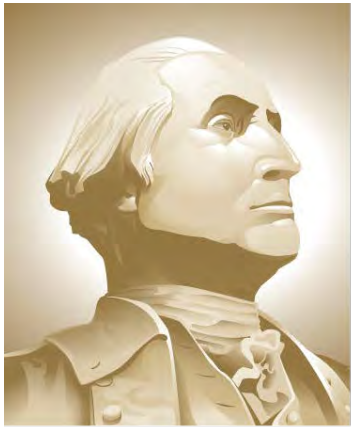
VTRA 2010 TRAFFIC DENSITIES BY CARGO – FV and TANK- FV

Presentation by: J. Rene van Dorp



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VCU

CASE Q: Gateway + Bunkering Operations

GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

AUGUST 28, 2013

PRELIMINARY

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 Interacting Vessels (IV) with Focus Vessels (FV)

BASE CASE CARGO – FV : Bulk Carriers, Container Vessels, Other Cargo Vessels that travel in VTRA 2010 Base Case

BASE CASE TANK – FV : Oil Barge, Oil Tankers, Chemical Carrier, ATB 's that travel in VTRA 2010 Base Case

WHAT IF – FV : CARGO AND TANK FV'S added to VTRA 2010 Base Case to model What-If Scenario

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

IMPORTANT:

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

POTENTIAL

TO INDICATE THAT THESE ANALYSIS RESULTS DO NOT FOLLOW FROM AN HISTORICAL DATA ANALYSIS, BUT THROUGH THE USE OF AN ANALYSIS TOOL THAT EVALUATES SUCH **POTENTIAL**.

THE 2010 YEAR IS CONSIDERED **THE BASE CASE YEAR** AND A BASE CASE YEAR POTENTIAL IS EVALUATED.

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.**

CASE Q: GW 487 + Bunkering

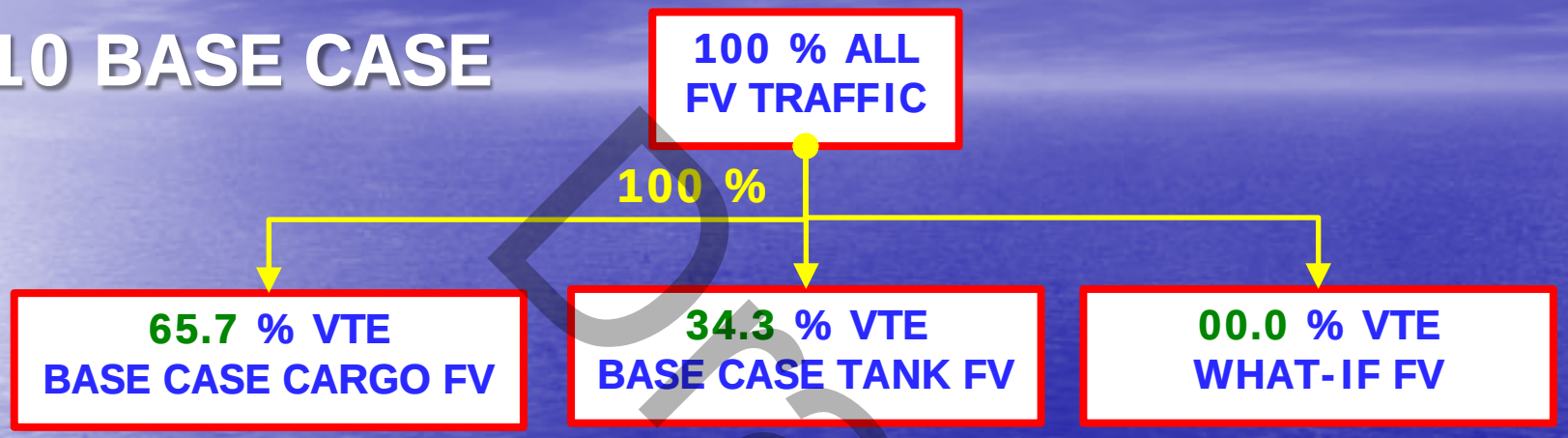
BASE CASE 2010 TRAFFIC WITH FOLLOWING WHAT-IF FOCUS VESSELS

487 Gateway Bulk Carriers + Bunkering Barges

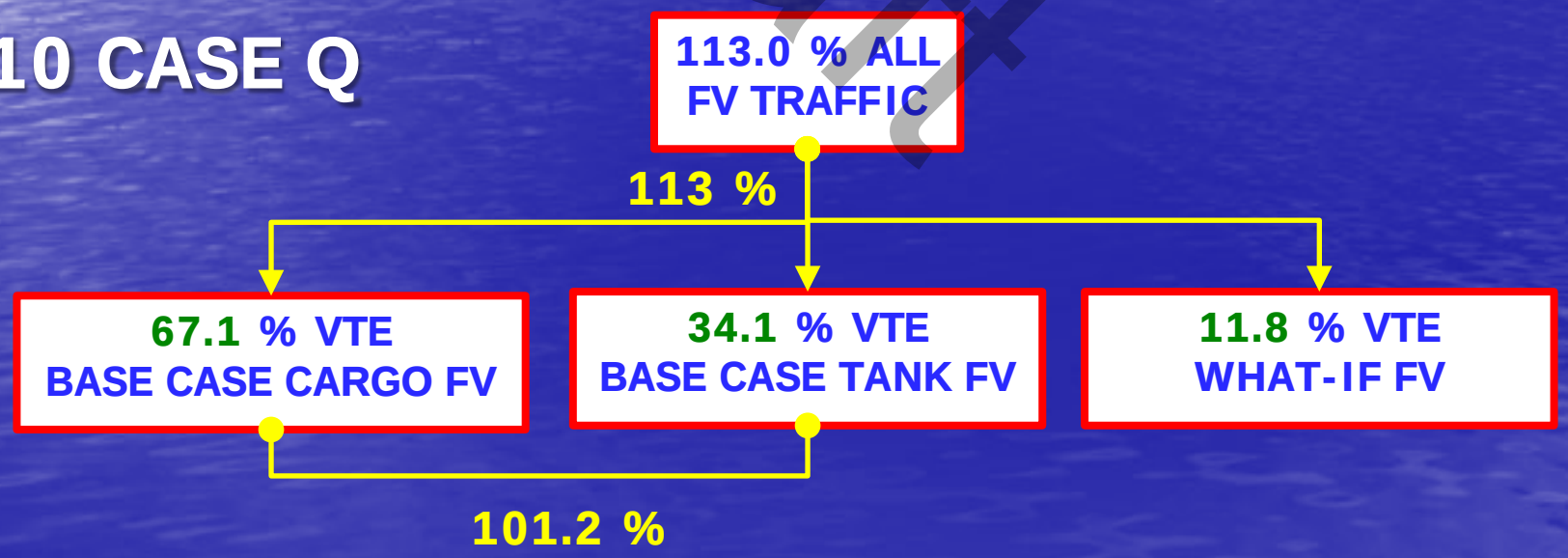
A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL TOTAL TIME OF EXPOSURE

VTE : TOTAL TIME OF EXPOSURE - PER YEAR

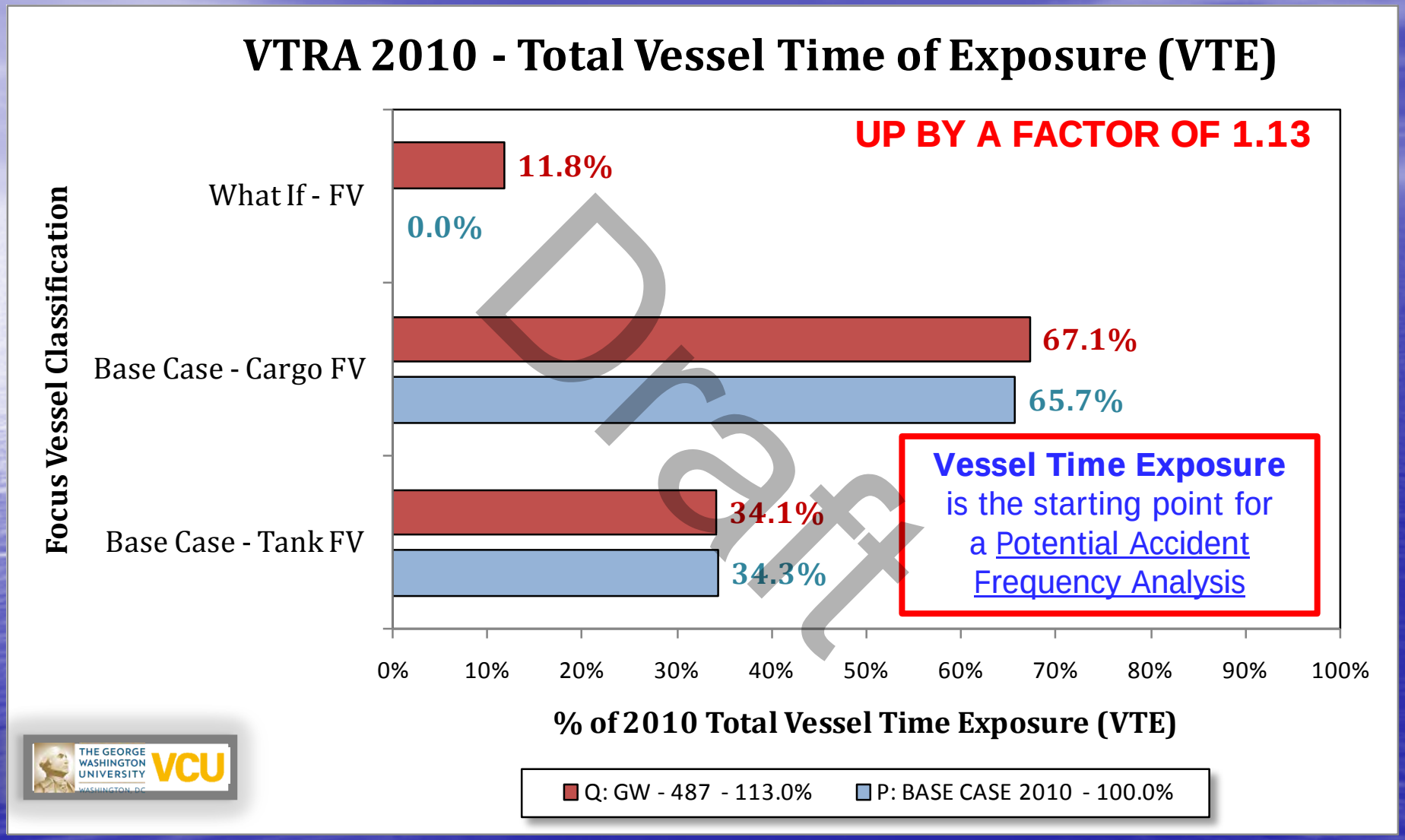
2010 BASE CASE



2010 CASE Q



CASE Q: GW 487 + BUNKERING



VTE = VESSEL TIME EXPOSURE:

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

CASE Q: GW 487 + BUNKERING

FINDINGS - VTE:

1. Base Case Cargo Focus vessels travel about same amount of time when including additional Gateway Vessels.

2. Base Case Cargo Focus vessels travel about same amount of time when including additional Gateway Vessels.

3. Case Q What-If Focus Vessels add about 11.8% of Focus Vessel Traffic to the 2010 – Base Case.

VTE = TOTAL TIME EXPOSURE:

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

P: ALL FV Traffic Density

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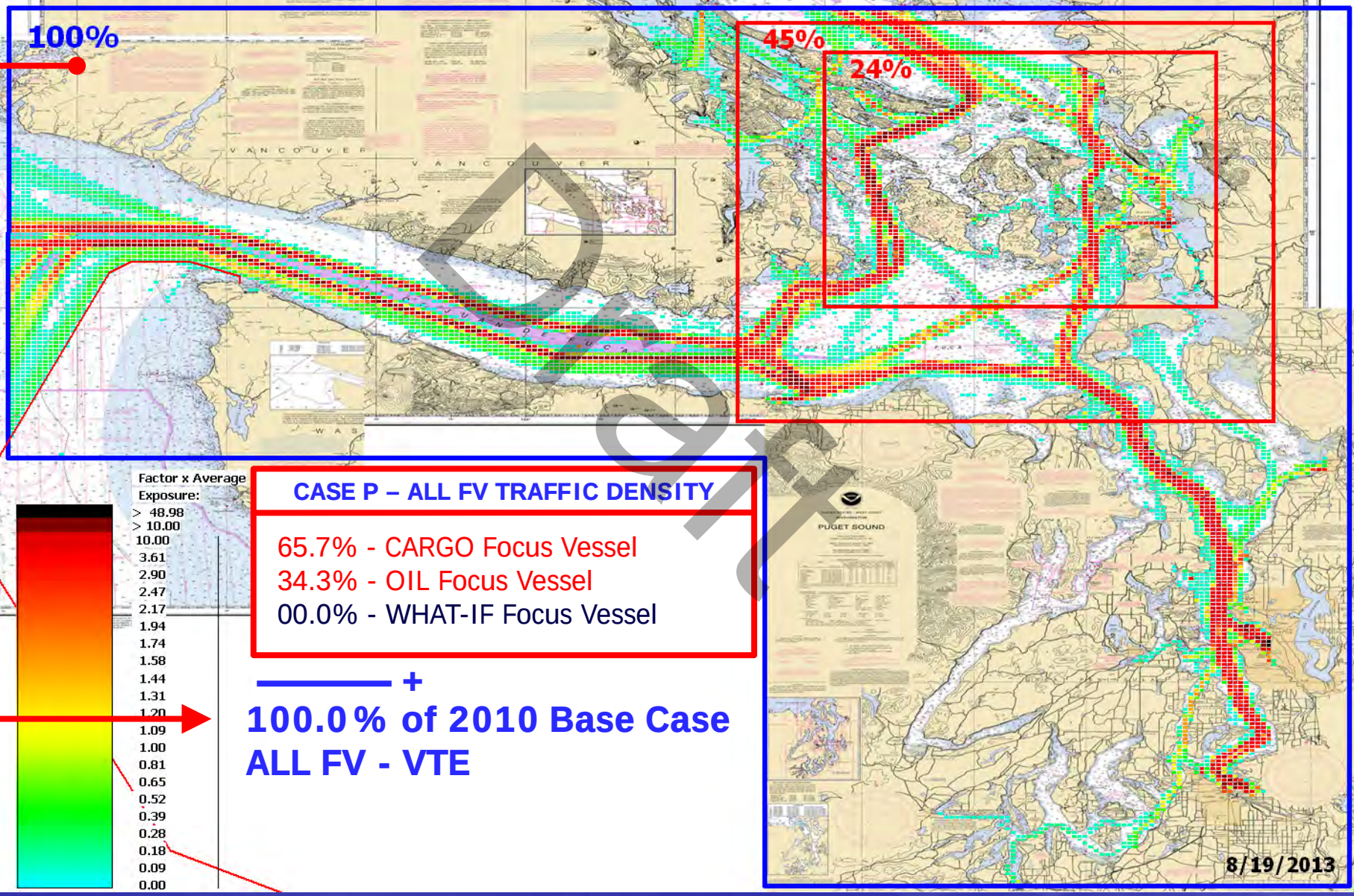
P: VTRA 2010 - BASE CASE - All FV



Factor x Average Exposure:

> 48.98
> 10.00
10.00
3.61
2.90
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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

Q: ALL FV Traffic Density

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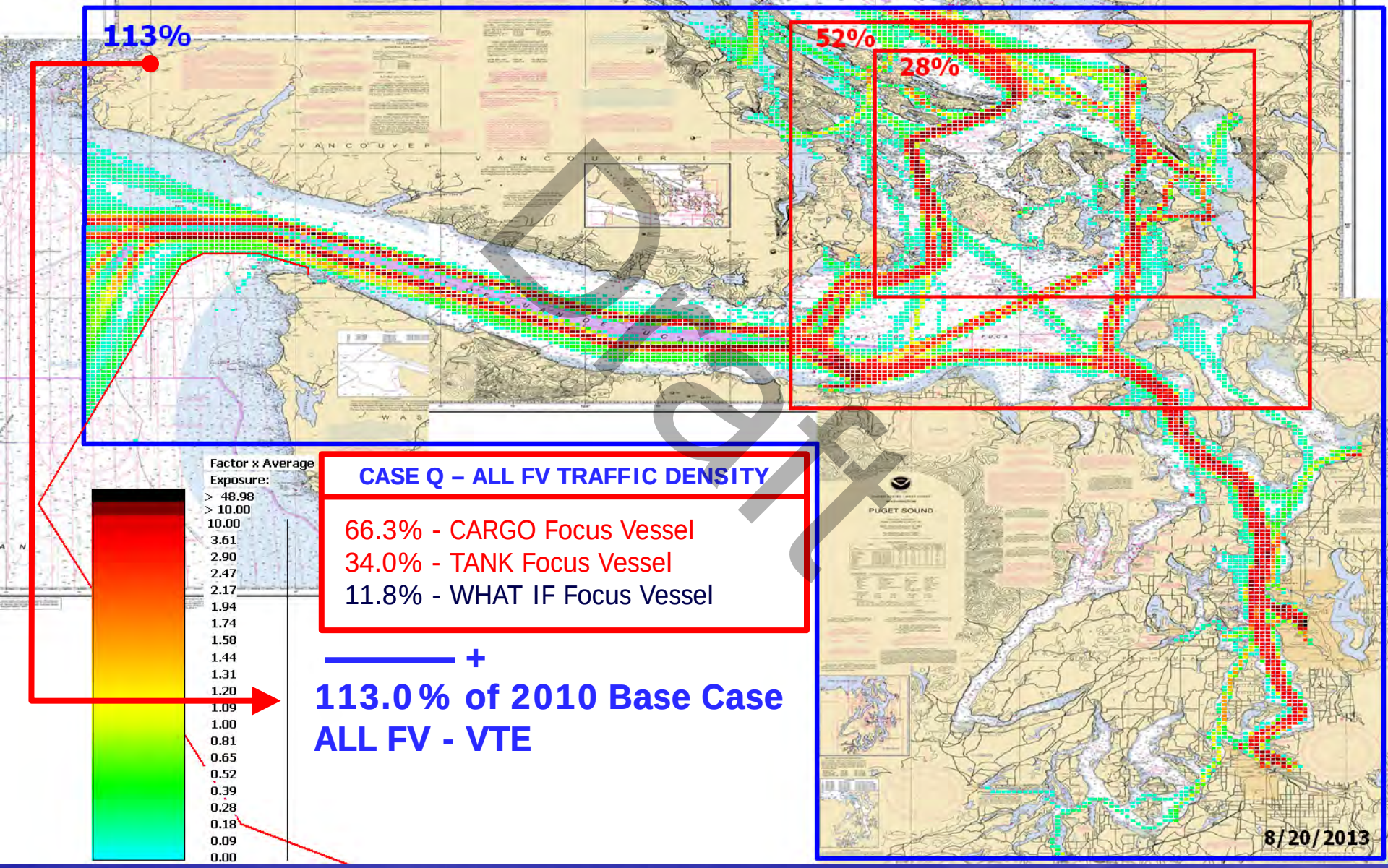
VCU

Q: VTRA 2010 - GATEWAY 487 - All FV



CASE Q – ALL FV TRAFFIC DENSITY

66.3% - CARGO Focus Vessel
34.0% - TANK Focus Vessel
11.8% - WHAT IF Focus Vessel

