

# Puget Sound Maritime Air Emissions Inventory

August 2012







## 2011 PUGET SOUND MARITIME AIR EMISSIONS INVENTORY

September 2012

**Prepared by:**

*Starcrest Consulting Group, LLC  
Poulsbo, Washington 98370*





TABLE OF CONTENTS

**OVERVIEW ..... 1**

**EXECUTIVE SUMMARY ..... 1**

**ES.1.1 Maritime-Related Source Categories ..... 3**

**ES.1.2 Puget Sound Maritime Air Emissions Inventory Findings ..... 4**

        ES.1.2.1 Emissions Inventory Domain..... 4

        ES.1.2.2 2011 Airshed Total Emissions ..... 5

**ES.1.3 Overview of Comparison, 2011 vs 2005 ..... 9**

**SECTION 1 INTRODUCTION..... 1**

**1.1 Reason for Study ..... 1**

**1.2 Scope of Study..... 4**

        1.2.1 Pollutants..... 4

        1.2.2 Temporal Extent..... 9

        1.2.3 Emission Source Categories ..... 9

        1.2.4 Geographical Extent..... 9

**1.3 Background Air Quality Conditions and Regulations ..... 13**

        1.3.1 Air Quality Conditions ..... 13

        1.3.2 Washington State Regulations..... 14

        1.3.3 Federal Regulations..... 14

        1.3.4 International Regulations..... 17

**1.4 Emission Reduction Strategies ..... 18**

        1.4.1 BNSF Railway Company (BNSF)..... 18

        1.4.2 Port of Everett ..... 19

        1.4.3 Port of Olympia ..... 19

        1.4.4 Port of Seattle ..... 19

        1.4.5 Port of Tacoma ..... 22

        1.4.6 Tacoma Public Utilities – Locomotives..... 24

        1.4.7 Union Pacific ..... 24

        1.4.8 Washington State Ferries ..... 25

**SECTION 2 SUMMARY RESULTS ..... 26**

**2.1 Results..... 26**

**2.2 Emission Comparison, 2011 vs 2005 ..... 35**

**2.3 Port and Petroleum Facility Summaries ..... 39**

TABLE OF CONTENTS (cont'd)

<b>SECTION 3 OCEAN-GOING VESSELS.....</b>	<b>66</b>
<b>3.1 Source Category Description and Operational Characteristics .....</b>	<b>66</b>
3.1.1 Auto Carriers .....	69
3.1.2 Bulk Carriers .....	70
3.1.3 Containerships.....	71
3.1.4 Passenger Cruise Vessels.....	72
3.1.5 General Cargo Vessels.....	73
3.1.6 Ocean-Going Tugboats .....	74
3.1.7 Refrigerated Vessels.....	75
3.1.8 RoRo Vessels.....	76
3.1.9 Tanker Vessels.....	77
<b>3.2 Geographical Delineation.....</b>	<b>78</b>
<b>3.3 Data and Information Acquisition .....</b>	<b>85</b>
3.3.1 2005 Puget Sound Maritime Air Emissions Inventory.....	85
3.3.2 Marine Exchange of Puget Sound (MarEx).....	86
3.3.3 Lloyd’s Register of Ships.....	86
3.3.4 Puget Sound Pilots.....	87
3.3.5 Vessel Operational Data .....	87
<b>3.4 Operational Profiles.....</b>	<b>88</b>
3.4.1 Vessel Activity .....	88
3.4.2 Vessel Routing.....	93
<b>3.5 Emission Reduction Technologies Identified .....</b>	<b>100</b>
<b>3.6 Emissions Estimating Methodology.....</b>	<b>101</b>
3.6.1 Propulsion Engine Maximum Continuous Rated Power.....	102
3.6.2 Propulsion Engine Load Factor .....	102
3.6.3 Propulsion Engine Time in Mode.....	104
3.6.4 Propulsion Engine Emission Factors .....	104
3.6.5 Varying Emission Factors for Low Loads for Propulsion Engines .....	107
3.6.6 Propulsion Engine Maneuvering Loads .....	109
3.6.7 Auxiliary Engine Emission Factors.....	110
3.6.8 Auxiliary Engine Defaults.....	111
3.6.9 Auxiliary Boilers .....	113
3.6.10 Fuel Correction Factors.....	115
3.6.11 Other Correction Factors .....	116
<b>3.7 Data Facts and Findings .....</b>	<b>116</b>
3.7.1 Port of Anacortes Data Findings.....	117
3.7.2 Port of Everett Data Findings .....	119
3.7.3 Port of Olympia Data Findings .....	120
3.7.4 Port of Seattle Data Findings.....	121
3.7.5 Port of Tacoma Data Findings .....	126
3.7.6 Tankers in Puget Sound.....	131
<b>3.8 Emission Estimates.....</b>	<b>132</b>
3.8.1 Main Port Emission Estimates .....	135
3.8.2 Petroleum Facilities Emission Estimates.....	138
3.8.3 Other Maritime Facilities Emission Estimates .....	138
<b>3.9 Emission Comparison, 2011 vs 2005.....</b>	<b>139</b>

TABLE OF CONTENTS (cont'd)

<b>SECTION 4 HARBOR VESSELS</b> .....	<b>141</b>
<b>4.1 Source Description</b> .....	<b>141</b>
<b>4.2 Geographical Delineation</b> .....	<b>143</b>
<b>4.3 Data and Information Acquisition</b> .....	<b>143</b>
<b>4.4 Operational Profiles</b> .....	<b>144</b>
4.4.1 Assist and Escort Tugboats.....	147
4.4.2 Harbor and Ocean Tugboats .....	147
4.4.3 Commercial Fishing Vessels.....	148
4.4.4 Ferry Vessels.....	149
4.4.5 Excursion Vessels .....	149
4.4.6 Government Vessels.....	150
4.4.7 Work Boats .....	150
<b>4.5 Emission Reduction Initiatives Identified</b> .....	<b>150</b>
<b>4.6 Emissions Estimating Methodology</b> .....	<b>151</b>
4.6.1 Emission Equations.....	151
4.6.2 Emission Factors for Diesel Engines.....	151
4.6.3 Fuel Correction Factors for Diesel Alternatives .....	154
4.6.4 Emission Factors for Gasoline Engines.....	154
4.6.5 Fuel Correction Factors for Gasoline Engines.....	155
<b>4.7 Commercial Harbor and Government (non military) Vessel Emissions Estimates</b> .....	<b>156</b>
<b>4.8 Recreational Vessels</b> .....	<b>158</b>
<b>4.9 Emission Comparison, 2011 vs 2005</b> .....	<b>165</b>

TABLE OF CONTENTS (cont'd)

<b>SECTION 5 CARGO HANDLING EQUIPMENT .....</b>	<b>171</b>
<b>5.1 Source Description.....</b>	<b>171</b>
5.1.1 Crane.....	174
5.1.2 Forklift.....	175
5.1.3 Side Handler .....	175
5.1.4 Straddle Carrier.....	176
5.1.5 Top Handler .....	176
5.1.6 Yard Tractor .....	177
<b>5.2 Geographical Delineation.....</b>	<b>177</b>
<b>5.3 Data and Information Acquisition .....</b>	<b>178</b>
<b>5.4 Operational Profiles.....</b>	<b>178</b>
5.4.1 Port of Anacortes.....	179
5.4.2 Port of Everett .....	180
5.4.3 Port of Olympia .....	183
5.4.4 Port of Seattle .....	184
5.4.5 Port of Tacoma .....	188
<b>5.5 Emission Reduction Technologies Identified .....</b>	<b>193</b>
<b>5.6 Emissions Estimating Methodology.....</b>	<b>194</b>
5.6.1 Emission Control Factors.....	196
5.6.2 Greenhouse Gas Emission Factors.....	197
<b>5.7 Emission Estimates.....</b>	<b>198</b>
5.7.1 Port of Anacortes Emission Estimates.....	198
5.7.2 Port of Everett Emission Estimates .....	198
5.7.3 Port of Olympia Emission Estimates .....	199
5.7.4 Port of Seattle Emission Estimates .....	199
5.7.5 Port of Tacoma Emission Estimates .....	200
<b>5.8 Emission Comparison, 2011 vs 2005 .....</b>	<b>200</b>
<b>SECTION 6 LOCOMOTIVES.....</b>	<b>202</b>
<b>6.1 Source Description.....</b>	<b>202</b>
<b>6.2 Geographical Delineation.....</b>	<b>202</b>
<b>6.3 Data and Information Acquisition .....</b>	<b>207</b>
<b>6.4 Operational Profiles.....</b>	<b>208</b>
<b>6.5 Emission Reduction Technologies Identified .....</b>	<b>210</b>
<b>6.6 Emissions Estimating Methodology.....</b>	<b>210</b>
<b>6.7 Emission Estimates.....</b>	<b>212</b>
<b>6.8 Emission Comparison, 2011 vs 2005 .....</b>	<b>214</b>



TABLE OF CONTENTS (cont'd)

<b>SECTION 7 HEAVY-DUTY VEHICLES</b> .....	<b>216</b>
7.1 Source Description.....	216
7.2 Geographical Delineation.....	218
7.3 Data and Information Acquisition .....	220
7.4 Operational Profiles.....	221
7.5 Emission Reduction Technologies Identified .....	224
7.6 Emissions Estimating Methodology.....	224
7.7 Emission Estimates.....	229
7.8 Emission Comparison, 2011 vs 2005 .....	234
<b>SECTION 8 FLEET VEHICLES</b> .....	<b>239</b>
8.1 Source Description.....	239
8.2 Geographical Delineation.....	240
8.3 Data and Information Acquisition .....	240
8.4 Operational Profiles.....	240
8.5 Emission Reduction Technologies Identified .....	243
8.6 Emissions Estimating Methodology.....	244
8.7 Emission Estimates.....	246
8.8 Emission Comparison, 2011 vs 2005 .....	247
<b>SECTION 9 EMISSIONS COMPARISON BY PORT</b> .....	<b>248</b>
9.1 Emissions Calculation and Allocation Methodology Changes.....	250
9.2 Port of Everett.....	252
9.3 Port of Olympia .....	258
9.4 Port of Seattle.....	264
9.4.1 2011 vs 2005 Port Emissions Comparisons .....	264
9.4.2 2011 vs 2005 Airshed Emissions Comparisons .....	272
9.5 Port of Tacoma .....	276
9.5.1 2011 vs 2005 Port Emissions Comparisons .....	276
9.5.2 2011 vs 2005 Airshed Emissions Comparisons .....	284
<b>SECTION 10 CLEAN AIR STRATEGY EMISSION REDUCTIONS</b> .....	<b>288</b>
<b>10.1 Port of Seattle</b> .....	<b>289</b>
10.1.1 Ocean-Going Vessels .....	289
10.1.2 Commercial Harbor Vessels.....	290
10.1.3 Cargo Handling Equipment .....	290
10.1.4 Locomotives .....	291
10.1.5 Heavy-Duty Vehicles.....	291
<b>10.2 Port of Tacoma</b> .....	<b>292</b>
10.2.1 Ocean-Going Vessels .....	292
10.2.2 Harbor Vessels .....	293
10.2.3 Cargo Handling Equipment.....	293
10.2.4 Locomotives .....	294
10.2.5 Heavy-Duty Vehicles.....	295
<b>APPENDIX A - GLOSSARY</b>	
<b>APPENDIX B - SUPPORTING DATA</b>	



