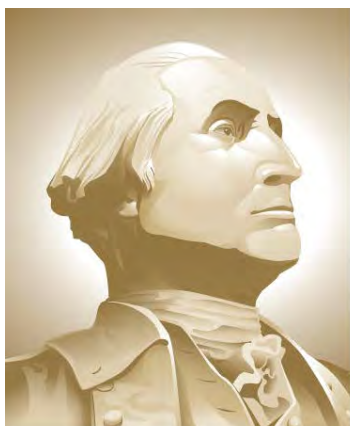


VTRA 2010 POTENTIAL GROUNDING FREQUENCY BY ALL FV, CARGO – FV, TANK- FV and WHAT-IF FV

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

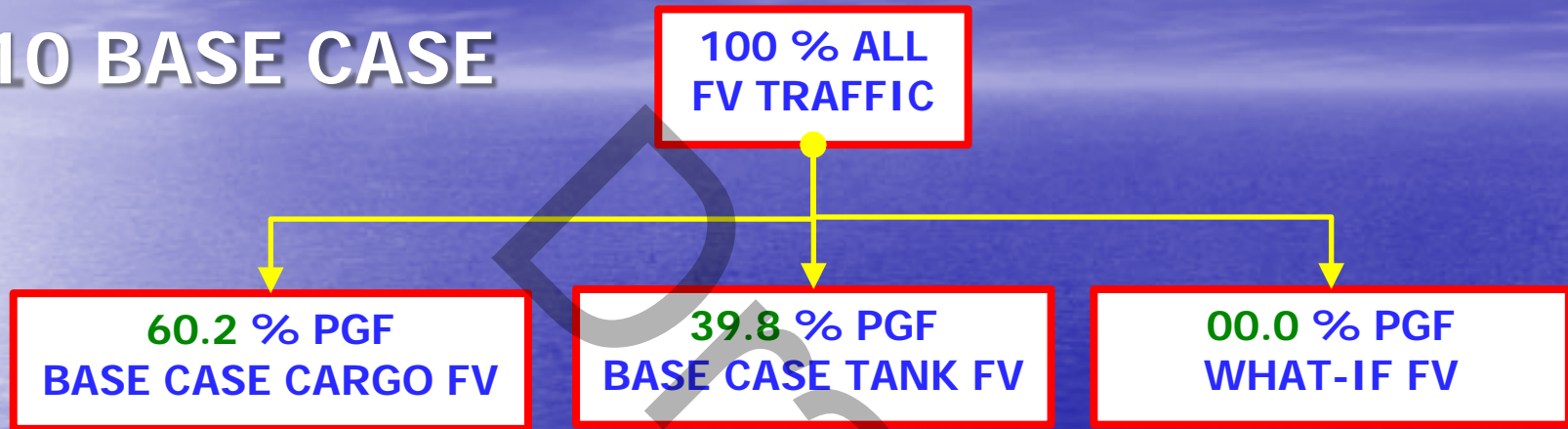
AUGUST 5, 2013

PRELIMINARY

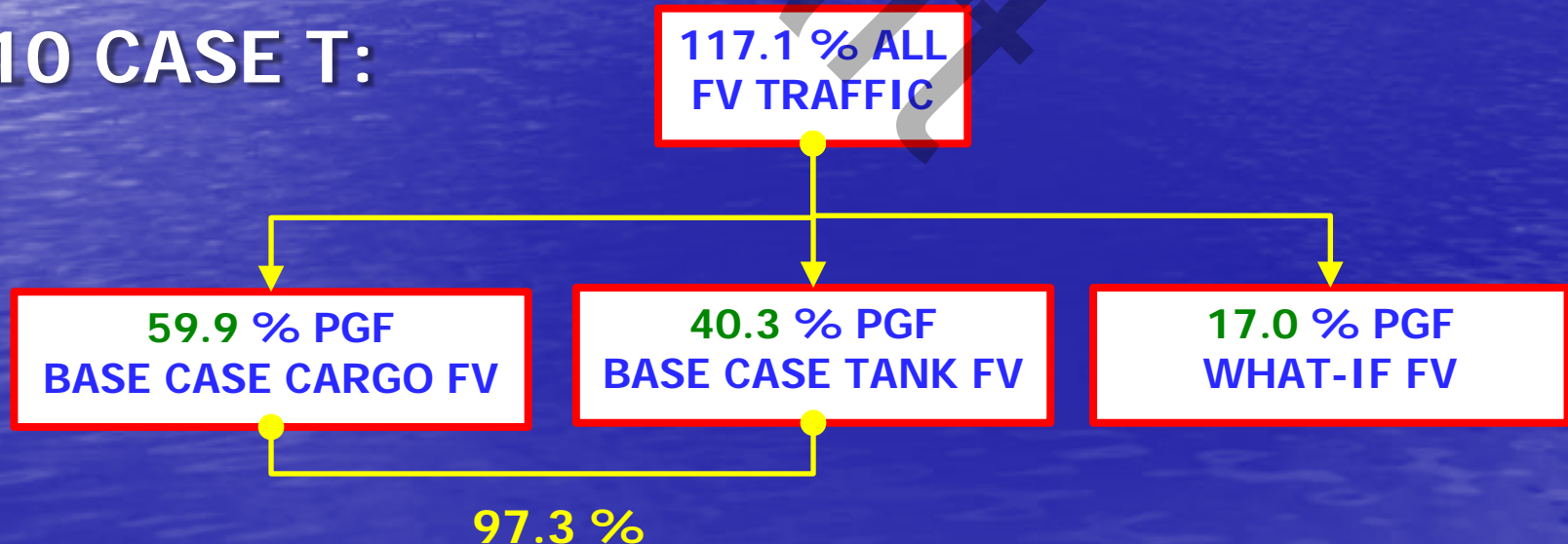
A TAXONOMY OF 2010 FOCUS VESSEL POTENTIAL ANNUAL COLLISION FREQUENCY