113.0% of 2010 Base Case
ALL FV - VTE

Q: WHAT-IF FOCUS VESSEL
Traffic Density

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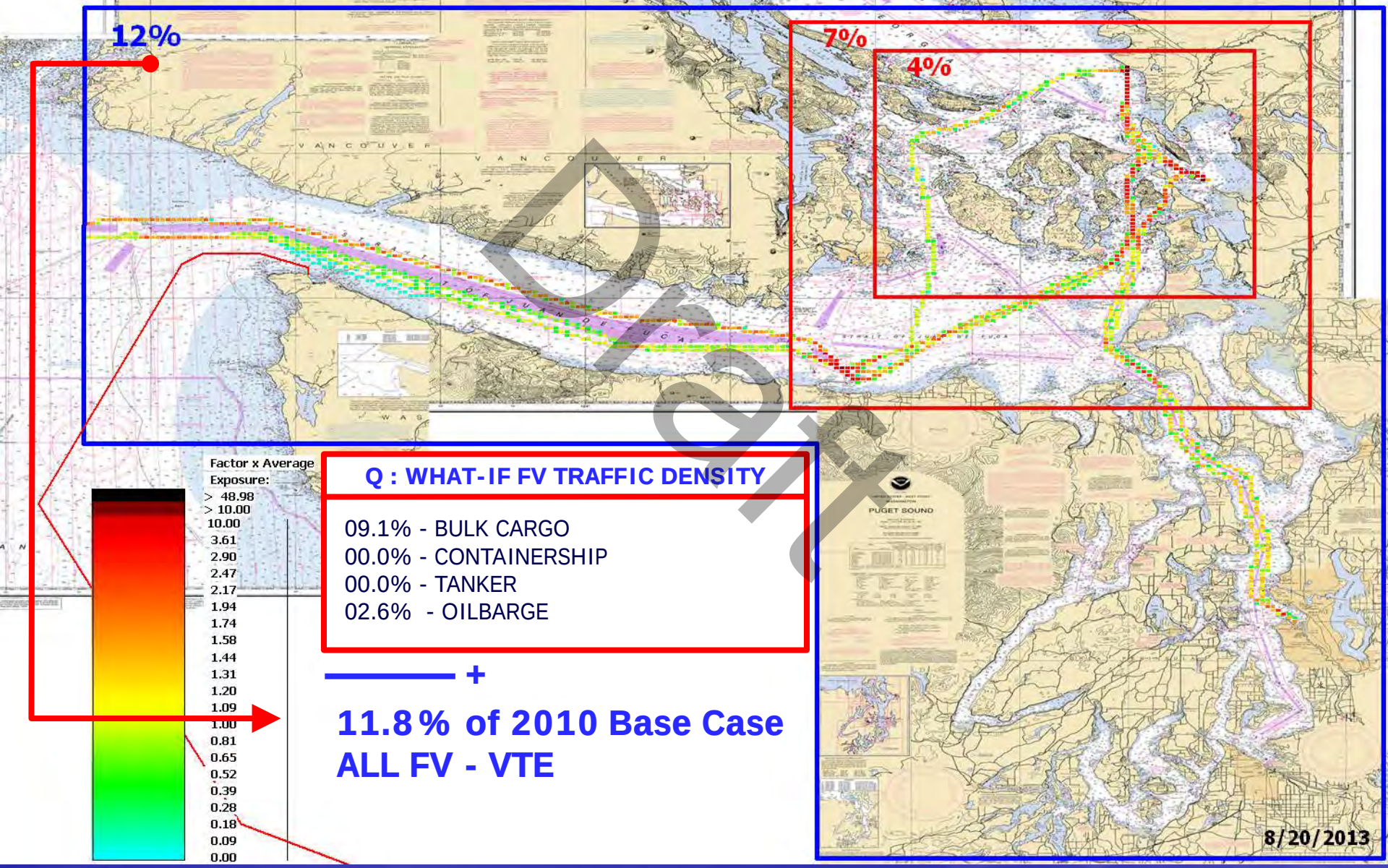
VCU

Q: VTRA 2010 - GATEWAY 487



Q : WHAT-IF FV TRAFFIC DENSITY

09.1% - BULK CARGO
00.0% - CONTAINERSHIP
00.0% - TANKER
02.6% - OILBARGE

———— +

11.8 % of 2010 Base Case
ALL FV - VTE

P: BASE CASE CARGO FV
Traffic Density

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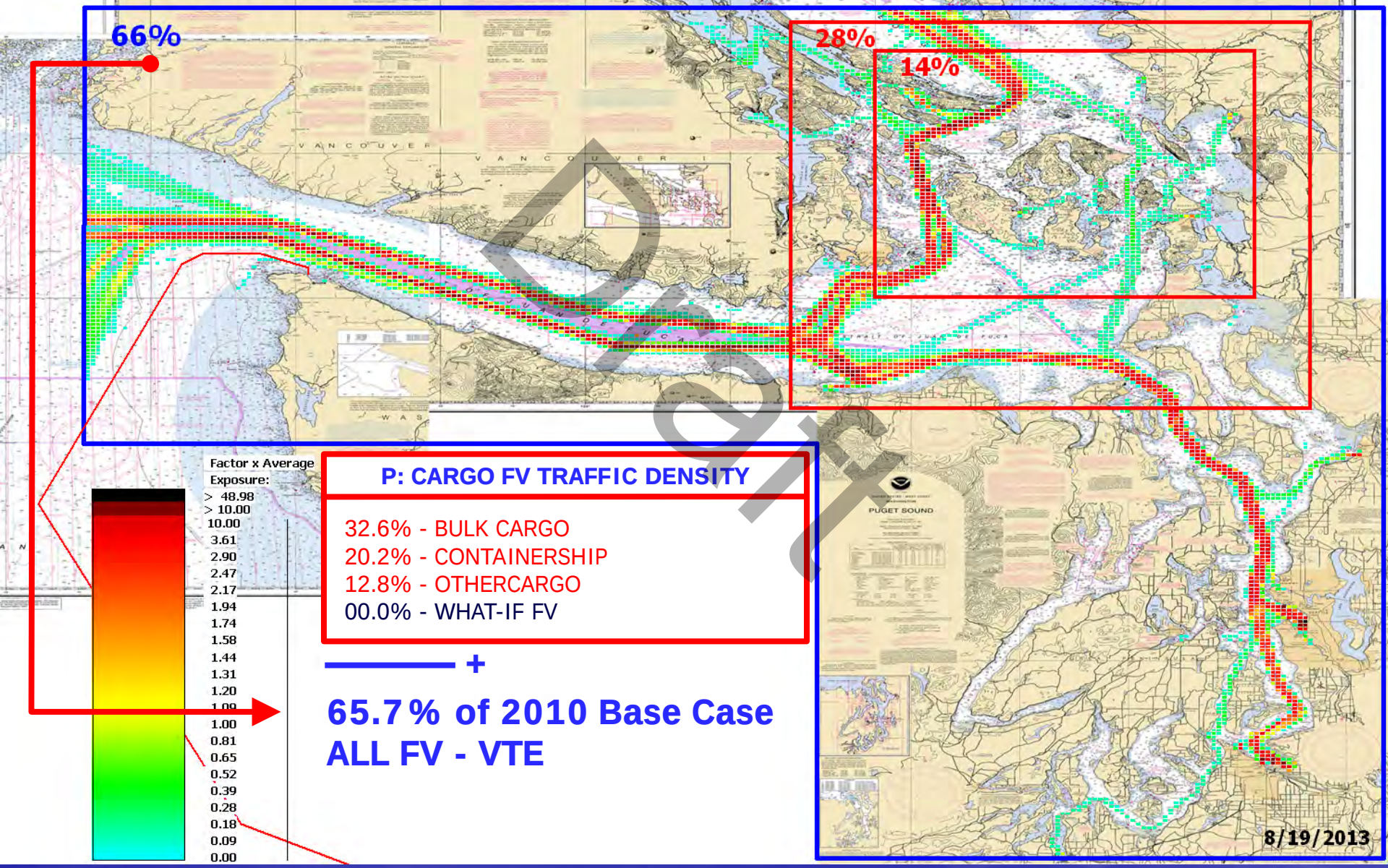
P: VTRA 2010 - BASE CASE - Cargo FV



P: CARGO FV TRAFFIC DENSITY

32.6% - BULK CARGO
20.2% - CONTAINERSHIP
12.8% - OTHERCARGO
00.0% - WHAT-IF FV

+

65.7% of 2010 Base Case ALL FV - VTE

Q: BASE CASE CARGO FV
Traffic Density

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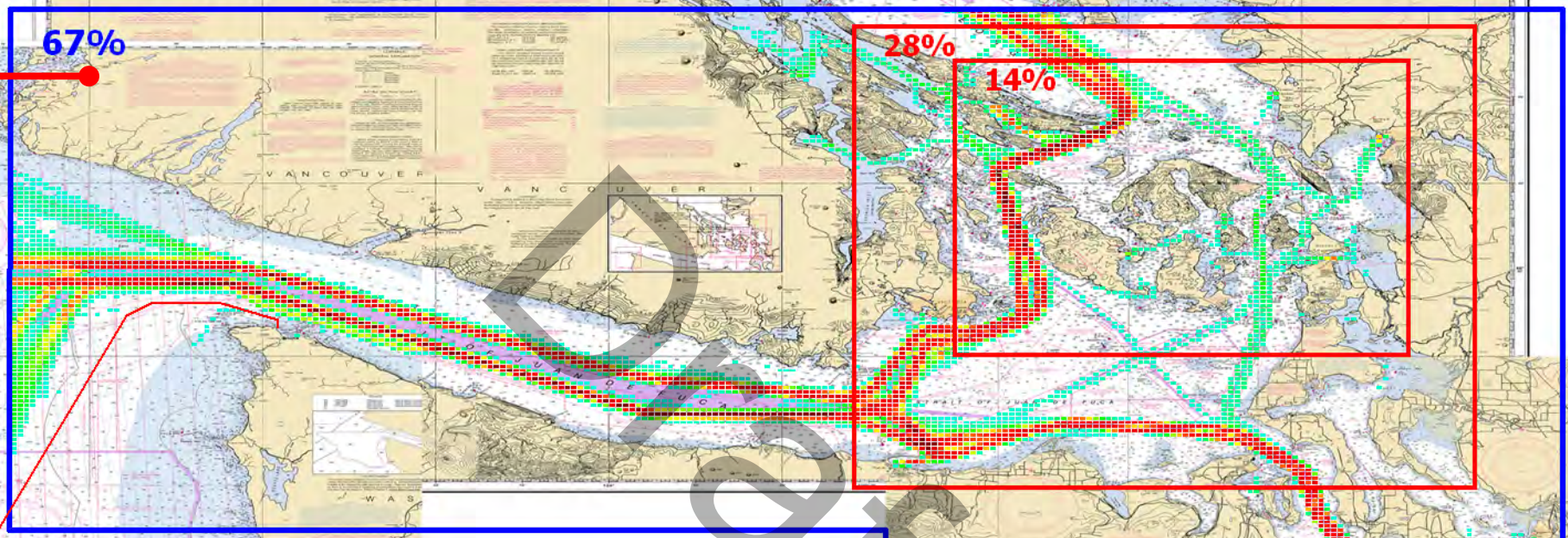
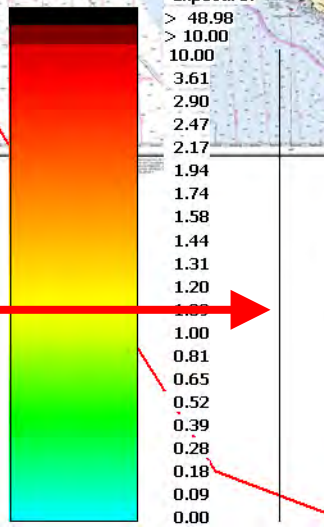
Q: VTRA 2010 - GATEWAY 487 - Cargo FV



