

VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

3D Relative Risk Profile Comparison
Potential Grounding Accident Frequency

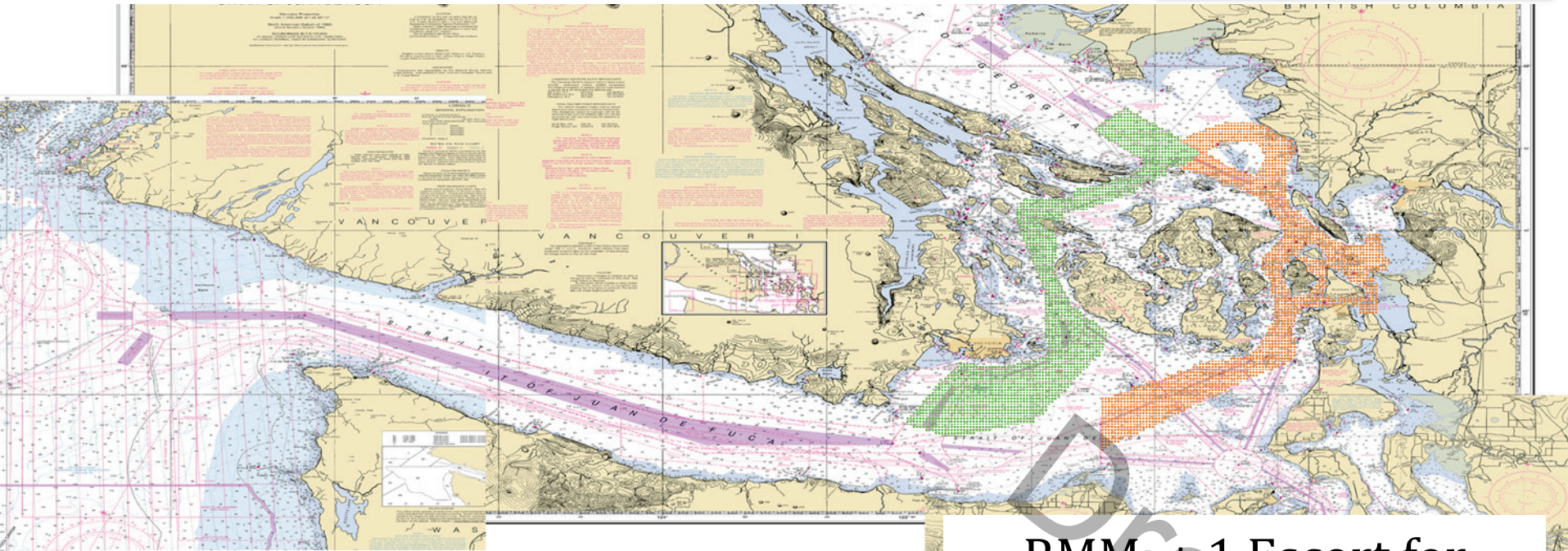
**CASE T: GW – KM – DP & +1 Escort Rosario – Laden
Tankers, Chem. Carrier, ATB & Cape Size Bulker**

