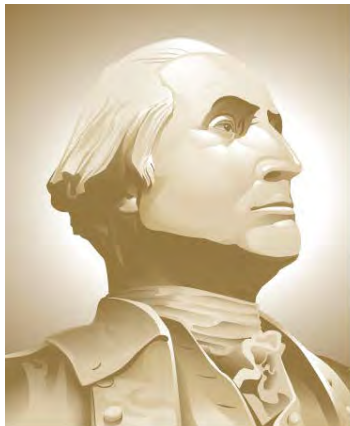# VTRA 2010 TRAFFIC DENSITIES BY CARGO – FV and TANK- FV

Presentation by: J. Rene van Dorp

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

VCU

2010 BASE CASE

GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

AUGUST 19, 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

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#	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

IMPORTANT:

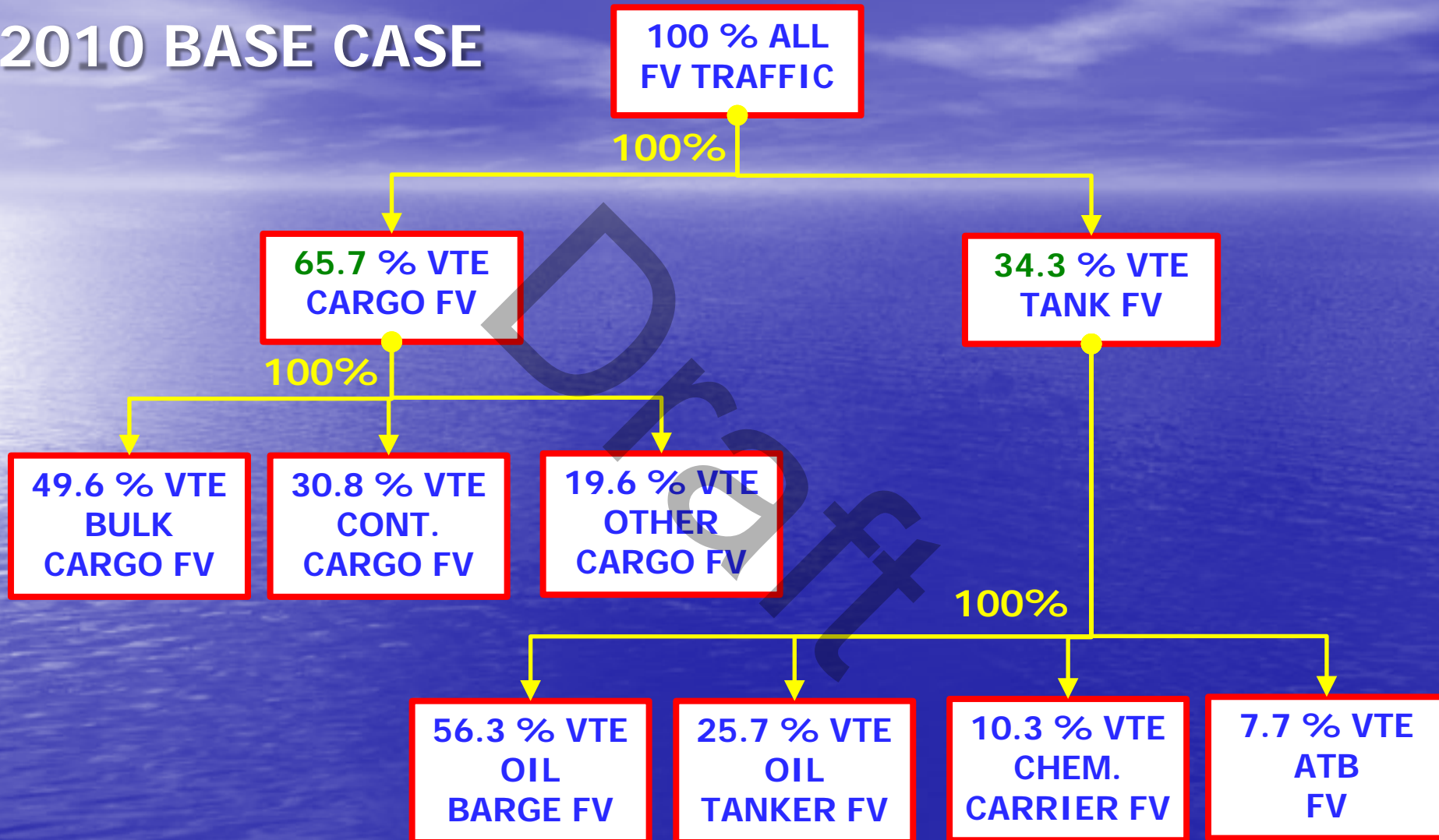THE OPERATIVE WORD IN PRESENTING THESE ANALYSIS RESULTS IS THE USE OF THE WORD

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NEXT, **WHAT-IF SCENARIOS** ARE DEVELOPED FROM THE BASE CASE BY ADDING ADDITIONAL HYPOTHETICAL TRAFFIC AND A WHAT-IF POTENTIAL IS EVALUATED AND COMPARED **RELATIVE TO THE BASE CASE** TO INFORM **RISK MANAGEMENT**.

A TAXONOMY OF 2010 FOCUS VESSEL TRAFFIC
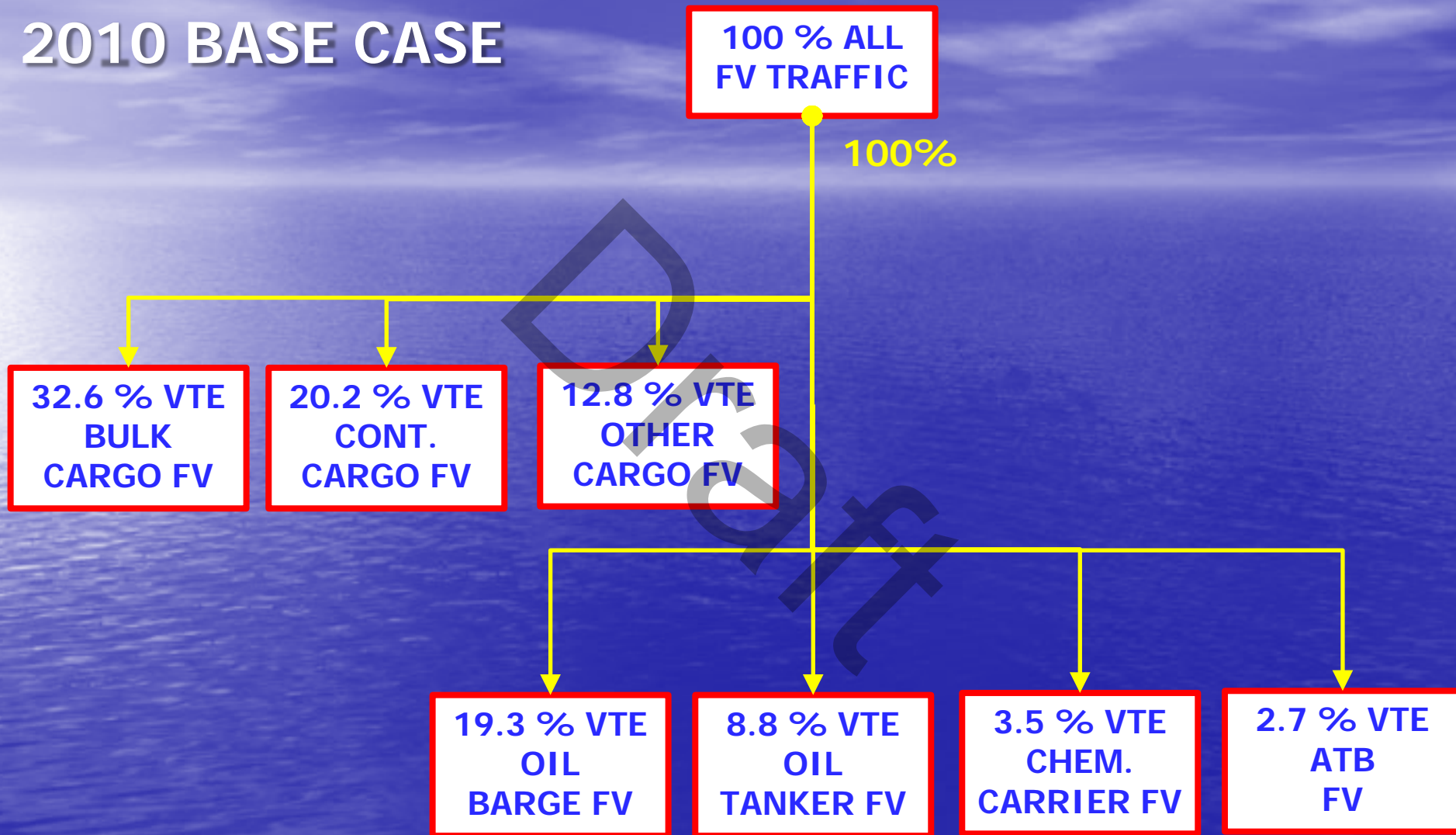
2010 BASE CASE

```
                        100 % ALL
                        FV TRAFFIC
                            │
                          100%
           ┌────────────────┴────────────────┐
    65.7 % VTE                          34.3 % VTE
    CARGO FV                            TANK FV
        │                                   │
      100%                                  │
  ┌─────┼─────────┐                         │
49.6 % VTE  30.8 % VTE  19.6 % VTE          │
BULK        CONT.       OTHER               │
CARGO FV    CARGO FV    CARGO FV            │
                              100%          │
                   ┌──────────┼─────────────┼──────────┐
              56.3 % VTE  25.7 % VTE  10.3 % VTE   7.7 % VTE
              OIL         OIL         CHEM.        ATB
              BARGE FV    TANKER FV   CARRIER FV   FV
```