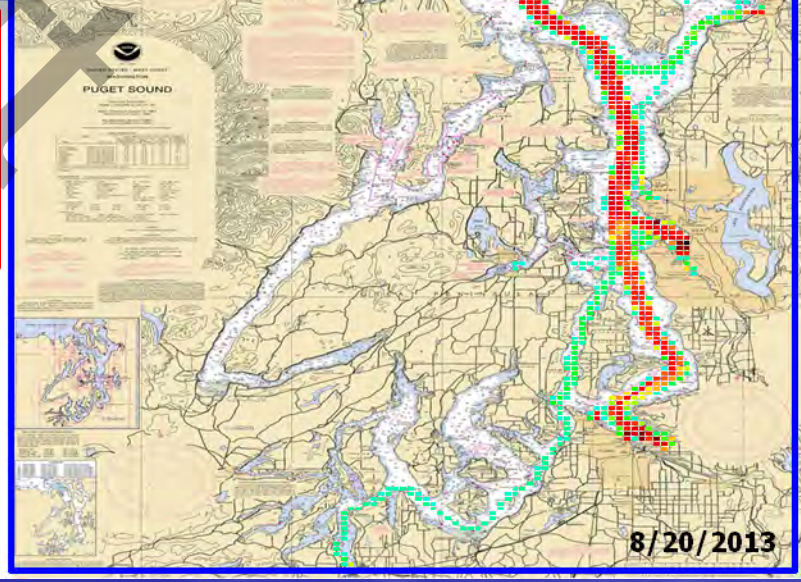


Q: CARGO FV TRAFFIC DENSITY

34.0% - BULK CARGO
20.3% - CONTAINERSHIP
12.9% - OTHERCARGO
00.0% - WHAT-IF FV

+

67.1% of 2010 Base Case ALL FV - VTE



8/20/2013

P: BASE CASE TANK FV
Traffic Density

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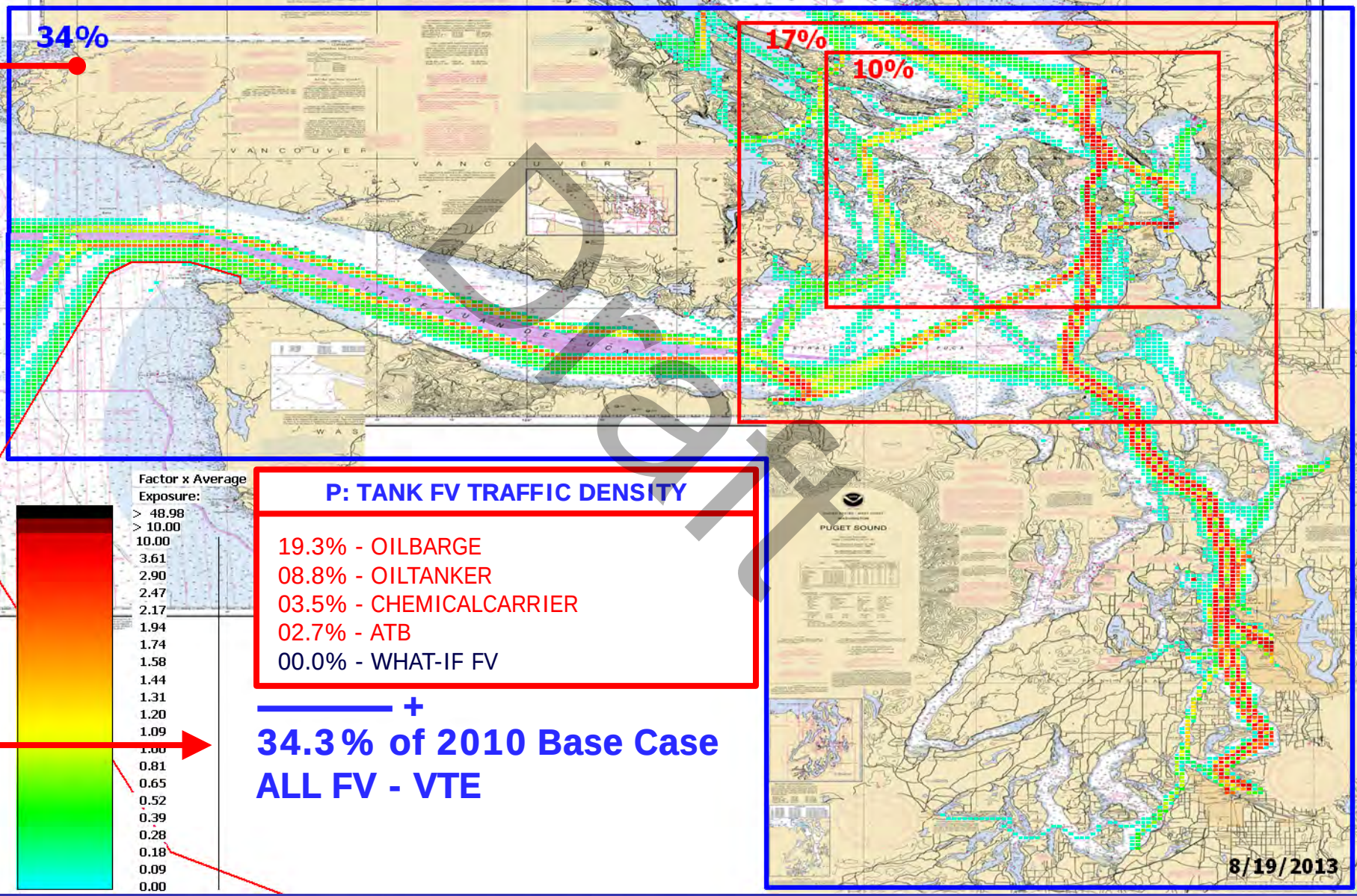
VCU

P: VTRA 2010 - BASE CASE - TANK FV



Factor x Average Exposure:
> 48.98
> 10.00
10.00
3.61
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1.31
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1.09
1.00
0.81
0.65
0.52
0.39
0.28
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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

Q: BASE CASE TANK FV
Traffic Density

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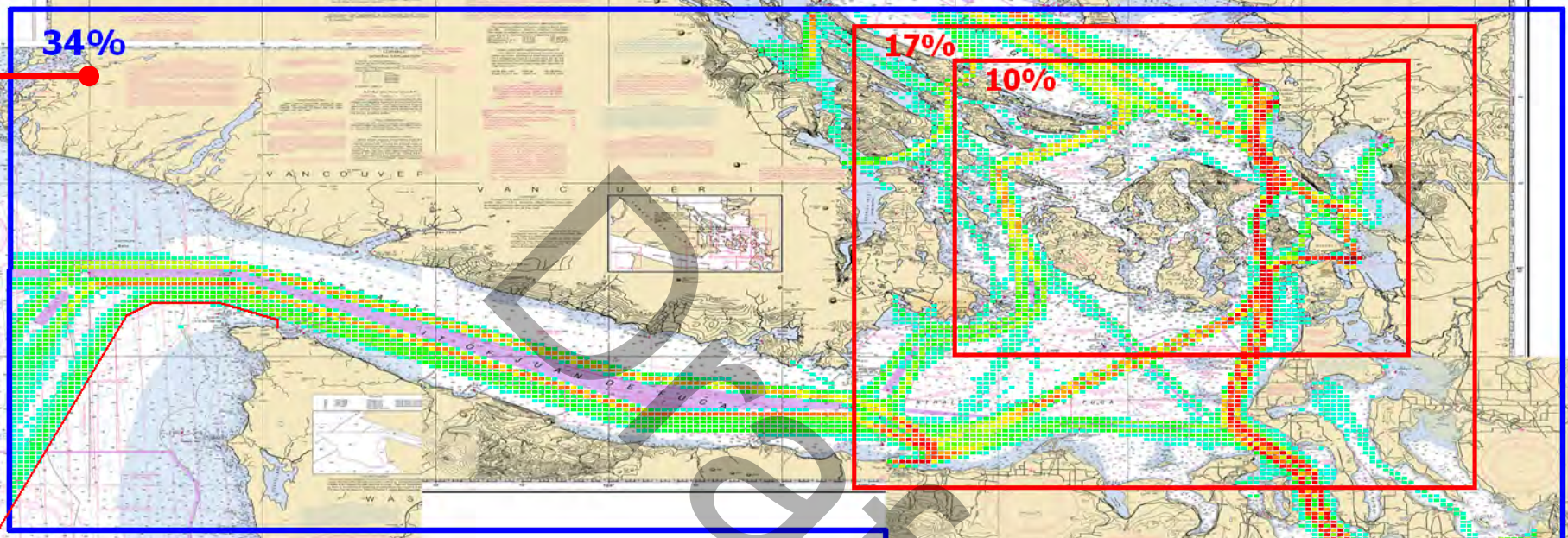
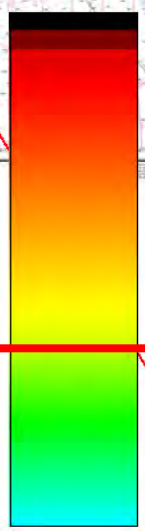
WASHINGTON, DC
VCU