LIST OF FIGURES

Figure O.1: Georgia Basin/Puget Sound International Airshed.....	2
Figure O.2: 2011 Total Airshed Emissions.....	4
Figure O.3: 2011 vs 2005 Total Airshed Emissions Change.....	5
Figure ES.1: Georgia Basin/Puget Sound International Airshed.....	4
Figure ES.2: 2011 Total Airshed Emissions Distribution.....	7
Figure ES.3: 2011 Total Airshed Emissions by Clean Air Agency.....	8
Figure ES.4: 2011 vs 2005 Total Airshed Emissions Change.....	10
Figure 1.1: Georgia Basin/Puget Sound International Airshed.....	10
Figure 1.2: Puget Sound Counties and Major Ports.....	11
Figure 2.1: 2011 Total Airshed Emissions, tpy.....	27
Figure 2.2: Contribution of 2011 Total Airshed Emissions by Source Category.....	28
Figure 2.3: 2011 Total Airshed NO <sub>x</sub> Emissions by Source Category.....	29
Figure 2.4: 2011 Total Airshed VOC Emissions by Source Category.....	29
Figure 2.5: 2011 Total Airshed CO Emissions by Source Category.....	30
Figure 2.6: 2011 Total Airshed SO <sub>2</sub> Emissions by Source Category.....	30
Figure 2.7: 2011 Total Airshed PM <sub>10</sub> Emissions by Source Category.....	31
Figure 2.8: 2011 Total Airshed PM <sub>2.5</sub> Emissions by Source Category.....	31
Figure 2.9: 2011 Total Airshed DPM Emissions by Source Category.....	32
Figure 2.10: 2011 Total Airshed CO <sub>2e</sub> Emissions by Source Category.....	32
Figure 2.11: Distribution of Total Airshed Emissions by Regional Clean Air Agency.....	34
Figure 2.12: 2011 vs 2005 Total Airshed Emissions Change.....	36
Figure 2.13: Port of Anacortes 2011 Port Emissions.....	41
Figure 2.14: Port of Anacortes 2011 vs 2005 Port Emissions Change.....	43
Figure 2.15: Port of Everett 2011 Port Emissions.....	44
Figure 2.16: Port of Everett 2011 vs 2005 Port Emissions Change.....	46
Figure 2.17: Port of Everett 2011 vs 2005 Port Emissions 10,000 Tonnes of Cargo Change.....	46
Figure 2.18: Port of Olympia 2011 Port Emissions.....	47
Figure 2.19: Port of Olympia 2011 vs 2005 Port Emissions Change.....	49
Figure 2.20: Port of Olympia 2011 vs 2005 Port Emissions per 10,000 Tonnes of Cargo Metric Change.....	49
Figure 2.21: Port of Seattle 2011 Port Emissions Contribution by Source Category.....	50
Figure 2.22: Port of Seattle 2011 vs 2005 Port Emissions Change.....	52
Figure 2.23: Port of Seattle 2011 vs 2005 Port Emissions per 10,000 TEU Change.....	52
Figure 2.24: Port of Seattle 2011 vs 2005 Port Emissions per 10,000 Tonnes of Cargo Change.....	53
Figure 2.25: Port of Seattle 2011 vs 2005 Airshed Emissions Change.....	56
Figure 2.26: Port of Seattle 2011 vs 2005 Airshed Emissions per 10,000 TEU Change.....	56
Figure 2.27: Port of Seattle 2011 vs 2005 Airshed Emissions per 10,000 Tonnes of Cargo Change.....	57
Figure 2.28: Port of Tacoma 2011 Port Emissions.....	58
Figure 2.29: Port of Tacoma 2011 vs 2005 Port Emissions Change.....	60
Figure 2.30: Port of Tacoma 2011 vs 2005 Port Emissions per 10,000 TEU Change.....	60
Figure 2.31: Port of Tacoma 2011 vs 2005 Port Emissions per 10,000 Tonnes of Cargo Change.....	61

**List of Figures (cont'd)**

Figure 2.32: Port of Tacoma 2011 vs 2005 Airshed Emissions Change .....	64
Figure 2.33: Port of Tacoma 2011 vs 2005 Airshed Emissions per 10,000 TEU Change.....	64
Figure 2.34: Port of Tacoma 2011 vs 2005 Airshed Emissions 10,000 Tonnes of Cargo Change .....	65
Figure 3.1: Puget Sound 2011 Distribution of OGV by Inbound Calls.....	67
Figure 3.2: Puget Sound 2011 Distribution of Discrete OGV Types.....	67
Figure 3.3: 2011 Distribution of Ships' Flags by Vessel Call.....	68
Figure 3.4: 2011 Distribution of Ships' Flags by Discrete Vessel.....	68
Figure 3.5: Auto Carrier .....	69
Figure 3.6: Bulk Carrier .....	70
Figure 3.7: Containership.....	71
Figure 3.8: Cruise Vessels .....	72
Figure 3.9: General Cargo Vessel .....	73
Figure 3.10: Integrated Tug and Barge .....	74
Figure 3.11: Refrigerated Vessel .....	75
Figure 3.12: RoRo Vessel.....	76
Figure 3.13: Tanker.....	77
Figure 3.14: 2011 OGV Inventory Boundary.....	78
Figure 3.15: 2011 OGV Inventory Boundary – JA Buoy to/from U.S. Marine Facilities.....	80
Figure 3.16: 2011 OGV Inventory Boundary – Victoria to/from U.S. Marine Facilities.....	82
Figure 3.17: 2011 OGV Inventory Boundary – Vancouver to/from U.S. Marine Facilities.....	83
Figure 3.18: 2011 OGV Inventory Boundary – Vancouver to/from Anacortes, Cherry Point, Ferndale, March Point, and Sandy Point .....	84
Figure 3.19: 2011 OGV Inbound Calls by Facility Type .....	91
Figure 3.20: 2011 Distribution of OGV Shifts vs Inbound Calls by Vessel Type.....	92
Figure 3.21: Propeller Law Curve of Power Demand .....	103
Figure 3.22: Port of Seattle 2011 OGV Model Year, by Vessel Type.....	123
Figure 3.23: Port of Seattle 2011 OGV DWT by Vessel Type.....	124
Figure 3.24: Port of Seattle 2011 OGV Main and Auxiliary Engine Power by Vessel Type, kW .....	125
Figure 3.25: Port of Tacoma Average 2011 OGV Model Year, by Vessel Type .....	128
Figure 3.26: Port of Tacoma Average 2011 OGV DWT by Vessel Type.....	129
Figure 3.27: Port of Tacoma Average 2011 OGV Main and Auxiliary Engine Power by Vessel Type, kW.....	130
Figure 3.28: 2011 Distribution of Total OGV Airshed Emissions by Transit, Maneuvering, and Hotelling Mode.....	135
Figure 3.29: 2011 Distribution of Other Maritime Facilities Port Emissions.....	139
Figure 3.30: 2011 vs 2005 Total OGV Airshed Emissions Change.....	140
Figure 4.1: 2011 Commercial Harbor and Government Vessels Count by Vessel Type.....	142
Figure 4.2: 2011 Commercial Harbor and Government Vessel Emissions by Vessel Type.....	156
Figure 4.3: 2011 Commercial Harbor and Government Vessel Emissions by Regional Clean Air Agency.....	157
Figure 4.4: 2011 vs 2005 Commercial Harbor and Government Vessel Emissions Change .....	166
Figure 5.1: 2011 CHE Count Distribution.....	172

List of Figures (cont'd)

Figure 5.2: 2011 CHE Distribution by Port.....	173
Figure 5.3: Container Crane .....	174
Figure 5.4: Rubber Tired Gantry Crane.....	174
Figure 5.5: Forklift.....	175
Figure 5.6: Side Handler.....	175
Figure 5.7: Straddle Carrier.....	176
Figure 5.8: Top Handler.....	176
Figure 5.9: Yard Tractor.....	177
Figure 5.10: Port of Anacortes 2011 CHE Counts and Distribution by Type.....	179
Figure 5.11: Port of Everett 2011 CHE Counts and Distribution by Type.....	181
Figure 5.12: Port of Olympia 2011 CHE Counts and Distribution by Type.....	183
Figure 5.13: Port of Seattle 2011 CHE Counts and Distribution by Type .....	185
Figure 5.14: Port of Tacoma 2011 CHE Counts and Distribution by Type.....	188
Figure 5.15: 2011 vs 2005 Total CHE Emissions Change.....	201
Figure 6.1: State of Washington Rail System Map .....	203
Figure 6.2: Port of Seattle Harbor Rail System Map.....	204
Figure 6.3: Port of Tacoma Rail System Map.....	205
Figure 6.4: Port of Olympia Rail System Map.....	206
Figure 6.5: 2011 vs 2005 Airshed Locomotive Emissions Change .....	215
Figure 7.1: Truck with Container .....	217
Figure 7.2: Bobtail Truck .....	218
Figure 7.3: Puget Sound Metropolitan Transportation System Map.....	219
Figure 7.4: 2011 Heavy-Duty Vehicle Age Distribution.....	220
Figure 7.5: Port of Seattle Cruise Terminal Anti-Idling Signage.....	222
Figure 7.6: 2011 vs 2005 Total HDV Port Emissions Change .....	235
Figure 7.7: 2011 vs 2005 Total Airshed HDV Emissions Change .....	236
Figure 7.8: 2011 vs 2005 Total HDV Port and Airshed Emissions Change.....	237
Figure 7.9: 2011 and 2005 HDV Age Distributions .....	238
Figure 8.1: 2011 Terminal Fleet Vehicle Fuel Type Distribution .....	242
Figure 8.2: 2011 Terminal Fleet Vehicle MOBILE6.2 Classifications.....	244
Figure 9.1: Port of Everett 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Change .....	253
Figure 9.2: Port of Olympia 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Change .....	259
Figure 9.3: Port of Seattle 2011 vs 2005 Port Tons of Emissions per 10,000 TEU Change .....	265
Figure 9.4: Port of Seattle 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Change .....	266
Figure 9.5: Port of Seattle 2011 vs 2005 Airshed Tons of Emissions per 10,000 TEU Change.....	273
Figure 9.6: Port of Seattle 2011 vs 2005 Airshed Tons of Emissions per 10,000 Tonnes of Cargo Change .....	274
Figure 9.7: Port of Tacoma 2011 vs 2005 Port Tons of Emissions per 10,000 TEU Change .....	277

**List of Figures (cont'd)**

Figure 9.8: Port of Tacoma 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Change .....278

Figure 9.9: Port of Tacoma 2011 vs 2005 Airshed Tons of Emissions per 10,000 TEU Change .....285

Figure 9.10: Port of Tacoma 2011 vs 2005 Airshed Tons of Emissions per 10,000 Tonnes of Cargo Change .....286

