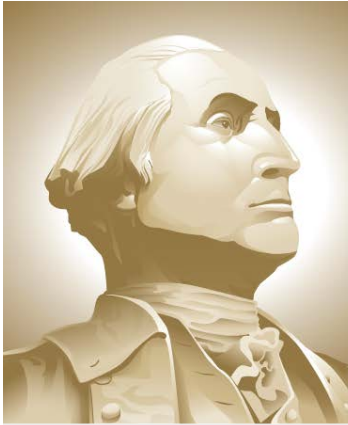


DRAFT VTRA 2010 TRAFFIC DENSITIES BY BULK – FV, CONT – FV, OTHER CARGO – FV OIL – FV, CHEM - FV and NON - FV

Presentation by: J. Rene van Dorp



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GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

JUNE 5, 2013

Table. Focus Vessel (FV) Classification for the 26 VTOSS vessel type classification used in the GW/VCU MTS simulation model.

NON – FV : Those vessels that are only considered as Interacting Vessels (IV) with Focus Vessels (FV) in this study

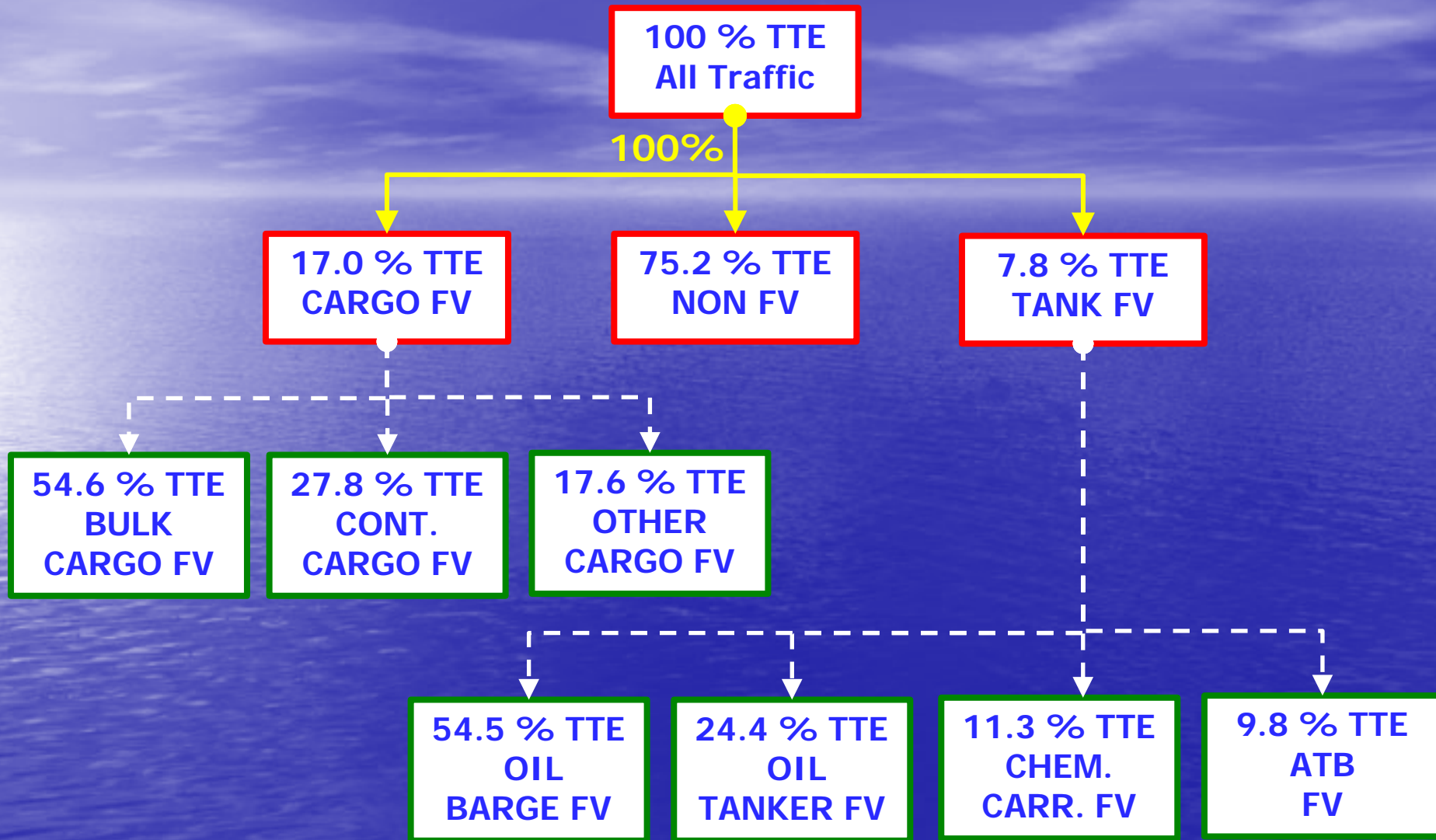
CARGO – FV : Bulk Carriers, Container Vessels, Other Cargo Vessels

TANK – FV : Oil Barge, Oil Tankers, Chem-Carrier, ATB

Note: Focus Vessels (FV's) are also considered as Interacting Vessels (IV's) when interacting with another Focus Vessel.

#	VESSEL TYPE	FOCUS VESSEL?	#	VESSEL TYPE	FOCUS VESSEL?
1	BULKCARRIER	CARGO - FV	14	PASSENGERSHIP	NO
2	CHEMICALCARRIER	TANK - FV	15	REFRIGERATEDCARGO	CARGO-FV
3	CONTAINERSHIP	CARGO - FV	16	RESEARCHSHIP	NO
4	DECKSHIPCARGO	CARGO - FV	17	ROROCARGOSHIP	CARGO-FV
5	FERRY	NO	18	ROROCARGOCONTSHIP	CARGO-FV
6	FERRYNONLOCAL	NO	19	SUPPLYOFFSHORE	NO
7	FISHINGFACTORY	NO	20	TUGTOWBARGE	NO
8	FISHINGVESSEL	NO	21	UNKNOWN	NO
9	LIQGASCARRIER	TANK - FV	22	USCOASTGUARD	NO
10	NAVYVESSEL	NO	23	VEHICLECARRIER	CARGO-FV
11	OILTANKER	TANK - FV	24	YACHT	NO
12	OTHERSPECIALCARGO	CARGO - FV	25	ATB	TANK - FV
13	OTHERSPECIFICSERV	NO	26	OIL BARGE	TANK - FV

A TAXONOMY OF 2010 VESSEL TRAFFIC

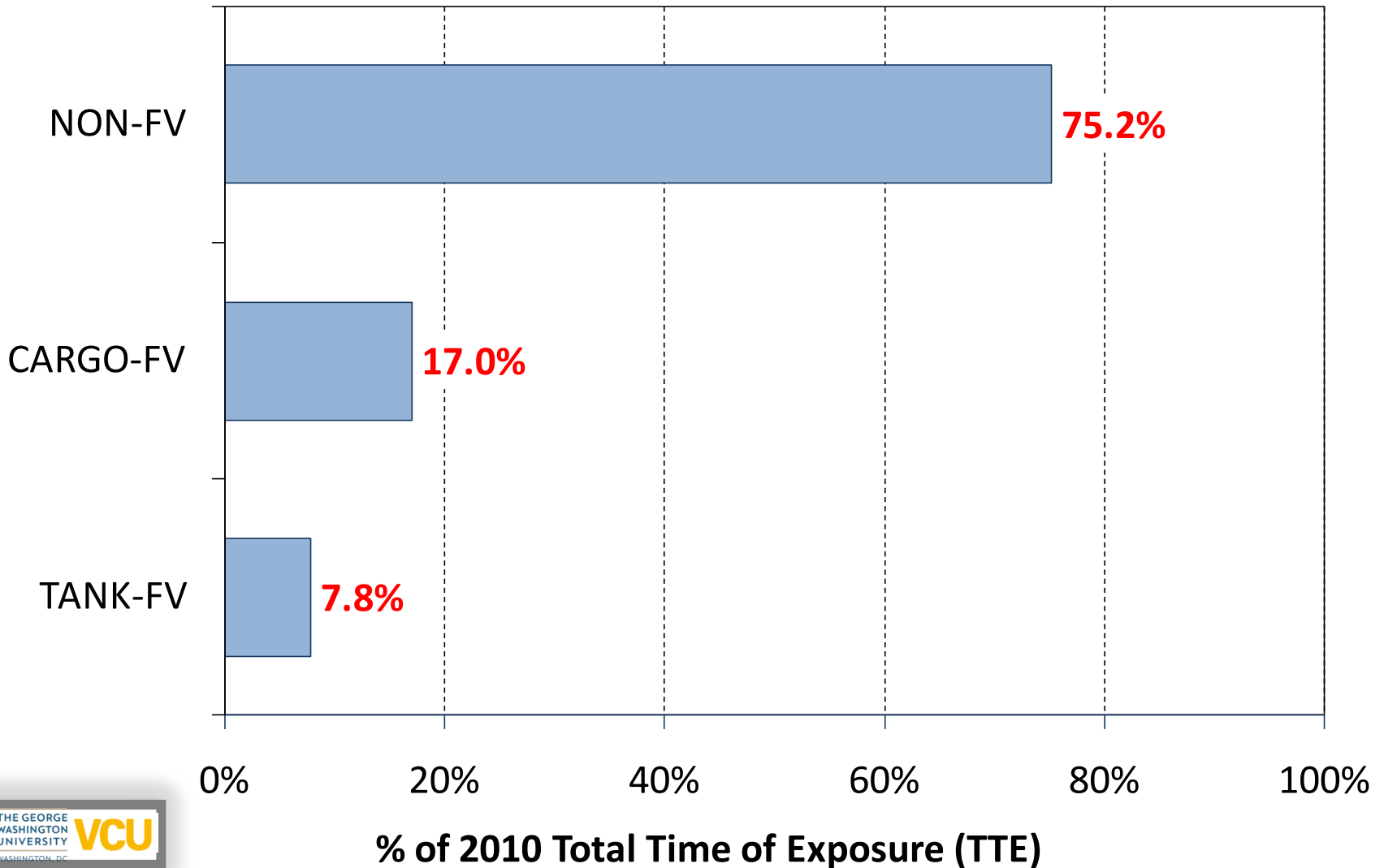


TTE = TOTAL TIME EXPOSURE:

TOTAL AMOUNT OF ANNUAL TIME A VESSEL IS MOVING IN THE VTRA STUDY AREA

VTRA MODEL - VTOSS 2010

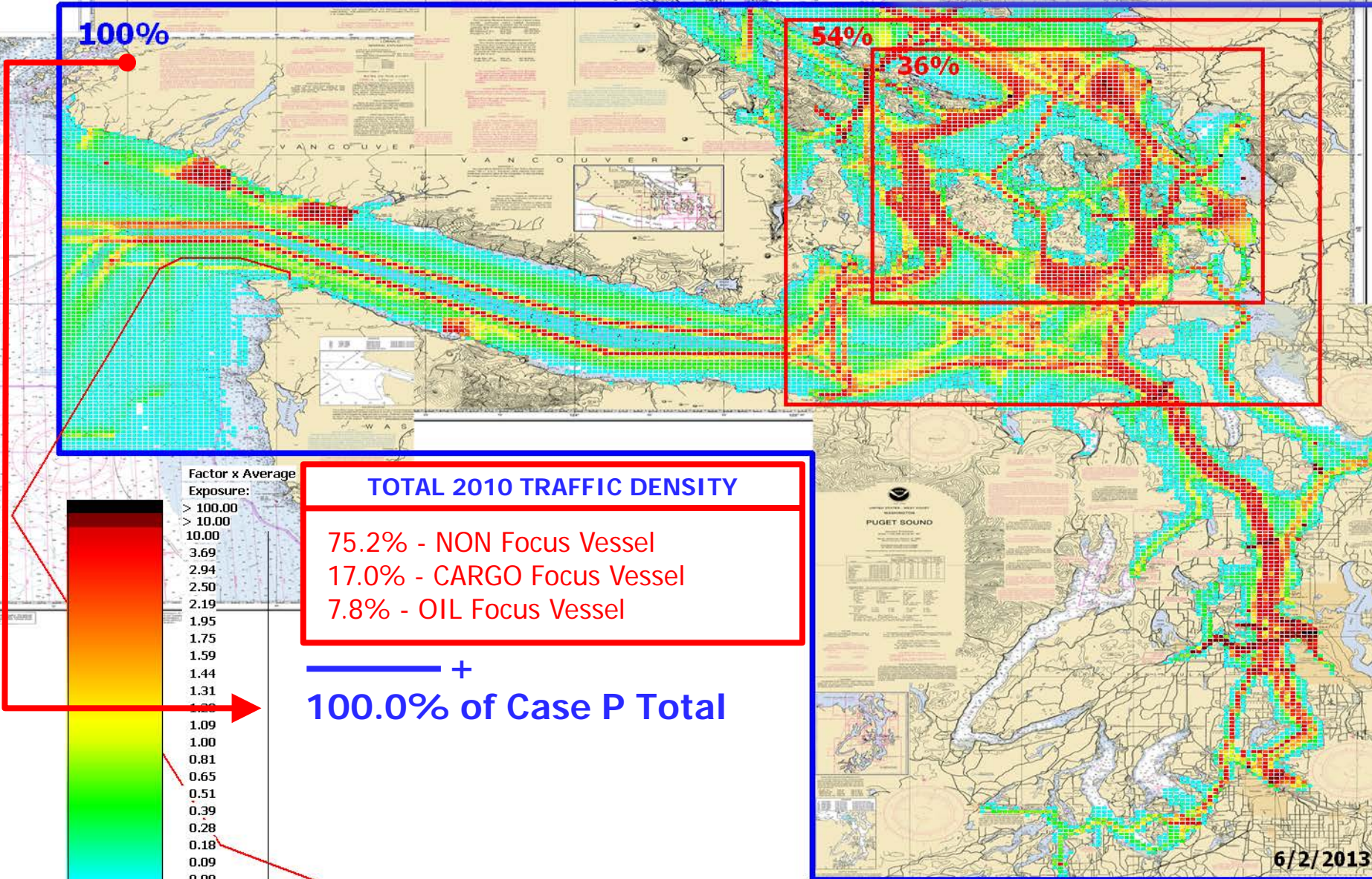
VESSEL CLASSIFICATION



100% of Total Traffic Density



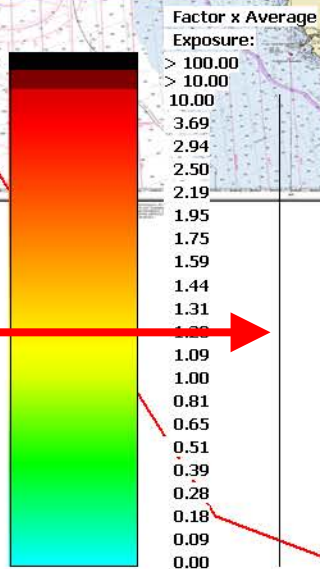
P: VTRA 2010 - Total Density



TOTAL 2010 TRAFFIC DENSITY

- 75.2% - NON Focus Vessel
- 17.0% - CARGO Focus Vessel
- 7.8% - OIL Focus Vessel

