

VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

3D Relative Risk Profile Comparison
Potential Collision Oil Loss

CASE T: GW – KM – DP & One Way ATB's Rosario

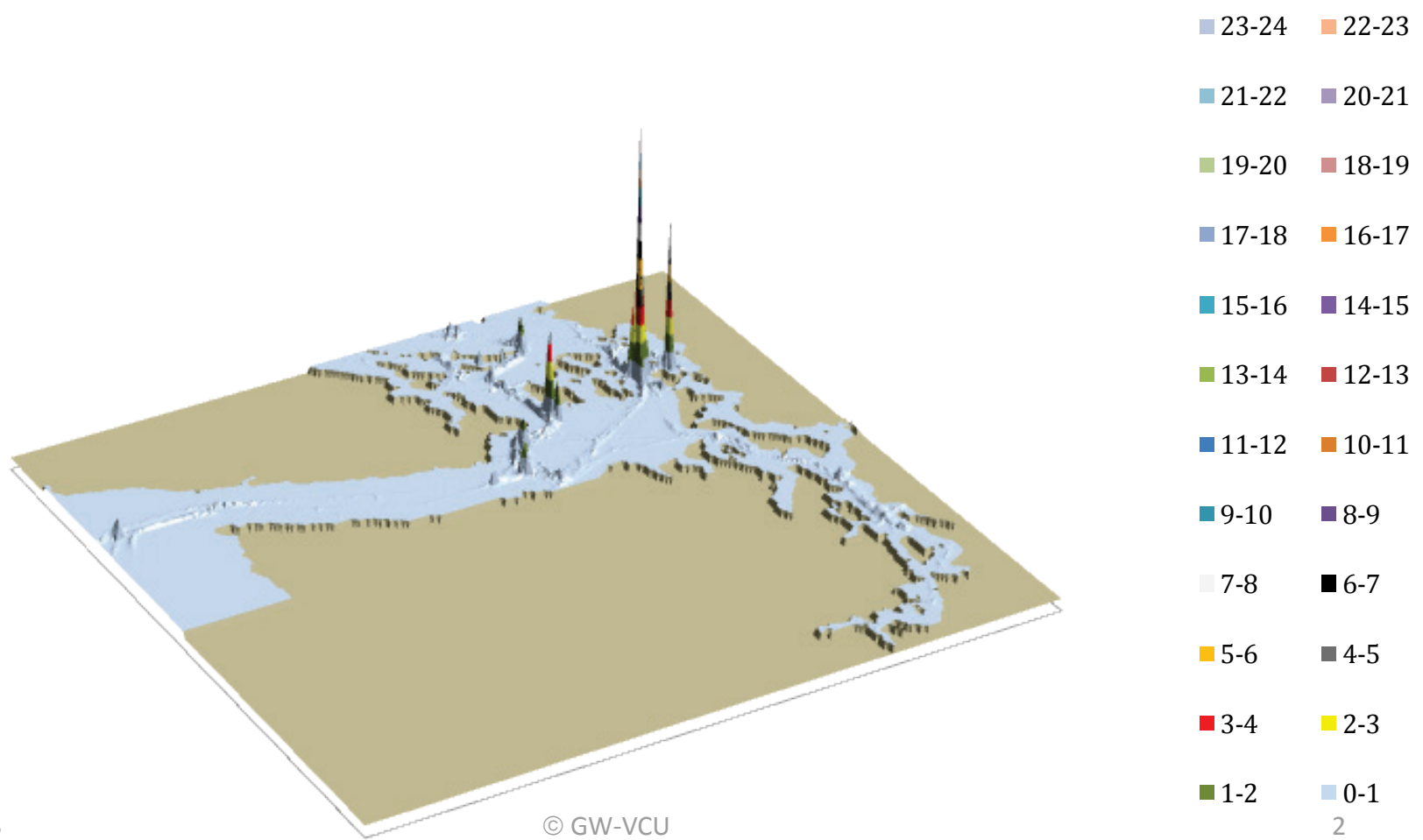
Dr. J. Rene van Dorp and Dr. Jason R.W Merrick