**LIST OF TABLES**

Table O.1: 2011 Total Airshed Emissions, tpy.....	4
Table O.2: 2011 vs 2005 Total Airshed Emissions Comparison, tpy .....	5
Table ES.1: 2011 Total Airshed Emissions, tpy.....	6
Table ES.2: 2011 Total Airshed Emissions Contribution by Source Category .....	6
Table ES.3: 2011 Total Airshed Emissionsby Clean Air Agency, tpy.....	7
Table ES.4: Distribution of 2011 Total Airshed Emissionsby Clean Air Agency.....	8
Table ES.5: 2011 vs 2005 Port Activity Comparison .....	9
Table ES.6: 2011 vs 2005 Total Airshed Emissions Comparison, tpy .....	10
Table ES.7: 2011 vs 2005 Total Airshed Emissionsby Source Category, tpy .....	12
Table ES.8: Port of Seattle 2011 Emission Reductions, tpy.....	14
Table ES.9: Port of Tacoma 2011 Port Direct Emission Reductions, tpy.....	14
Table 1.1: Pollutant Description.....	5
Table 2.1: 2011 Total Airshed Emissions, tpy.....	27
Table 2.2: Contribution of 2011 Total Airshed Emissions by Source Category .....	28
Table 2.3: 2011 Total Airshed Emissions by Regional Clean Air Agency, tpy .....	33
Table 2.4: 2011 vs 2005 Port Activity Comparison .....	35
Table 2.5: 2011 vs 2005 Total Airshed Emissions Comparison, tpy.....	36
Table 2.6: 2011 vs 2005 Total Airshed Emissions by Source Category, tpy .....	38
Table 2.7: Port of Anacortes 2011 Port Emissions, tpy.....	41
Table 2.8: Port of Anacortes 2011 vs 2005 Port Emissions Comparison, tpy .....	42
Table 2.9: Port of Everett 2011 Port Emissions, tpy.....	44
Table 2.10: Port of Everett 2011 vs 2005 Port Emissions Comparison, tpy .....	45
Table 2.11: Port of Olympia 2011 Port Emissions, tpy .....	47
Table 2.12: Port of Olympia 2011 vs 2005 Port Emissions Comparison, tpy.....	48
Table 2.13: Port of Seattle 2011 Port Emissions, tpy .....	50
Table 2.14: Port of Seattle 2011 vs 2005 Port Emissions Comparison, tpy.....	51
Table 2.15: Port of Seattle 2011 Air District Emissions, tpy.....	53
Table 2.16: Port of Seattle 2011 Air District OGV Emissions by County by Mode, tpy .....	54
Table 2.17: Port of Seattle 2011 Airshed Emissions, tpy.....	54
Table 2.18: Port of Seattle 2011 vs 2005 Airshed Emissions Comparison, tpy .....	55
Table 2.19: Port of Tacoma 2011 Port Emissions, tpy .....	58
Table 2.20: Port of Tacoma 2011 vs 2005 Port Emissions Comparison, tpy.....	59
Table 2.21: Port of Tacoma 2011 Air District Zone Emissions, tpy .....	61
Table 2.22: Port of Tacoma 2011 Air District Zone OGV Emissions by County, tpy.....	62
Table 2.23: Port of Tacoma 2011 Airshed Emissions, tpy .....	62
Table 2.24: Port of Tacoma 2011 vs 2005 Airshed Emissions Comparison, tpy.....	63
Table 2.25: Refinery Related 2011 Port Emissions, tpy .....	65
Table 3.1: 2011 OGV Movements by Vessel Type .....	90
Table 3.2: OGV Vessel Routes Used in Puget Sound Maritime Air Emissions Inventory ...	94
Table 3.3: OGV Routes Not Included in Puget Sound Maritime Air Emissions Inventory.	95
Table 3.4: 2011 OGV Anacortes Destinations.....	96
Table 3.5: 2011 OGV Everett Destinations.....	96
Table 3.6: 2011 OGV Olympia Destinations .....	96
Table 3.7: 2011 OGV Port Angeles Destinations.....	97
Table 3.8: 2011 OGV Tacoma Destinations .....	97

**LIST OF TABLES (cont'd)**

Table 3.9: 2011 OGV Seattle Destinations .....	98
Table 3.10: 2011 OGV Other Ports Destinations .....	99
Table 3.11: 2011 Excluded Piers in Lake Washington .....	100
Table 3.12: Emission Factors for OGV Main Engines Using RO, g/kW-hr .....	105
Table 3.13: GHG Emission Factors for OGV Main Engines Using RO, g/kW-hr .....	105
Table 3.14: NO <sub>x</sub> Emission Factors for Engines on Specific Vessels, g/kW-hr .....	106
Table 3.15: Low-Load Emission Factor Regression Equation Variables .....	108
Table 3.16: Low-Load Adjustment Multipliers for Emission Factors .....	109
Table 3.17: Composite Maneuvering Load Factors .....	110
Table 3.18: Auxiliary Engine Emission Factors, g/kW-hr .....	111
Table 3.19: Greenhouse Gas Emission Factors for Auxiliary Engines, g/kW-hr.....	111
Table 3.20: 2011 Auxiliary Engine Power and Load Defaults, kW .....	112
Table 3.21: 2011 Auxiliary Boiler Energy Defaults, kW .....	114
Table 3.22: Fuel Correction Factors.....	115
Table 3.23: 2011 OGVs by Vessel Type.....	116
Table 3.24: Port of Anacortes 2011 OGV Movements .....	117
Table 3.25: Port of Anacortes 2011 OGV Type Characteristics .....	117
Table 3.26: Port of Port Angeles 2011 OGV Movements .....	118
Table 3.27: Port of Port Angeles 2011 OGV Type Characteristics .....	119
Table 3.28: Port of Everett 2011 OGV Movements .....	119
Table 3.29: Port of Everett 2011 OGV Type Characteristics .....	120
Table 3.30: Port of Olympia 2011 OGV Movements .....	120
Table 3.31: Port of Olympia 2011 Average OGV Type Characteristics .....	120
Table 3.32: Port of Seattle 2011 OGV Movements.....	121
Table 3.33: Port of Seattle 2011 OGV Type Characteristics.....	122
Table 3.34: Port of Tacoma 2011 OGV Movements.....	126
Table 3.35: Port of Tacoma Average 2011 OGV Type Characteristics .....	127
Table 3.36: 2011 Tanker Movements.....	131
Table 3.37: 2011 Total OGV Airshed Emissions by County and Regional Clean Air Agency, tpy .....	132
Table 3.38: 2011 Total OGV Airshed Emissions by Vessel Type, tpy.....	133
Table 3.39: 2011 Total OGV Airshed Emissions by Engine Type, tpy .....	134
Table 3.40: 2011 Total OGV Airshed Emissions by Mode, tpy.....	134
Table 3.41: Port of Anacortes 2011 OGV Port Emissions by Mode, tpy.....	136
Table 3.42: Port of Port Angeles 2011 OGV Port Emissions by Mode, tpy.....	136
Table 3.43: Port of Everett 2011 OGV Port Emissions by Mode, tpy .....	136
Table 3.44: Port of Olympia 2011 OGV Port Emissions by Mode, tpy .....	137
Table 3.45: Port of Seattle 2011 OGV Port Emissions by Mode, tpy.....	137
Table 3.46: Port of Tacoma 2011 OGV Port Emissions by Mode, tpy .....	137
Table 3.47: Petroleum Facilities 2011 OGV Port Emissions by Mode, tpy .....	138
Table 3.48: Other Maritime Facilities 2011 OGV Port Emissions by Mode, tpy .....	138
Table 3.49: 2011 vs 2005 Total OGV Airshed Emissions Comparison, tpy .....	140
Table 3.50: 2011 vs 2005 Total OGV Inbound Movements Comparison.....	140
Table 4.1: 2011 Commercial Harbor and Government Vessel Counts by Vessel Type .....	142



**LIST OF TABLES (cont'd)**

Table 4.2: 2011 Commercial Harbor and Government Vessel Propulsion Engines Inventory .....	145
Table 4.3: 2011 Commercial Harbor and Government Vessel Auxiliary Engines Inventory .....	146
Table 4.4: Source of Emission Factors .....	152
Table 4.5: Harbor Vessel Emission Factors for Diesel Engines, g/kW-hr.....	153
Table 4.6: Fuel Correction Factors.....	154
Table 4.7: Harbor Vessel Emission Factors for Gasoline Engines, g/kW-hr .....	154
Table 4.8: Load Factors.....	155
Table 4.9: 2011 Commercial Harbor and Government Vessel Emissions by Vessel Type, tpy .....	156
Table 4.10: 2011 Commercial Harbor and Government Vessel Emissions by Regional Clean Air Agency, tpy .....	157
Table 4.11: 2011 Commercial Harbor and Government Vessel Emissions by County, tpy.....	158
Table 4.12: 2011 Public Marina Vessel Counts by Associated Port and County .....	160
Table 4.13: 2011 Private Marinas and Other Non-Port Public Entities Vessel Counts by County .....	161
Table 4.14: 2011 Recreational Vessel Fuel and Average Horsepower by Vessel Type .....	163
Table 4.15: 2011 Recreational Vessel Airshed Emissions by County, tpy.....	163
Table 4.16: 2011 Recreational Vessel Airshed Emissions by Public Marina and Associated Port, tpy .....	164
Table 4.17: 2011 vs 2005 Load Factor Changes.....	165
Table 4.18: 2011 vs 2005 Harbor Vessel Count Comparison .....	165
Table 4.19: 2011 vs 2005 Commercial Harbor and Government Vessel Emissions Comparison, tpy.....	166
Table 4.20: 2011 vs 2005 Harbor Vessel Activity Change.....	167
Table 4.21: 2011 vs 2005 Commercial Harbor and Government Vessel Average Operational Hours Comparison .....	167
Table 4.22: 2011 vs 2005 Commercial Harbor and Government Vessel Average Engine Horsepower by Engine and Vessel Type, hp.....	168
Table 4.23: 2011 vs 2005 Commercial Harbor and Government Vessel Average Propulsion Engine Model Year by Vessel Type .....	168
Table 4.24: 2011 vs 2005 Commercial Harbor and Government Vessel Average Auxiliary Engine Model Year by Vessel Type .....	169
Table 4.25: 2011 vs 2005 Recreational Vessels Emissions Comparison.....	169
Table 4.26: 2011 vs 2005 Recreational Vessels Count Comparison.....	170
Table 5.1: 2011 CHE Distribution by Type.....	172
Table 5.2: 2011 CHE Distribution by Port.....	173
Table 5.3: Port of Anacortes 2011 CHE Characteristics .....	179
Table 5.4: Port of Everett 2011 CHE Characteristics .....	180
Table 5.5: Port of Everett 2011 CHE Characteristics by Terminal.....	182
Table 5.6: Port of Olympia 2011 CHE Characteristics .....	183
Table 5.7: Port of Seattle 2011 CHE Characteristics.....	185
Table 5.8: Port of Seattle 2011 CHE Characteristics by Terminal .....	186
Table 5.9: Port of Tacoma 2011 CHE Characteristics .....	189

**LIST OF TABLES (cont'd)**

Table 5.10: Port of Tacoma 2011 CHE Characteristics by Terminal .....	190
Table 5.11: 2011 CHE Count of Emission Reduction Technologies .....	193
Table 5.12: NONROAD Engine Source Categories.....	195
Table 5.13: Emission Control Factors for CHE Retrofits.....	196
Table 5.14: Emission Control Factors for On-road Engines.....	197
Table 5.15: 2011 CHE Total Emissions, tpy .....	198
Table 5.16: Port of Anacortes 2011 CHE Emissions by Terminal, tpy.....	198
Table 5.17: Port of Everett 2011 CHE Emissions, tpy.....	198
Table 5.18: Port of Olympia 2011 CHE Emissions, tpy.....	199
Table 5.19: Port of Seattle 2011 CHE Emissions, tpy .....	199
Table 5.20: Port of Tacoma 2011 CHE Emissions, tpy.....	200
Table 5.21: 2011 vs 2005 Port Total CHE Emissions Comparison, tpy .....	200
Table 5.22: 2011 vs 2005 Total CHE Activity and Count Comparison .....	201
Table 6.1: 2011 Switching Locomotive Port Emissions, tpy.....	212
Table 6.2: 2011 Line-Haul Locomotive Port Emissions, tpy .....	213
Table 6.3: 2011 Line-Haul Locomotive Airshed Emissions Exclusive of Port Emissions, tpy .....	213
Table 6.4: 2011 Line-Haul Locomotive Airshed Emissions by County Exclusive of Port Emissions, tpy.....	213
Table 6.5: 2011 vs 2005 Locomotive Activity and Fuel Consumption Comparison.....	214
Table 6.6: 2011 vs 2005 Locomotive Airshed Emissions Comparison, tpy.....	214
Table 7.1: 2011 On-Terminal HDV Operational Profiles .....	223
Table 7.2: HDV Emission Factors – Driving, g/mile.....	225
Table 7.3: HDV Emission Factors – Idling, g/hour .....	226
Table 7.4: 2011 Total HDV Port Emissions by Terminal, tpy .....	230
Table 7.5: 2011 Total HDV Port Emissions - Driving by Terminal, tpy .....	231
Table 7.6: 2011 Total HDV Port Emissions - Idling by Terminal, tpy .....	232
Table 7.7: 2011 Total HDV Airshed Emissions by County Exclusive of Port Emissions, tpy .....	233
Table 7.8: Distribution of 2011 Total HDV Airshed Emissions by Clean Air Agency Exclusive of Port Emissions, tpy.....	234
Table 7.9: 2011 vs 2005 Total HDV Port Emissions Comparison, tpy .....	234
Table 7.10: 2011 vs 2005 Total HDV Port VMT and Idling Hours Comparison .....	235
Table 8.1: 2011 Terminal Fleet Vehicle Characteristics .....	241
Table 8.2: 2011 Terminal Fleet Vehicle Count by Fuel Type.....	242
Table 8.3: 2011 Terminal Fleet Vehicle MOBILE6.2 Classifications .....	244
Table 8.4: Alternative Fueled LDV and HDV Emissions Factors for N <sub>2</sub> O and CH <sub>4</sub> , g/mile .....	245
Table 8.5: Gasoline and Diesel Fueled LDV and HDV Emissions Factors for N <sub>2</sub> O and CH <sub>4</sub> , g/mile.....	245
Table 8.6: 2011 Total Terminal Fleet Vehicle Emissions by Terminal, tpy .....	246
Table 8.7: 2011 Import/Export Vehicle Emissions, tpy.....	247
Table 8.8: Terminal Fleet Vehicle 2011 vs 2005 Emissions Comparison, tpy.....	247
Table 8.9: Terminal Fleet Vehicle 2011 vs 2005 Count Comparison .....	247
Table 9.1: Port of Everett 2011 vs 2005 TEU and Cargo Throughput Comparison.....	252