VTE = VESSEL TIME EXPOSURE:

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

A TAXONOMY OF 2010 FOCUS VESSEL TRAFFIC

2010 BASE CASE

100 % ALL FV TRAFFIC

100%

32.6 % VTE BULK CARGO FV

20.2 % VTE CONT. CARGO FV

12.8 % VTE OTHER CARGO FV

19.3 % VTE OIL BARGE FV

8.8 % VTE OIL TANKER FV

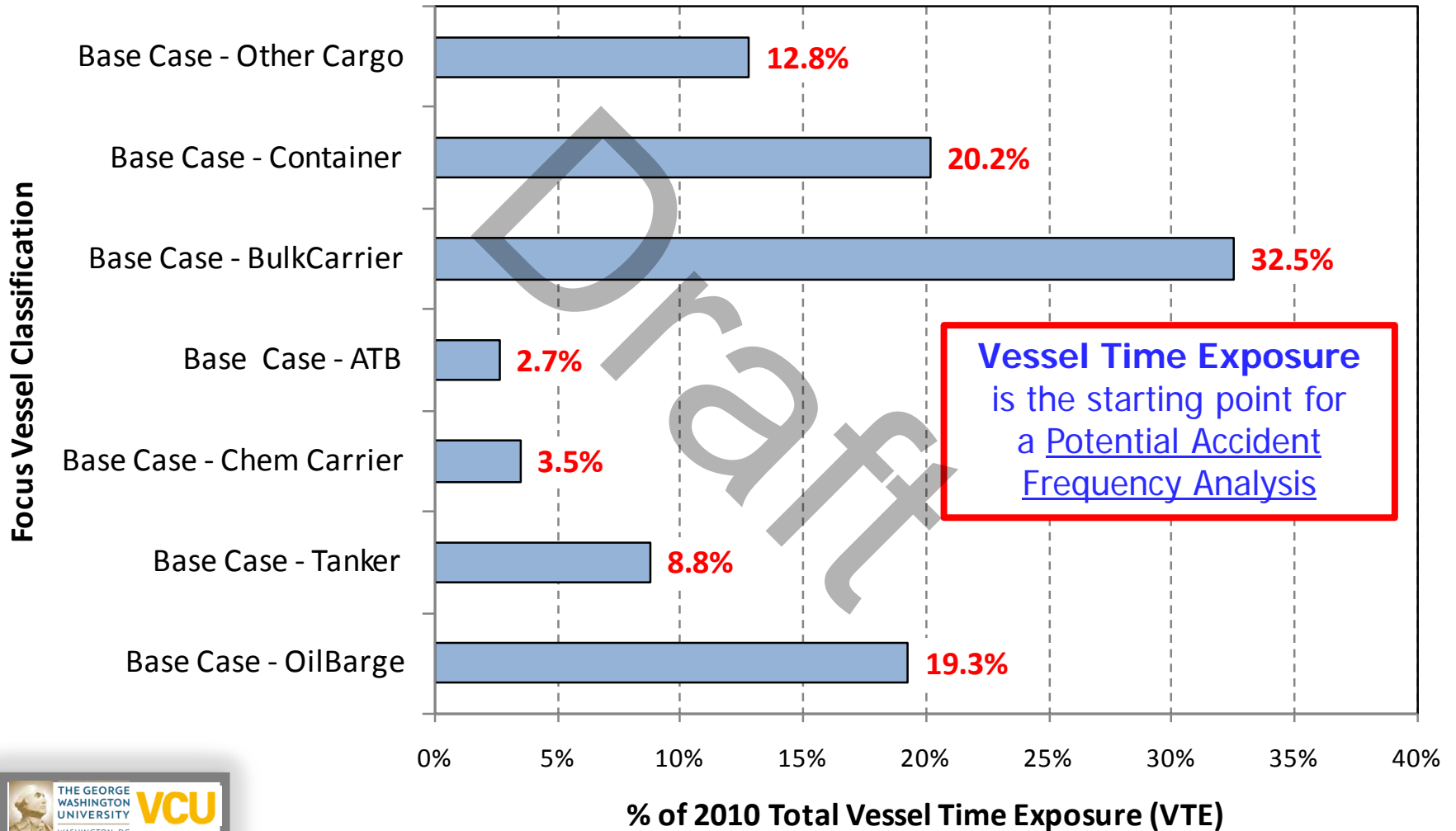**3.5 % VTE CHEM. CARRIER FV**

2.7 % VTE ATB FV

VTE = VESSEL TIME EXPOSURE:
TOTAL AMOUNT OF ANNUAL TIME A FOCUS VESSEL IS MOVING IN THE VTRA STUDY AREA

2010 BASE CASE

VTRA 2010 - Total Vessel Time of Exposure (VTE)

P: All FV Traffic Density

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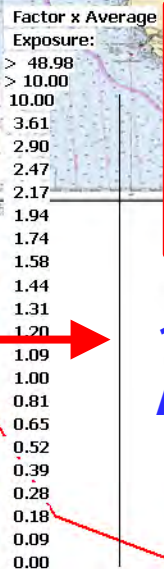WASHINGTON, DC
VCU