November 2013



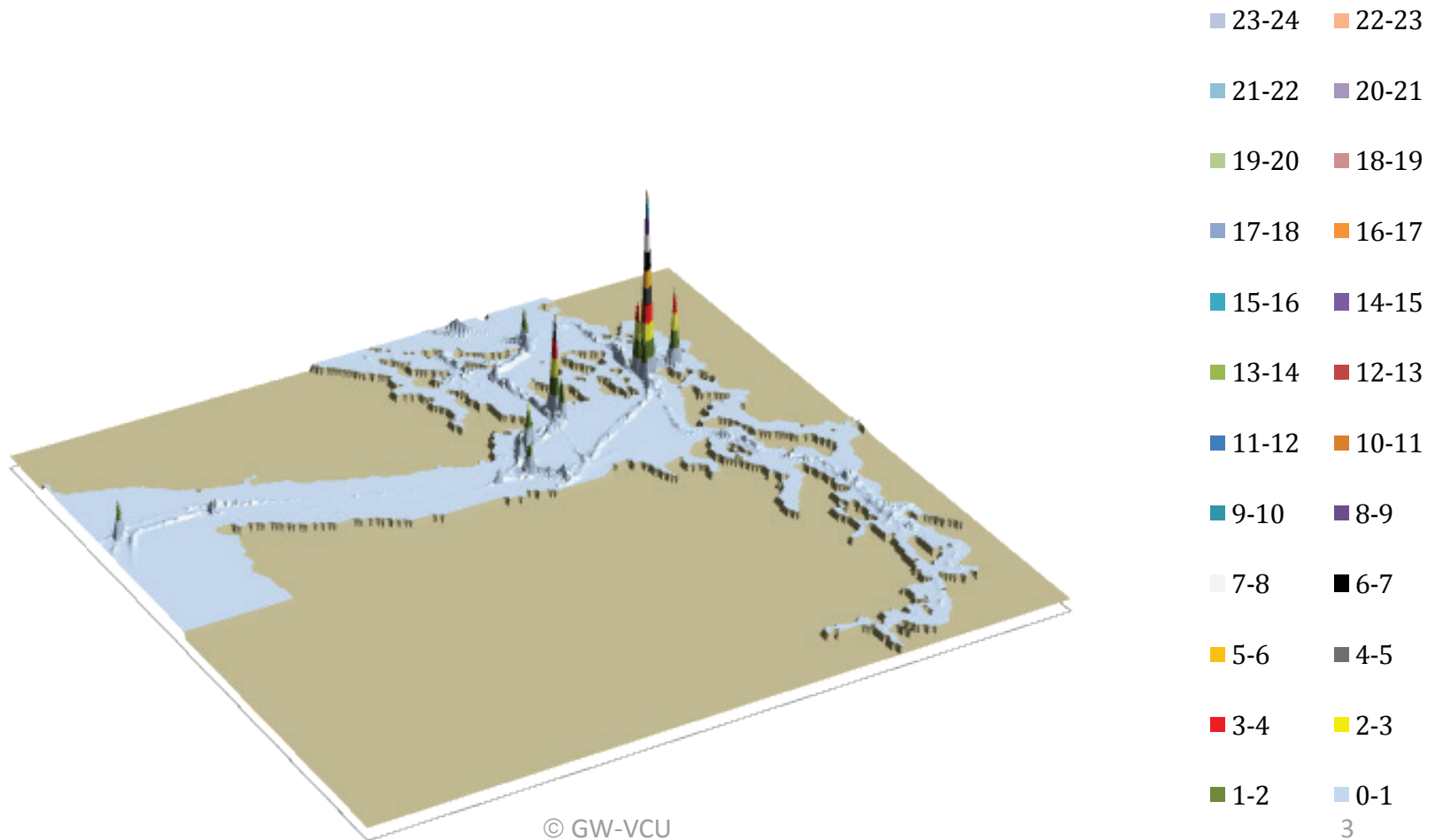
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP 3D Risk Profile All FV - Pot. Collision Oil Loss: 189% of Base Case PCO



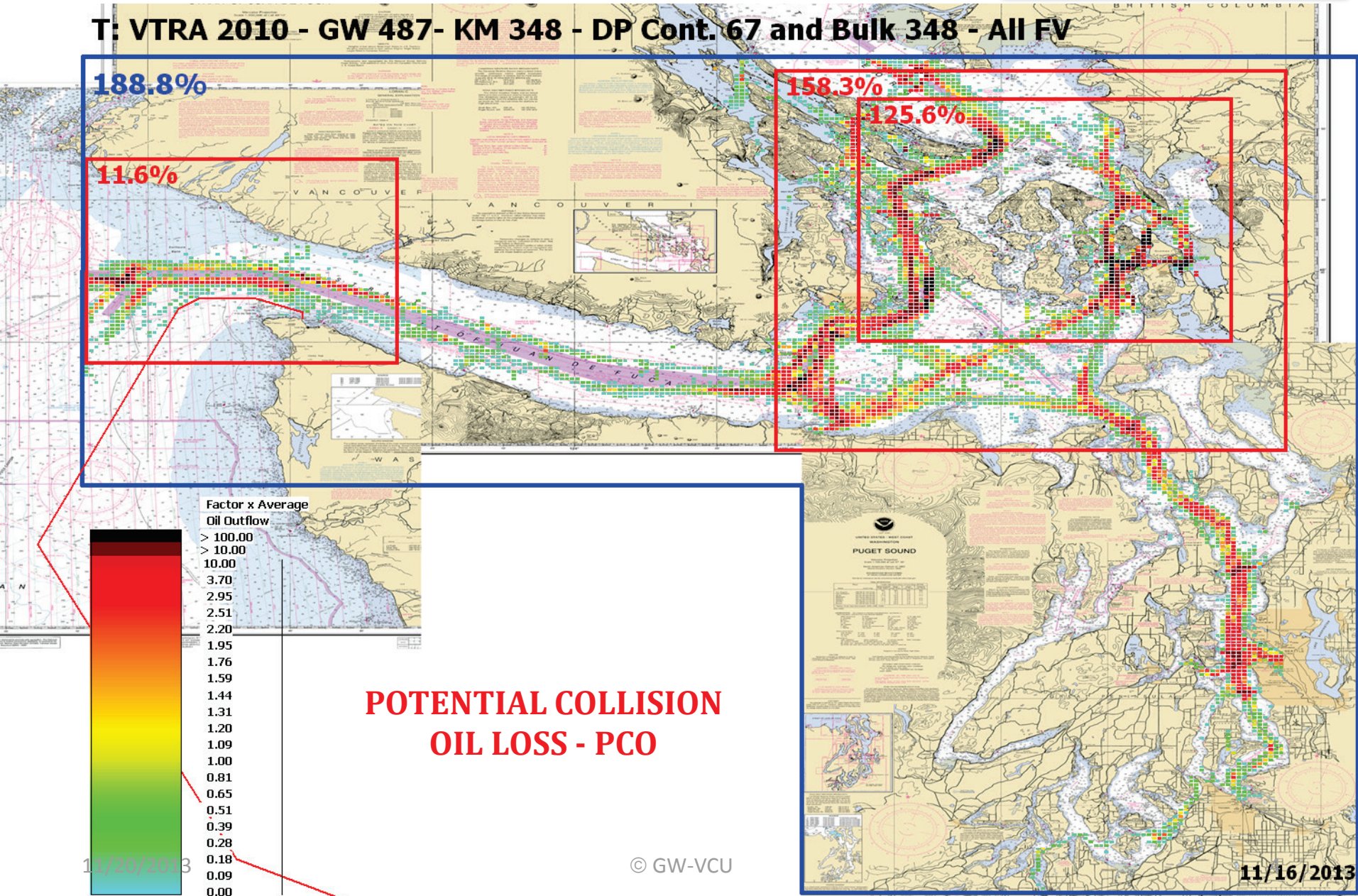
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP & OW ATB 3D Risk Profile All FV - Pot. Collision Oil Loss: 177% of Base Case PCO



