>
<td>6%</td>
</tr>
</tbody>
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Total Long Tons: 198,000

Total Long Tons: 205,000

Source: ACP (Panama Canal Authority); Norbridge research and analysis
Steam Coal to Asia
Grain to Asia
Venezuelan Crude to Asia
The Potential Implications of the Expanded Panama Canal on Western Hemisphere Trade

American Association of Port Authorities & the European Sea Ports Organisation

Transatlantic Exchange on Ports and Transportation Logistics Policy

March 23, 2011
Some Market Realities

Chinese Factory

Local Truck - Guangdong

Freight Forwarder CFS

Container Terminal – Yantian, China

Local Dray to DC

Rail Ramp – Chicago

Intermodal Train LA-Chicago

Rail Ramp – Long Beach

Container Terminal – Long Beach

Distribution Center

Truck to store

Store Shelf
Some Market Realities

- The Players
- Services
- Big Ships
- Port Capacity
- Rail Capacity
There are a lot of players and options

• 100-150 significant BCOs
• 50-100 third party vendors
• 15 global shipping lines offering over 70 services per week
• Three basic routing options
• 10 major North American gateway ports
• Six railroads
Asia-West Coast services represented approximately 75% of Asia-North America services and capacity in 2007.

Source: Compair Q3 2007
*Noted: Deployed capacity equal to sum of one-way capacity on all vessels deployed on the trade (all on weekly services)
Los Angles and Long Beach

First Ports of Call on Asia-North America Services
(# of Services)

POLA/POLB: 35
Seattle/Tacoma: 11
NY/NJ: 11
Savannah: 4
Vancouver: 3
Oakland: 3
Others (3): 3

Source: Compair Q3 2007
Given 3% growth, the largest service vessel size scenario for the Asia-USEC trade is estimated to be approximately 8,600 TEUs by 2020.

![Chart showing optimal ship size for 2010-2020](chart)

- **2010**: 6,000 TEUs (10 Services)
- **2015**: 7,000 TEUs (15 Services)
- **2020**: 8,600 TEUs (20 Services)

Note: US NATL represents ports from Jaxport to Boston
Note: Asia includes SEA, NFE, and China
Source: PIERS data; Norbridge Analysis
Given 4.5% growth, the largest service vessel size scenario for the Asia-US NATL trade is estimated to be approximately 10,000 TEUs by 2020.

Note: US NATL represents ports from Jaxport to Boston
Note: Asia includes SEA, NFE, and China
Source: PIERS data; Norbridge Analysis
Ample port capacity likely exists on both coasts.

Source: Compair Q3 2007
*Noted: Deployed capacity equal to sum of one-way capacity on all vessels deployed on the trade (all on weekly services)
**Significant expansion opportunities also exist**

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</table>
The Southwest (6.8M TEUs), Midwest (3.2M TEUs) and Mid-Atlantic (2.1M TEUs) are the largest inland markets for U.S.-Asia traffic moving over West Coast ports.

China, Southeast Asia, and Northern Asia Container Traffic over West Coast Ports by Inland Market — 2008

- Southwest: 6.8M
- Midwest: 3.2M
- Mid-Atlantic: 2.1M
- Southeast: 1.6M
- Gulf: 1.5M

Total TEUs: 20.7M

The Potential Opportunities

The no-brainers
• Mid-Atlantic
• Southeast

The battlegrounds
• Ohio Valley
• Atlanta
• Texas
• Memphis
• Chicago
The Potential Implications of the Expanded Panama Canal on Western Hemisphere Trade

March 23, 2011
Panama Canal Expansion: Potential
2009: “The worst of times”

Percent change in TEUs: 2009 vs 2008
Global & North American Container Shipping Industries
The Global Container Shipping Industry

✓ 400+ companies

✓ Operating 4,718 fully cellular container capable ships
  ▪ 13.1M TEU of capacity

✓ On 400+ trade routes

✓ Carrying about 140M total TEUs per year (2008)
  ▪ Estimated to have dipped by about 15% in 2009 to approximately 122M TEUs

Source: Containerisation International; AXS Alphaliner
The increasing supply of container ships may pose challenges for years.

Number of Vessels*

<table>
<thead>
<tr>
<th></th>
<th>Active</th>
<th>On-Order</th>
<th>Laid-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>5,896</td>
<td>735</td>
<td>581</td>
</tr>
</tbody>
</table>

Vessel Capacity (TEUs, millions)

<table>
<thead>
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<th></th>
<th>Active</th>
<th>On-Order</th>
<th>Laid-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>13.7</td>
<td>4.1</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Note: All container capable vessels
Source: January 2010 AXS Alphaliner; Norbridge analysis

11% of Active Fleet
North American Container Port Industry
Asian Imports have declined across all coasts.

Imports by U.S. Port Region of Entry
TEUs, 2005-2009 Asia – U.S. Container Trade

Source: PIERS 2005-2009
Supply Chain Trends

Chinese Factory

Local Truck - Guangdong

Freight Forwarder CFS

Container Terminal – Yantian, China

Local Dray to DC

Rail Ramp – Chicago

Intermodal Train LA-Chicago

Rail Ramp – Long Beach

Container Terminal – Long Beach

Distribution Center

Truck to store

Store Shelf
Global Sourcing

- China will remain dominant global source for US imports
- Near-shoring may grow at the margin (exchange rates, fuel costs)

Supply Chain Strategies

- Start with customer locations, then sources, then DCs, then flow routing
- Speed (high value product) and cost (low value) are key; also reliability

Port Selection

- End-to-end supply chain cost and service considerations are key
- All else equal, shippers seek rapid cargo transit and low inland costs
- Shippers select port if they deconsolidate or transload on the coast
- Carriers and 3PLs make port selection otherwise (port-to-door routing)

Transloading will wax & wane

- Compelling economics under many circumstances
- Equipment, inland service, rate differentials and capacity are key considerations
Asian Import & Export Loads: By Coast

Asia Import and Export Loads by Coast, 2005-2009

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific</td>
<td>-4.7%</td>
<td>-1.7M</td>
</tr>
<tr>
<td>Atlantic</td>
<td>1.0%</td>
<td>0.1M</td>
</tr>
<tr>
<td>Gulf</td>
<td>5.7%</td>
<td>0.04M</td>
</tr>
<tr>
<td>Total Imports</td>
<td>-3.2%</td>
<td>-1.5M</td>
</tr>
<tr>
<td>Total Loads</td>
<td>17.2M TEUs (2009)</td>
<td>-0.1M</td>
</tr>
</tbody>
</table>

Source: PIERS data 2009, NBI Analysis
Note (1): Pacific region includes traffic into Canada West Coast ports
Note (2): Total Loads shown (excludes empties)

Note: different scale for the Gulf
China continues to dominate North American container trade.

Size and Growth of North America Container Trade Regions (2003-2008)

Source: 2003 and 2008 PIERS data; Norbridge Analysis

Note: Excludes AK, HI, Guam and Puerto Rico ports
Global Insight projects China will continue to drive U.S. container growth

Size and Growth of US Container Trade Regions (2008-2013)

Source: GI; Norbridge research and analysis

Note: Bubble size indicates projected 2013 throughput
Asia-North America container services have steadily declined

Total Number of Services & Average Weekly TEU Capacity by Year to North America from India, SE Asia, N. Asia, and China (3Q)

Source: Com Pair Q3 2006-2009
The maximum number of Asia-Suez services peaked in 2008 with three services.

Source: Compair Q3 2005-Q3 2009