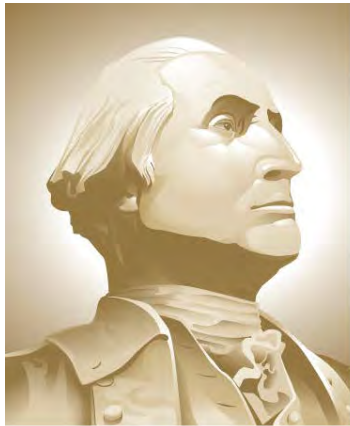


# VTRA 2010 POTENTIAL COLLISION OIL FUEL AND CARGO LOSSES BY ALL FV, CARGO – FV, TANK- FV AND WHAT-IF FV

Presentation by: J. Rene van Dorp



THE GEORGE  
WASHINGTON  
UNIVERSITY

WASHINGTON, DC

VCU

CASE T: Gateway, Kinder Morgan, Delta Port

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

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

**OCTOBER 9, 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 T: GW 487, KM 348, DP 348 and 67:**

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

487 Gateway Bulk Carriers + Bunkering Barges

348 Kinder Morgan Tankers + Bunkering Barges

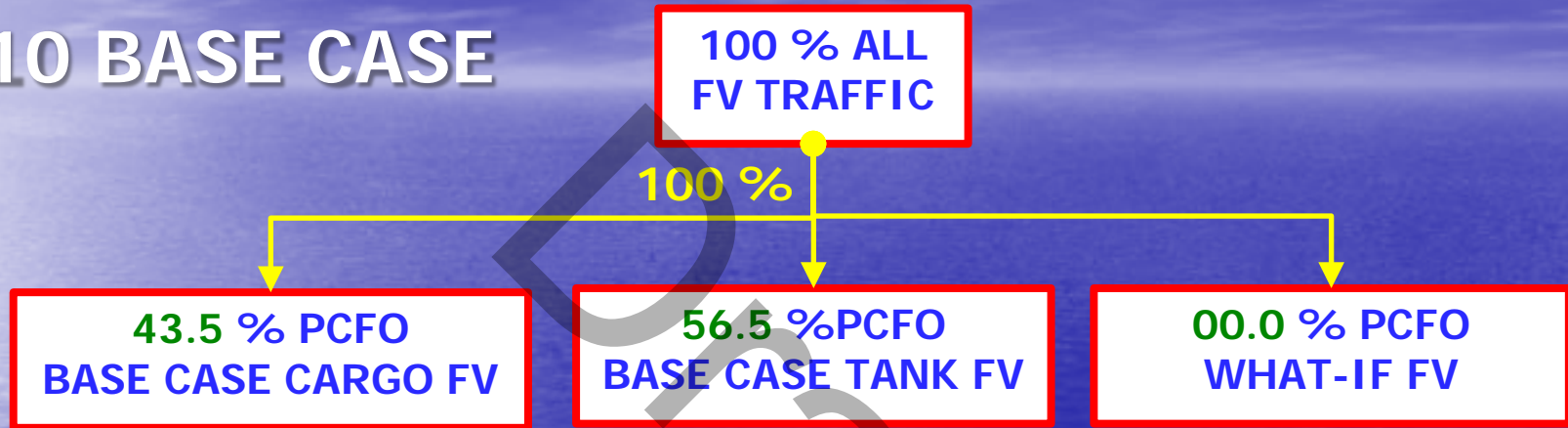
348 Delta Port Bulk Carriers + Bunkering Barges

67 Delta Port Container Ships+ Bunkering Barges

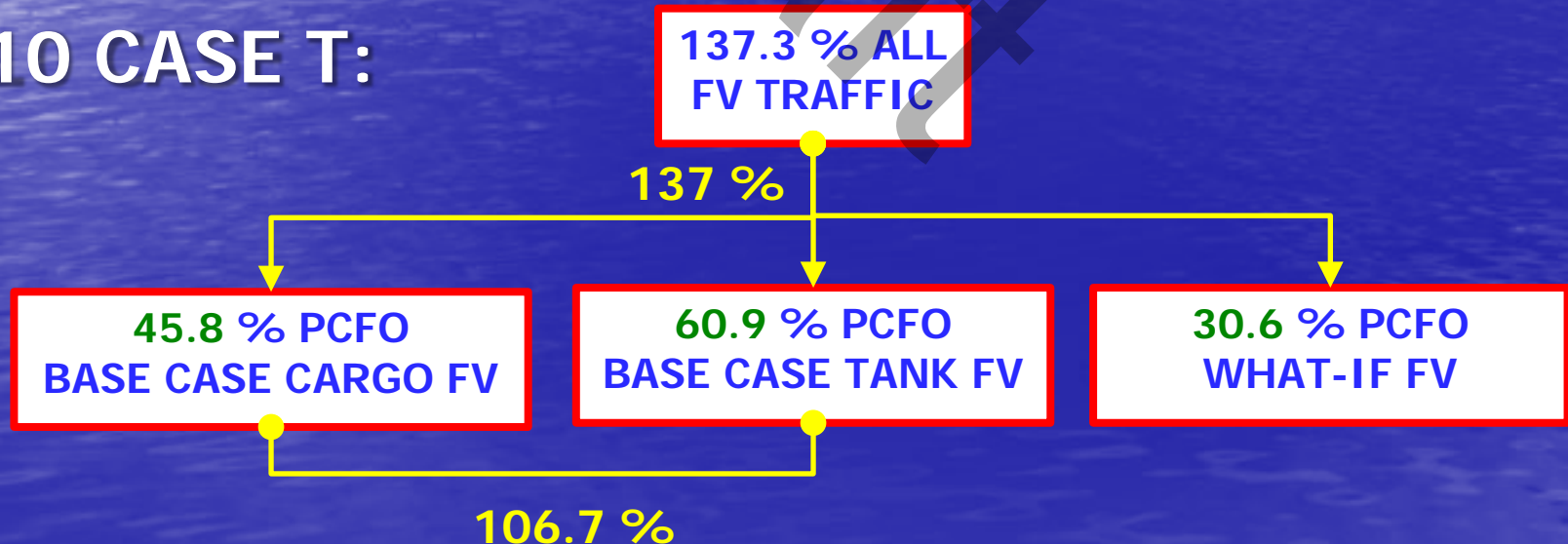
# A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL COLLISION FUEL OIL LOSS

PCFO : POTENTIAL COLLISION FUEL OIL LOSS - PER YEAR

## 2010 BASE CASE

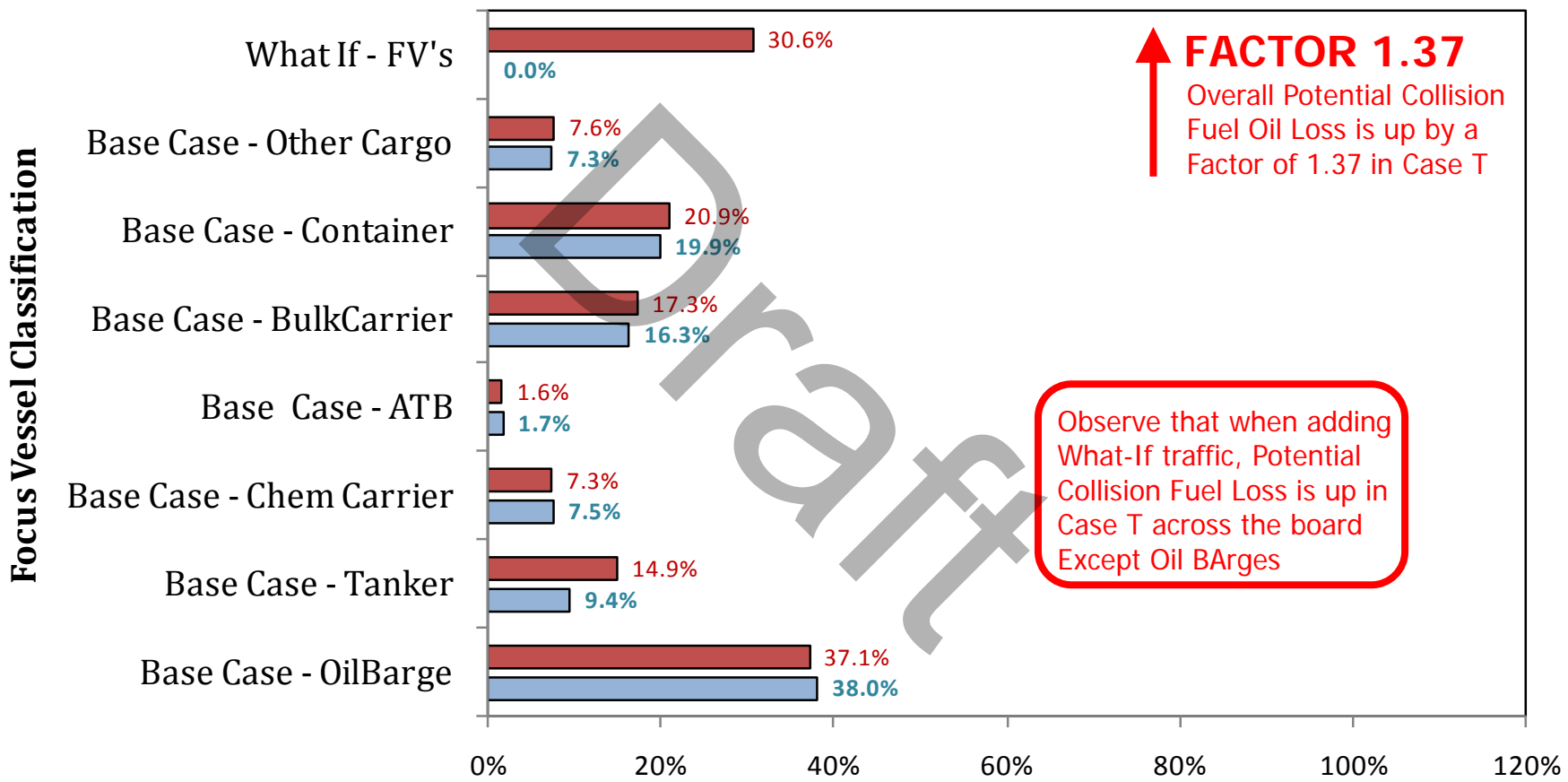


## 2010 CASE T:



# CASE T: GW 487, KM 348, DP 348 and 67:

## VTRA 2010 - COLLISION FUEL OIL LOSS



**↑ FACTOR 1.37**  
 Overall Potential Collision Fuel Oil Loss is up by a Factor of 1.37 in Case T

Observe that when adding What-If traffic, Potential Collision Fuel Loss is up in Case T across the board Except Oil Barges