**LIST OF TABLES (cont'd)**

Table 9.2: Port of Everett 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Comparison.....	252
Table 9.3: Port of Everett 2011 vs 2005 Port Emissions Comparison, tpy.....	254
Table 9.4: Port of Everett 2011 vs 2005 OGV Port Emissions Comparison, tpy.....	255
Table 9.5: Port of Everett 2011 vs 2005 OGV Activity Comparison.....	255
Table 9.6: Port of Everett 2011 vs 2005 Port Recreational Vessels Emissions Comparison, tpy.....	256
Table 9.7: Port of Everett 2011 vs 2005 Port CHE Emissions Comparison, tpy.....	256
Table 9.8: Port of Everett 2011 vs 2005 CHE Activity and Equipment Count Comparison.....	256
Table 9.9: Port of Everett 2011 vs 2005 Port Locomotive Emissions Comparison, tpy.....	257
Table 9.10: Port of Everett 2011 vs 2005 Port HDV Emissions Comparison, tpy.....	257
Table 9.11: Port of Everett 2011 vs 2005 Port Terminal Fleet Vehicles Emissions Comparison, tpy.....	258
Table 9.12: Port of Olympia 2011 vs 2005 TEU and Tonnage Comparison.....	258
Table 9.13: Port of Olympia 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Comparison.....	259
Table 9.14: Port of Olympia 2011 vs 2005 Port Emissions Comparison, tpy.....	260
Table 9.15: Port of Olympia 2011 vs 2005 Port OGV Emissions Comparison, tpy.....	261
Table 9.16: Port of Olympia 2011 vs 2005 OGV Activity Comparison.....	261
Table 9.17: Port of Olympia 2011 vs 2005 Port Recreational Vessel Emissions Comparison, tpy.....	262
Table 9.18: Port of Olympia 2011 vs 2005 Port CHE Emissions Comparison, tpy.....	262
Table 9.19: Port of Olympia 2011 vs 2005 CHE Activity and Equipment Count Comparison.....	262
Table 9.20: Port of Olympia 2011 vs 2005 Port Locomotive Emissions Comparison, tpy.....	263
Table 9.21: Port of Olympia 2011 vs 2005 Port HDV Emissions Comparison, tpy.....	263
Table 9.22: Port of Seattle 2011 vs 2005 TEU and Cargo Throughput Comparison.....	264
Table 9.23: Port of Seattle 2011 vs 2005 Port Tons of Emissions per 10,000 TEU Comparison.....	264
Table 9.24: Port of Seattle 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Comparison.....	265
Table 9.25: Port of Seattle 2011 vs 2005 Port Emissions Comparison, tpy.....	267
Table 9.26: Port of Seattle 2011 vs 2005 OGV Port Emissions Comparison, tpy.....	268
Table 9.27: Port of Seattle 2011 vs 2005 OGV Activity Comparison.....	268
Table 9.28: Port of Seattle 2011 vs 2005 Port Commercial Harbor and Government Vessel Emissions Comparison, tpy.....	269
Table 9.29: Port of Seattle 2011 vs 2005 Port Recreational Vessel Emissions Comparison, tpy.....	269
Table 9.30: Port of Seattle 2011 vs 2005 Port CHE Emissions Comparison, tpy.....	270
Table 9.31: Port of Seattle 2011 vs 2005 CHE Activity and Equipment Count Comparison.....	270
Table 9.32: Port of Seattle 2011 vs 2005 Port Locomotive Emissions Comparison, tpy.....	271
Table 9.33: Port of Seattle 2011 vs 2005 Port HDV Emissions Comparison, tpy.....	271
Table 9.34: Port of Seattle 2011 vs 2005 Port Fleet Vehicle Emissions Comparison, tpy.....	272

**LIST OF TABLES (cont'd)**

Table 9.35: Port of Seattle 2011 vs 2005 Airshed Tons of Emissions per 10,000 TEU Comparison.....	272
Table 9.36: Port of Seattle 2011 vs 2005 Airshed Tons of Emissions per 10,000 Tonnes of Cargo Comparison.....	274
Table 9.37: Port of Seattle 2011 vs 2005 Airshed Emissions Comparison, tpy .....	275
Table 9.38: Port of Tacoma 2011 vs 2005 TEU and Cargo Throughput Comparison.....	276
Table 9.39: Port of Tacoma 2011 vs 2005 Port Tons of Emissions per 10,000 TEU Comparison.....	276
Table 9.40: Port of Tacoma 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Comparison.....	277
Table 9.41: Port of Tacoma 2011 vs 2005 Port Emissions Comparison, tpy.....	279
Table 9.42: Port of Tacoma 2011 vs 2005 Port OGV Emissions Comparison, tpy.....	280
Table 9.43: Port of Tacoma 2011 vs 2005 OGV Activity Comparison .....	280
Table 9.44: Port of Tacoma 2011 vs 2005 Port Commercial Harbor Vessel Emissions Comparison, tpy.....	281
Table 9.45: Port of Tacoma 2011 vs 2005 Port CHE Emissions Comparison, tpy .....	281
Table 9.46: Port of Tacoma 2011 vs 2005 CHE Activity and Equipment Count Comparison .....	282
Table 9.47: Port of Tacoma 2011 vs 2005 Port Locomotive Emissions Comparison, tpy ..	282
Table 9.48: Port of Tacoma 2011 vs 2005 Port HDV Emissions Comparison, tpy.....	283
Table 9.49: Port of Tacoma 2011 vs 2005 Port Terminal Fleet Vehicles Emissions Comparison, tpy.....	284
Table 9.50: Port of Tacoma 2011 vs 2005 Airshed Emissions, tons emissions per 10,000 TEU .....	284
Table 9.51: Port of Tacoma 2011 vs 2005 Airshed Tons of Emissions per 10,000 Tonnes of Cargo Comparison.....	285
Table 9.52: Port of Tacoma 2011 vs 2005 Airshed Emissions Comparison, tpy.....	287
Table 10.1: Port of Seattle 2011 Emission Reductions, tpy.....	289
Table 10.2: Port of Seattle 2011 OGV Emission Reductions, tpy .....	289
Table 10.3: Port of Seattle 2011 Commercial Harbor Vessel Emission Reductions, tpy.....	290
Table 10.4: Port of Seattle 2011 CHE Emission Reductions, tpy .....	290
Table 10.5: Port of Seattle 2011 Locomotive Emission Reductions, tpy .....	291
Table 10.6: Port of Seattle 2011 HDV Emissions Reductions, tpy.....	291
Table 10.7: Port of Tacoma 2011 Port Emission Reductions, tpy.....	292
Table 10.8: Port of Tacoma 2011 OGV Emission Reductions, tpy.....	292
Table 10.9: Port of Tacoma 2011 Commercial Harbor Vessel Emission Reductions, tpy..	293
Table 10.10: Port of Tacoma 2011 CHE Emission Reductions, tpy .....	293
Table 10.11: Port of Tacoma 2011 Locomotives Emissions Reductions, tpy .....	294
Table 10.12: Port of Tacoma 2011 HDV Emissions Reductions, tpy.....	295

## ACKNOWLEDGEMENTS

The Puget Sound Maritime Air Emissions Inventory was the result of a group effort made up of Funding Committee Partners, participating Ports' staff and regional environmental agencies.

### *Project Leadership and Management*

Ron Stuart, Port of Tacoma  
Cindy Lin, Port of Tacoma

### *Funding Organizations*

American Lung Association of Washington and Idaho - \$1,000  
BNSF Railway Company - \$5,000  
Environmental Protection Agency - \$8,572  
Northwest Clean Air Agency - \$10,000  
North West & Canada Cruise Ship Association - \$5,000  
Pacific Merchant Shipping Association - \$5,000  
Port of Anacortes - \$4,000  
Port of Everett - \$10,000  
Port of Olympia - \$10,000  
Port of Seattle - \$75,000  
Port of Tacoma - \$75,000  
Puget Sound Clean Air Agency - \$25,000  
Washington State Department of Ecology - \$35,000  
Washington State Department of Transportation Ferries - \$10,000  
Western States Petroleum Association - \$10,000

### *Puget Sound Maritime Air Forum Members*

Guiselle Aldrete, Starcrest Consulting Group  
Bruce Anderson, Starcrest Consulting Group  
Gina Bonifacino, EPA  
Dan Brown, EPA  
Mark Buford, Northwest Clean Air Agency  
Carole Cenci, Puget Sound Clean Air Agency  
Christos Christoforou, Northwest Clean Air Agency  
Wayne Elson, EPA  
Janice Gedlund, Port of Seattle  
Frank Holmes, Western States Petroleum Association  
Sheila Helgath, Washington State Ferries  
Leslie Hughes, North Pacific Fishing Vessel Owner's Association  
Stephanie Jones-Stebbins, Port of Seattle  
Jason Jordan, Port of Tacoma  
Renee Klein, American Lung Association  
Cindy Lin, Port of Tacoma  
Rose Muller, Starcrest Consulting Group

**ACKNOWLEDGEMENTS (CONT'D)**

Mike Moore, Pacific Merchant Shipping Association  
Carrie Nyssen, American Lung Association  
Stacey Patterson – Farallon Consulting  
Joseph Ray, Starcrest Consulting Group  
Jordan Royer, Pacific Merchant Shipping Association  
Alex Smith, Port of Olympia  
Donna Spalding, North West & Canada Cruise Ship Association  
Michael Stanfill, BNSF  
Tina Stotz, Holland America  
Ron Stuart, Port of Tacoma  
Connie Thoman, Port of Anacortes  
Svea Truax, RSEC Environmental and Engineering  
Jon Turvey, Holland America  
Frank Van Haren, Washington Department of Ecology  
Ellen Watson, Port of Seattle  
Brandon Whitaker, Port of Everett  
Jennifer Wiener, BNSF  
Jim Wilson, ORCAA

---

Project Managers:	Ron Stuart, Port of Tacoma Bruce Anderson, Principal, Starcrest
Authors:	Archana Agrawal, Principal, Starcrest Guiselle Aldrete, Consultant for Starcrest Bruce Anderson, Principal, Starcrest Joseph Ray, Principal, Starcrest Rose Muller, Consultant for Starcrest
Contributors:	Steve Ettinger, Principal, Starcrest Paul Johansen, Consultant for Starcrest Jill Morgan, Consultant for Starcrest Sam Wells, Consultant for Starcrest Paula Worley, Consultant for Starcrest
Cover:	Kimberly Cline, Port of Tacoma
Document Preparation:	Denise Anderson, Consultant for Starcrest