P: VTRA 2010 - BASE CASE - All FV

100%

44%

24%

Factor x Average Exposure:
> 48.98
> 10.00
10.00
3.61
2.90
2.47
2.17
1.94
1.74
1.58
1.44
1.31
1.20
1.09
1.00
0.81
0.65
0.52
0.39
0.28
0.18
0.09
0.00
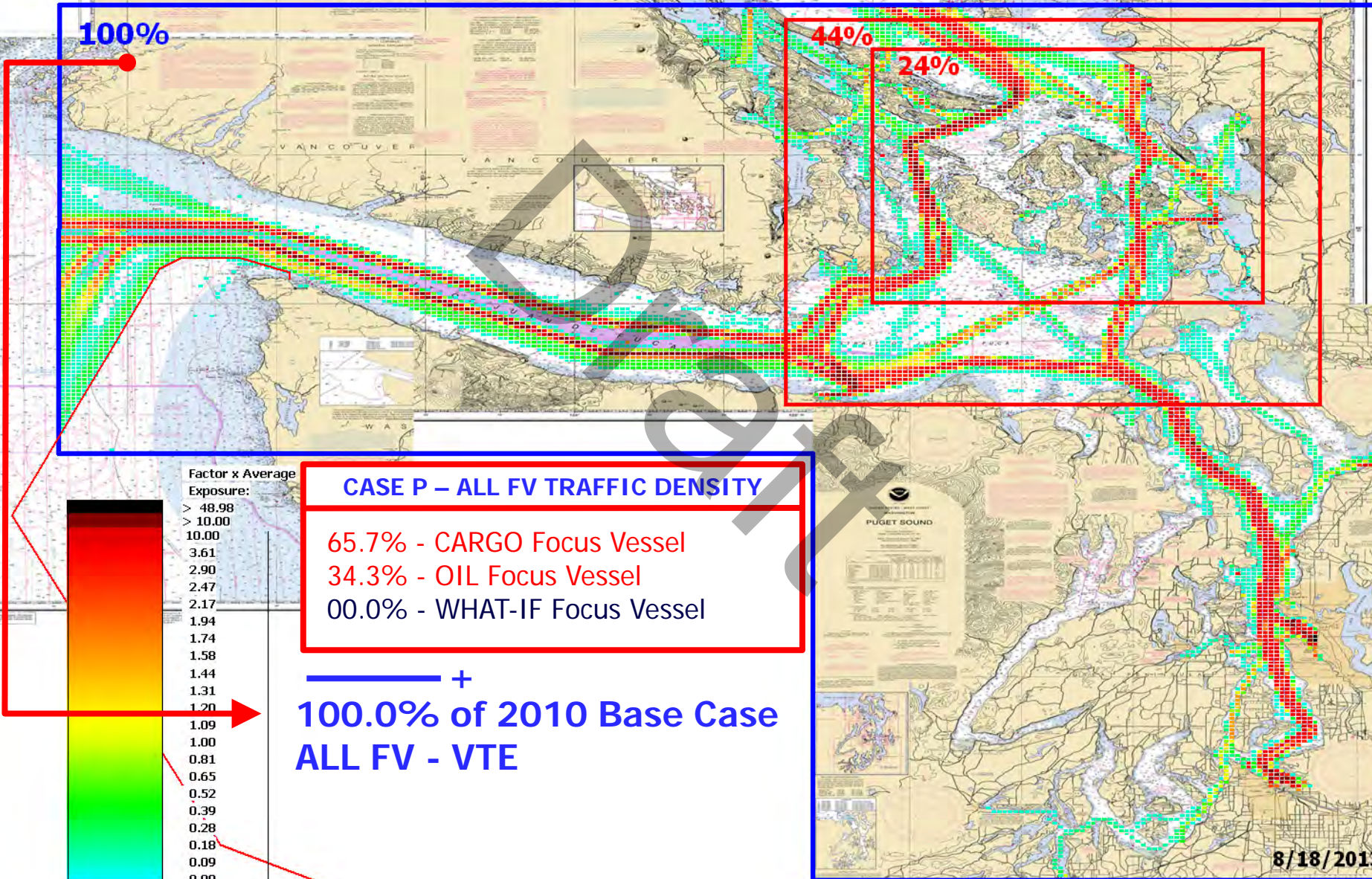
CASE P – ALL FV TRAFFIC DENSITY

65.7% - CARGO Focus Vessel
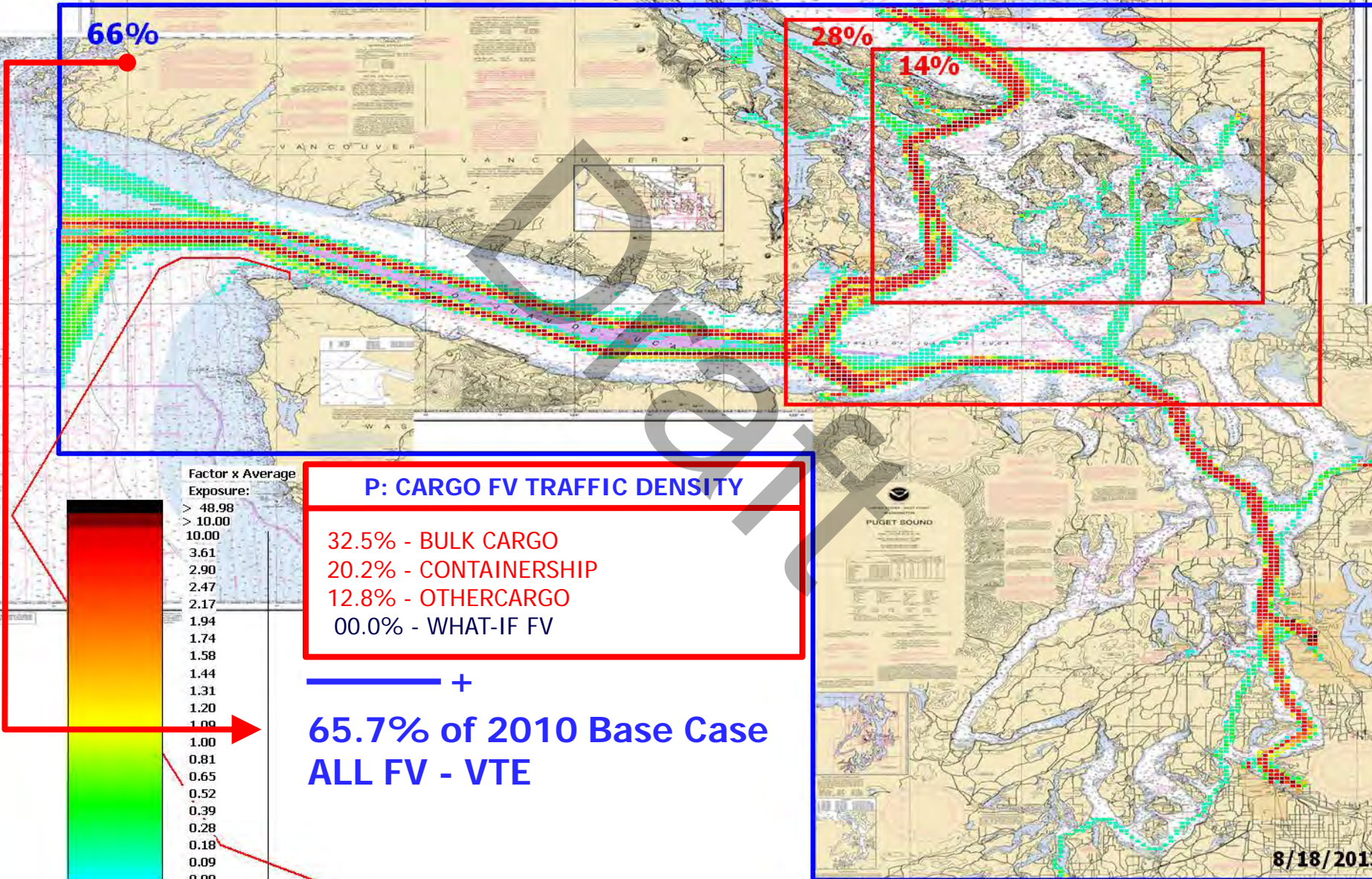34.3% - OIL Focus Vessel
00.0% - WHAT-IF Focus Vessel

