VTRA SUMMARY DENSITY ANALYSIS
A Closer look by Vessel Type and Location

Presentation by: J. Rene van Dorp

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Puget Sound Harbor Safety Committee Presentation October 2012
The Vessel Traffic Operation Support System (VTOSS)

Canada / United States
Co-Operative Vessel Traffic Management System

Areas of Operation by Centre

- Victoria (VHF Ch 11)
- Seattle (VHF Ch 5A)
- Tofino (VHF Ch 74)
- Navigation Lanes

Vancouver Island

Washington

Former VTRA - 2005 VTOSS Data Source
FORMER VTRA STUDY – VTOSS ROUTES

VTOSS ROUTES GENERATED FROM VTOSS 2005 DATA
FORMER VTRA STUDY – ROUTES TO AND FROM FISHING

FISHING ROUTES TO AND FROM COMMERCIAL AND TRIBAL FISHERIES
FORMER VTRA STUDY – USCG PERMITTED REGATTAS, ETC.

ROUTES FOR ORGANIZED AND USCG PERMITTED EVENTS
FORMER VTRA STUDY – WHALE WATCHING ROUTES

WHALE WATCHING ROUTES
FORMER VTRA STUDY – COMPLETE TRAFFIC DENSITY

100 % of Total Traffic

Complete Traffic Density:
STUDY AREA OF FORMER VTRA
UPDATING THE TRAFFIC DATA - UPDATE TO VTOSS 2010 DATA

Presentation by: J. Rene van Dorp

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Puget Sound Harbor Safety Committee Presentation October 2012
UPDATE TO VTOSS 2010 DATA CURRENTLY UNDERWAY - FUNDED BY THE MAKAH
UPDATING THE VTRA STUDY - LOCATIONS

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Puget Sound Harbor Safety Committee Presentation October 2012
FORMER VTRA STUDY – 9 DEFINED LOCATIONS

- Strait of Juan de Fuca West
- Puget Sound North
- Puget Sound South
- Haro Strait-Boundary Pass
- Rosario Strait
- Saddle Bag
- Guemes Channel
- Strait of Juan de Fuca East
- Cherry Point

FORMER VTRA STUDY AREA

VTRA = Vessel Traffic Risk Assessment
ENLARGED STUDY AREA
APPROXIMATELY COVERS VTOSS COVERAGE AREA

FOR UPDATED VTRA STUDY - 15 DEFINED LOCATIONS

- Buoy J
- West Strait of Juan de Fuca
- ATBA
- Georgia Strait
- Haro Strait-Boundary Pass
- South of Tacoma
- Islands Trust
- East Strait of Juan de Fuca
- Rosario
- Guemes
- Saddle Bag
- SJIS
- Sarag. /Skagit
- Puget Sound North
- Puget Sound South
- South of Tacoma
UPDATING THE VTRA STUDY – SELECTION OF FOCUS VESSELS

Presentation by: J. Rene van Dorp

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Puget Sound Harbor Safety Committee Presentation October 2012
FORMER VTRA STUDY – COMPLETE TRAFFIC DENSITY

Complete Traffic Density:

ENLARGED STUDY AREA FOR UPDATED VTRA

APPROXIMATELY COVERS COVERAGE AREA OF VTOSS DATA

100% of Total Traffic
FORMER VTRA STUDY – COMPLETE TRAFFIC DENSITY

Study Area: 100.0% of TTE - 100.0% of TA - DRF 1.0

- Fishing Vessel: 37.7%
- Ferry: 17.8%
- Tugtowbarge: 17.1%
- Bulk Carrier: 6.2%
- Yacht: 5.7%
- Navy Vessel: 2.6%
- Oil Tanker: 2.3%
- Container Ship: 2.0%
- US Coast Guard: 2.0%
- Vehicle Carrier: 1.4%
- Passenger Ship: 1.3%
- Other Special Cargo: 1.1%
- Fishing Factory: 0.9%
- ATB: 0.5%
- Research Ship: 0.4%
- ITB: 0.4%
- Chemical Carrier: 0.3%
- Other Specific Service: 0.1%
- Supply Offshore: 0.1%
- Deckship Cargo: 0.1%
- RORO Cargo Ship: 0.1%
- Refrigerated Cargo: 0.1%
- Ferry Non Local: 0.1%
- RORO Cargo Cont Ship: 0.0%
- Liquid Gas Carrier: 0.0%
- Unknown: 0.0%