PCF : POTENTIAL GROUNDING FREQUENCY - PER YEAR

2010 BASE CASE

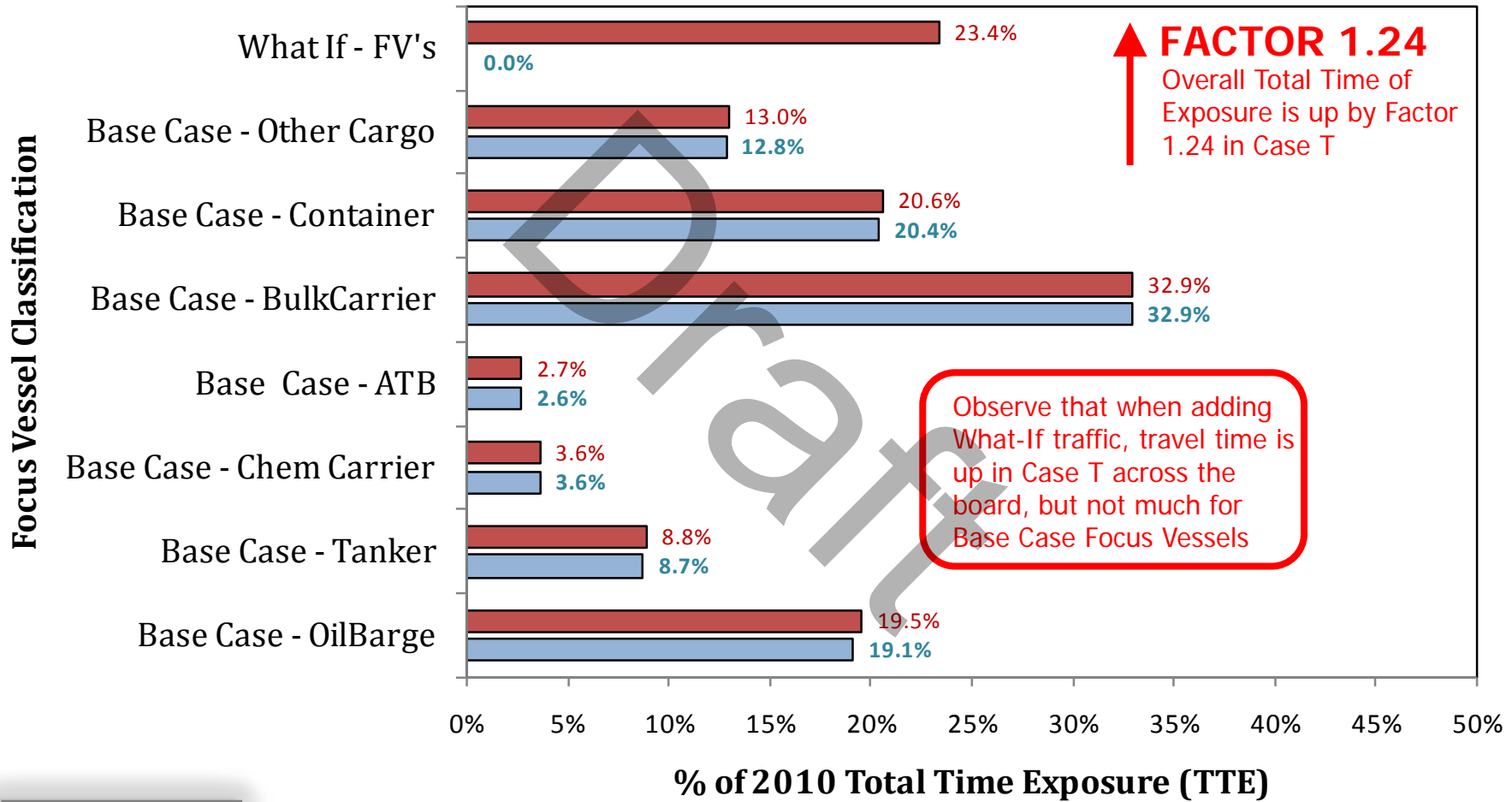


2010 CASE T:



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

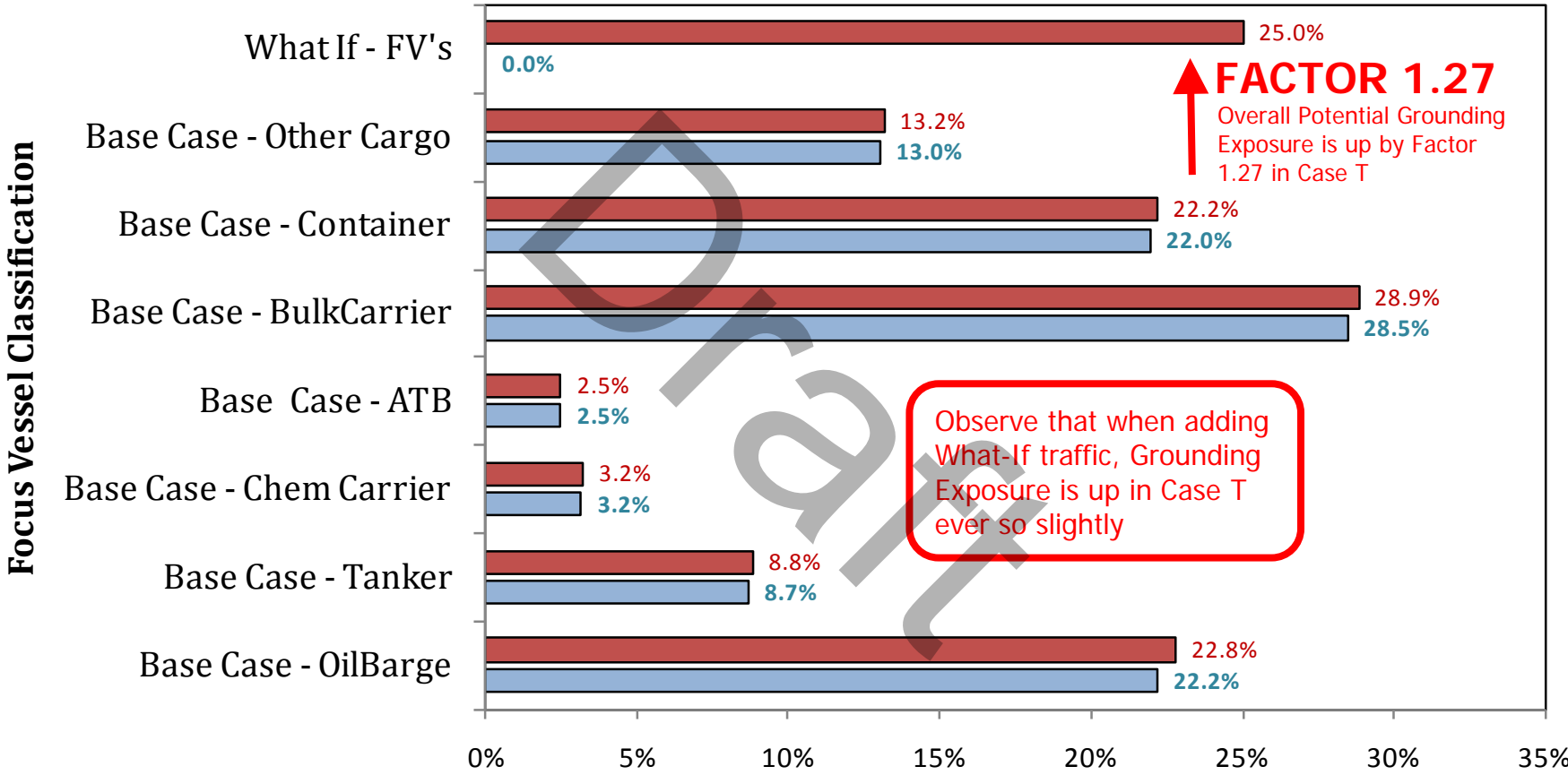
VTRA 2010 - Total Time of Exposure (TTE)



