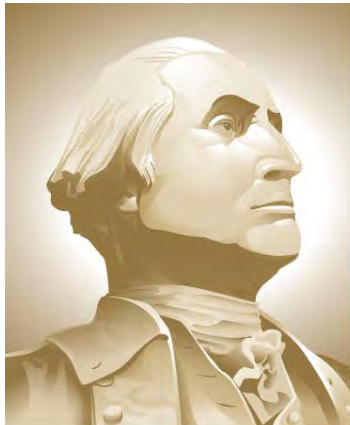


# VTRA 2010 CASE S RESULTS BY ACCIDENT TYPE

Presentation by: J. Rene van Dorp



THE GEORGE  
WASHINGTON  
UNIVERSITY

WASHINGTON, DC

VCU

**CASE S: Delta Port 415 + Bunkering Operations**

**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**AUGUST 31, 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	OTHERSPECIFCSERV	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 S: DP 415 + Bunkering Operations:

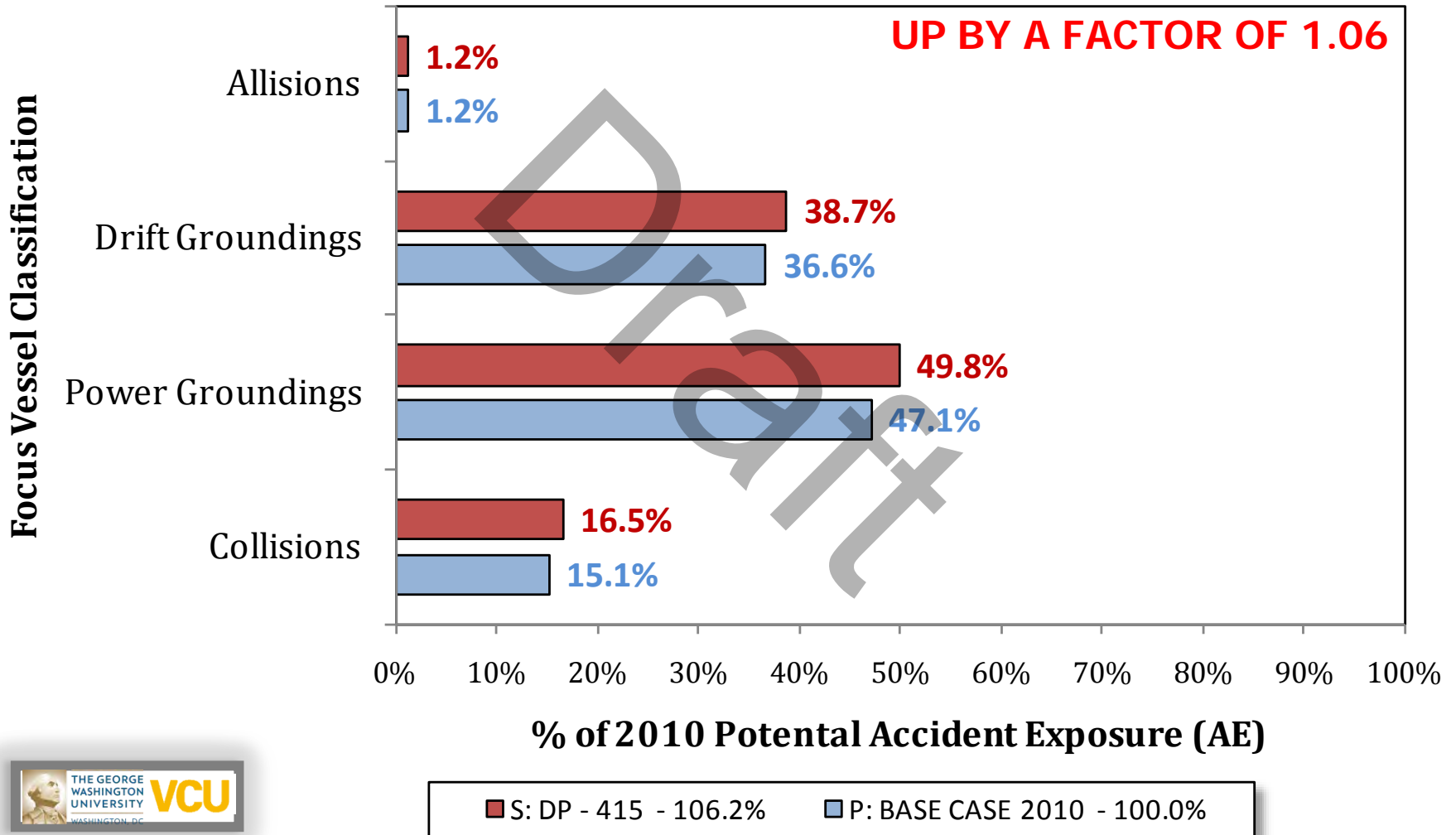
## BASE CASE 2010 TRAFFIC WITH FOLLOWING WHAT-IF FOCUS VESSELS

348 Delta Port Bulk Carriers + Bunkering Barges

67 Delta Port Container Ships+ Bunkering Barges

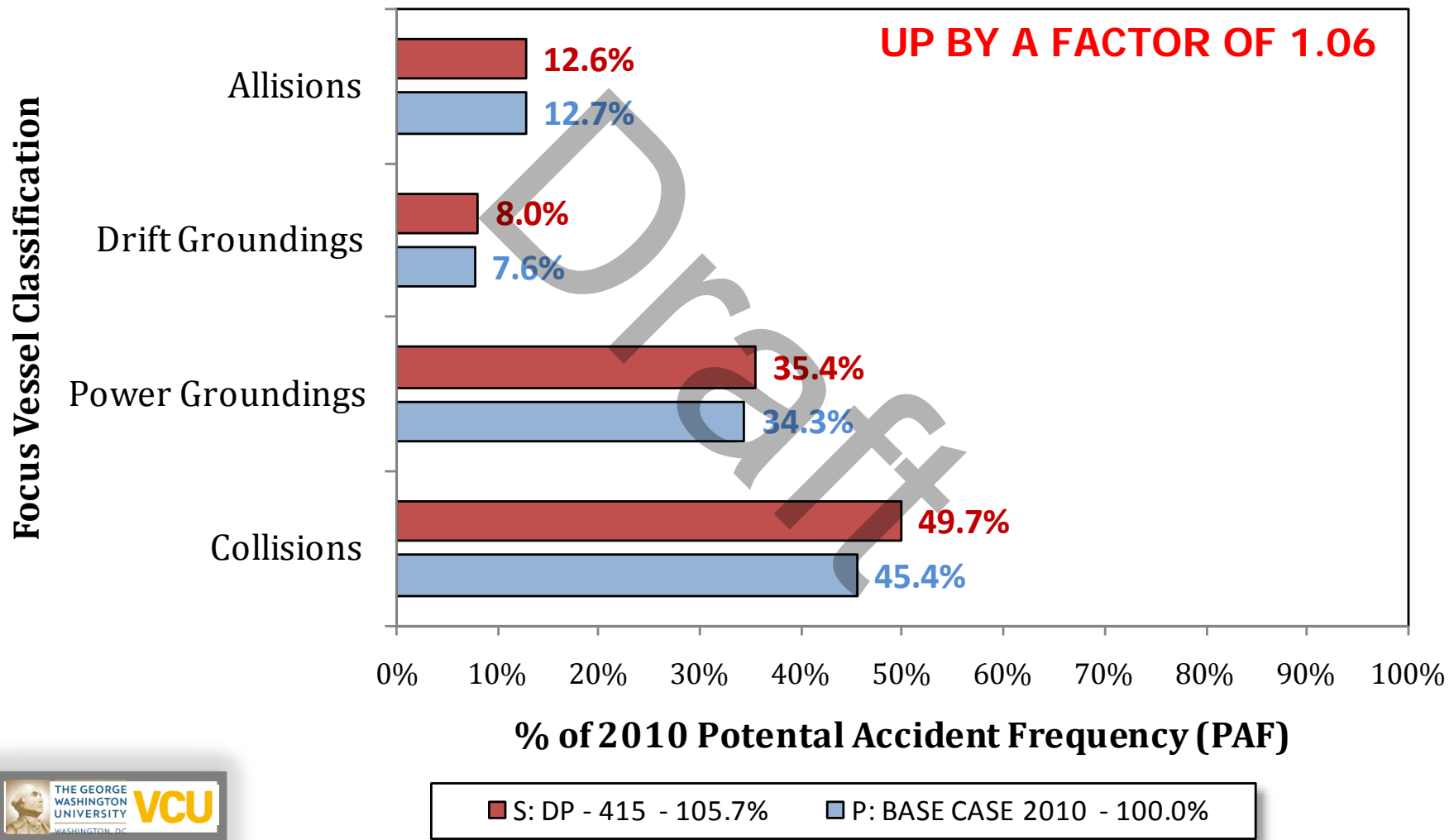
# CASE S: DP 415 + BUNKERING

## VTRA 2010 - ACCIDENT EXPOSURE



# CASE S: DP 415 + BUNKERING

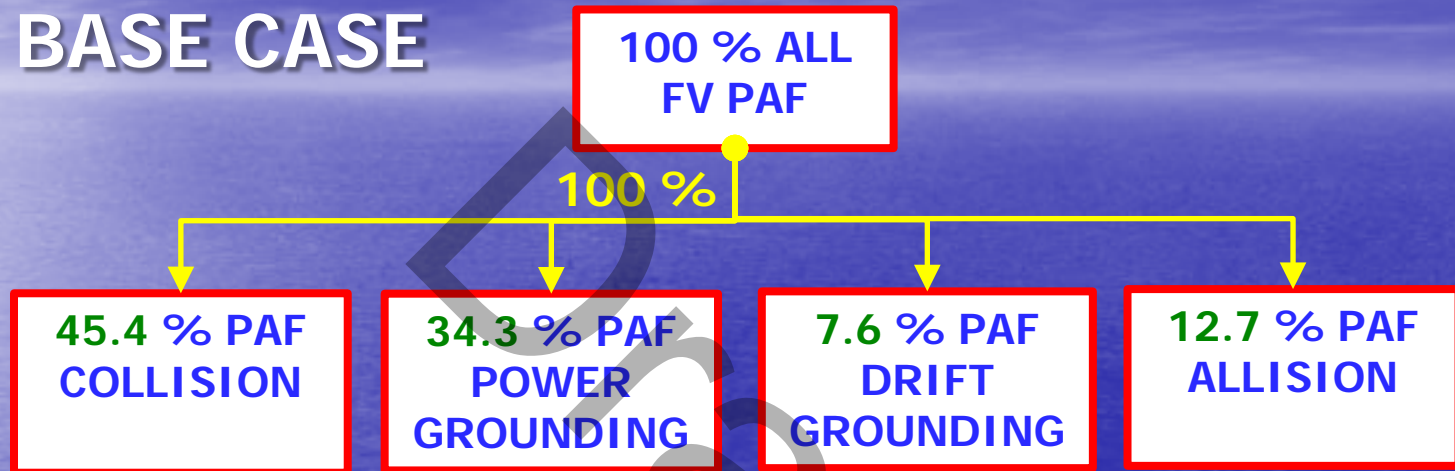
## VTRA 2010 - ACCIDENT FREQUENCY



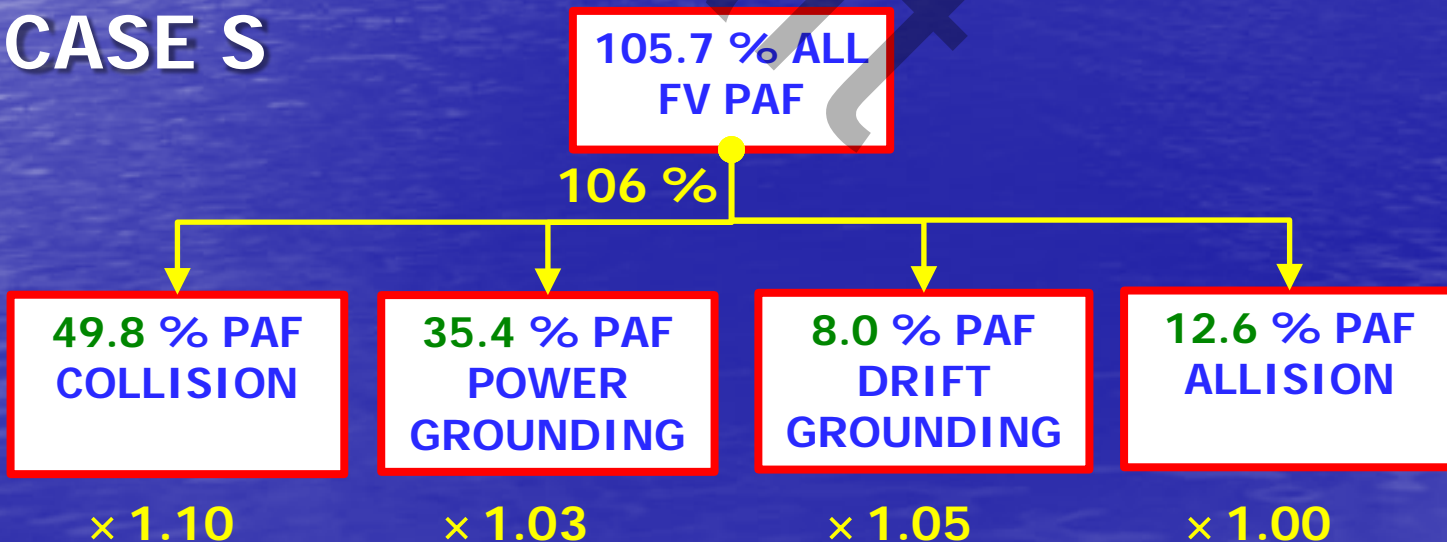
# A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL ACCIDENT FREQUENCY