% of 2010 Potential Collision Fuel Oil Outflow (PCFO)

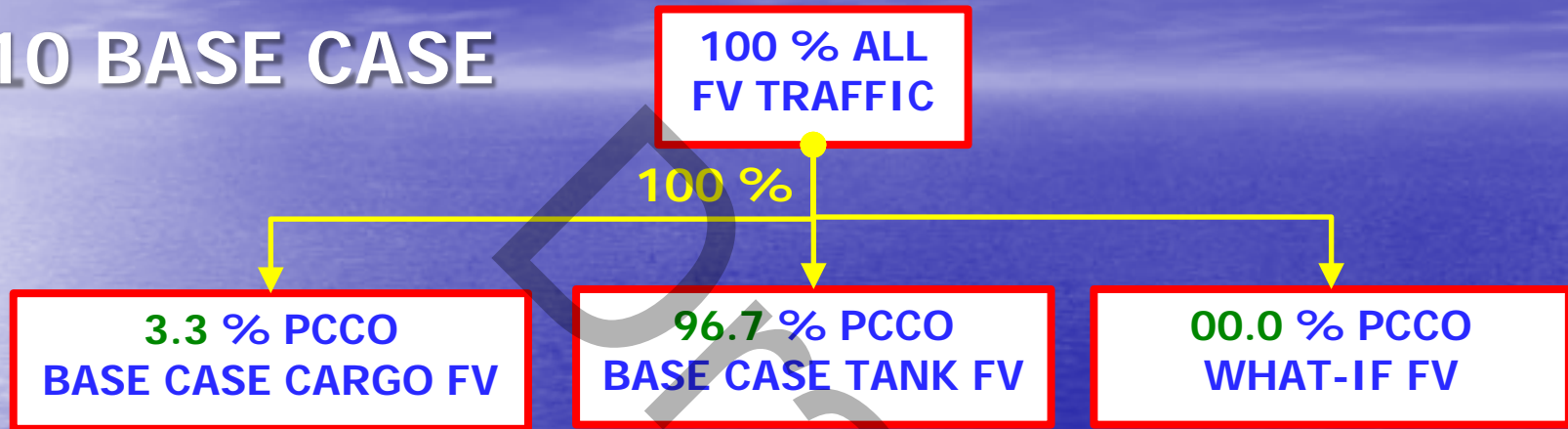
■ T: GW - KM - DP - 137.3%    ■ P: BASE CASE 2010 - 100.0%



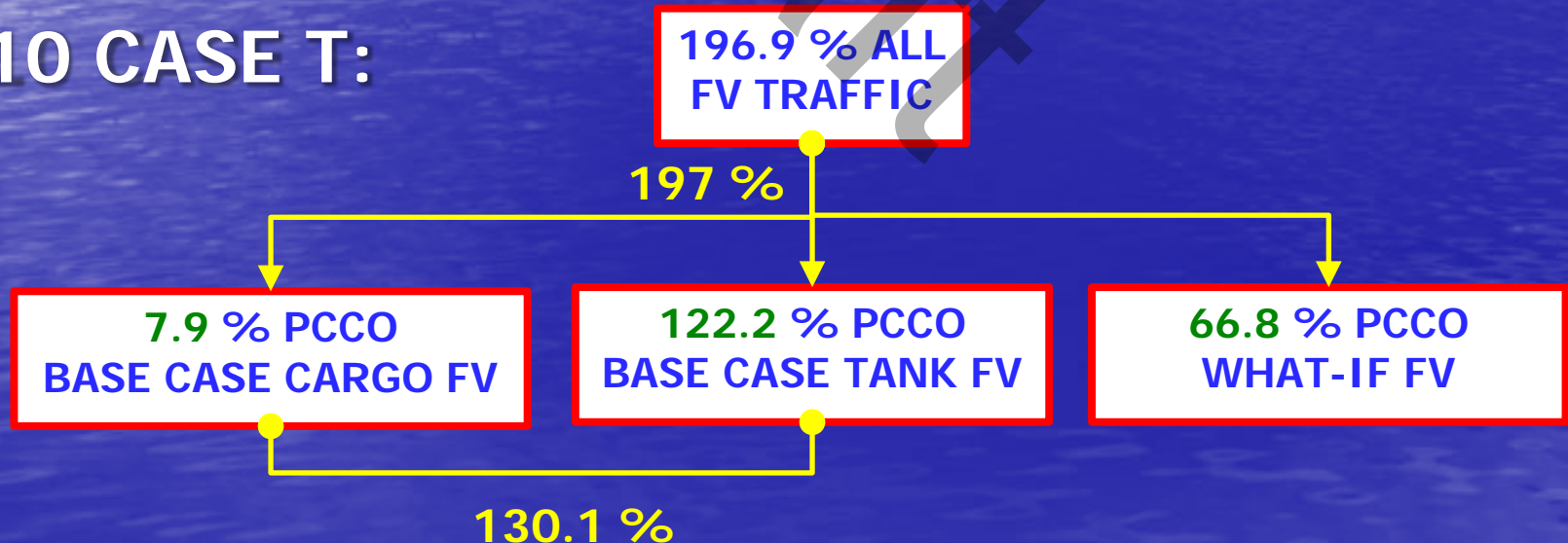
# A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL COLLISION CARGO OIL LOSS

PCCO : POTENTIAL COLLISION CARGO OIL LOSS - PER YEAR

## 2010 BASE CASE

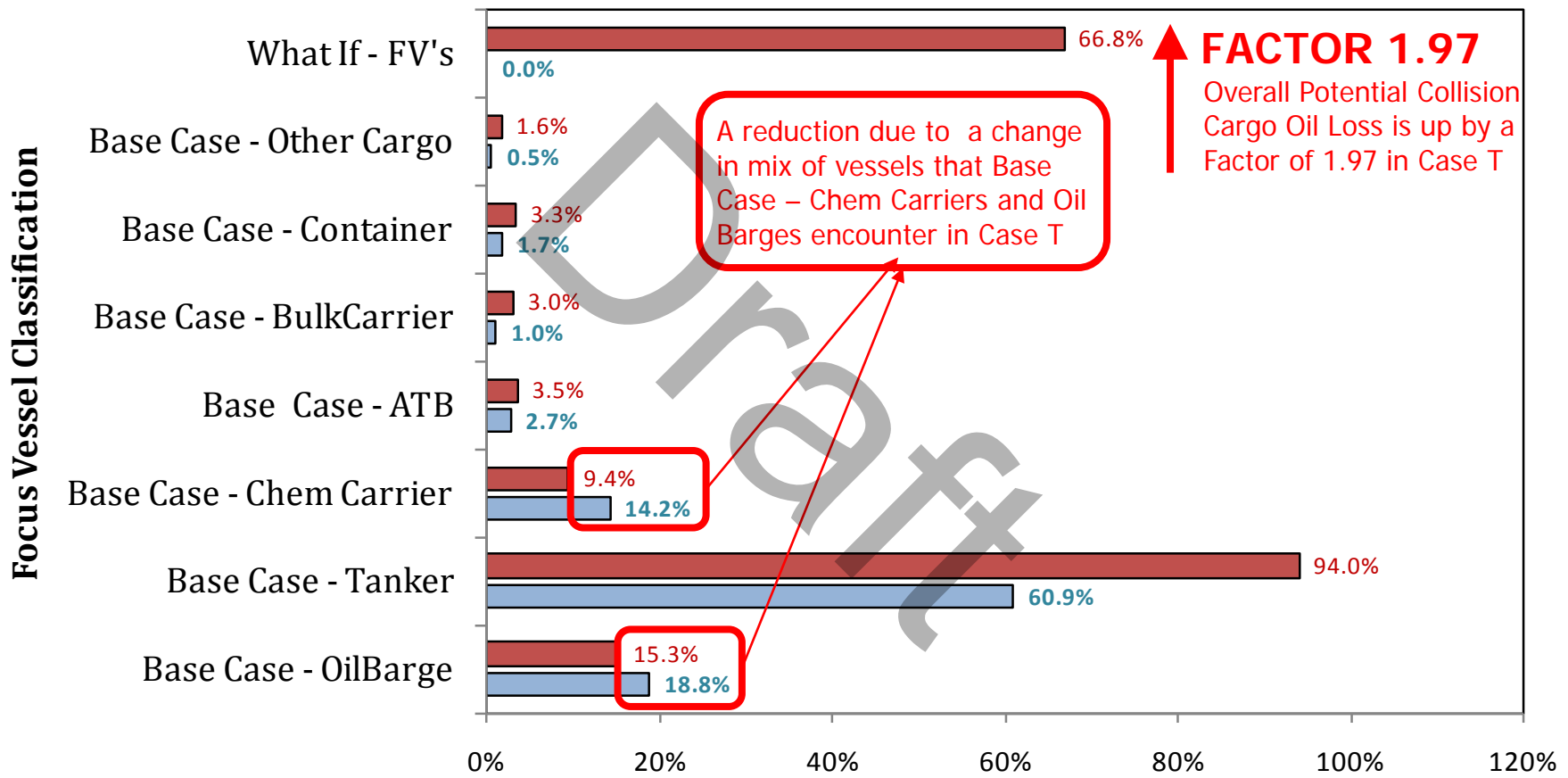


## 2010 CASE T:



# CASE T: GW 487, KM 348, DP 348 and 67:

## VTRA 2010 - COLLISION CARGO OIL LOSS



A reduction due to a change in mix of vessels that Base Case - Chem Carriers and Oil Barges encounter in Case T

**FACTOR 1.97**  
 Overall Potential Collision Cargo Oil Loss is up by a Factor of 1.97 in Case T

% of 2010 Potential Collision Cargo Oil Outflow (PCCO)