% of cumulative total time vessel type is moving within: Study Area

- 55.5%
- 5.7%
- 0.1%
- 61.3%
FORMER VTRA STUDY – 61.3% OF TOTAL TRAFFIC DENSITY

61.3% of Total Traffic

Traffic Density Only:

Ferries, Fishing Vessels, Regattas, Yachts, and Whale Watching.

ENLARGED STUDY AREA FOR UPDATED VTRA
FORMER VTRA STUDY – 38.7 % OF TOTAL TRAFFIC DENSITY

38.7 % of Total Traffic

Traffic Density Excluding:
Ferries, Fishing Vessels, Regattas, Yachts, and Whale Watching.

ENLARGED STUDY AREA FOR UPDATED VTRA
FORMER VTRA STUDY – SELECTION OF FOCUS VESSELS

VESSELS CERTAINLY NOT CONSIDERED FOR FOCUS VESSELS:
Ferries, Fishing Vessels, Regattas, Yachts, and Whale Watchers.

FOR VTRA STUDY AREA WE MAY DEFINE:

VESSEL TYPE EXPOSURE (VTE): The annual amount of time a vessel of a particular type is traversing though the VTRA study area.

TOTAL TIME EXPOSURE (TTE): Sum of vessel type exposures across all vessel types.

PARTIAL TIME EXPOSURE (PTE): Sum of vessel type exposures across all vessel types excluding the vessel types above.
This graph details the build-up across vessel types of 100% of the PTE for the VTRA study area i.e. 100% of Total Area (TA).

Recall PTE represents 38.7% of the Total Time of Exposure i.e. the total annual time a vessel is moving though the VTRA study area.
**FORMER VTRA STUDY – PTE = 38.7 % TOTAL TIME EXPOSURE**

### Study Area: 100.0% of PTE - 100.0% of TA - DF 1.0

<table>
<thead>
<tr>
<th>Vessel Type</th>
<th>% of 100.0% of PTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TUGTOWBARGE</td>
<td>44.0%</td>
</tr>
<tr>
<td>BULK CARRIER</td>
<td>16.0%</td>
</tr>
<tr>
<td>NAVY VESSEL</td>
<td>6.6%</td>
</tr>
<tr>
<td>OIL TANKER</td>
<td>5.8%</td>
</tr>
<tr>
<td>CONTAINERSHIP</td>
<td>5.2%</td>
</tr>
<tr>
<td>US COAST GUARD</td>
<td>5.1%</td>
</tr>
<tr>
<td>VEHICLE CARRIER</td>
<td>3.6%</td>
</tr>
<tr>
<td>PASSENGERSHIP</td>
<td>3.3%</td>
</tr>
<tr>
<td>OTHER SPECIAL CARGO</td>
<td>2.9%</td>
</tr>
<tr>
<td>FISHING FACTORY</td>
<td>2.2%</td>
</tr>
<tr>
<td>ATB</td>
<td>1.2%</td>
</tr>
<tr>
<td>RESEARCH SHIP</td>
<td>1.1%</td>
</tr>
<tr>
<td>ITB</td>
<td>1.0%</td>
</tr>
<tr>
<td>CHEMICAL CARRIER</td>
<td>0.7%</td>
</tr>
<tr>
<td>OTHER SPECIFIC SERV</td>
<td>0.4%</td>
</tr>
<tr>
<td>SUPPLY OFFSHORE</td>
<td>0.3%</td>
</tr>
<tr>
<td>DECKSHIP CARGO</td>
<td>0.2%</td>
</tr>
<tr>
<td>RORO CARGO SHIP</td>
<td>0.2%</td>
</tr>
<tr>
<td>REFRIGERATED CARGO</td>
<td>0.1%</td>
</tr>
<tr>
<td>RORO CARGO CONT SHIP</td>
<td>0.1%</td>
</tr>
<tr>
<td>LIQ GASCARRIER</td>
<td>0.0%</td>
</tr>
<tr>
<td>#N/A</td>
<td></td>
</tr>
</tbody>
</table>