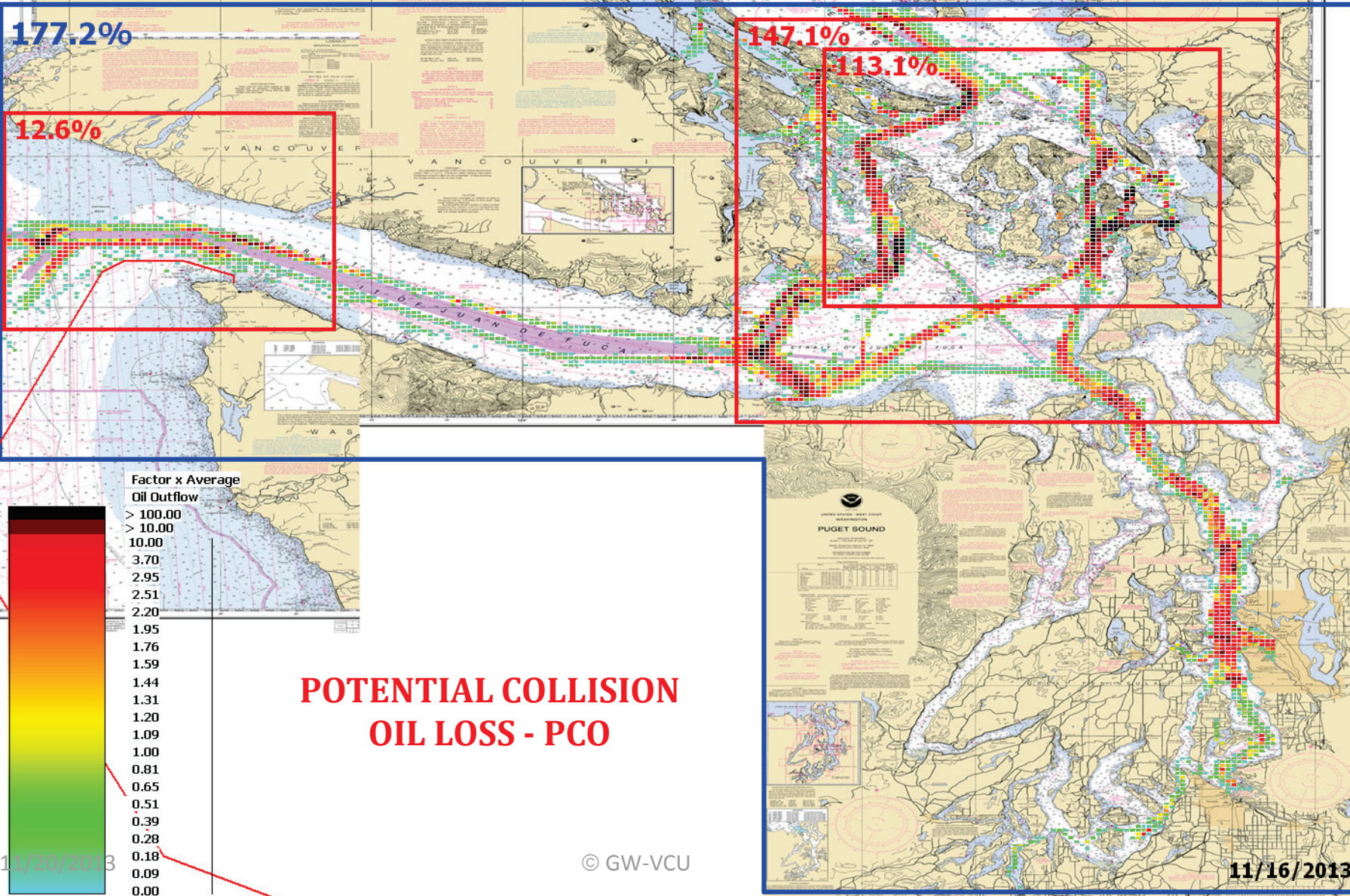
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