■ T: GW - KM - DP - 196.9%    ■ P: BASE CASE 2010 - 100.0%

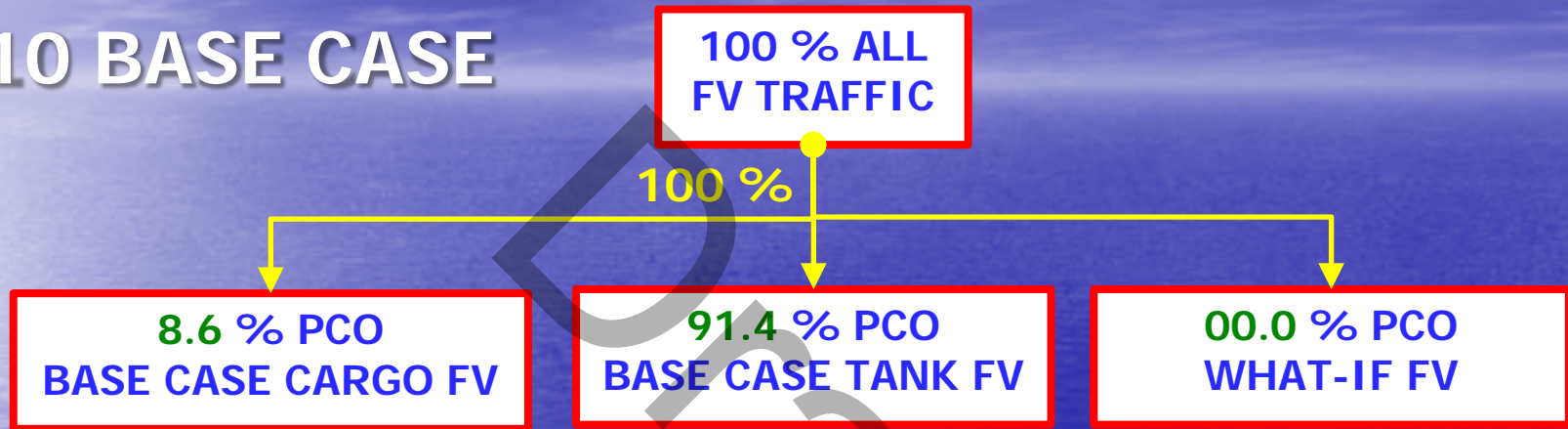




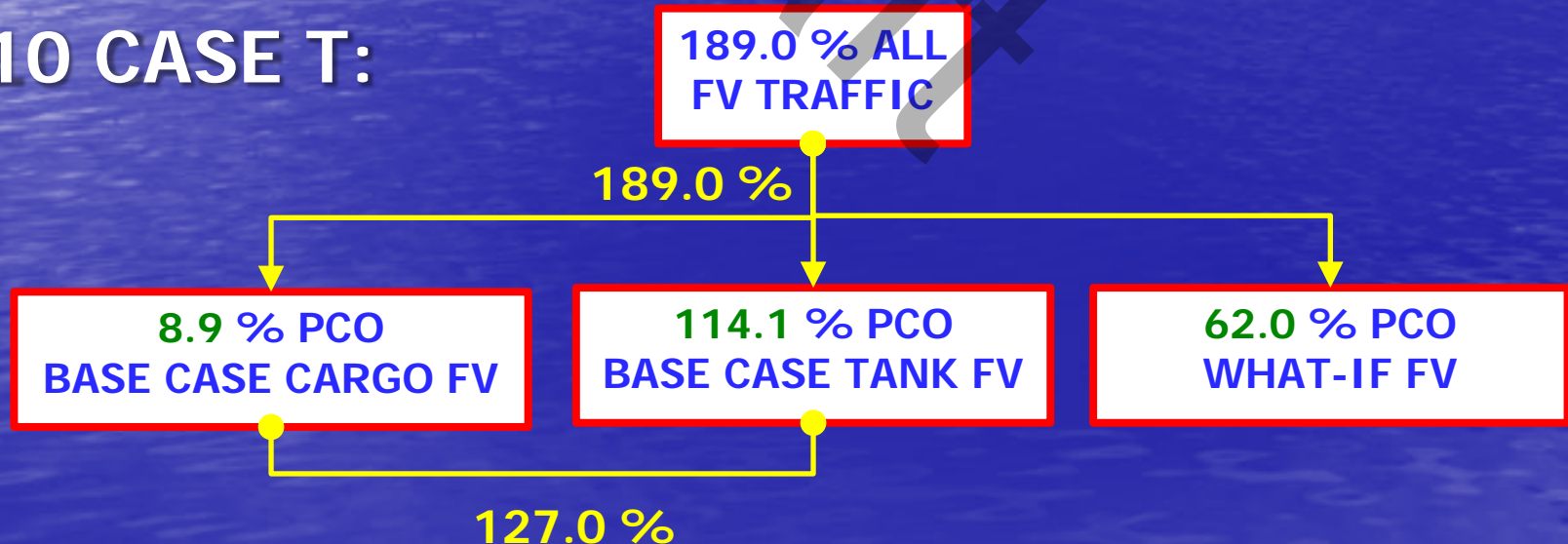
# A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL COLLISION OIL (CARGO + FUEL) LOSS

PCO : POTENTIAL COLLISION OIL LOSS - PER YEAR

## 2010 BASE CASE

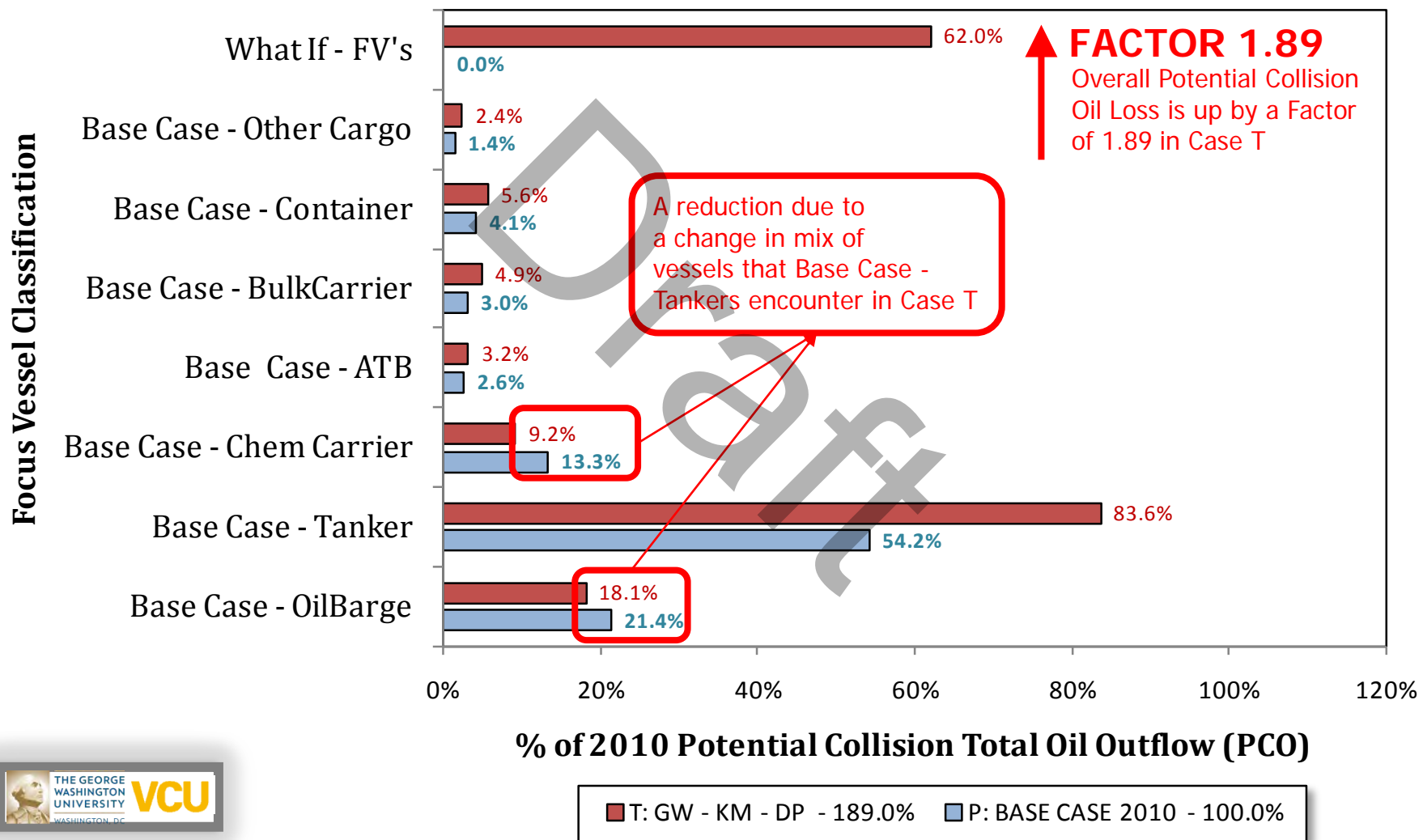


## 2010 CASE T:



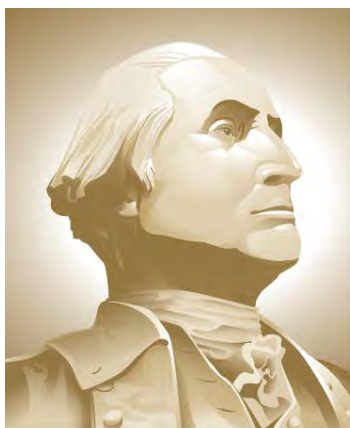
# CASE T: GW 487, KM 348, DP 348 and 67:

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



# VTRA 2010 COLLISION FREQ. BY CARGO – FV and TANK- FV A WATERWAY BY LOCATION ANALYSIS

Presentation by: J. Rene van Dorp



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VCU

**CASE T: Gateway, Kinder Morgan, Delta Port**

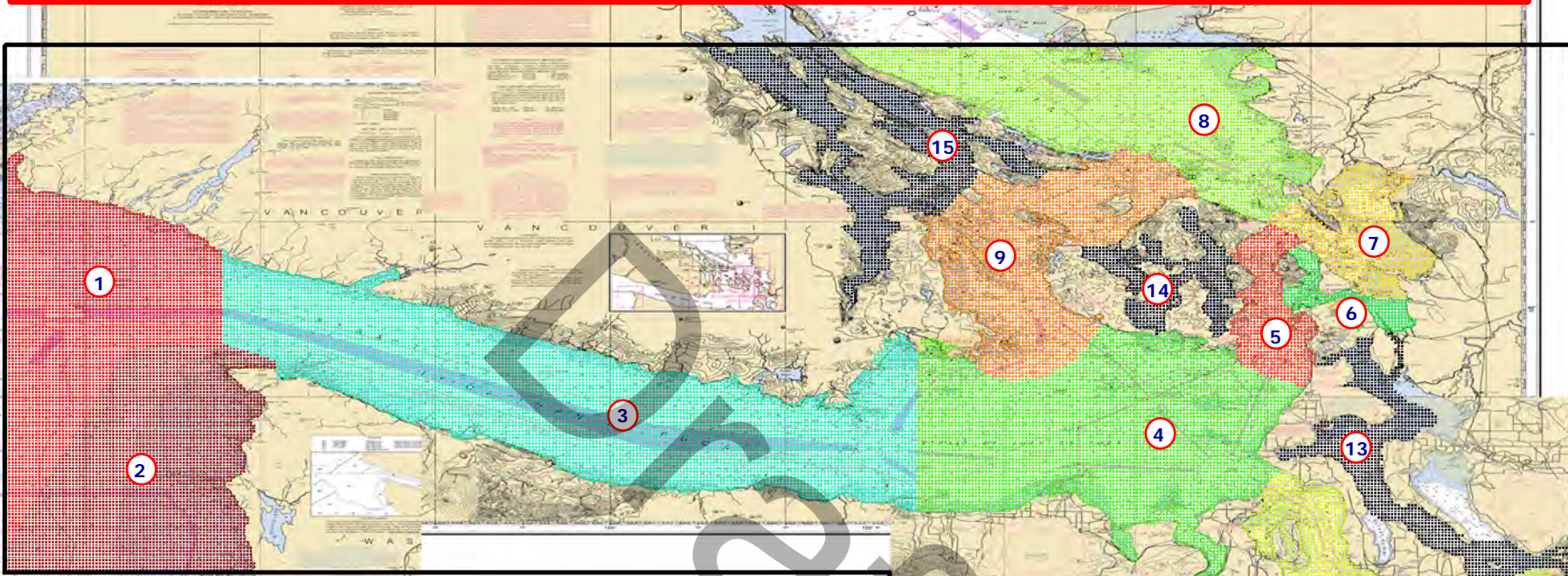
**GWU Personnel:** Dr. J. Rene van Dorp

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

**OCTOBER 9, 2013**

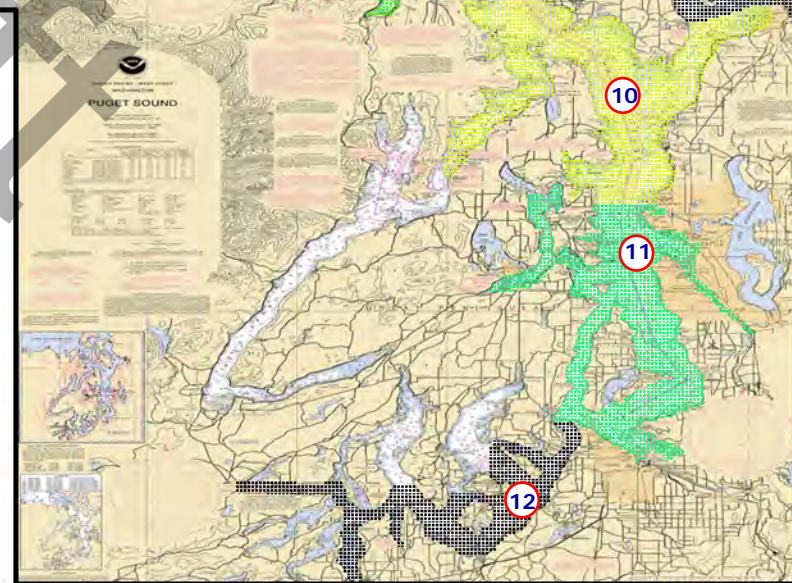
PRELIMINARY

# DEFINITION OF 15 WATERWAY LOCATIONS



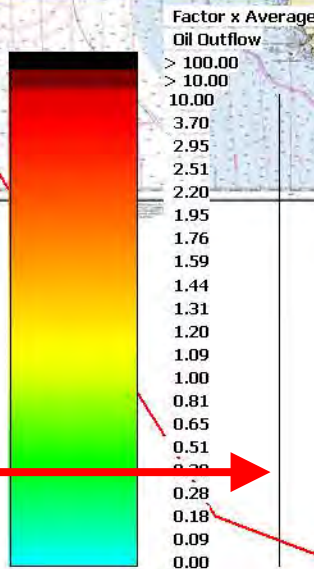
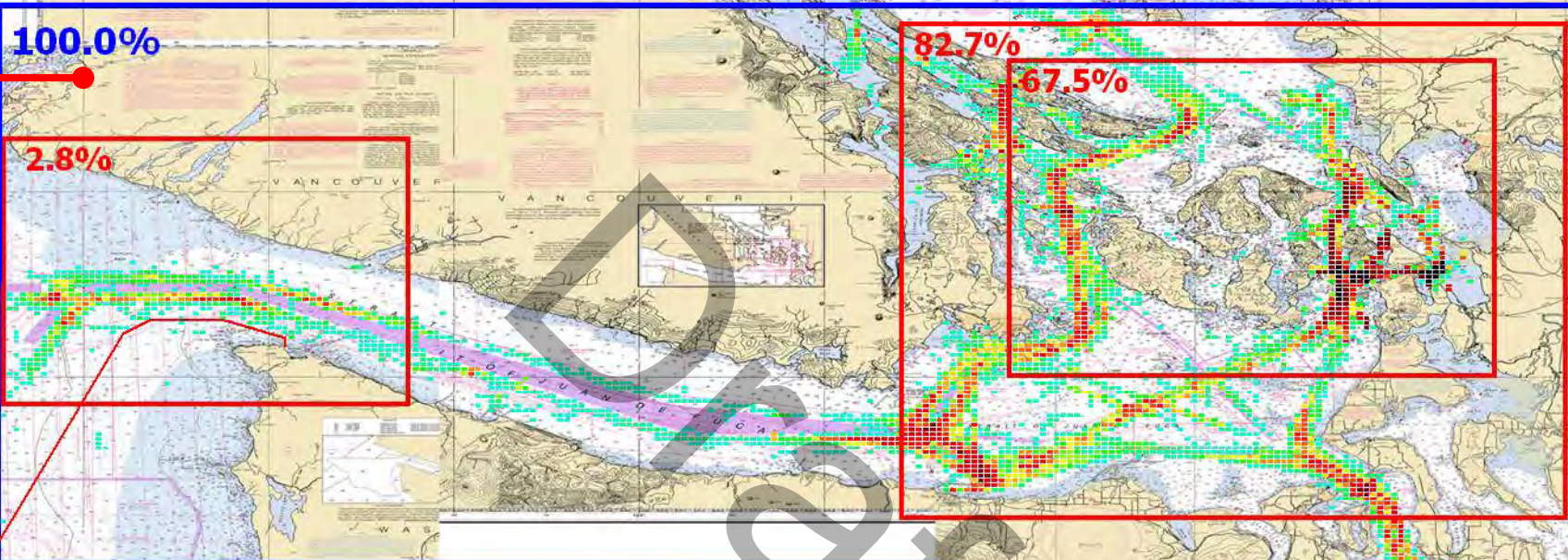
## VTRA 2010 Waterway Locations

- |                 |                 |
|-----------------|-----------------|
| 1. Buoy J       | 9. Harp/Boun.   |
| 2. ATBA         | 10. PS North    |
| 3. WSJF         | 11. PS South    |
| 4. ESJF         | 12. Tacoma      |
| 5. Rosario      | 13. Sar/Skagit  |
| 6. Guemes       | 14. SJ Islands  |
| 7. Saddlebag    | 15. Islands Trt |
| 8. Georgia Str. |                 |



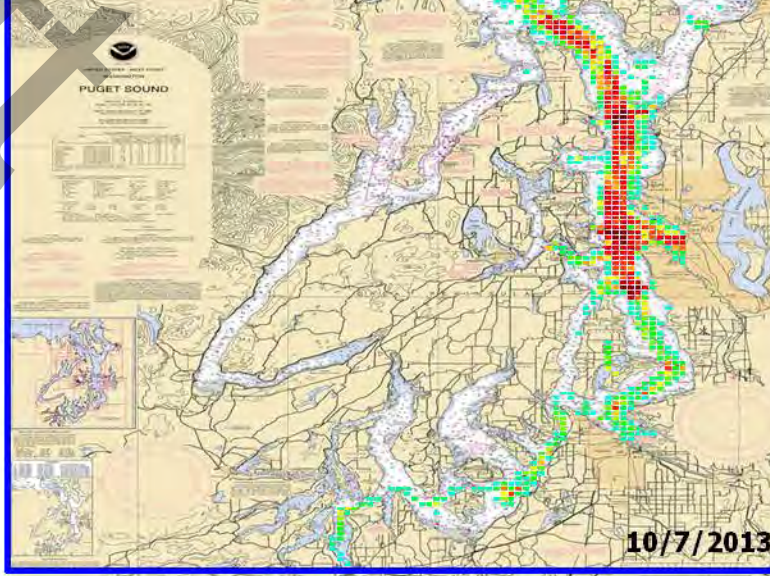
**P: ALL FV POTENTIAL COLLISION OIL (FUEL + CARGO) LOSS (PCO)**

**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**



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

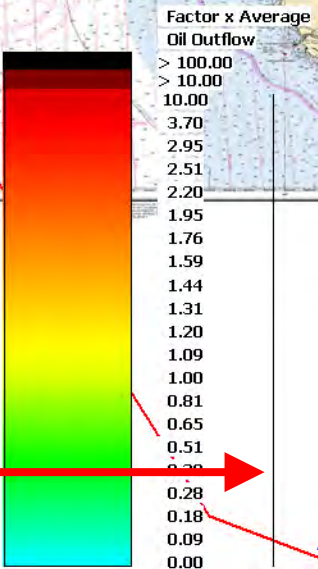
**T: VTRA 2010 - GW 487- KM 348 - DP Cont. 67 and Bulk 348 - All FV**