**ACRONYMS AND ABBREVIATIONS**

ATB	articulated tug-barge
BNSF	BNSF Railway Company
bhp	brake horsepower
BSFC	brake-specific fuel consumption
CARB	California Air Resource Board
CAS	Northwest Ports Clean Air Strategy
CFR	Code Federal Regulations
CH <sub>4</sub>	methane
CHE	cargo handling equipment
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalents
DOC	diesel oxidation catalyst
DPF	diesel particulate filter
DPM	diesel particulate matter
DWT	deadweight in tonnes
ECA	emission control area
EF	emission factor
EMD	Electro-Motive Diesel, Inc.
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
FCF	fuel correction factor
Forum	Puget Sound Maritime Air Forum
g	gram
gensets	electrical generator sets
GVWR	gross vehicle weight rating
HAL	Holland America Line
HC	hydrocarbon
HDDV	heavy-duty diesel fueled vehicle
HDGV	heavy-duty gasoline vehicle
HDV	heavy-duty vehicles
hp	horsepower
hr	hour
IFO	intermediate fuel oil
IMO	International Maritime Organization
ITB	integrated tug-barge
kg	kilogram
K-Line	Kawasaki Kisen Kaisha
kW	kilowatts
kW-hr	kilowatt-hour
lbs	pounds
LDGT	light-duty gasoline truck
LDGV	light-duty gasoline vehicle
LDV	light-duty vehicles
LF	load factor

ACRONYMS AND ABBREVIATIONS (CONT'D)

LLA	low load adjustment
LPG	liquefied petroleum gas
LPG	liquefied petroleum gas
MarEx	Marine Exchange of Puget Sound
MARPOL	International Convention for the Prevention of Pollution from Ships
MCR	maximum continuous rated (power)
MOBILE	EPA on-road vehicle emission modeling software
mph	miles per hour
N <sub>2</sub> O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NO <sub>x</sub>	oxides of nitrogen
NONROAD	EPA non-road equipment emission modeling software
NWCCA	North West & Canada Cruise Ship Association
NWCAA	Northwest Clean Air Agency
OGVs	ocean-going vessels
ORCAA	Olympic Region Clean Air Agency
PM	particulate matter
PM <sub>10</sub>	particulate matter, diameter of ten microns or less
PM <sub>2.5</sub>	particulate matter, diameter of 2.5 microns or less; fine particulate
POLA	Port of Los Angeles
POLB	Port of Long Beach
ppb	parts per billion
ppm	parts per million
PSCAA	Puget Sound Clean Air Agency
PSEI	Puget Sound Emissions Inventory
PSRC	Puget Sound Regional Council
RFID	radio-frequency identification
RIA	regulatory impact analysis
RO	residual oil
RoRo	roll-on/roll-off
rpm	revolutions per minute
RSD	Regulatory Support Document
RTG	rubber tired gantry (crane)
SIG	Seattle International Gateway
SO <sub>2</sub>	sulfur dioxide
SO <sub>x</sub>	sulfur oxides
TEU	twenty-foot equivalent units
tonnes	1,000 kg also known as a metric ton
TOTE	Totem Ocean Trailer Express
tpy	tons per year
TII	Total Terminals, Inc
U.S.	United States
USCG	United States Coast Guard
ULSD	ultra low sulfur diesel (fuel)
UP	Union Pacific (Railroad)



**ACRONYMS AND ABBREVIATIONS (CONT'D)**

VBP	Vessel Boarding Program
VLCC	very large crude carriers
VMT	vehicle miles traveled
VOCs	volatile organic compounds
VTS	Vessel Traffic Service
vs	versus
WDOE	Washington State Department of Ecology
WSF	Washington State Ferries
WSPA	Western States Petroleum Association
WUT	Washington United Terminals



## **OVERVIEW**

### **What is the 2011 inventory?**

The 2011 Puget Sound Maritime Air Emissions Inventory updates the 2005 baseline inventory which identified and quantified pollutants emitted from maritime-related diesel equipment and alternatively fueled equipment operating within the greater Puget Sound region airshed. The inventory update quantifies maritime-related emissions for the calendar year 2011, and compares the data against the 2005 baseline inventory.

### **Why was the inventory developed?**

The purpose of this emission inventory is to provide scientific data and evaluation of emissions from maritime-related activities in the region in 2011 and compare those emissions to 2005. This study will improve understanding of the nature, location, and magnitude of emissions from maritime-related operations, aid in the planning and prioritization of pollution prevention investments in the region, and evaluate the success of existing emission reduction programs.

### **Who developed the emissions inventory?**

The inventory was funded by the Puget Sound Maritime Air Forum (Forum), a voluntary association of private and public maritime organizations, ports, air agencies, environmental, public health advocacy groups, and other parties with operational or regulatory responsibilities related to the maritime industry. The Forum is committed to accurately quantifying and voluntarily reducing air emissions associated with the maritime transportation of freight, vehicles and passengers. The Forum selected Starcrest Consulting Group, LLC (Starcrest) to be the technical lead for the inventory in collaboration with the Forum. Several Forum members collected and provided data for the inventory update.

### **What does the inventory measure?**

Similar to the 2005 inventory, this emissions inventory quantifies annual marine diesel emissions, expressed in tons per year, from maritime-related activities associated with U.S. operations in a defined portion of the greater Georgia Basin/Puget Sound International Airshed (see Figure O.1 on the next page). The emissions inventory domain is bounded in the north by the black dotted line and to the south by the solid red line. This area spans approximately 140 miles south to north and 160 miles west to east, at its extremities. The geographical domain used in the 2011 inventory is the same as the domain used in the 2005 inventory and is referred to as the greater Puget Sound airshed in this report.

Pollutants measured in the inventories include relevant U.S. Environmental Protection Agency (EPA) criteria pollutants and precursors, including carbon monoxide, nitrogen oxides, sulfur dioxides, volatile organic compounds and fine particulate matter, as well as greenhouse gases, and diesel particulate matter. The 2011 inventory update is an activity-based inventory following a similar methodology as the 2005 baseline inventory.

Data was gathered for the following six major source categories associated with marine sectors:

- Ocean-going vessels (OGV): cargo and cruise ships, tankers;
- Harbor vessels: commercial harbor vessels, government (non-military) vessels, and recreational vessels;
- Cargo handling equipment: cranes, straddle carriers, yard trucks, forklifts;
- Off-terminal and on-road heavy-duty trucks;
- Fleet vehicles which consist primarily of light-duty vehicles and some on-terminal heavy-duty vehicles not associated with direct cargo movement; and
- Locomotive operations.

Military operations and equipment of the U.S. Department of Defense have not been included due to national security considerations.

**Figure O.1: Georgia Basin/Puget Sound International Airshed**



### **Why does the inventory focus on diesel engines?**

Marine diesel engines, like all diesel engines, are significant generators of fine particles and toxic emissions. Exposure to these pollutants can contribute to increased rates of lung cancer, chronic respiratory and cardiovascular disease, and other health effects. Diesel emissions also contribute to acid deposition, climate change and impaired visibility. Given the implications for public health and the environment, reducing and minimizing these emissions is a top priority for the Forum. This inventory will help identify where pollution prevention efforts could provide the best public health and environmental benefits.

While the EPA has not listed diesel exhaust emissions as a hazardous air pollutant, it is important to note that effective federal regulations require dramatically cleaner fuels and lower-emitting diesel engines. In the meantime, members are proactively working together to achieve early emissions reductions from maritime-related operations to protect public health and the environment.

### **Technical Approach**

The technical approach used for the 2011 inventory is consistent with the 2005 baseline report with updates to source category activities and emissions modeling methods or parameters (where applicable). The inventory is activity-based using 2011 annual activity data collected from ports, individuals, agencies and companies (or their representatives) that own, operate, maintain and/or charter equipment and vessels. When there are emissions modeling methods or parameter updates that differ from the 2005 inventory and affect the comparison of 2011 results with 2005 results, the 2005 emissions have been updated using the same modeling parameters to allow a direct comparison between the baseline year and 2011. This approach avoids misrepresentation of emissions changes due to modeling methods or parameter updates and is used in other marine-related inventories to compare among years and monitor emission reduction progress.

### **What's being done now to reduce maritime air pollution?**

In addition to participating in the emissions inventory project, the Forum partners are also working within their own organizations on local initiatives and nationally and internationally on efforts to reduce emissions. The Forum partners and their customers are switching to cleaner fuels, using shore power instead of ship engines when cruise and cargo ships are in port, replacing old engines with cleaner engines, retrofitting older engines with advanced pollution control devices, rebuilding engines to lower emission standards, and implementing systems to use equipment more efficiently.

The Northwest Ports Clean Air Strategy (CAS) was developed collaboratively in 2007 by the Port of Tacoma, the Port of Seattle and Port Metro Vancouver, British Columbia, along with the Puget Sound Clean Air Agency (PSCAA), EPA, the Washington State Department of Ecology (WDOE) and Environment Canada. The CAS defines emission reduction initiatives, potential actions and sets air emission reduction goals.

Through the implementation of the CAS over the last four years, the ports have achieved significant progress in reducing emissions in several areas: at berth emissions for ocean going vessels through the use of low-sulfur fuels and shore power; reduced cargo handling equipment emissions, reduced on-terminal truck emissions through engine retrofits and scrap-and-replace incentive programs, and reduced locomotive emissions through application of idle-reduction technologies.

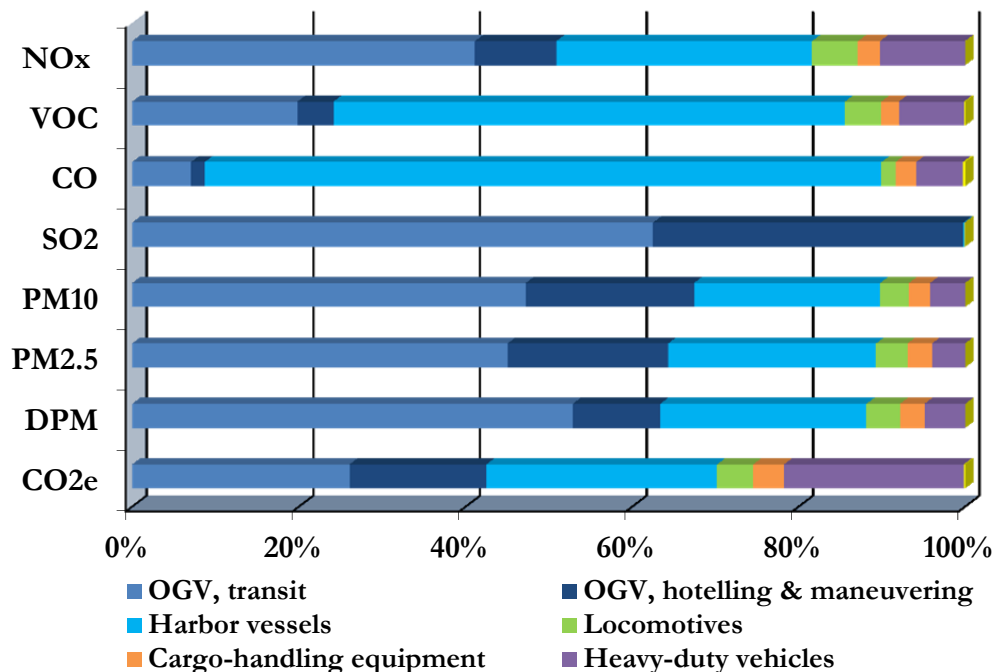
**What are the findings?**

Total emissions from the inventoried maritime-related sources in the greater Puget Sound region airshed are summarized in Table O.1. Contributions by source category are summarized in Figure O.2. Harbor vessels emissions include commercial harbor vessels, government (non-military), and recreational vessels.