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



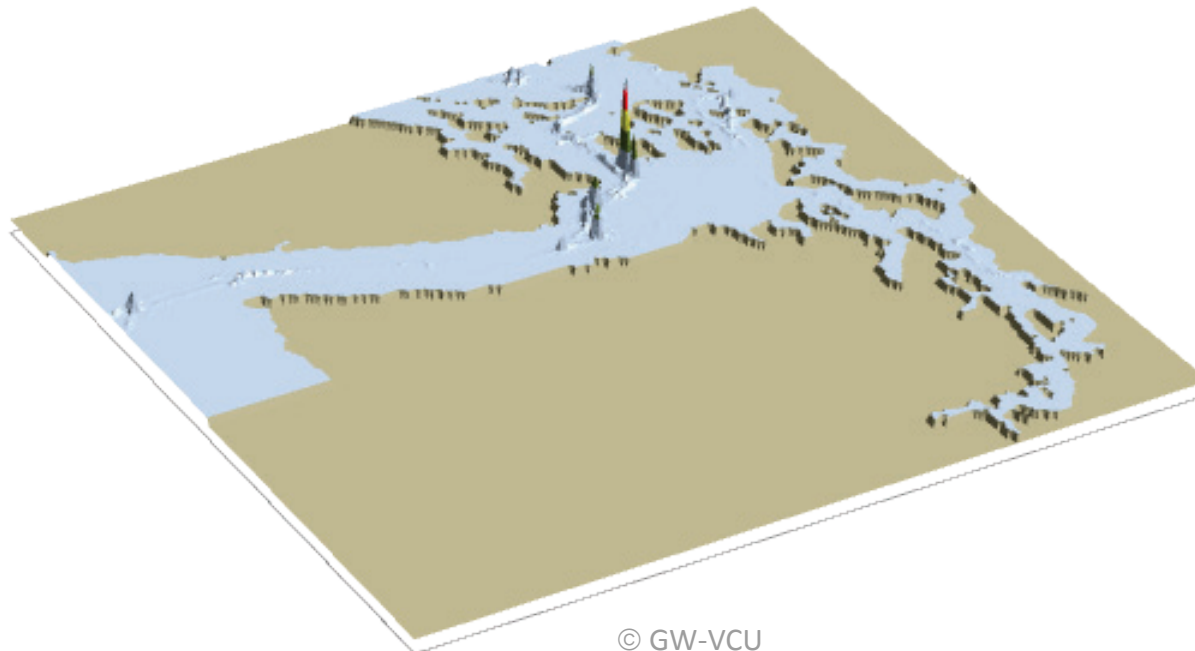
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW - KM - DP & ONE WAY ATB ROSARIO - All FV



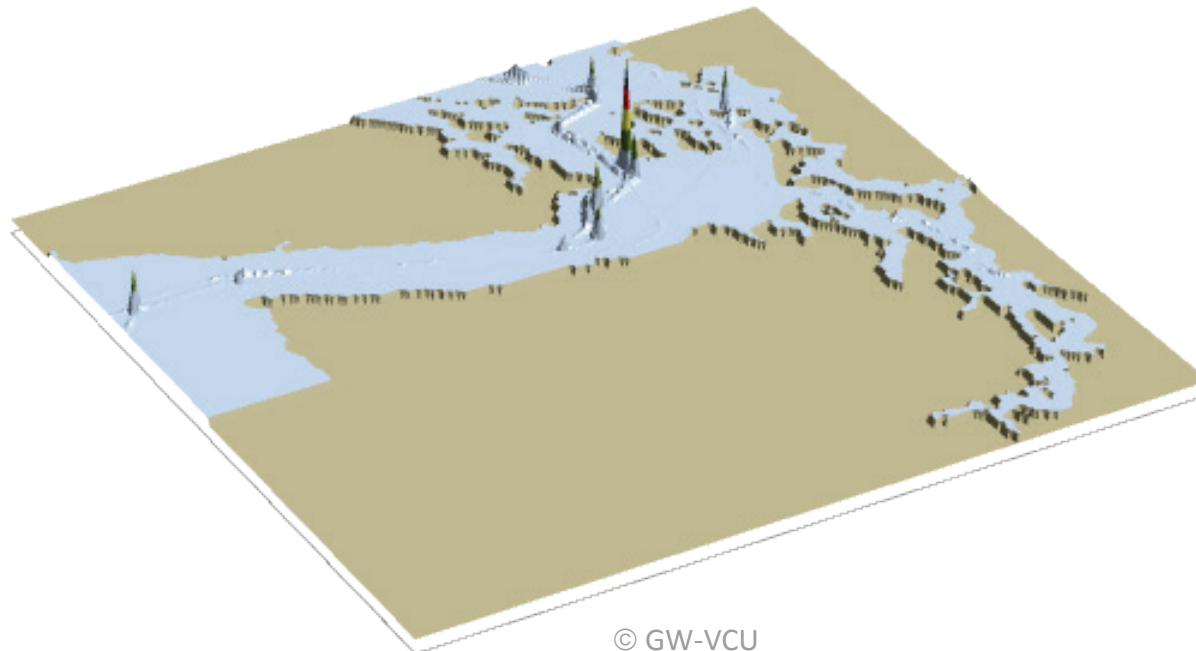
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP 3D Risk Profile What If FV - Pot. Coll. Oil Loss: 62% of Base Case PCO