Dr. J. Rene van Dorp and Dr. Jason R.W Merrick

November 2013



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

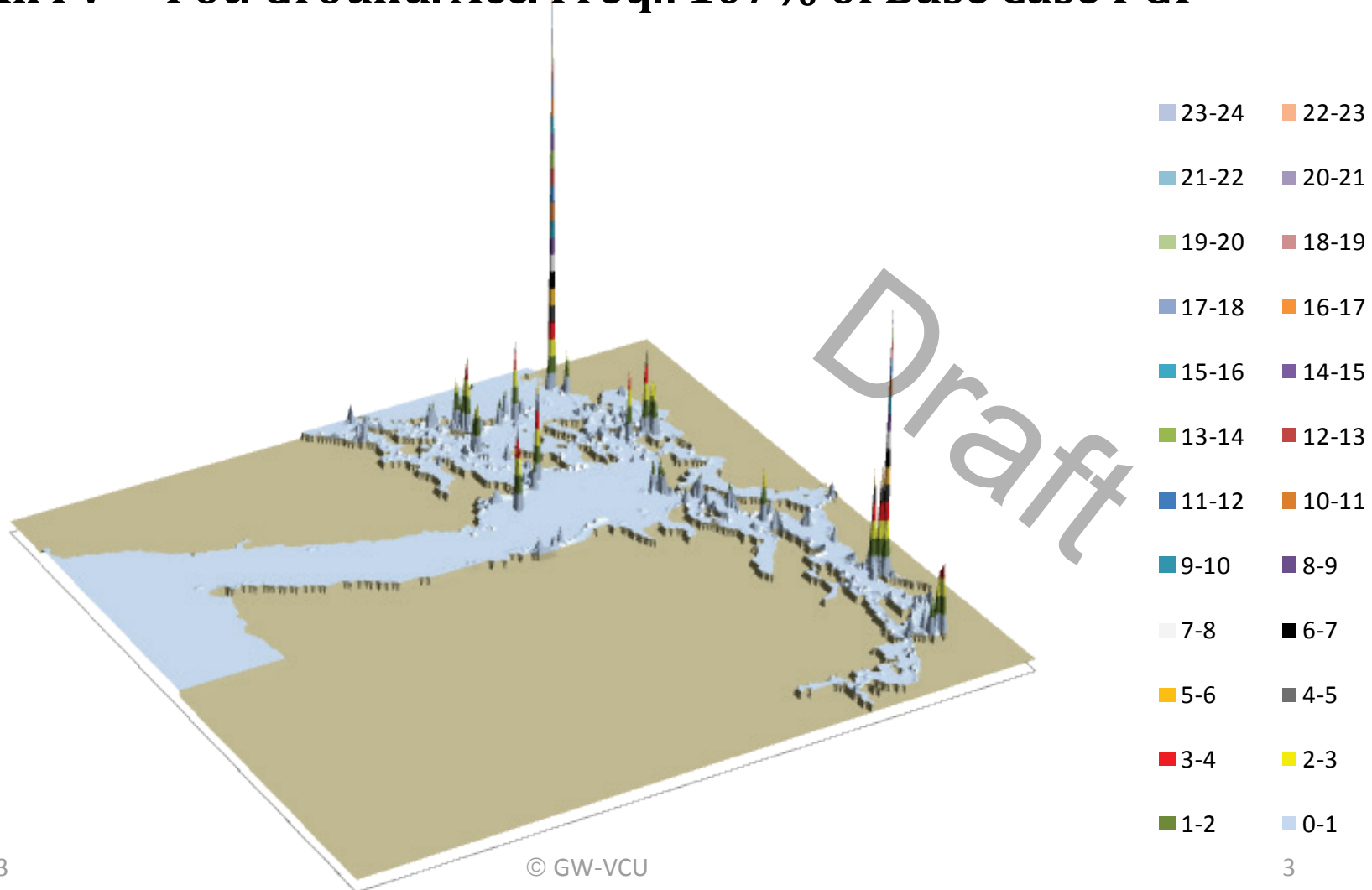


**DEFINITION OF ASSUMED LOCATIONS
FOR ADDED ESCORT VESSEL
FOR HARO-BOUNDARY ROUTES (GREEN)
AND
FOR ROSARIO ROUTES (ORANGE)**

RMM: + 1 Escort for
Laden Tankers, Chem.
Carrier, ATB & Cape Size
Bulkers on Rosario Routes
(Orange)

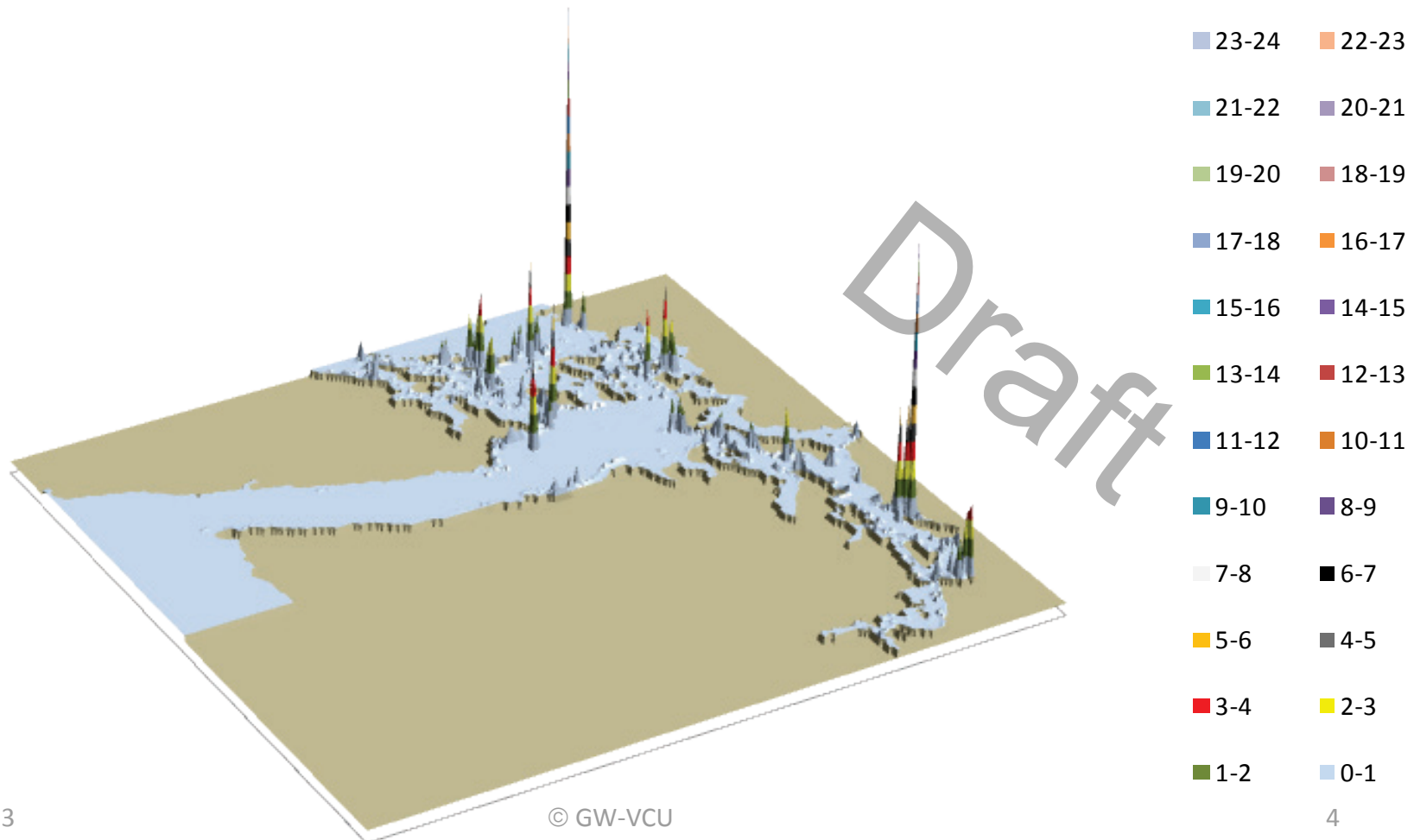
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP & EH 3D Risk Profile All FV - Pot. Ground. Acc. Freq.: 107% of Base Case PGF