**188.8%**

**11.6%**

**158.3%**

**125.6%**



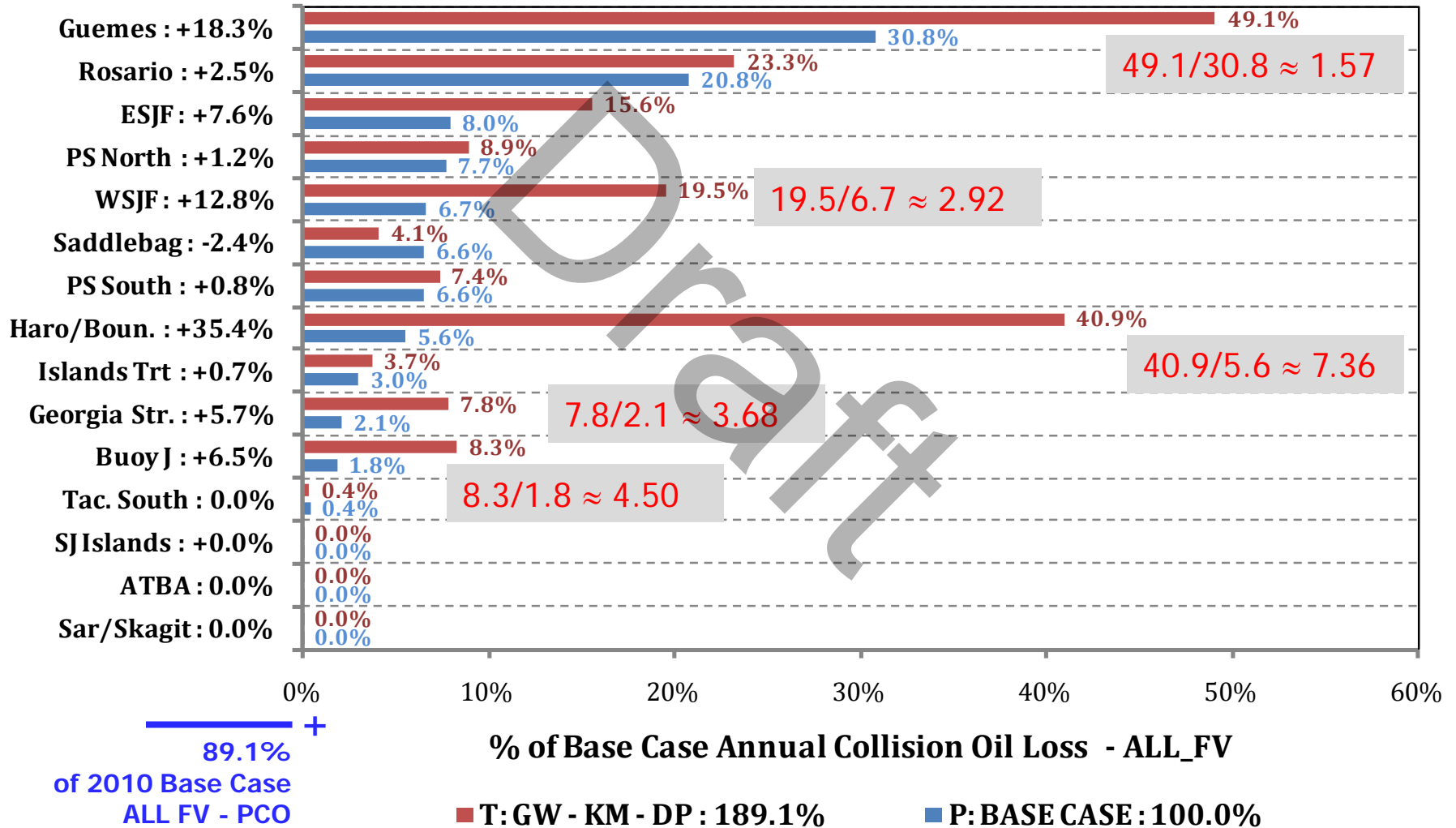
- T: POTENTIAL COLL. OIL LOSS (PCO)**
- 04.9% - BULK CARGO
  - 05.6% - CONTAINERSHIP
  - 02.4% - OTHER CARGO
  - 18.1% - OIL BARGE
  - 83.6% - TANKER
  - 09.2% - CHEMICAL CARRIER
  - 03.2% - ATB
  - 62.0% - WHAT-IF FV

**188.8% +**  
**ALL FV - PCO**

# WATERWAY LOCATION

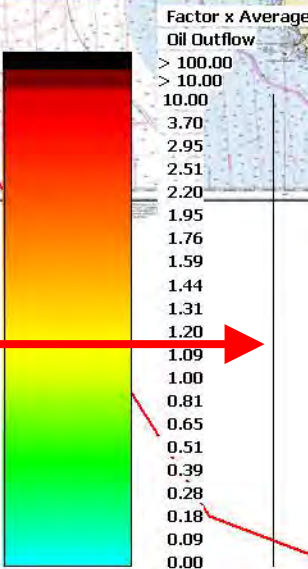
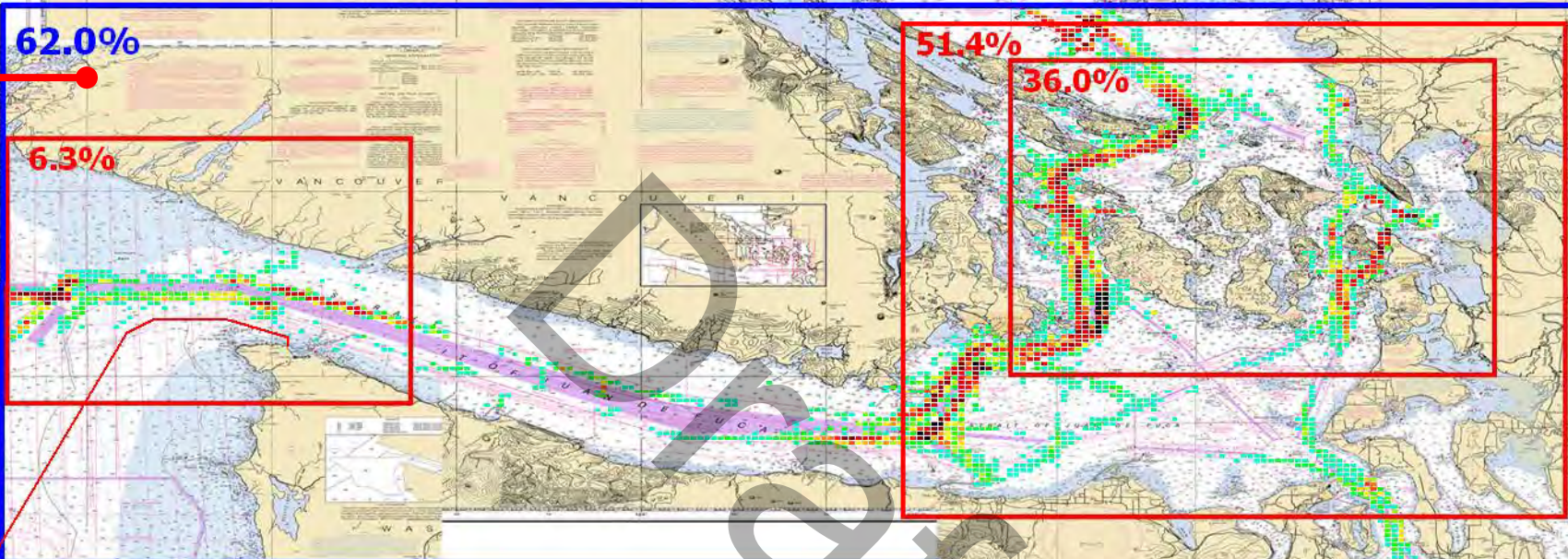
## Potential Collision Oil Loss Comparison – ALL FV

### % Base Case Collision Oil Loss - ALL\_FV



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

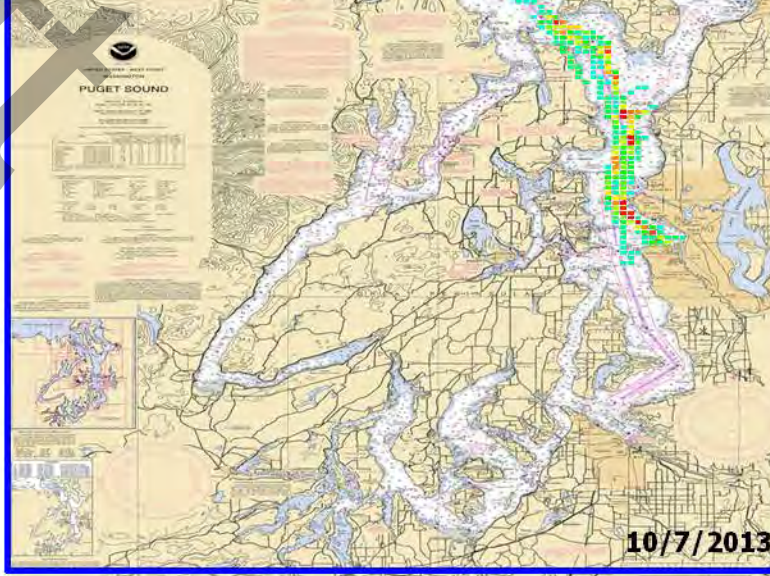
**T: VTRA 2010 - GW 487- KM 348 - DP Cont. 67 and Bulk 348**