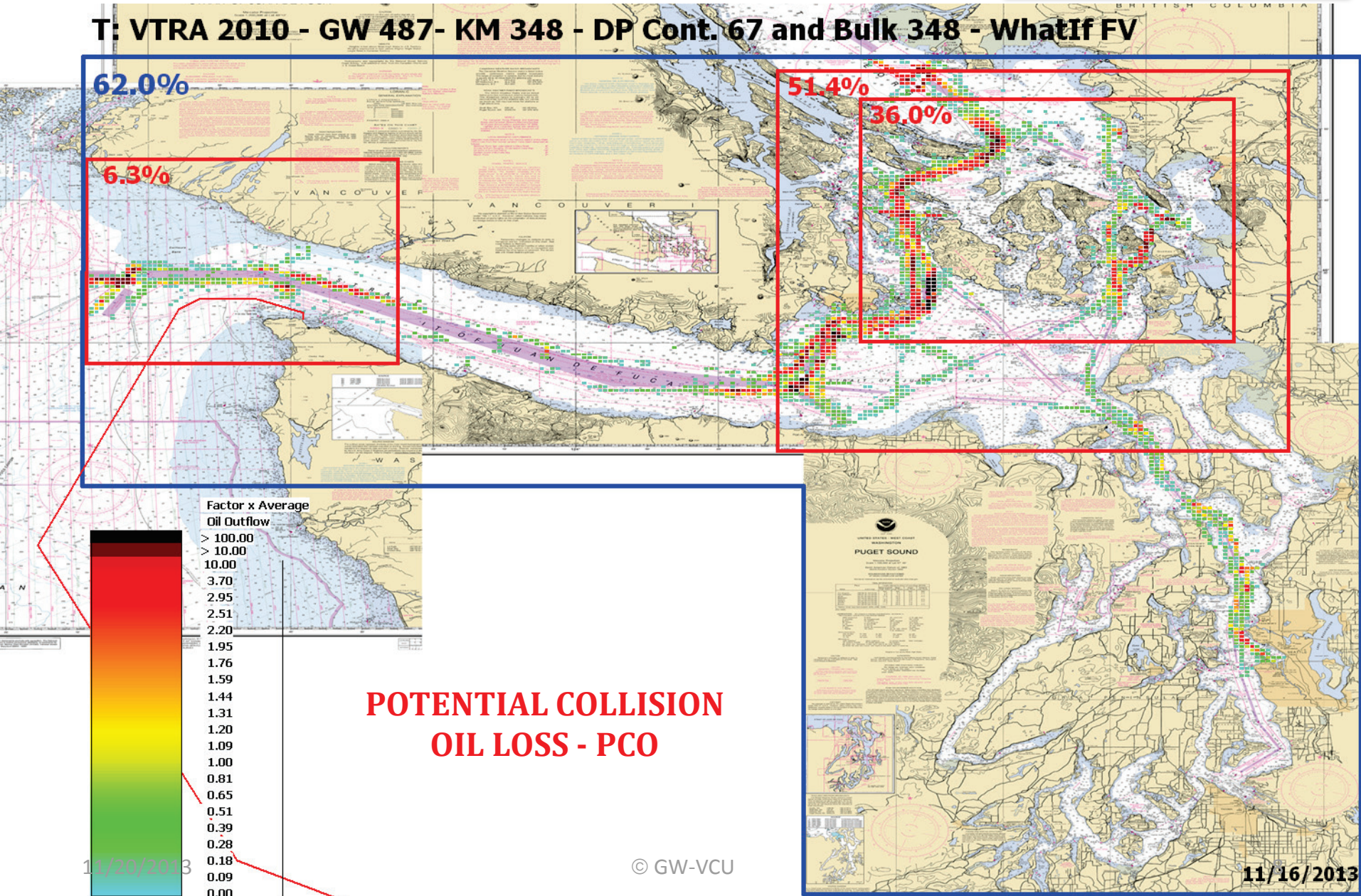
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: GW - KM - DP & OW ATB 3D Risk Profile What If FV - Pot. Coll. Oil Loss: 63% of Base Case PCO