PAF : POTENTIAL ACCIDENT FREQUENCY - PER YEAR

## 2010 BASE CASE

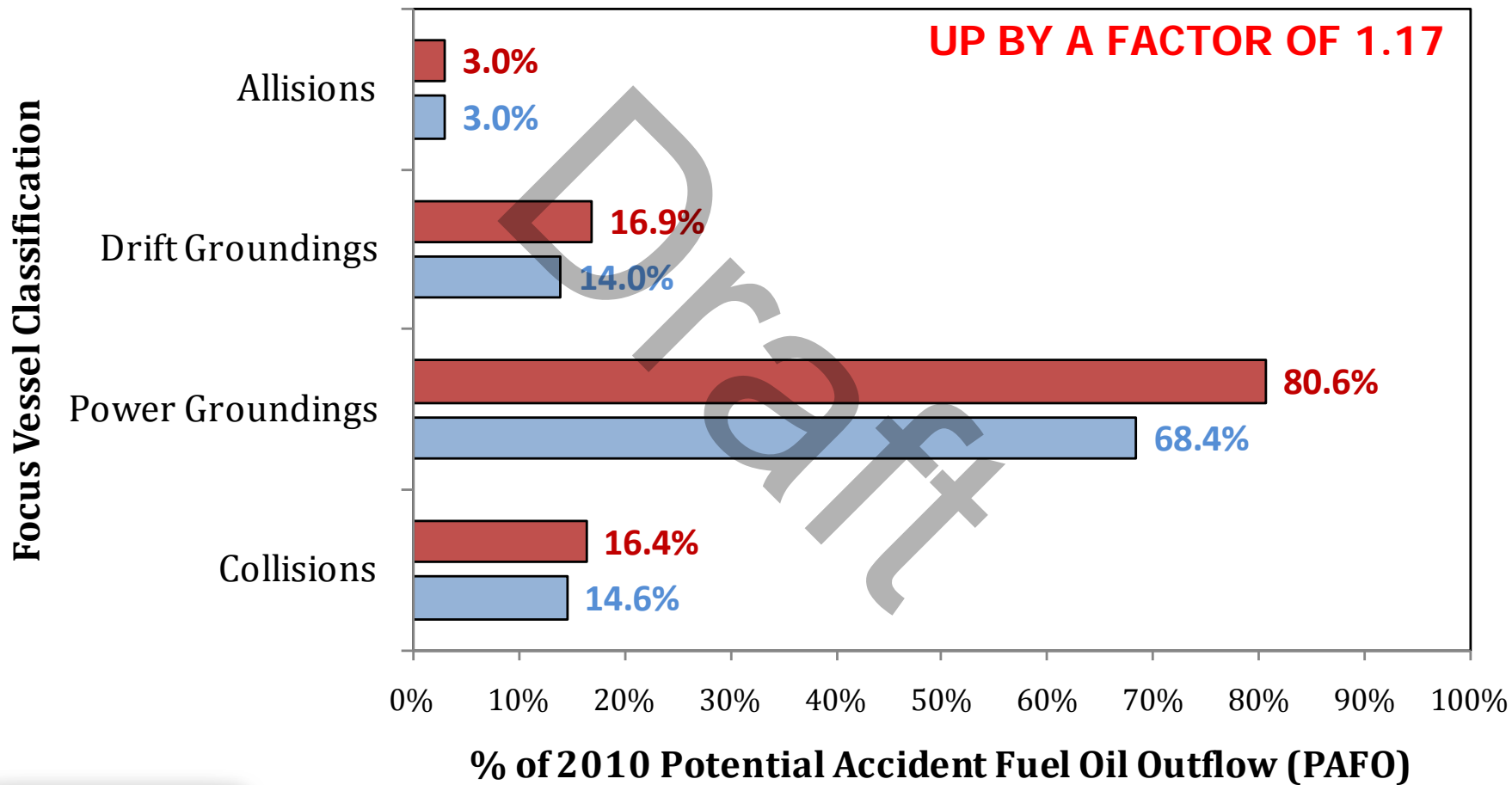


## 2010 CASE S



# CASE S: DP 415 + BUNKERING

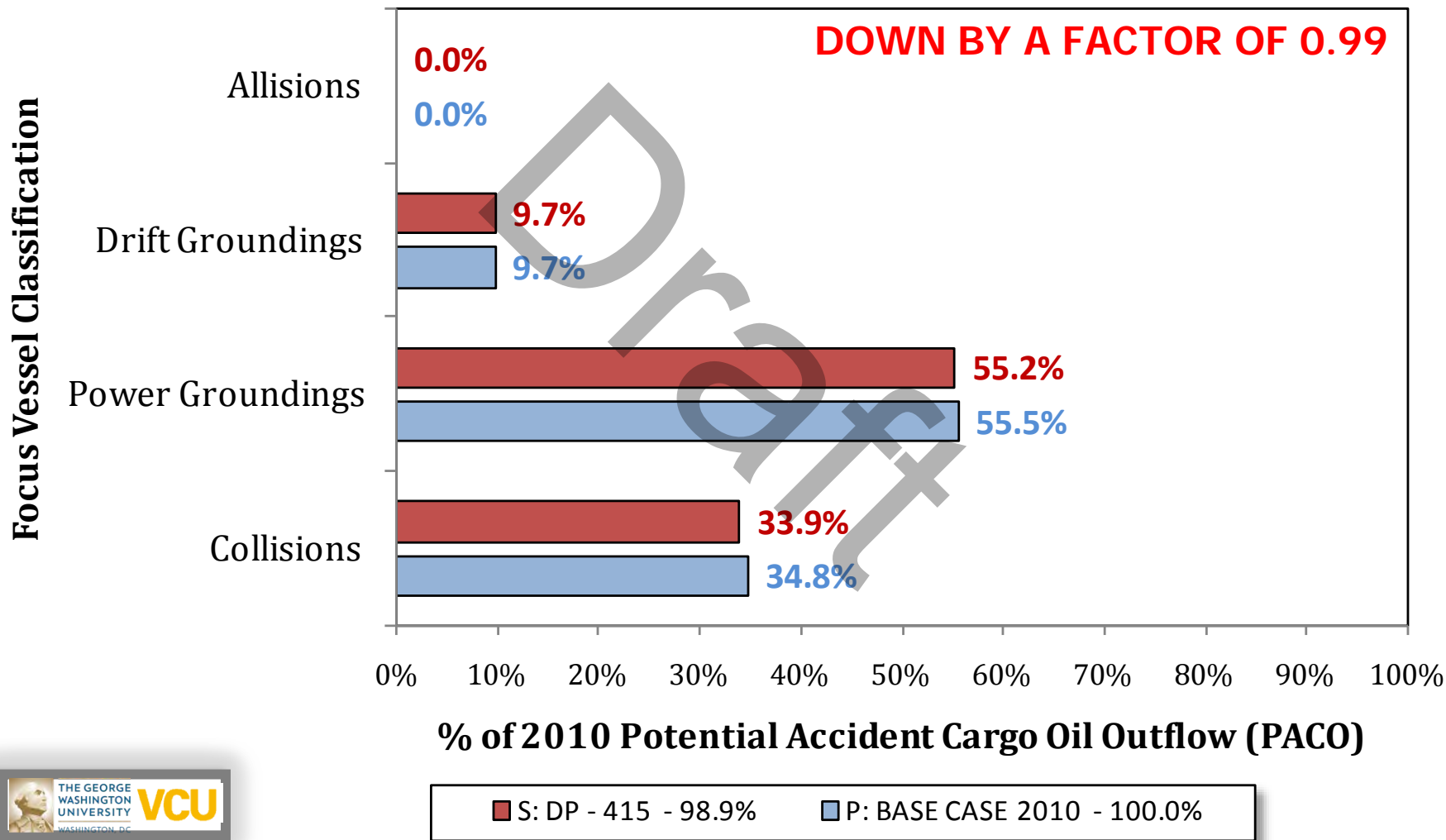
## VTRA 2010 - ACCIDENT FUEL OIL LOSS





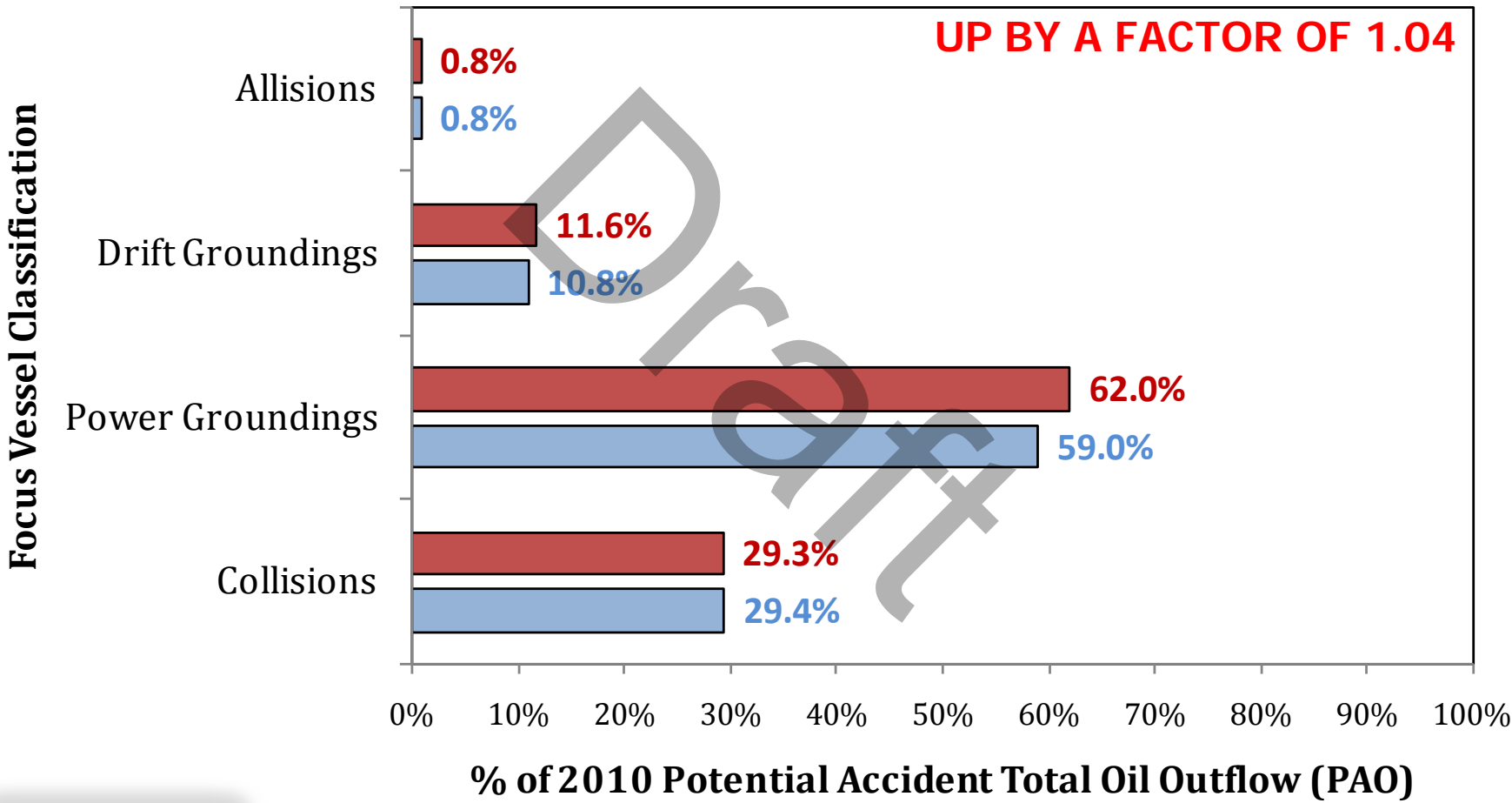
# CASE S: DP 415 + BUNKERING

## VTRA 2010 - ACCIDENT CARGO OIL LOSS



# CASE S: DP 415 + BUNKERING

## VTRA 2010 - ACCIDENT OIL LOSS (CARGO + FUEL)

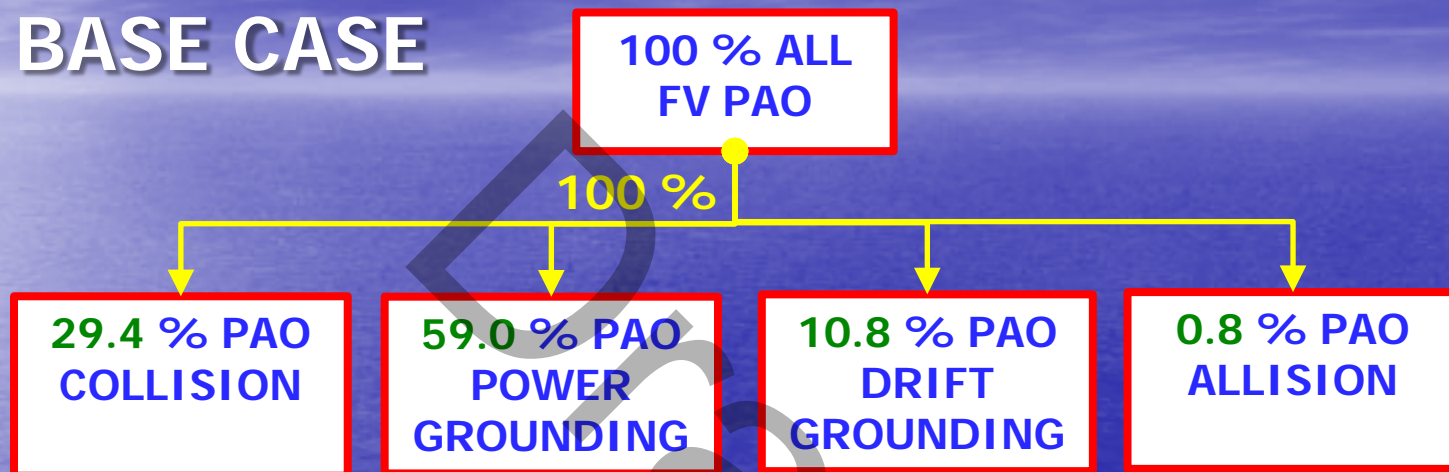


■ S: DP - 415 - 103.7%    ■ P: BASE CASE 2010 - 100.0%

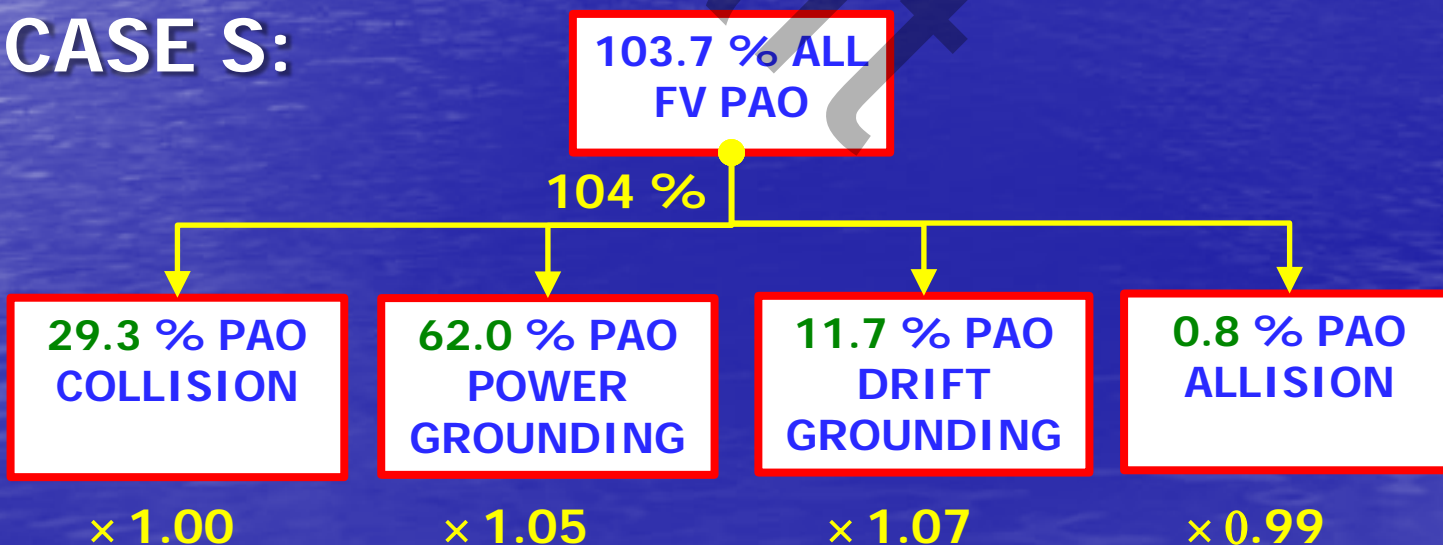
# A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL ACCIDENT OIL (CARGO + FUEL) LOSS

PAF : POTENTIAL ACCIDENT OIL LOSS - PER YEAR

## 2010 BASE CASE

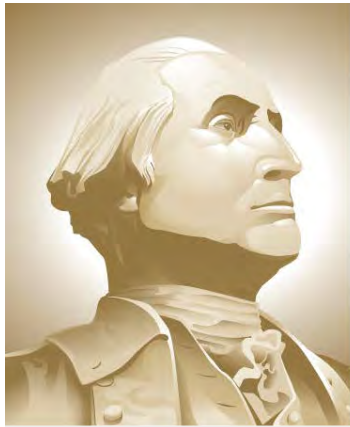


## 2010 CASE S:



# VTRA 2010 CASE S RESULTS – COLLISION EXPOSURE AND ACCIDENT GEOGRAPHIC PROFILES

Presentation by: J. Rene van Dorp



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WASHINGTON, DC

VCU

**CASE S: Delta Port 415 + Bunkering Operations**

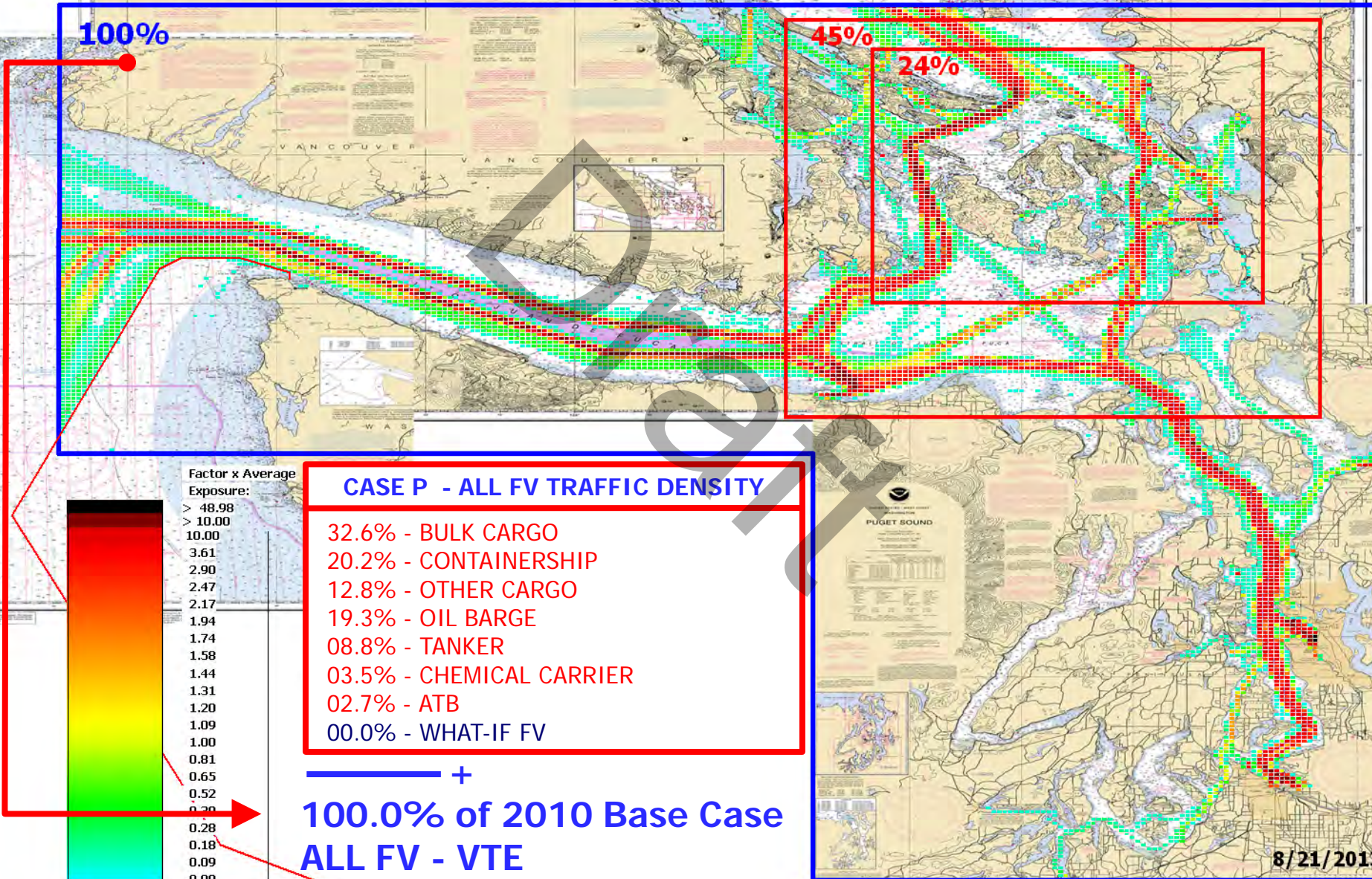
**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**AUGUST 31, 2013**

**P: All FV TOTAL VESSEL TIME EXPOSURE (VTE)**

**P: VTRA 2010 - BASE CASE - All FV**



100%

45%

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**

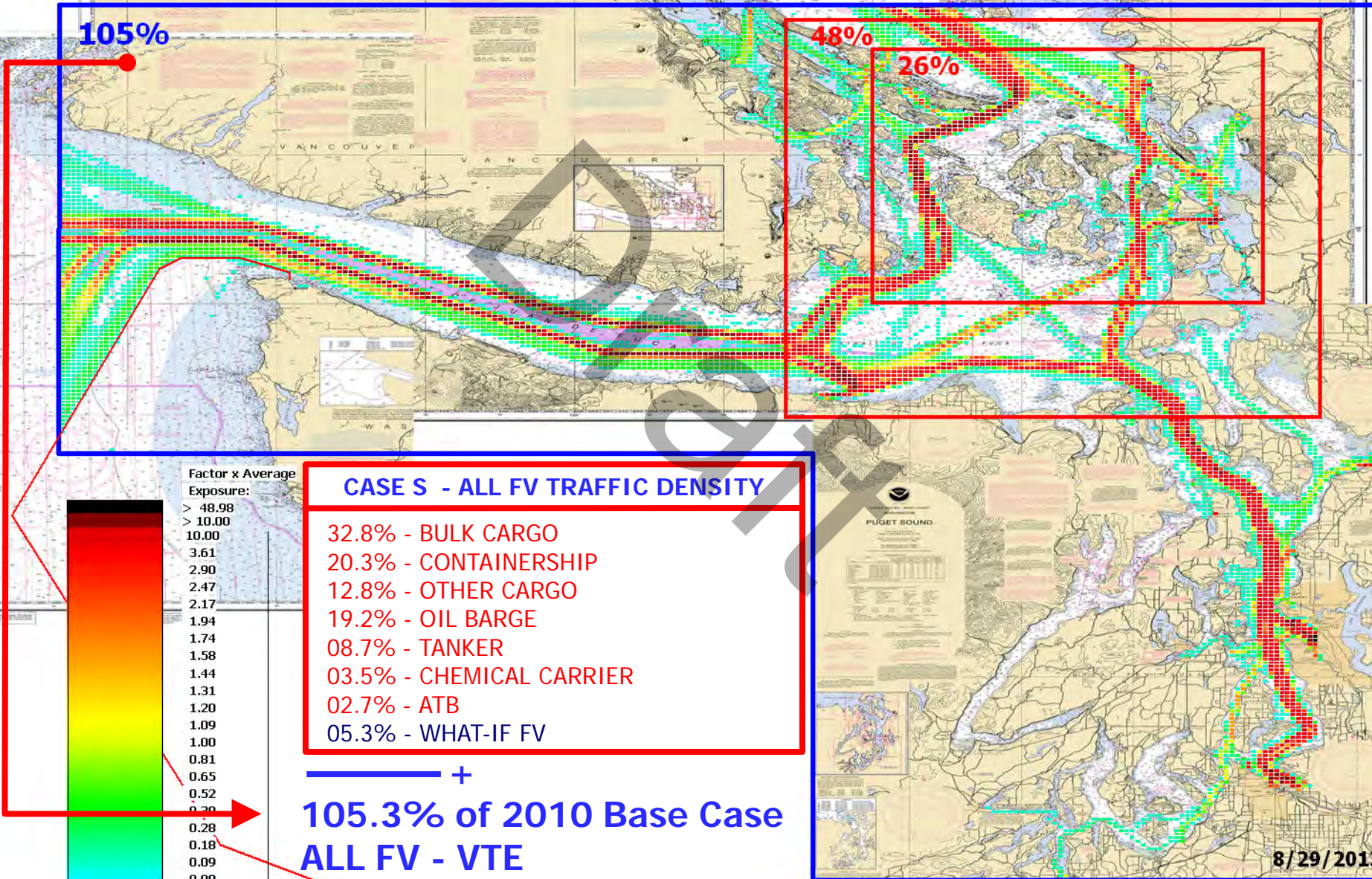
- 32.6% - BULK CARGO
- 20.2% - CONTAINERSHIP
- 12.8% - OTHER CARGO
- 19.3% - OIL BARGE
- 08.8% - TANKER
- 03.5% - CHEMICAL CARRIER
- 02.7% - ATB
- 00.0% - WHAT-IF FV

+

**100.0% of 2010 Base Case  
ALL FV - VTE**

# S: All FV TOTAL VESSEL TIME EXPOSURE (VTE)

S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348 - All FV



105%

48%

26%

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

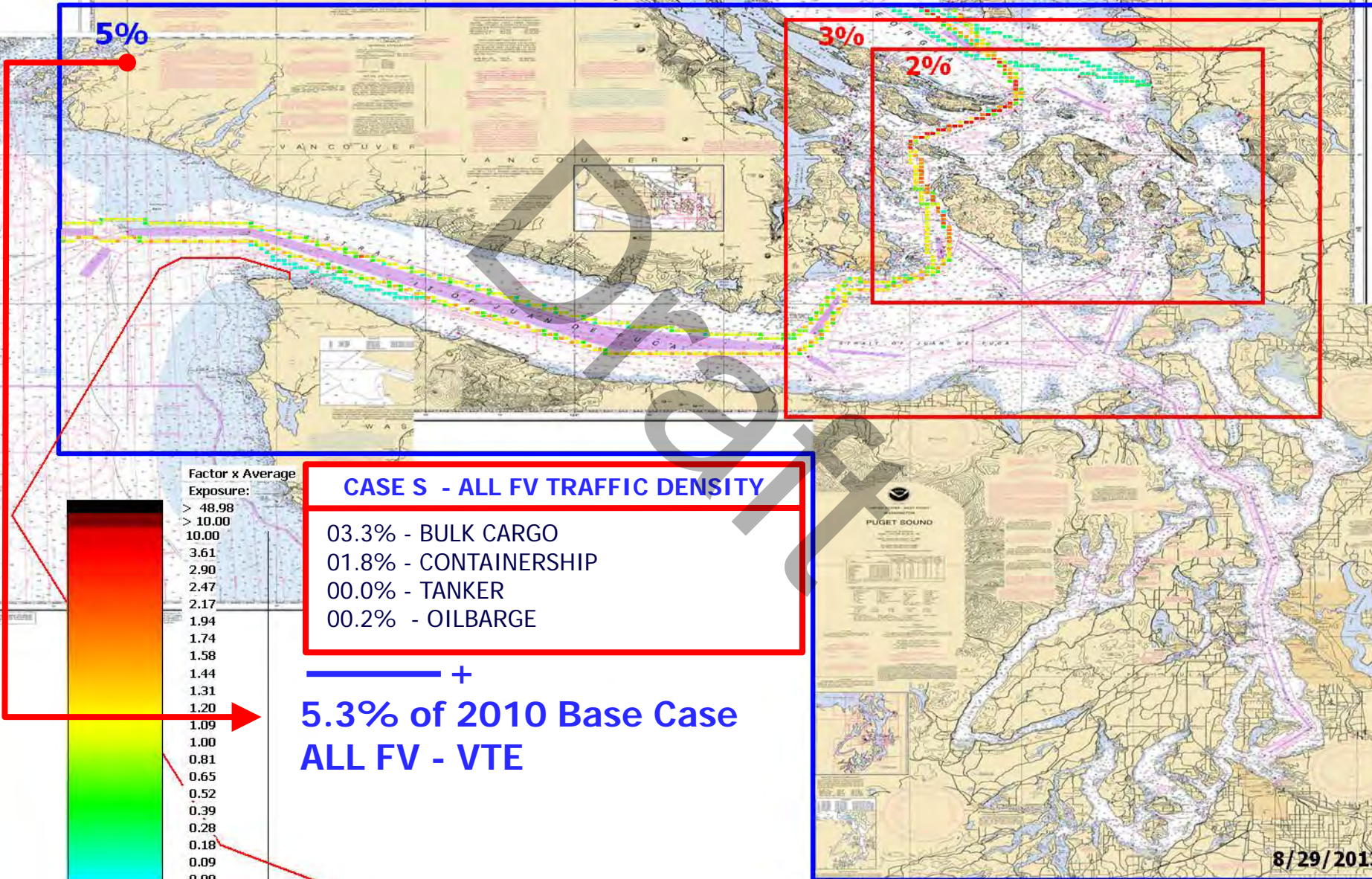
**CASE S - ALL FV TRAFFIC DENSITY**

- 32.8% - BULK CARGO
- 20.3% - CONTAINERSHIP
- 12.8% - OTHER CARGO
- 19.2% - OIL BARGE
- 08.7% - TANKER
- 03.5% - CHEMICAL CARRIER
- 02.7% - ATB
- 05.3% - WHAT-IF FV

+  
**105.3% of 2010 Base Case  
ALL FV - VTE**

# S: WHAT-IF FV TOTAL VESSEL TIME EXPOSURE (VTE)

## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



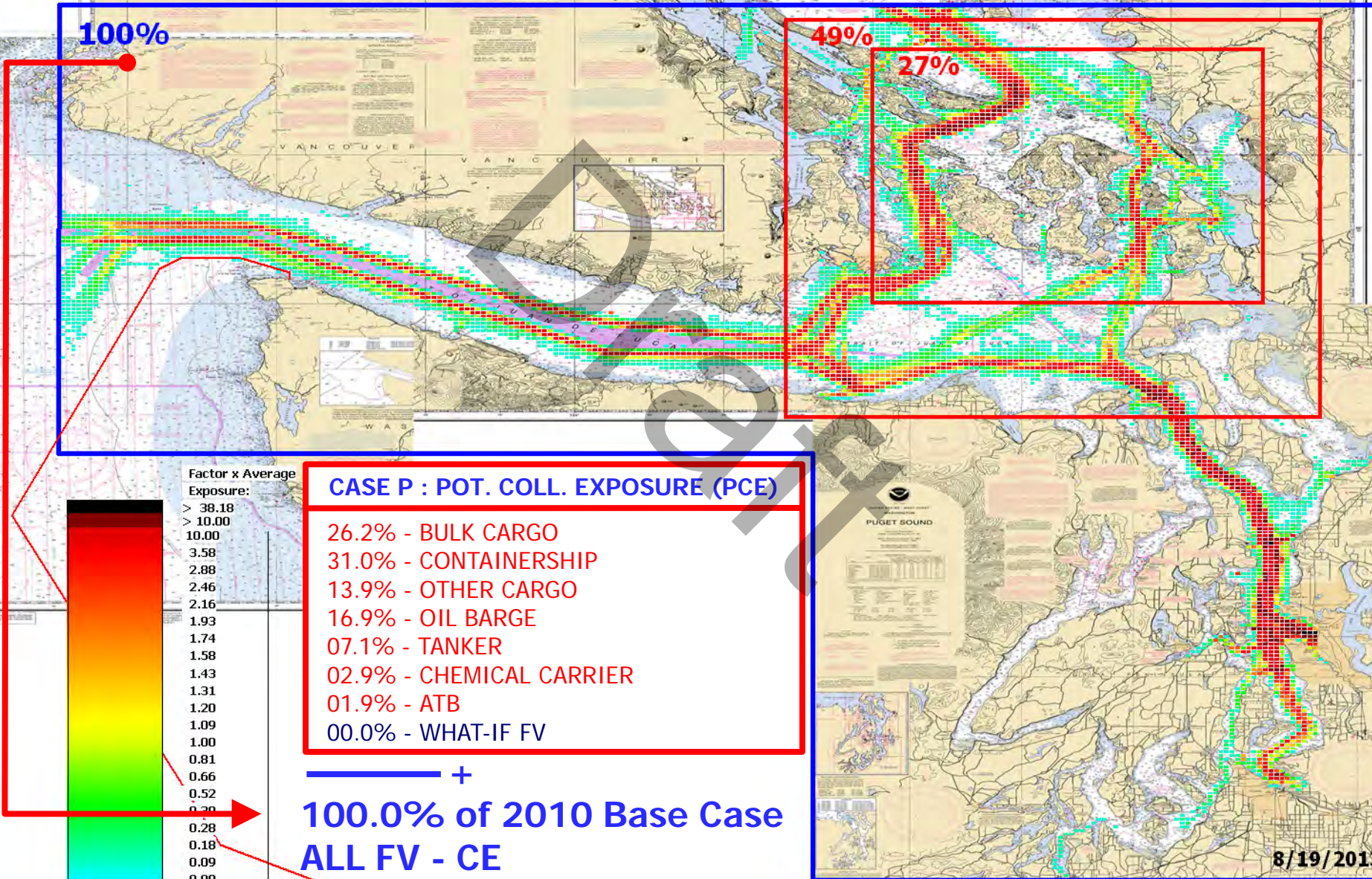
**CASE S - ALL FV TRAFFIC DENSITY**

- 03.3% - BULK CARGO
- 01.8% - CONTAINERSHIP
- 00.0% - TANKER
- 00.2% - OILBARGE

**+ 5.3% of 2010 Base Case ALL FV - VTE**

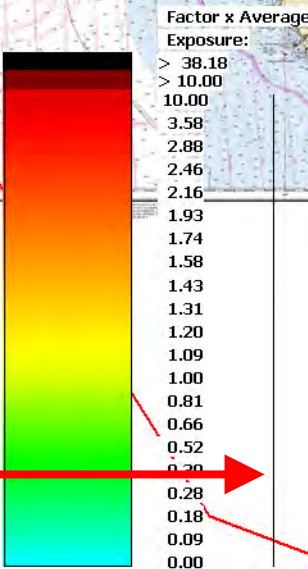
**P: ALL FV POTENTIAL COLLISION EXPOSURE (PCE)**