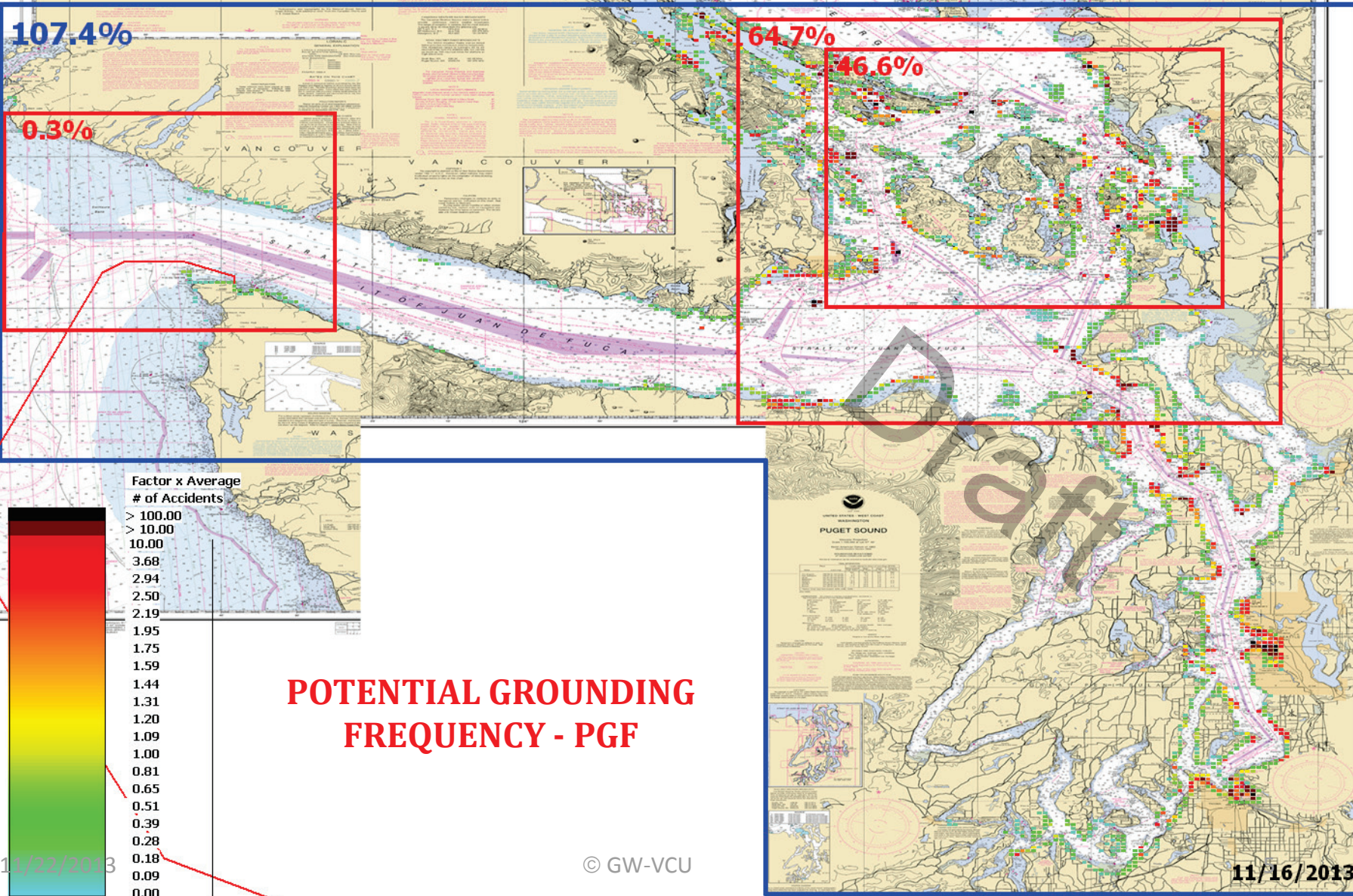
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP & ER 3D Risk Profile All FV - Pot. Ground. Acc. Freq.: 113% of Base Case PGF



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW - KM - DP & +1 ESCORT HARO-BOUNDARY - ALL FV



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW - KM - DP & +1 ESCORT ROSARIO - ALL FV

112.7%

69.8%

50.0%

0.3%

Factor x Average
of Accidents

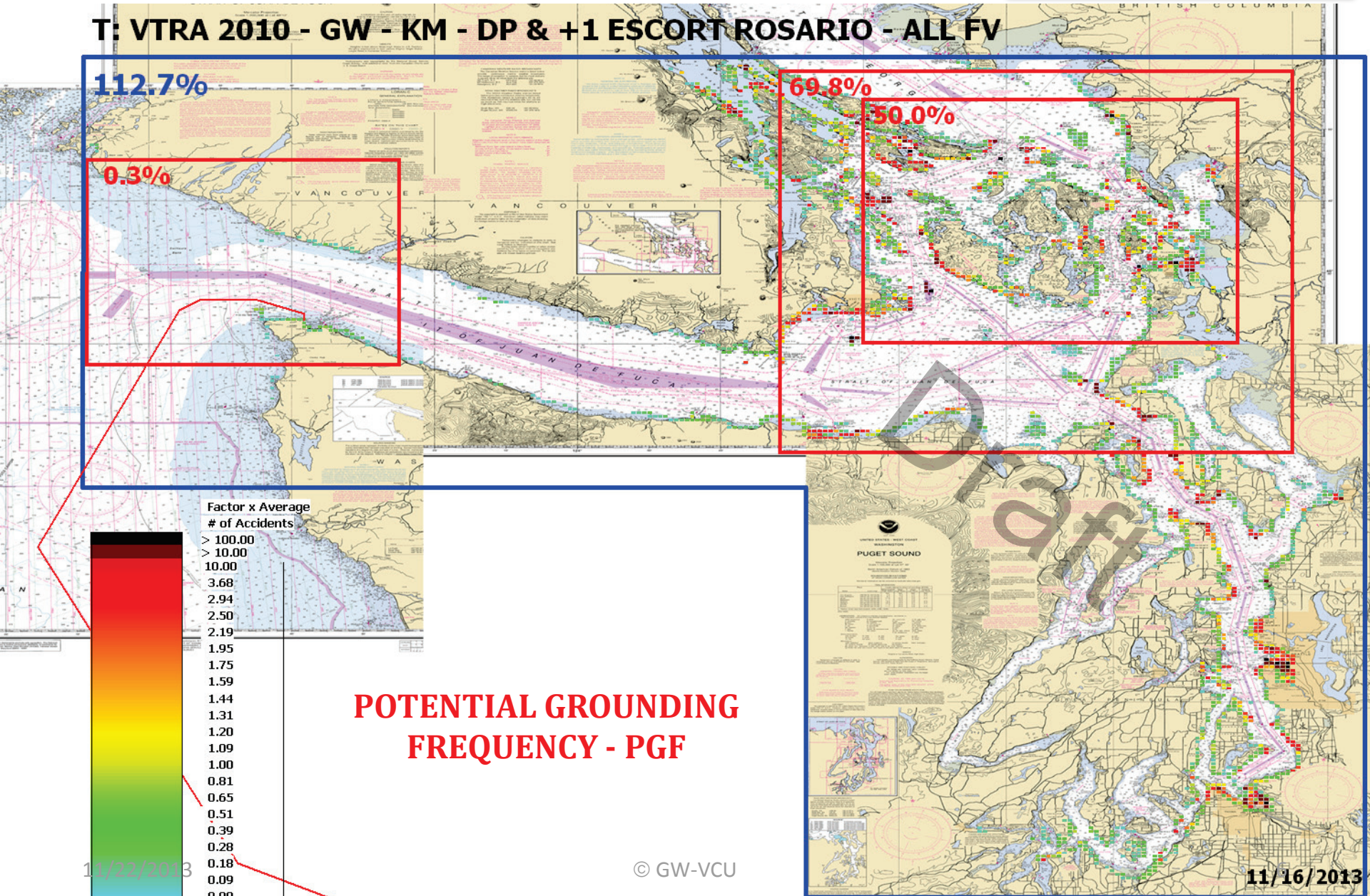
- > 100.00
- > 10.00
- 10.00
- 3.68
- 2.94
- 2.50
- 2.19
- 1.95
- 1.75
- 1.59
- 1.44
- 1.31
- 1.20
- 1.09
- 1.00
- 0.81
- 0.65
- 0.51
- 0.39
- 0.28
- 0.18
- 0.09
- 0.00