**T: POTENTIAL COLL. OIL LOSS (PCO)**

- 15.2% - BULKCARRIER
- 00.7% - CONTAINERSHIP
- 41.3% - OIL TANKER
- 04.8% - OIL BARGE

**62.0% of 2010 Base Case ALL FV – PCO**

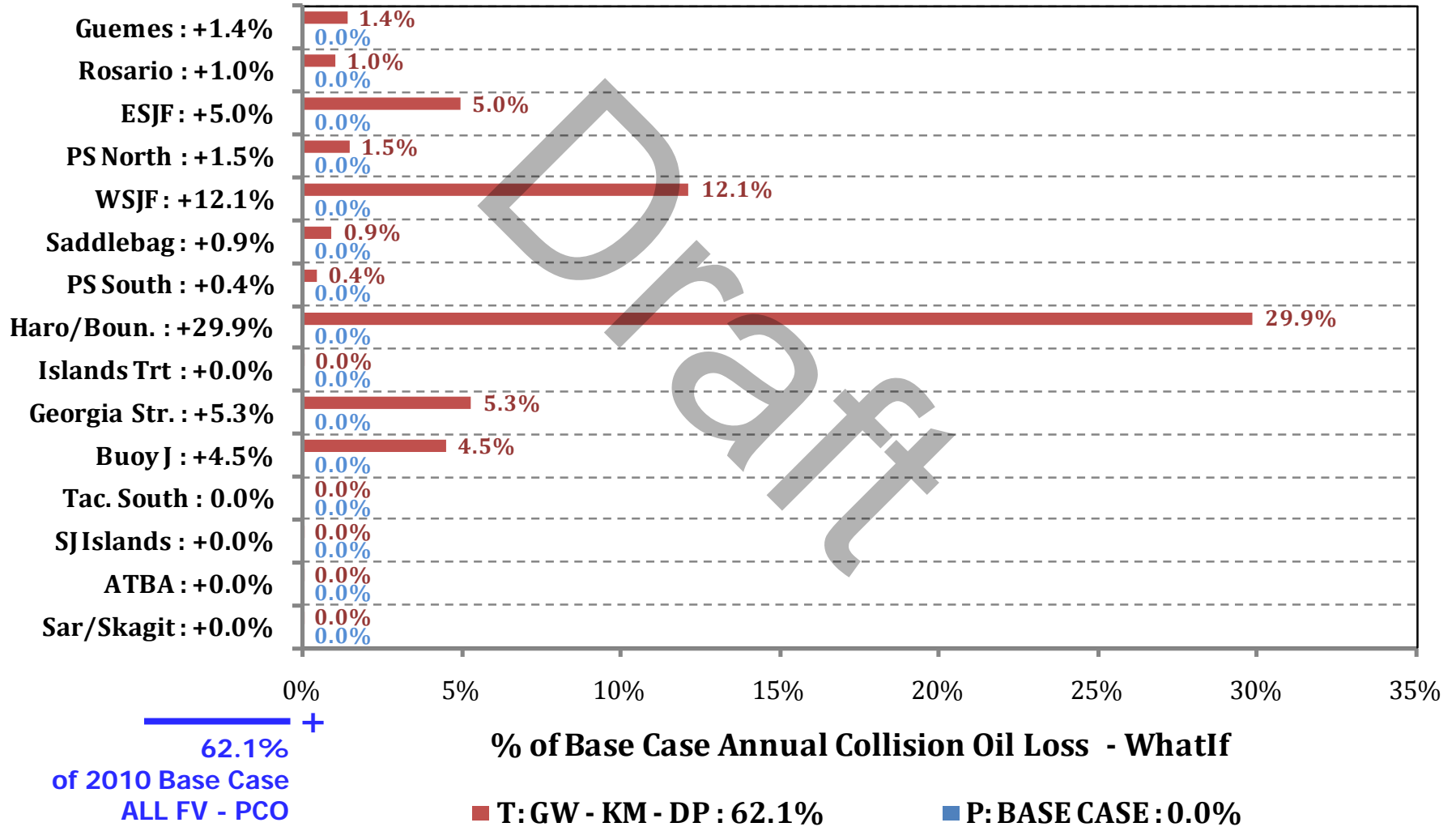




# WATERWAY LOCATION

## Potential Collision Oil Loss Comparison – WHAT-IF FV

### % Base Case Collision Oil Loss - WhatIf



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

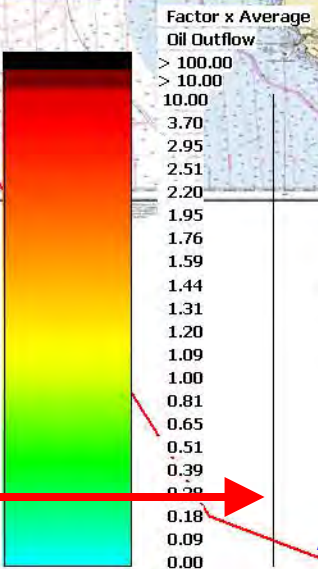
**P: VTRA 2010 - BASE CASE**

**13.2%**

**0.5%**

**8.8%**

**5.6%**

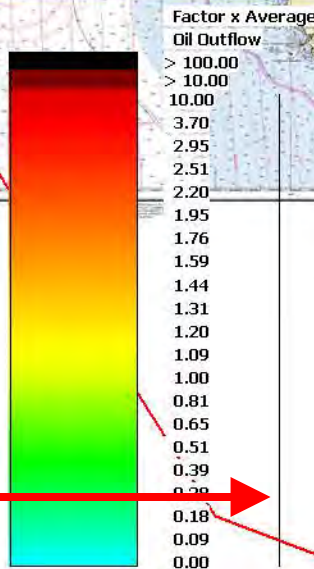
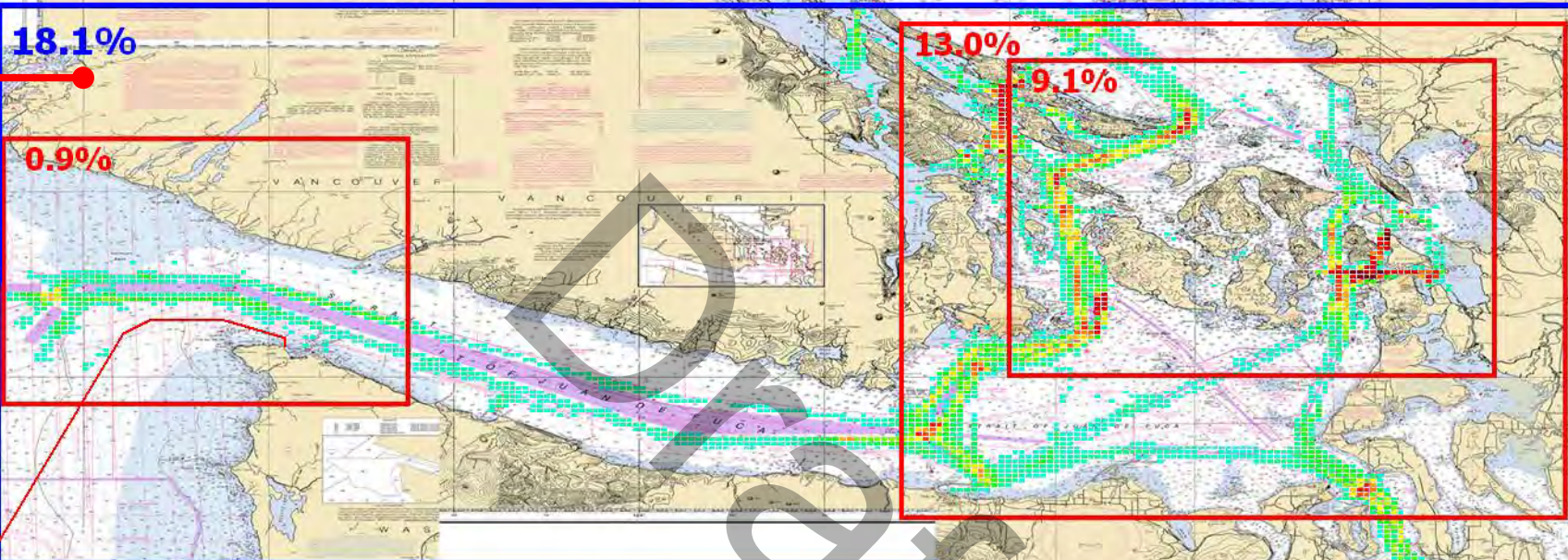


- P: POT. COLL. FUEL OIL LOSS (PCFO)**
- 2.1% - BULK CARGO
  - 2.6% - CONTAINERSHIP
  - 1.0% - OTHER CARGO
  - 5.0% - OIL BARGE
  - 1.2% - TANKER
  - 1.0% - CHEMICAL CARRIER
  - 0.2% - ATB
  - 0.0% - WHAT-IF FV

**+**  
**13.2% of 2010 Base Case**  
**ALL FV - PCO**

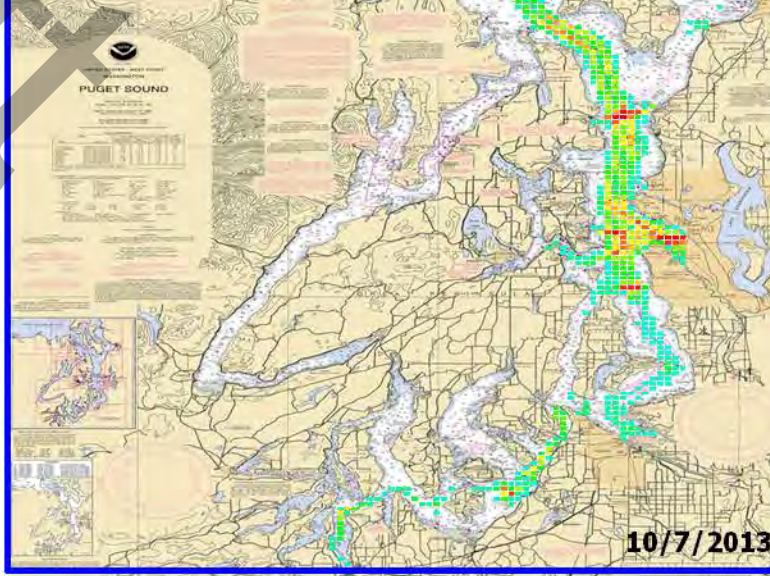
**T: ALL FV POTENTIAL COLLISION FUEL OIL LOSS (PCFO)**