**P: VTRA 2010 - BASE CASE - All FV**



**CASE P : POT. COLL. EXPOSURE (PCE)**

- 26.2% - BULK CARGO
- 31.0% - CONTAINERSHIP
- 13.9% - OTHER CARGO
- 16.9% - OIL BARGE
- 07.1% - TANKER
- 02.9% - CHEMICAL CARRIER
- 01.9% - ATB
- 00.0% - WHAT-IF FV



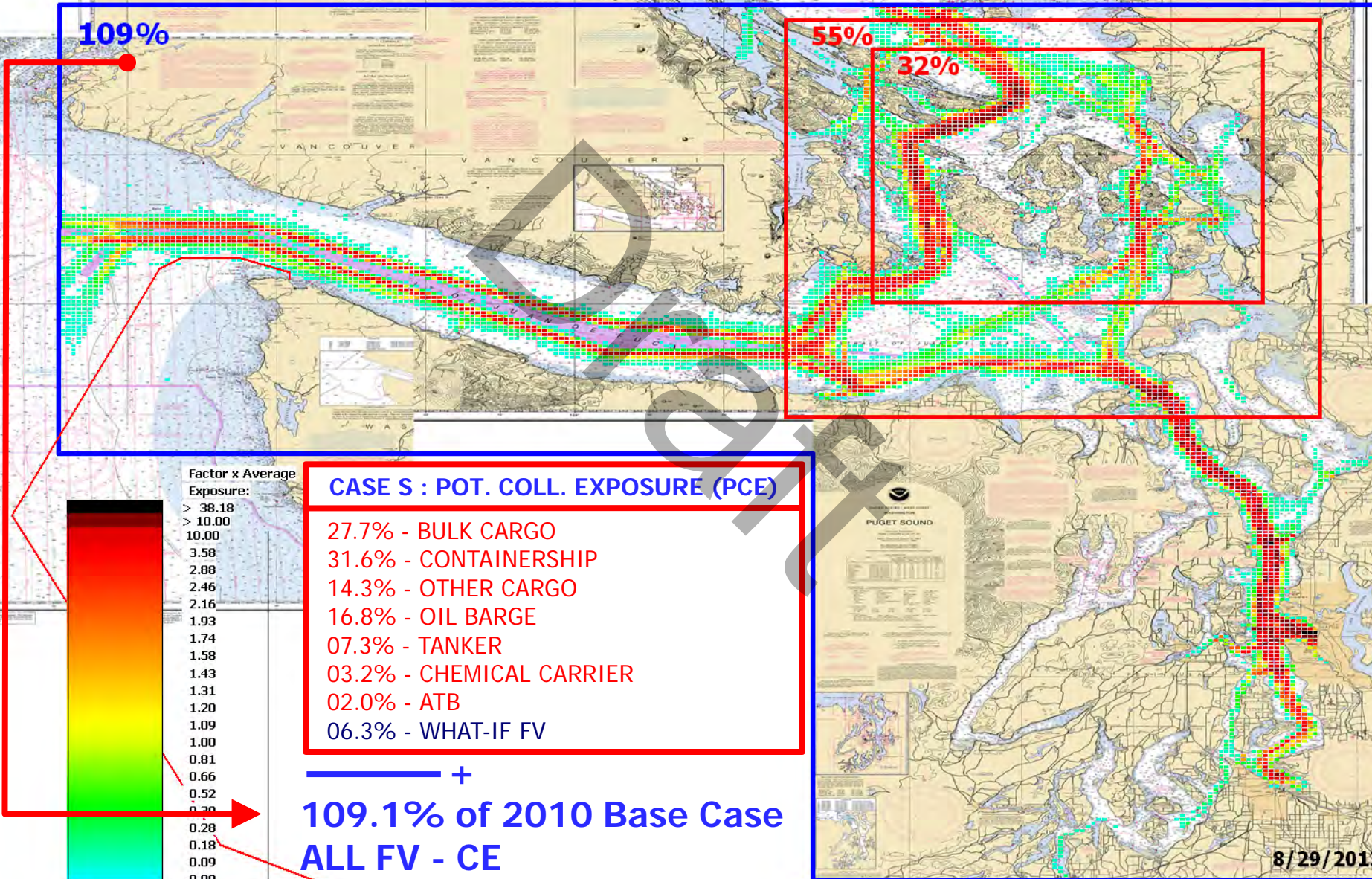
**100.0% of 2010 Base Case ALL FV - CE**



# S: All FV POTENTIAL COLLISION EXPOSURE (PCE)



## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348 - All FV



109%

55%

32%

Factor x Average Exposure:

> 38.18
> 10.00
3.58
2.88
2.46
2.16
1.93
1.74
1.58
1.43
1.31
1.20
1.09
1.00
0.81
0.66
0.52
0.39
0.28
0.18
0.09
0.00

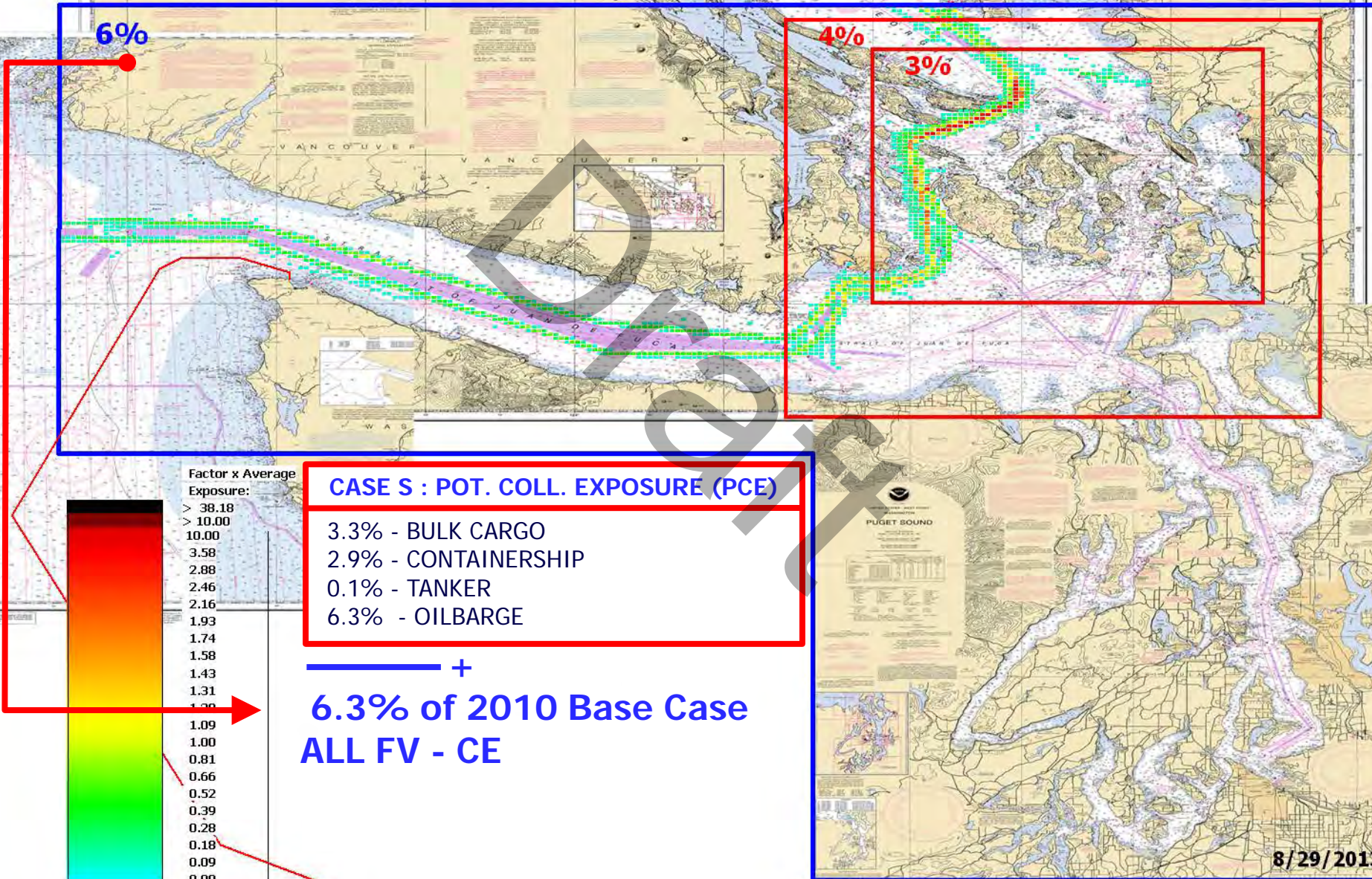
### CASE S : POT. COLL. EXPOSURE (PCE)

- 27.7% - BULK CARGO
- 31.6% - CONTAINERSHIP
- 14.3% - OTHER CARGO
- 16.8% - OIL BARGE
- 07.3% - TANKER
- 03.2% - CHEMICAL CARRIER
- 02.0% - ATB
- 06.3% - WHAT-IF FV

+  
**109.1% of 2010 Base Case**  
**ALL FV - CE**

# S: WHAT-IF FV POTENTIAL COLLISION EXPOSURE (PCE)

## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



### CASE S : POT. COLL. EXPOSURE (PCE)

- 3.3% - BULK CARGO
- 2.9% - CONTAINERSHIP
- 0.1% - TANKER
- 6.3% - OILBARGE

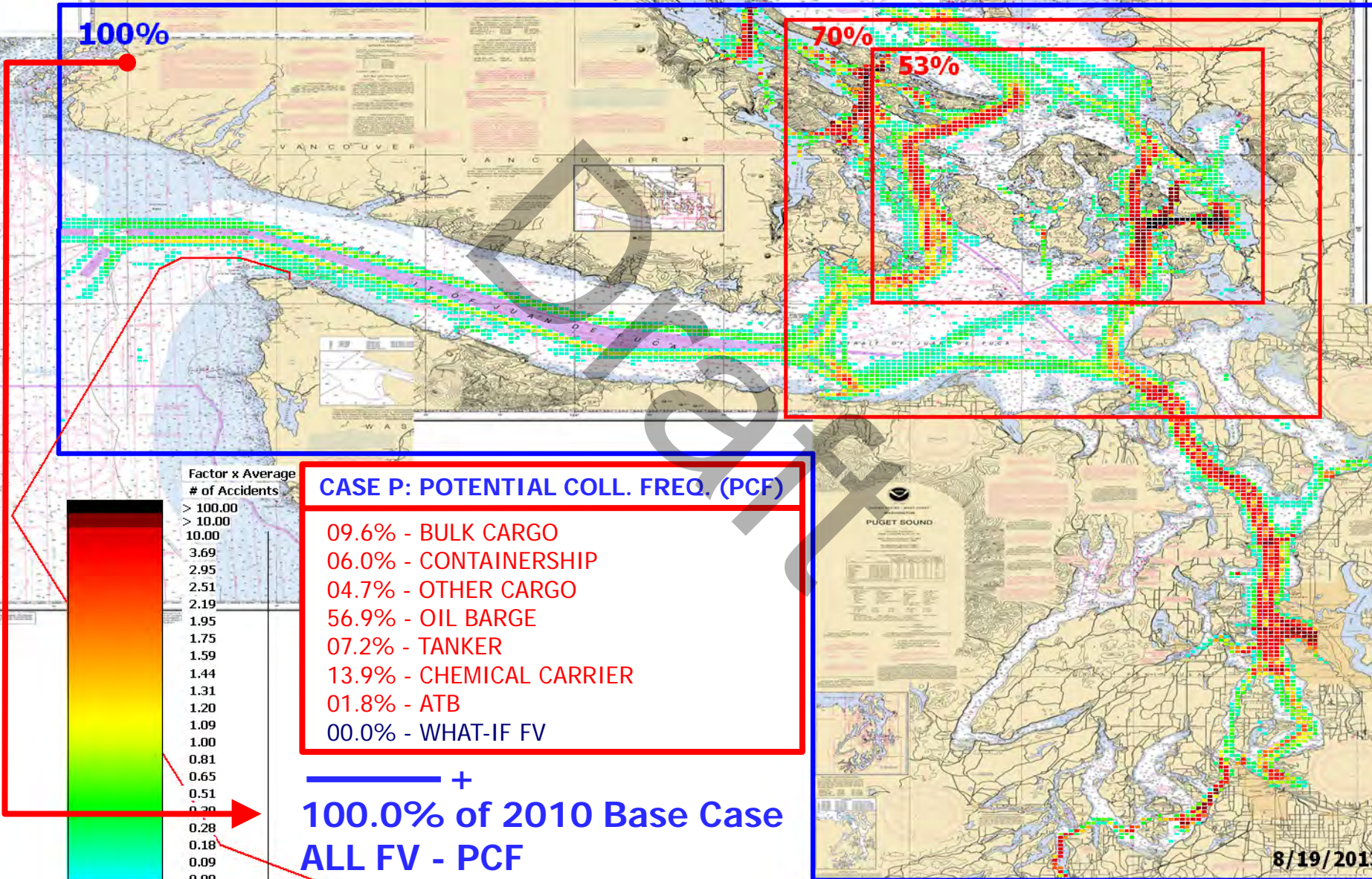
— +  
**6.3% of 2010 Base Case**  
**ALL FV - CE**

Factor x Average Exposure:

> 38.18
> 10.00
3.58
2.88
2.46
2.16
1.93
1.74
1.58
1.43
1.31
1.20
1.09
1.00
0.81
0.66
0.52
0.39
0.28
0.18
0.09
0.00

**P: ALL FV POTENTIAL COLLISION FREQUENCY (PCF)**

**P: VTRA 2010 - BASE CASE - All FV**



Factor x Average # of Accidents

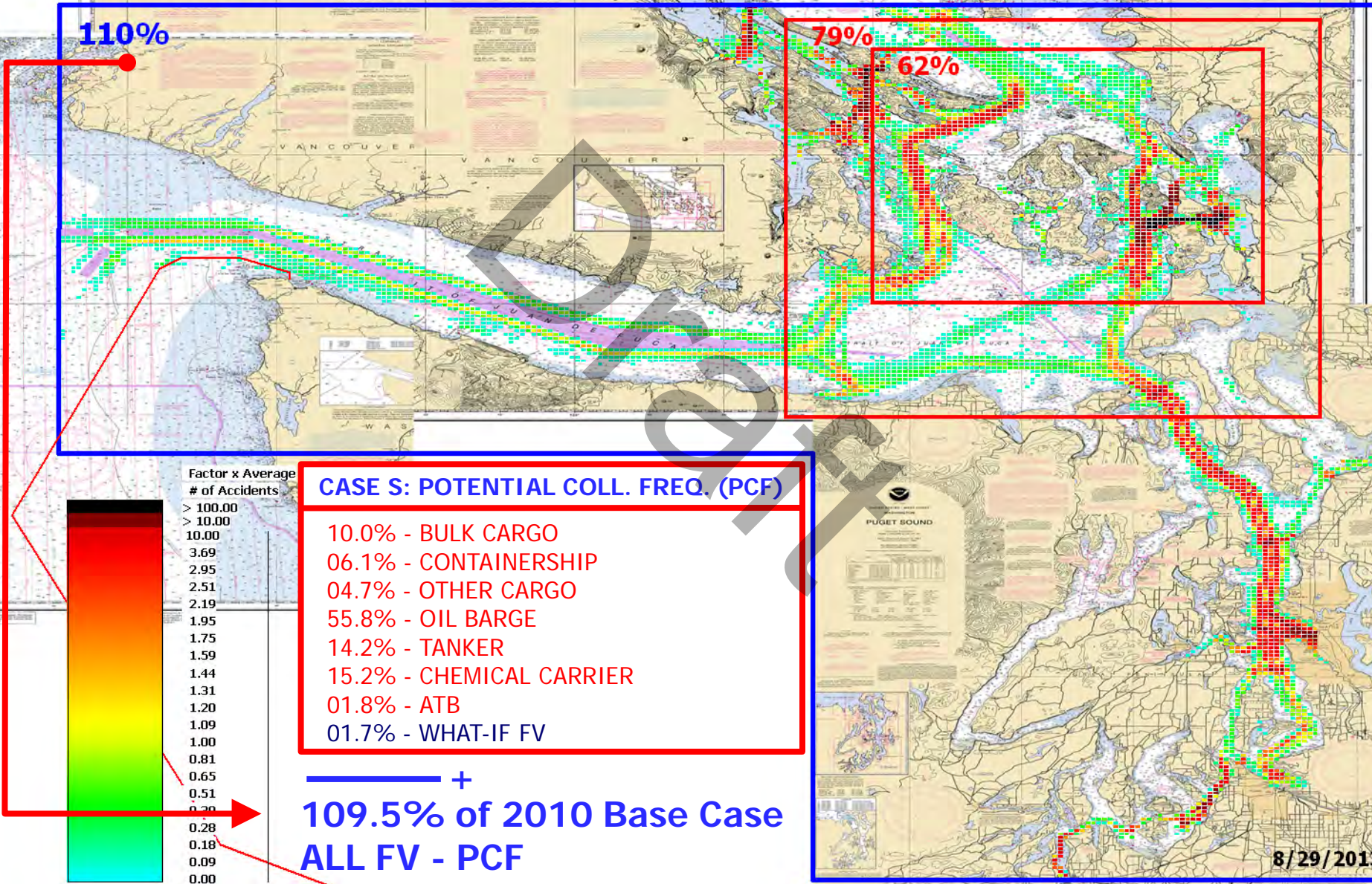
> 100.00
> 10.00
10.00
3.69
2.95
2.51
2.19
1.95
1.75
1.59
1.44
1.31
1.20
1.09
1.00
0.81
0.65
0.51
0.39
0.28
0.18
0.09
0.00

- CASE P: POTENTIAL COLL. FREQ. (PCF)**
- 09.6% - BULK CARGO
  - 06.0% - CONTAINERSHIP
  - 04.7% - OTHER CARGO
  - 56.9% - OIL BARGE
  - 07.2% - TANKER
  - 13.9% - CHEMICAL CARRIER
  - 01.8% - ATB
  - 00.0% - WHAT-IF FV

**100.0% of 2010 Base Case ALL FV - PCF**

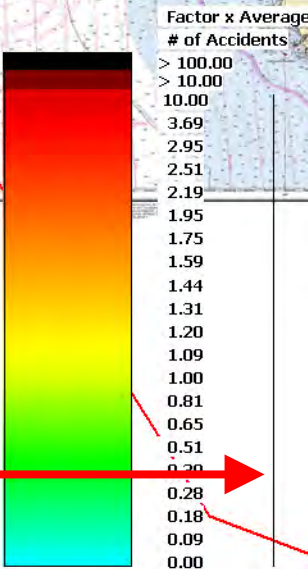
**S: ALL FV POTENTIAL COLLISION FREQUENCY (PCF)**

**S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348 - All FV**



**CASE S: POTENTIAL COLL. FREQ. (PCF)**

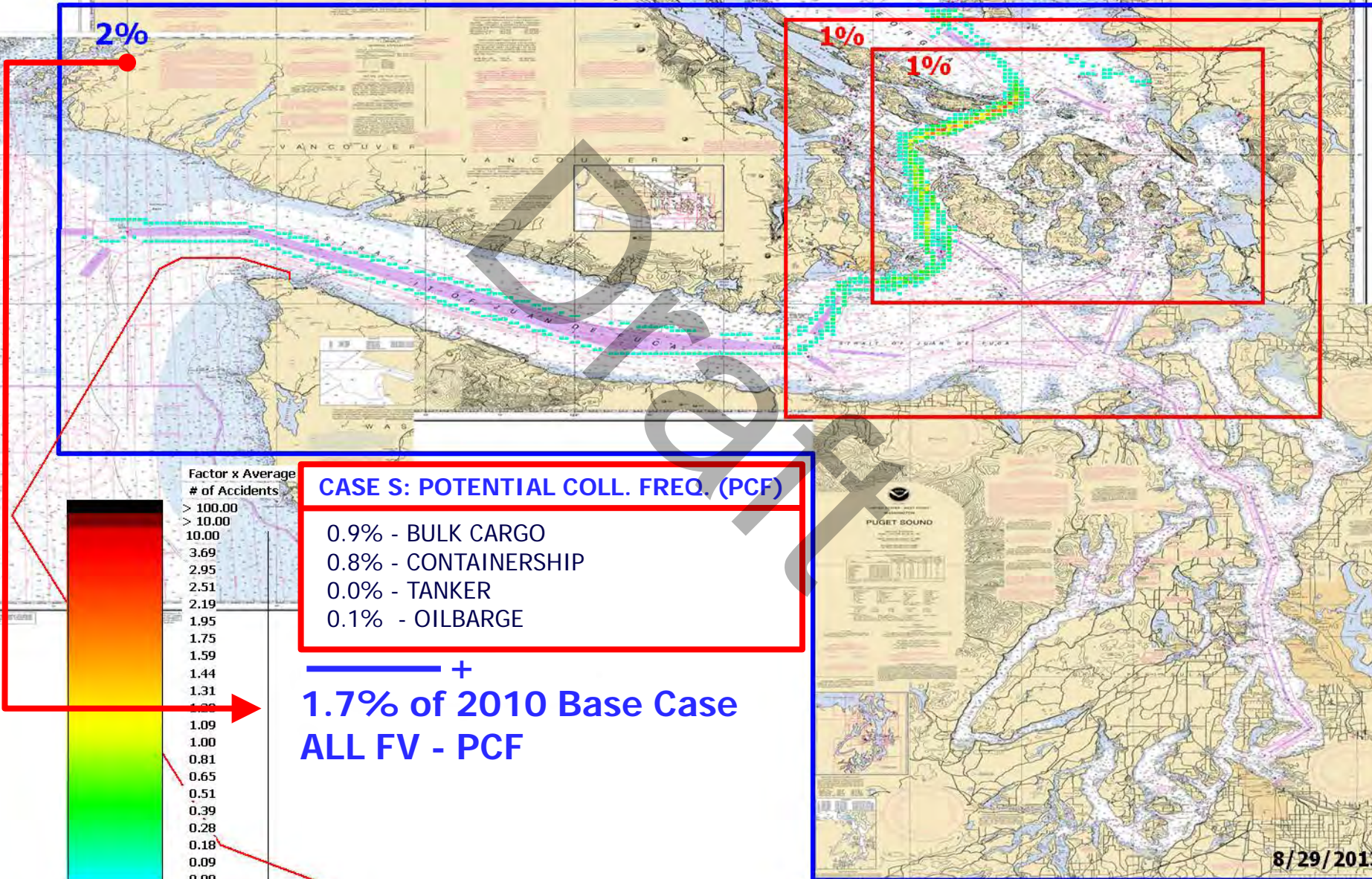
- 10.0% - BULK CARGO
- 06.1% - CONTAINERSHIP
- 04.7% - OTHER CARGO
- 55.8% - OIL BARGE
- 14.2% - TANKER
- 15.2% - CHEMICAL CARRIER
- 01.8% - ATB
- 01.7% - WHAT-IF FV



**109.5% of 2010 Base Case ALL FV - PCF**

# S: WHAT-IF FV POTENTIAL COLLISION FREQUENCY (PCF)

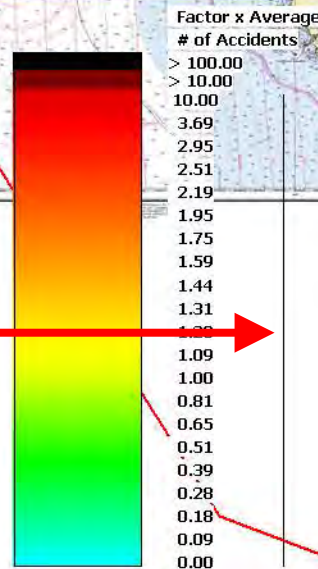
## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