POTENTIAL GROUNDING
FREQUENCY - PGF

11/22/2013

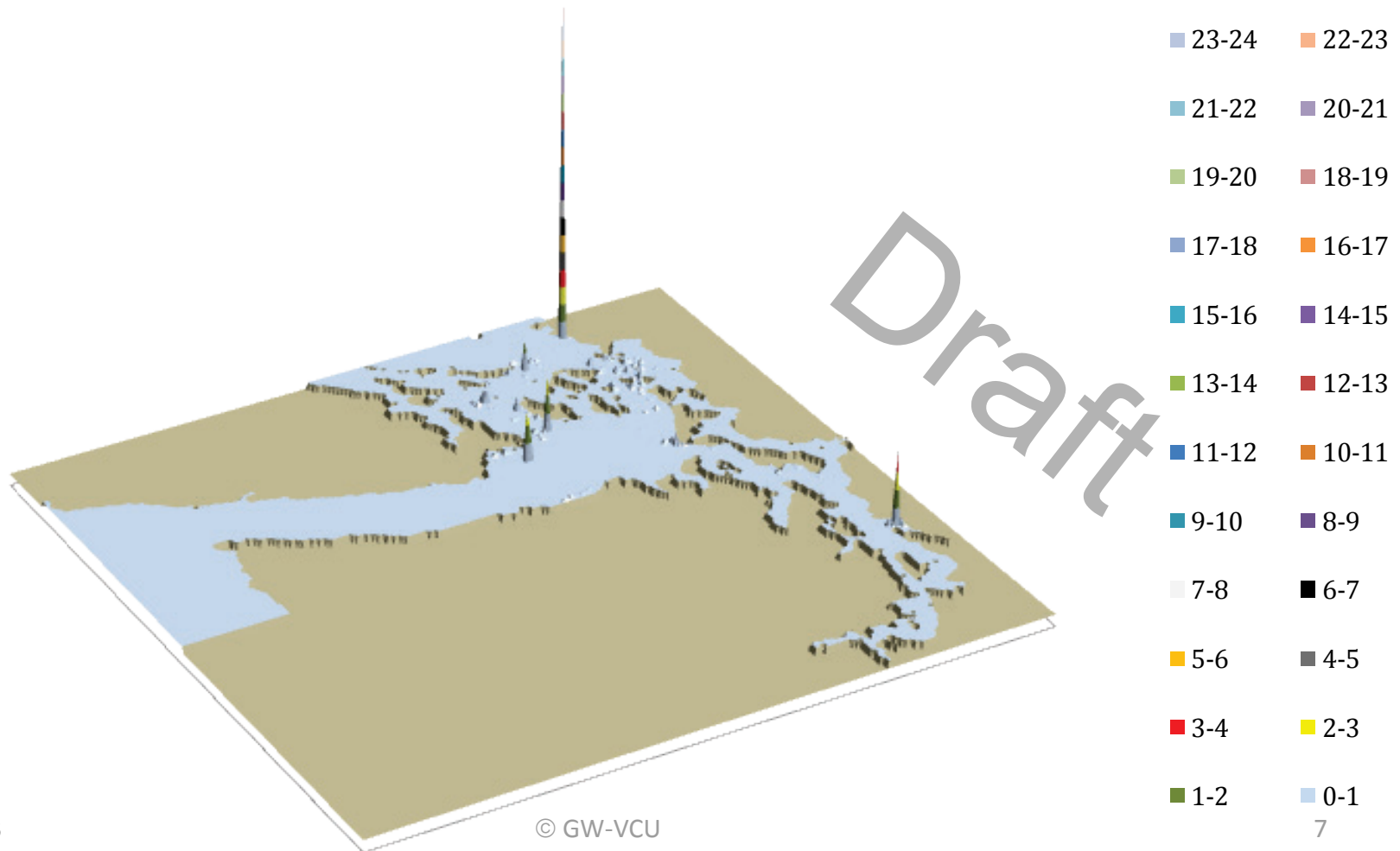
© GW-VCU

11/16/2013



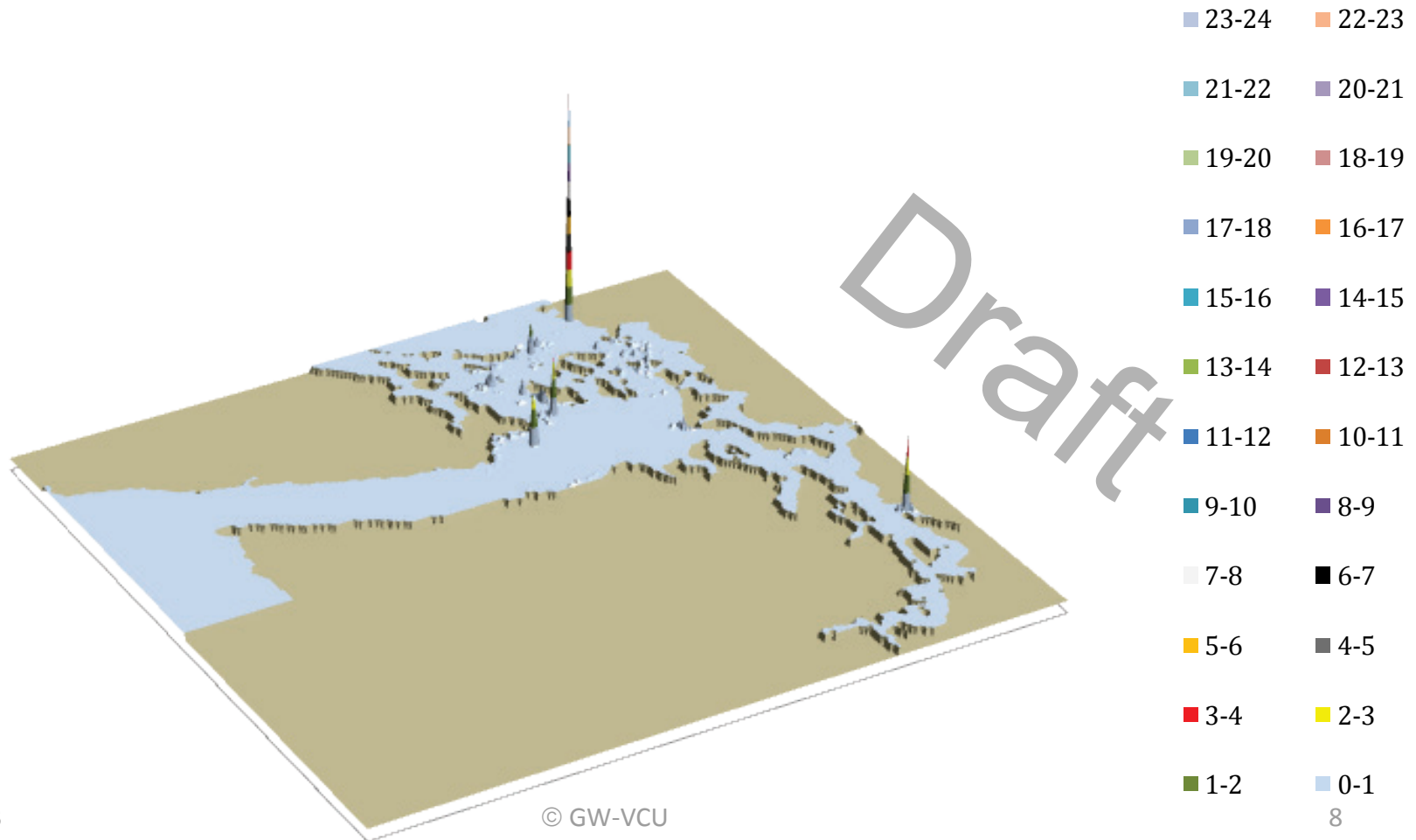
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP & EH 3D Risk Profile