**Table O.1: 2011 Total Airshed Emissions, tpy**

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
OGV, transit	9,424	363	840	7,333	616	493	593	452,613
OGV, hotelling & maneuvering	2,234	79	196	4,376	264	211	118	285,028
Harbor vessels	7,050	1,124	9,672	5	292	272	278	481,123
Locomotives	1,264	80	200	11	45	41	45	75,289
Cargo handling equipment	594	37	297	1	33	32	33	64,275
Heavy-duty vehicles	2,340	143	666	3	55	44	55	375,071
Fleet vehicles	6	3	34	0	0	0	0	2,828
<b>Total</b>	<b>22,912</b>	<b>1,830</b>	<b>11,905</b>	<b>11,729</b>	<b>1,304</b>	<b>1,092</b>	<b>1,122</b>	<b>1,736,226</b>

**Figure O.2: 2011 Total Airshed Emissions**



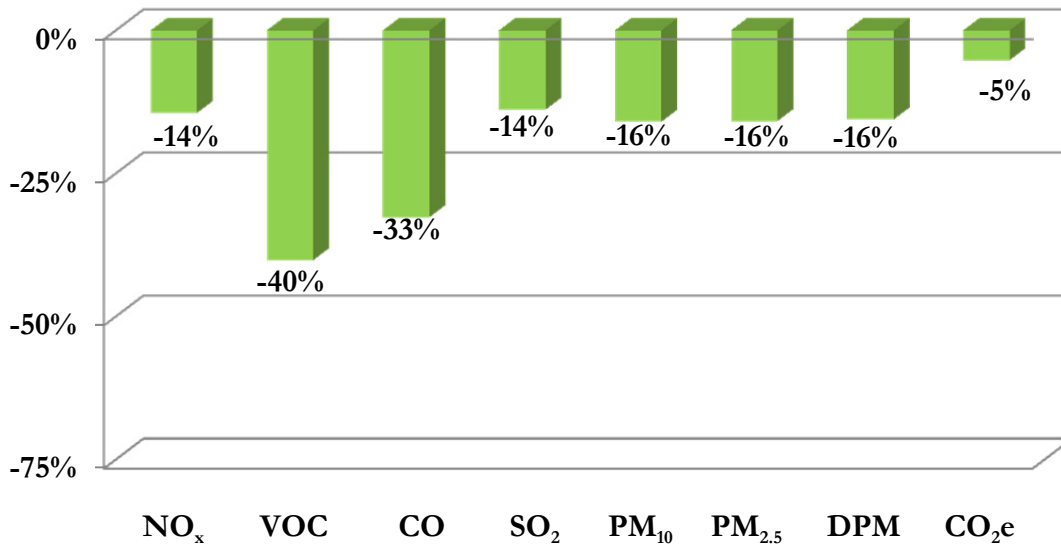
Please read the full report for details regarding emissions from each source category.

Table O.2 and Figure O.3 compare the 2011 airshed total maritime-related air emissions to the 2005 emissions. In 2011, emissions decreases ranged from 5% to 40% as compared to 2005, depending on pollutant. These reductions are primarily from activity level changes, switching to ultra low sulfur diesel, and the various efforts associated with the implementation of the CAS, as detailed in Section 10 of the report.

**Table O.2: 2011 vs 2005 Total Airshed Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	22,912	1,830	11,905	11,729	1,304	1,092	1,122	1,736,226
2005	26,790	3,060	17,686	13,621	1,552	1,298	1,329	1,831,684
<b>Change, tpy</b>	<b>-3,877</b>	<b>-1,230</b>	<b>-5,781</b>	<b>-1,892</b>	<b>-248</b>	<b>-206</b>	<b>-208</b>	<b>-95,457</b>
<b>Change, %</b>	<b>-14%</b>	<b>-40%</b>	<b>-33%</b>	<b>-14%</b>	<b>-16%</b>	<b>-16%</b>	<b>-16%</b>	<b>-5%</b>

**Figure O.3: 2011 vs 2005 Total Airshed Emissions Change**



*Note: 2005 emissions were recalculated using the same methods used for the 2011 emission estimates. The above figure accounts for these changes so that a direct comparison can be made between 2011 vs 2005.*

### **What's next?**

This inventory provides the most complete picture to date of maritime-related emissions in the greater Puget Sound region airshed. Review and assessment of this data will enable the maritime community to better plan, design, implement and evaluate the effectiveness of fact-based air pollution control strategies to help maintain air quality, minimize health risks, and protect the environment.

In 2008 the International Maritime Organization (IMO) amended international rules to lower worldwide fuel sulfur content for ocean-going vessels from 4.5% to 3.5% beginning in 2012. Fuel sulfur limits will lower again to 0.5% as early as 2020, but no later than 2025 (subject to a fuel availability study to be conducted in 2018). New NO<sub>x</sub> engine emission standards require vessels constructed after 2011 to meet Tier 2 levels (14.4 gram NO<sub>x</sub>/kilowatt-hour [kW-hr]); a reduction of 20% from current levels. Vessels constructed after 2016 are required to meet Tier 3 levels (3.4 gram NO<sub>x</sub>/kW-hr); a reduction of 80% below current Tier 1 standards.

On 26 March 2010, the IMO officially designated waters off North American coasts (except for Mexico) as an Emission Control Area (ECA) in which stringent international fuel content limitations and engine emission standards will apply to ships. The North American ECA went into effect on August 1, 2012. The second phase of the ECA will reduce sulfur content of fuels an additional 90% from the August 2012 levels. These standards will dramatically reduce ship sulfur and particulate related emissions and deliver substantial air quality and public health benefits that extend hundreds of miles inland.

Since the implementation of the CAS in 2008, the ports, stakeholders and partners have achieved considerable progress toward emission reduction measures. The ports will continue to encourage the spirit of collaboration and cooperation among their partners to promote proactive engagement of stakeholders and implement innovative approaches for reducing emissions. The ports also recognize the need to review and adjust the CAS on a regular basis in light of new standards, technology advancement, air emissions data, and evolving climate change policy frameworks. A five-year review and update of the CAS is currently underway to incorporate these external changes and to integrate lessons learned.



## **EXECUTIVE SUMMARY**

The 2011 Puget Sound Maritime Air Emissions Inventory was developed by members of the Puget Sound Maritime Air Forum (Forum) to provide an update to the 2005 baseline and to assess the changes in maritime-related air emissions in the greater Puget Sound region since the baseline year. With the exception of a portion of Pierce County, which has been designated as nonattainment for the 24-hr fine particulate standard, PM<sub>2.5</sub>, the region is currently in attainment with federal, state and local ambient air quality standards.

On April 30, 2012, U.S. Environmental Protection Agency (EPA) finalized a rule that redirects the implementation of the 2008 National Ambient Air Quality Standards (NAAQS) for ozone including 0.075 parts per billion (ppb) 8-hour ozone standards requirement in 2032<sup>1</sup>. The more stringent ozone standard may result in the region being designated as nonattainment for ozone.

Effective focus of air pollution prevention resources on maritime-related emissions requires a good understanding of the nature, location, and magnitude of emissions, which include ocean-going vessels (OGV), harbor vessels, heavy-duty and light-duty vehicles, locomotives, and cargo handling equipment. This report is not a policy document and does not include policy recommendations. The purpose of this 2011 emissions inventory update is to provide scientifically valid data to determine changes since the 2005 baseline and aid in the planning and prioritization of pollution prevention investments in the region.

Project partners are motivated by a commitment to protect the environment and public health in the Puget Sound region and elsewhere. Public and private organizations with maritime operations could have prepared separate inventories of their own operations and effectively reduced their emissions, but success in protecting ambient air quality standards and reducing the public health risks from exposure to diesel emissions relies on the larger maritime community working together to address the issue from an industry-wide perspective. One example is the Northwest Ports Clean Air Strategy (CAS) which was developed in 2007 and adopted in 2008 by the Port of Tacoma, Port of Seattle and Port Metro Vancouver, British Columbia to reduce maritime-related air emissions in the region. The Forum partners also are working within their own organizations on local initiatives, with other West Coast entities on national efforts and with the Pacific Ports Clean Air Collaborative to reduce emissions.

---

<sup>1</sup>EPA, <http://www.epa.gov/glo/actions.html>.

The 2011 Puget Sound Maritime Air Emissions Inventory includes quantified emissions from most U.S. maritime-related sources within a portion of the Georgia Basin/Puget Sound International Airshed (see Figure ES.1) for the year 2011. It includes sources such as cargo and cruise ships, fishing boats, tugboats, tankers, recreational vessels, ferries, cargo handling equipment, locomotives, buses, trucks and light-duty vehicles. Military operations and U.S. Department of Defense equipment were not included due to national security considerations. Pollutants in the inventory include relevant EPA criteria pollutants and precursors (carbon monoxide [CO], nitrogen oxides [NO<sub>x</sub>], sulfur oxides [SO<sub>2</sub>], volatile organic compounds [VOC], particulate matter [PM]); greenhouse gases (carbon dioxide [CO<sub>2</sub>], methane [CH<sub>4</sub>], nitrous oxide [N<sub>2</sub>O], and carbon dioxide equivalents [CO<sub>2</sub>e]); and diesel particulate matter [DPM].

This activity-based emissions inventory provides detailed information on the major source categories associated with the marine activities, which are ocean-going vessels, harbor vessels, cargo handling equipment, on-road heavy-duty and light-duty vehicles, and rail operations.

Emissions inventories that are updated over time are very useful tools to quantify mass emissions and track emission changes from the various sources of emissions in a geographic area and to help prioritize those sources for potential emission reductions. Furthermore, the regional emissions inventory, including the maritime-related portion, is a critical component of an overall air quality assessment and mitigation strategy development process employed by air regulatory agencies to ensure the area complies with local, state and national air quality standards.

Diesel fueled engines and boilers, like many other mobile, stationary, and area sources, are significant generators of criteria pollutants, their precursors and toxic emissions. Excessive exposure to these pollutants can contribute to increased rates of lung cancer, chronic respiratory disease, impaired lung development in children, cardiovascular disease, and other health effects. Given the implications for public health, the reduction and minimization of these emissions are a top priority for the Forum as well as the American Lung Association, the Puget Sound Clean Air Agency (PSCAA), the Olympic Region Clean Air Agency (ORCAA), the Northwest Clean Air Agency (NWCAA), the Washington Department of Ecology (WDOE), EPA, and others. This emission inventory will support that effort by increasing the understanding of the emission contributions from the maritime-related sources, one component of the state's air quality concerns. Because the health impacts of toxic emissions can be proximity dependent, this inventory will contribute to a better understanding of where emission reductions could provide the best public health benefit. While the EPA has not yet officially designated diesel emissions as a hazardous air pollutant, and there are no established regulatory standards for diesel particulate emissions beyond inclusion in the PM<sub>10</sub> and PM<sub>2.5</sub> ambient air standards, it is important to note that federal regulations are in place to require dramatically cleaner fuels and new diesel engines in the future. In addition, in its Health Assessment Document for Diesel Engine Exhaust [EPA/600/8-90/057F May 2002, page ii, pdf p.3] EPA concludes that "long-term (i.e., chronic) inhalation exposure is likely to pose a lung cancer hazard to humans, as well as damage the lung in other ways depending on exposure."

The Forum participants are committed to proactively working with regulatory agencies and others to achieve early emissions reductions from maritime-related operations to protect public health and the environment.

### **ES.1.1 Maritime-Related Source Categories**

Maritime-related air emission source categories included in this inventory are:

- Ocean-going vessels
- Harbor vessels
- Cargo handling equipment
- Locomotives
- Heavy-duty vehicles
- Fleet vehicles

Ocean-going vessels include containerships, ocean-going tug boats, refrigerated vessels (reefers), roll-on roll-off (RoRo) ships, passenger cruise vessels, auto carriers, general cargo ships, dry bulk ships, bulk liquid tankers and miscellaneous vessels. There were a total of 2,582 inbound ocean-going vessel calls to the Puget Sound region in 2011. Military vessels were not included due to security considerations.

Harbor vessels include commercial, recreational, and government vessels that spend the majority of their operational time within or near ports, harbors, and coastal areas. Vessel parameters and/or activity data was updated for 263 vessels out of 709 total harbor vessels including commercial fishing vessels, ocean tugs, harbor tugs, towboats, excursion vessels, government (non-military) vessels, ferries, tank barges, work boats, and assist and escort tugs. Vessels that were not updated were assumed to operate at their 2005 activity levels.

Non-road cargo handling equipment includes equipment used to move cargo (containers, general cargo, and bulk cargo) to and from marine vessels, railcars and on-road trucks. This category includes cranes, straddle carriers, yard tractors, top and side handlers, forklifts and other related equipment not designed for use on public roads. A total of 1,196 pieces of cargo handling equipment was inventoried at Puget Sound terminals.