■ T: GW - KM - DP - 124.4%
 ■ P: BASE CASE 2010 - 100.0%

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

VTRA 2010 - GROUNDING EXPOSURE



FACTOR 1.27
 Overall Potential Grounding Exposure is up by Factor 1.27 in Case T

Observe that when adding What-If traffic, Grounding Exposure is up in Case T ever so slightly

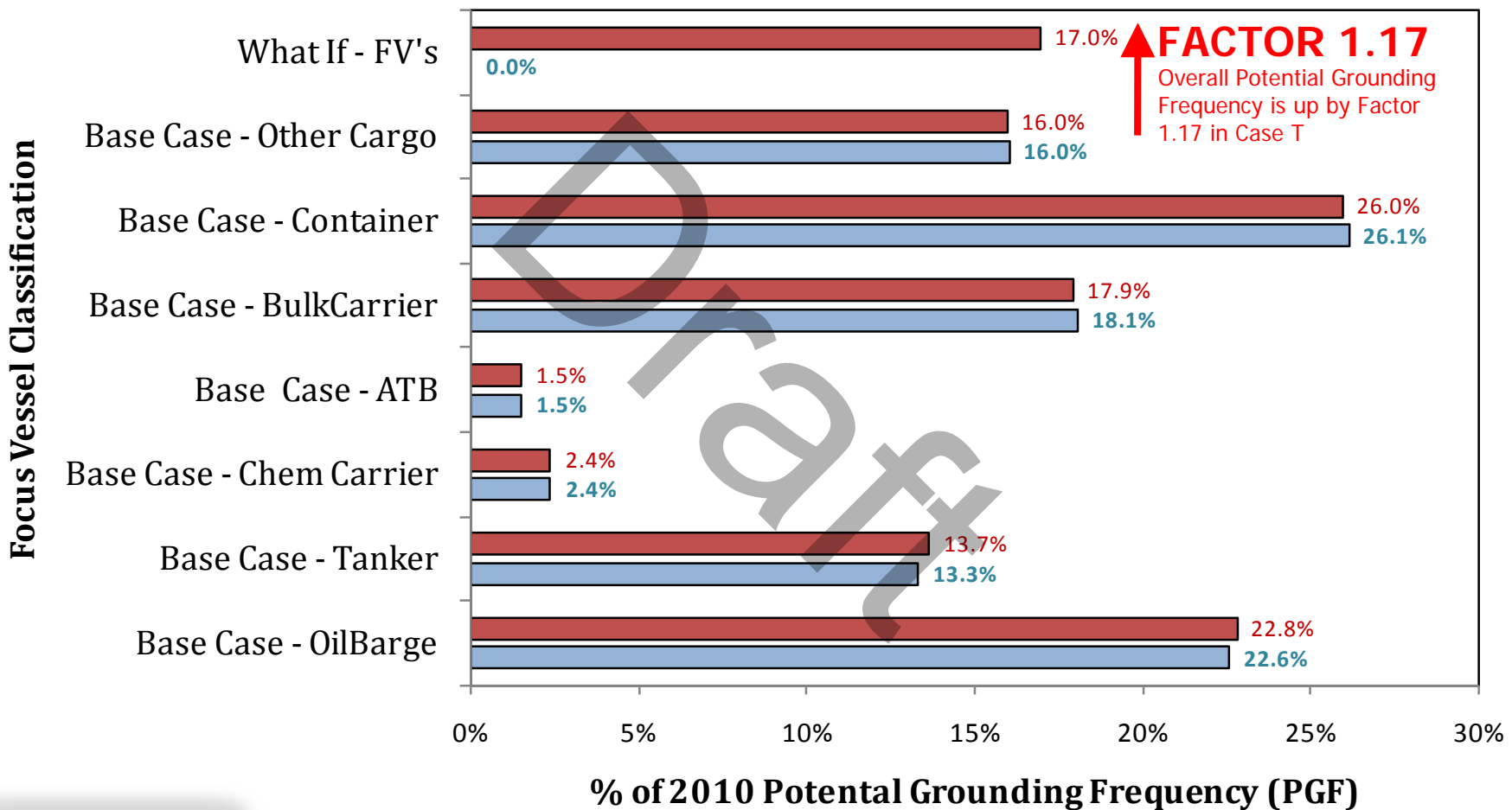
% of 2010 Potential Grounding Exposure (GE)

■ T: GW - KM - DP - 126.6% ■ P: BASE CASE 2010 - 100.0%



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

VTRA 2010 - GROUNDING FREQUENCY

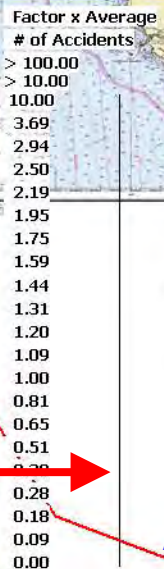
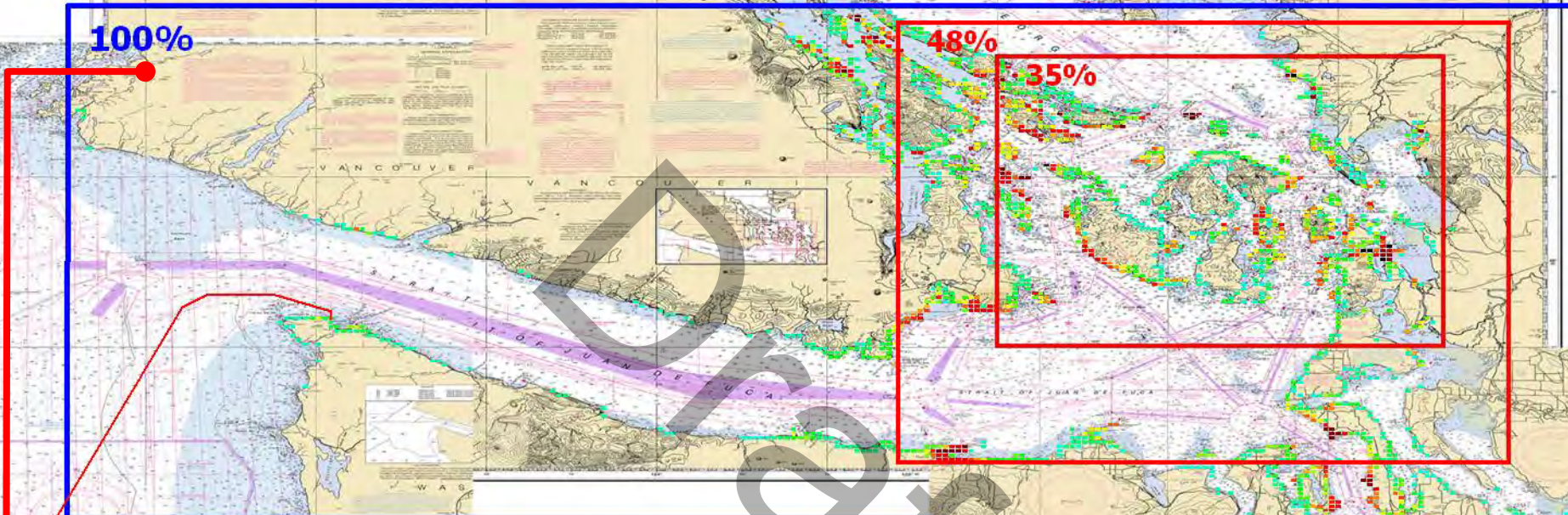