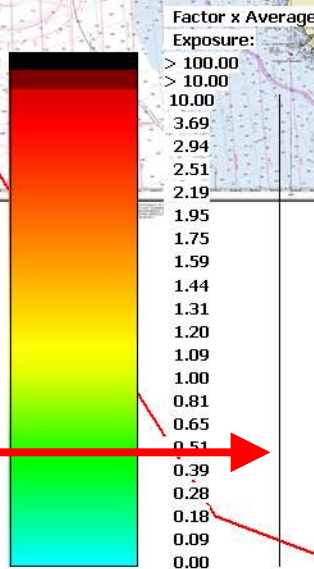
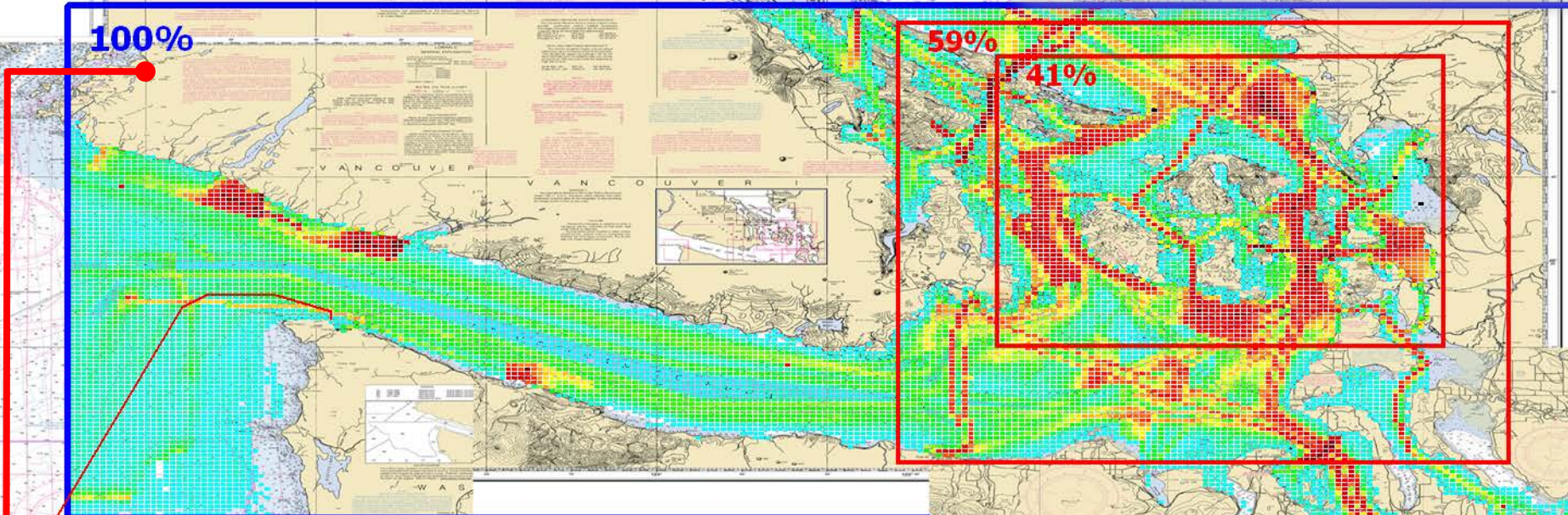
100.0% of Case P Total



75.2% of Total Traffic Density



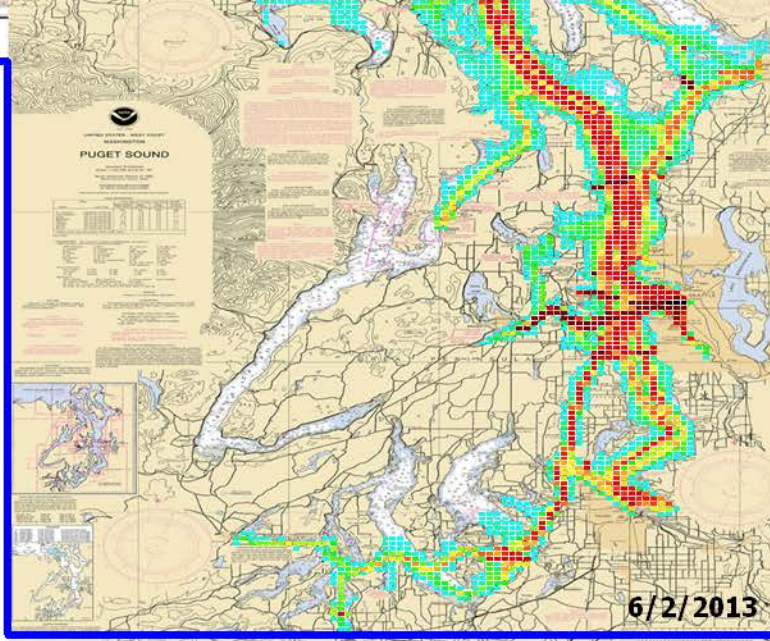
P: VTRA 2010 - NON Focus Vessel Density



2010 NON FV – 75.2% of 2010 Total

41.3% - FISHINGVESSEL	02.1% - LOG_BARGE
18.1% - FERRY	01.7% - TUGTOWBARGE
06.8% - BULKCARGOBARGE	01.5% - USCOASTGUARD
06.0% - UNLADENBARGE	01.1% - FISHINGFACTORY
04.0% - YACHT	00.8% - RESEARCHSHIP
03.9% - NAVYVESSEL	00.7% - OTHERSPECIFICSERV
03.3% - TUGNOTOW	00.6% - CONTAINERBARGE
02.8% - FERRYNONLOCAL	00.2% - SUPPLYOFFSHORE
02.7% - PASSENGERSHIP	00.2% - CHEMICALBARGE
02.2% - WOODCHIPBARGE	00.0% - DERRICKBARGE

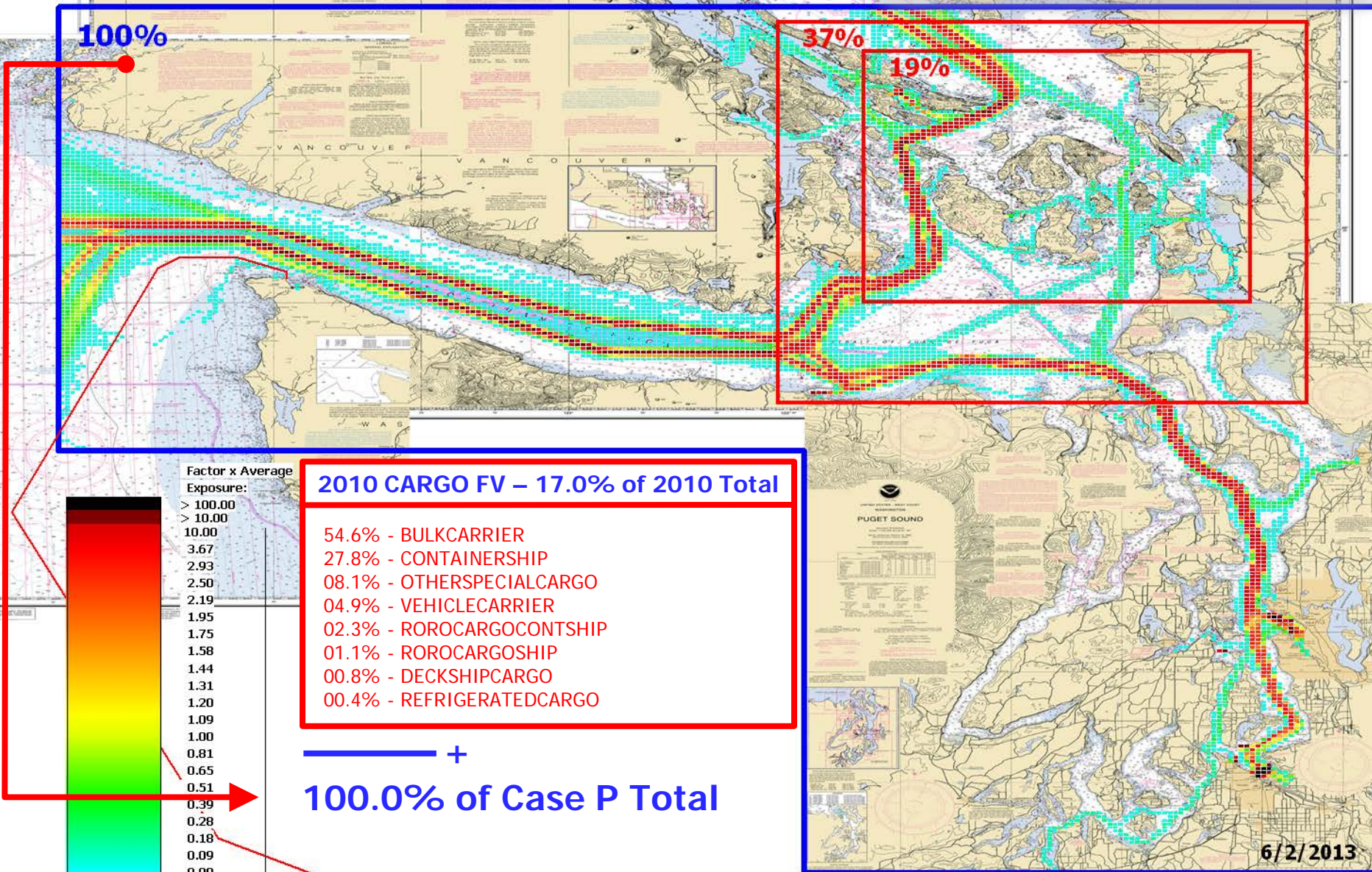
— +
100.0% of Case P Total



17.0% of Total Traffic Density



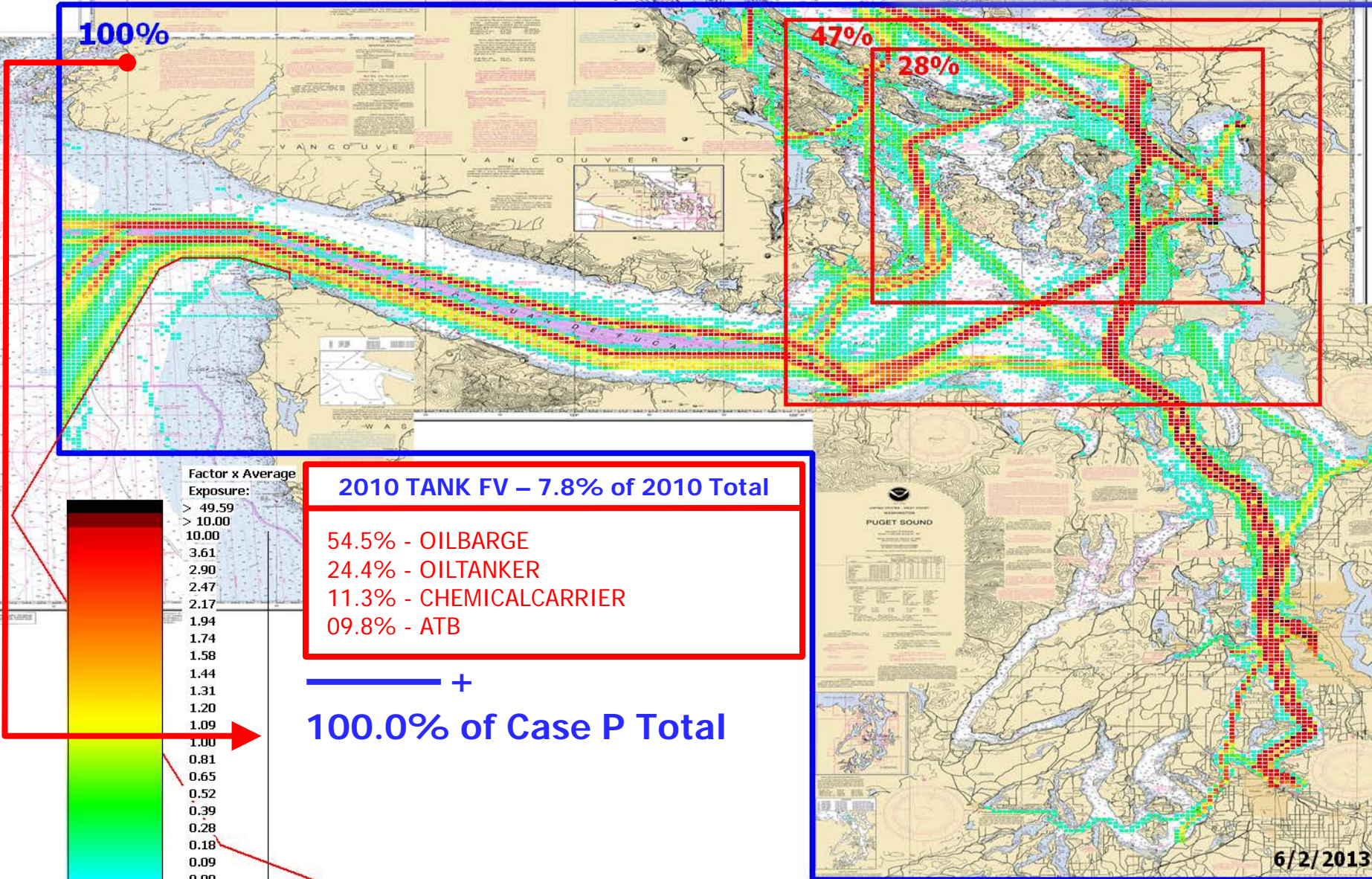
P: VTRA 2010 - CARGO Focus Vessel Density



7.8% of Total Traffic Density



P: VTRA 2010 - Tank Focus Vessel Density



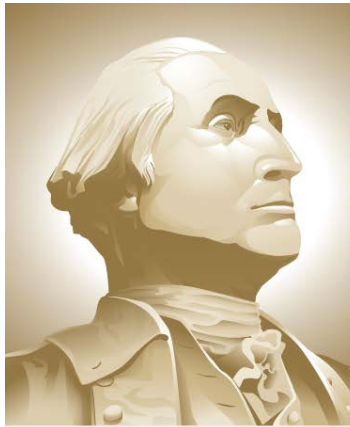
2010 TANK FV – 7.8% of 2010 Total

- 54.5% - OILBARGE
- 24.4% - OILTANKER
- 11.3% - CHEMICALCARRIER
- 09.8% - ATB

— +
100.0% of Case P Total

VTRA 2010 TRAFFIC DENSITY CARGO FOCUS VESSELS

Presentation by: J. Rene van Dorp



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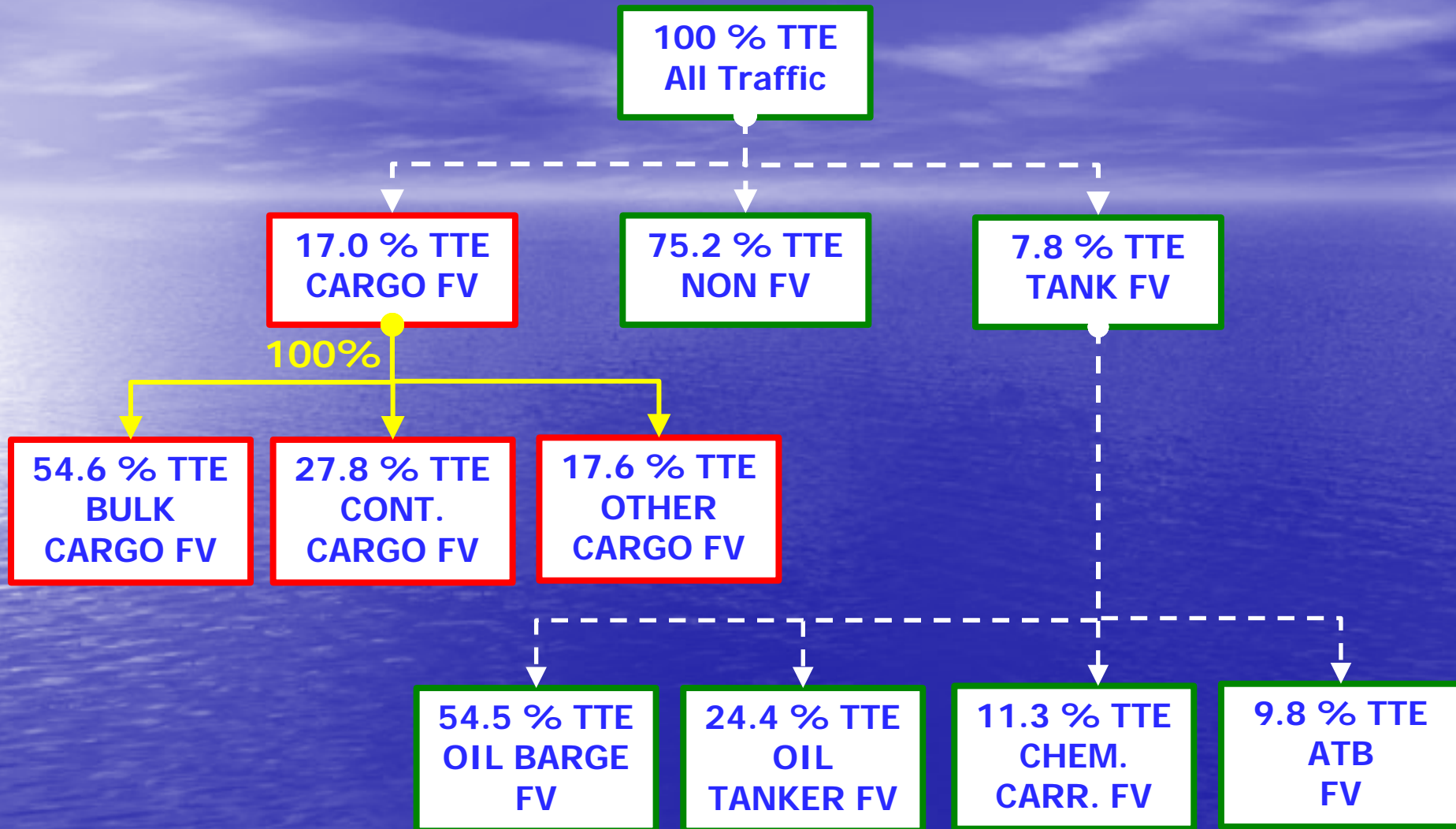
VCU

GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

JUNE 5, 2013

A TAXONOMY OF 2010 VESSEL TRAFFIC

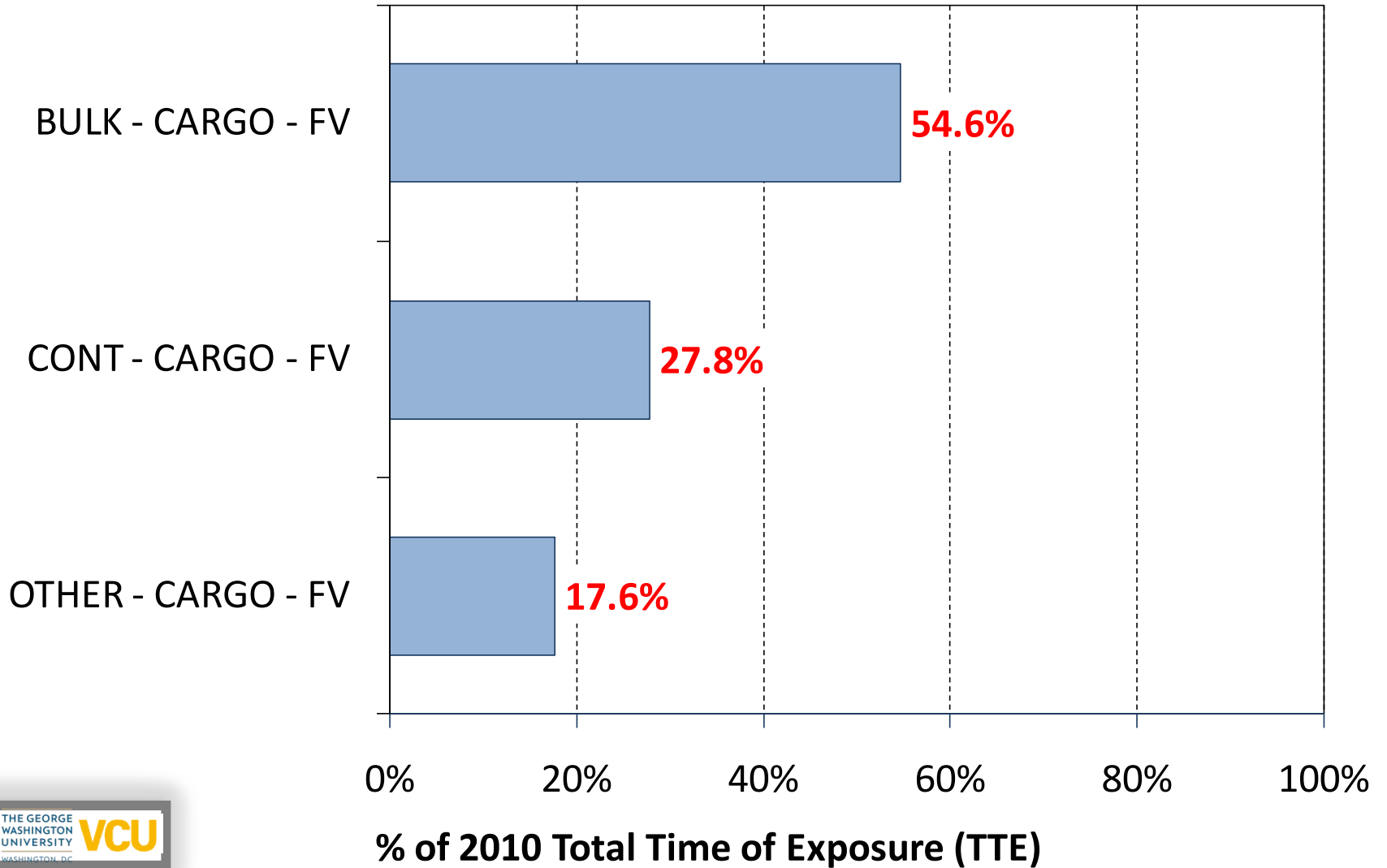


TTE = TOTAL TIME EXPOSURE:

TOTAL AMOUNT OF ANNUAL TIME A VESSEL IS MOVING IN THE VTRA STUDY AREA

VTRA MODEL - VTOSS 2010

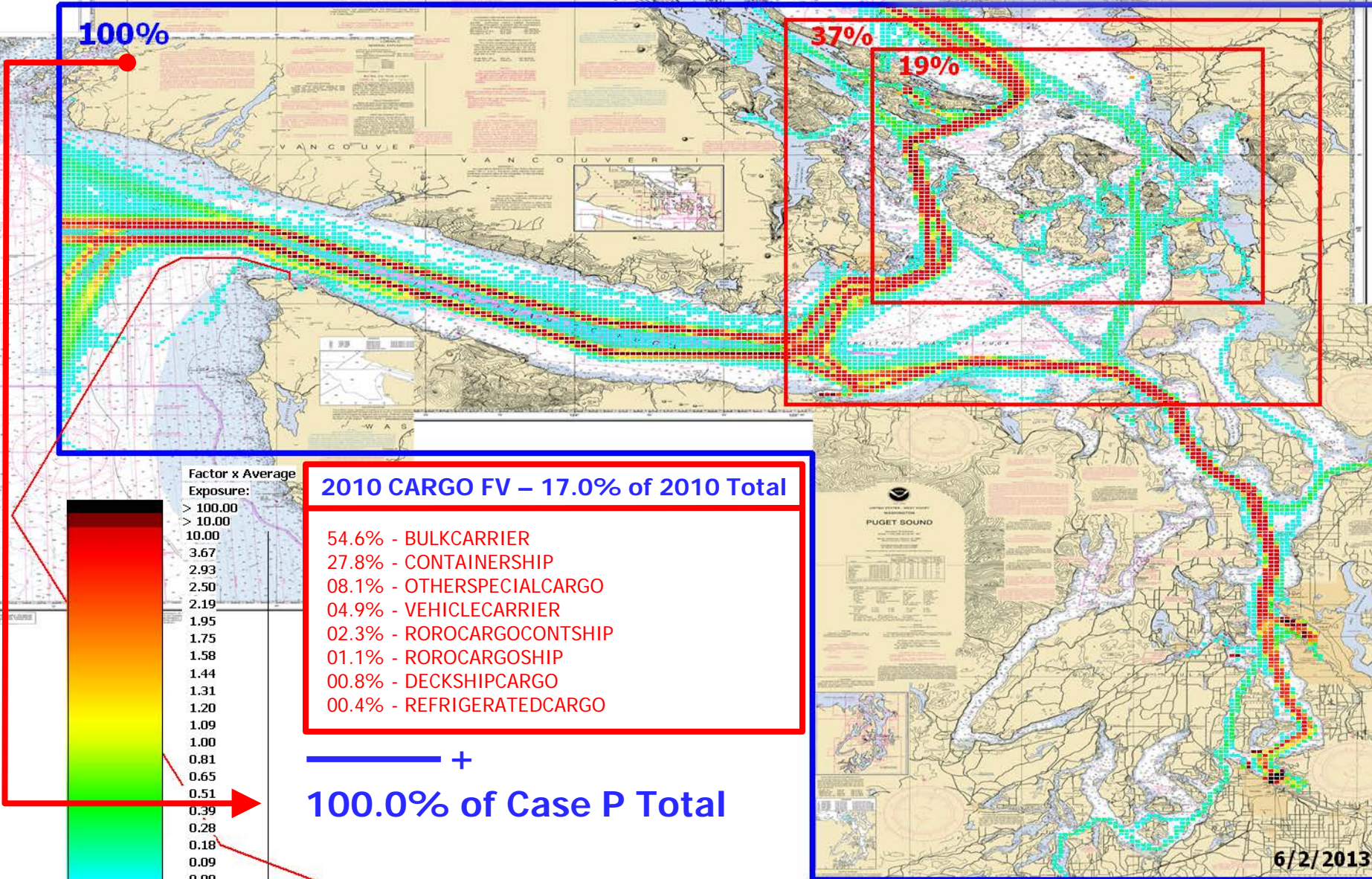
CARGO FV - CLASSIFICATION



100% of Cargo FV Traffic Density



P: VTRA 2010 - CARGO Focus Vessel Density



100%

37%

19%

2010 CARGO FV – 17.0% of 2010 Total

- 54.6% - BULKCARRIER
- 27.8% - CONTAINERSHIP
- 08.1% - OTHERSPECIALCARGO
- 04.9% - VEHICLECARRIER
- 02.3% - ROROCARGOCONTSHIP
- 01.1% - ROROCARGOSHIP
- 00.8% - DECKSHIPCARGO
- 00.4% - REFRIGERATEDCARGO

— +
100.0% of Case P Total

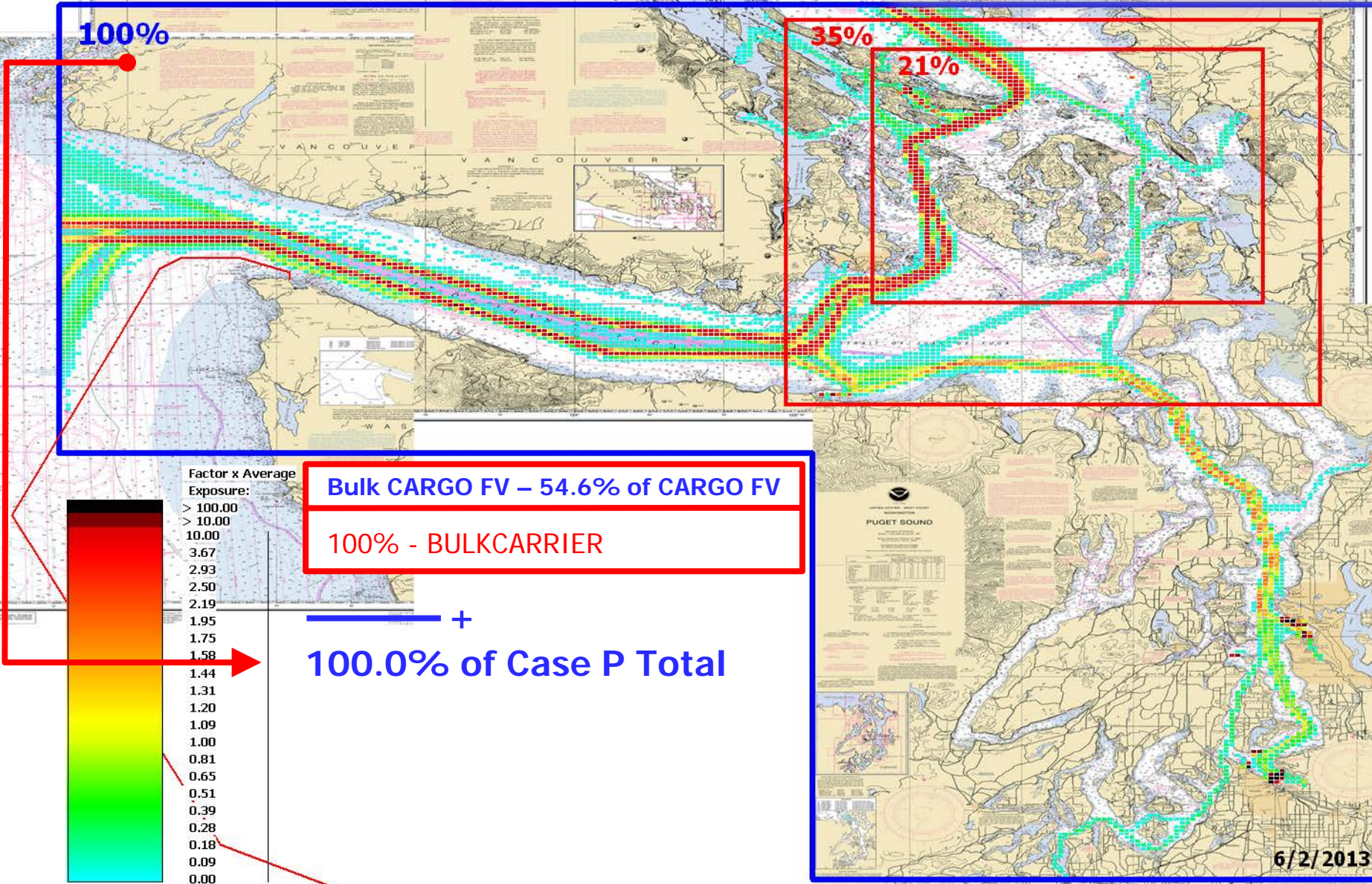
Factor x Average Exposure:

- > 100.00
- > 10.00
- 10.00
- 3.67
- 2.93
- 2.50
- 2.19
- 1.95
- 1.75
- 1.58
- 1.44
- 1.31
- 1.20
- 1.09
- 1.00
- 0.81
- 0.65
- 0.51
- 0.39
- 0.28
- 0.18
- 0.09
- 0.00

54.6% of Cargo FV Traffic Density



P: VTRA 2010 - Bulk CARGO FV Density



100%

35%

21%

Bulk CARGO FV – 54.6% of CARGO FV
100% - BULKCARRIER

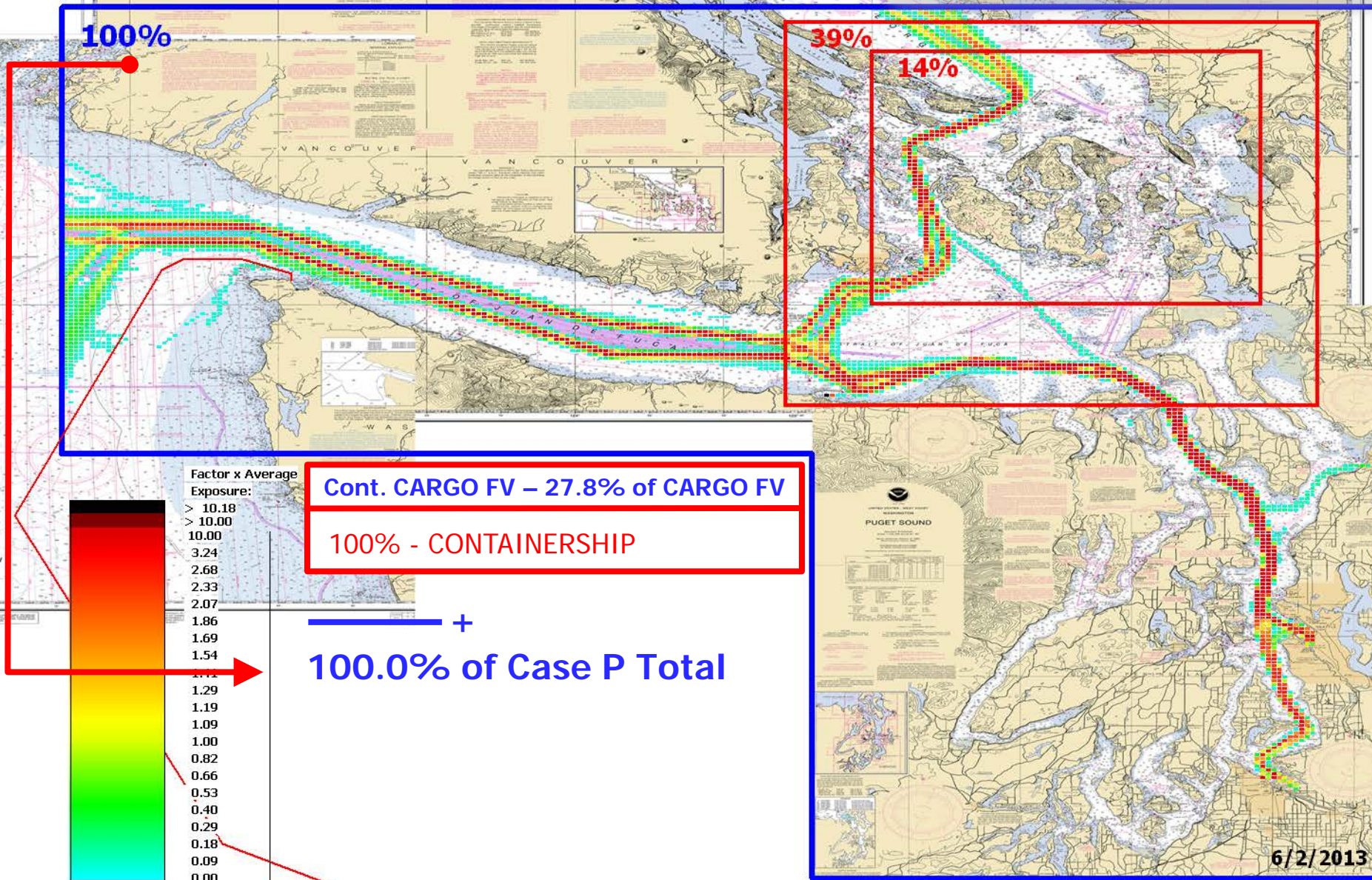
+
100.0% of Case P Total

- Factor x Average Exposure:
- > 100.00
 - > 10.00
 - 10.00
 - 3.67
 - 2.93
 - 2.50
 - 2.19
 - 1.95
 - 1.75
 - 1.58
 - 1.44
 - 1.31
 - 1.20
 - 1.09
 - 1.00
 - 0.81
 - 0.65
 - 0.51
 - 0.39
 - 0.28
 - 0.18
 - 0.09
 - 0.00