Q: VTRA 2010 - GATEWAY 487 - TANK FV



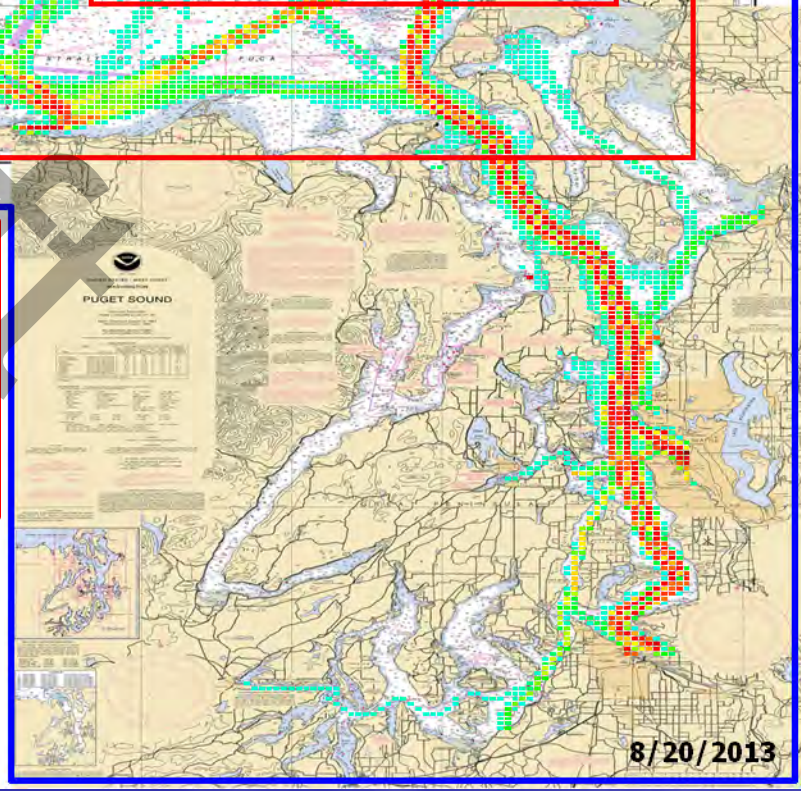


Q: TANK FV TRAFFIC DENSITY

19.2% - OILBARGE
08.7% - OILTANKER
03.5% - CHEMICALCARRIER
02.6% - ATB
00.0% - WHAT-IF FV

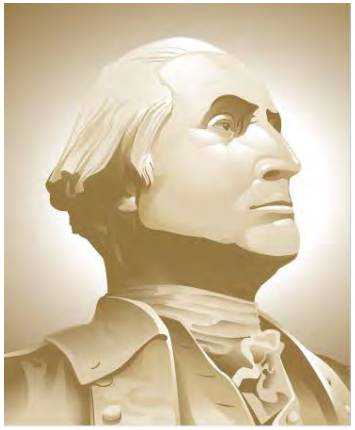
+

34.1% of 2010 Base Case ALL FV - VTE



VTRA 2010 OIL MOVEMENT DENSITY BY CRUDE, PRODUCT AND FUEL

Presentation by: J. Rene van Dorp



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WASHINGTON, DC

VCU

CASE T: Gateway, Kinder Morgan, Delta Port

GWU Personnel: Dr. J. Rene van Dorp

VCU Personnel: Dr. Jason R. W. Merrick

AUGUST 28, 2013

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12	OTHERSPECIALCARGO	CARGO - FV	25	ATB	TANK - FV
13	OTHERSPECIFICSERV	NO	26	OIL BARGE	TANK - FV

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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 POTENTIAL TOTAL TIME OF EXPOSURE

VTE : TOTAL TIME OF EXPOSURE - PER YEAR

2010 BASE CASE

100 % ALL FV OIL MOVEMENT

100 %

- 36.9 % OTE BASE CASE CRUDE
- 39.4 % OTE BASE CASE PRODUCT
- 23.7 % OTE BASE CASE FUEL
- 0.0 % OTE WHAT-IF OIL

2010 CASE Q

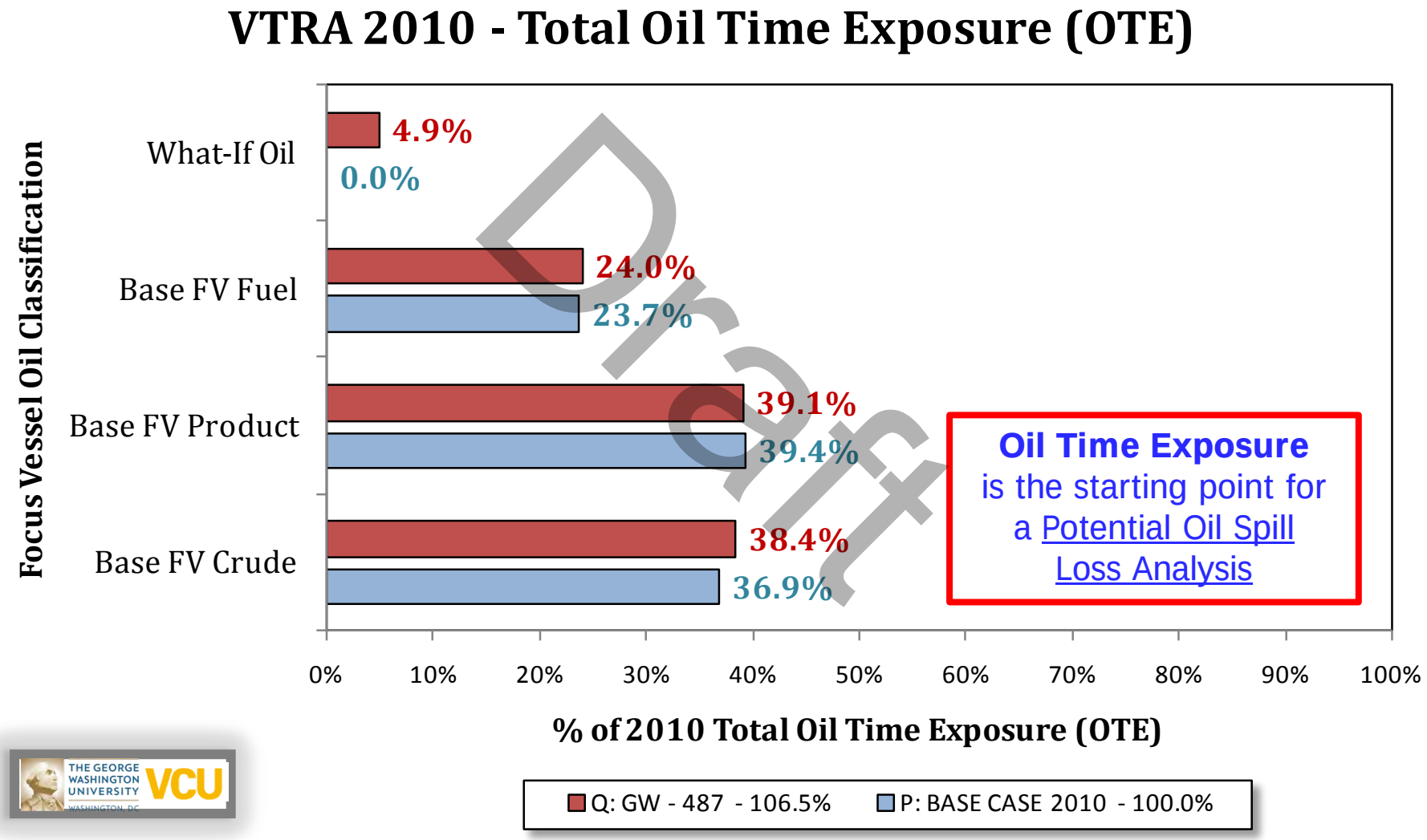
106.5 % ALL FV OIL MOVEMENT

107 %

- 38.4 % OTE BASE CASE CRUDE
- 39.1 % OTE BASE CASE PRODUCT
- 24.0 % OTE BASE CASE FUEL
- 4.9 % OTE WHAT-IF OIL

101.6 %

CASE Q: GW 487 + BUNKERING



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

P: ALL FV ALL OIL MOVEMENT

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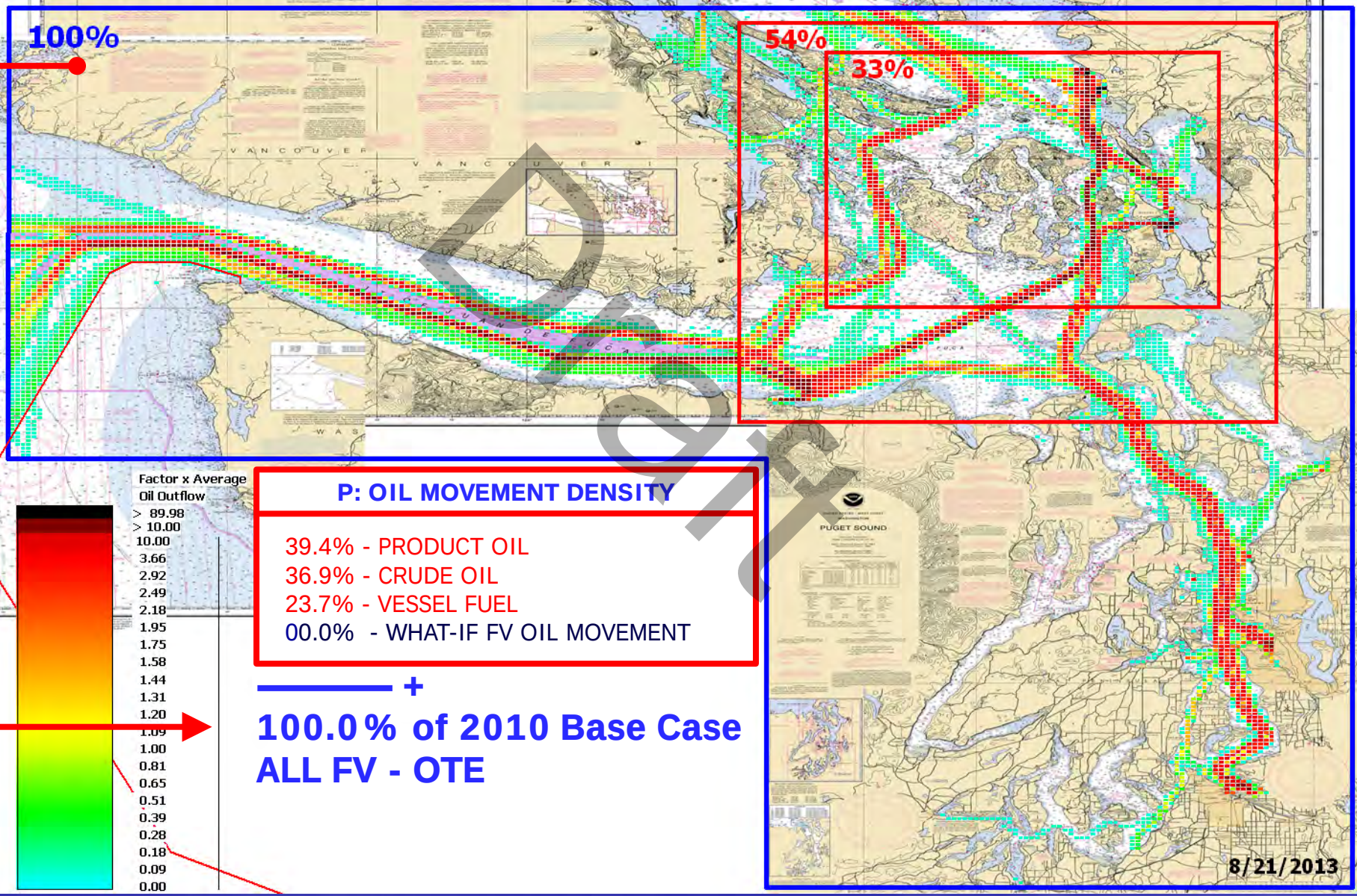
P: VTRA 2010 - BASE CASE - All FV