What-If FV - Pot. Grou. Acc. Fr.: 16% of Base Case PGF



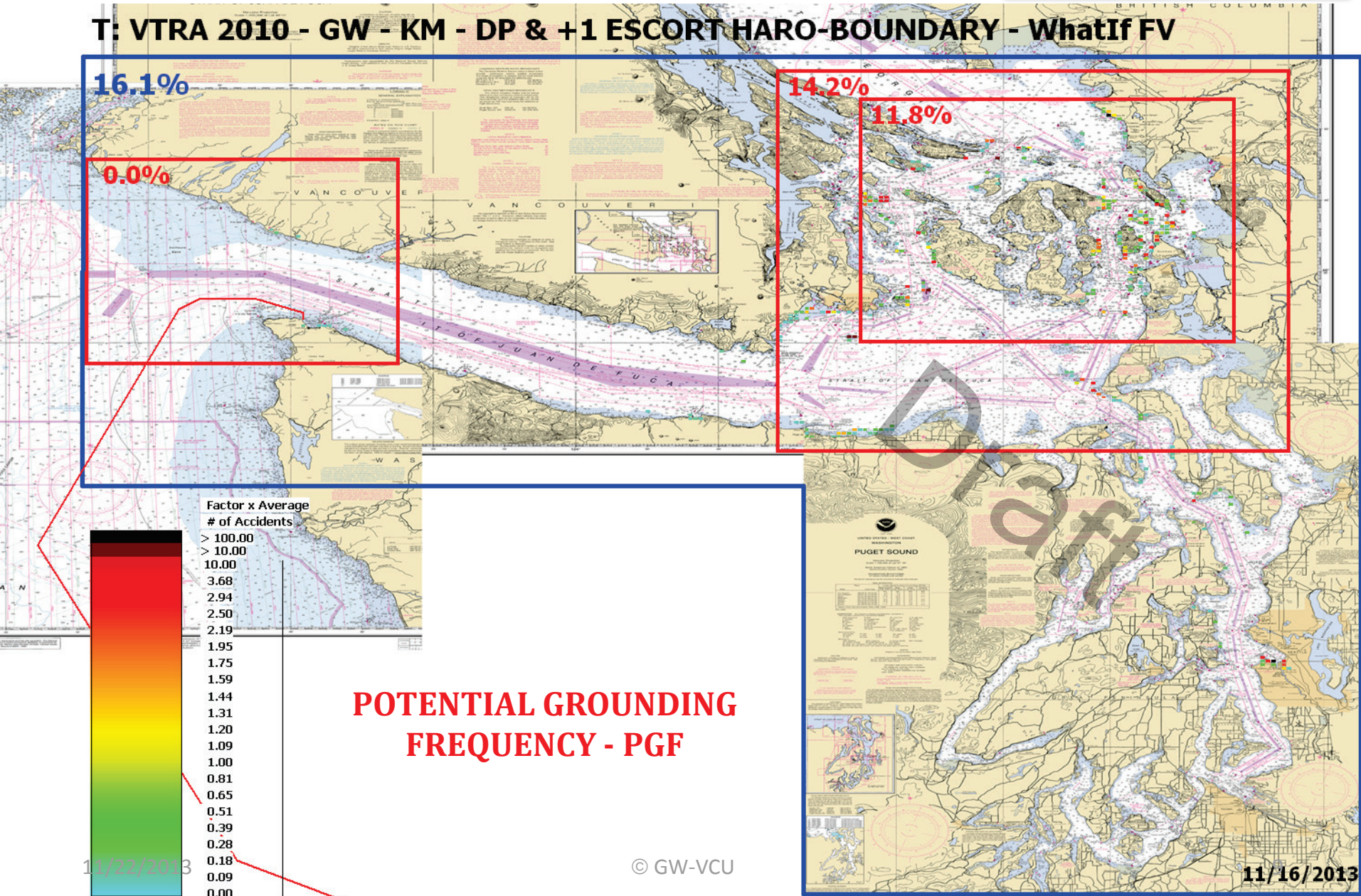
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP & ER 3D Risk Profile What-If FV - Pot. Grou. Acc. Fr.: 17% of Base Case PGF