27.8% of Cargo FV Traffic Density



P: VTRA 2010 - Container CARGO FV Density



Factor x Average Exposure:

- > 10.18
- 10.00
- 3.24
- 2.68
- 2.33
- 2.07
- 1.86
- 1.69
- 1.54
- 1.41
- 1.29
- 1.19
- 1.09
- 1.00
- 0.82
- 0.66
- 0.53
- 0.40
- 0.29
- 0.18
- 0.09
- 0.00

Cont. CARGO FV - 27.8% of CARGO FV

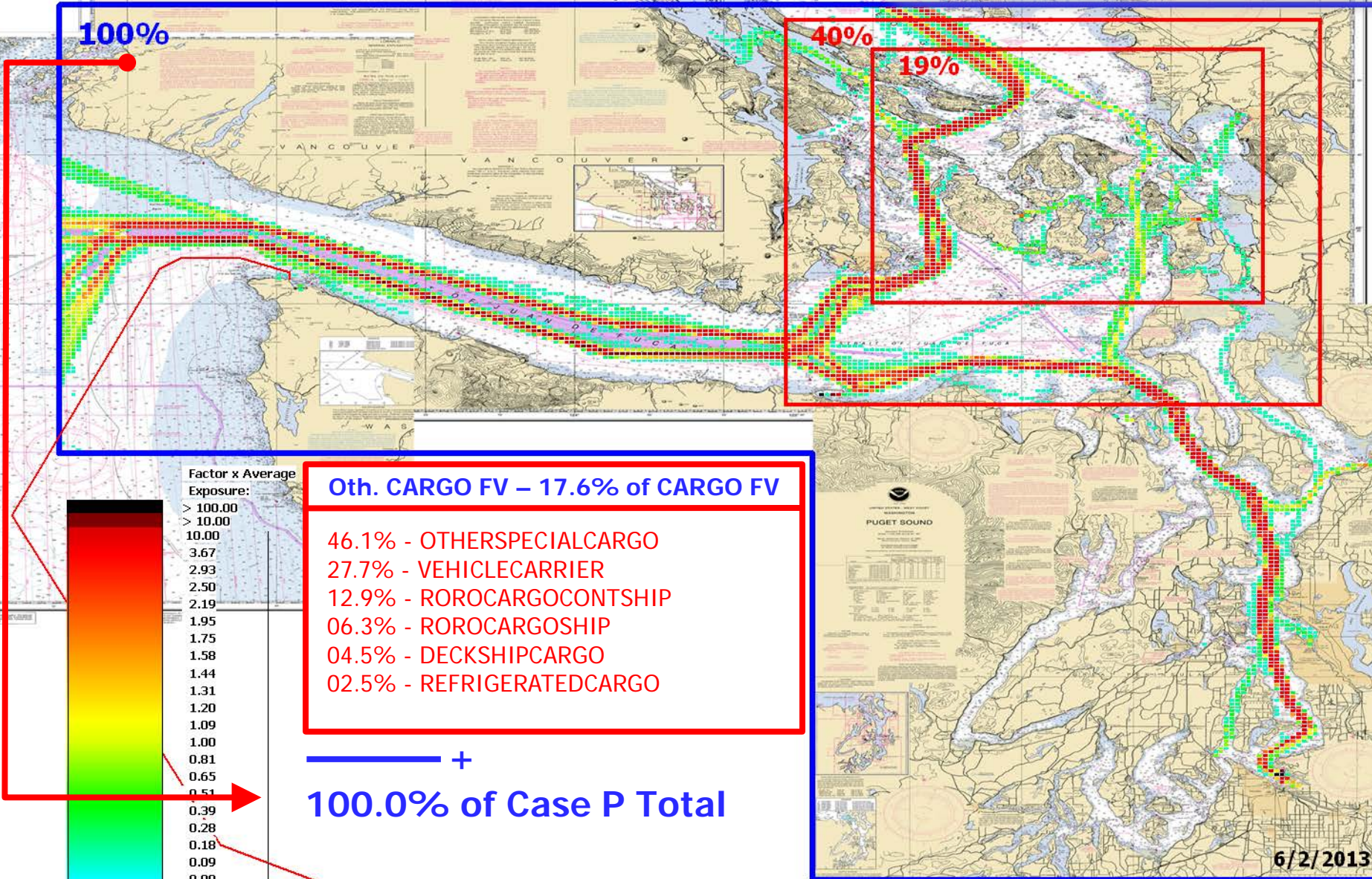
100% - CONTAINERSHIP

+
100.0% of Case P Total

17.6% of Cargo FV Traffic Density



P: VTRA 2010 - Other CARGO FV Density



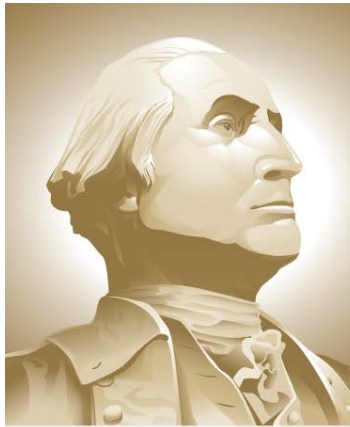
Oth. CARGO FV – 17.6% of CARGO FV

- 46.1% - OTHERSPECIALCARGO
- 27.7% - VEHICLECARRIER
- 12.9% - ROROCARGOCONTSHIP
- 06.3% - ROROCARGOSHIP
- 04.5% - DECKSHIPCARGO
- 02.5% - REFRIGERATEDCARGO

100.0% of Case P Total

VTRA 2010 TRAFFIC DENSITY TANK FOCUS VESSELS

Presentation by: J. Rene van Dorp



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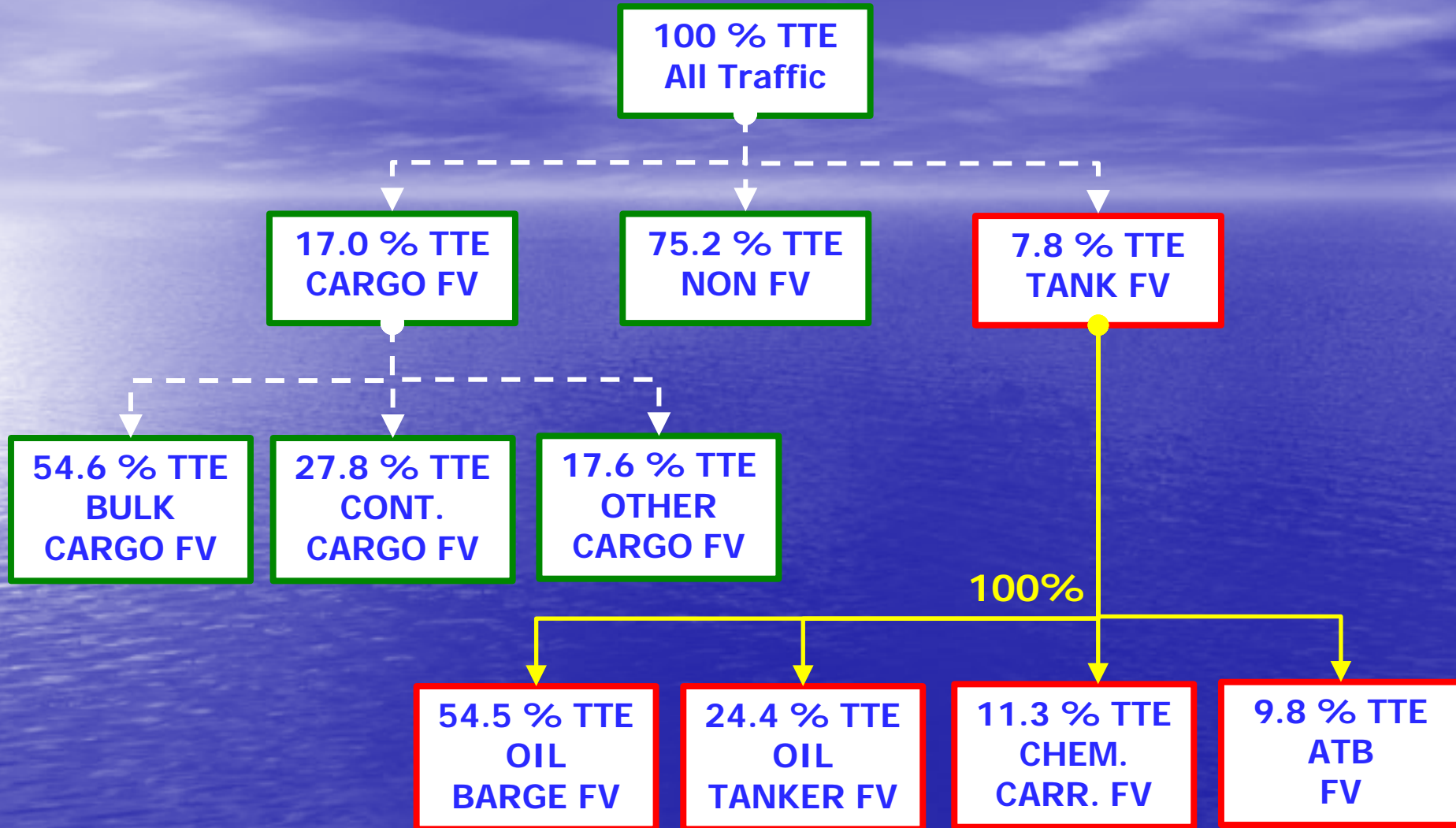
VCU

GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

JUNE 5, 2013

A TAXONOMY OF 2010 VESSEL TRAFFIC

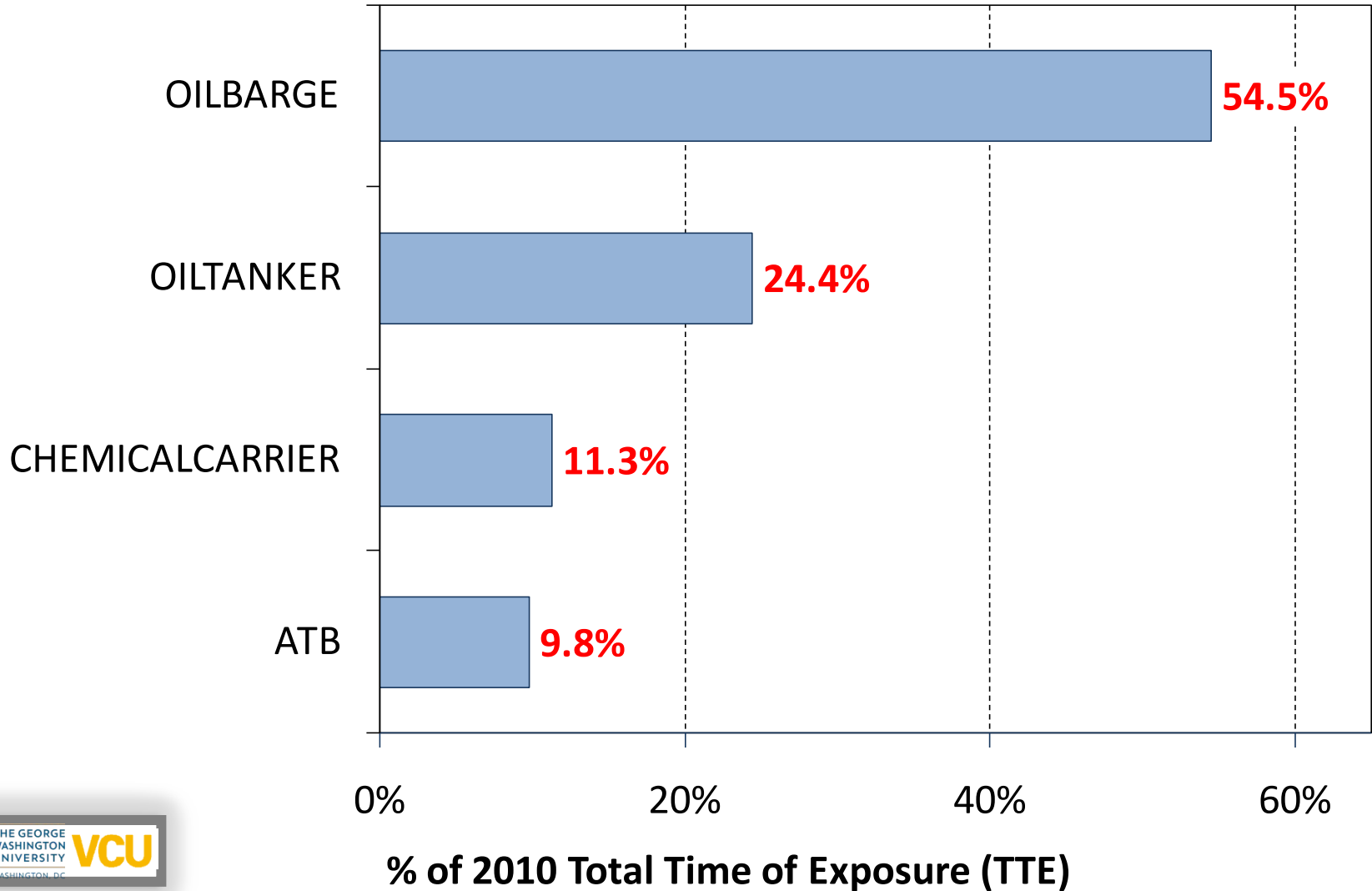


TTE = TOTAL TIME EXPOSURE:

TOTAL AMOUNT OF ANNUAL TIME A VESSEL IS MOVING IN THE VTRA STUDY AREA

VTRA MODEL - VTOSS 2010

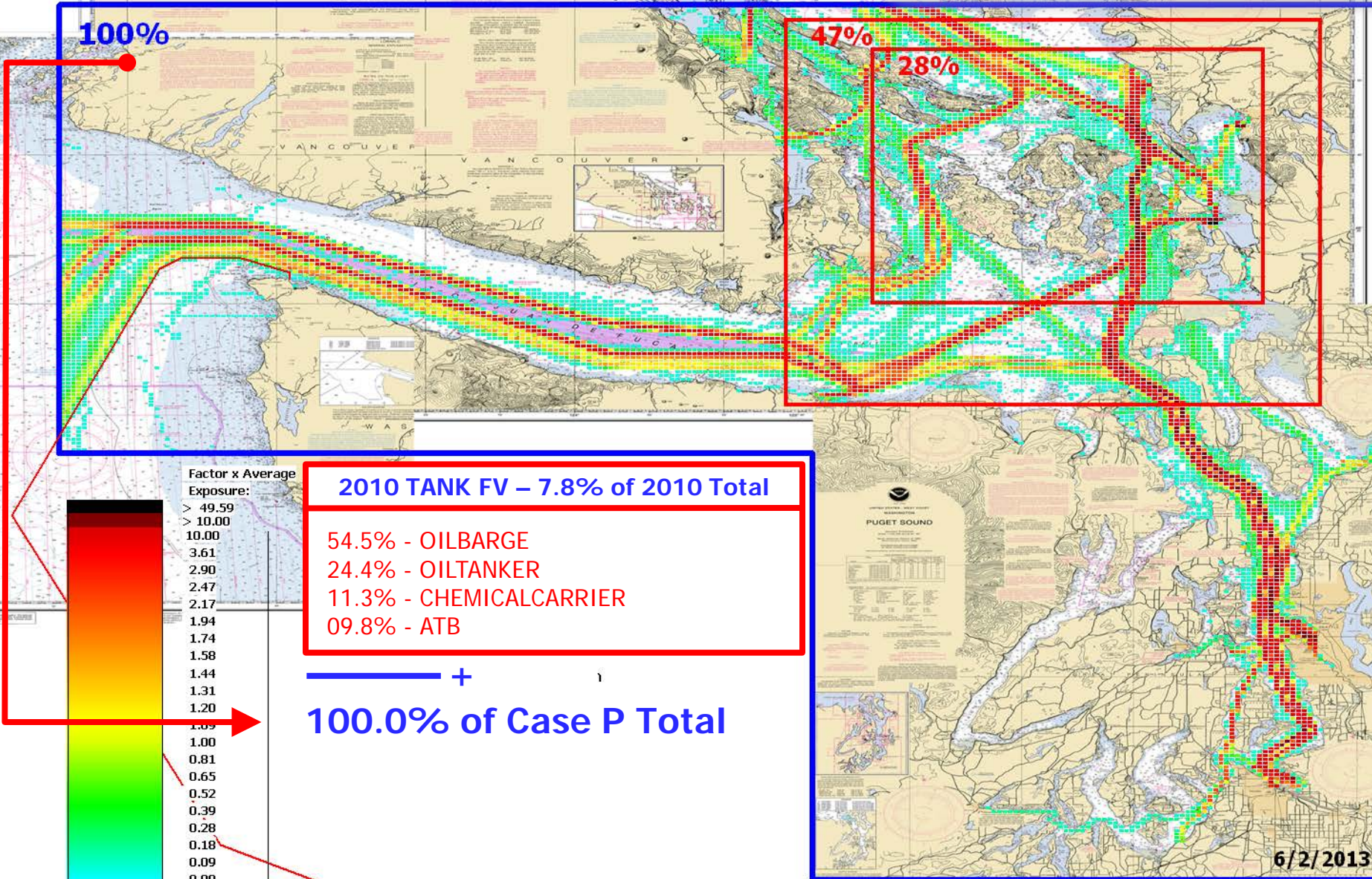
TANK FV CLASSIFICATION



100% of TANK FV Density



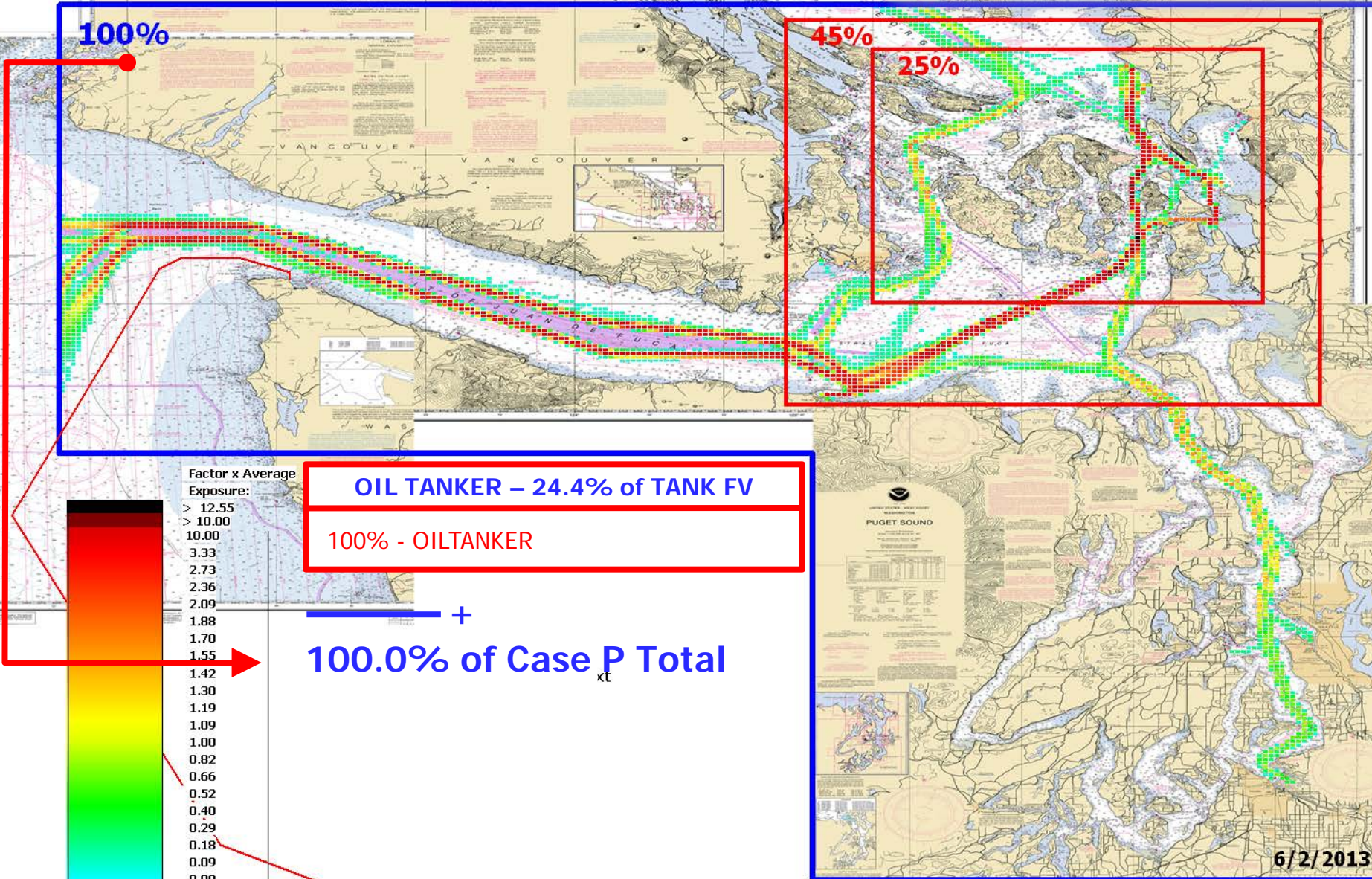
P: VTRA 2010 - Tank Focus Vessel Density



24.4% of TANK FV Density



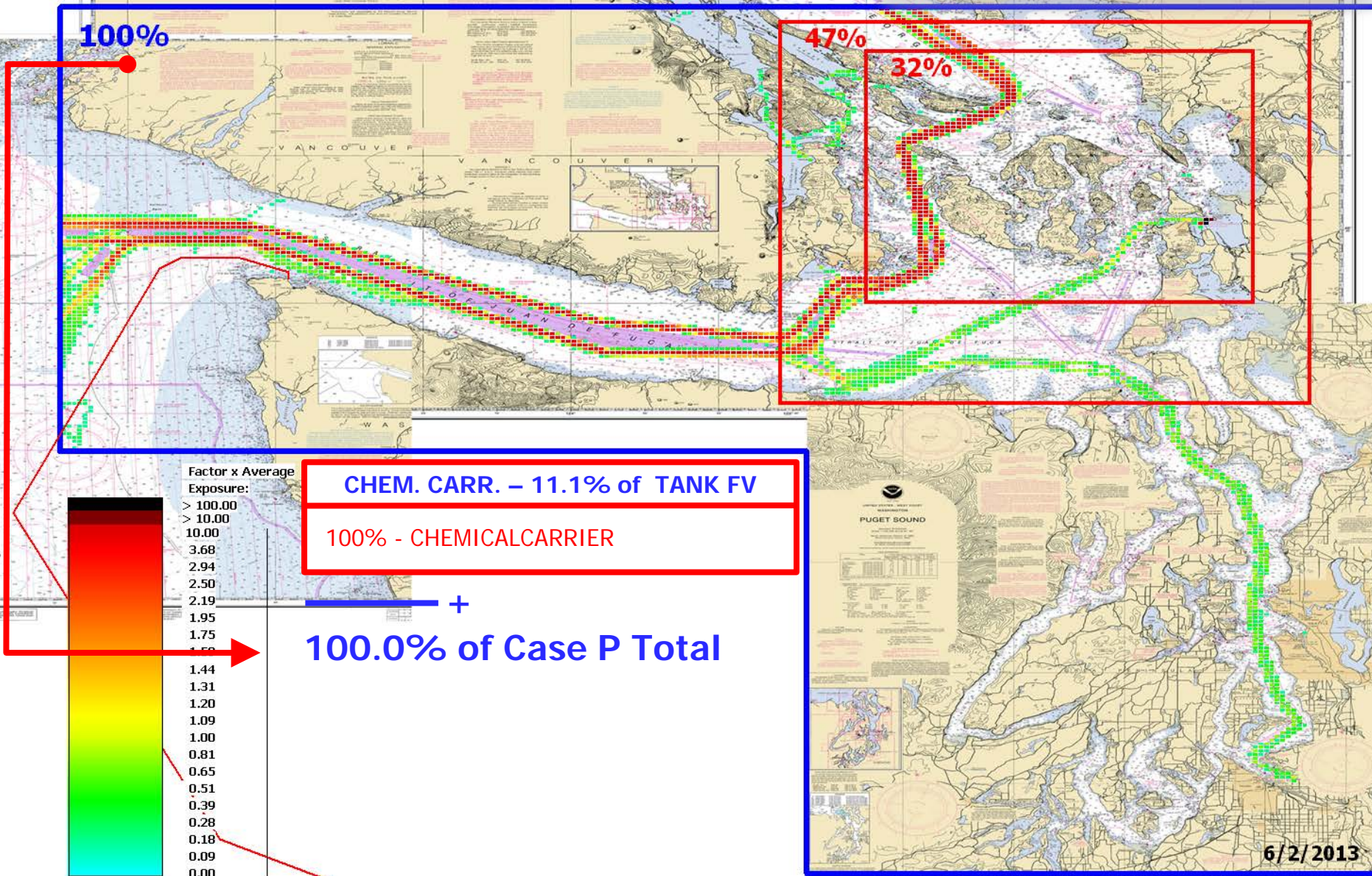
P: VTRA 2010 - OILTANKER Density



11.1% of TANK FV Density



P: VTRA 2010 - CHEMICALCARRIER Density



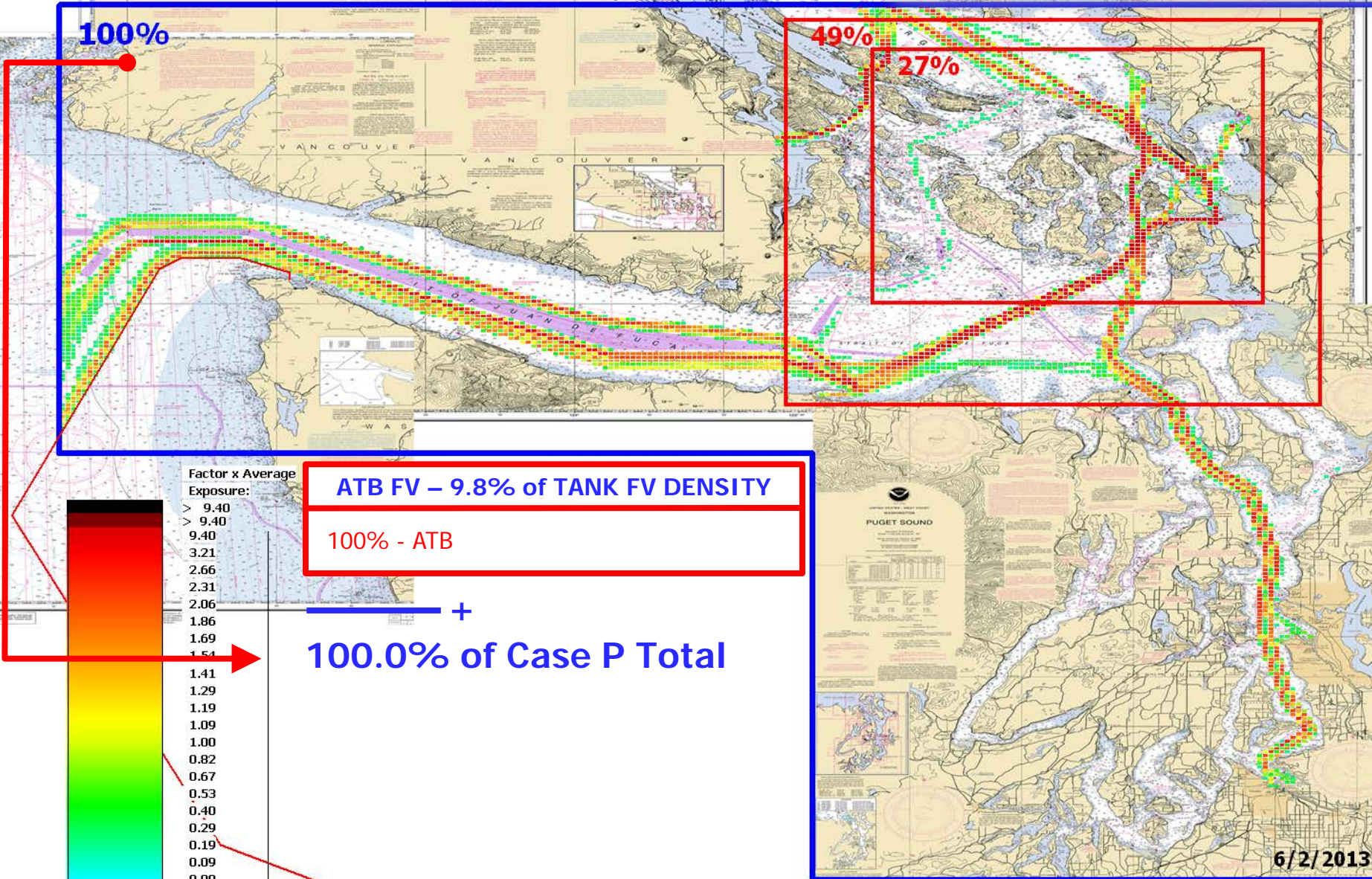
CHEM. CARR. - 11.1% of TANK FV
100% - CHEMICALCARRIER

+
100.0% of Case P Total

9.8% of TANK FV Density



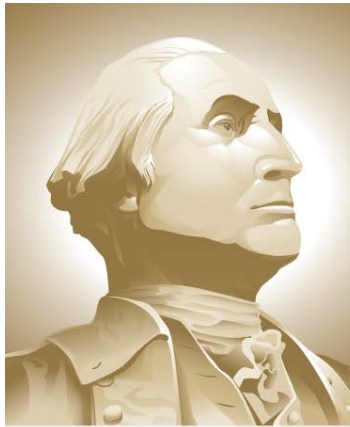
P: VTRA 2010 - ATB Density



VTRA 2010

A TAXONOMY OF VESSEL TRAFFIC

Presentation by: J. Rene van Dorp



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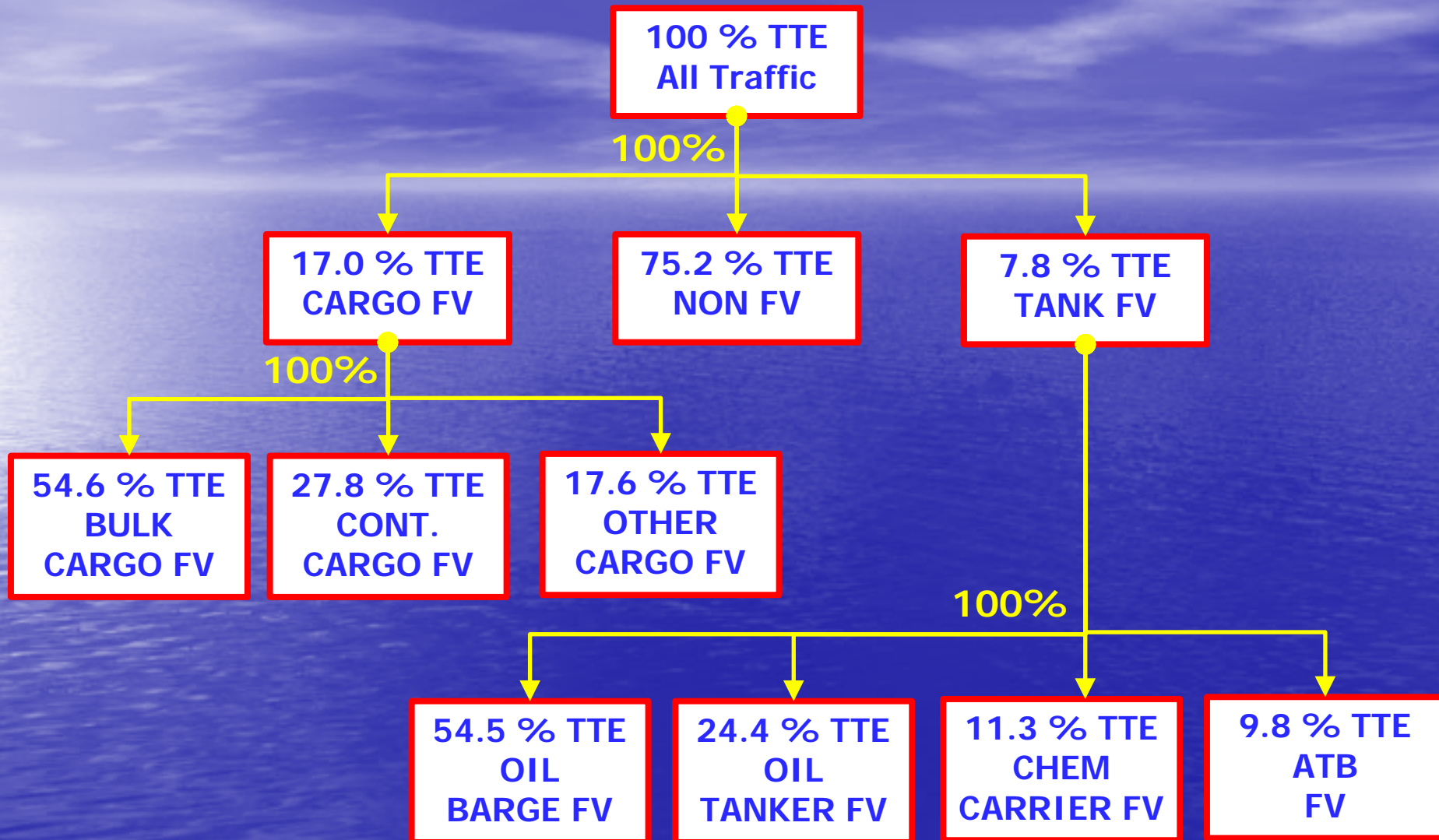
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JUNE 5, 2013