─────── +

100.0% of 2010 Base Case ALL FV - VTE

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P: CARGO FV Traffic Density

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P: VTRA 2010 - BASE CASE - Cargo FV

66%

28%

14%

Factor x Average Exposure:

> 48.98
> 10.00
10.00
3.61
2.90
2.47
2.17
1.94
1.74
1.58
1.44
1.31
1.20
1.09
1.00
0.81
0.65
0.52
0.39
0.28
0.18
0.09
0.00

P: CARGO FV TRAFFIC DENSITY

32.5% - BULK CARGO
20.2% - CONTAINERSHIP
12.8% - OTHERCARGO
00.0% - WHAT-IF FV

65.7% of 2010 Base Case ALL FV - VTE

8/18/2013

P: TANK FV Traffic Density

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

VCU

P: VTRA 2010 - BASE CASE - TANK FV
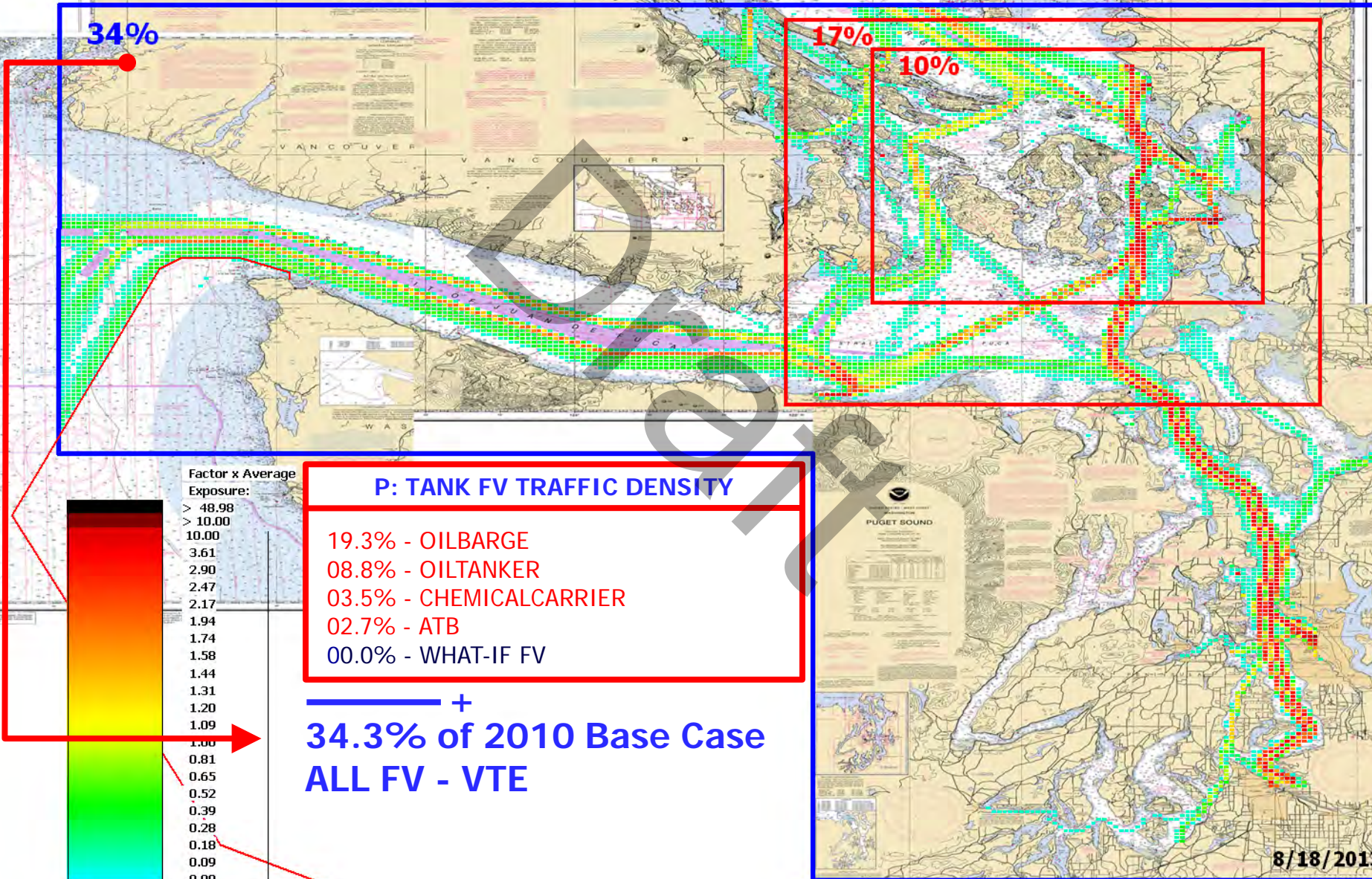
34%

17%

10%

Factor x Average Exposure:

> 48.98
> 10.00
10.00
3.61
2.90
2.47
2.17
1.94
1.74
1.58
1.44
1.31
1.20
1.09
1.00
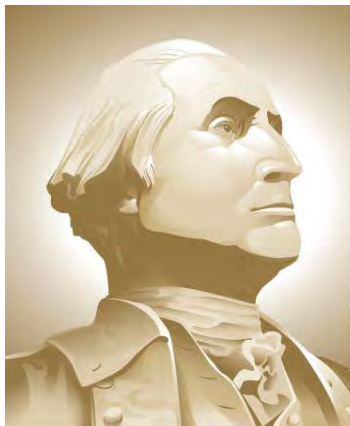0.81
0.65
0.52
0.39
0.28
0.18
0.09
0.00