**Interpretation:**

16% x 100% x 38.7% = 6.2% of the time a Bulk Carrier is moving through The VTRA Study area
FORMER VTRA STUDY – PTE = 38.7 % TOTAL TIME EXPOSURE

Study Area: 100.0% of PTE - 100.0% of TA - DF 1.0

Traffic Exposure by Vessel Type:

- **TUGTOWBARGE**: 44.0%
- **BULK CARRIER**: 16.0%
- **NAVY VESSEL**: 6.6%
- **OIL TANKER**: 5.8%
- **CONTAINERSHIP**: 5.2%
- **US COASTGUARD**: 5.1%
- **VEHICLE CARRIER**: 3.6%
- **PASSENGERSHIP**: 3.3%
- **OTHER SPECIAL CARGO**: 2.9%
- **FISHING FACTORY**: 2.2%
- **ATB**: 1.2%
- **RESEARCH SHIP**: 1.1%
- **ITB**: 1.0%
- **CHEMICAL CARRIER**: 0.7%
- **OTHER SPECIFIC SERV**: 0.4%
- **SUPPLY OFFSHORE**: 0.3%
- **DECKSHIP CARGO**: 0.2%
- **RORO CARGOSHIP**: 0.2%
- **REFRIGERATED CARGO**: 0.2%
- **RORO CARGO CONT SHIP**: 0.1%
- **LIQ GAS CARRIER**: 0.1%
- **#N/A**: 0.0%

Limited to CHPT: ≈ 2.8% of PTE

PTE = Partial Time Exposure
TA = Total Area
DF = Density Factor
DF = PTE/TA
FORMER VTRA STUDY – OIL TANKER TRAFFIC DENSITY

5.8% of PTE

Traffic Density:
OIL TANKERS ONLY

57.89%
33.93%
Traffic Density
Tug Tow Barge Traffic:

ATB ONLY

FORMER VTRA STUDY – ATB TRAFFIC DENSITY

1.2 % of PTE
FORMER VTRA STUDY – ITB TRAFFIC DENSITY

Traffic Density
Tug Tow Barge Traffic:

ITB ONLY

1.0 % of PTE
FORMER VTRA DATA – FOCUS VESSELS FOR UPDATED VTRA ???

Study Area: 100.0% of PTE - 100.0% of TA - DF 1.0

Vessel Type

- TUGTOWBARGE: 44.0%
- BULK CARRIER: 16.0%
- NAVY VESSEL: 6.6%
- OIL TANKER: 5.8%
- CONTAINERSHIP: 5.2%
- US COAST GUARD: 5.1%
- VEHICLE CARRIER: 3.6%
- PASSENGERSHIP: 3.3%
- OTHER SPECIAL CARGO: 2.9%
- FISHING FACTORY: 2.2%
- ATB: 1.2%
- RESEARCH SHIP: 1.1%
- ITB: 1.0%
- CHEMICAL CARRIER: 0.7%
- OTHER SPECIFIC SERVICE: 0.4%
- SUPPLY OFF SHORE: 0.3%
- DECKSHIP CARGO: 0.2%
- RORO CARGO SHIP: 0.2%
- REFRIGERATED CARGO: 0.1%
- RORO CARGO CONTAINER SHIP: 0.1%
- LIQUID GAS CARRIER: 0.0%
#N/A

% of 100.0% of PTE

WHAT IS % OF OIL BARGES??

16.0% + 1.2% + 1.0% + 29.3% = AT LEAST A FACTOR 10 DIFFERENCE EVEN WITHOUT OIL BARGES!
FORMER VTRA STUDY – TUG TOW BARGE TRAFFIC DENSITY

Traffic Density
All Tug Tow Barge Traffic:

NOT INCLUDING ATB and ITB

44.0 % of PTE
FORMER VTRA STUDY – BULK CARRIER TRAFFIC DENSITY

Traffic Density:

BULK CARRIERS ONLY

16.0 % of PTE
FORMER VTRA STUDY – CONTAINER VESSELS TRAFFIC DENSITY

Traffic Density:
CONTAINER VESSELS ONLY

5.2% of PTE
FORMER VTRA DATA - FOCUS VESSELS FOR UPDATED VTRA ???