**CASE S: POTENTIAL COLL. FREQ. (PCF)**

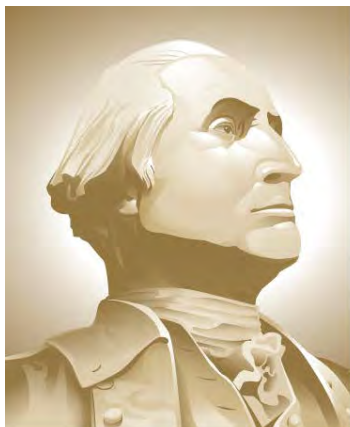
- 0.9% - BULK CARGO
- 0.8% - CONTAINERSHIP
- 0.0% - TANKER
- 0.1% - OILBARGE

**+  
1.7% of 2010 Base Case  
ALL FV - PCF**



# **VTRA 2010 CASE S RESULTS – COLLISION OIL (CARGO + FUEL), CARGO AND FUEL OIL GEOGRAPHIC PROFILES**

Presentation by: J. Rene van Dorp



**THE GEORGE  
WASHINGTON  
UNIVERSITY**

WASHINGTON, DC

**VCU**

**CASE S: Delta Port 415 + Bunkering Operations**

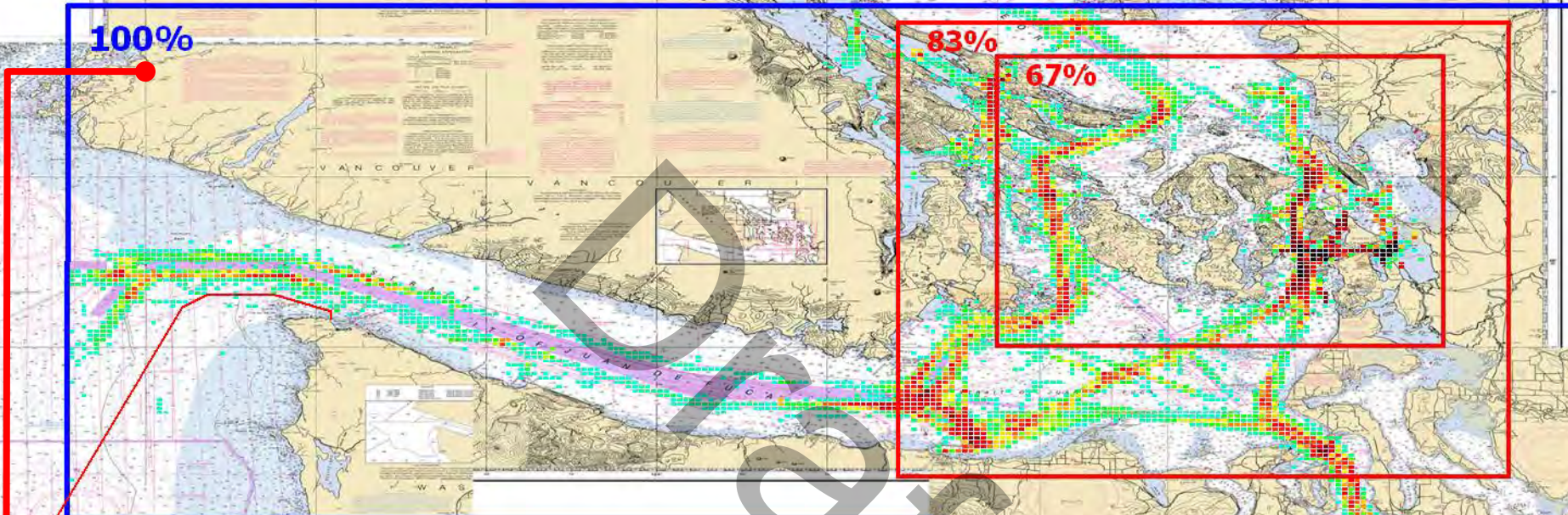
**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

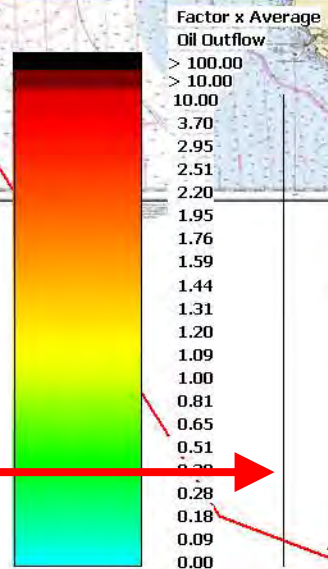
**AUGUST 31, 2013**

**P: ALL FV POTENTIAL COLLISION OIL (FUEL + CARGO) LOSS (PCO)**

**P: VTRA 2010 - BASE CASE - All FV**



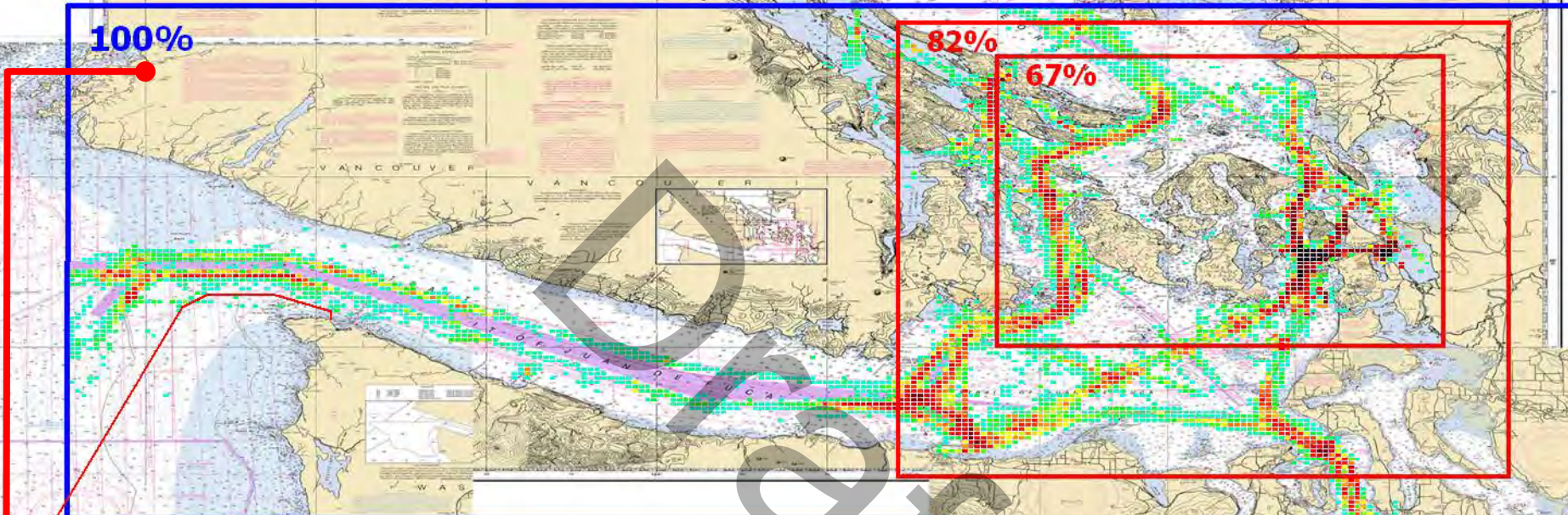
- P: POTENTIAL COLL. OIL LOSS (PCO)**
- 03.0% - BULK CARGO
  - 04.1% - CONTAINERSHIP
  - 01.4% - OTHER CARGO
  - 21.4% - OIL BARGE
  - 54.2% - TANKER
  - 13.3% - CHEMICAL CARRIER
  - 02.6% - ATB
  - 00.0% - WHAT-IF FV



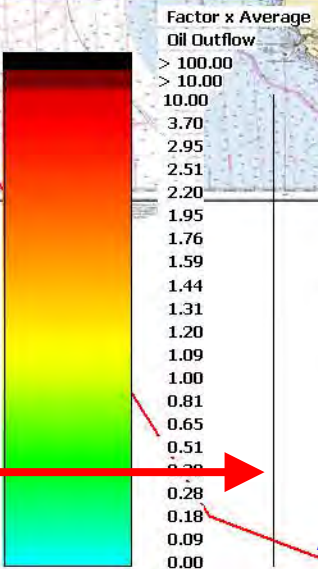
**100.0% of 2010 Base Case ALL FV – PCO**

**S: ALL FV POTENTIAL COLLISION OIL (FUEL + CARGO) LOSS (PCO)**

**S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348 - All FV**



- S: POTENTIAL COLL. OIL LOSS (PCO)**
- 03.6% - BULK CARGO
  - 04.2% - CONTAINERSHIP
  - 01.5% - OTHER CARGO
  - 17.2% - OIL BARGE
  - 61.0% - TANKER
  - 06.9% - CHEMICAL CARRIER
  - 03.8% - ATB
  - 01.4% - WHAT-IF FV

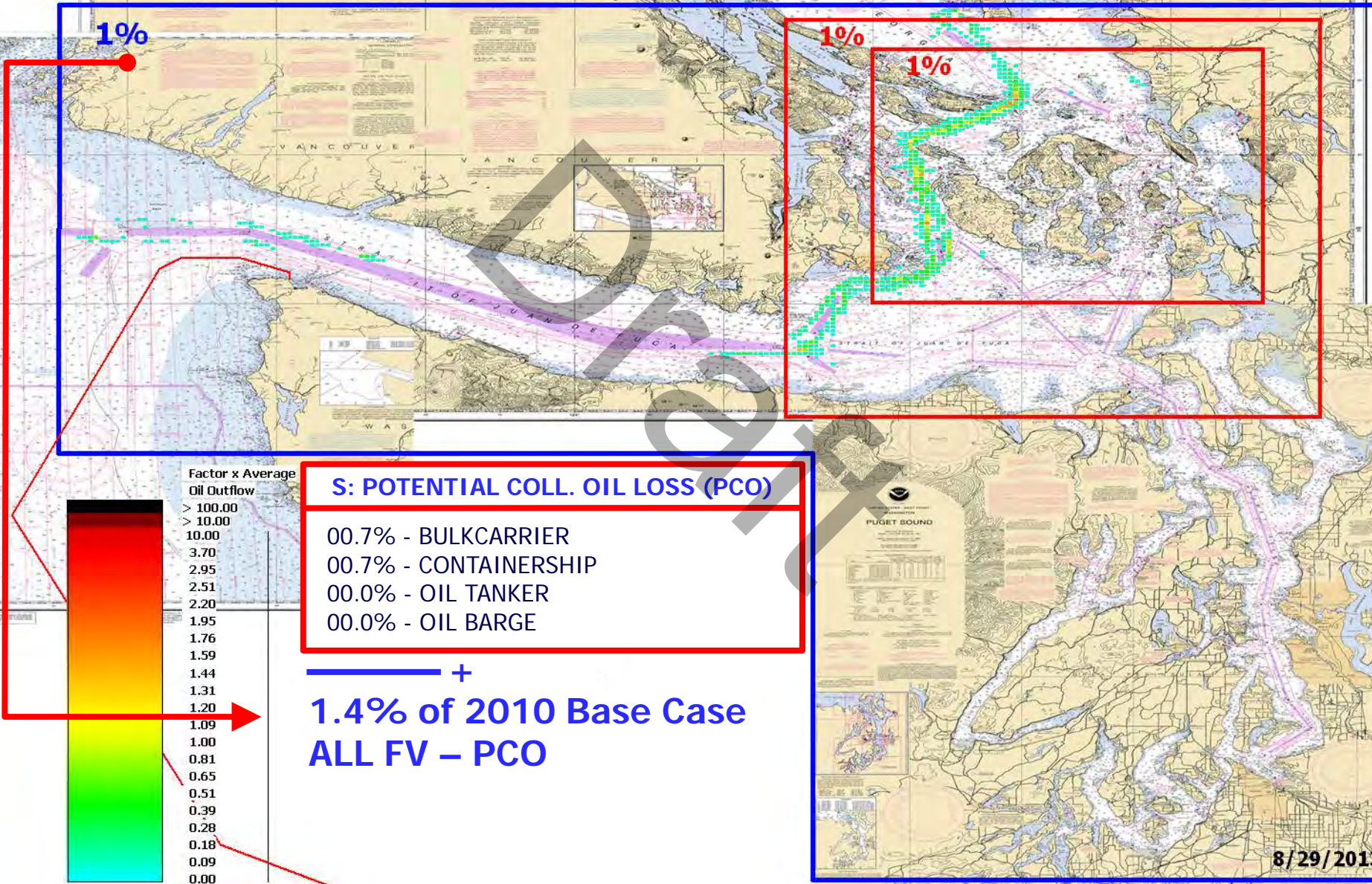


**99.6% of 2010 Base Case ALL FV - PCO**



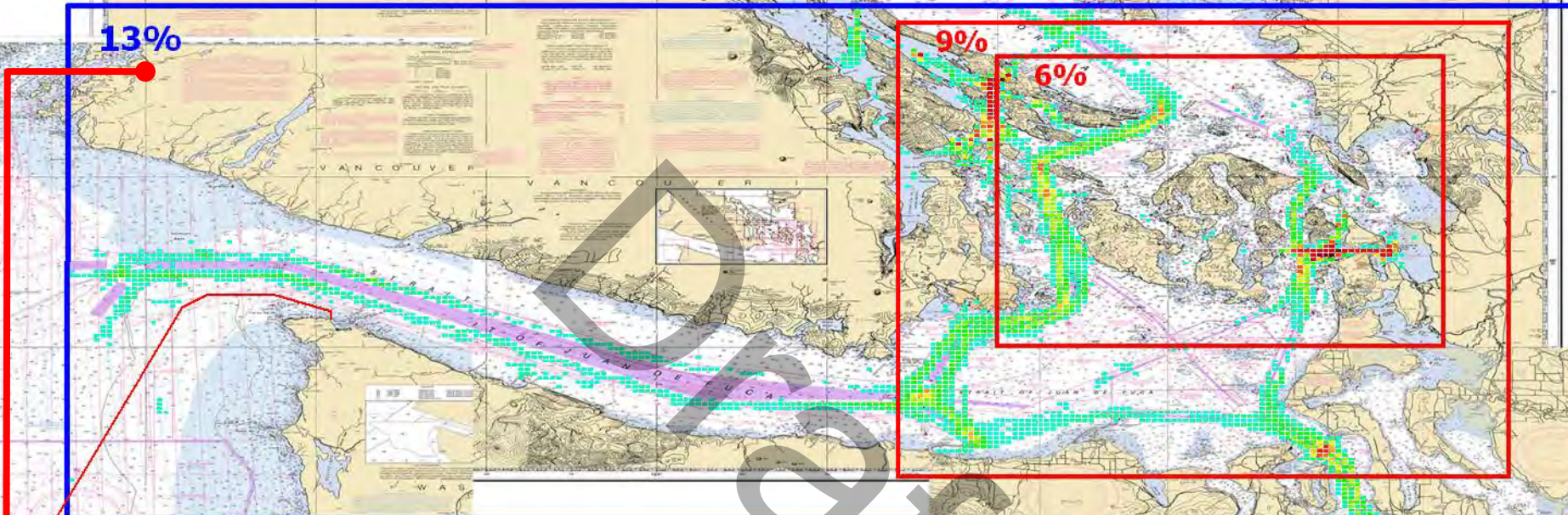
**S: WHAT-IF FV POTENTIAL COLLISION OIL (FUEL+CARGO) LOSS (PCO)**

**S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348**

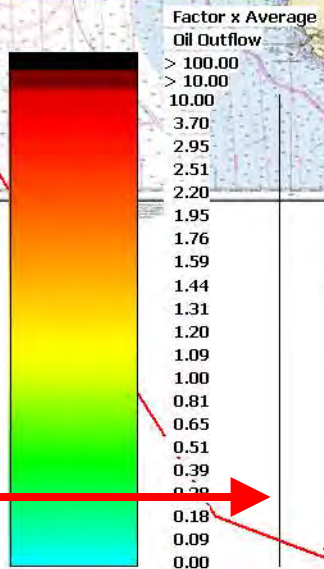


**P: ALL FV POTENTIAL COLLISION FUEL OIL LOSS (PCFO)**

**P: VTRA 2010 - BASE CASE**



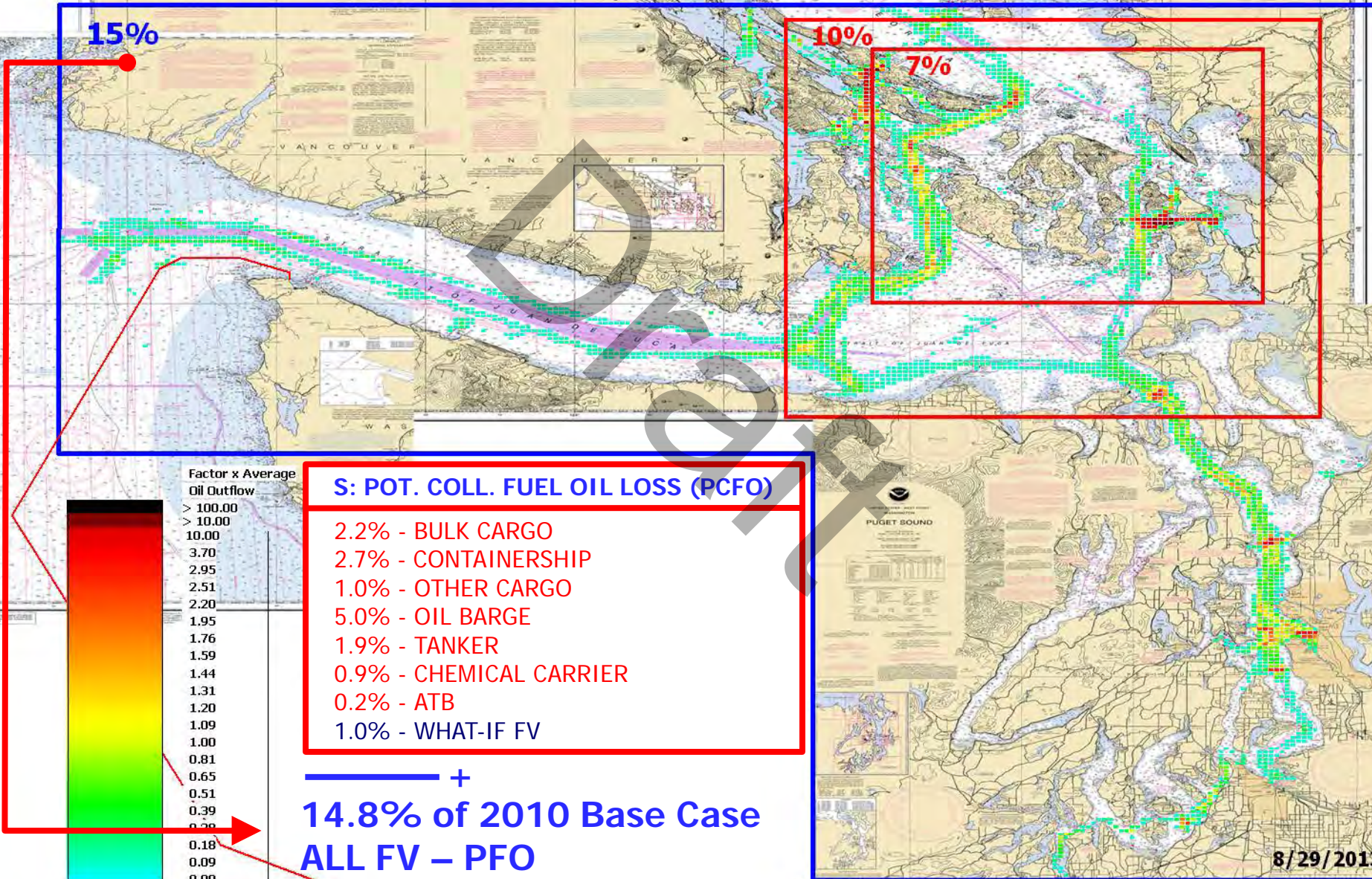
- P: POT. COLL. FUEL OIL LOSS (PCFO)**
- 2.1% - BULK CARGO
  - 2.6% - CONTAINERSHIP
  - 1.0% - OTHER CARGO
  - 5.0% - OIL BARGE
  - 1.2% - TANKER
  - 1.0% - CHEMICAL CARRIER
  - 0.2% - ATB
  - 0.0% - WHAT-IF FV



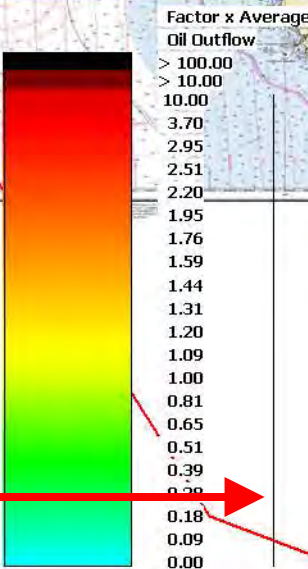
**13.2% of 2010 Base Case ALL FV – PCO**

**S: ALL FV POTENTIAL COLLISION FUEL OIL LOSS (PCFO)**

**S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348**



- S: POT. COLL. FUEL OIL LOSS (PCFO)**
- 2.2% - BULK CARGO
  - 2.7% - CONTAINERSHIP
  - 1.0% - OTHER CARGO
  - 5.0% - OIL BARGE
  - 1.9% - TANKER
  - 0.9% - CHEMICAL CARRIER
  - 0.2% - ATB
  - 1.0% - WHAT-IF FV

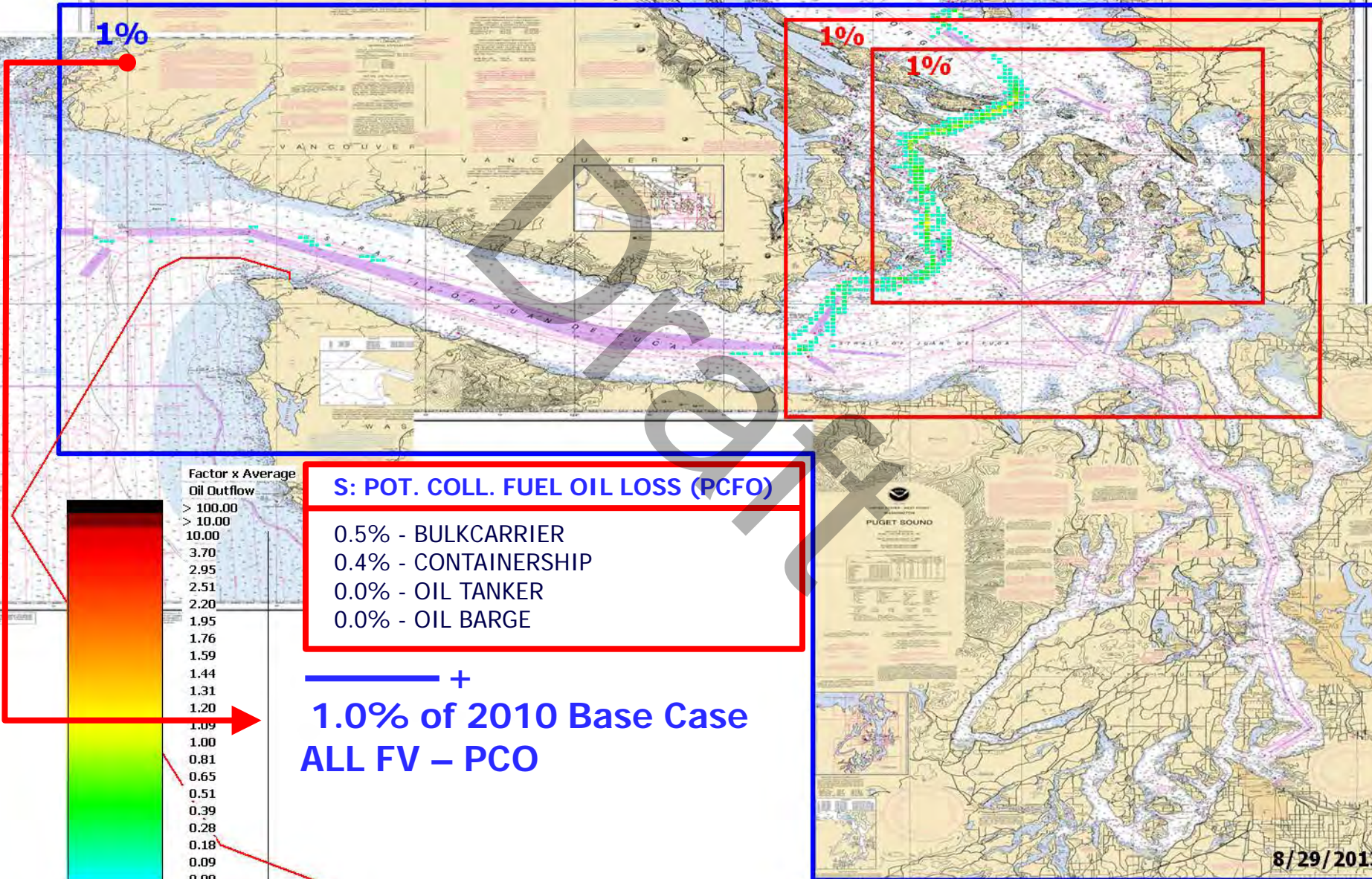


**14.8% of 2010 Base Case ALL FV – PFO**

# S: WHAT-IF FV POTENTIAL COLLISION FUEL OIL LOSS (PCFO)



## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



1%

1%

1%

Factor x Average Oil Outflow

> 100.00
> 10.00
10.00
3.70
2.95
2.51
2.20
1.95
1.76
1.59
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