■ T: GW - KM - DP - 117.1% ■ P: BASE CASE 2010 - 100.0%



P: ALL FV POTENTIAL GROUNDING FREQUENCY (PGF)

P: VTRA 2010 - BASE CASE



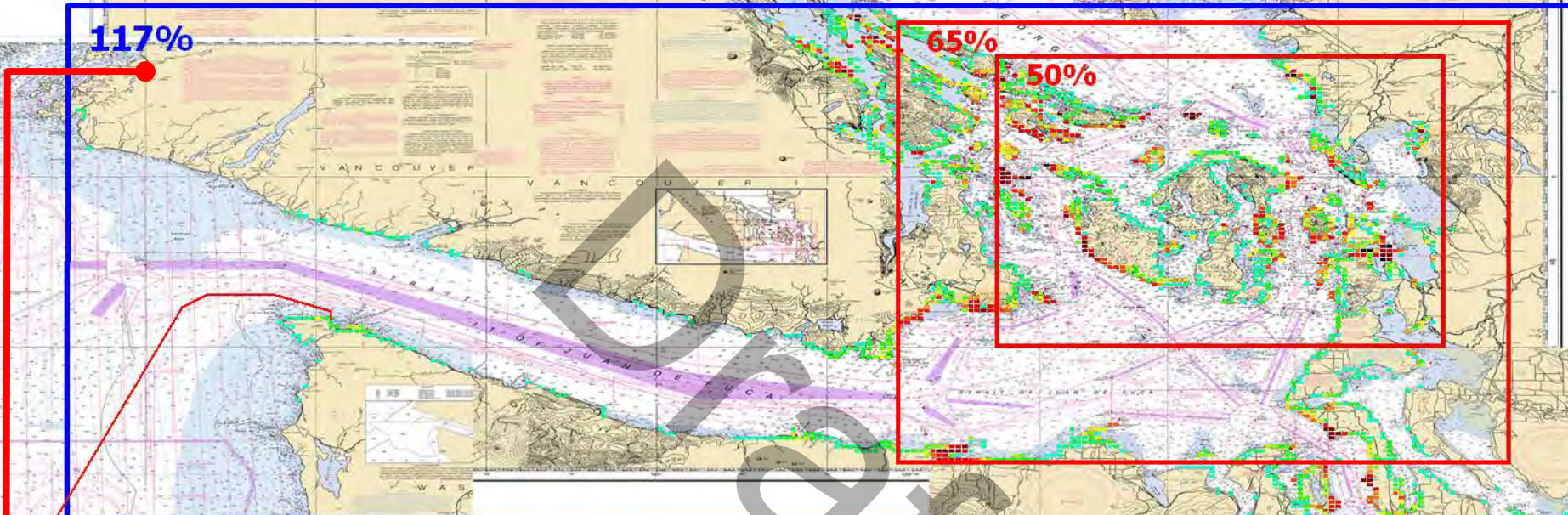
P: POTENTIAL GROUND. FREQ. (PGF)

18.1%	- BULK CARGO
26.1%	- CONTAINERSHIP
16.0%	- OTHERCARGO
22.6%	- OIL BARGE
13.3%	- TANKER
02.4%	- CHEMICAL CARRIER
01.5%	- ATB
00.0%	- WHAT-IF FV