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

Q: ALL FV ALL OIL MOVEMENT

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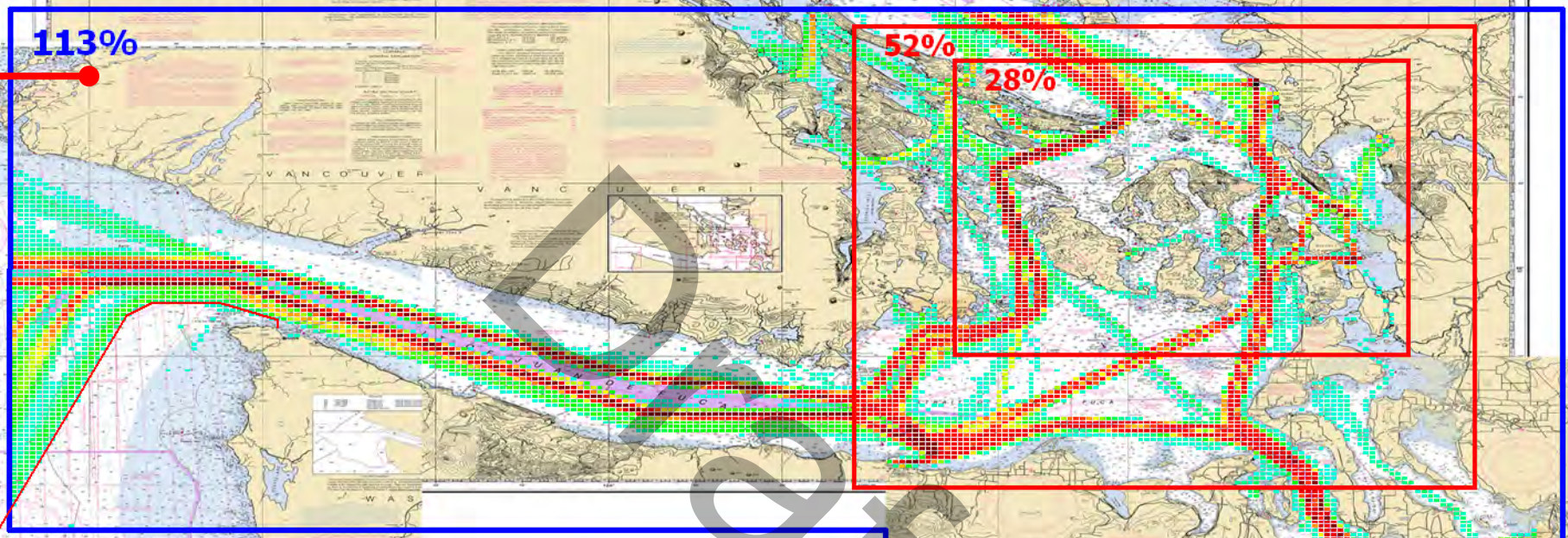
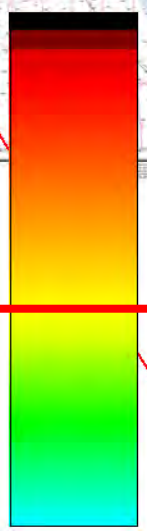
VCU

Q: VTRA 2010 - GATEWAY 487 - All FV





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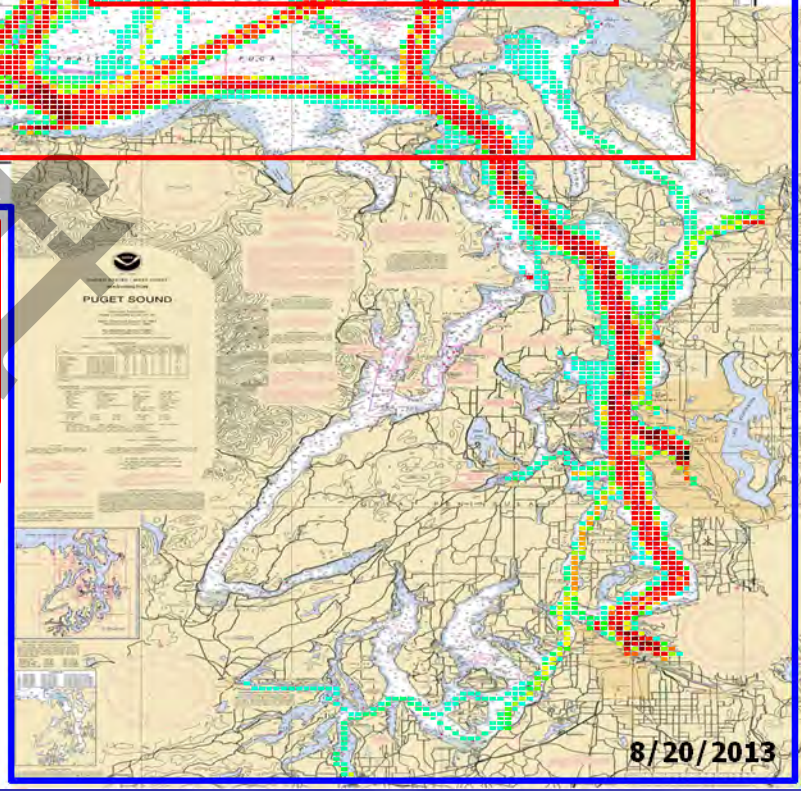
Q: OIL MOVEMENT DENSITY

39.1% - PRODUCT OIL
38.4% - CRUDE OIL
24.0% - VESSEL FUEL
04.9% - WHAT-IF FV OIL MOVEMENT

\+

106.5% of 2010 Base Case
ALL FV - OTE



8/20/2013

P: ALL FV PRODUCT OIL MOVEMENT

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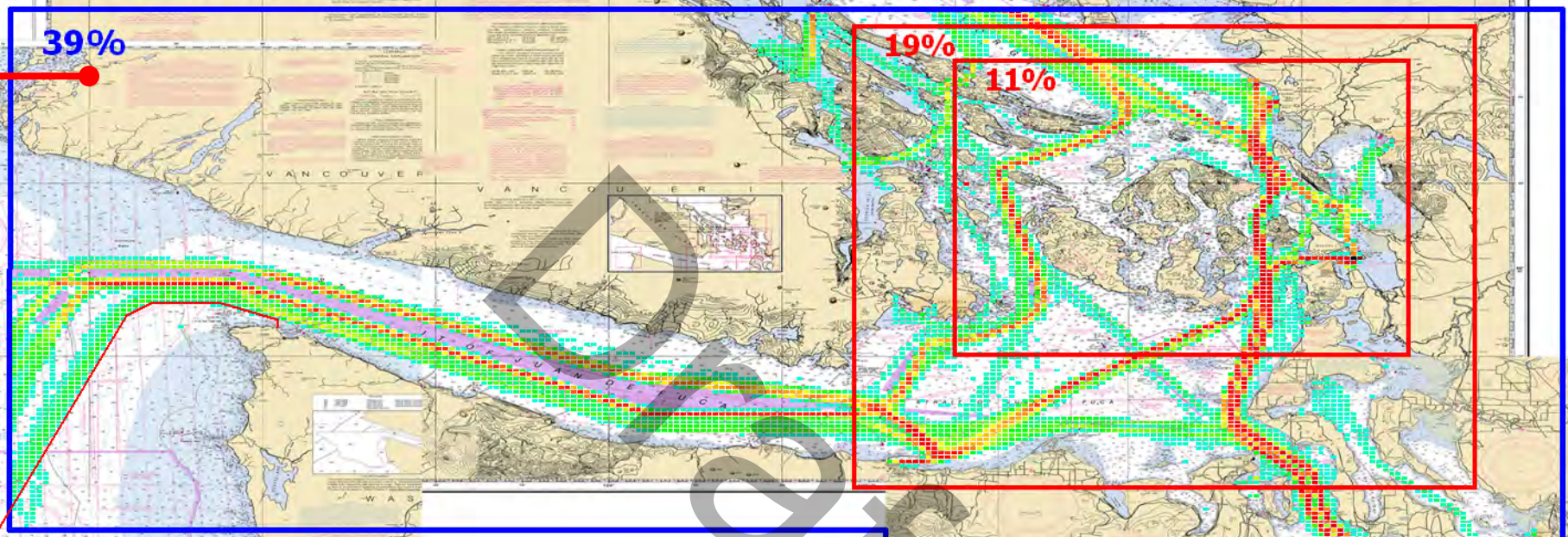
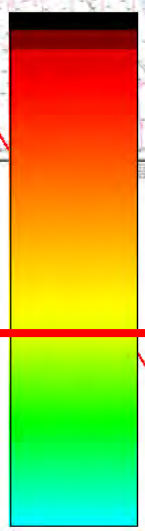
P: VTRA 2010 - BASE CASE - All FV





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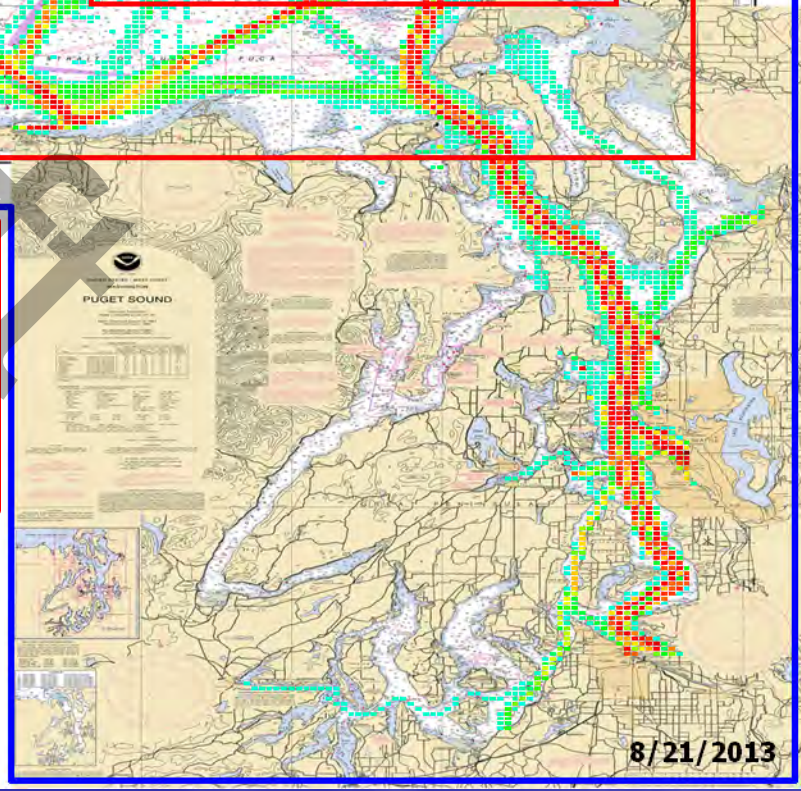
0.81
0.65
0.51
0.39
0.28
0.18
0.09
0.00