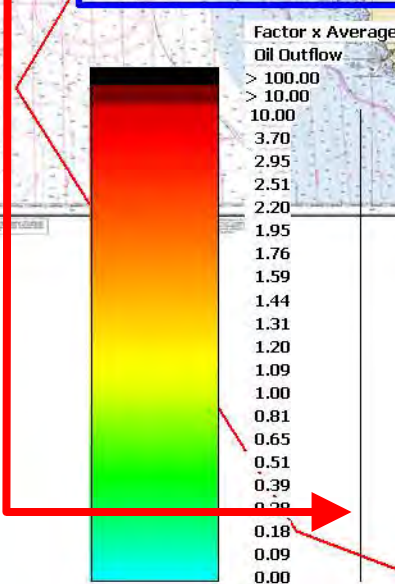
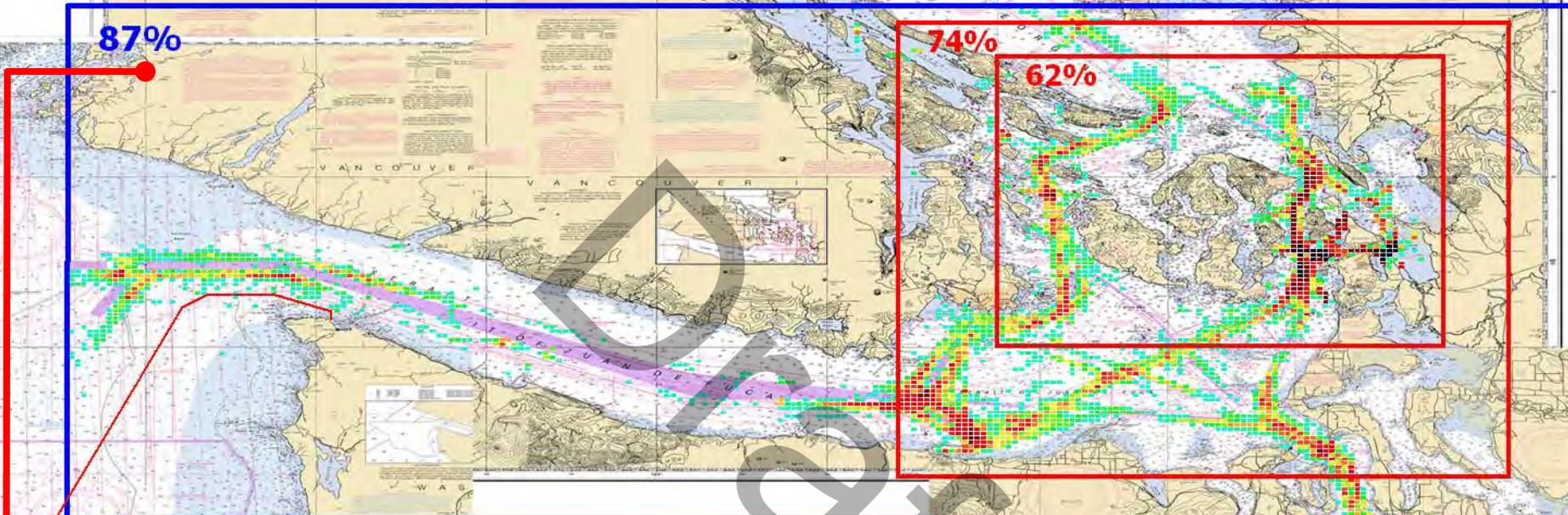
### S: POT. COLL. FUEL OIL LOSS (PCFO)

- 0.5% - BULKCARRIER
- 0.4% - CONTAINERSHIP
- 0.0% - OIL TANKER
- 0.0% - OIL BARGE

— +  
**1.0% of 2010 Base Case**  
**ALL FV – PCO**

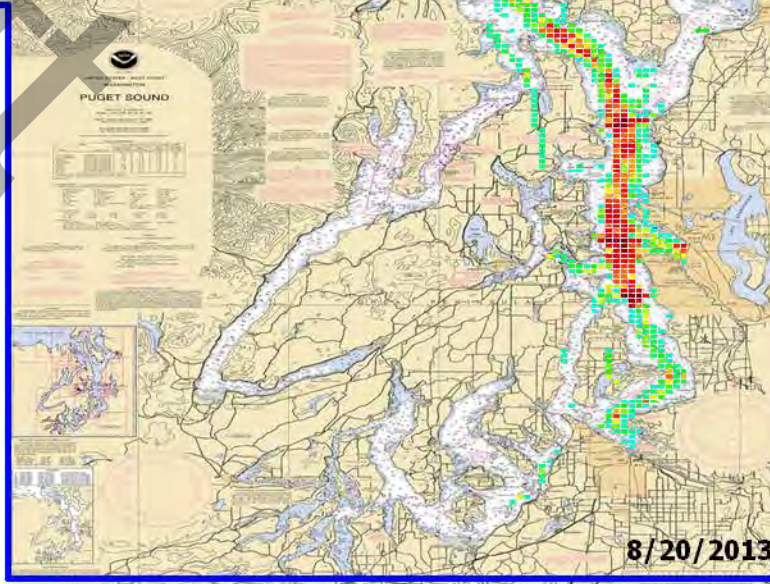
**P: ALL FV POTENTIAL COLLISION CARGO OIL LOSS (PCCO)**

**P: VTRA 2010 - BASE CASE**



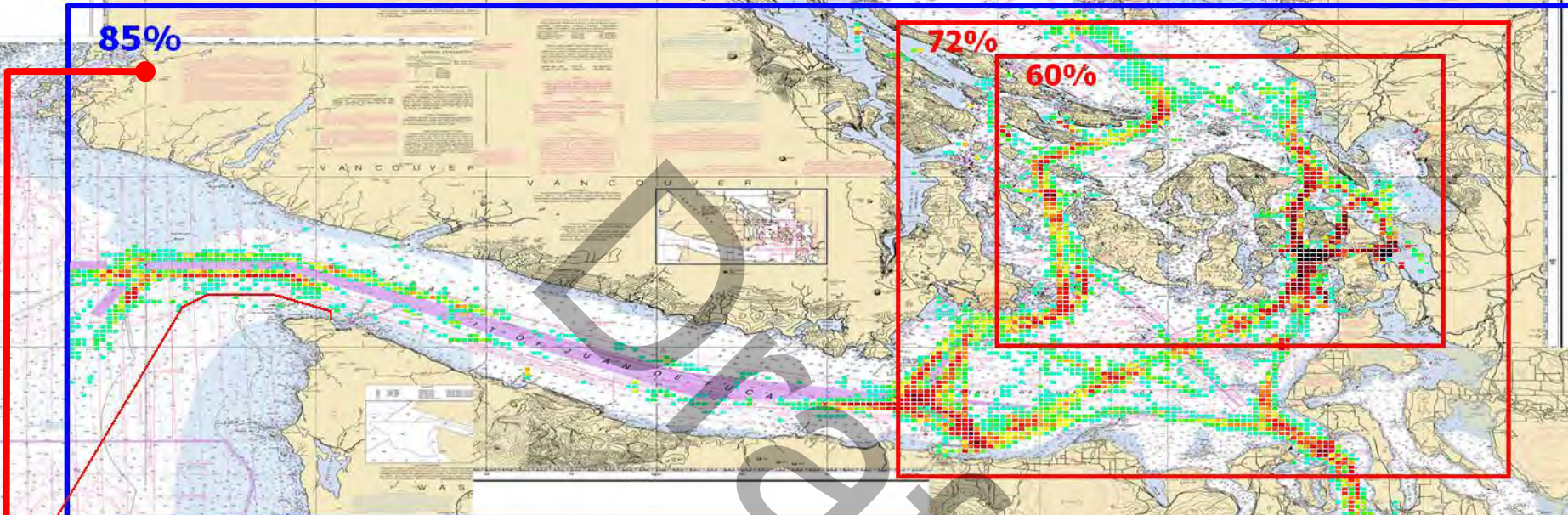
- P: POT. COLL. CARGO OIL LOSS (PCCO)**
- 00.9% - BULK CARGO
  - 01.5% - CONTAINERSHIP
  - 00.5% - OTHER CARGO
  - 16.3% - OIL BARGE
  - 52.9% - TANKER
  - 12.4% - CHEMICAL CARRIER
  - 02.3% - ATB
  - 00.0% - WHAT-IF FV

**86.8% of 2010 Base Case ALL FV - PCO**

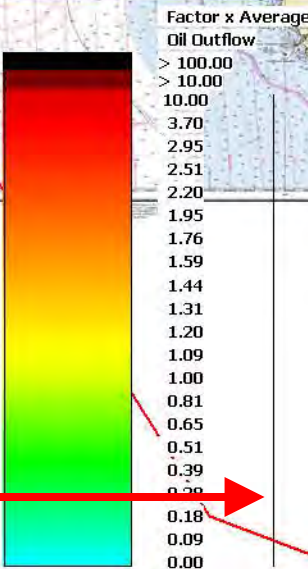


**S: ALL FV POTENTIAL COLLISION CARGO OIL LOSS (PCCO)**

**S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348**



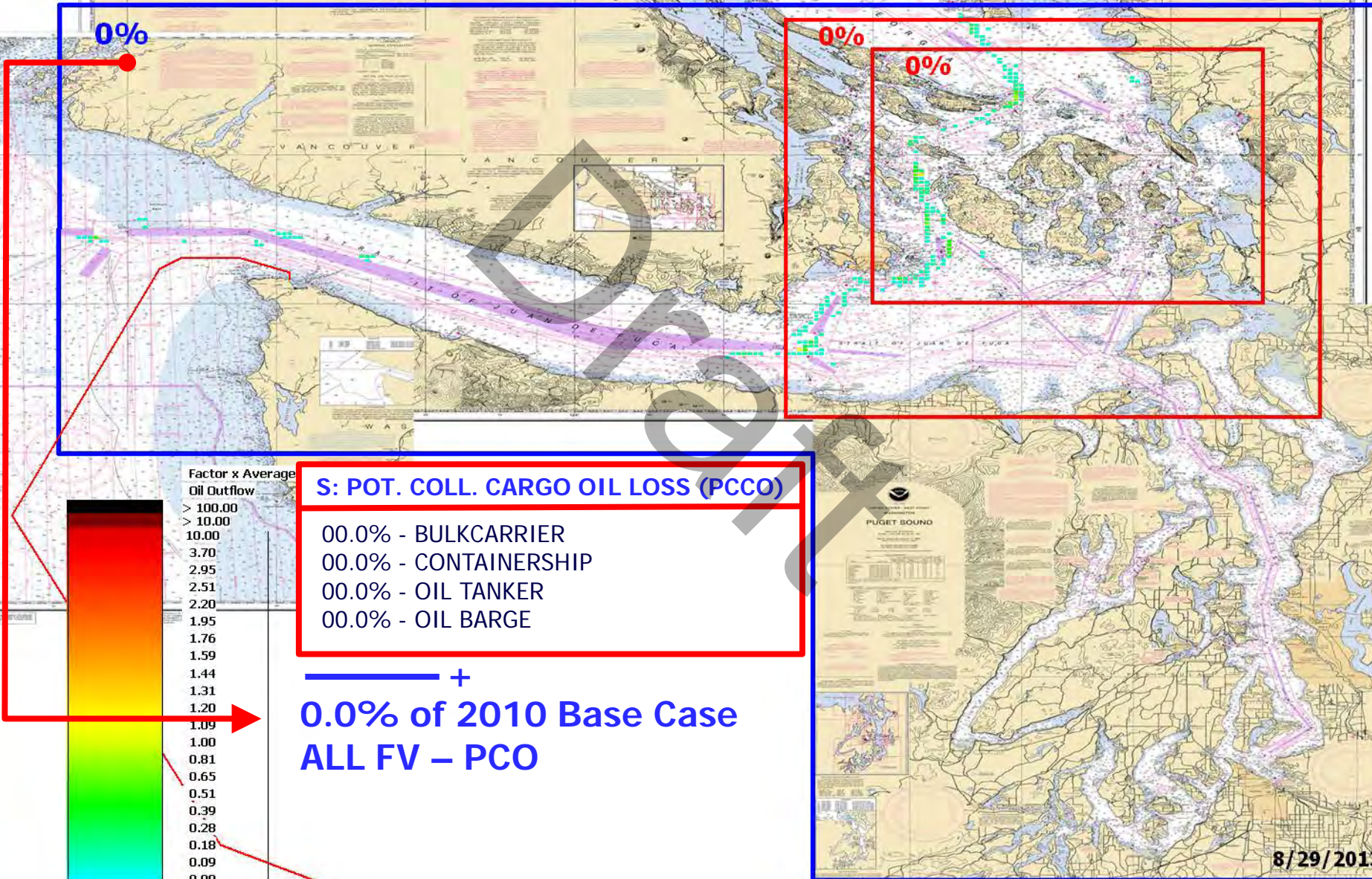
- S: POT. COLL. CARGO OIL LOSS (PCCO)**
- 01.4% - BULK CARGO
  - 01.6% - CONTAINERSHIP
  - 00.5% - OTHER CARGO
  - 12.2% - OIL BARGE
  - 59.1% - TANKER
  - 06.0% - CHEMICAL CARRIER
  - 03.5% - ATB
  - 00.4% - WHAT-IF FV



**84.8% of 2010 Base Case ALL FV – PCO**

# S: WHAT-IF FV POTENTIAL COLLISION CARGO OIL LOSS (PCCO)

## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



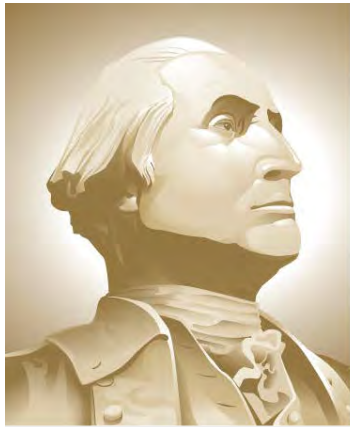
### S: POT. COLL. CARGO OIL LOSS (PCCO)

- 00.0% - BULKCARRIER
- 00.0% - CONTAINERSHIP
- 00.0% - OIL TANKER
- 00.0% - OIL BARGE

— +  
**0.0% of 2010 Base Case**  
**ALL FV - PCO**

# VTRA 2010 CASE S RESULTS – GROUNDING EXPOSURE AND ACCIDENT GEOGRAPHIC PROFILES

Presentation by: J. Rene van Dorp



THE GEORGE  
WASHINGTON  
UNIVERSITY

WASHINGTON, DC

VCU

**CASE S: Delta Port 415 + Bunkering Operations**

**GWU Personnel:** Dr. J. Rene van Dorp

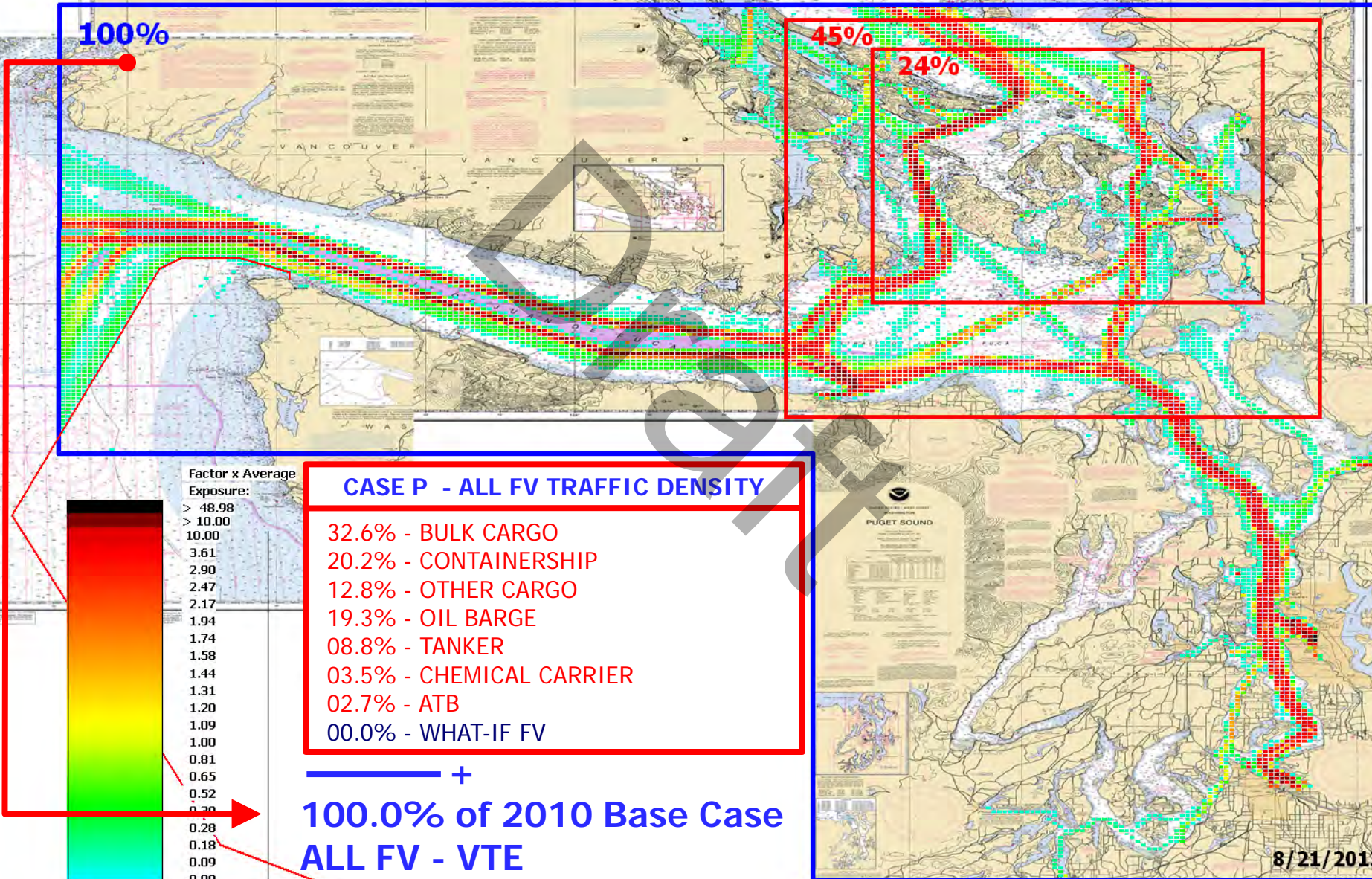
**VCU Personnel:** Dr. Jason R. W. Merrick

**AUGUST 31, 2013**



**P: All FV TOTAL VESSEL TIME EXPOSURE (VTE)**

**P: VTRA 2010 - BASE CASE - All FV**



100%

45%

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**

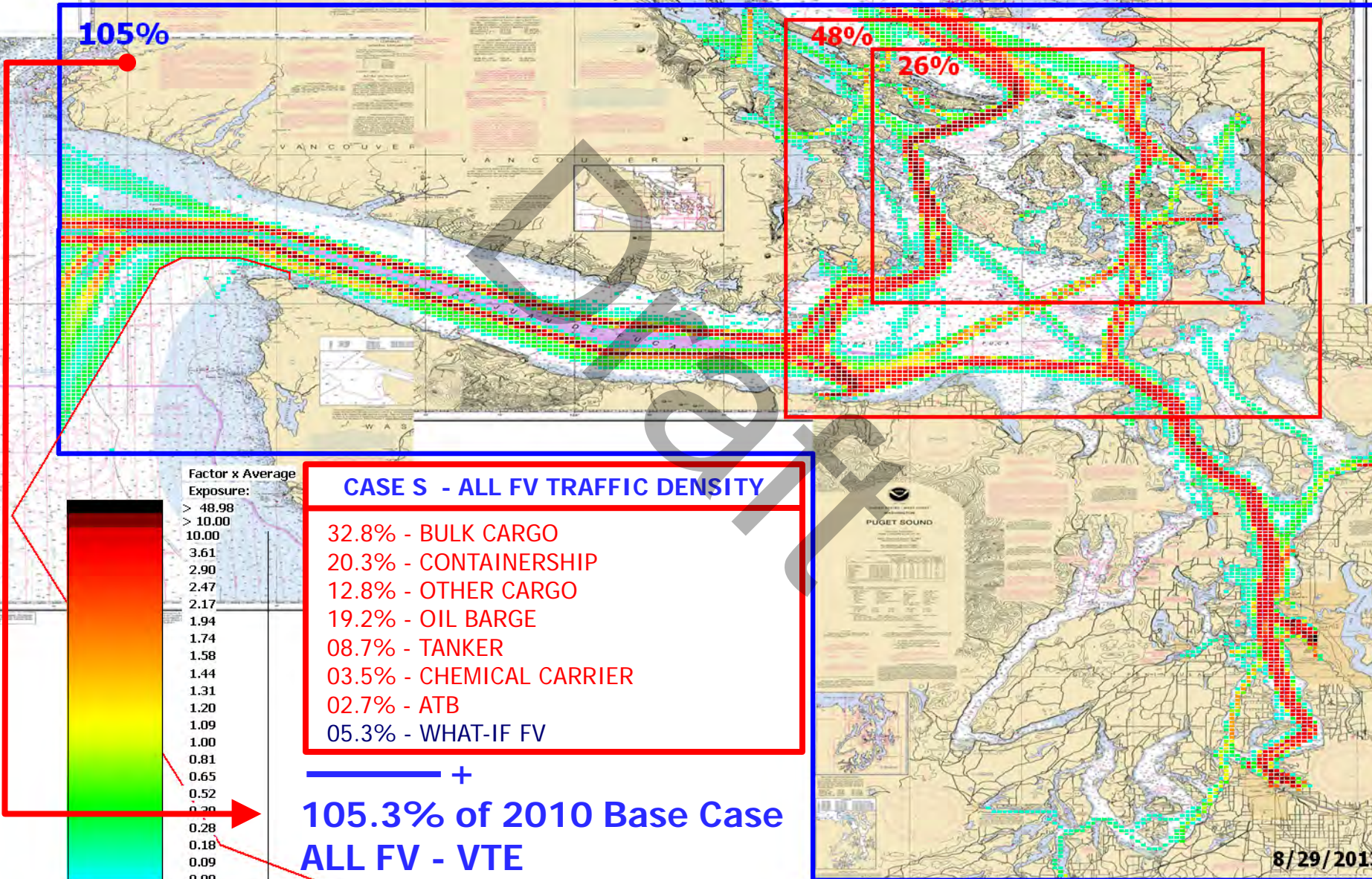
- 32.6% - BULK CARGO
- 20.2% - CONTAINERSHIP
- 12.8% - OTHER CARGO
- 19.3% - OIL BARGE
- 08.8% - TANKER
- 03.5% - CHEMICAL CARRIER
- 02.7% - ATB
- 00.0% - WHAT-IF FV