+
100.0% of 2010 Base Case
ALL FV - PGF

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

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

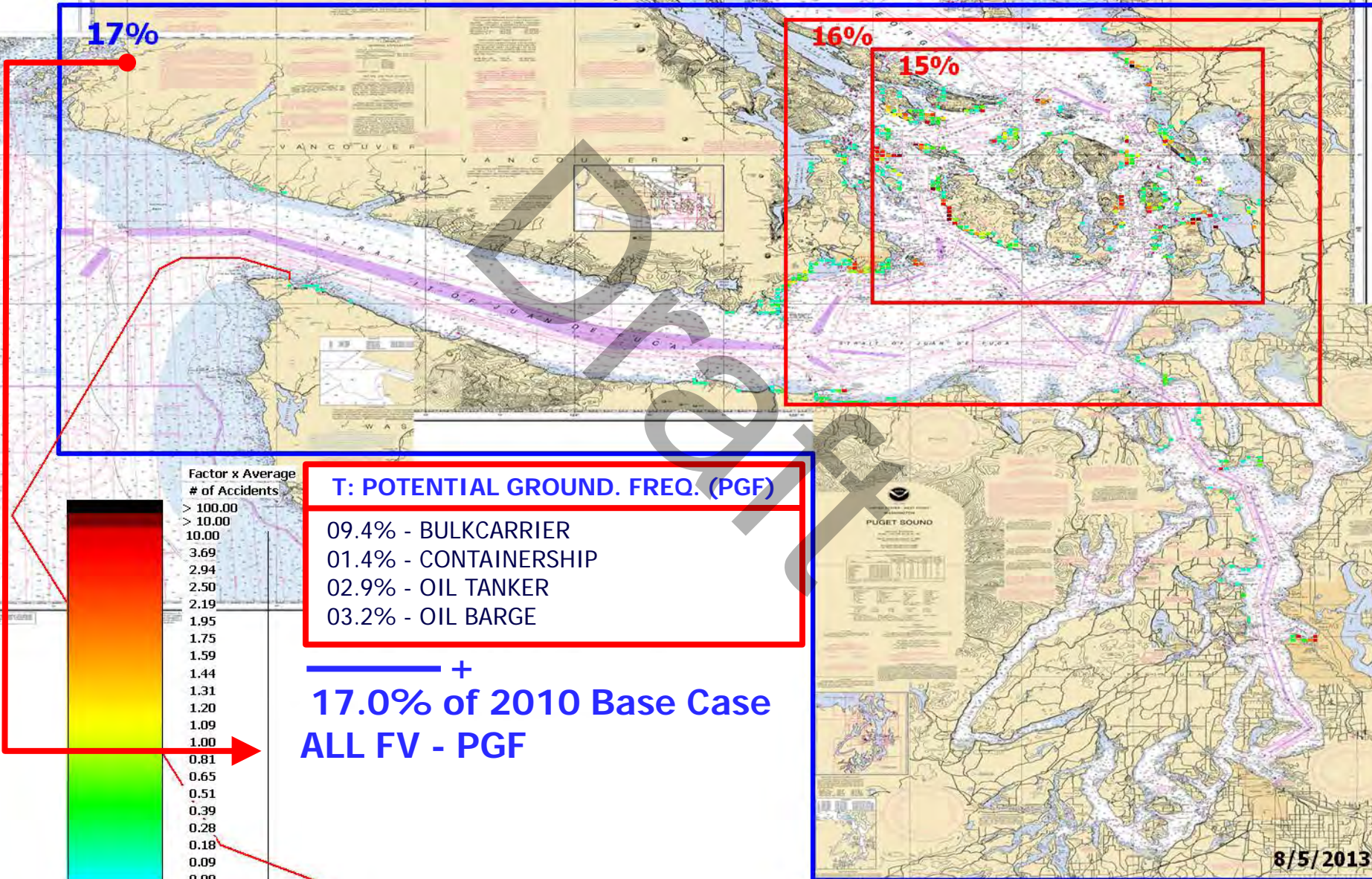


- T: POTENTIAL GROUND. FREQ. (PGF)**
- 17.9% - BULK CARGO
 - 26.0% - CONTAINERSHIP
 - 16.0% - OTHERCARGO
 - 22.8% - OIL BARGE
 - 13.7% - TANKER
 - 02.4% - CHEMICAL CARRIER
 - 01.5% - ATB
 - 17.0% - WHAT-IF FV

**100.2% of 2010 Base Case
ALL FV - PGF**

T: WHAT-IF FV POTENTIAL GROUNDING FREQUENCY (PGF)

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



17%

16%

15%

Factor x Average # of Accidents

> 100.00
> 10.00
10.00
3.69
2.94
2.50
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

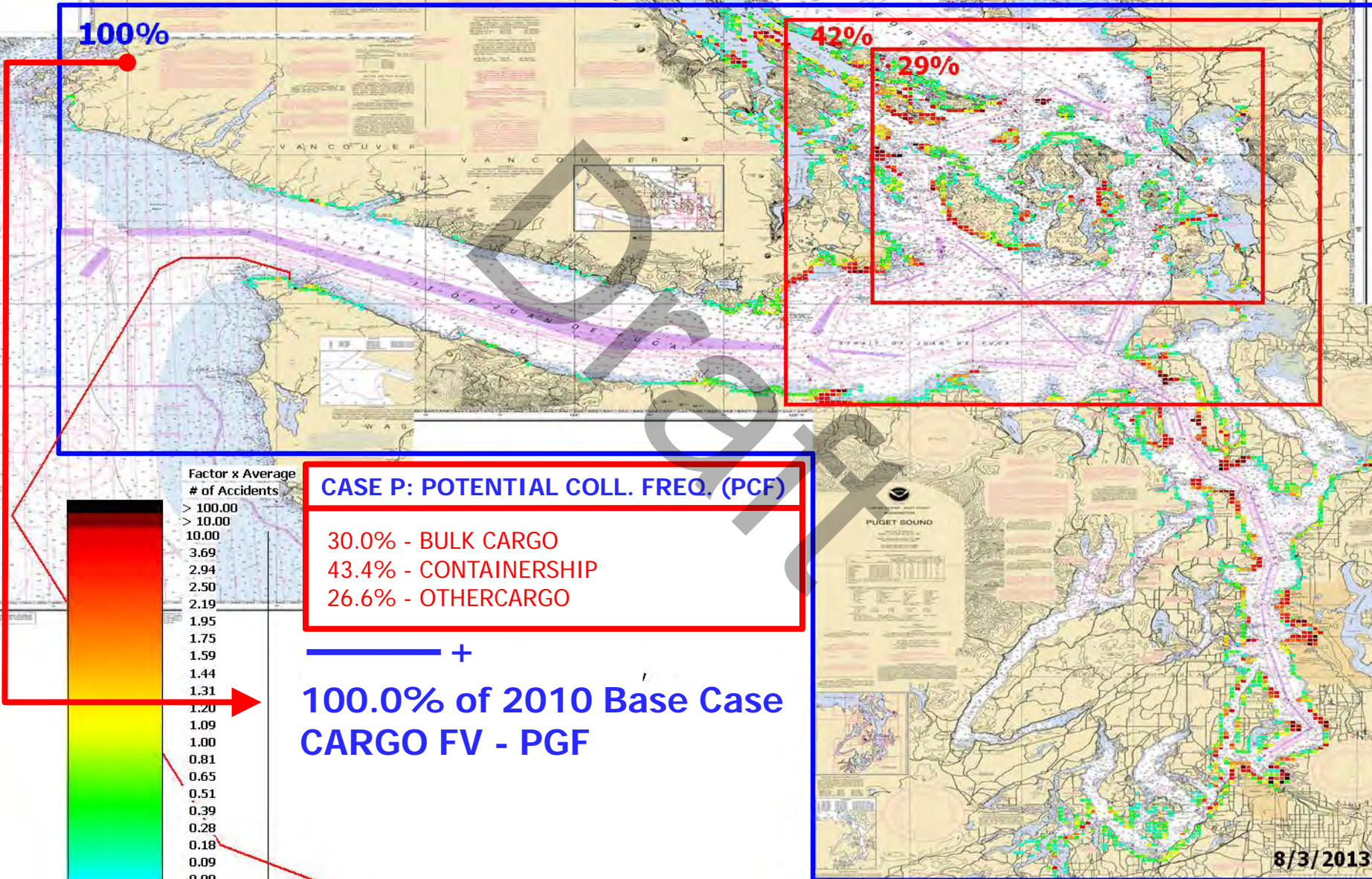
T: POTENTIAL GROUND. FREQ. (PGF)