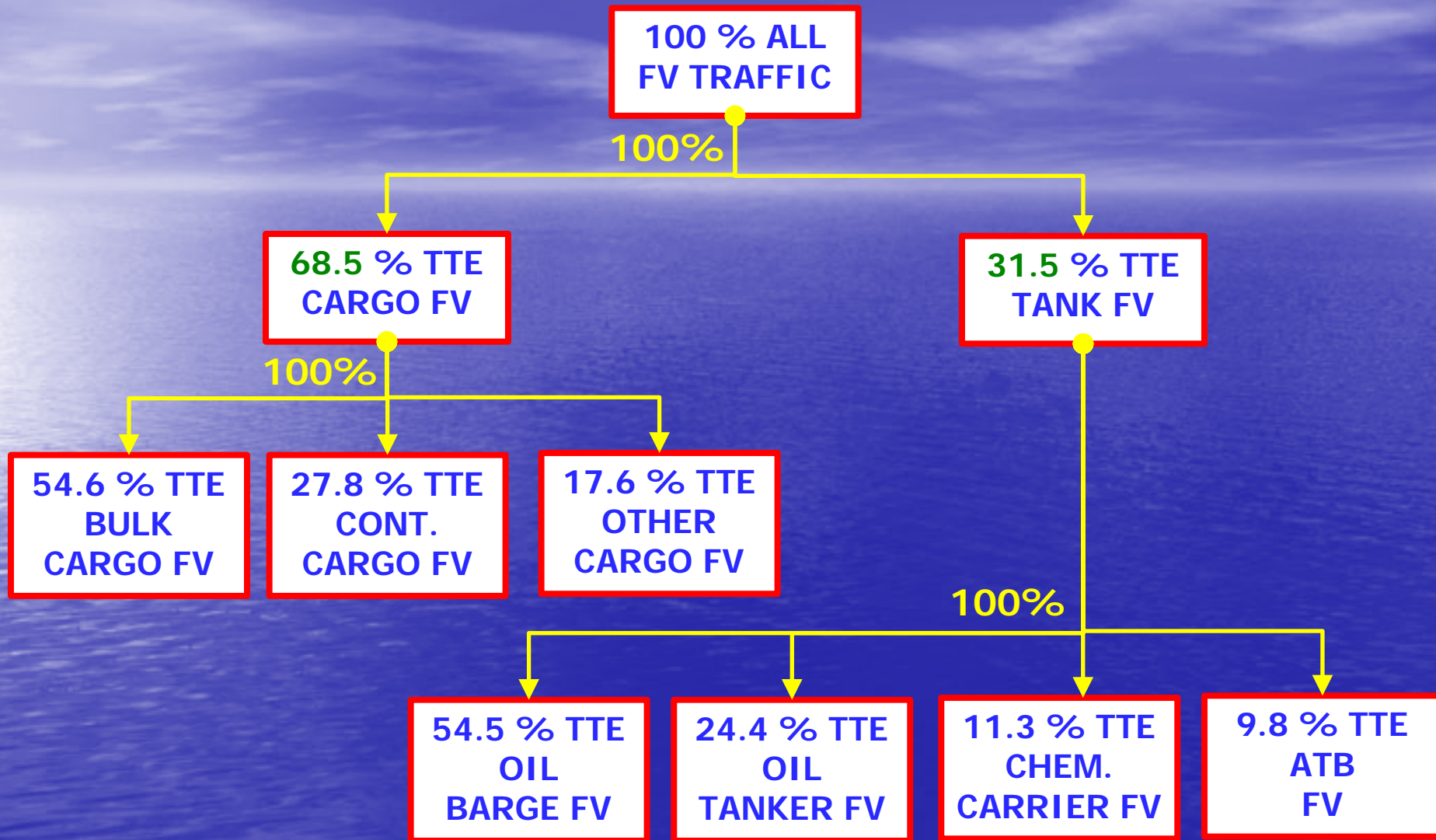
A TAXONOMY OF 2010 VESSEL TRAFFIC



TTE = TOTAL TIME EXPOSURE:

TOTAL AMOUNT OF ANNUAL TIME A VESSEL IS MOVING IN THE VTRA STUDY AREA

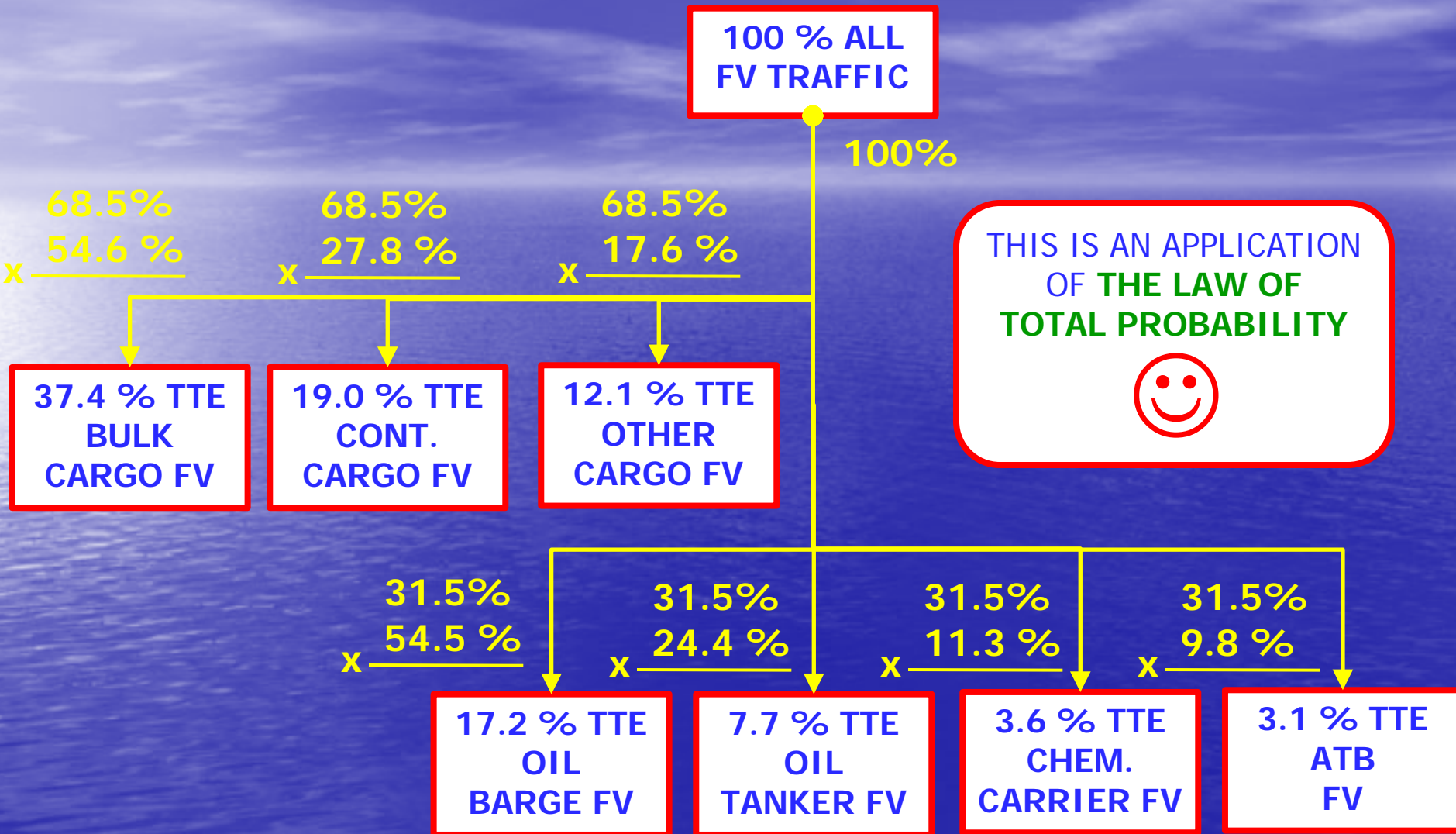
A TAXONOMY OF 2010 FOCUS VESSEL TRAFFIC



TTE = TOTAL TIME EXPOSURE:

TOTAL AMOUNT OF ANNUAL TIME A VESSEL IS MOVING IN THE VTRA STUDY AREA

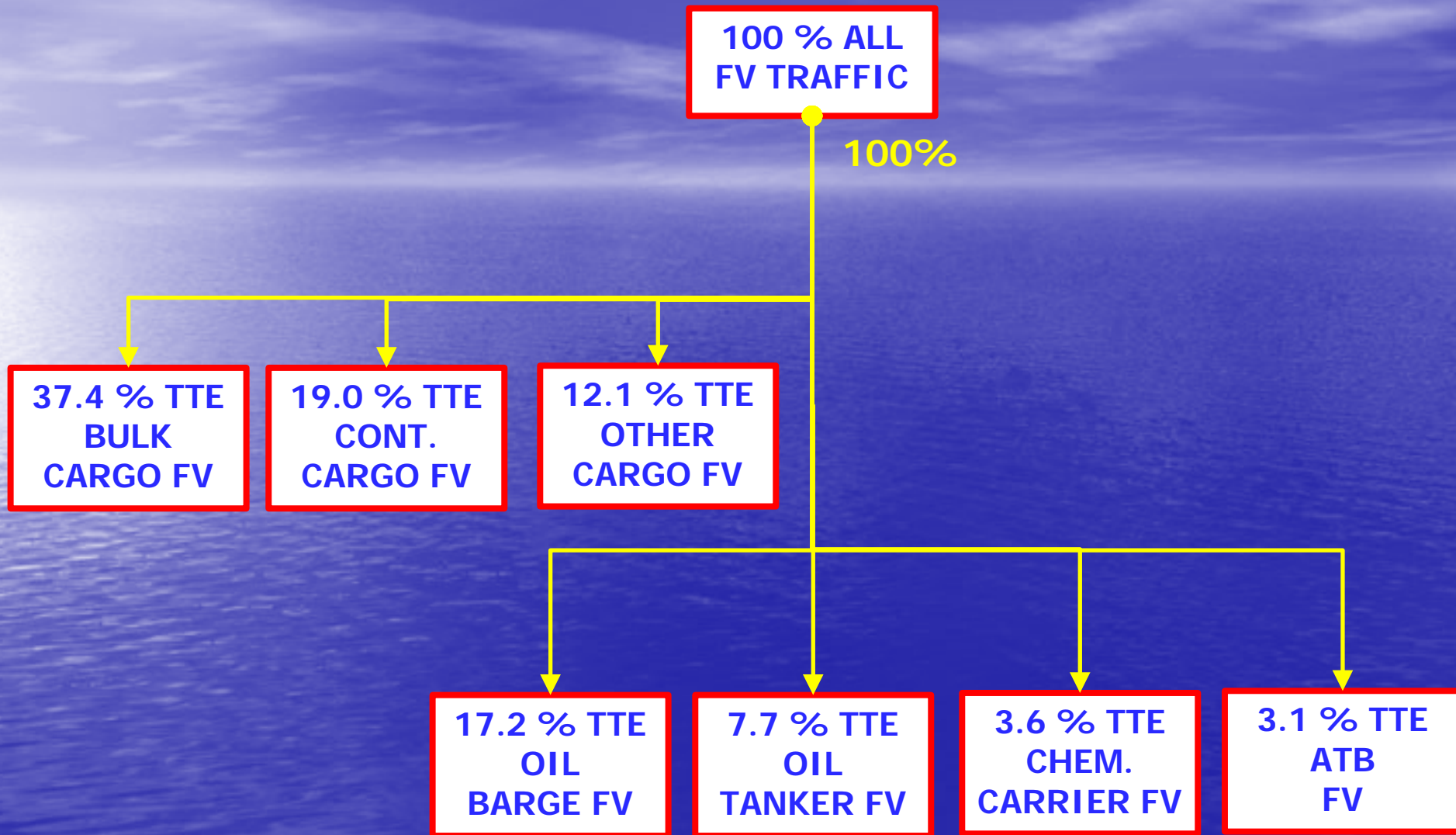
A TAXONOMY OF 2010 FOCUS VESSEL TRAFFIC



TTE = TOTAL TIME EXPOSURE:

TOTAL AMOUNT OF ANNUAL TIME A VESSEL IS MOVING IN THE VTRA STUDY AREA

A TAXONOMY OF 2010 FOCUS VESSEL TRAFFIC

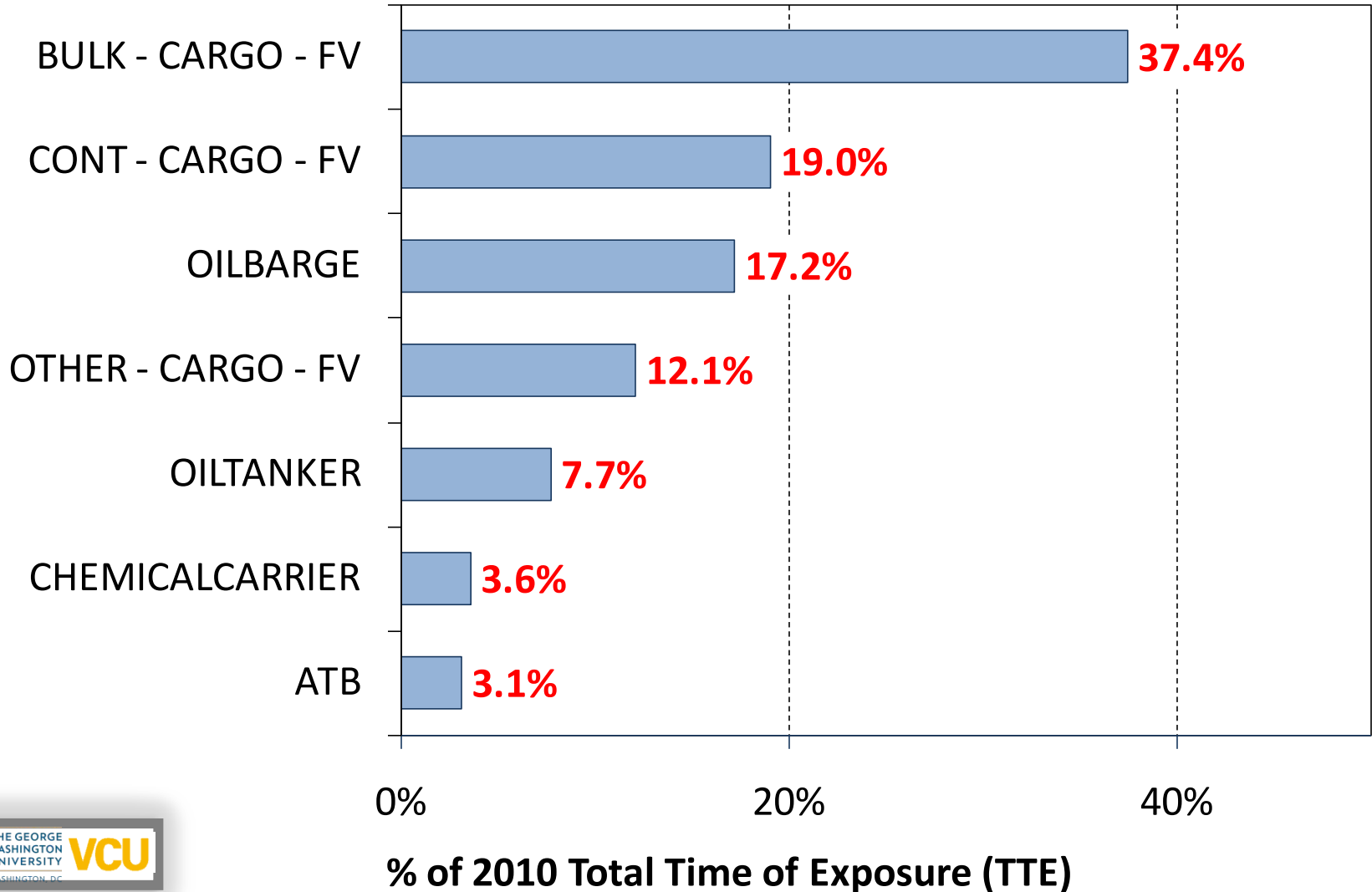


TTE = TOTAL TIME EXPOSURE:

TOTAL AMOUNT OF ANNUAL TIME A VESSEL IS MOVING IN THE VTRA STUDY AREA

VTRA MODEL - VTOSS 2010

FOCUS VESSEL CLASSIFICATION



COMPLETION OF BASE CASE FOCUS VESSEL RISK

STEP 1: COMPLETED FOCUS VESSEL PRESENTATION AND TAXONOMY IN TERMS OF TOTAL TIME OF EXPOSURE (TTE).