+

**100.0% of 2010 Base Case  
ALL FV - VTE**

# S: All FV TOTAL VESSEL TIME EXPOSURE (VTE)

S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348 - All FV



105%

48%

26%

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 S - ALL FV TRAFFIC DENSITY**

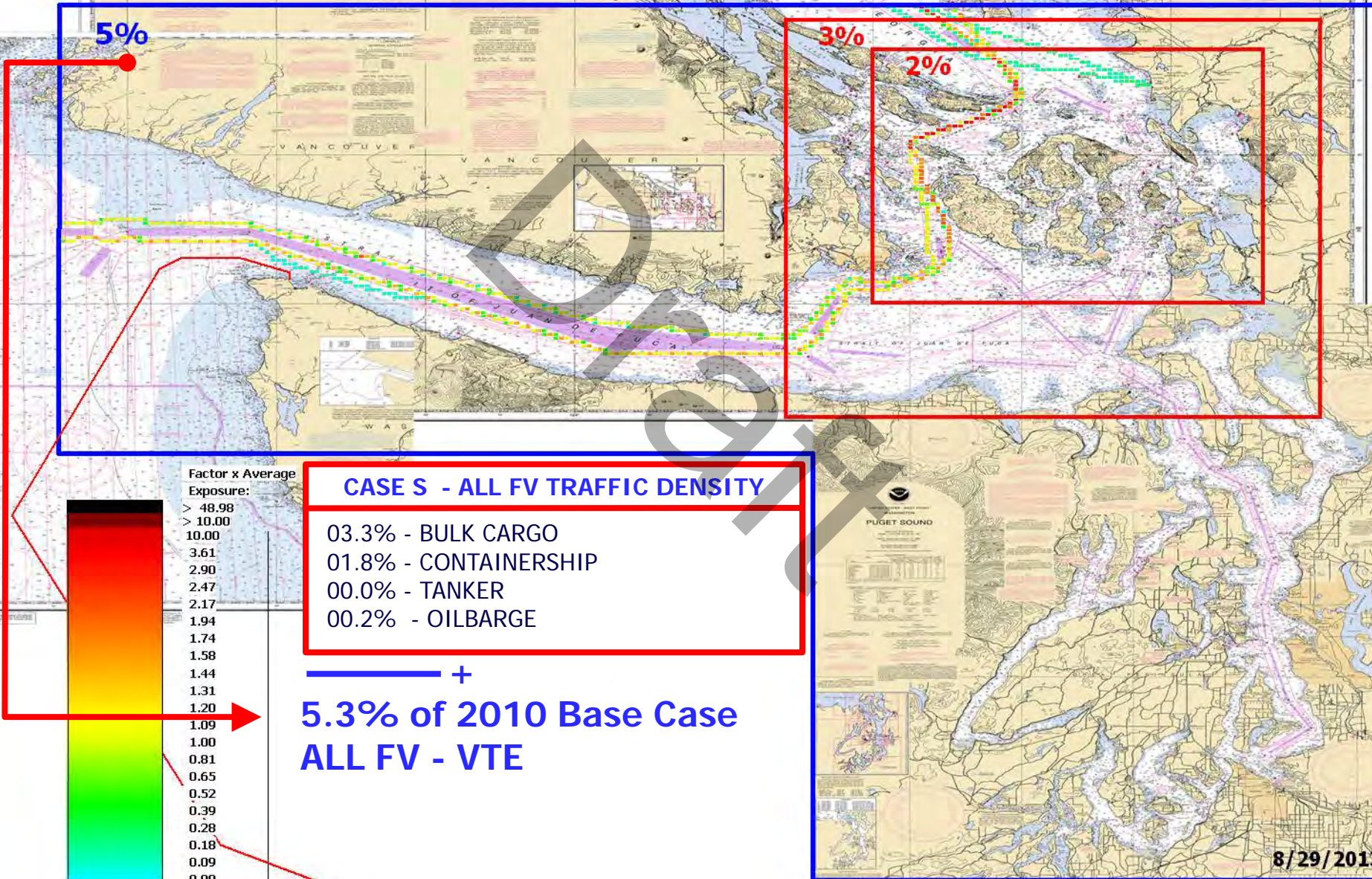
- 32.8% - BULK CARGO
- 20.3% - CONTAINERSHIP
- 12.8% - OTHER CARGO
- 19.2% - OIL BARGE
- 08.7% - TANKER
- 03.5% - CHEMICAL CARRIER
- 02.7% - ATB
- 05.3% - WHAT-IF FV

+  
**105.3% of 2010 Base Case  
ALL FV - VTE**

# S: WHAT-IF FV TOTAL VESSEL TIME EXPOSURE (VTE)

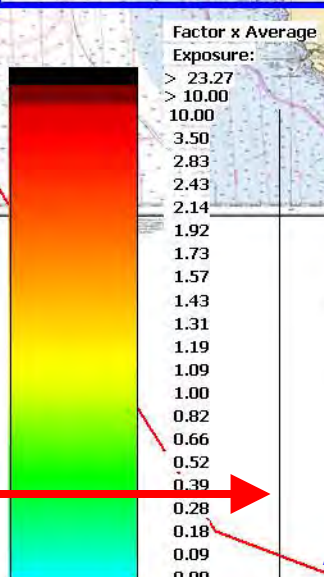
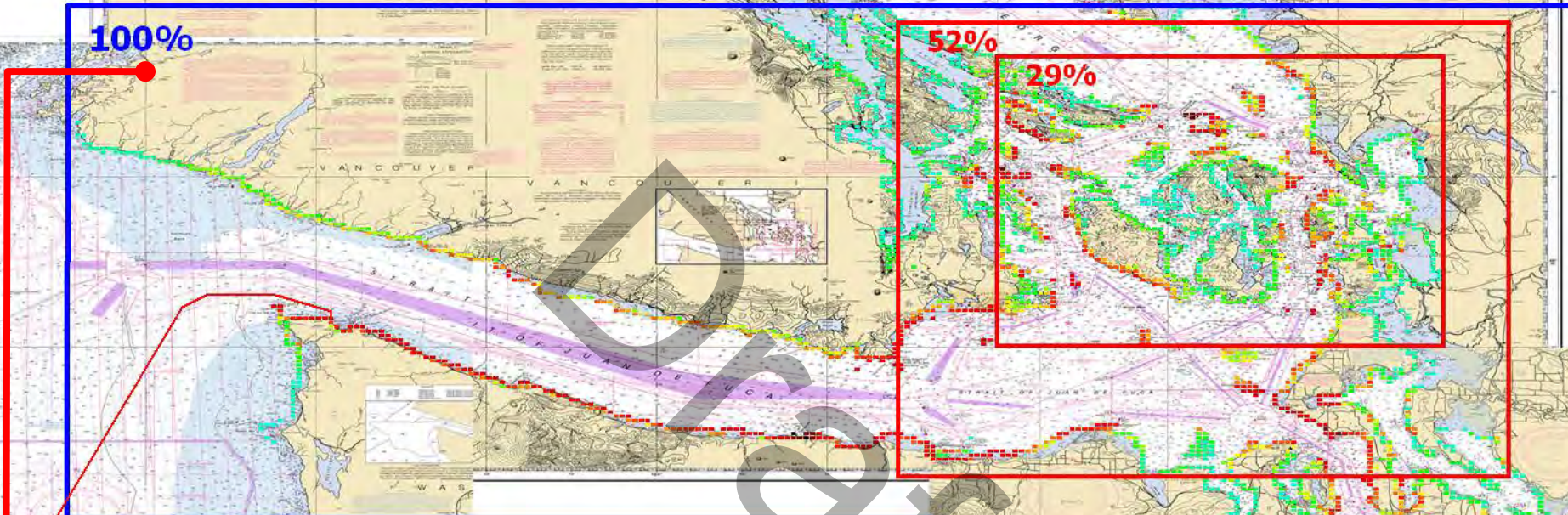


## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



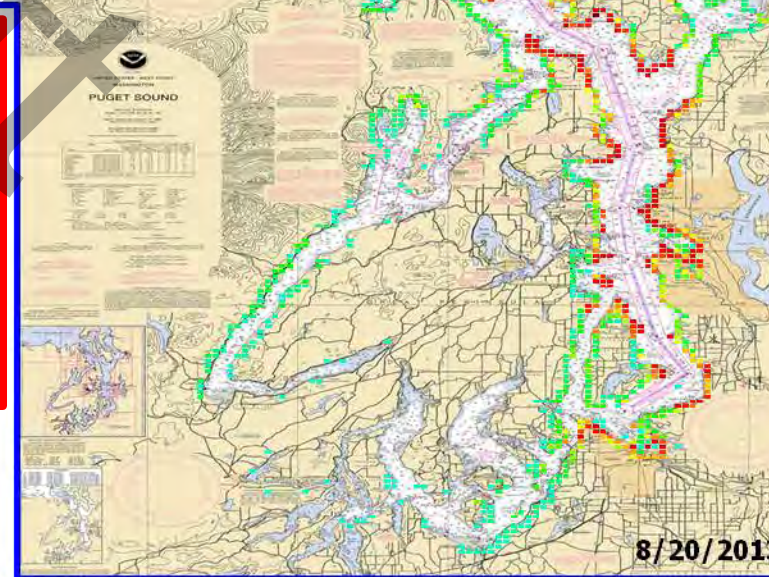
**P: ALL FV POTENTIAL GROUNDING EXPOSURE (PGE)**

**P: VTRA 2010 - BASE CASE**



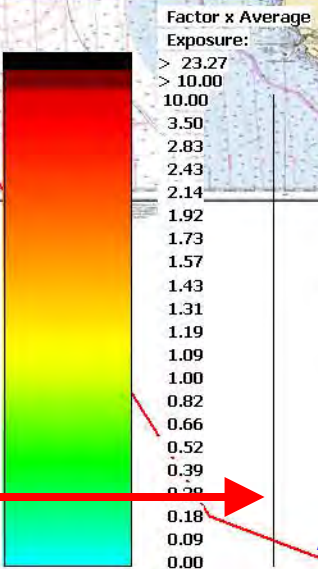
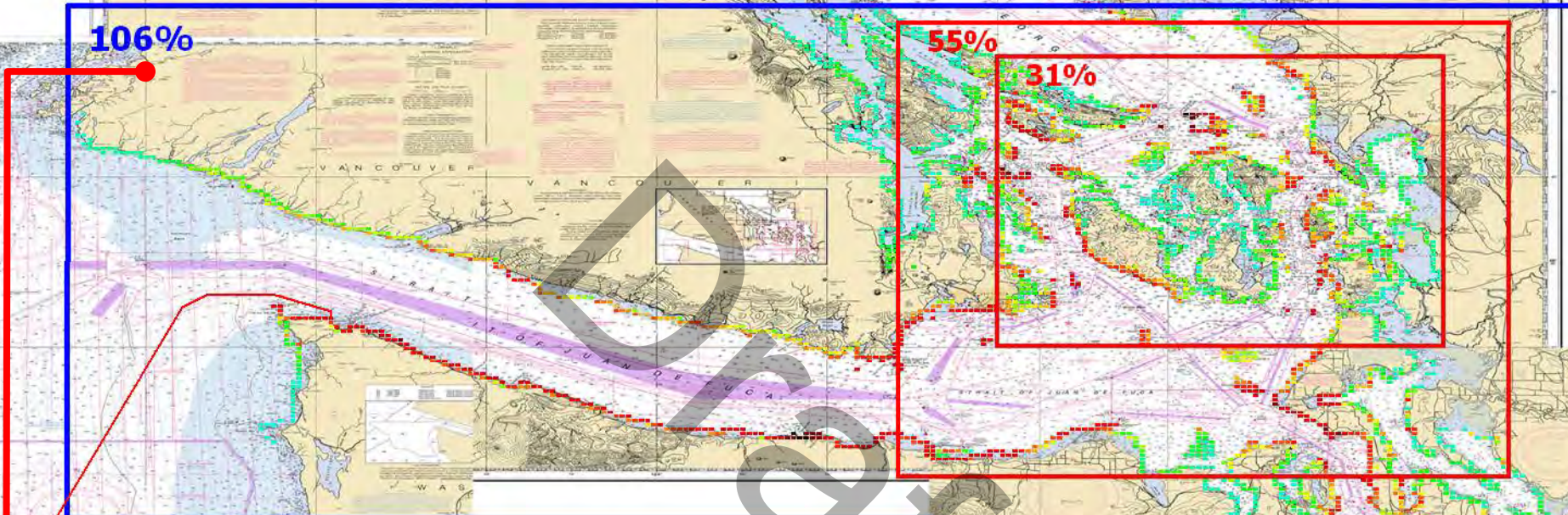
- P: POT. GROUND. EXPOSURE (PGE)**
- 28.3% - BULK CARGO
  - 21.8% - CONTAINERSHIP
  - 12.9% - OTHERCARGO
  - 22.8% - OIL BARGE
  - 08.7% - TANKER
  - 03.2% - CHEMICAL CARRIER
  - 02.5% - ATB
  - 00.0% - WHAT-IF FV

**100.0% of 2010 Base Case ALL FV - PGE**



**S: ALL FV POTENTIAL GROUNDING EXPOSURE (PGE)**

**S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348**



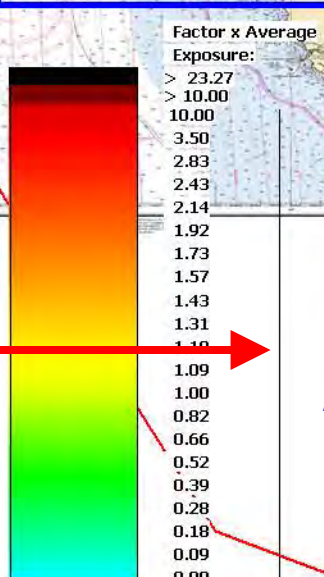
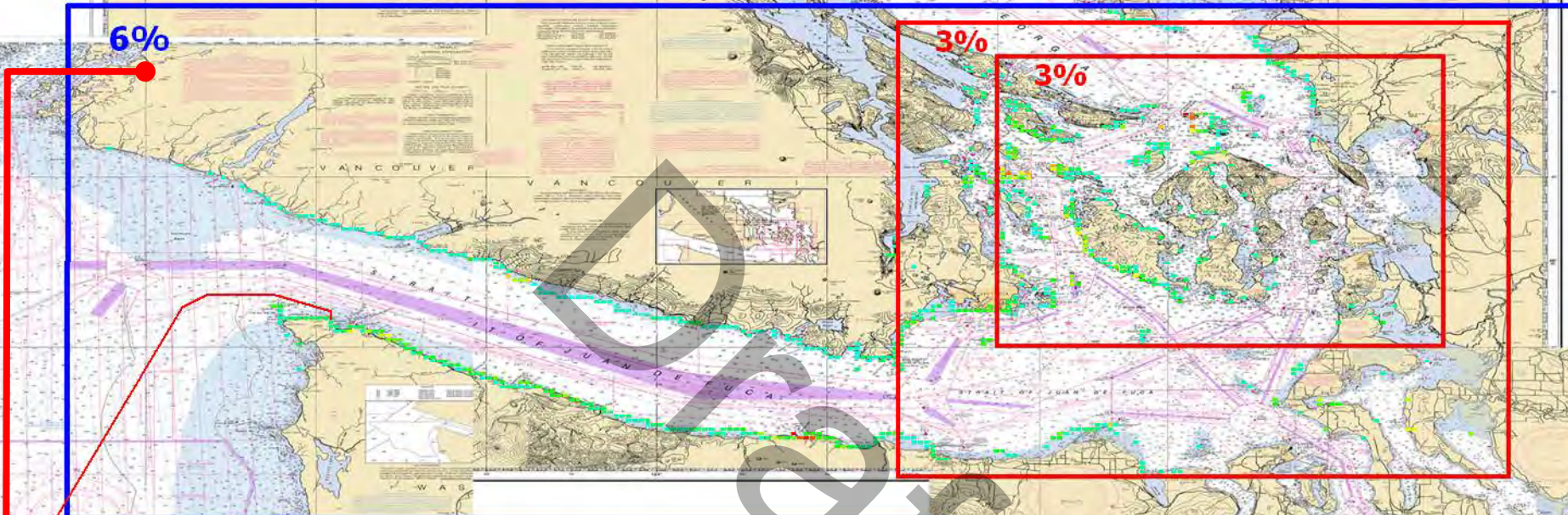
- S: POT. GROUND. EXPOSURE (PGE)**
- 28.4% - BULK CARGO
  - 21.9% - CONTAINERSHIP
  - 12.9% - OTHERCARGO
  - 22.6% - OIL BARGE
  - 08.6% - TANKER
  - 03.2% - CHEMICAL CARRIER
  - 02.5% - ATB
  - 05.5% - WHAT-IF FV

**+ 105.6% of 2010 Base Case ALL FV - PGE**

# S: WHAT-IF FV POTENTIAL GROUNDING EXPOSURE (PGE)

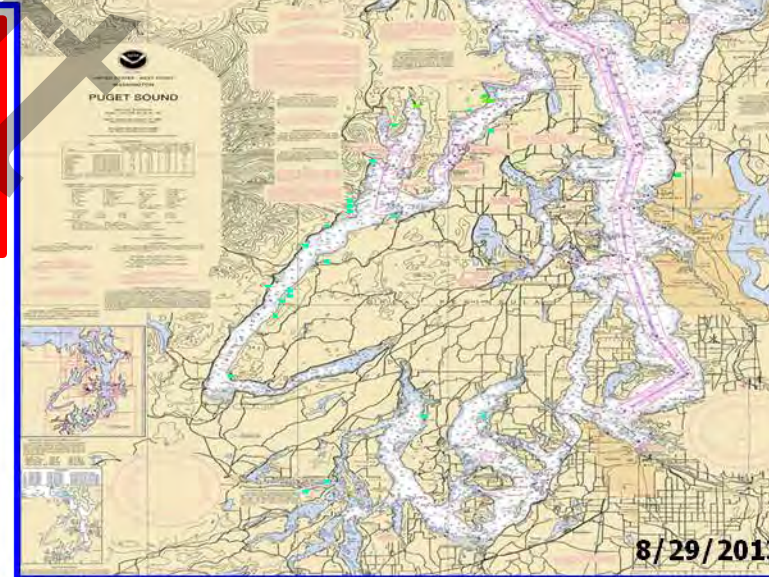


## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



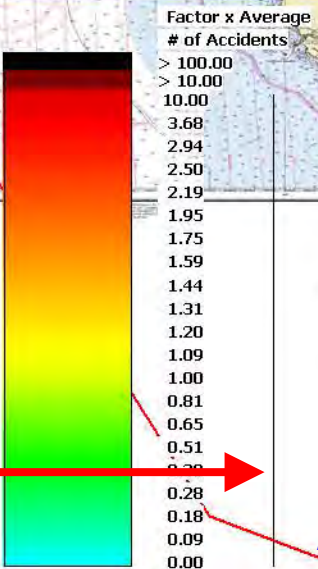
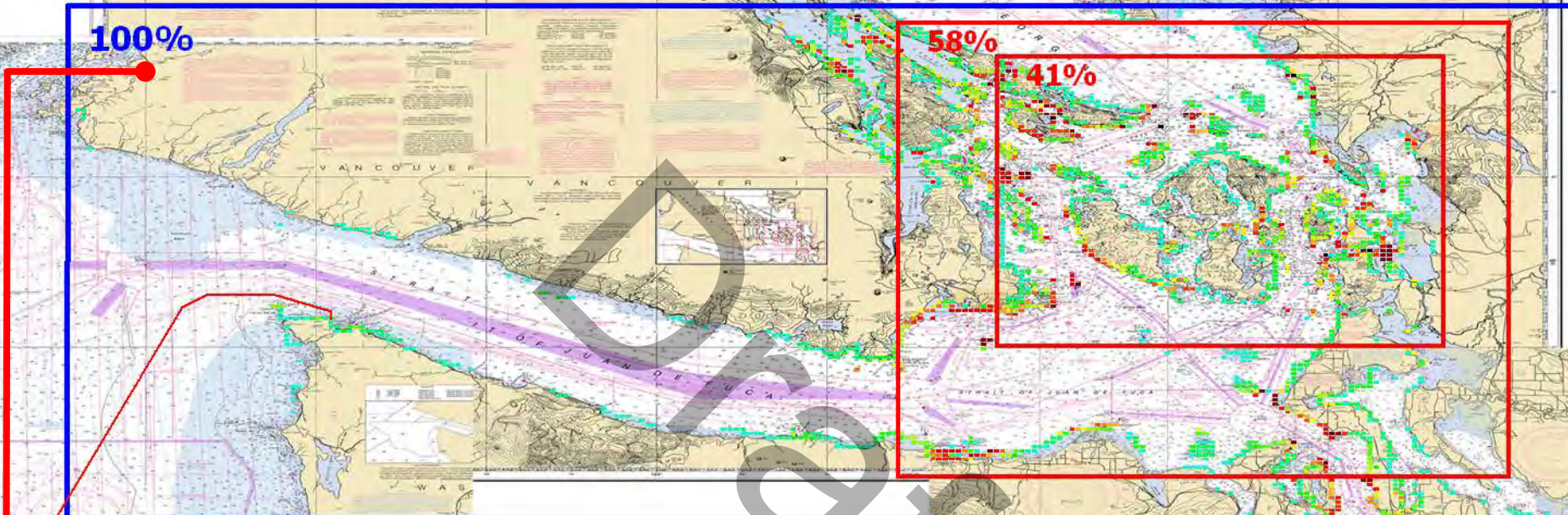
**S: POT. GROUND. EXPOSURE (PGE)**  
3.6% - BULK CARGO  
1.8% - CONTAINERSHIP  
0.0% - TANKER  
0.1% - OILBARGE

**+  
5.5% of 2010 Base Case  
ALL FV - PGE**



**P: ALL FV POTENTIAL  
GROUNDING FREQUENCY (PGF)**

**P: VTRA 2010 - BASE CASE**

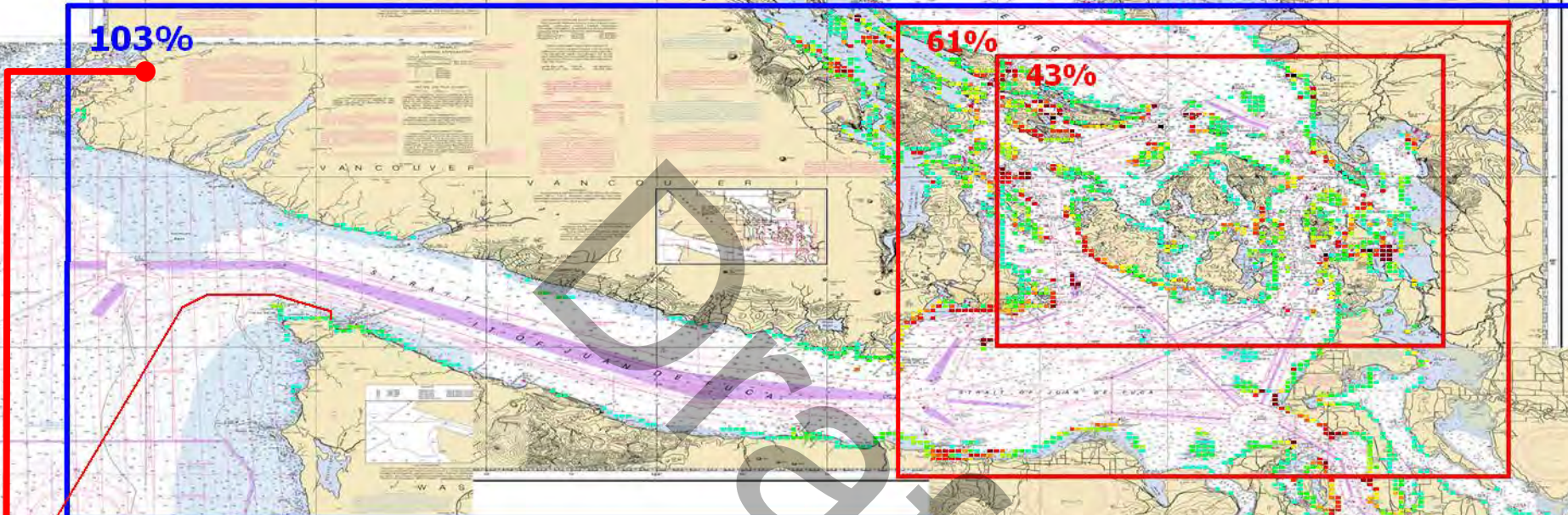


- P: POTENTIAL GROUND. FREQ. (PGF)**
- 22.0% - BULK CARGO
  - 22.8% - CONTAINERSHIP
  - 14.4% - OTHERCARGO
  - 24.3% - OIL BARGE
  - 11.4% - TANKER
  - 03.0% - CHEMICAL CARRIER
  - 02.1% - ATB
  - 00.0% - WHAT-IF FV