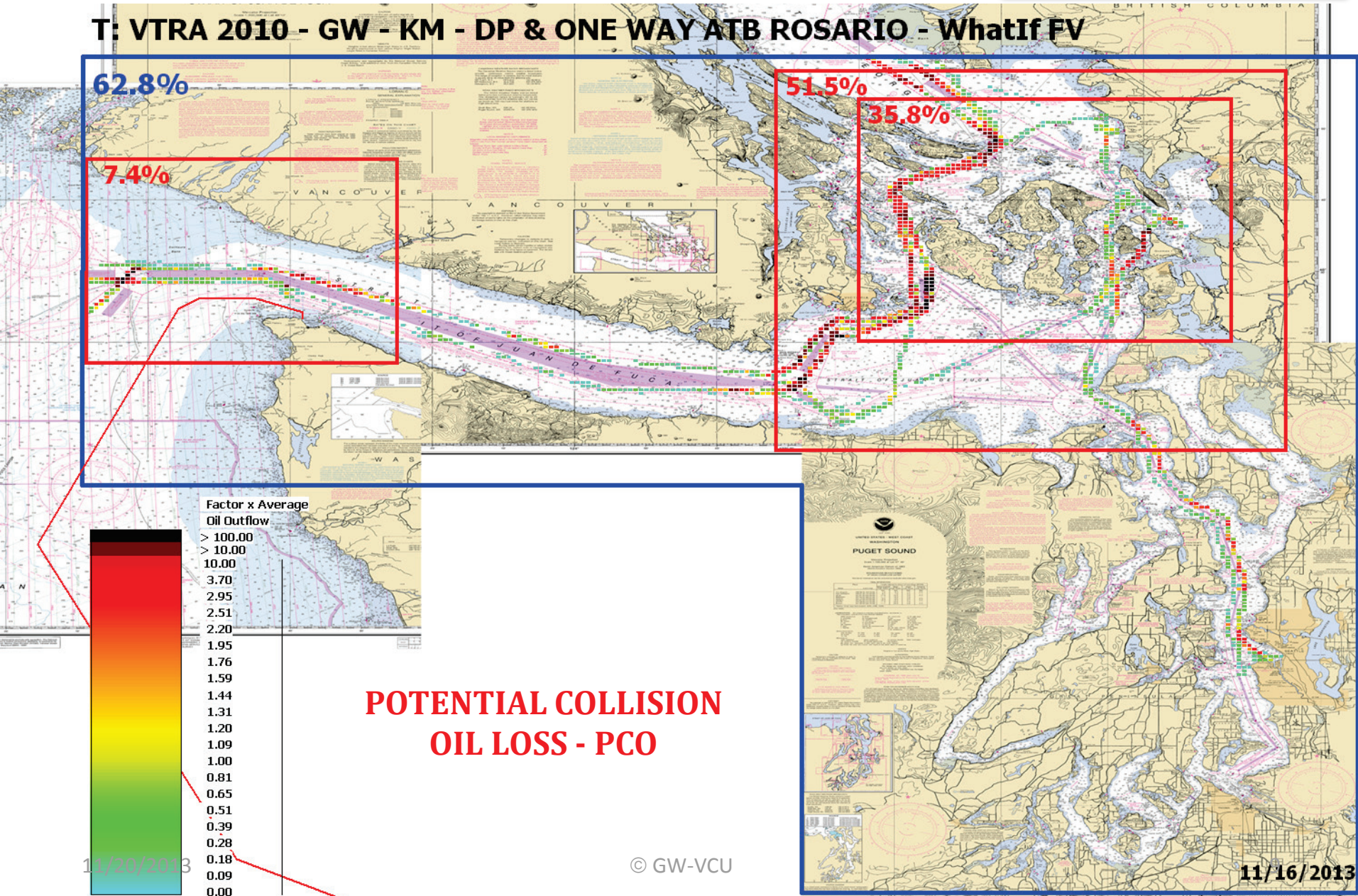
VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