P: TANK FV TRAFFIC DENSITY

19.3% - OILBARGE
08.8% - OILTANKER
03.5% - CHEMICALCARRIER
02.7% - ATB
00.0% - WHAT-IF FV

+

34.3% of 2010 Base Case ALL FV - VTE

8/18/2013

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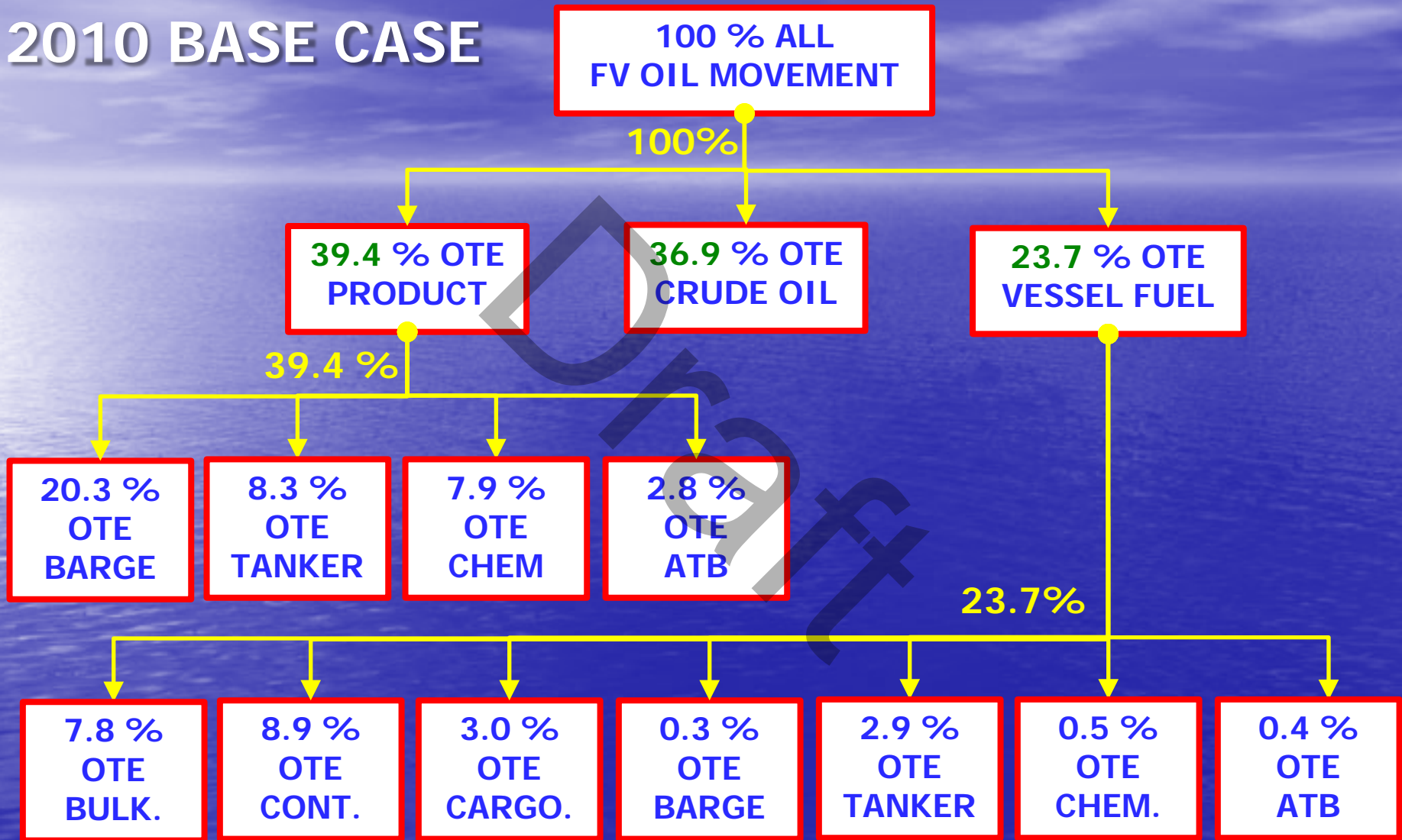
FOCUS VESSELS MOVE OIL: Crude, Product and Fuel

Disclaimer: No information is available on volume of oil or type of oil on board a vessel and we have to rely on overarching assumptions regarding movement of amount and type of oil as focus vessels move through the study area.

Assumption 1 : Tankers are classified as crude or product carriers by name
Assumption 2 : Chemical carriers transport product.
Assumption 3 : Oil barges are assumed to transport product.
Assumption 4 : All Focus Vessels fuel tanks are 50% full
Assumption 5 : US bound crude tankers are assumed fully laden as they arrive in study area, drop of equal amounts at their stops and leave empty.
Assumption 6 : Canadian bound crude tankers are assumed empty as they arrive and fully laden as they depart.
Assumption 7 : Product Tankers and ATB's are assumed fully laden as they depart study area, empty as they arrive.
Assumption 8 : Chemical carriers are assumed fully laden as they arrive in the study area, empty when they leave the study area.
Assumption 9 : When ATB's go back and forth between two destinations within the study area they are assumed 50% full
Assumption 10: Oil barges are assumed fully laden as they travel through study area.
Assumption 11: Tank Focus Vessels not covered by 1-10 are assumed fully laden.

A TAXONOMY OF 2010 FOCUS VESSEL OIL MOVEMENT

2010 BASE CASE

100 % ALL FV OIL MOVEMENT

100%

39.4 % OTE PRODUCT — **36.9 % OTE CRUDE OIL** — **23.7 % OTE VESSEL FUEL**

39.4 %

- **20.3 % OTE BARGE**
- **8.3 % OTE TANKER**
- **7.9 % OTE CHEM**
- **2.8 % OTE ATB**

23.7%

- **7.8 % OTE BULK.**
- **8.9 % OTE CONT.**
- **3.0 % OTE CARGO.**
- **0.3 % OTE BARGE**
- **2.9 % OTE TANKER**
- **0.5 % OTE CHEM.**
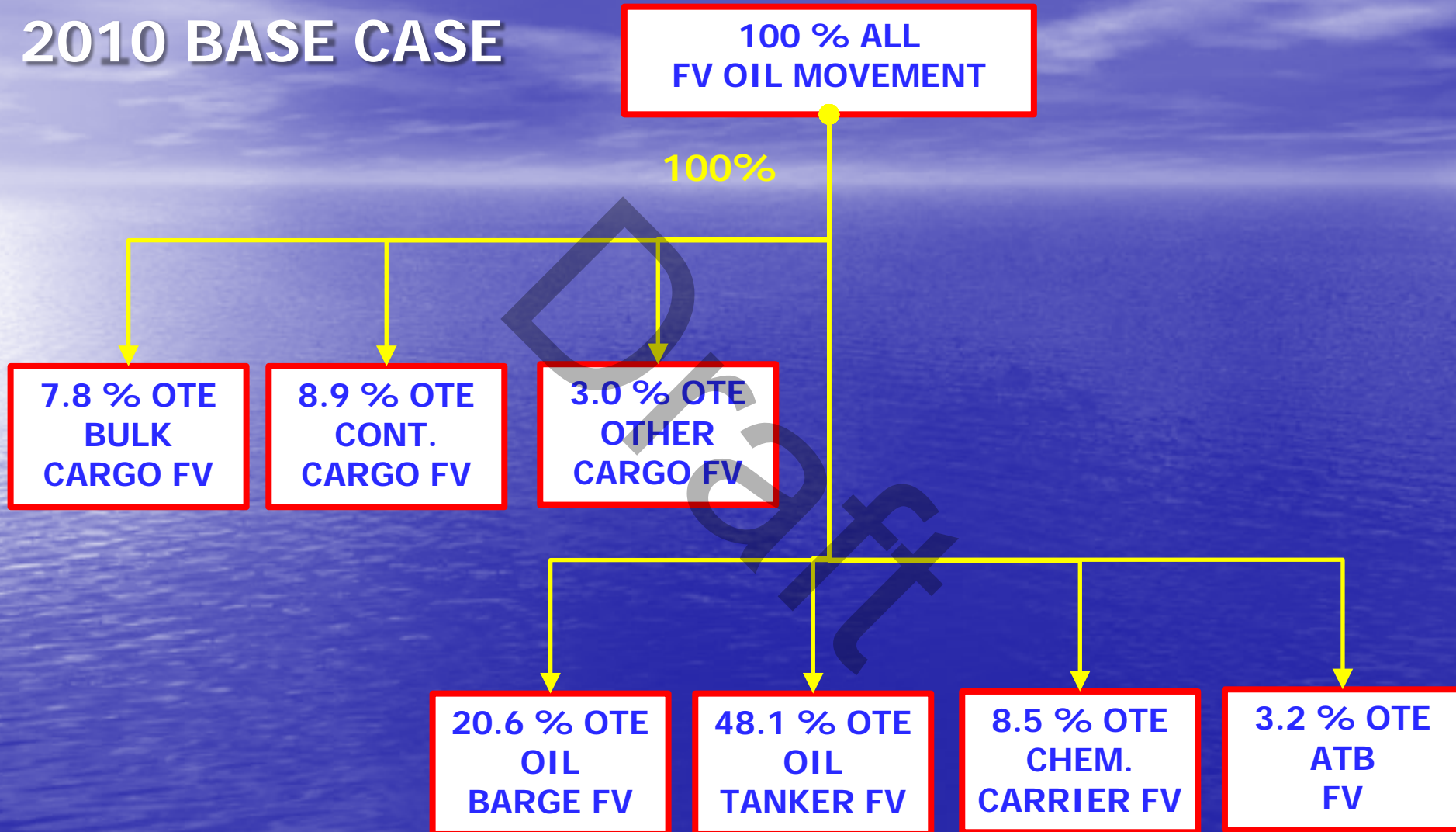- **0.4 % OTE ATB**