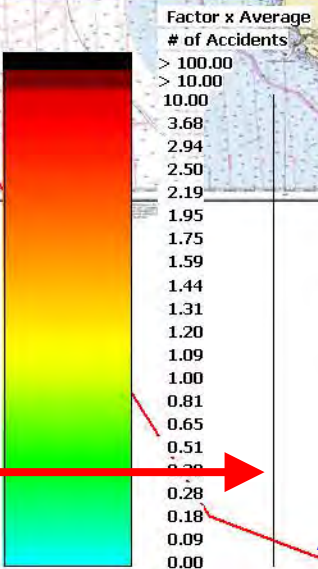
**100.0% of 2010 Base Case  
ALL FV - PGF**

**S: ALL FV POTENTIAL  
GROUNDING FREQUENCY (PGF)**

**S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348**



- S: POTENTIAL GROUND. FREQ. (PGF)**
- 22.0% - BULK CARGO
  - 22.7% - CONTAINERSHIP
  - 14.2% - OTHERCARGO
  - 23.8% - OIL BARGE
  - 11.5% - TANKER
  - 03.1% - CHEMICAL CARRIER
  - 02.1% - ATB
  - 03.2% - WHAT-IF FV



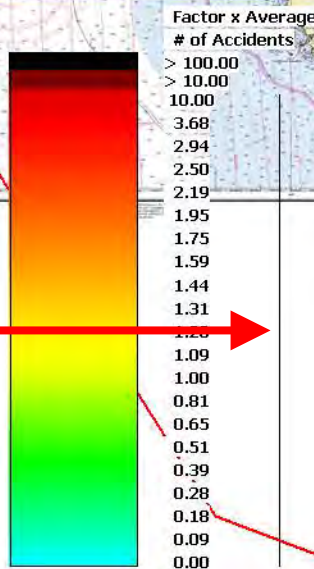
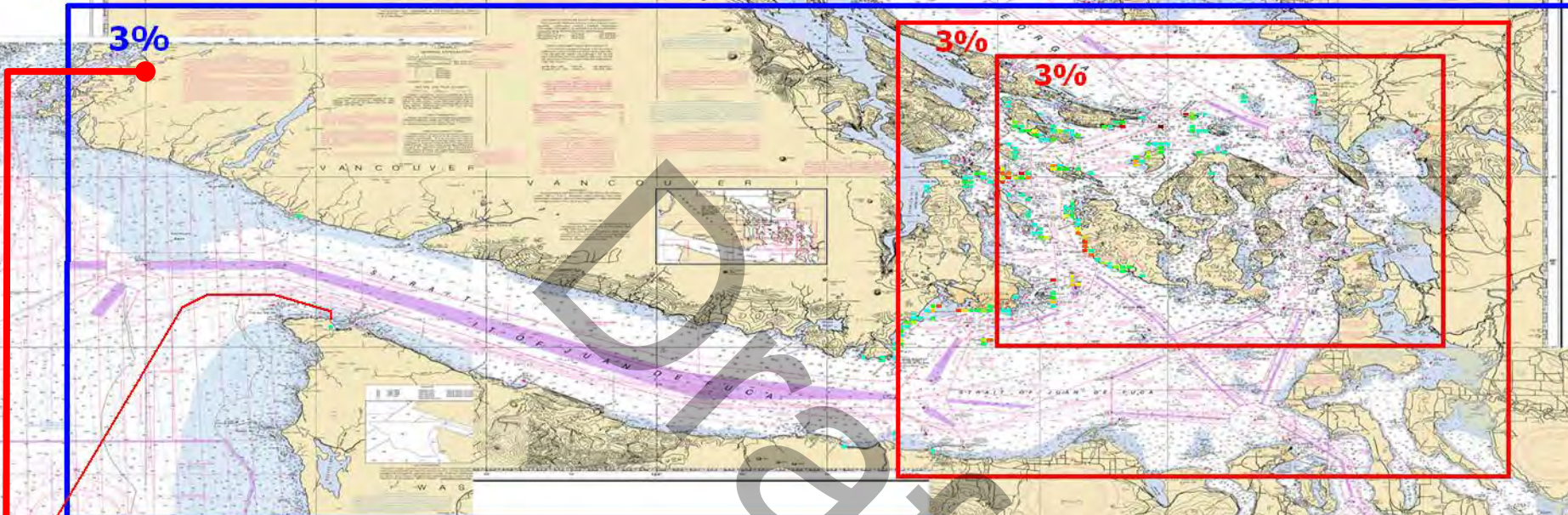
**102.6% of 2010 Base Case  
ALL FV - PGF**



# S: WHAT-IF FV POTENTIAL GROUNDING FREQUENCY (PGF)



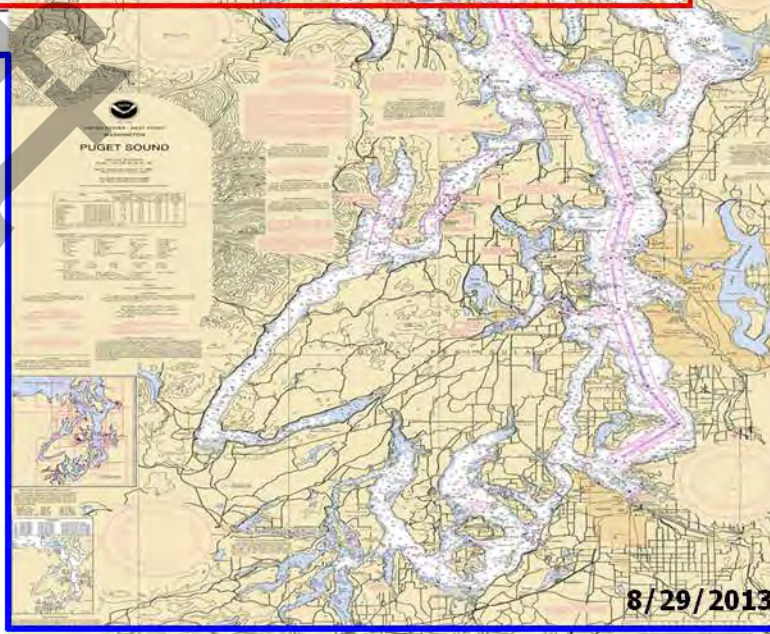
## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



**S: POTENTIAL GROUND. FREQ. (PGF)**

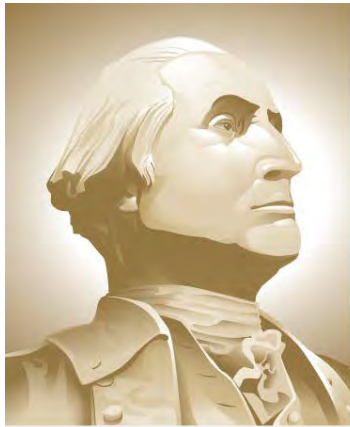
- 01.2% - BULK CARGO
- 02.0% - CONTAINERSHIP
- 00.0% - TANKER
- 00.0% - OILBARGE

**+  
3.2% of 2010 Base Case  
ALL FV - PGF**



# **VTRA 2010 CASE S RESULTS – GROUNDING OIL (CARGO + FUEL), CARGO AND FUEL OIL GEOGRAPHIC PROFILES**

Presentation by: J. Rene van Dorp



**THE GEORGE  
WASHINGTON  
UNIVERSITY**

WASHINGTON, DC

**VCU**

**CASE S: Delta Port 415 + Bunkering Operations**

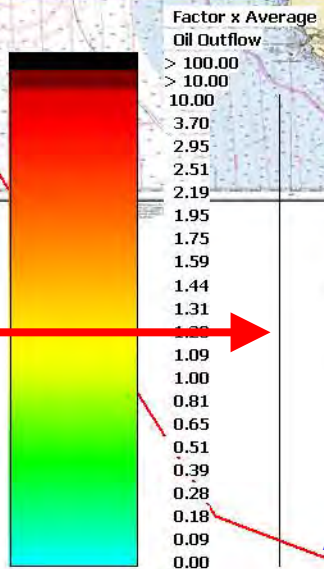
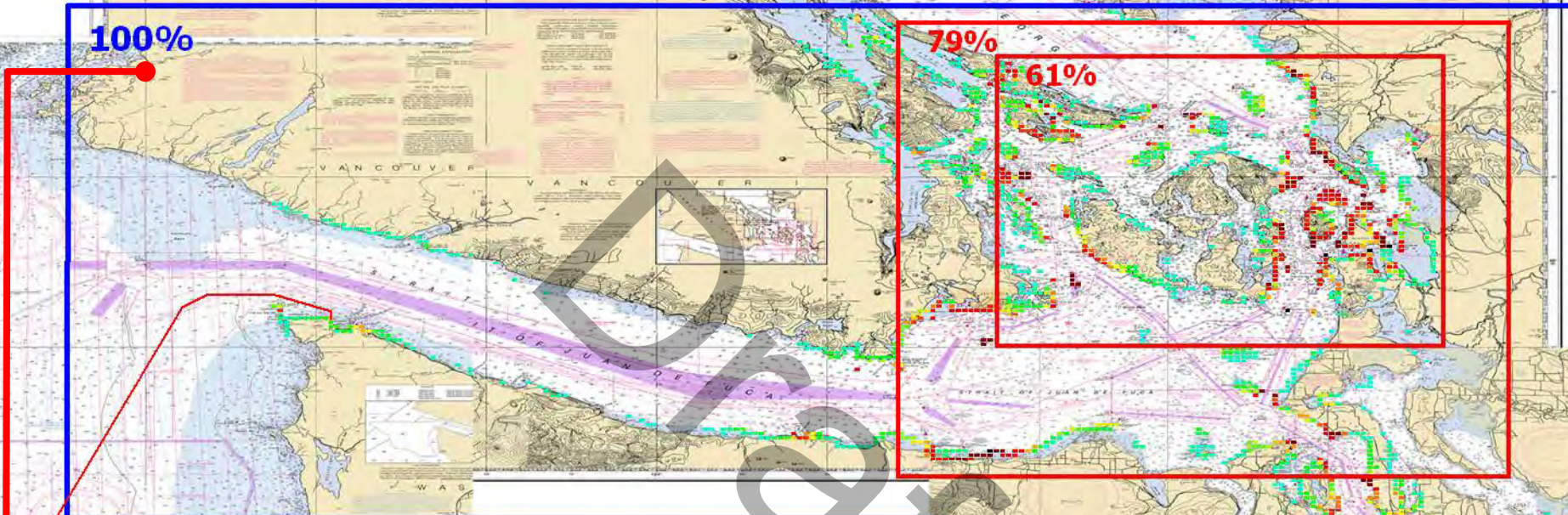
**GWU Personnel:** Dr. J. Rene van Dorp

**VCU Personnel:** Dr. Jason R. W. Merrick

**AUGUST 31, 2013**

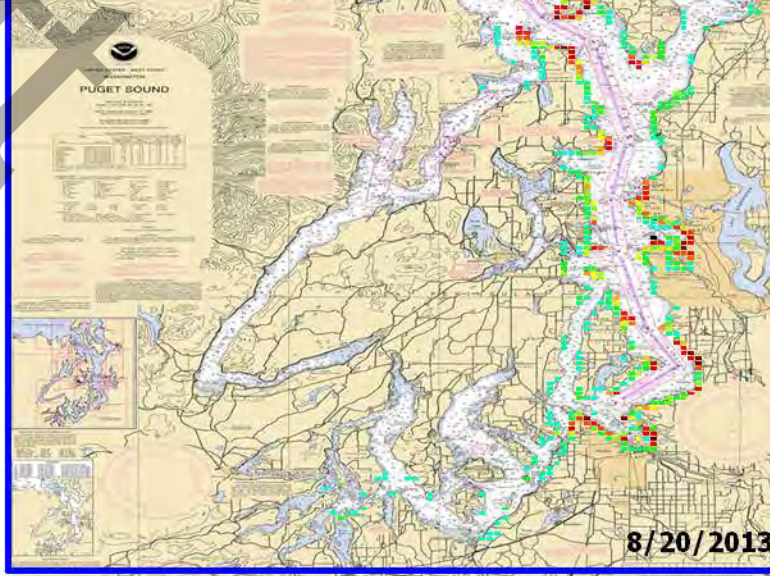
**P: ALL FV POTENTIAL  
GROUNDING OIL (FUEL + CARGO) LOSS (PGO)**

**P: VTRA 2010 - BASE CASE**



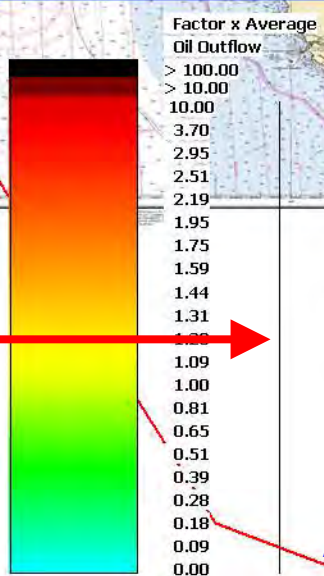
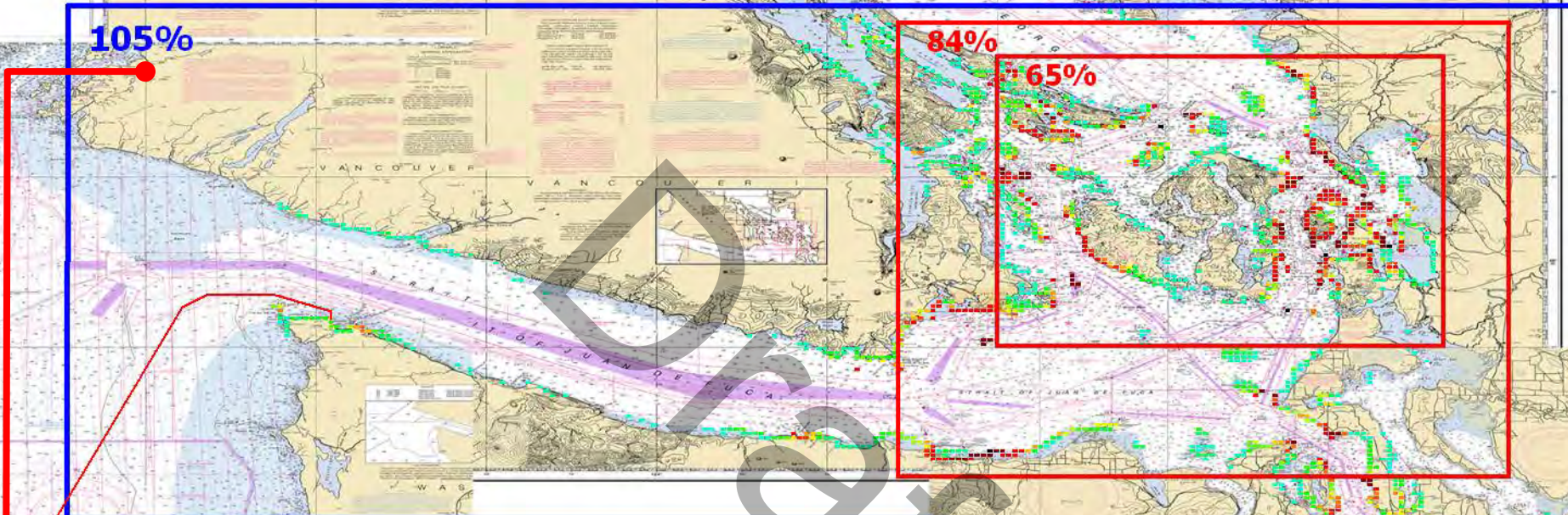
- P: POT. GROUND. OIL LOSS (PGO)**
- 06.7% - BULK CARGO
  - 18.8% - CONTAINERSHIP
  - 02.3% - OTHERCARGO
  - 02.3% - OIL BARGE
  - 54.8% - TANKER
  - 03.3% - CHEMICAL CARRIER
  - 11.8% - ATB
  - 00.0% - WHAT-IF FV

**100.0% of 2010 Base Case  
ALL FV – PGO**



**S: ALL FV POTENTIAL  
GROUNDING OIL (FUEL + CARGO) LOSS (PGO)**

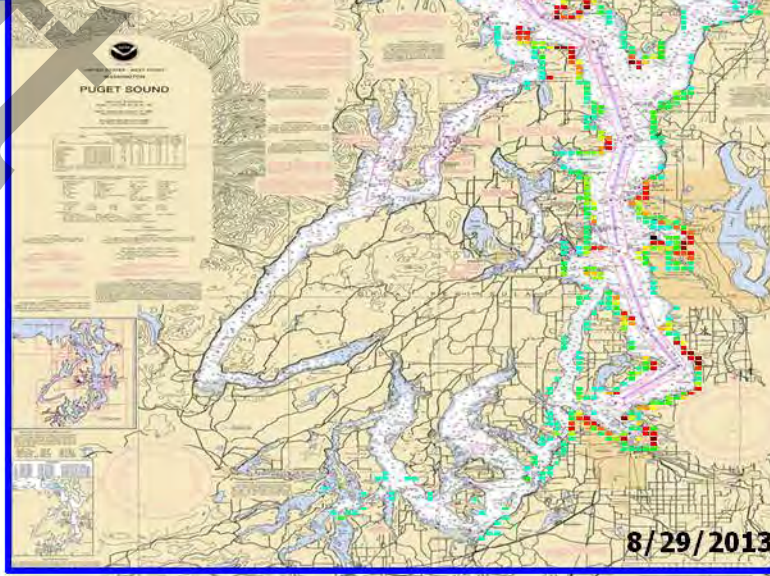
**S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348**



- S: POT. GROUND. OIL LOSS (PGO)**
- 06.6% - BULK CARGO
  - 18.7% - CONTAINERSHIP
  - 02.3% - OTHERCARGO
  - 02.3% - OIL BARGE
  - 55.4% - TANKER
  - 03.3% - CHEMICAL CARRIER
  - 10.8% - ATB
  - 05.9% - WHAT-IF FV

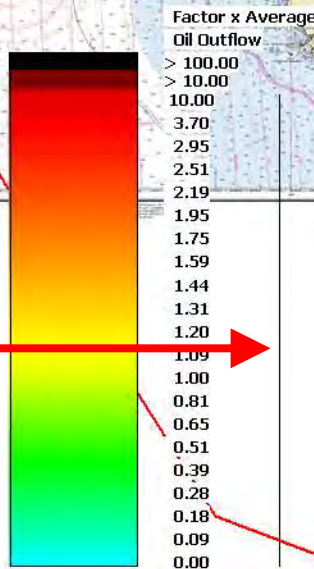
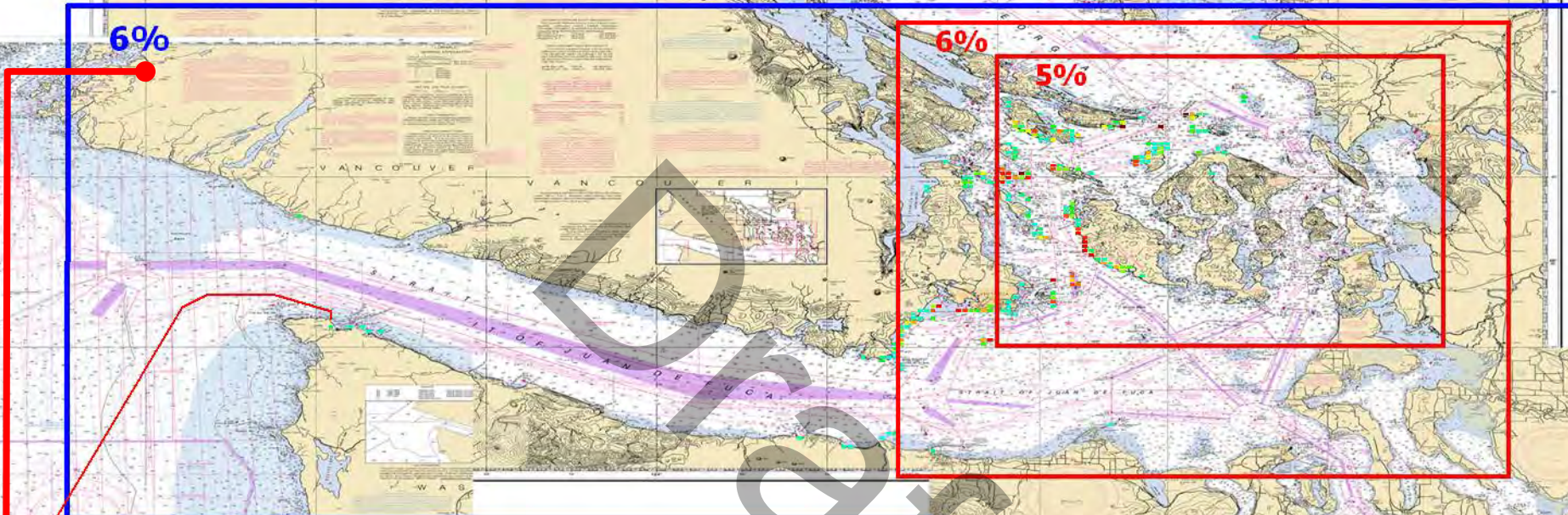
+