09.4% - BULKCARRIER
01.4% - CONTAINERSHIP
02.9% - OIL TANKER
03.2% - OIL BARGE

+
17.0% of 2010 Base Case
ALL FV - PGF

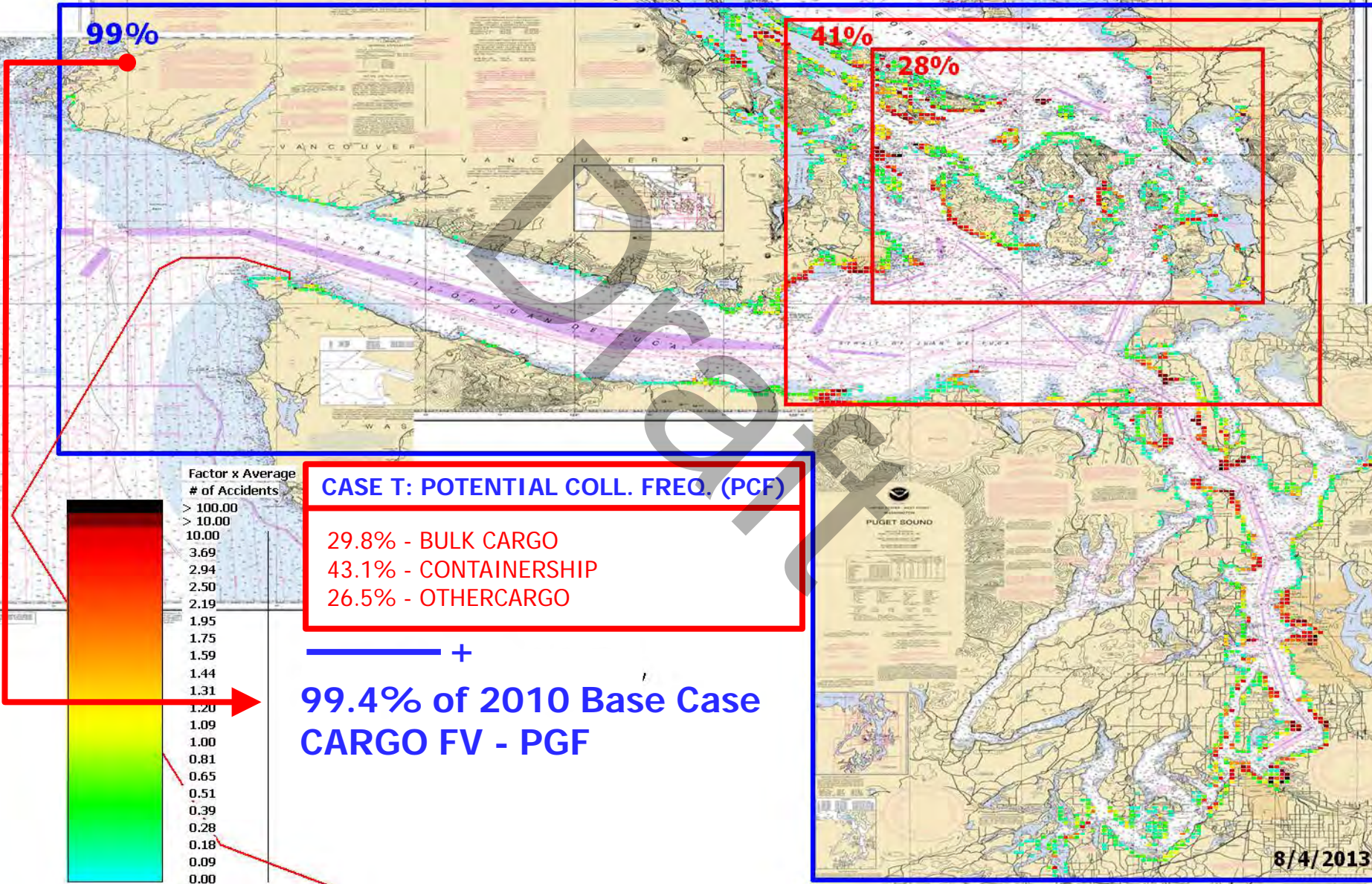
**P: BASE CASE CARGO FV POTENTIAL
GROUNDING FREQUENCY (PGF)**

P: VTRA 2010 - BASE CASE



**T: BASE CASE CARGO FV POTENTIAL
GROUNDING FREQUENCY (PGF)**

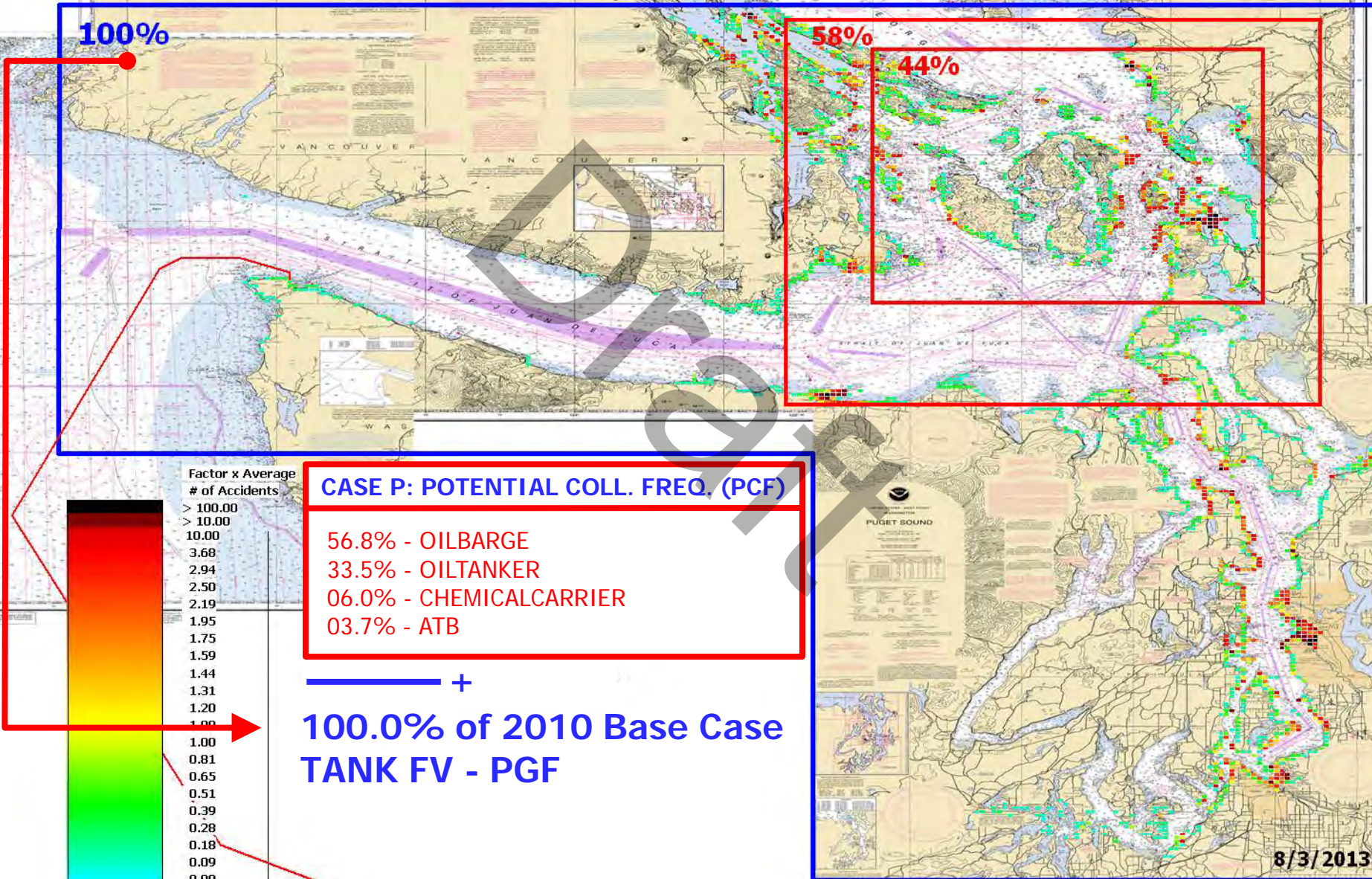
T: VTRA 2010 - GW 487- KM 348 - DP Cont. 67 and Bulk 348