WHERE DO WE GO FROM HERE?

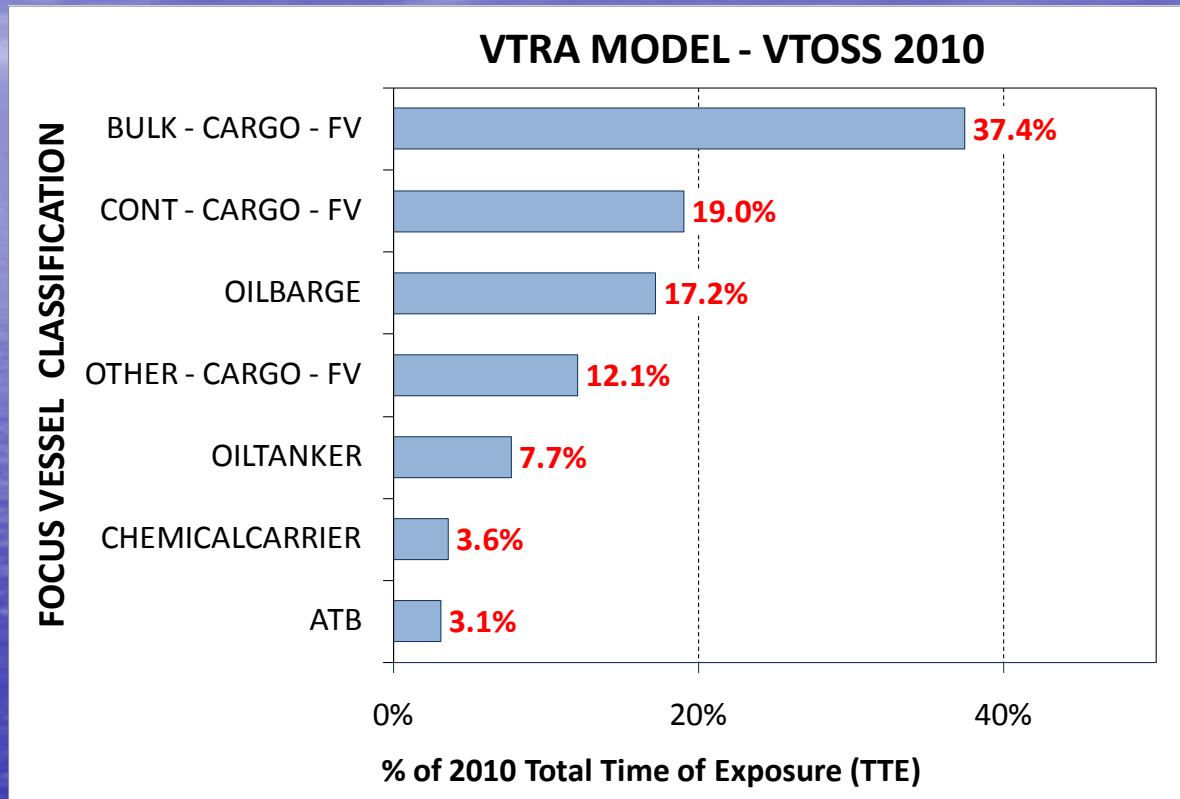
STEP 2: DEVELOP SIMILAR FOCUS VESSEL PRESENTATION AND TAXONOMY IN TERMS OF **POTENTIAL ACCIDENT FREQUENCY.**

STEP 3: DEVELOP SIMILAR FOCUS VESSEL PRESENTATION AND TAXONOMY IN TERMS OF **POTENTIAL FUEL LOSSES.**

STEP 4: DEVELOP SIMILAR FOCUS VESSEL PRESENTATION AND TAXONOMY IN TERMS OF **POTENTIAL NON-FUEL OIL LOSSES.**

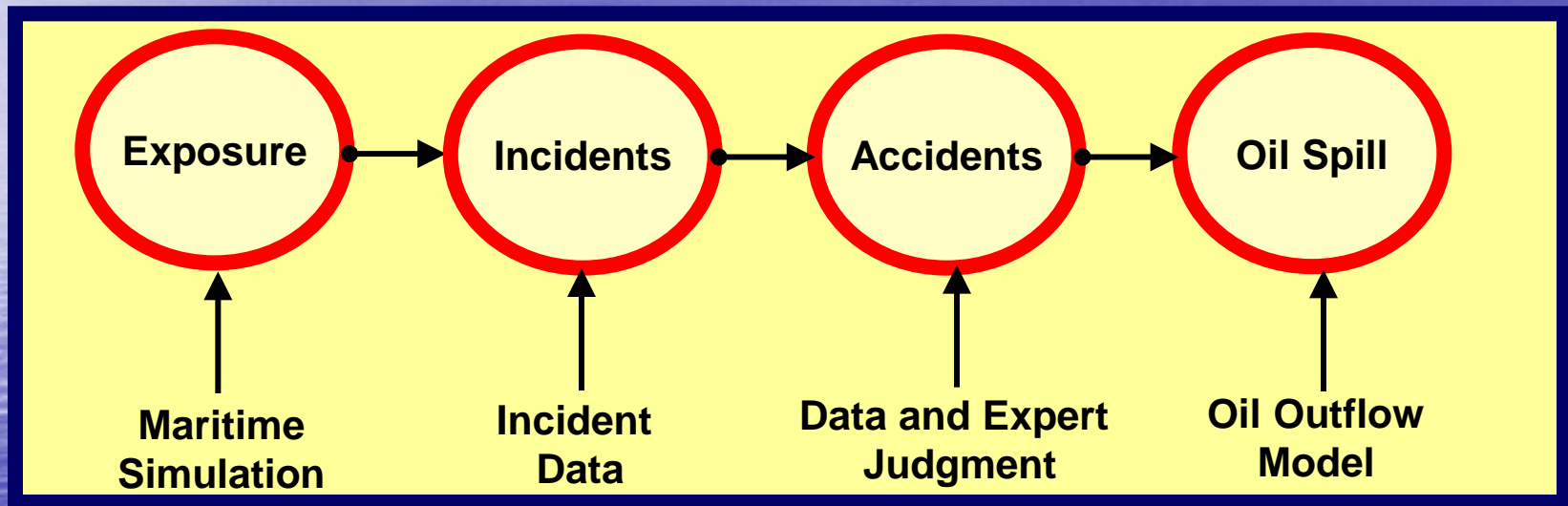
TOTAL TIME OF EXPOSURE BY FOCUS VESSEL

STEP 1: COMPLETED



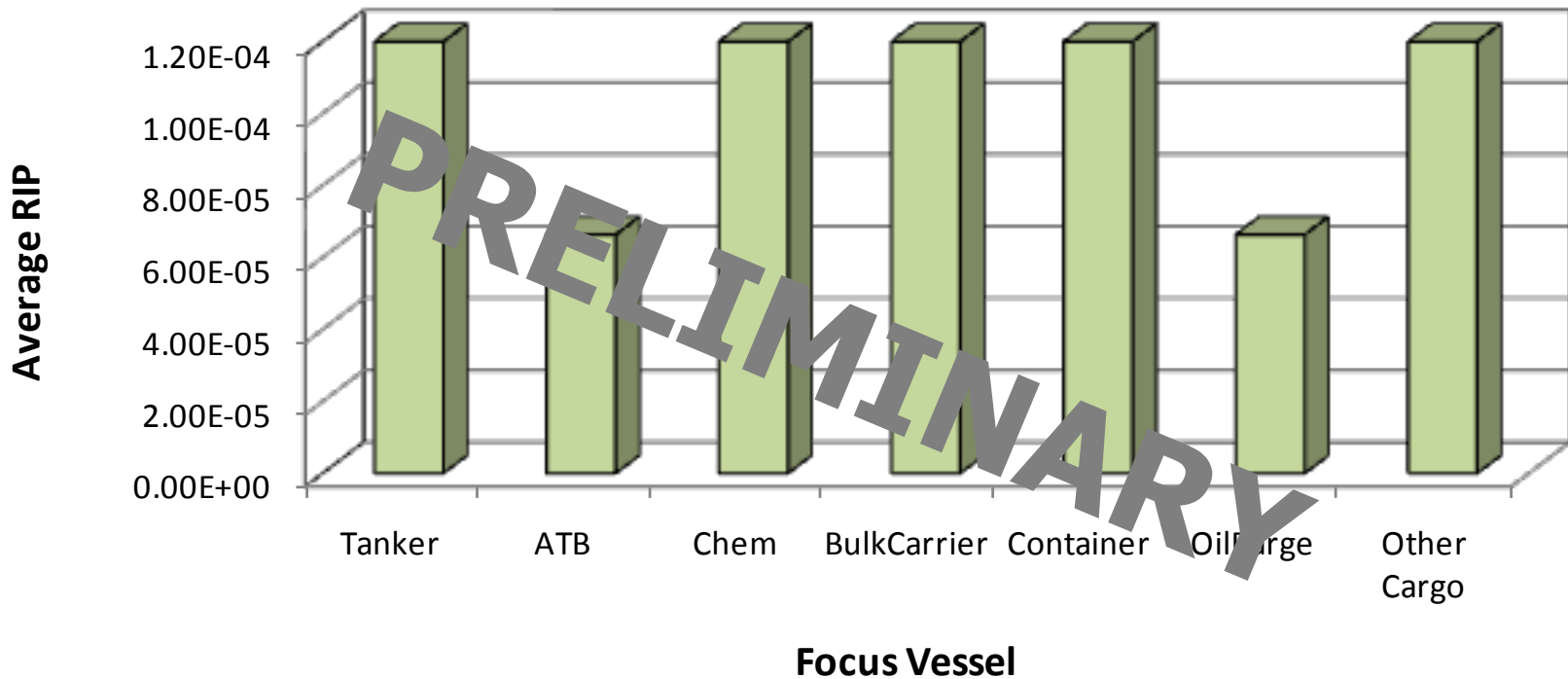
TOTAL TIME EXPOSURE (TTE): Amount of time per Year FV is moving with the area.

An Oil Spill is a series of cascading events referred to as a Causal Chain



ASSUMPTION BASE CASE INCIDENT RATES

Assumption: Apply former Tanker and ATB model VTRA Incident Rates per Interaction to other FV's.

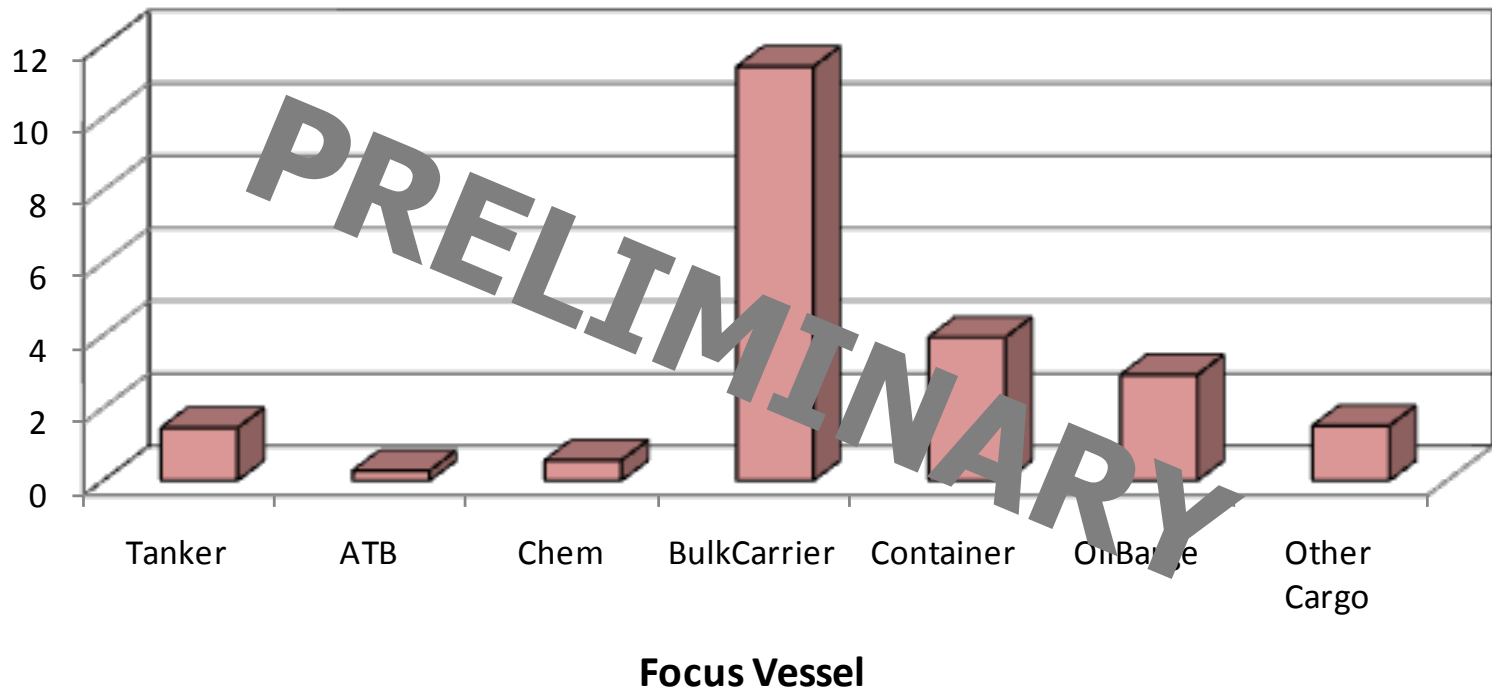


Incidents: Human Error, Propulsion, Steering or Navigational Aid Failures.

ASSUMPTION BASE CASE INCIDENT RATES

Assumption: Apply former Tanker and ATB VTRA Incident Rates per Interaction to other FV's.

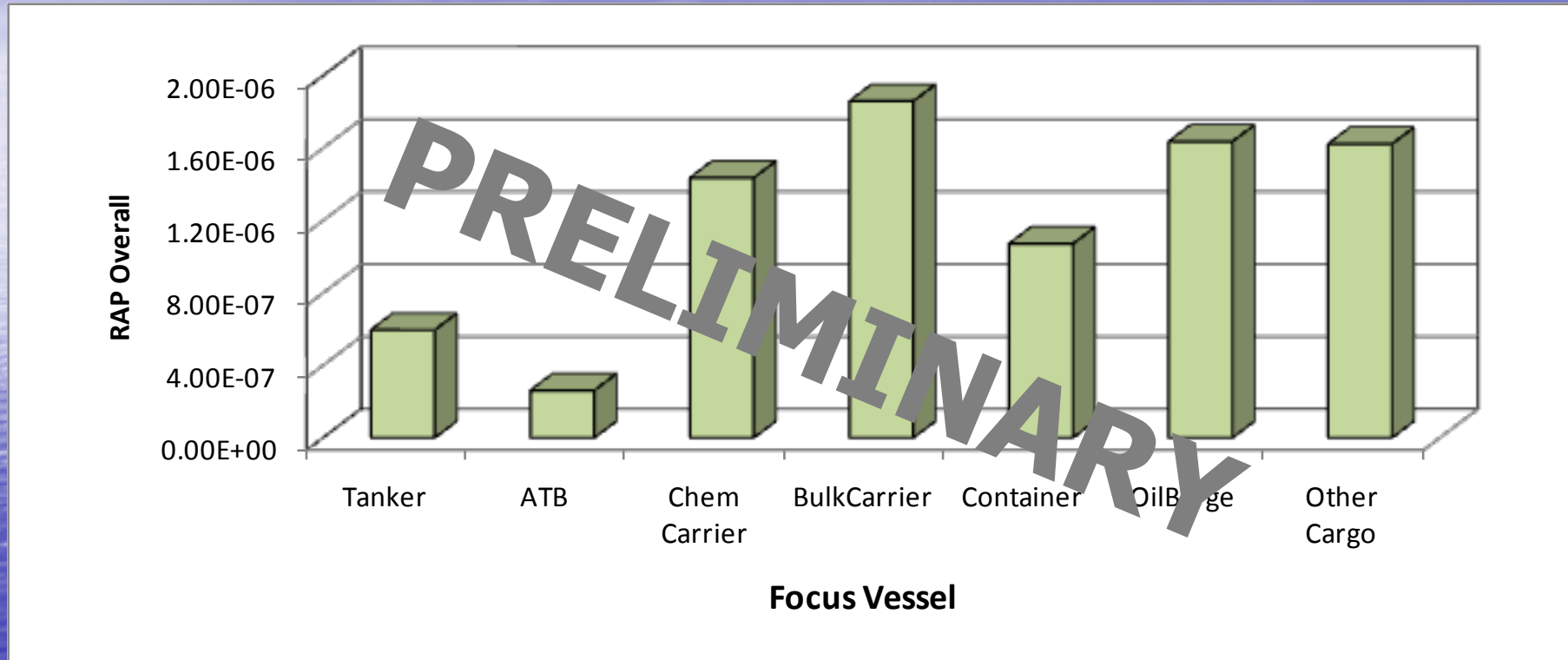
Potential Average # Incidents per Year



Incidents: Human Error, Propulsion, Steering or Navigational Aid Failures.