Study Area: 100.0% of PTE - 100.0% of TA - DF 1.0

IF CONSIDERED AS SINGLE FV CLASS THIS MAY RAISE COMPUTATIONAL ISSUES, WHY???

WHAT IS % OF OILBARGES???

AT LEAST A FACTOR 10 DIFFERENCE EVEN WITHOUT OILBARGES!
Two vessel classification for counting purposes
1: Focus Vessels (FV): CHPT OIL TANKERS, ATB, ITB
2: Interacting Vessels (IV): All other Traffic

SUPPOSE TWOVESSELS ARE INTERACTING

One FV-IV Interaction
Two vessel classification for counting purposes
1: Focus Vessels (FV): CHPT OIL TANKERS, ATB, ITB
2: Interacting Vessels (IV): All other Traffic

SUPPOSE THREE VESSELS ARE INTERACTING

Two FV-IV Interactions
Two vessel classification for counting purposes
1: Focus Vessels (FV): CHPT OIL TANKERS, ATB, ITB
2: Interacting Vessels (IV): All other Traffic

Suppose two vessels are interacting

How many FV-IV Interactions?

- First One
- Second One
Two vessel classification for counting purposes
1: Focus Vessels (FV): CHPT OIL TANKERS, ATB, ITB
2: Interacting Vessels (IV): All other Traffic

Suppose three vessels are interacting

How many FV-IV Interactions?

Six FV-IV Interactions
Two vessel classification for counting purposes
1: Focus Vessels (FV): CHPT OIL TANKERS, ATB, ITB
2: Interacting Vessels (IV): All other Traffic

Suppose four vessels are interacting

How many FV-IV Interactions?

Twelve FV-IV Interactions
Two vessel classification for counting purposes
1: Focus Vessels (FV): CHPT OIL TANKERS, ATB, ITB
2: Interacting Vessels (IV): All other Traffic

![Graph showing number of FV-IV interactions vs number of vessels interacting.](image)
UPDATING THE VTRA STUDY – REFINING TUGTOW BARGE TYPES

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Puget Sound Harbor Safety Committee Presentation October 2012
### Former VTRA Study

<table>
<thead>
<tr>
<th>Vessel Type</th>
<th>Barge Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TugtowBarge</td>
<td>OilBarge, TugNotow, BulkcargoBarge, ChemicalBarge, ContainerBarge, DerrickBarge, UnladenBarge, Log_Barge, WoodchipBarge</td>
</tr>
<tr>
<td>ATB</td>
<td></td>
</tr>
<tr>
<td>ITB</td>
<td></td>
</tr>
</tbody>
</table>

### Updated VTRA Study

<table>
<thead>
<tr>
<th>Vessel Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TugtowBarge</td>
</tr>
<tr>
<td>ATB</td>
</tr>
<tr>
<td>ITB</td>
</tr>
<tr>
<td>OilBarge</td>
</tr>
<tr>
<td>TugNotow</td>
</tr>
<tr>
<td>BulkcargoBarge</td>
</tr>
<tr>
<td>ChemicalBarge</td>
</tr>
<tr>
<td>ContainerBarge</td>
</tr>
<tr>
<td>DerrickBarge</td>
</tr>
<tr>
<td>UnladenBarge</td>
</tr>
<tr>
<td>Log_Barge</td>
</tr>
<tr>
<td>WoodchipBarge</td>
</tr>
</tbody>
</table>

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0.0% 0.0% 0.0% 0.0% 0.1% 0.1% 0.2% 0.2% 0.3% 0.4% 0.5% 0.6% 0.8% 0.8% 1.0% 1.0% 1.2% 1.6% 1.9% 2.2% 2.9% 3.3% 3.4% 3.4% 5.1% 5.2% 5.8% 5.8% 6.5% 9.5% 10.2% 10.6% 16.0%