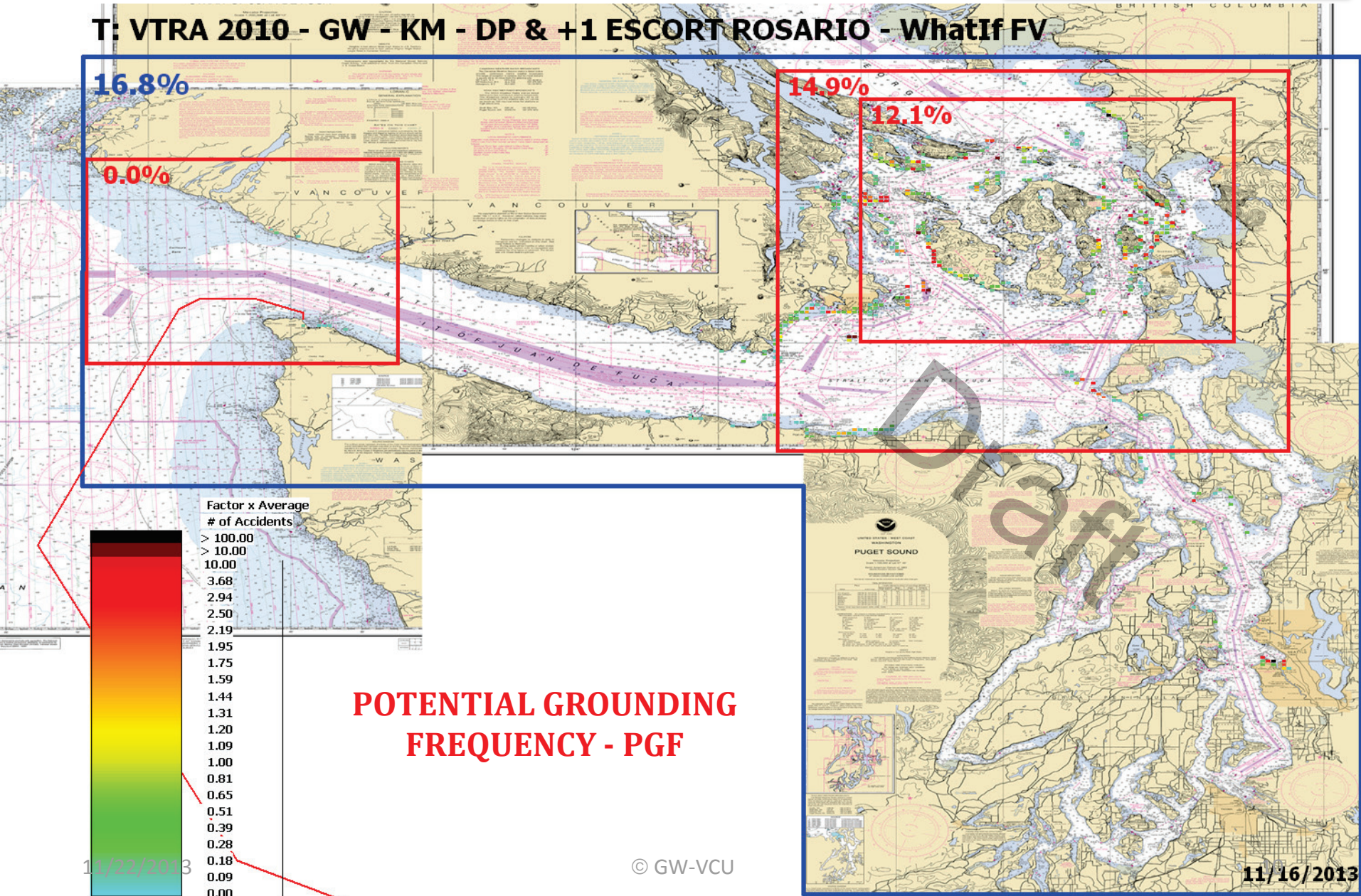
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW - KM - DP & +1 ESCORT HARO-BOUNDARY - WhatIf FV



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW - KM - DP & +1 ESCORT ROSARIO - WhatIf FV