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



VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

T: VTRA 2010 - GW - KM - DP & ONE WAY ATB ROSARIO - WhatIf FV



POTENTIAL COLLISION OIL LOSS - PCO

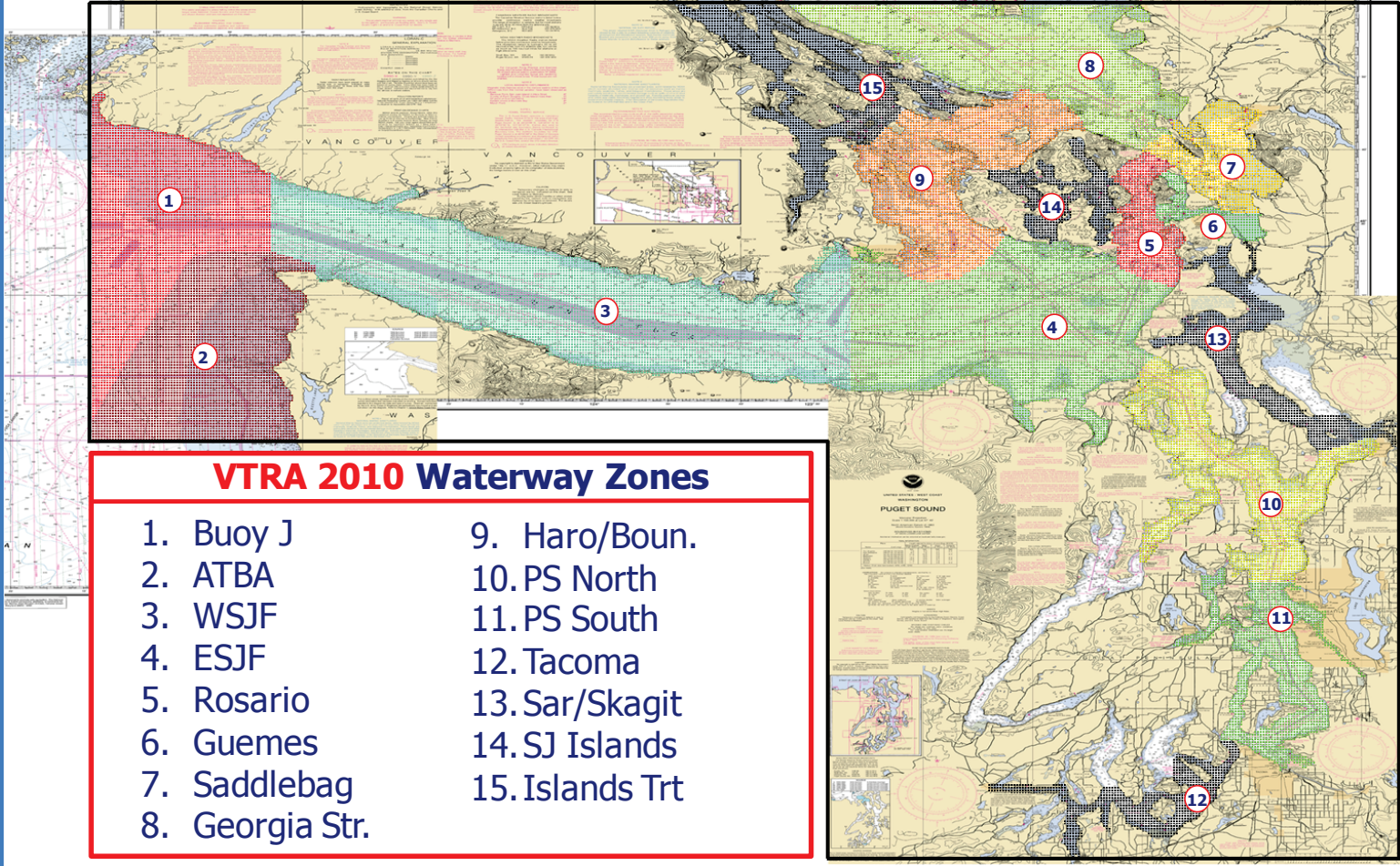
11/20/2013

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VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

DEFINITION OF 15 WATERWAY ZONES



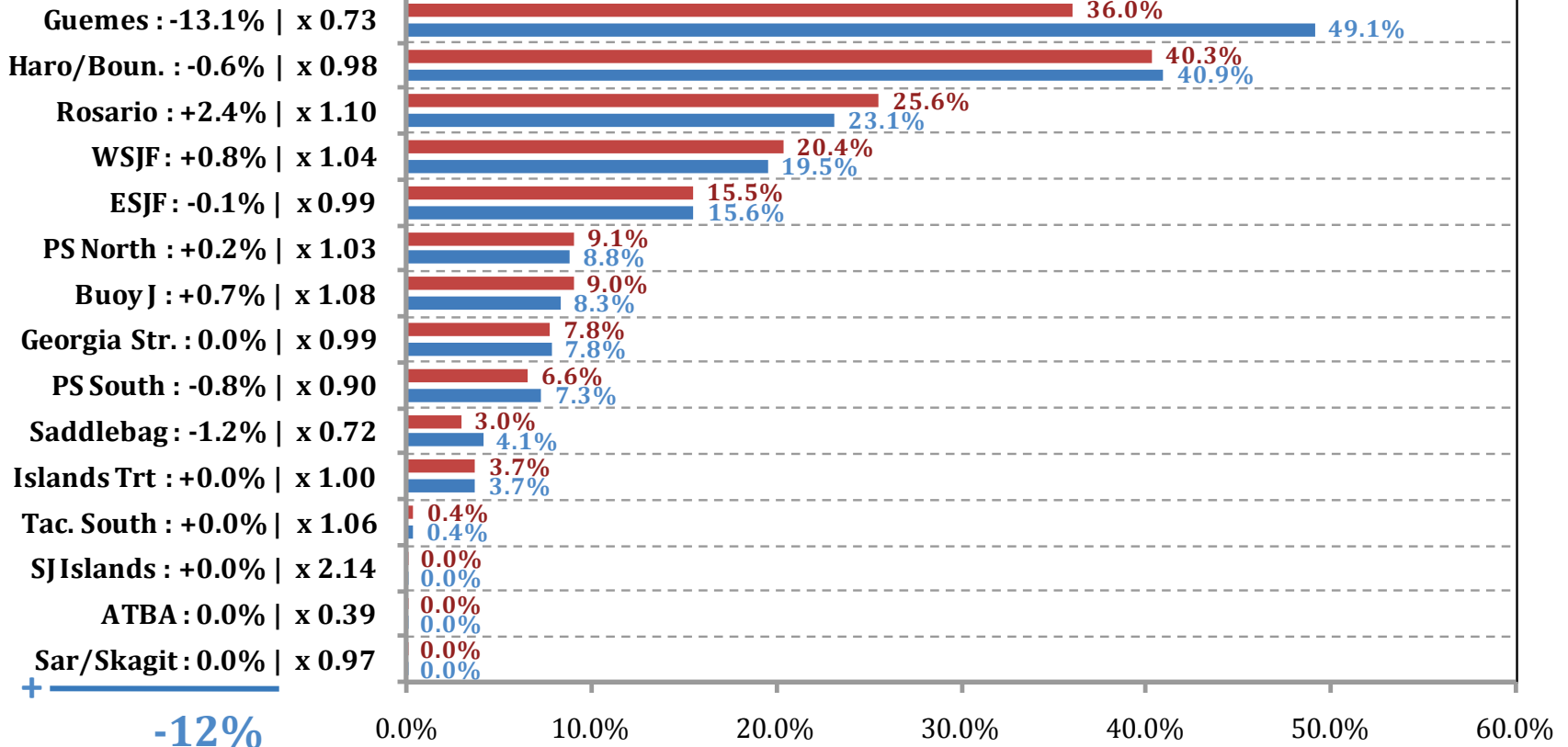
VTRA 2010 Waterway Zones

- | | |
|-----------------|-----------------|
| 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 Collision Oil Loss - ALL_FV