ASSUMPTION BASE CASE ACCIDENT RATES

Assumption: Apply former Tanker and ATB model VTRA Accident Rates per Interaction to other FV's.

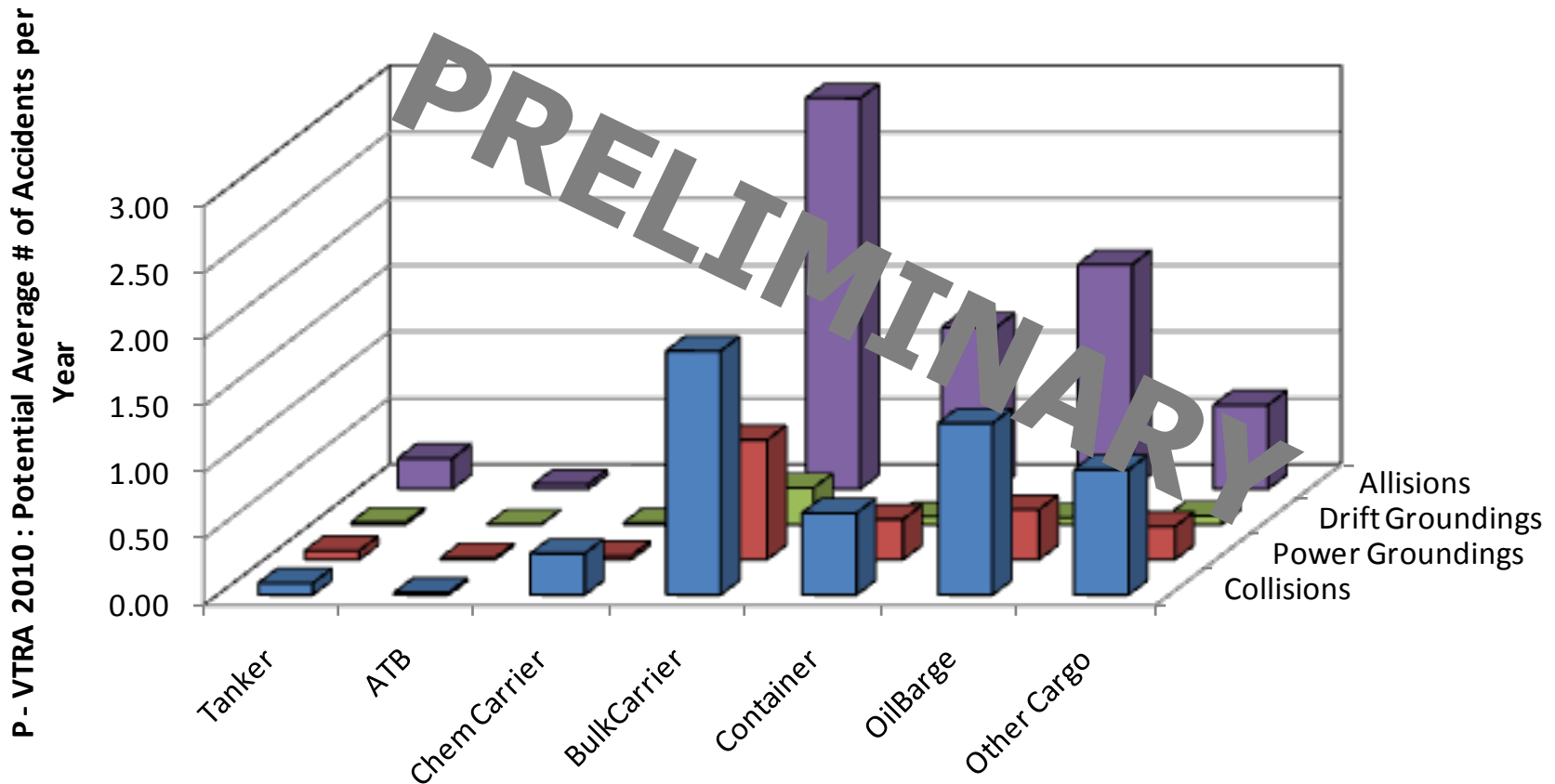


Accidents: Collision, Power and Drift Grounding, Allisions.

ASSUMPTION BASE CASE ACCIDENT RATES

Assumption: Apply former Tanker and ATB VTRA Accident Rates per Interaction to other FV's.

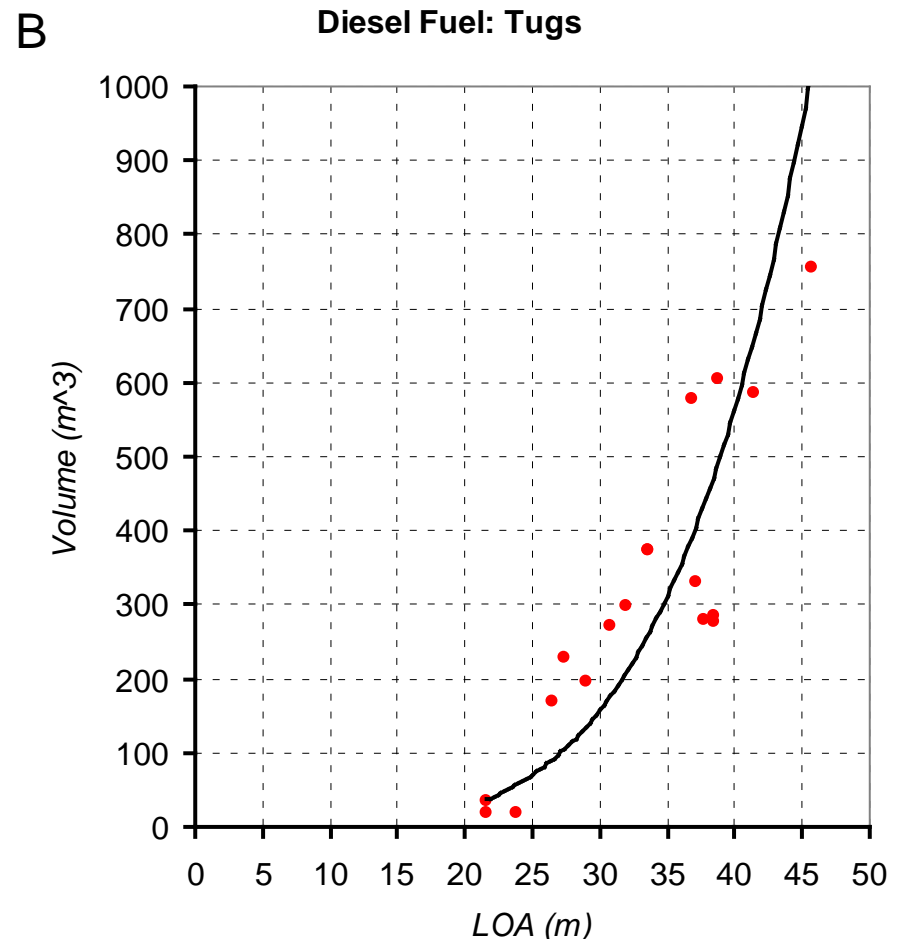
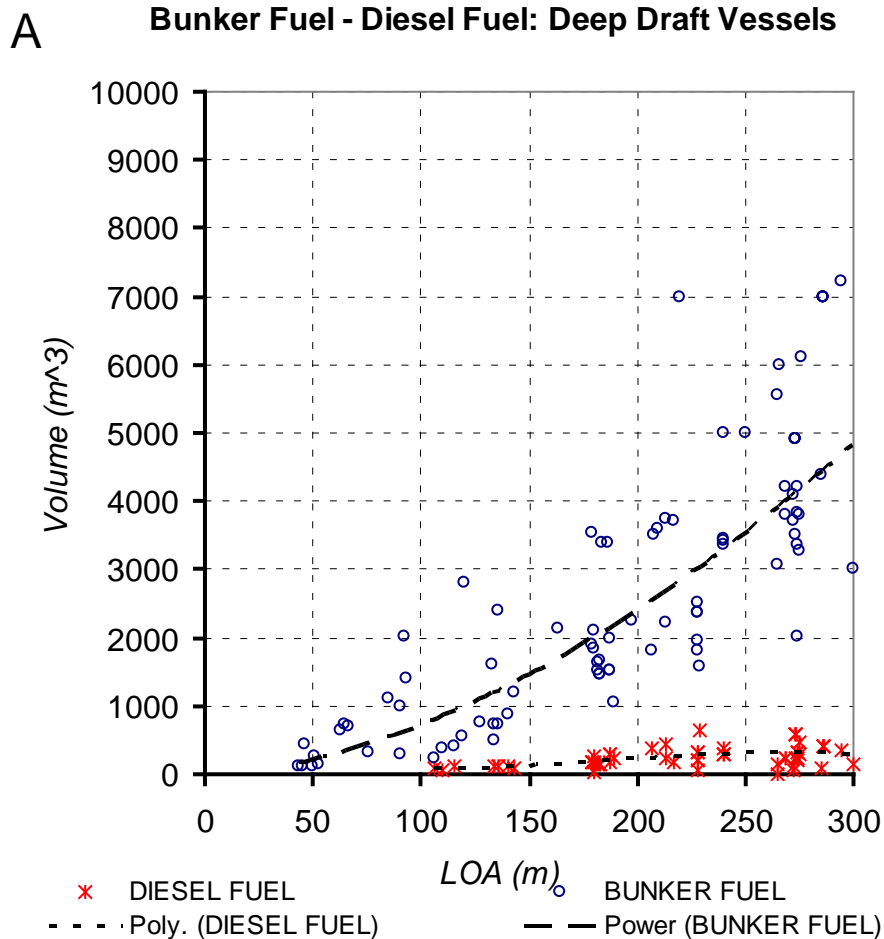
P - VTRA 2010 : Potential Average # of Accidents per Year



ASSUMPTION BASE CASE FUEL LOSSES

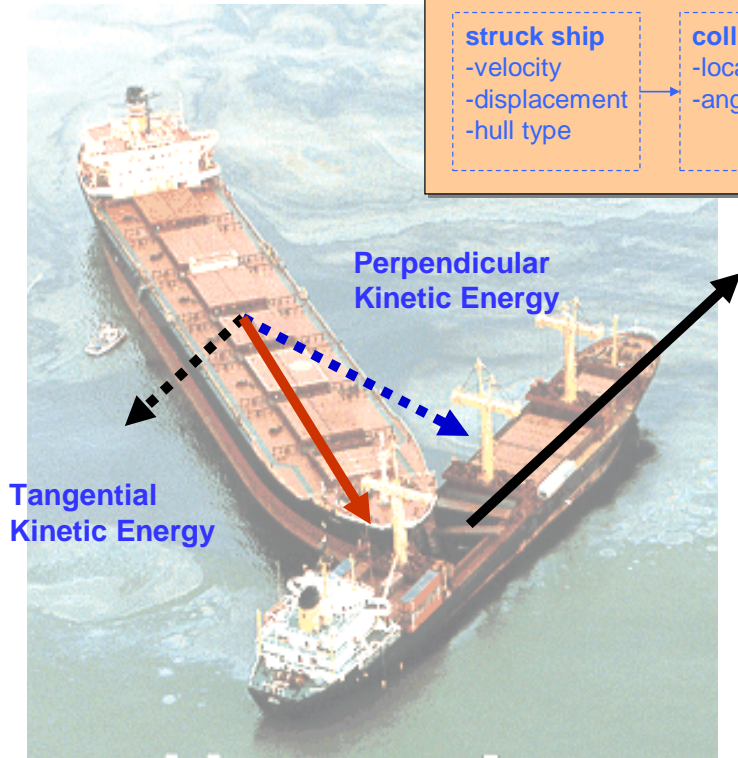
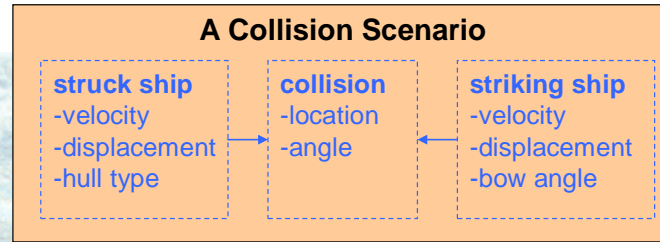
No information on how much diesel fuel or bunker fuel capacity a vessel has on board.

ASSUMPTION: FULLY LADEN WITH FUEL OR BUNKER FOR ALL VESSELS WHILE USING FORMER VTRA FUEL CAPACITY REGRESSION ANALYSES



ASSUMPTION BASE CASE NON - FUEL LOSSES

DATA LIMITATION: No information on what type of product/oil a TANK Focus Vessel carries and how much.



APPROACH:
**USE FORMER VTRA OIL
OUT FLOW MODEL
WITH CONSISTENT
FULLY LADEN
ASSUMPTION ACROSS
ALL TANK FOCUS
VESSELS**

COMPLETION OF WHAT-IF ANALYSES

WHAT-IF ANALYSIS **INPUT CALL NUMBERS** THROUGH COLLABORATIVE ANALYSIS APPROACH

STEP 5: **WHAT-IF GATEWAY** WAS OPERATIONAL IN 2010 **BASE CASE** WHERE DO WE SEE PREDOMINANT CHANGES AND WHY?

STEP 6: **WHAT-IF KINDER-MORGAN** INCREASES WERE IN EFFECT IN 2010 **BASE CASE** WHERE DO WE SEE PREDOMINANT CHANGES AND WHY?

STEP 7: **WHAT-IF DELTA TERMINAL INCREASES** WERE IN EFFECT IN 2010 **BASE CASE** WHERE DO WE SEE PREDOMINANT CHANGES AND WHY?

STEP 8: **WHAT-IF GW, KM AND DT INCREASES** WERE IN EFFECT IN 2010 **BASE CASE** WHERE DO WE SEE PREDOMINANT CHANGES AND WHY?

COMPLETION OF RISK MANAGEMENT ANALYSIS

STEP 9: BENCH MARK/SENSITIVITY ANALYSIS:
HOW DO CHANGES IN WHAT-IF STEPS 5, 6, 7
AND 8 COMPARE TO **A HISTORICAL HIGH
TRAFFIC CASE WITHOUT** Gateway, Kinder
Morgan or Delta traffic increases.

**STEP 10: DEFINE RISK MITIGATION MEASURES (RMM)
THROUGH **COLLABOR. ANALYSIS APPROACH.****

STEP 11: **BASE RMM CASE: IMPLEMENT AND TEST RMM'S
EFFECTIVENESS ON BASE CASE.**

STEP 12: **WHAT-IF RMM CASES: IMPLEMENT AND TEST
RMM'S EFFECTIVENESS ON OTHER WHAT-IF
ANALYSES?**

COMPLETION OF RISK MANAGEMENT ANALYSIS

STEP 13: BENCH MARK/SENSITIVITY ANALYSIS:
HOW DO CHANGES IN RMM STEPS 12 and 13
COMPARE TO **A HISTORICAL LOW TRAFFIC
CASE WITHOUT** Gateway, Kinder Morgan or
Delta traffic increases.

STEP 14: WRITE DRAFT FINAL REPORT BY 8/31/13 (??)

QUESTIONS?