P: BASE CASE TANK FV POTENTIAL GROUNDING FREQUENCY (PGF)



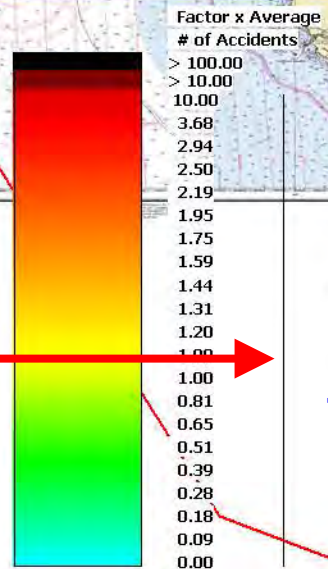
P: VTRA 2010 - BASE CASE



CASE P: POTENTIAL COLL. FREQ. (PCF)

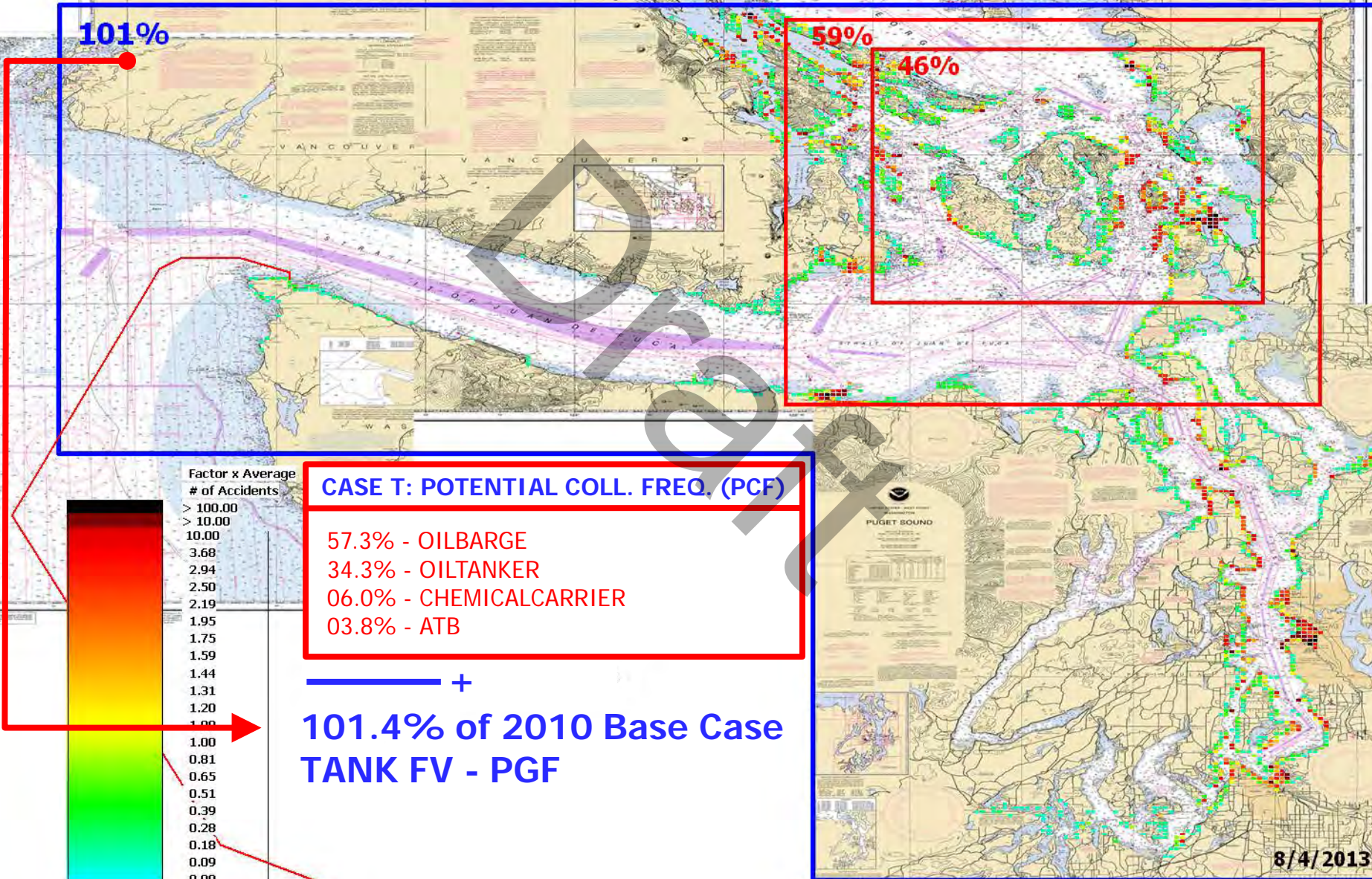
- 56.8% - OILBARGE
- 33.5% - OILTANKER
- 06.0% - CHEMICALCARRIER
- 03.7% - ATB