Study Area: 100.0% of PTE - 100.0% of TA - DF 1.0

Vessel Type

- BULK CARRIER
- OIL BARGE
- TUG TOW BARGE
- OIL TANKER
- UNLADEN BARGE
- CONTAINERSHIP
- US COAST GUARD
- WOODCHIP BARGE
- VEHICLE CARRIER
- PASSENGERSHIP
- OTHER SPECIAL CARGO
- FISHING FACTORY
- LOG BARGE
- CONTAINER BARGE
- ATB
- RESEARCH SHIP
- ITB
- TUG NOTOW
- CHEMICAL CARRIER
- OTHER SPECIFIC SERV
- SUPPLY OFFSHORE
- DECKSHIP CARGO
- RORO CARGO SHIP
- REFRIGERATED CARGO
- RORO CARGO CONTSHIP
- CHEMICAL BARGE
- LIQ GAS CARRIER
- DERRICK BARGE
- UNKNOWN

% of 100.0% of PTE

2005 VTOSS DATA – WITH BREAK DOWN OF TUG WITH TOW
Traffic Density
Tug Tow Barge Traffic:

OIL BARGES ONLY

FORMER VTRA STUDY – OIL BARGE TRAFFIC DENSITY

10.8% of PTE
FORMER VTRA STUDY – BULK CARGO BARGE TRAFFIC DENSITY

Traffic Density
Tug Tow Barge Traffic:
BULK CARGO BARGES ONLY

10.6% of PTE
Traffic Density
Tug Tow Barge Traffic:

UNCLASSIFIED
TUG TOW BARGES

9.5% of PTE

56.62%
Traffic Density
Tug Tow Barge Traffic:

unladen
TUG TOW BARGES

5.8% of PTE
Traffic Density
Tug Tow Barge Traffic:
WOOD CHIP BARGES ONLY

3.4% of PTE

FORMER VTRA STUDY – WOOD CHIP BARGE TRAFFIC DENSITY
Traffic Density
Tug Tow Barge Traffic:

TUGS NO TOW ONLY
2005 VTOSS DATA – PRE = 38.7% of Total Time Exposure

Study Area: 46.6% of PTE - 100.0% of TA - DF 0.47

Interpretation: 23.1% x 46.6% x 38.7% = 4.2% of the time an OILBARGE is moving through The VTRA Study area
2005 VTOSS DATA – PRE = 38.7% of Total Time Exposure

Study Area: 46.6% of PTE - 100.0% of TA - DF 0.47

One fifth of the time a TUGTOWBARGE is moving in the VTRA study area it is not classified in VTOSS data.
Summary Interpretation:
About 18.9% x 100.0% x 38.7% = 4.2% of the time a vessel is moving through the VTRA Study area it is an OIL TRANSPORTING VESSEL.
FORMER VTRA STUDY – COMPLETE TRAFFIC DENSITY

100% of Total Traffic Density

Complete Traffic Density:
ENLARGED STUDY AREA FOR UPDATED VTRA
APPROXIMATELY COVERS COVERAGE AREA OF VTOSS DATA
FORMER VTRA STUDY – 38.7 % OF TOTAL TRAFFIC DENSITY

38.7 % of Total Traffic

Traffic Density Excluding:

Ferries, Fishing Vessels, Regattas, Yachts, and Whale Watching.

ENLARGED STUDY AREA FOR UPDATED VTRA
ENLARGED STUDY AREA APPROXIMATELY COVERS VTOSS COVERAGE AREA
### 2005 VTOSS Data – Traffic Density by Location