OTE = TOTAL OIL TIME EXPOSURE:
TOTAL AMOUNT OF ANNUAL TIME A CUBIC METER OF FOCUS VESSEL OIL IS MOVING THROUGH THE VTRA STUDY AREA

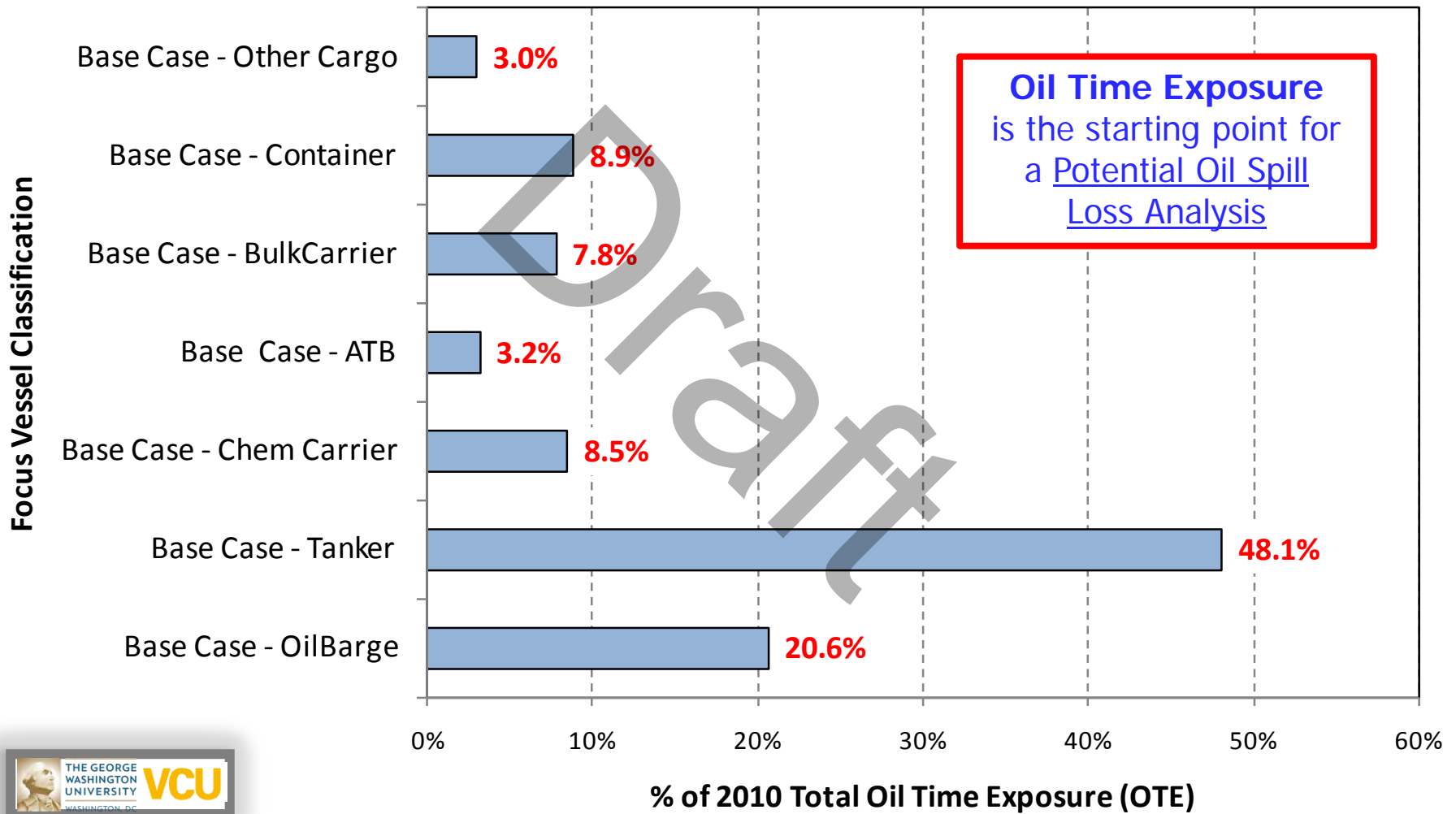# A TAXONOMY OF 2010 FOCUS VESSEL TRAFFIC