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



8/21/2013

Q: ALL FV PRODUCT OIL MOVEMENT

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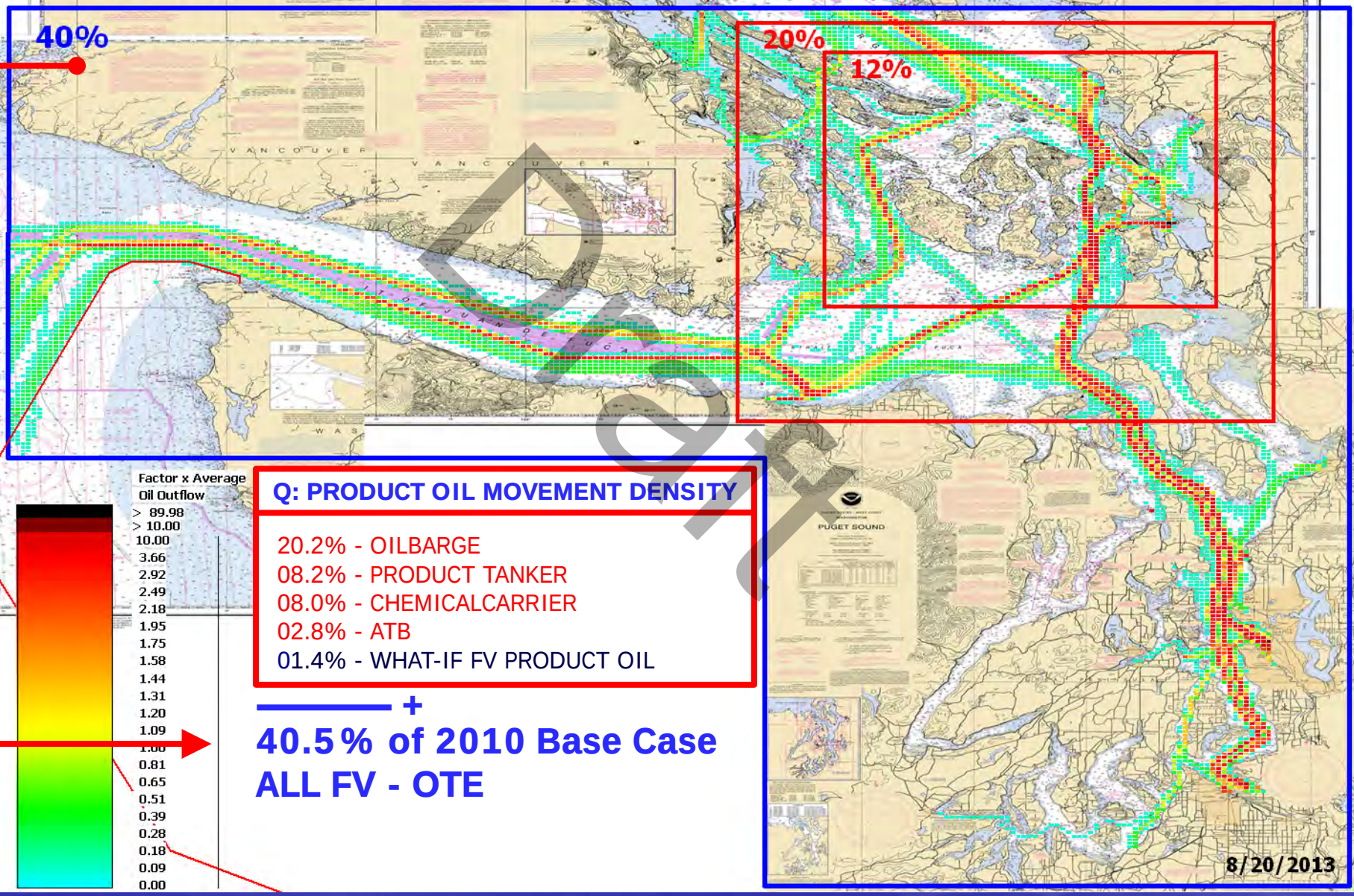
VCU

Q: VTRA 2010 - GATEWAY 487 - All FV



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1.00
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0.51
0.39
0.28
0.18
0.09
0.00

Q: PRODUCT OIL MOVEMENT DENSITY

20.2% - OILBARGE
08.2% - PRODUCT TANKER
08.0% - CHEMICALCARRIER
02.8% - ATB
01.4% - WHAT-IF FV PRODUCT OIL

\+

40.5% of 2010 Base Case ALL FV - OTE

P: ALL FV CRUDE OIL MOVEMENT

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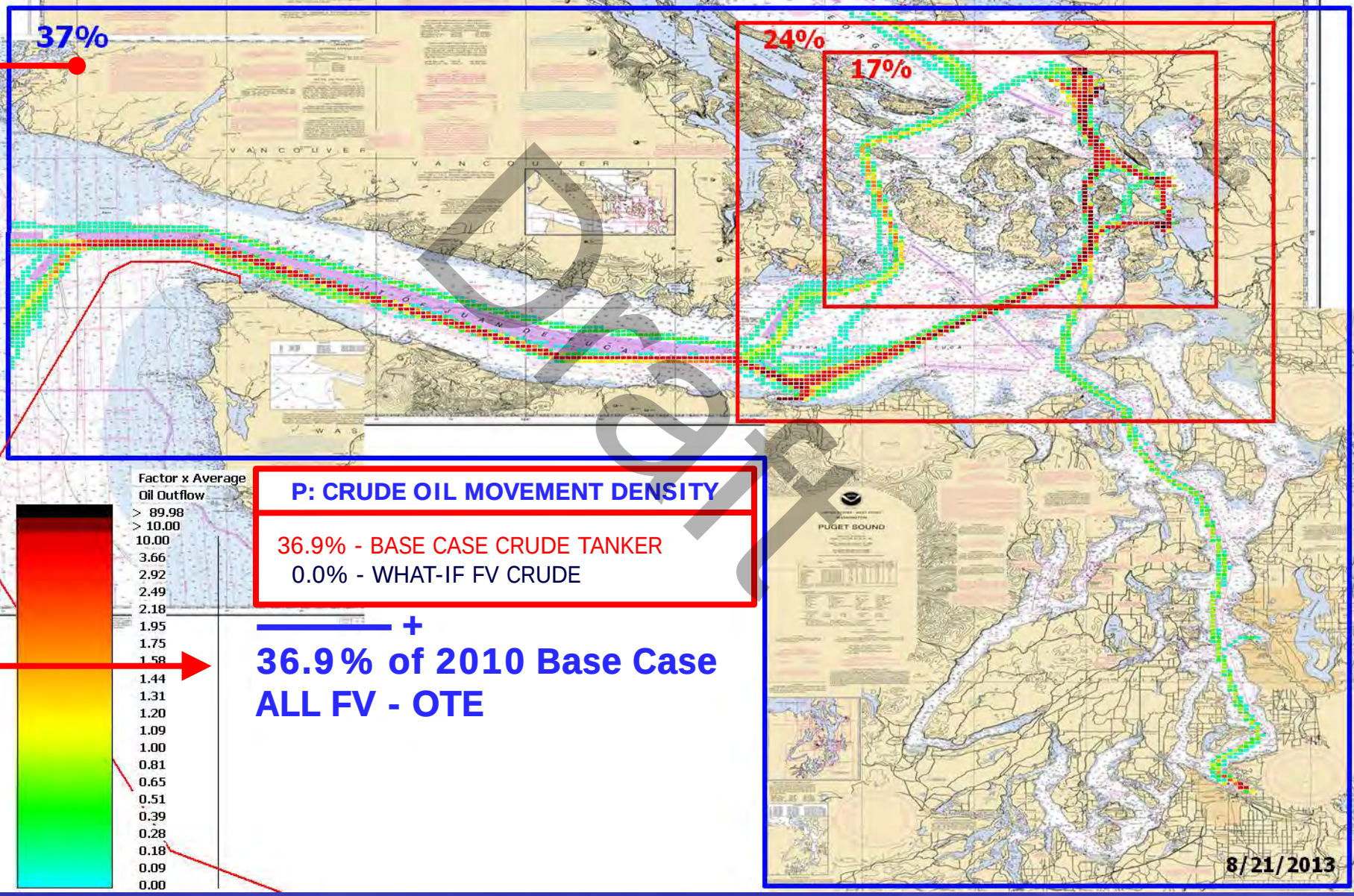
VCU