% of PTE Exposure = % of Time a PTE Vessel Travels within an Area

% Area = Relative Size of a Location compared to Study Area

Density Risk Factor (DF) = % PTE Exposure / % Area

<table>
<thead>
<tr>
<th>LOCATION ID</th>
<th>LOCATION</th>
<th># GRID CELLS</th>
<th>% AREA</th>
<th>% PTE EXPOSURE</th>
<th>DENSITY FACTOR (DF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>West Strait of Juan de Fuca</td>
<td>2857</td>
<td>19.6%</td>
<td>21.9%</td>
<td>1.12</td>
</tr>
<tr>
<td>2</td>
<td>Puget Sound South</td>
<td>619</td>
<td>4.3%</td>
<td>12.3%</td>
<td>2.88</td>
</tr>
<tr>
<td>3</td>
<td>Guemes Channel</td>
<td>127</td>
<td>0.9%</td>
<td>1.0%</td>
<td>1.11</td>
</tr>
<tr>
<td>4</td>
<td>East Strait of Juan de Fuca</td>
<td>2049</td>
<td>14.1%</td>
<td>16.2%</td>
<td>1.15</td>
</tr>
<tr>
<td>5</td>
<td>Georgia Strait</td>
<td>1424</td>
<td>9.8%</td>
<td>9.0%</td>
<td>0.92</td>
</tr>
<tr>
<td>6</td>
<td>Puget Sound North</td>
<td>983</td>
<td>6.8%</td>
<td>14.1%</td>
<td>2.08</td>
</tr>
<tr>
<td>7</td>
<td>Saddlebag</td>
<td>375</td>
<td>2.6%</td>
<td>1.7%</td>
<td>0.65</td>
</tr>
<tr>
<td>8</td>
<td>Haro Strait - Boundary Pass</td>
<td>1066</td>
<td>7.3%</td>
<td>8.3%</td>
<td>1.13</td>
</tr>
<tr>
<td>9</td>
<td>Rosario Strait</td>
<td>307</td>
<td>2.1%</td>
<td>4.7%</td>
<td>2.22</td>
</tr>
<tr>
<td>10</td>
<td>Bouy J</td>
<td>1478</td>
<td>10.2%</td>
<td>5.2%</td>
<td>0.51</td>
</tr>
<tr>
<td>11</td>
<td>ATBA</td>
<td>1520</td>
<td>10.5%</td>
<td>0.0%</td>
<td>0.00</td>
</tr>
<tr>
<td>12</td>
<td>South of Tacoma</td>
<td>326</td>
<td>2.2%</td>
<td>2.7%</td>
<td>1.21</td>
</tr>
<tr>
<td>13</td>
<td>San Juan Islands</td>
<td>259</td>
<td>1.8%</td>
<td>0.0%</td>
<td>0.02</td>
</tr>
<tr>
<td>14</td>
<td>Saratoga/Skagit</td>
<td>459</td>
<td>3.2%</td>
<td>0.4%</td>
<td>0.13</td>
</tr>
<tr>
<td>15</td>
<td>Islands Trust</td>
<td>696</td>
<td>4.8%</td>
<td>2.6%</td>
<td>0.54</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>14545</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>1.0</strong></td>
</tr>
</tbody>
</table>
% PTE Exposure = % Time a PTE Vessel is moving

% Area = Relative Size of a Location compared to SA

Density Risk Factor (DRF) = % PTE Exposure / % Area
FORMER VTRA STUDY – 38.7 % OF TOTAL TRAFFIC DENSITY

Traffic Density Excluding:
Ferries, Fishing Vessels, Regattas, Yachts, and Whale Watching.

ENLARGED STUDY AREA FOR UPDATED VTRA
FORMER VTRA STUDY – PTE = 38.7 % OF TOTAL TIME EXPOS.