2010 BASE CASE

100 % ALL FV OIL MOVEMENT

100%

7.8 % OTE BULK CARGO FV

8.9 % OTE CONT. CARGO FV

3.0 % OTE OTHER CARGO FV

20.6 % OTE OIL BARGE FV

48.1 % OTE OIL TANKER FV

8.5 % OTE CHEM. CARRIER FV

3.2 % OTE ATB FV

OTE = TOTAL OIL TIME EXPOSURE:
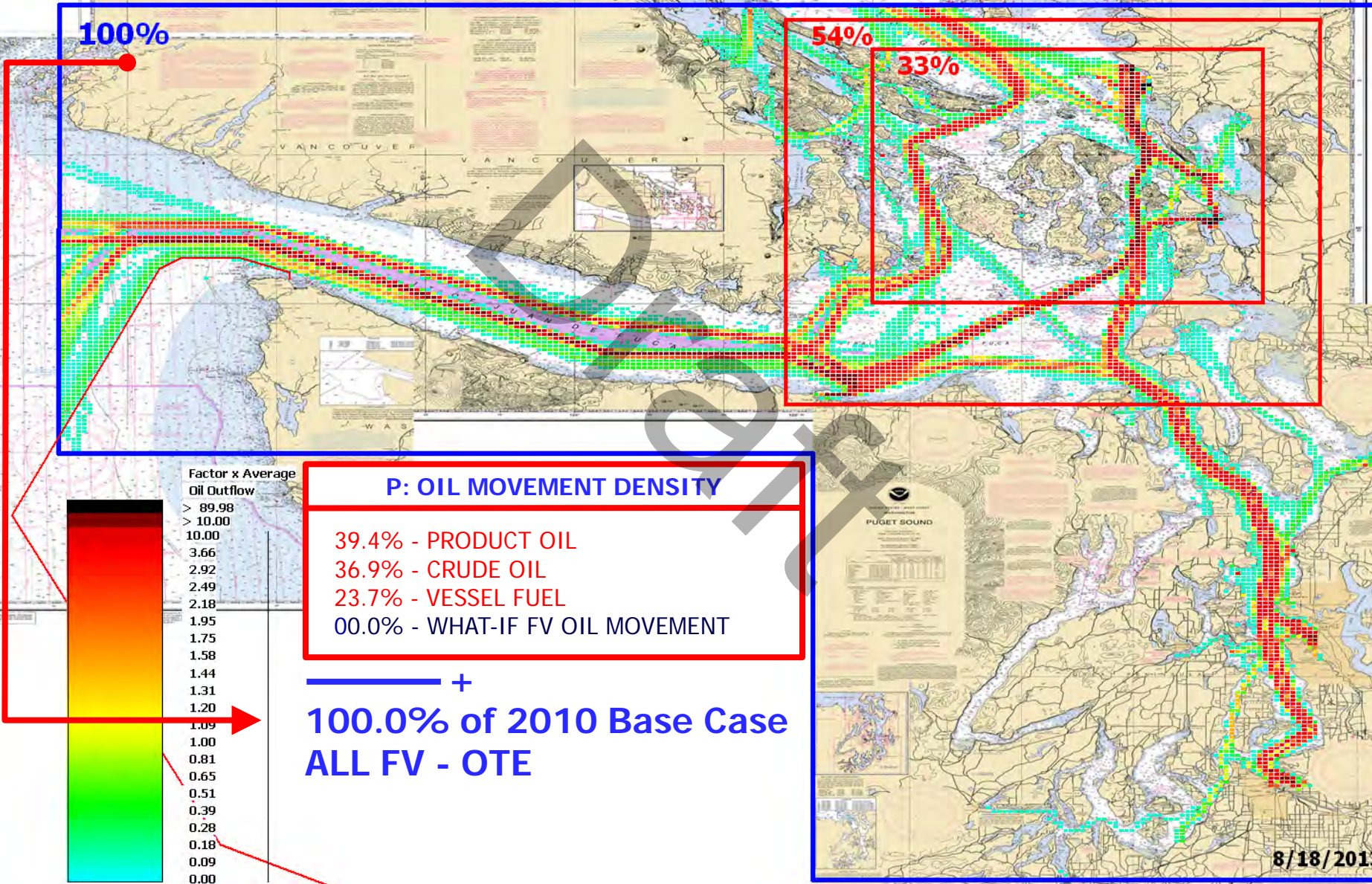TOTAL AMOUNT OF ANNUAL TIME A CUBIC METER OF FOCUS VESSEL OIL IS MOVING THROUGH THE VTRA STUDY AREA

2010 BASE CASE

VTRA 2010 - Total Oil Time Exposure (OTE)

Oil Time Exposure is the starting point for a Potential Oil Spill Loss Analysis

Focus Vessel Classification	% of 2010 Total Oil Time Exposure (OTE)
Base Case - Other Cargo	3.0%
Base Case - Container	8.9%
Base Case - BulkCarrier	7.8%
Base Case - ATB	3.2%
Base Case - Chem Carrier	8.5%
Base Case - Tanker	48.1%
Base Case - OilBarge	20.6%

P: ALL FV OIL MOVEMENT

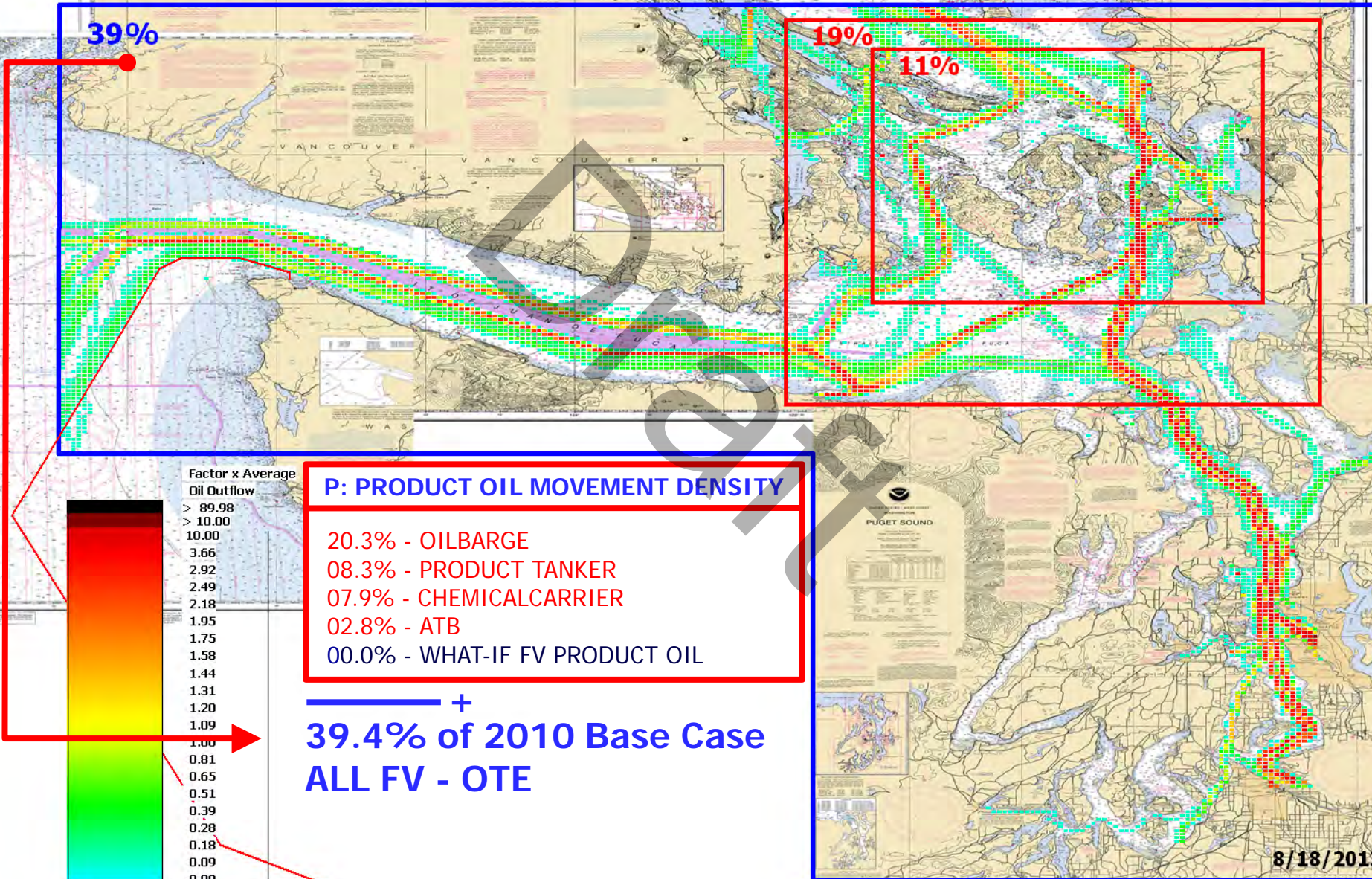THE GEORGE WASHINGTON UNIVERSITY — WASHINGTON, DC — VCU

P: VTRA 2010 - BASE CASE - All FV

100%

54%

33%

Factor x Average Oil Outflow

> 89.98
> 10.00
10.00
3.66
2.92
2.49
2.18
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

P: OIL MOVEMENT DENSITY

39.4% - PRODUCT OIL
36.9% - CRUDE OIL
23.7% - VESSEL FUEL
00.0% - WHAT-IF FV OIL MOVEMENT

+

100.0% of 2010 Base Case ALL FV - OTE

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P: PRODUCT FV OIL MOVEMENT

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P: VTRA 2010 - BASE CASE - All FV

39%

19%

11%

Factor x Average Oil Outflow

> 89.98
> 10.00
10.00
3.66
2.92
2.49
2.18
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