The locomotive category includes switching or yard locomotives serving marine cargo terminals, and line-haul or Class 1 locomotives carrying cargo to or from marine terminals to out-of-area destinations. Marine cargo transported by rail may be loaded at on-dock or near-dock rail yards. Emissions from line-haul and related switch locomotives serving maritime-related facilities were included in the inventory.

On-road heavy-duty vehicles include the heavy-duty trucks that are used to move cargo to and from terminals, local and national destinations and between terminals and off-port railcar loading facilities. This category also includes the buses that are used to transport passengers to and from cruise ship terminals and the airport or other locations in the region.

Fleet vehicles consist primarily of light-duty vehicles and some on-terminal heavy-duty vehicle not associated with direct cargo movement. There are three categories of fleet vehicles: terminal fleet vehicles, cruise terminal vehicles, and import/export vehicles. There were approximately 805 terminal fleet vehicles were used on cargo terminals in 2011.

## ES.1.2 Puget Sound Maritime Air Emissions Inventory Findings

### ES.1.2.1 Emissions Inventory Domain

The red solid line in Figure ES.1 illustrates the entire Georgia Basin/Puget Sound International Airshed. The southern portion of which, below the dashed black line and within the solid red line as shown in Figure ES.1, represents the geographical domain of this emissions inventory. This domain includes the U.S. portions Georgia Basin/Puget Sound International Airshed as well as the entire Straits of Juan de Fuca and the waters east of Vancouver Island (stopping at the U.S./Canada Border to the north). Specifically, the Georgia Basin portion of the emissions inventory includes Whatcom and San Juan Counties and the southern coastline of the Strait of Juan de Fuca, while the Puget Sound portion encompasses the counties to the south of Whatcom County in Washington State. The specific emissions inventory over-water domain is detailed in Section 3.2.

Figure ES.1: Georgia Basin/Puget Sound International Airshed



In 2005, the geographical domain of the emissions inventory was considered one emissions zone, the airshed. In 2011, in an effort to gain a deeper understanding of port-related emissions, the Port of Tacoma and Port of Seattle allocated 2011 emissions into three geographical zones, compared to using only one zone in 2005. For comparison purposes, the allocations were also retroactively applied to the 2005 emissions results. The three geographical zones are:

- Port - emissions within port terminals and adjacent waterways
- Air district – emissions within the PSCAA boundaries (Pierce, King, Kitsap, and Snohomish counties)
- Airshed – emission within the inventory domain

The other participating port's specific port emissions and comparisons remain consistent with the 2005 approach.

#### *ES.1.2.2 2011 Airshed Total Emissions*

Total emissions from U.S. maritime-related sources (expressed in tons per year or tpy) in the inventory domain or airshed, are presented in Table ES.1. Distribution of emissions by emissions source category is presented in Table ES.2 and Figure ES.2. Greenhouse gases are presented as carbon dioxide equivalents (CO<sub>2</sub>e), which include the contributions of carbon dioxide, nitrous oxide, and methane. Details regarding emissions from each source category are provided in relevant sections of this report as noted below. The 2011 airshed total emissions include the following:

- Ocean-going vessel emissions include hotelling (i.e., dockside), maneuvering, and transiting emissions, which are detailed in Section 3. The emissions inventory over-water domain is detailed in Section 3.2.
- Harbor vessel emissions include commercial harbor vessels (i.e., assist tugs, private ferries including Washington State Ferries [WSF], harbor tugs, excursion vessels, workboats, etc.), government vessels (local, state, federal non-military, and port-owned vessels), and recreational vessels, which are detailed separately in Section 4.
- Cargo handling equipment emissions include emissions from all terminal equipment including yard trucks, top picks, side picks, rubber-tired gantry cranes and other heavy-duty and light-duty equipment, which are detailed in Section 5.
- Locomotive emissions include switch and line-haul operations, which are detailed in Section 6.
- Heavy-duty vehicle emissions include on-road drayage and long-haul trucks, which are detailed in Section 7.
- Fleet vehicles consist primarily of light-duty vehicles and some on-terminal heavy-duty vehicles not associated with direct cargo movement. There are three categories of fleet vehicles: terminal fleet vehicles, cruise terminal vehicles, and import/export vehicles, which are detailed in Section 8.

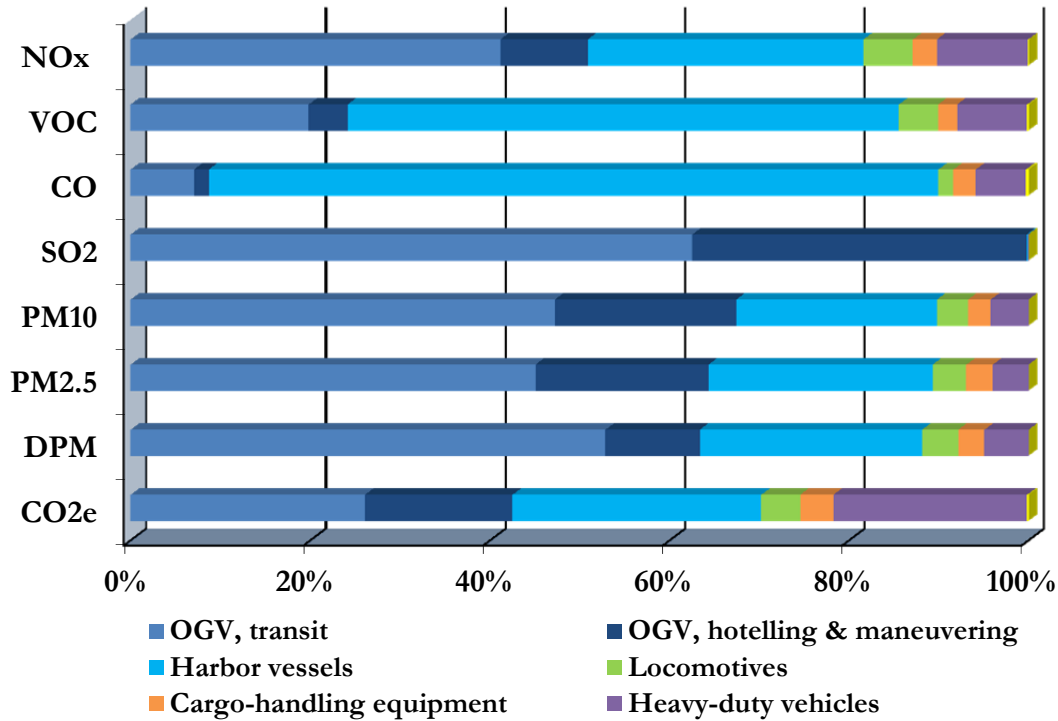
Table ES.1: 2011 Total Airshed Emissions, tpy

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, transit	9,424	363	840	7,333	616	493	593	452,613
OGV, hotelling & maneuvering	2,234	79	196	4,376	264	211	118	285,028
Harbor vessels	7,050	1,124	9,672	5	292	272	278	481,123
Locomotives	1,264	80	200	11	45	41	45	75,289
Cargo handling equipment	594	37	297	1	33	32	33	64,275
Heavy-duty vehicles	2,340	143	666	3	55	44	55	375,071
Fleet vehicles	6	3	34	0	0	0	0	2,828
<b>Total</b>	<b>22,912</b>	<b>1,830</b>	<b>11,905</b>	<b>11,729</b>	<b>1,304</b>	<b>1,092</b>	<b>1,122</b>	<b>1,736,226</b>

Table ES.2: 2011 Total Airshed Emissions Contribution by Source Category

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, transit	41%	20%	7%	62%	47%	45%	53%	26%
OGV, hotelling & maneuvering	10%	4%	2%	37%	20%	19%	11%	16%
Harbor vessels	31%	61%	81%	0%	22%	25%	25%	28%
Locomotives	5%	4%	2%	0%	3%	4%	4%	4%
Cargo handling equipment	<3%	<2%	<2%	0%	<2%	<3%	<3%	<4%
Heavy-duty vehicles	10%	8%	6%	0%	4%	4%	5%	22%
Fleet vehicles	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Figure ES.2: 2011 Total Airshed Emissions Distribution



In table ES.3, the 2011 airshed total emissions from U.S. maritime-related sources in the emissions inventory domain are allocated by regional clean air agency jurisdiction. The NWCAA includes Island, Skagit and Whatcom counties. The ORCAA includes Clallam, Grays Harbor, Jefferson, Mason, Pacific, and Thurston counties. The PSCAA includes Pierce, King, Kitsap, and Snohomish counties.

Table ES.3: 2011 Total Airshed Emissions by Clean Air Agency, tpy

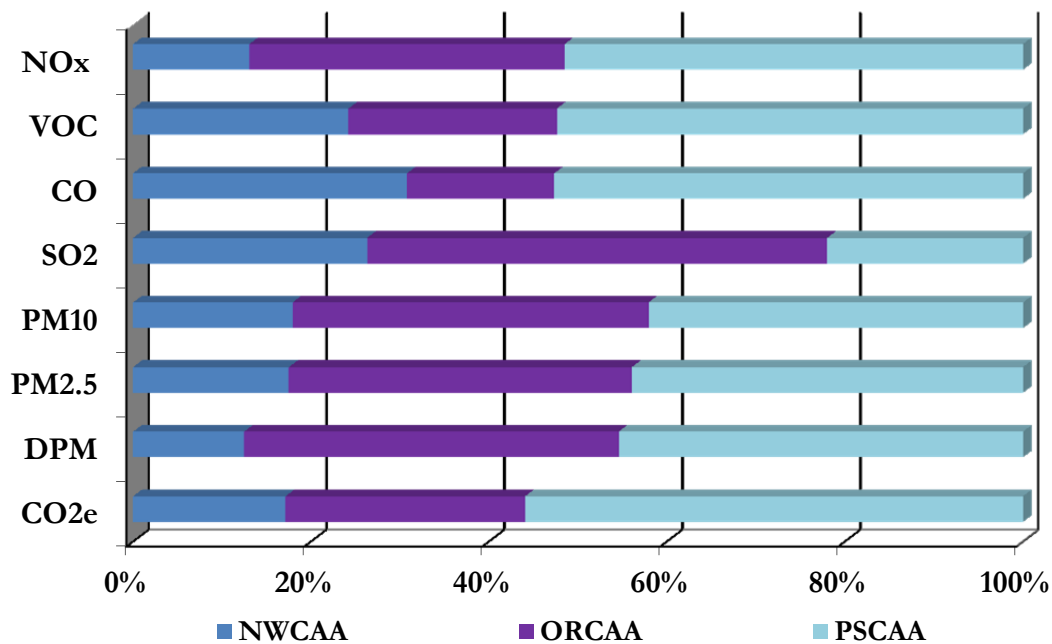
Agency	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
NWCAA	2,988	442	3,663	3,076	233	191	140	296,048
ORCAA	8,074	428	1,970	6,056	521	421	472	465,699
PSCAA	11,851	959	6,271	2,597	550	480	510	974,479
<b>Total</b>	<b>22,912</b>	<b>1,830</b>	<b>11,905</b>	<b>11,729</b>	<b>1,304</b>	<b>1,092</b>	<b>1,122</b>	<b>1,736,226</b>

Table ES.4 and Figure ES.3 presents the 2011 U.S. maritime-related clean air agency distribution of emissions by regional clean air agency boundaries. The PSCAA region comprises half of the U.S. maritime-related emissions due to having the two major ports in the region located within PSCAA as well as having significant portion of the over-water boundary. ORCAA has the next highest percentage of emissions which is due to the long ocean-going vessel transits associated with the Straits of Juan de Fuca.