**T: VTRA 2010 - GW 487- KM 348 - DP Cont. 67 and Bulk 348**



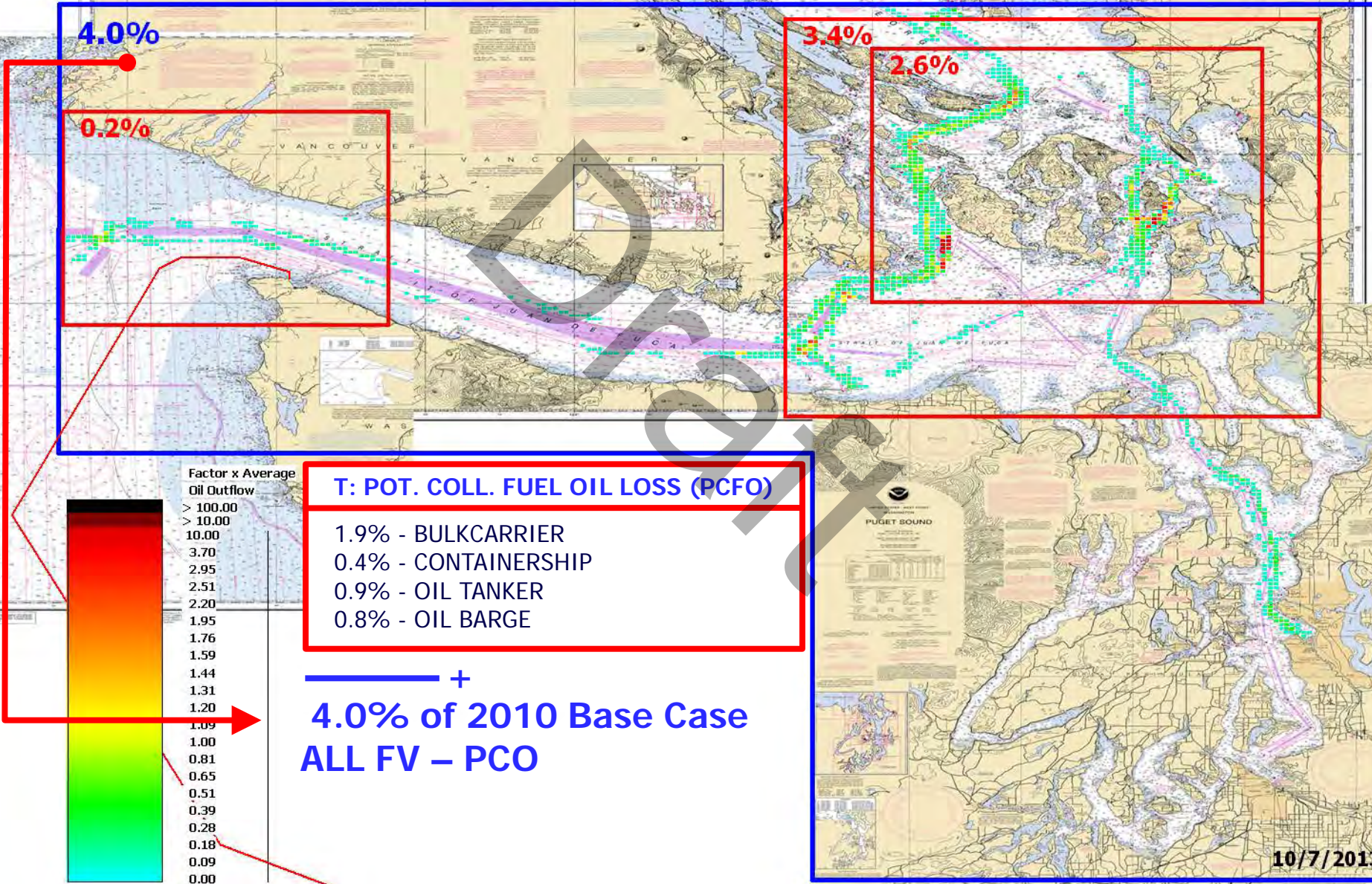
- T: POT. COLL. FUEL OIL LOSS (PCFO)**
- 2.3% - BULK CARGO
  - 2.8% - CONTAINERSHIP
  - 1.0% - OTHER CARGO
  - 4.9% - OIL BARGE
  - 2.0% - TANKER
  - 1.0% - CHEMICAL CARRIER
  - 0.2% - ATB
  - 4.0% - WHAT-IF FV

**+**  
**18.1% of 2010 Base Case**  
**ALL FV - PFO**



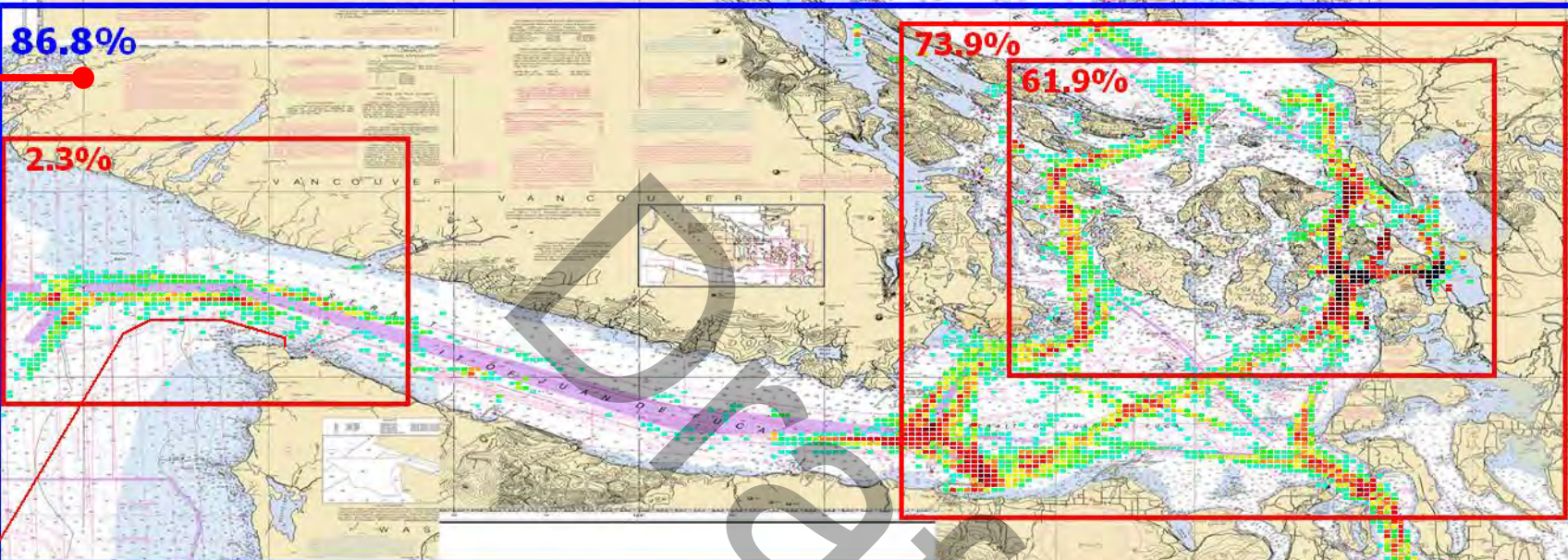
# T: WHAT-IF FV POTENTIAL COLLISION FUEL OIL LOSS (PCFO)

T: VTRA 2010 - GW 487- KM 348 - DP Cont. 67 and Bulk 348



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

**P: VTRA 2010 - BASE CASE**

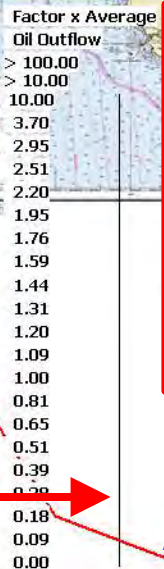


86.8%

2.3%

73.9%

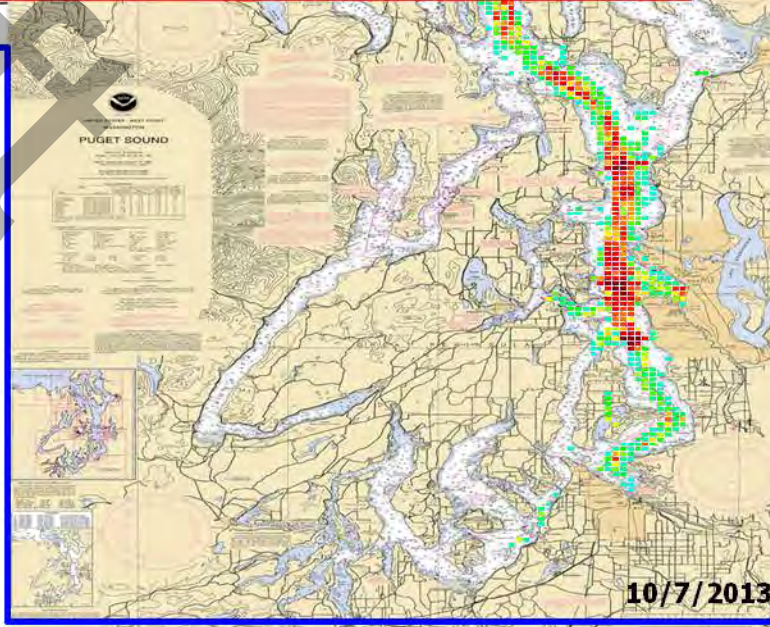
61.9%



**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**



# T: ALL FV POTENTIAL COLLISION CARGO OIL LOSS (PCCO)

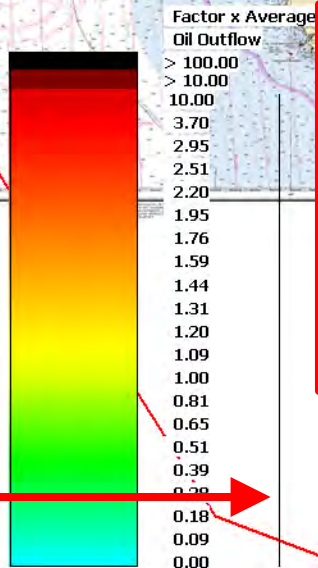
T: VTRA 2010 - GW 487- KM 348 - DP Cont. 67 and Bulk 348

170.7%

10.8%

145.3%

116.4%



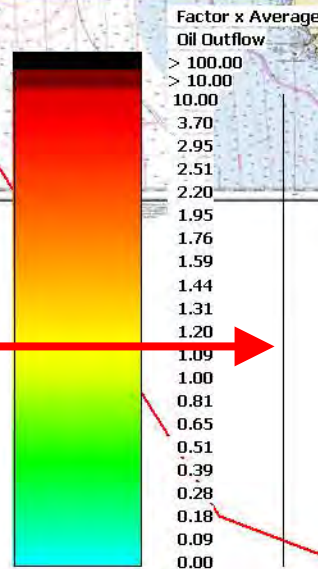
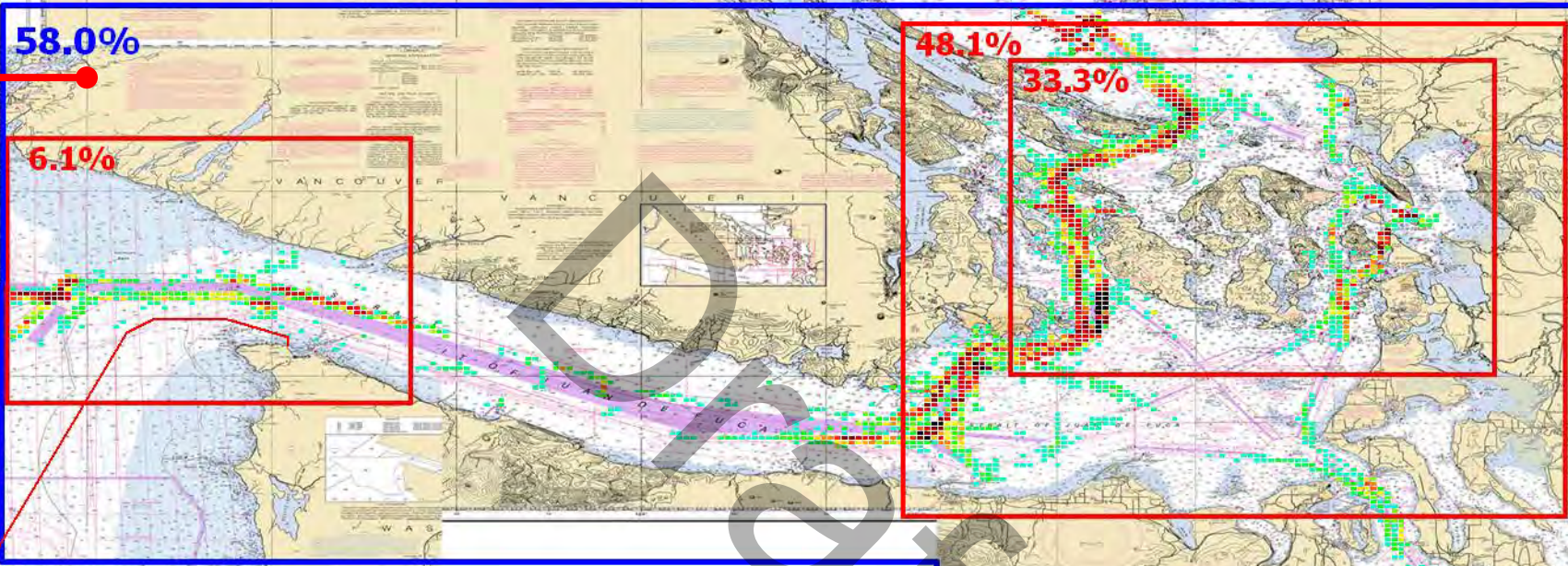
## T: POT. COLL. CARGO OIL LOSS (PCCO)