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



**T: BASE CASE TANK FV POTENTIAL
GROUNDING FREQUENCY (PGF)**

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



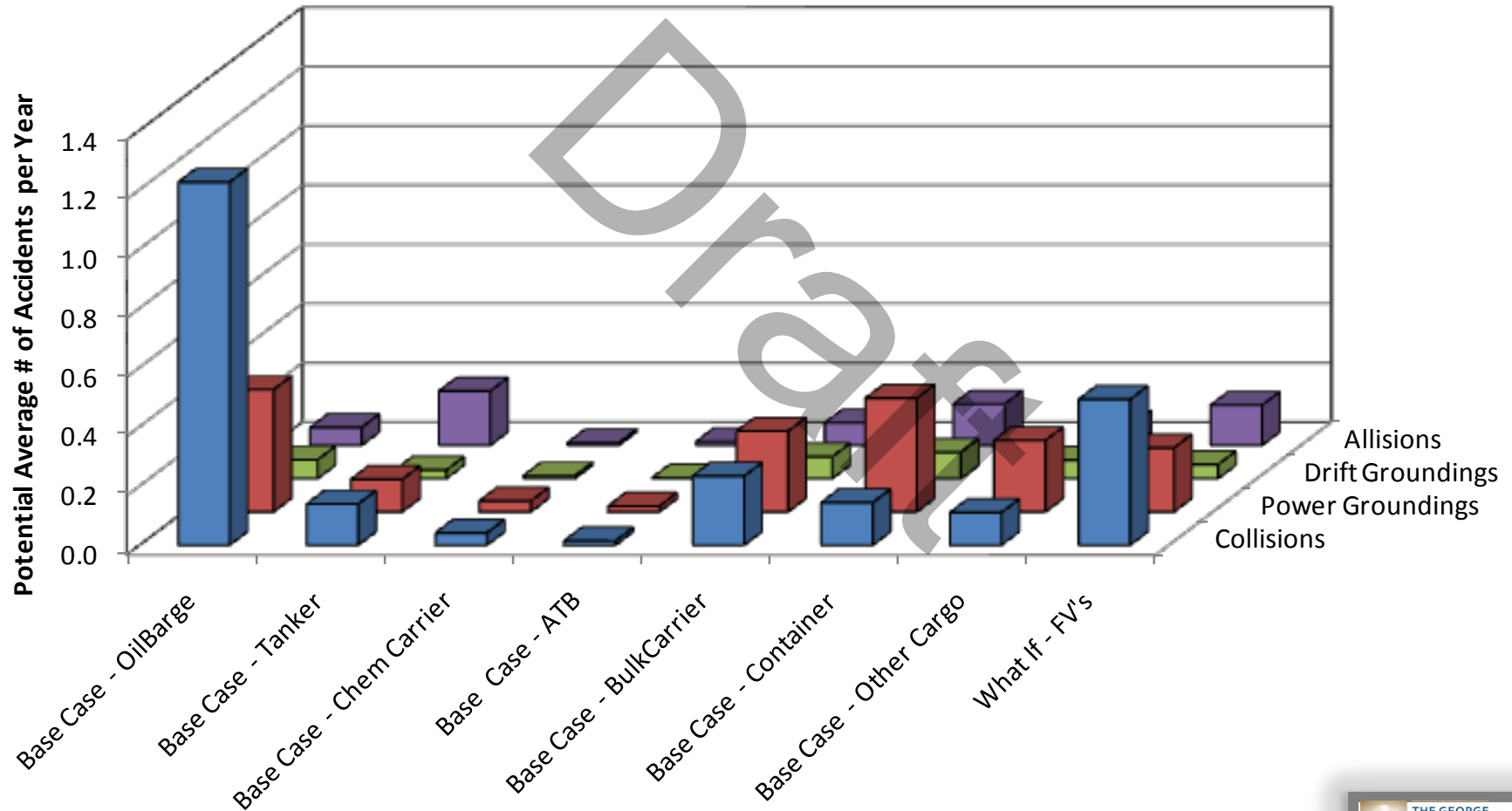
Factor x Average
of Accidents

> 100.00
> 10.00
10.00
3.68
2.94
2.50
2.19
1.95
1.75
1.59
1.44
1.31
1.20
1.00
1.00
0.81
0.65
0.51
0.39
0.28
0.18
0.09
0.00

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 Accidents per Year



T - VTRA 2010 : Potential Average # of Accidents per Year					
Focus Vessel	Collisions	Power Groundings	Drift Groundings	Allisions	Total
Base Case - OilBarge	62.5%	27.9%	19.4%	11.1%	40.8%
Base Case - Tanker	7.1%	7.4%	8.8%	33.5%	10.7%
Base Case - Chem Carrier	2.1%	2.5%	3.0%	1.6%	2.3%
Base Case - ATB	0.7%	1.3%	0.8%	2.4%	1.2%
Base Case - All Tank FV's	72.5%	39.1%	32.0%	48.5%	54.9%
Base Case - BulkCarrier	11.9%	18.4%	22.5%	13.9%	15.2%
Base Case - Container	7.3%	25.9%	27.0%	25.5%	17.5%
Base Case - Other Cargo	5.6%	16.3%	19.0%	13.3%	11.3%
Base Case - All Cargo FV's	24.9%	60.6%	68.5%	52.8%	44.0%
Base Case - All FV's	97.3%	99.7%	100.5%	101.3%	98.9%
What If - FV's	25.1%	14.6%	14.5%	24.8%	20.7%
Total - Base Case + What- IF	122.4%	114.3%	115.0%	126.1%	119.5%

T - VTRA 2010 : Potential Average # of Accidents per Year					
Focus Vessel	Collisions	Power Groundings	Drift Groundings	Allisions	Total
Base Case - OilBarge	1.23	0.41	0.06	0.06	1.76
Base Case - Tanker	0.14	0.11	0.03	0.18	0.46
Base Case - Chem Carrier	0.04	0.04	0.01	0.01	0.10
Base Case - ATB	0.01	0.02	0.00	0.01	0.05
Base Case - All Tank FV's	1.42	0.58	0.10	0.27	2.37
Base Case - BulkCarrier	0.23	0.27	0.07	0.08	0.66
Base Case - Container	0.14	0.38	0.09	0.14	0.76
Base Case - Other Cargo	0.11	0.24	0.06	0.07	0.49
Base Case - All Cargo FV's	0.49	0.90	0.22	0.29	1.90
Base Case - All FV's	1.91	1.48	0.33	0.55	4.27
What If - FV's	0.49	0.22	0.05	0.14	0.89
Total - Base Case + What- IF	2.40	1.69	0.38	0.69	5.16