16.8%

0.0%

14.9%

12.1%

POTENTIAL GROUNDING FREQUENCY - PGF

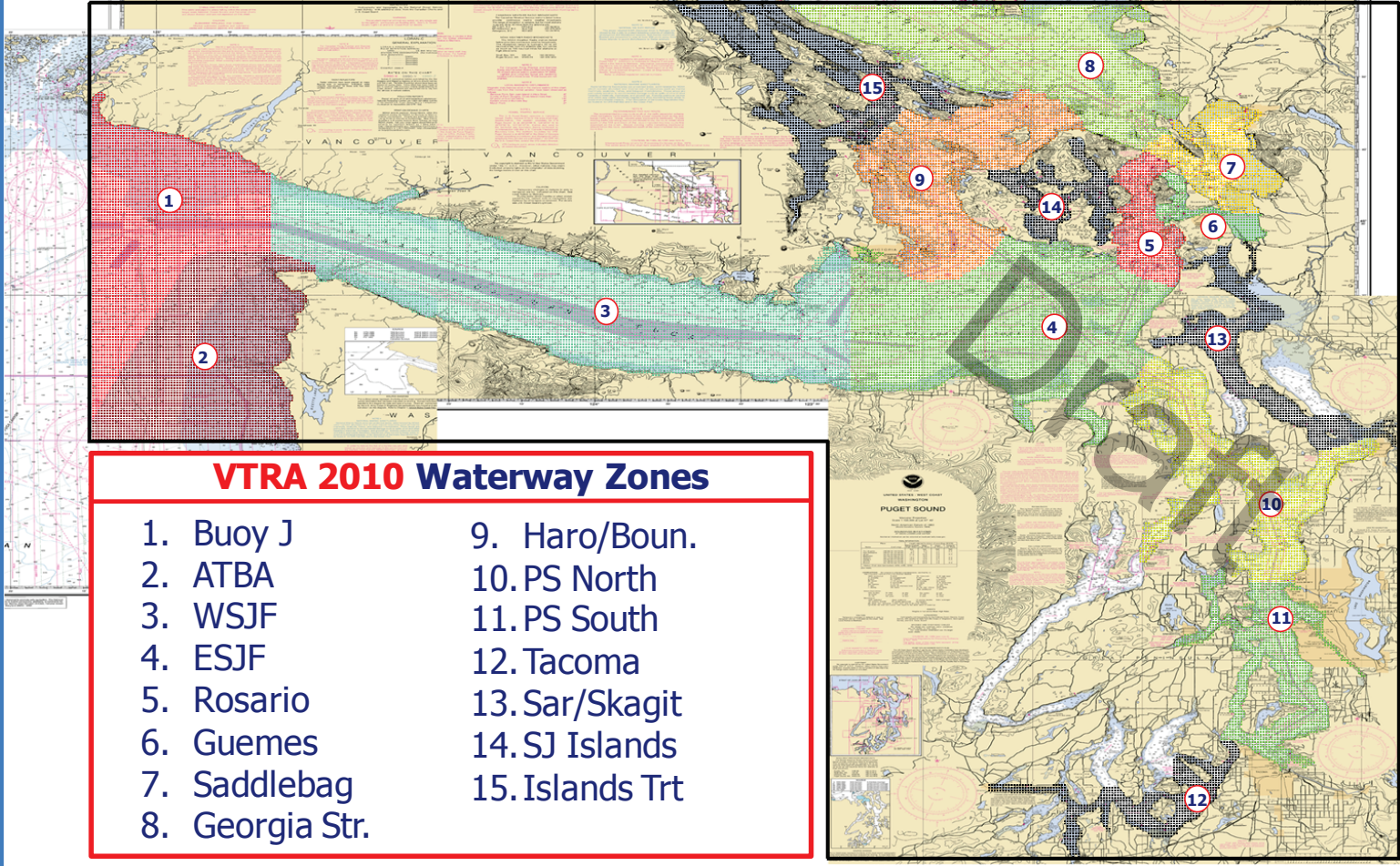
11/22/2013

© GW-VCU

11/16/2013

VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

DEFINITION OF 15 WATERWAY ZONES



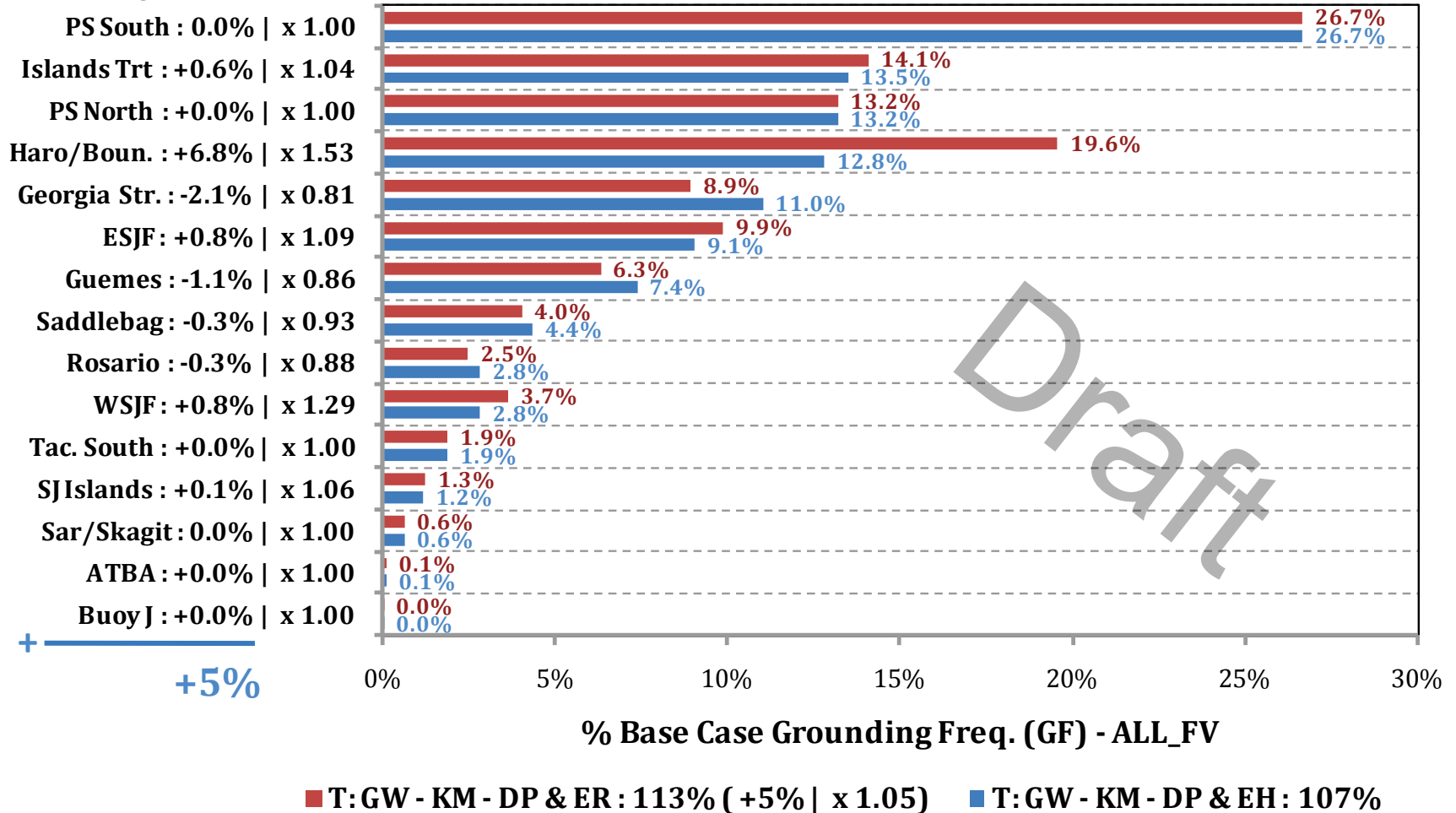
VTRA 2010 Waterway Zones

- | | |
|-----------------|-----------------|
| 1. Buoy J | 9. Haro/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. | |

VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

% Base Case Grounding Frequency - ALL_FV

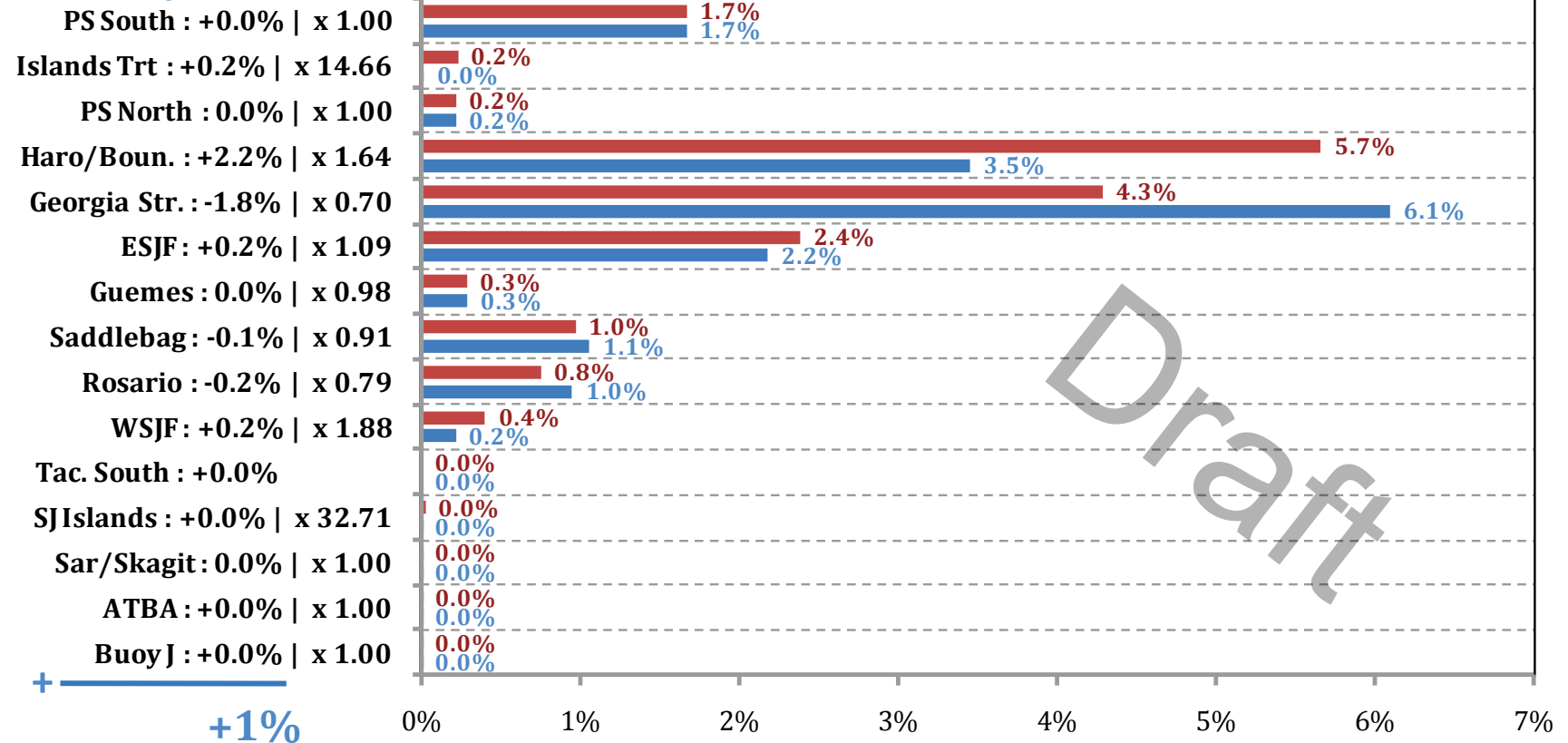
Waterway Zone:



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

% Base Case Grounding Frequency - WhatIf

Waterway Zone:



% Base Case Grounding Freq. (GF) - WhatIf

■ T:GW - KM - DP & ER : 17% (+1% | x 1.04) ■ T:GW - KM - DP & EH : 16%