Waterway Zone:



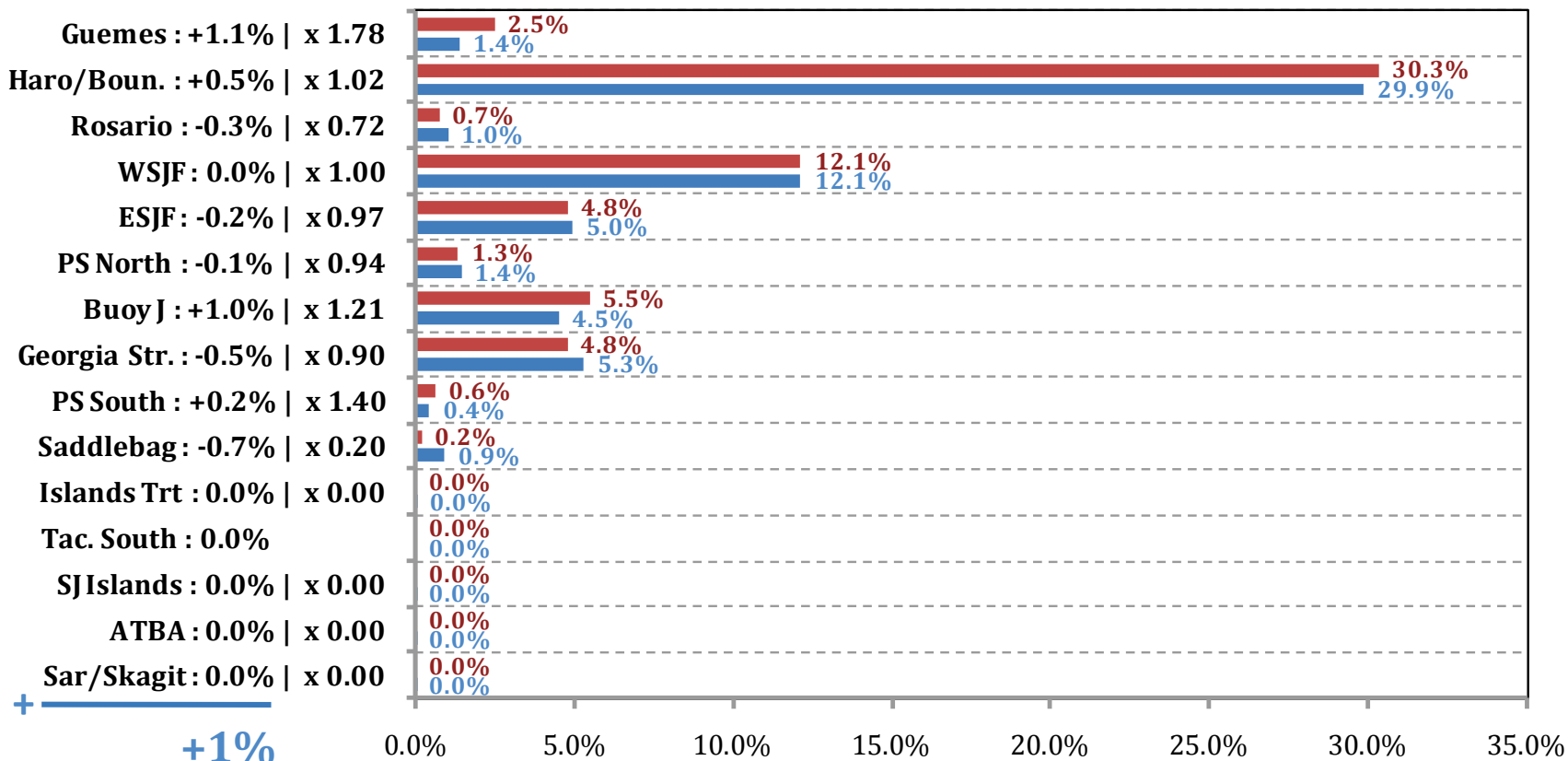
% of Base Case Annual Collision Oil Loss - ALL_FV

■ T:GW - KM - DP & OW ATB: 177% (-12% | x 0.94) ■ T:GW - KM - DP: 189%

VESSEL TRAFFIC RISK ASSESSMENT (VTRA) 2010

Waterway Zone:

% Base Case Collision Oil Loss - WhatIf



% of Base Case Annual Collision Oil Loss - WhatIf

■ T:GW - KM - DP & OW ATB : 63% (+1% | x 1.01) ■ T:GW - KM - DP : 62%