P: VTRA 2010 - BASE CASE - All FV



P: CRUDE OIL MOVEMENT DENSITY

36.9% - BASE CASE CRUDE TANKER
0.0% - WHAT-IF FV CRUDE

+

36.9% of 2010 Base Case ALL FV - OTE

Q: ALL FV CRUDE OIL MOVEMENT

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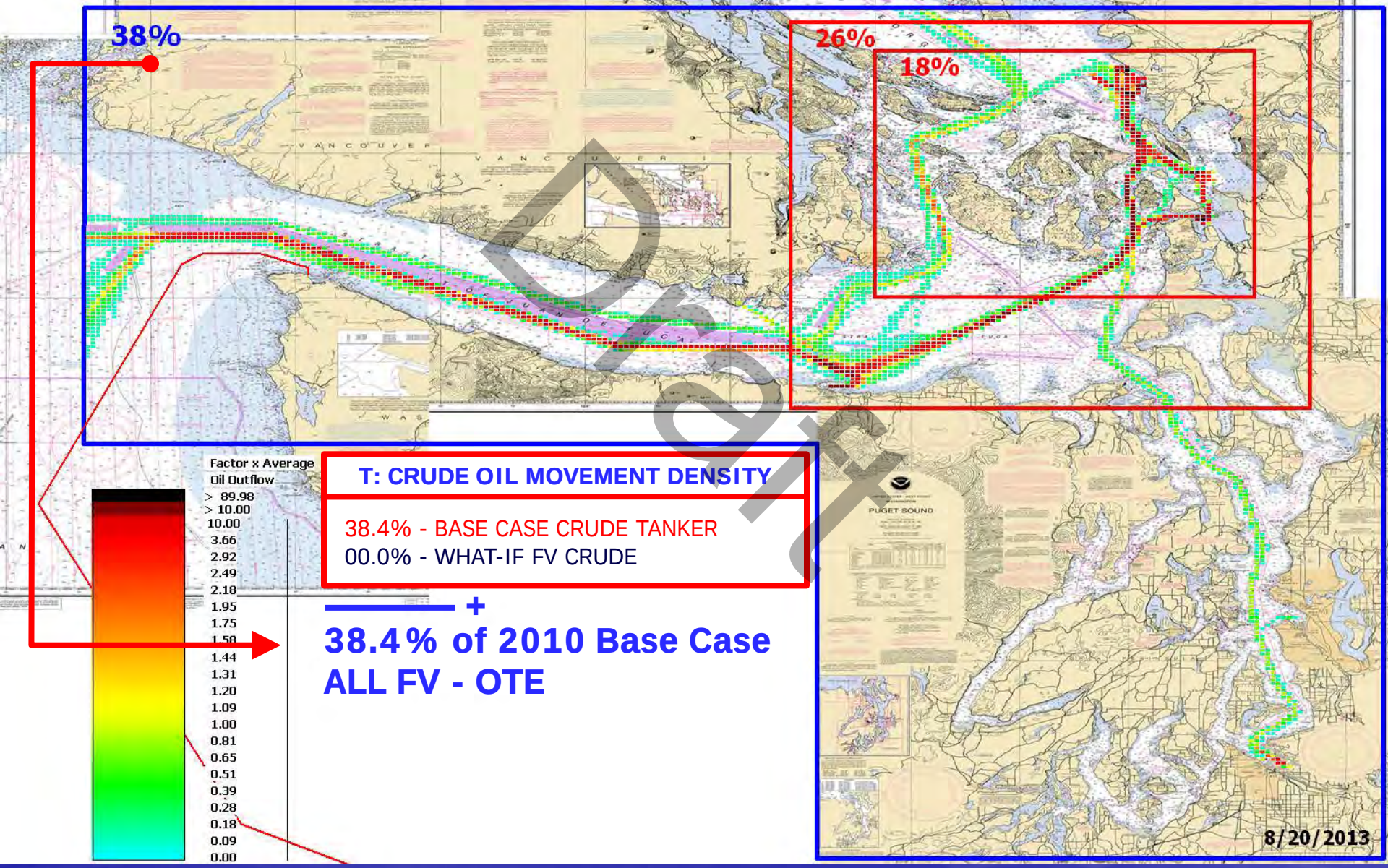
Q: VTRA 2010 - GATEWAY 487 - All FV



T: CRUDE OIL MOVEMENT DENSITY

38.4% - BASE CASE CRUDE TANKER
00.0% - WHAT-IF FV CRUDE

\+

38.4% of 2010 Base Case
ALL FV - OTE

P: ALL FV FUEL OIL MOVEMENT

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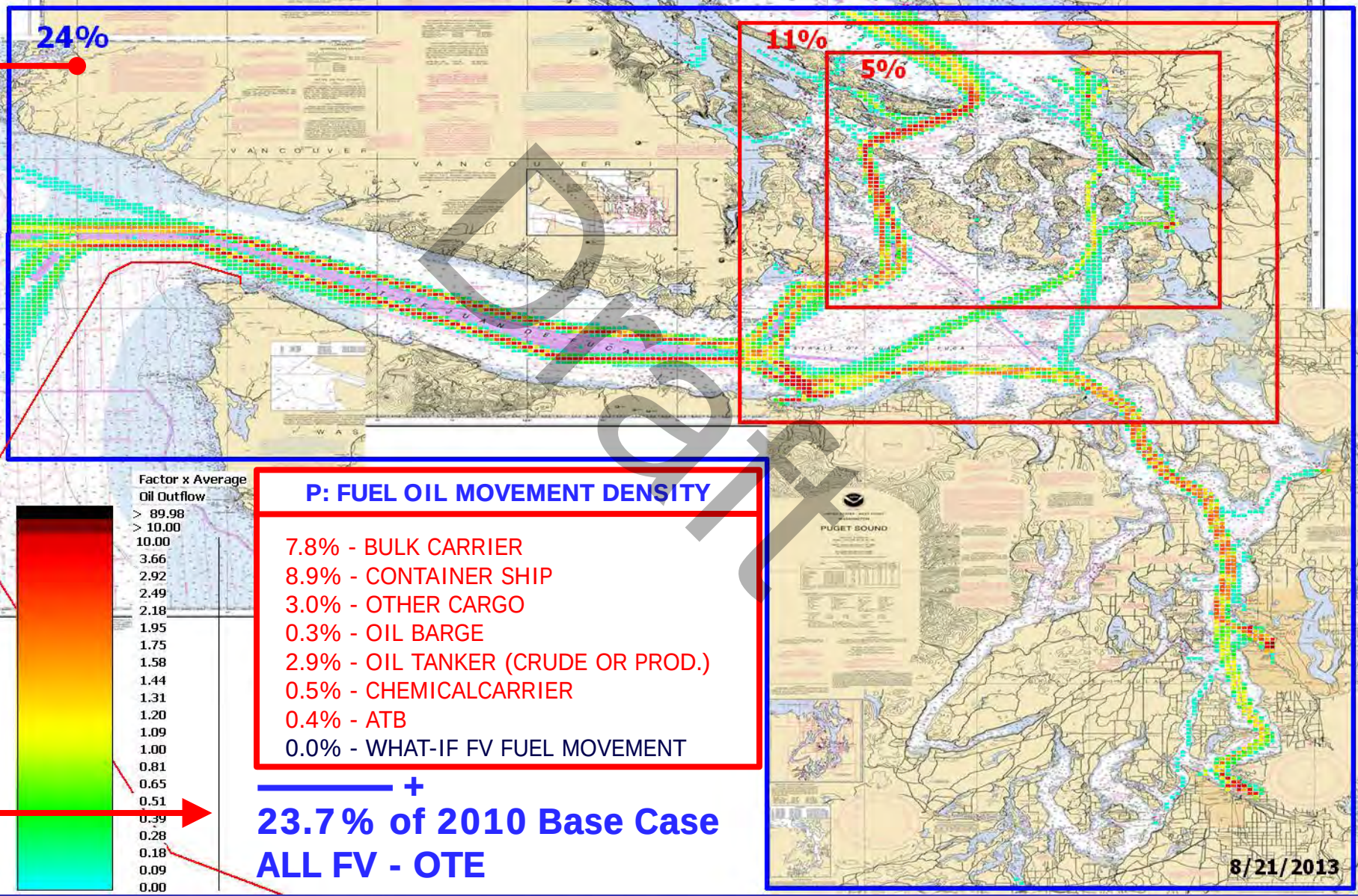
P: VTRA 2010 - BASE CASE - All FV



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

Q: ALL FV FUEL OIL MOVEMENT

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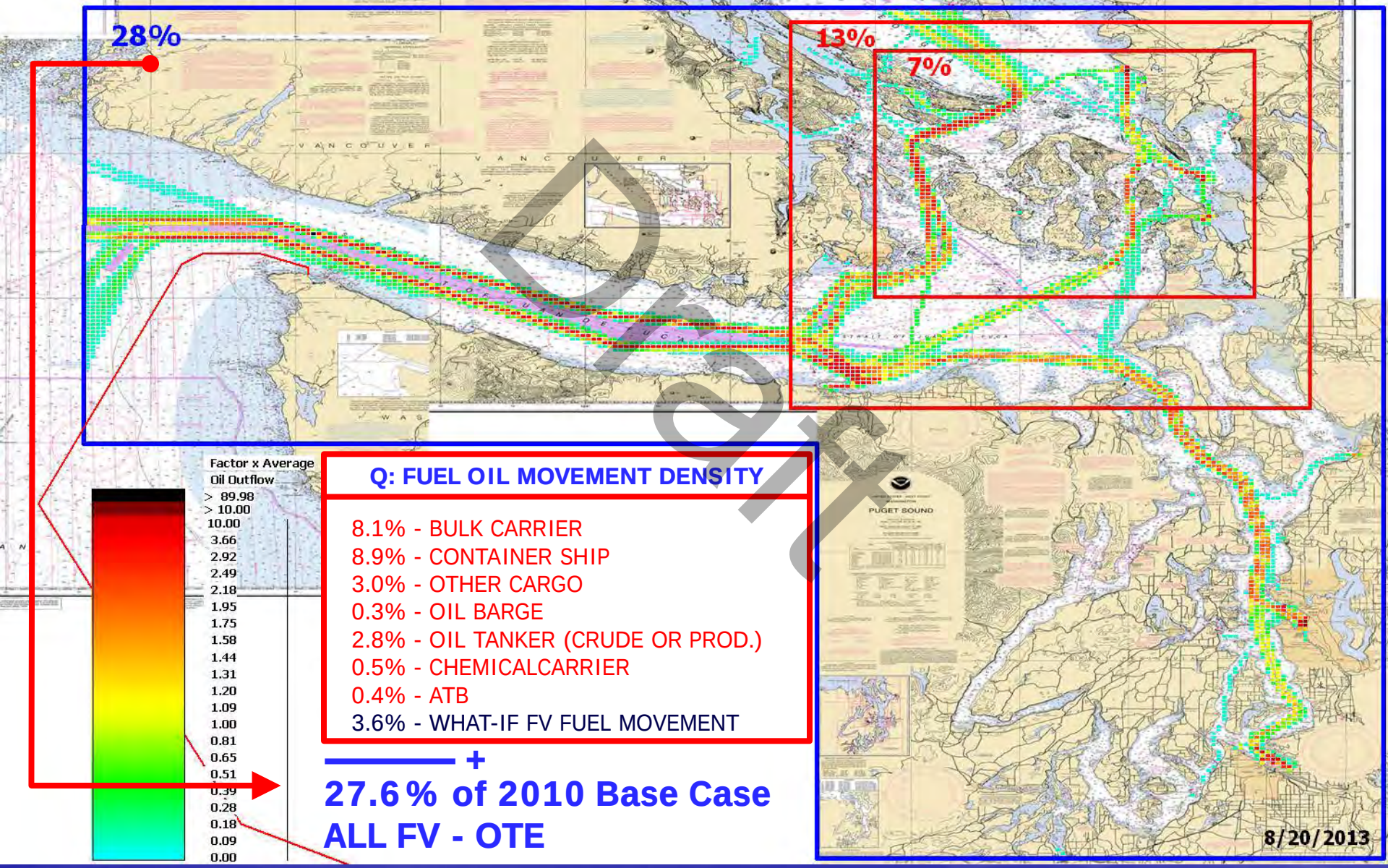
Q: VTRA 2010 - GATEWAY 487 - All FV



Q: FUEL OIL MOVEMENT DENSITY

8.1% - BULK CARRIER
8.9% - CONTAINER SHIP
3.0% - OTHER CARGO
0.3% - OIL BARGE
2.8% - OIL TANKER (CRUDE OR PROD.)
0.5% - CHEMICALCARRIER
0.4% - ATB
3.6% - WHAT-IF FV FUEL MOVEMENT

+

27.6% of 2010 Base Case ALL FV - OTE