Puget Sound South: 12.3% of PTE - 4.3% of TA - DF 2.88

<table>
<thead>
<tr>
<th>Vessel Type</th>
<th>% of 12.3% of PTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BULKCARRIER</td>
<td>4.5%</td>
</tr>
<tr>
<td>OILBARGE</td>
<td></td>
</tr>
<tr>
<td>BULK CARGO BARGE</td>
<td></td>
</tr>
<tr>
<td>TUGTOW BARGE</td>
<td>11.9%</td>
</tr>
<tr>
<td>NAVY VESSEL</td>
<td>0.3%</td>
</tr>
<tr>
<td>OIL TANKER</td>
<td>1.1%</td>
</tr>
<tr>
<td>UNLADEN BARGE</td>
<td>7.0%</td>
</tr>
<tr>
<td>CONTAINERSHIP</td>
<td>4.6%</td>
</tr>
<tr>
<td>US COAST GUARD</td>
<td>0.1%</td>
</tr>
<tr>
<td>WOOD CHIP BARGE</td>
<td>3.3%</td>
</tr>
<tr>
<td>VEHICLE CARRIER</td>
<td>2.7%</td>
</tr>
<tr>
<td>PASSENGER SHIP</td>
<td>2.8%</td>
</tr>
<tr>
<td>OTHER SPECIAL CARGO</td>
<td>1.5%</td>
</tr>
<tr>
<td>FISHING FACTORY</td>
<td>0.6%</td>
</tr>
<tr>
<td>LOG BARGE</td>
<td>2.8%</td>
</tr>
<tr>
<td>CONTAINER BARGE</td>
<td>3.1%</td>
</tr>
<tr>
<td>ATB</td>
<td>0.2%</td>
</tr>
<tr>
<td>RESEARCH SHIP</td>
<td>0.2%</td>
</tr>
<tr>
<td>ITB</td>
<td>1.7%</td>
</tr>
<tr>
<td>TUG NOTOW</td>
<td>0.2%</td>
</tr>
<tr>
<td>CHEMICAL CARRIER</td>
<td>0.2%</td>
</tr>
<tr>
<td>OTHER SPECIFIC SERVICE</td>
<td>0.5%</td>
</tr>
<tr>
<td>SUPPLY OF SHORE</td>
<td>0.1%</td>
</tr>
<tr>
<td>DECKSHIP CARGO</td>
<td>0.2%</td>
</tr>
<tr>
<td>RORO CARGO SHIP</td>
<td>0.1%</td>
</tr>
<tr>
<td>REFRIGERATED CARGO</td>
<td>0.1%</td>
</tr>
<tr>
<td>RORO CARGO CONT SHIP</td>
<td>0.1%</td>
</tr>
<tr>
<td>CHEMICAL CARRIER</td>
<td>0.1%</td>
</tr>
<tr>
<td>LIQ GAS CARRIER</td>
<td>0.0%</td>
</tr>
<tr>
<td>DERRICK BARGE</td>
<td>0.0%</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

About 80% of PTE in Puget Sound South can be attributed to: Tugs, Barges, ATB’s and ITB’s

Summary Interpretation:
About 80% x 12.3% x 38.7% = 3.8% of the time a vessel is moving through the VTRA Study area it is a TUG, BARGE, ATB or ITB moving in the PUGET SOUND SOUTH.
FORMER VTRA STUDY – PTE = 38.7% OF TOTAL TIME EXPOS.

Rosario Strait: 4.7% of PTE - 2.1% of TA - DF 2.22

About 80% of PTE in Rosario Strait can be attributed to: Tugs, Barges, ATB’s and ITB’s

Summary Interpretation:
About 80% x 4.7% x 38.7% = 1.5% of the time a vessel is moving through the VTRA Study area it is a TUG, BARGE, ATB or ITB moving in the ROSARIO STRAIT
FORMER VTRA STUDY – PTE = 38.7 % OF TOTAL TIME EXPOS.

Rosario Strait: 4.7% of PTE - 2.1% of TA - DF 2.22

At least 30% of PTE in Rosario Strait can be attributed to:
An Oil Transporting Vessel

Summary Interpretation:
About 30% x 4.7% x 38.7% = 0.6% of the time a vessel is moving through the VTRA Study area it is an OIL TRANSPORTING VESSEL in ROSARIO STRAIT
FORMER VTRA STUDY – PTE = 38.7% OF TOTAL TIME EXPOS.

Haro Strait - Boundary Pass: 8.3% of PTE - 7.3% of TA - DF 1.13

Vessel Type

- Bulkcarrier: 39.0%
- Containership: 8.0%
- Other Specific Cargo: 1.5%
- Log Barge: 0.6%
- Supply Offshore: 0.5%
- Other Officership: 0.3%
- Supply Offshore: 0.2%
- Fish Factory: 0.5%
- Others: 0.4%
- Tug Tow: 0.4%
- Unladen Barge: 0.4%
- Oil Barge: 0.3%
- Navy Vessel: 0.3%
- Others: 0.2%
- Deck Ship Offshore: 0.1%
- Aircraft: 0.1%
- Container Barge: 0.1%
- RORO Cargo Ship: 0.1%
- Chemical Barge: 0.1%
- Other Officership: 0.1%
- Container: 0.1%
- Chemical Carrier: 0.0%
- Unknown: 0.0%