P: PRODUCT OIL MOVEMENT DENSITY

20.3% - OILBARGE
08.3% - PRODUCT TANKER
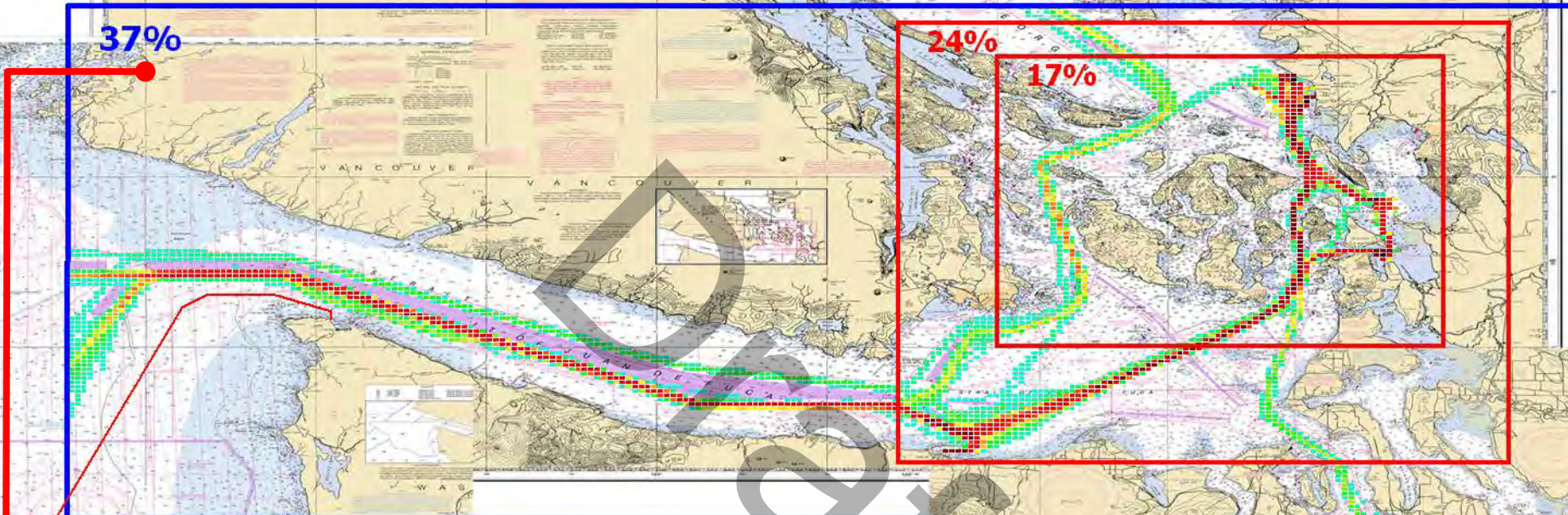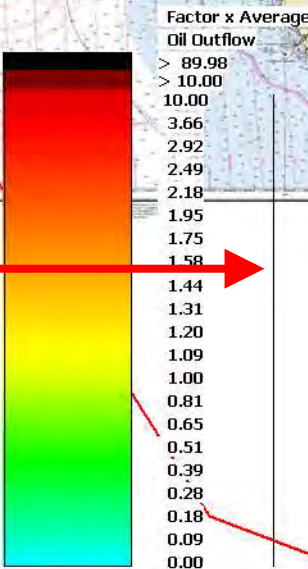07.9% - CHEMICALCARRIER
02.8% - ATB
00.0% - WHAT-IF FV PRODUCT OIL

39.4% of 2010 Base Case ALL FV - OTE

8/18/2013

P: FUEL FV OIL MOVEMENT

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P: VTRA 2010 - BASE CASE - All FV

24%

11%

5%

Factor x Average Oil Outflow

| > 89.98 |
| > 10.00 |
| 10.00 |
| 3.66 |
| 2.92 |
| 2.49 |
| 2.18 |
| 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 |
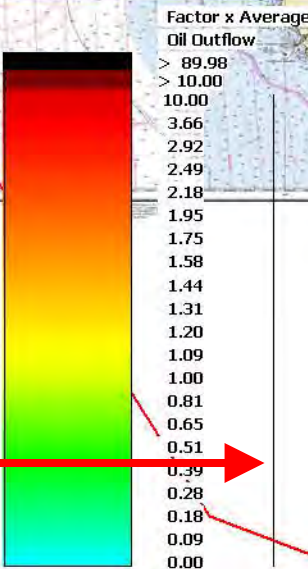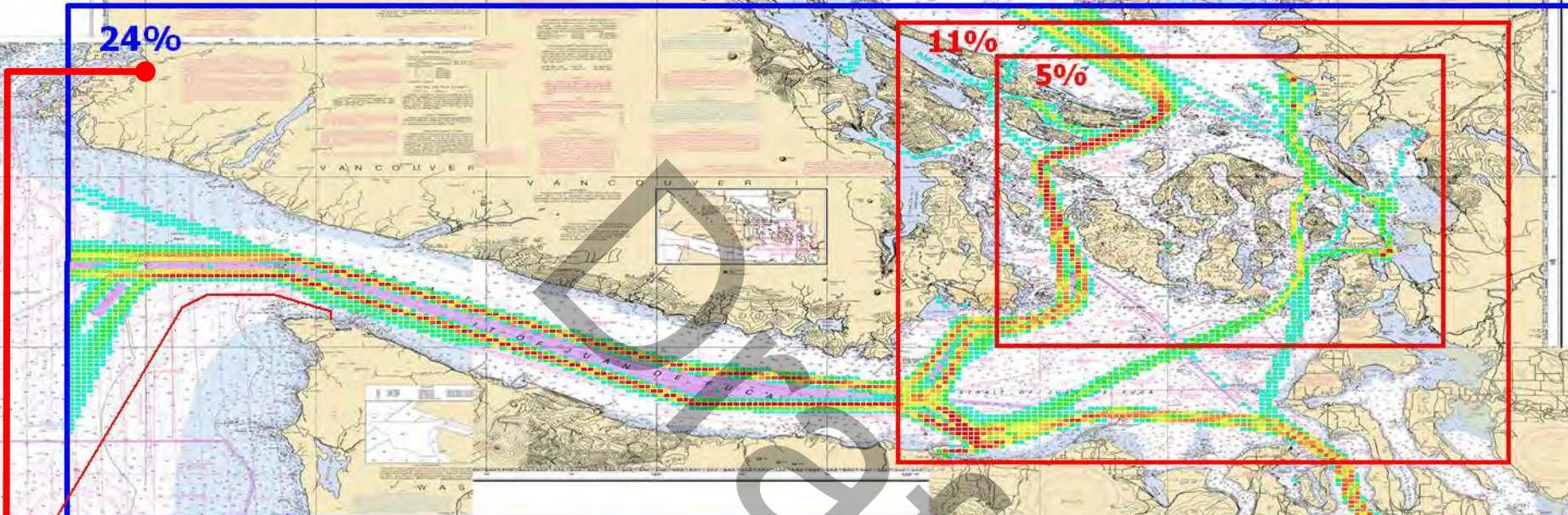
P: FUEL OIL MOVEMENT DENSITY

7.8% - BULK CARRIER
8.9% - CONTAINER SHIP
3.0% - OTHER CARGO
0.3% - OIL BARGE
2.9% - OIL TANKER (CRUDE OR PROD.)
0.5% - CHEMICALCARRIER
0.4% - ATB
0.0% - WHAT-IF FV FUEL MOVEMENT

─────── +

23.7% of 2010 Base Case ALL FV - OTE

8/18/2013