- 02.6% - BULK CARGO
- 02.9% - CONTAINERSHIP
- 01.4% - OTHER CARGO
- 13.2% - OIL BARGE
- 81.6% - TANKER
- 08.2% - CHEMICAL CARRIER
- 03.0% - ATB
- 58.0% - WHAT-IF FV

+  
170.7% of 2010 Base Case  
ALL FV - PCCO

**T: WHAT-IF FV POTENTIAL COLLISION CARGO OIL LOSS (PCCO)**

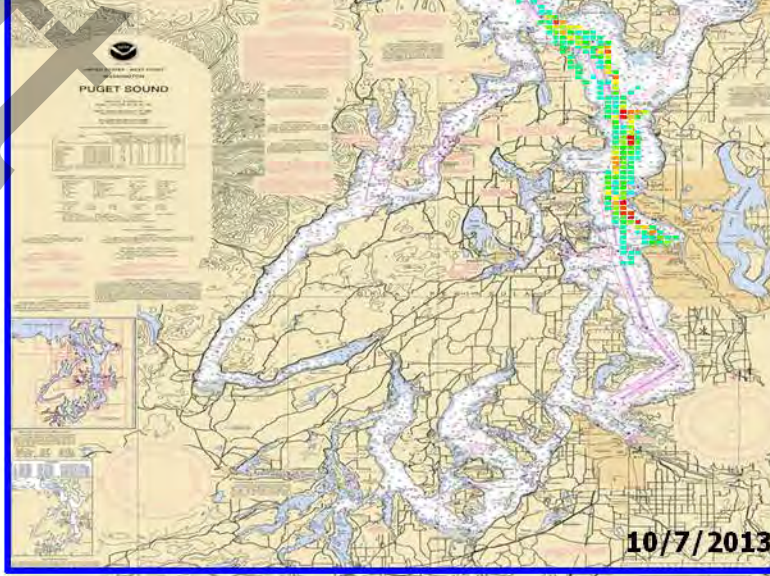
**T: VTRA 2010 - GW 487- KM 348 - DP Cont. 67 and Bulk 348**



**T: POT. COLL. CARGO OIL LOSS (PCCO)**

- 13.3% - BULKCARRIER
- 00.3% - CONTAINERSHIP
- 40.4% - OIL TANKER
- 04.0% - OIL BARGE

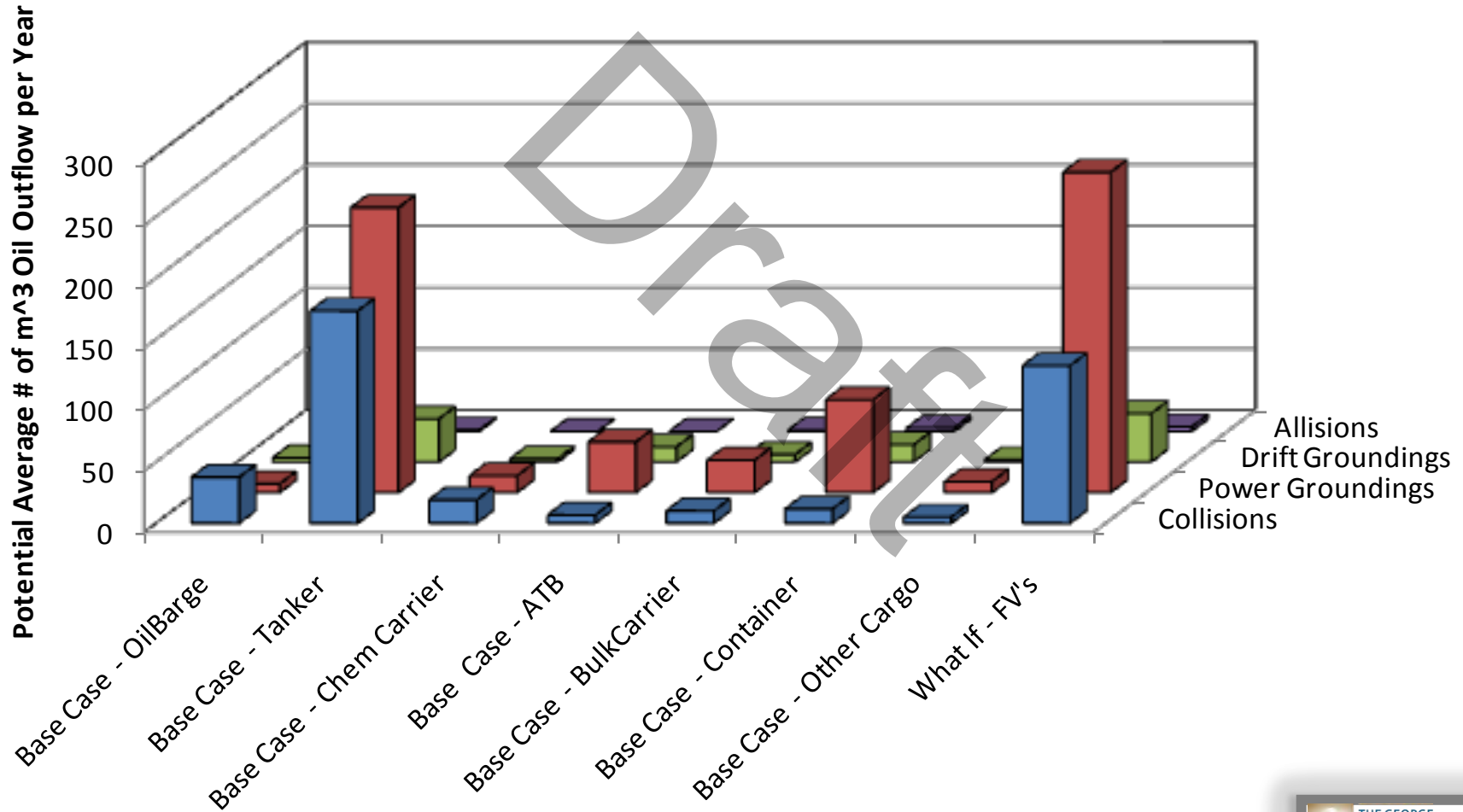
**58.0% of 2010 Base Case ALL FV – PCO**



# A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ACCIDENT FREQUENCY AND ACCIDENT TYPE

## CASE T: GW 487, KM 348, DP 348 and 67:

**T - VTRA 2010 : Potential Average # of m<sup>3</sup> Oil Outflow per Year**





**T - VTRA 2010 : Potential Average # of m<sup>3</sup> Oil Outflow per Year**

Focus Vessel	Collisions	Power Groundings	Drift Groundings	Allisions	Total
Base Case - OilBarge	18.1%	1.7%	4.4%	0.0%	6.8%
Base Case - Tanker	83.6%	55.9%	46.0%	21.1%	62.7%
Base Case - Chem Carrier	9.2%	3.3%	3.4%	0.0%	5.0%
Base Case - ATB	3.2%	10.0%	16.0%	0.0%	8.6%
Base Case - All Tank FV's	114.1%	70.9%	69.9%	21.1%	83.1%
Base Case - BulkCarrier	4.9%	6.4%	7.9%	16.1%	6.2%
Base Case - Container	5.6%	18.2%	18.5%	50.8%	14.8%
Base Case - Other Cargo	2.4%	2.1%	2.4%	10.9%	2.3%
Base Case - All Cargo FV's	12.9%	26.7%	28.8%	77.9%	23.3%
Base Case - All FV's	127.0%	97.7%	98.6%	99.0%	106.4%
What If - FV's	62.0%	62.9%	51.6%	64.7%	61.4%
<b>Total - Base Case + What- IF</b>	<b>189.0%</b>	<b>160.6%</b>	<b>150.2%</b>	<b>163.7%</b>	<b>167.8%</b>

**T - VTRA 2010 : Potential Average # of m<sup>3</sup> Oil Outflow per Year**

Focus Vessel	Collisions	Power Groundings	Drift Groundings	Allisions	Total
Base Case - OilBarge	37.5	7.1	3.4	0.0	48.0
Base Case - Tanker	173.1	232.3	35.1	1.2	441.8
Base Case - Chem Carrier	19.0	13.7	2.6	0.0	35.3
Base Case - ATB	6.7	41.3	12.2	0.0	60.3
Base Case - All Tank FV's	236.3	294.5	53.4	1.2	585.3
Base Case - BulkCarrier	10.1	26.4	6.0	0.9	43.5
Base Case - Container	11.7	75.8	14.1	2.9	104.4
Base Case - Other Cargo	5.0	8.9	1.8	0.6	16.3
Base Case - All Cargo FV's	26.7	111.1	22.0	4.4	164.2
Base Case - All FV's	263.0	405.6	75.3	5.6	749.6
What If - FV's	128.4	261.2	39.4	3.7	432.7
<b>Total - Base Case + What- IF</b>	<b>391.4</b>	<b>666.7</b>	<b>114.7</b>	<b>9.3</b>	<b>1182.2</b>