% of 8.3% of PTE
San Juan Islands: 0.03% of PTE - 1.8% of TA - DF 0.02
FORMER VTRA STUDY – FUTURE GATEWAY TRAFFIC

Presentation by: J. Rene van Dorp

THE GEORGE WASHINGTON UNIVERSITY

VCU

GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

Puget Sound Harbor Safety Committee Presentation October 2012
FORMER VTRA STUDY – GATEWAY TRAFFIC MODELLING

Equidistant in time Arrivals at 240 Arrivals per Year

FORMER VTRA STUDY – INBOUND GATEWAY ROUTE
FORMER VTRA STUDY – GATEWAY TRAFFIC MODELLING

No incoming traffic Leave through Rosario
Yes incoming traffic Leave through Haro
Leave after 12 hours

FORMER VTRA STUDY – INBOUND GATEWAY ROUTES
Random in time arrivals at 450 Arrivals per Year?

Arrivals Equidistant in time at 450 Arrivals per Year?

OR

50% ?

Add Inbound Route Through Haro-Strait?

What percentage at Each inbound Route?

Slow down in WSFJ or ESFJ in case of Outbound Traffic though Rosario or Haro?

Limited Dock Capacity?
FORMER VTRA STUDY – INBOUND GATEWAY ROUTES

What percentage through Leave through Rosario?

No incoming traffic Leave through Rosario
Yes incoming traffic Leave through Haro

50% ?

Leave after 12 hours?
FORMER VTRA STUDY – INBOUND GATEWAY ROUTES

UPDATE VTRA STUDY – GATEWAY TRAFFIC MODELLING

Leave after 12 hours?

What percentage through Leave through Haro?

50%?

No incoming traffic Leave through Haro

Yes incoming traffic Leave through Rosario
Other pressures/changes on updated VTRA Study area:

- **Kindermorgan pipeline**: It is currently anticipated that this traffic would consist of approximately 250 “entering” tanker transits per year of vessels up to 180,000 Dead Weight Tons (DWT).

- **TESORO Refinery**: The TESORO Refinery (and other refineries) plans to increase frequency of unit train (approximately 100 tank cars) deliveries, potentially reducing tanker traffic.

- **The Port of Vancouver**: Canadian interests are proposing to expand port facilities for shipping containerized and bulk cargo out of Roberts Bank facilities, British Columbia just south of Vancouver.

- **BP Cherry Point Refinery**: Vessel traffic changes resulting from the refinery dock expansion.

**AND OTHER ONES???

**FOR EACH CHANGE ASSUMPTIONS ARE NEEDED FOR SIMULATION IMPLEMENTATION**
DESIGNING A RISK MANAGEMENT PLAN
FACED WITH TRAFFIC INCREASES

Presentation by: J. Rene van Dorp

GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

Puget Sound Harbor Safety Committee Presentation October 2012
SOME OBSERVATION/COMMENTS TO KICKOFF THE STAKEHOLDER PROCESS/DISCUSSION
SOME OBVIOUS (?) OBSERVATIONS

The World is not Average, Neither is a Maritime Transportation System (MTS).

Different Vessels go to Different Locations.

Each Location has a Different Traffic profile.
Keeping everything the same
When Traffic Increases
Risk Increases, unless Mitigated.

There is no Guarantee that
Risk Increases due to Traffic Increases can be Fully Mitigated.
Design a Risk Management Plan By Location.

Risk does not typically disappear When mitigated locally but migrates.
Risk Mitigation at one Location Ought not to results in an Increase in Risk elsewhere that is larger.

Faced with inevitable (?) traffic Increases how can one Manage Risk Increases that Cannot be mitigated?
RISK MANAGEMENT CHALLENGE

EVENLY DISTRIBUTE FUTURE RISK?

i.e. allow for Risk Increases in Locations that currently have low risk of spills compared to those that are already higher?

EQUITABLE DISTRIBUTION OF FUTURE RISK?

Allow for each location to have a similar percentage increase in Risk?