**105.4% of 2010 Base Case  
ALL FV – PGO**



# S: WHAT-IF FV POTENTIAL GROUNDING OIL (FUEL + CARGO) LOSS (PGO)

S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



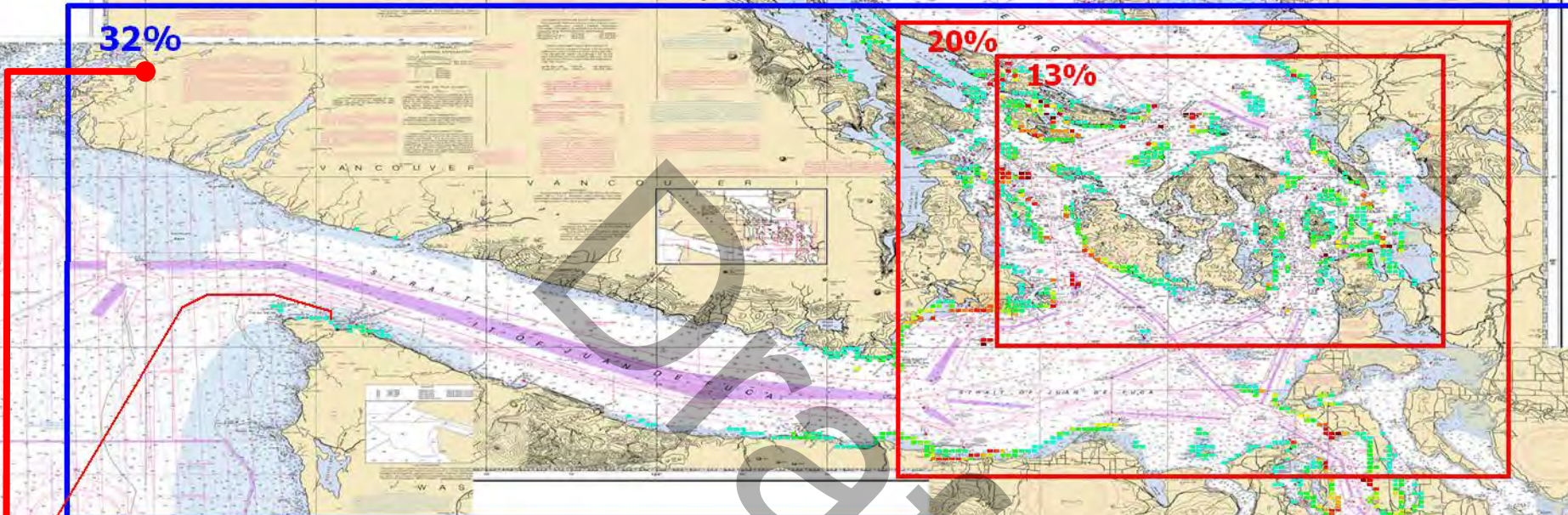
**S: POT. GROUND. OIL LOSS (PGO)**

- 02.6% - BULKCARRIER
- 03.3% - CONTAINERSHIP
- 00.0% - OIL TANKER
- 00.0% - OIL BARGE

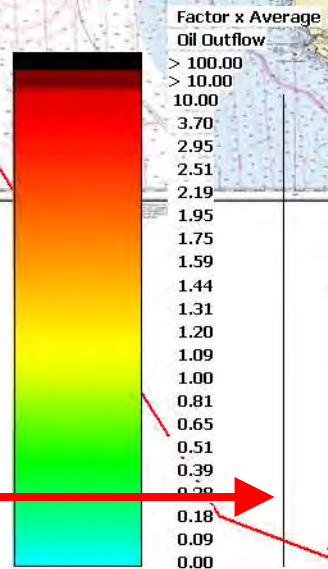
**5.9% of 2010 Base Case  
ALL FV – PGO**

**P: ALL FV POTENTIAL  
GROUNDING FUEL OIL LOSS (PGFO)**

**P: VTRA 2010 - BASE CASE**



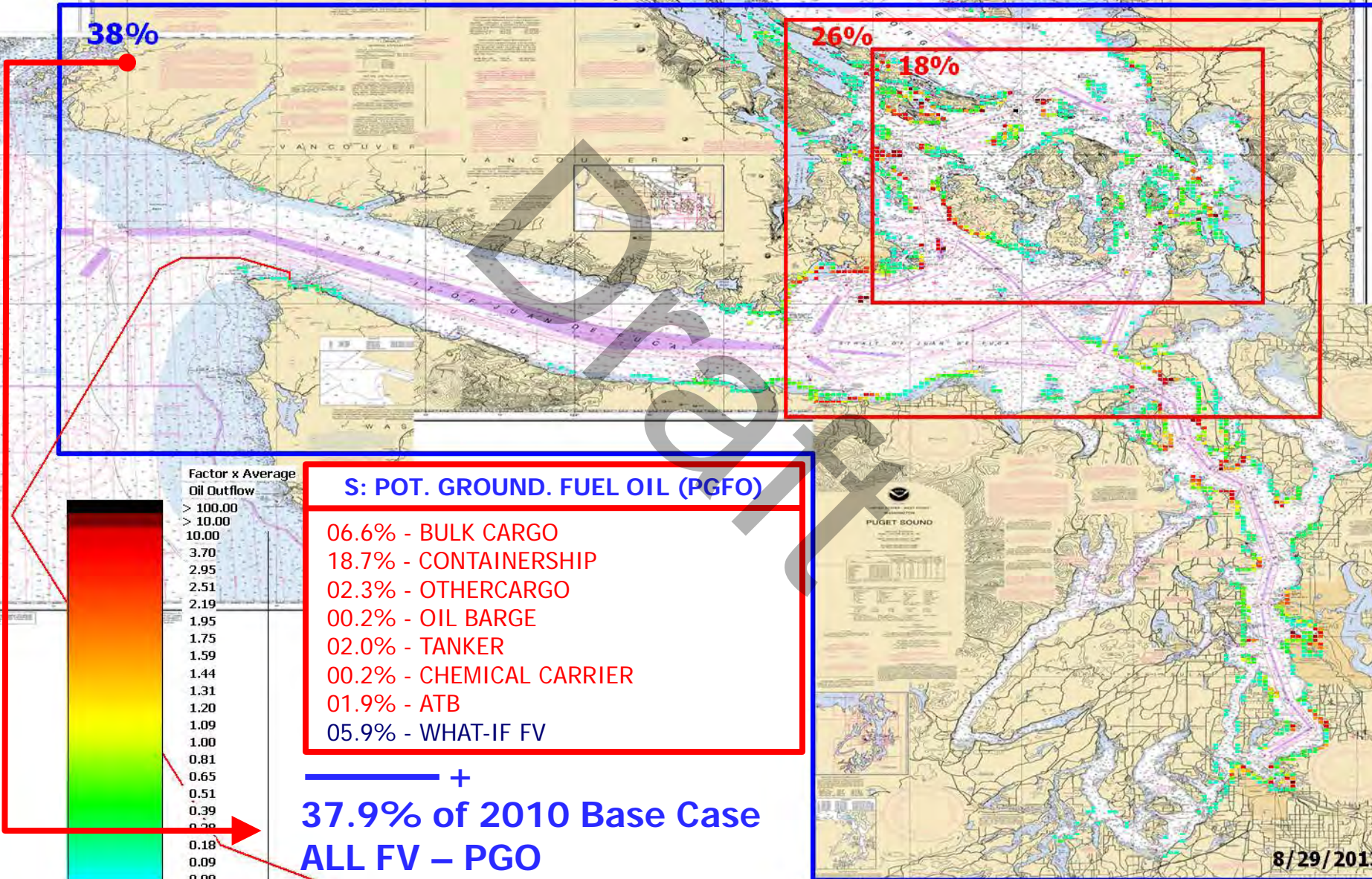
- P: POT. GROUND. FUEL OIL (PGFO)**
- 06.7% - BULK CARGO
  - 18.8% - CONTAINERSHIP
  - 02.3% - OTHERCARGO
  - 00.2% - OIL BARGE
  - 02.0% - TANKER
  - 00.2% - CHEMICAL CARRIER
  - 02.0% - ATB
  - 00.0% - WHAT-IF FV



**+  
32.0% of 2010 Base Case  
ALL FV – PGO**

**S: ALL FV POTENTIAL  
GROUNDING FUEL OIL LOSS (PGFO)**

**S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348**

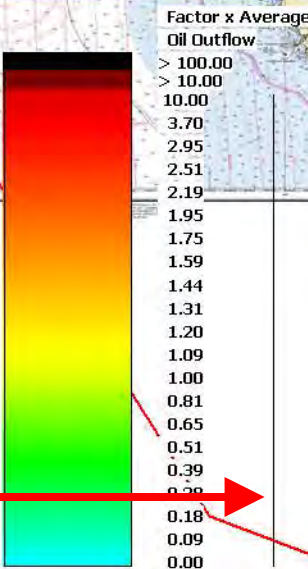


38%

26%

18%

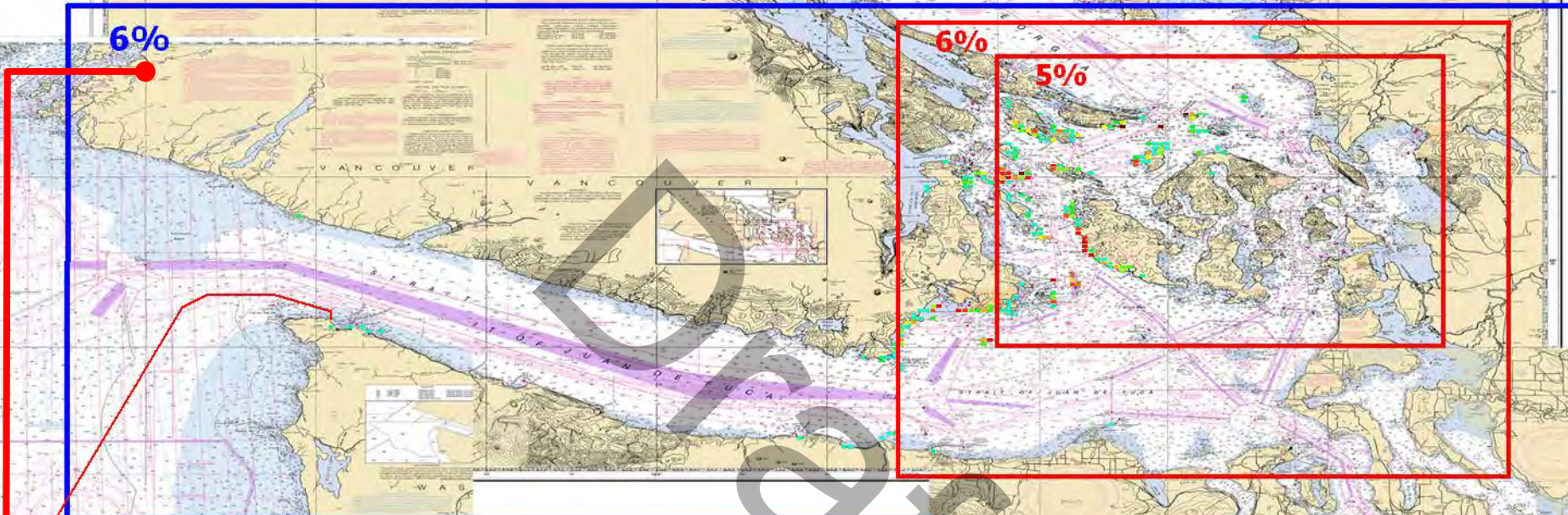
- S: POT. GROUND. FUEL OIL (PGFO)**
- 06.6% - BULK CARGO
  - 18.7% - CONTAINERSHIP
  - 02.3% - OTHERCARGO
  - 00.2% - OIL BARGE
  - 02.0% - TANKER
  - 00.2% - CHEMICAL CARRIER
  - 01.9% - ATB
  - 05.9% - WHAT-IF FV



+  
**37.9% of 2010 Base Case  
ALL FV – PGO**

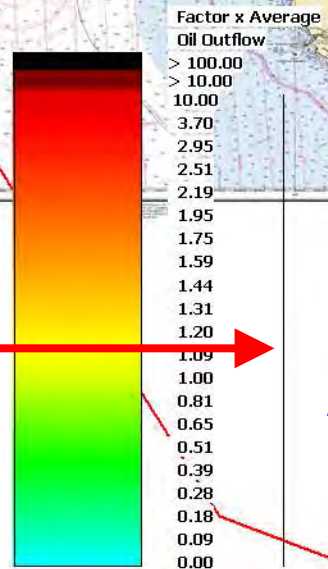
# S: WHAT-IF FV POTENTIAL GROUNDING FUEL OIL LOSS (PGFO)

## S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



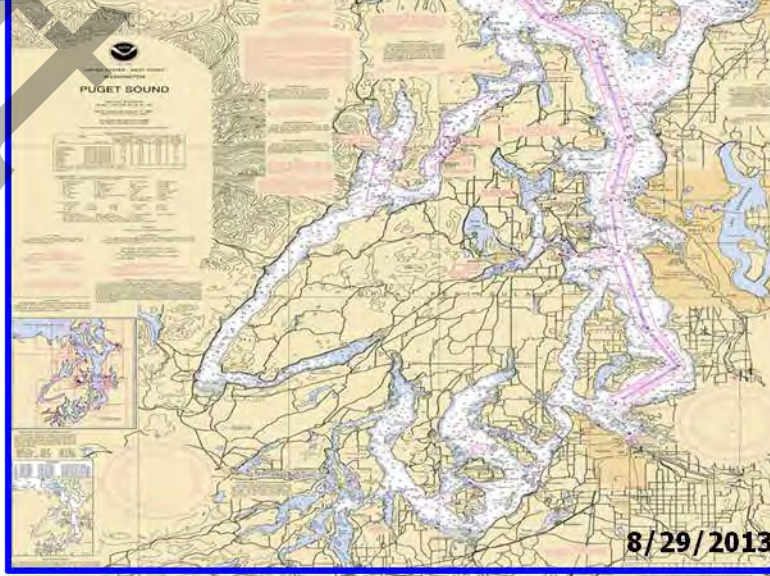
**S: POT. GROUND. FUEL OIL (PGFO)**

- 02.6% - BULKCARRIER
- 03.3% - CONTAINERSHIP
- 00.0% - OIL TANKER
- 00.0% - OIL BARGE



— +

**5.9% of 2010 Base Case**  
**ALL FV – PGO**

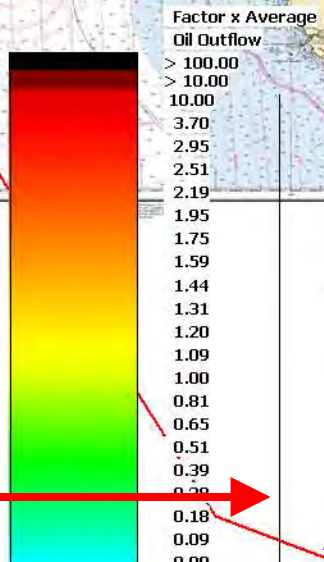
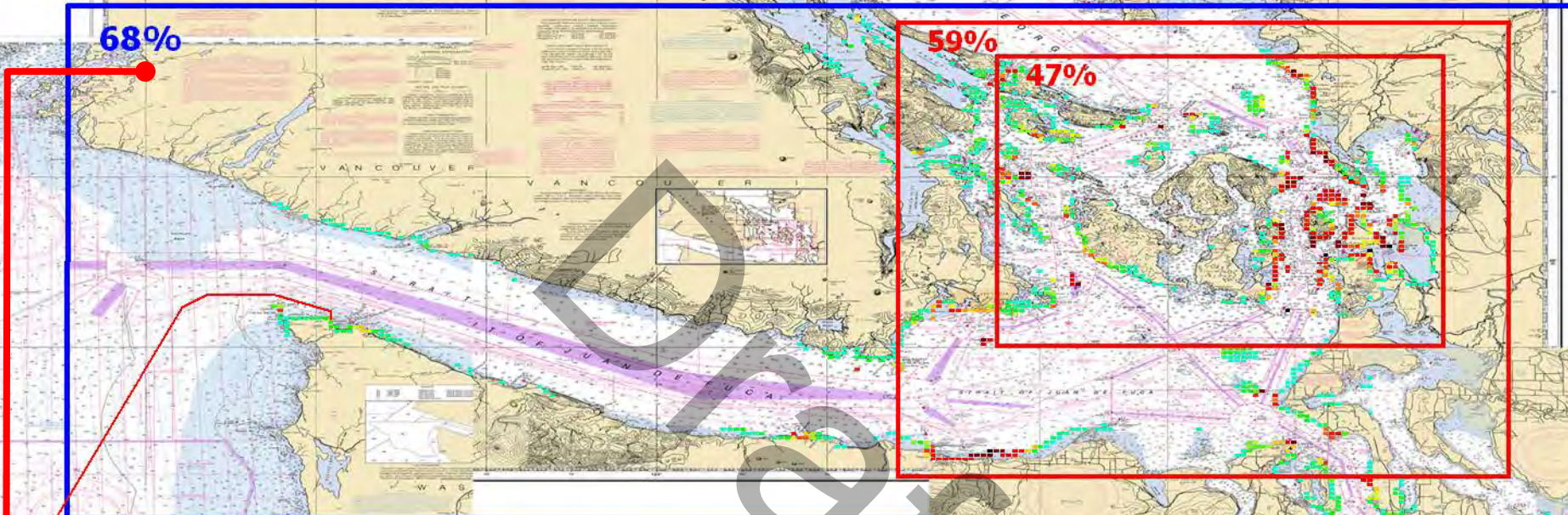




# P: ALL FV POTENTIAL GROUNDING CARGO OIL LOSS (PGCO)



## P: VTRA 2010 - BASE CASE

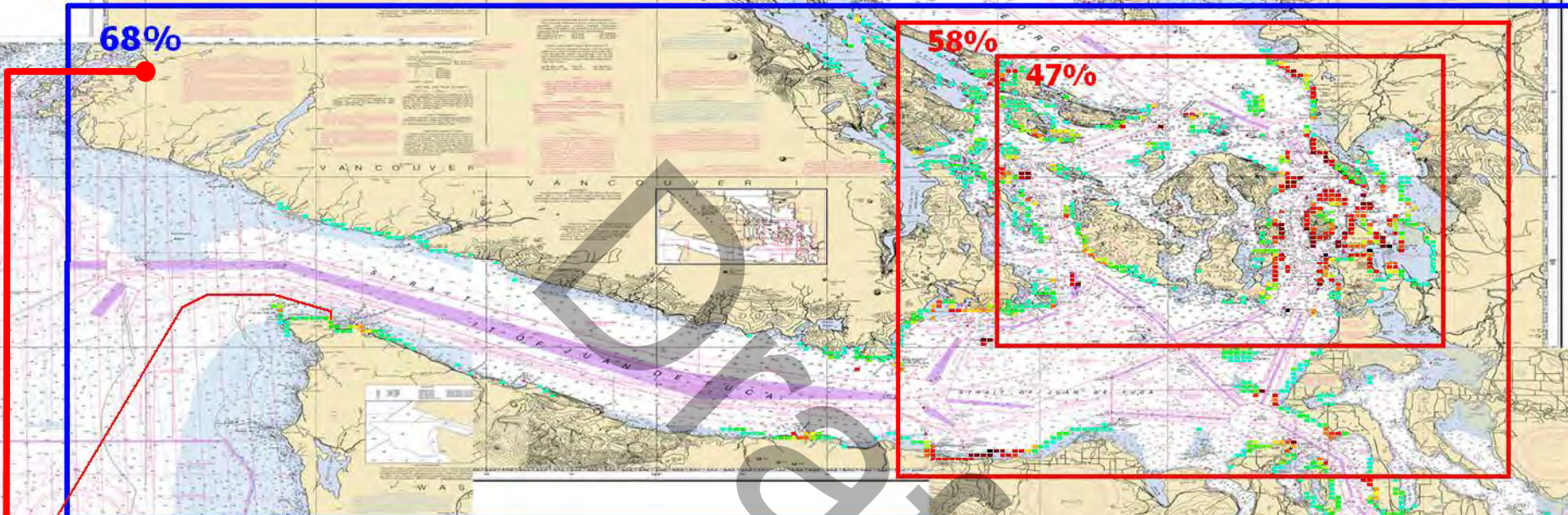


- P: POT. GROUND CARGO OIL (PGCO)**
- 00.0% - BULK CARGO
  - 00.0% - CONTAINERSHIP
  - 00.0% - OTHERCARGO
  - 02.1% - OIL BARGE
  - 52.8% - TANKER
  - 03.1% - CHEMICAL CARRIER
  - 09.8% - ATB
  - 00.0% - WHAT-IF FV

— +  
**67.8% of 2010 Base Case  
 ALL FV – PGO**

# S: ALL FV POTENTIAL GROUNDING CARGO OIL LOSS (PGCO)

S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



S: POT. GROUND CARGO OIL (PGCO)

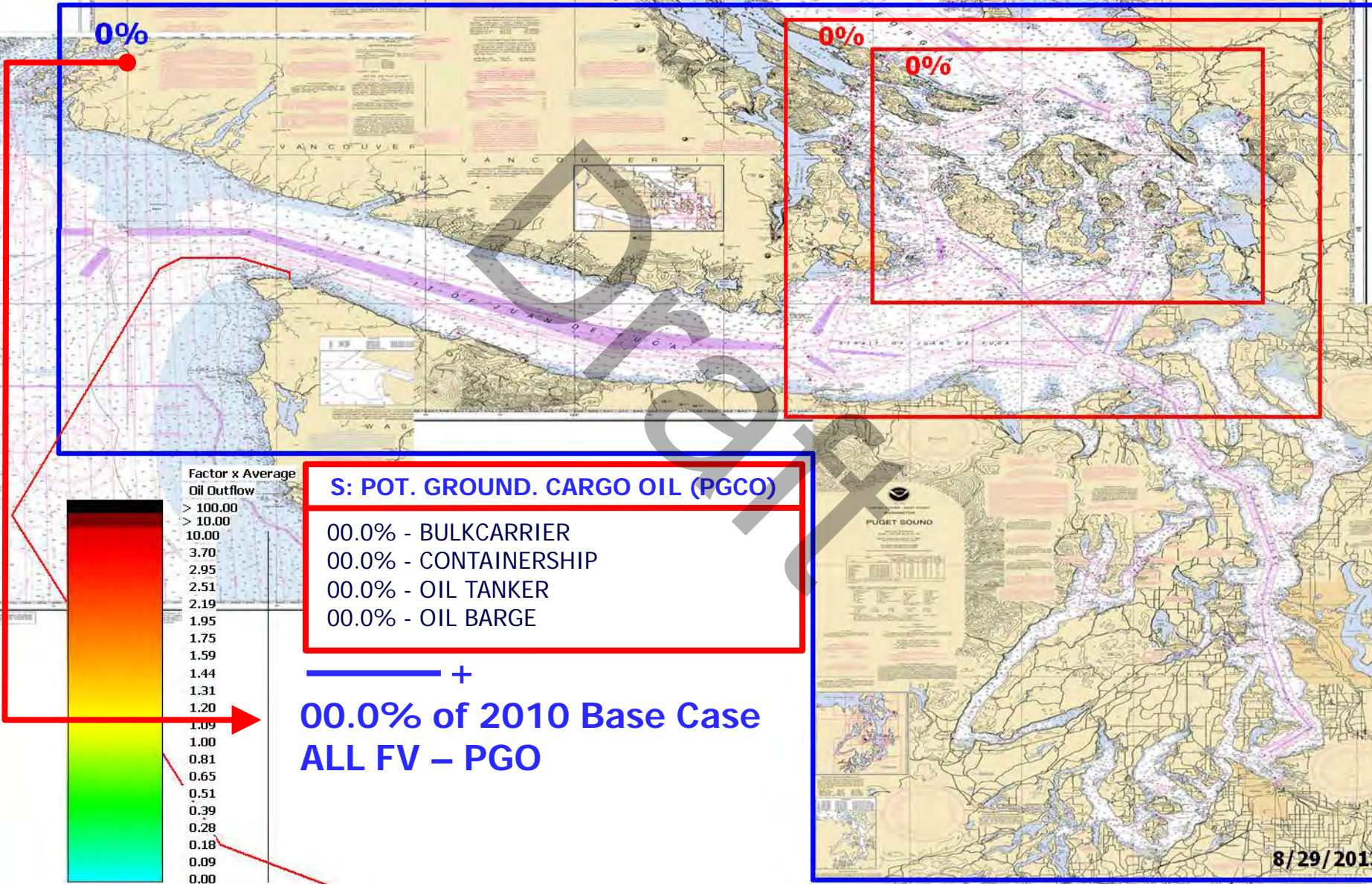
- 00.0% - BULK CARGO
- 00.0% - CONTAINERSHIP
- 00.0% - OTHERCARGO
- 02.1% - OIL BARGE
- 53.4% - TANKER
- 03.2% - CHEMICAL CARRIER
- 08.9% - ATB
- 00.0% - WHAT-IF FV

+  
67.6% of 2010 Base Case  
ALL FV - PGO

# S: WHAT-IF FV POTENTIAL GROUNDING CARGO OIL LOSS (PGCO)



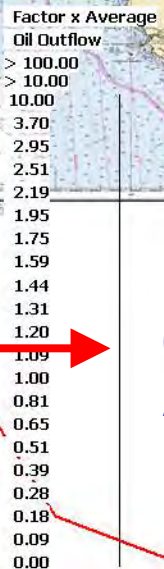
S: VTRA 2010 - Delta Port - Cont. 67 and Bulk 348



0%

0%

0%



## S: POT. GROUND. CARGO OIL (PGCO)

- 00.0% - BULKCARRIER
- 00.0% - CONTAINERSHIP
- 00.0% - OIL TANKER
- 00.0% - OIL BARGE

— +  
**00.0% of 2010 Base Case**  
**ALL FV – PGO**