**Table ES.4: Distribution of 2011 Total Airshed Emissions by Clean Air Agency**

Agency	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
NWCAA	13%	24%	31%	26%	18%	17%	12%	17%
ORCAA	35%	23%	16%	52%	40%	39%	42%	27%
PSCAA	52%	53%	53%	22%	42%	44%	46%	56%

**Figure ES.3: 2011 Total Airshed Emissions by Clean Air Agency**





### ES.1.3 Overview of Comparison, 2011 vs 2005

Table ES.5 compares the 2011 and 2005 ship inbound activity<sup>2</sup>, cargo throughput in twenty-foot-equivalent units (TEU), and total cargo tonnage in metric tons (tonnes) for the Ports of Anacortes, Everett, Olympia, Seattle, and Tacoma. Due to the worldwide economic downturn, the overall activity and throughput was down in 2011 for the Puget Sound ports when compared to 2005. The Port of Seattle and Port of Tacoma had lower vessel call counts and TEU throughput. The exceptions are the Port of Everett and Port of Olympia, which increased their vessel calls and tonnage in 2011 as compared to 2005. Overall, the inbound calls decreased 9%, TEU decreased 15% and tonnage decreased slightly by 1%.

**Table ES.5: 2011 vs 2005 Port Activity Comparison**

Port	2011 Inbound Activities	2005 Inbound Activities	2011 Throughput (TEU)	2005 Throughput (TEU)	2011 Cargo (tonnes)	2005 Cargo (tonnes)
Anacortes	38	29	na	na	na	na
Everett	103	47	20,918	9,561	152,995	103,757
Olympia	26	20	0	903	711,536	129,512
Seattle	1,136	1,197	2,033,535	2,087,929	22,762,678	20,564,860
Tacoma	875	1,093	1,488,795	2,070,000	17,270,252	20,400,000
<b>Total</b>	<b>2,178</b>	<b>2,386</b>	<b>3,543,248</b>	<b>4,168,393</b>	<b>40,897,461</b>	<b>41,198,129</b>
<b>Change, %</b>	<b>-9%</b>		<b>-15%</b>		<b>-1%</b>	

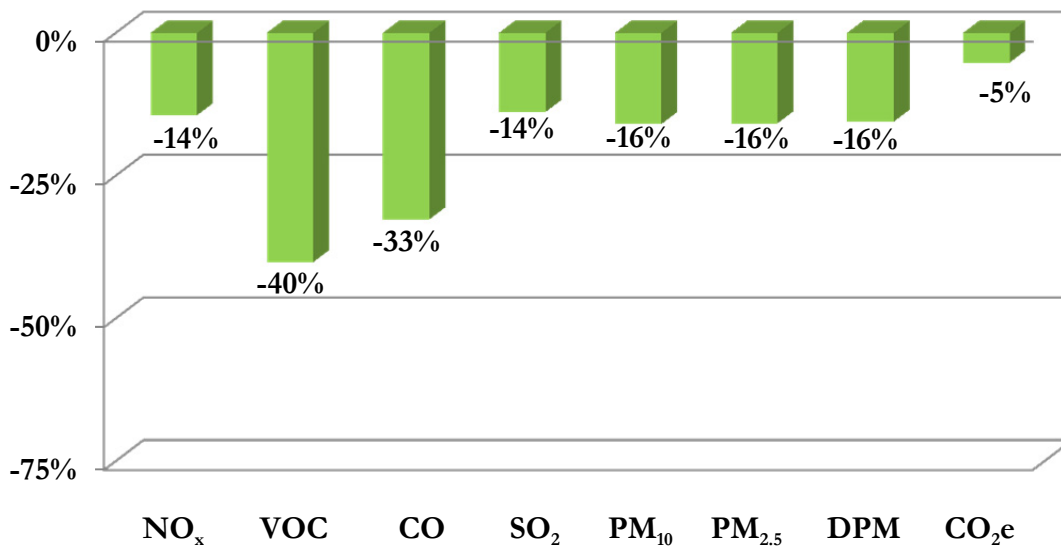
<sup>2</sup>Inbound activity counts are based on MarEx data and only include ocean-going vessel counts arriving directly from sea and shifts from other ports in the inventory domain to the designated port. Barge calls are not included in the ocean-going vessel inbound activity.

Table ES.6 and Figure ES.4 compare the total 2011 maritime-related air emissions to the 2005 emissions. In 2011, the emissions decreased 5% to 40% as compared to 2005, depending on pollutant. These reductions are primarily from activity level changes, switching to ultra low sulfur diesel (ULSD), and the various efforts associated with the implementation of the CAS, as detailed in Section 10.

**Table ES.6: 2011 vs 2005 Total Airshed Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	22,912	1,830	11,905	11,729	1,304	1,092	1,122	1,736,226
2005	26,790	3,060	17,686	13,621	1,552	1,298	1,329	1,831,684
<b>Change, tpy</b>	<b>-3,877</b>	<b>-1,230</b>	<b>-5,781</b>	<b>-1,892</b>	<b>-248</b>	<b>-206</b>	<b>-208</b>	<b>-95,457</b>
<b>Change, %</b>	<b>-14%</b>	<b>-40%</b>	<b>-33%</b>	<b>-14%</b>	<b>-16%</b>	<b>-16%</b>	<b>-16%</b>	<b>-5%</b>

**Figure ES.4: 2011 vs 2005 Total Airshed Emissions Change**



*Note: 2005 emissions were recalculated using the same methods used for the 2011 emission estimates. The above figure accounts for these changes so that a direct comparison can be made between 2011 vs 2005.*

For some of the source categories, the emissions calculation methodology was different in 2011 compared with 2005. In order to compare 2011 emissions to 2005 emissions, for those source categories with methodology changes, the 2005 emissions were updated with the 2011 emissions modeling parameter changes or were otherwise adjusted so the two inventories can be directly compared. Thus, the 2005 emissions included in this report are, in some cases, different from the published emissions in the 2005 Puget Sound Emissions Inventory (PSEI) report. The changes to the 2005 methodology are as follows:

- 2005 cargo handling equipment emissions were recalculated to include the updated 2011 load factors for yard tractors and rubber tired gantry (RTG) cranes. The RTG crane load factor changed from 43% to 21% in 2011; while the yard tractor load factor changed from 59% to 39% in 2011. These load factors have a direct impact on emissions and by applying the lower load factors in 2011 to the 2005 activity, the 2005 CHE emissions included in this 2011 PSEI report for comparison to 2011 emissions are lower than what was presented in the 2005 PSEI.
- 2005 commercial harbor vessels and government vessel emissions were recalculated to include the updated 2011 load factors for harbor tug, ferry, excursion and workboats. Please refer to section 4.9 for a comparison of the various load factors used in 2005 and the 2011 PSEI. The 2011 load factors are lower than the load factors used in 2005, thus the 2005 harbor vessel emissions included in this 2011 PSEI report for comparison to 2011 emissions are lower than what was presented in the 2005 PSEI. Recreational vessel counts and assumptions used in the 2005 inventory were rerun in the EPA non-road equipment emission modeling software, NONROAD2008a model, used for the 2011 inventory to enable direct comparisons.
- 2005 heavy-duty vehicle emissions were recalculated for on-terminal and total port-related emissions due to differences in source of heavy-duty vehicle model year distribution, truck size class and the version of the EPA on-road vehicle emission modeling software, model MOBILE, used for 2005 emissions and 2011 emissions.

Ocean-going vessels, locomotives, and fleet vehicle emission calculation methodology used in 2011 inventory is similar to the methodology used in 2005, except for a minor change in switching locomotive CO<sub>2</sub> emission estimates resulting from a change to the EPA's value for brake-specific fuel consumption. Thus 2005 total emissions for these categories remained the same as the published 2005 PSEI emissions, except for locomotive CO<sub>2</sub> emissions.

It's important to note that changes in activity have direct impacts on emissions when comparing 2011 vs 2005. In each of the source category sections, Sections 2 and 9, all present the changes in activities related to each section along with the emission changes between 2011 and 2005.

Table ES.7 summarizes the total maritime-related emissions for 2011 and 2005 and the 2011 vs 2005 comparison by source category.

**Table ES.7: 2011 vs 2005 Total Airshed Emissions by Source Category, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
Ocean-going vessels	11,658	442	1,036	11,709.00	879.65	703.72	711.12	737,640
Harbor vessels	7,050	1,124	9,672	5.34	291.52	271.64	277.72	481,123
Locomotives	1,264	80	200	10.51	45.15	41.35	45.15	75,289
Cargo handling equipment	594	37	297	0.60	32.60	31.70	32.60	64,275
Heavy-duty vehicles	2,340	143	666	3.40	55.00	43.50	55.00	375,071
Fleet vehicles	6	3	34	0.05	0.09	0.08	0.04	2,828
<b>Total</b>	<b>22,912</b>	<b>1,830</b>	<b>11,905</b>	<b>11,728.90</b>	<b>1,304.01</b>	<b>1,092.00</b>	<b>1,121.63</b>	<b>1,736,226</b>
<b>2005</b>								
Ocean-going vessels	14,551	509	1,200	12,923.71	1,030.66	822.51	841.99	812,391
Harbor vessels	6,228	2,207	14,455	380.17	293.72	270.58	259.54	450,134
Locomotives	2,156	109	269	168.60	59.11	54.39	59.11	98,495
Cargo handling equipment	832	81	814	61.84	54.89	53.25	54.64	79,581
Heavy-duty vehicles	3,012	148	899	86.70	114.00	97.60	114.00	387,846
Fleet vehicles	10	5	50	0.04	0.08	0.08	0.08	3,237
<b>Total</b>	<b>26,790</b>	<b>3,060</b>	<b>17,686</b>	<b>13,621.05</b>	<b>1,552.46</b>	<b>1,298.41</b>	<b>1,329.37</b>	<b>1,831,684</b>
<b>% Change</b>								
Ocean-going vessels	-20%	-13%	-14%	-9%	-15%	-14%	-16%	-9%
Harbor vessels	13%	-49%	-33%	-99%	-1%	0%	7%	7%
Locomotives	-41%	-27%	-25%	-94%	-24%	-24%	-24%	-24%
Cargo handling equipment	-29%	-54%	-64%	-99%	-41%	-40%	-40%	-19%
Heavy-duty vehicles	-22%	-3%	-26%	-96%	-52%	-55%	-52%	-3%
Fleet vehicles	-34%	-48%	-31%	24%	8%	3%	-47%	-13%
<b>Total</b>	<b>-14%</b>	<b>-40%</b>	<b>-33%</b>	<b>-14%</b>	<b>-16%</b>	<b>-16%</b>	<b>-16%</b>	<b>-5%</b>

A summary of the changes listed above and the leading actions that led to the changes are presented below:

- Ocean-going vessel emissions decreased 9% to 20% across all pollutants compared to 2005. The reductions were due to decreased vessel calls, use of shore power, and use of lower sulfur fuel in the auxiliary engines by some vessels/shipping lines while at berth.
- Harbor vessel SO<sub>2</sub>, and PM emissions decreased compared to 2005 due to the use of ULSD. NO<sub>x</sub>, DPM and CO<sub>2</sub> emissions increased due to the increased activity and changes in the fleet characteristics associated with harbor vessels.
- Locomotive emissions decreased compared to 2005 due to lower throughput, improved fuel efficiency, idle reduction, lower sulfur fuel, cleaner locomotive engines, and more fuel-efficient routing of trains within the air basin.
- Cargo handling equipment emissions decreased 19% to 99% across all pollutants compared to 2005. The reductions were due to decreased activity, use of ULSD, emission reduction retrofits such as diesel particulate filters (DPFs) and diesel oxidation catalysts (DOCs), engine repowers, and equipment turnover which includes the purchase of newer equipment.
- Heavy-duty vehicle emissions decreased compared to 2005, except for CO<sub>2e</sub> which remained essentially the same in 2011 as in 2005. The reduction in heavy-duty vehicle emissions is due to fleet turnover, the implementation of the clean truck programs by the Ports of Tacoma and Seattle, and the use of ULSD.
- For fleet vehicles, the varying emission changes compared to 2005 are due to the different fleet mix of gasoline, propane and diesel powered vehicles included in the two inventories.

As an addition to the 2011 Puget Sound Maritime Air Emissions Inventory, estimates have been developed of the emission reductions achieved in 2011 calendar year by the Port of Seattle and the Port of Tacoma through the implementation of Strategy measures. The 2011 emission reductions are discussed in Section 10.

Tables ES.8 and ES.9 summarize the 2011 emission reductions for ocean-going vessels, harbor craft, CHE, switching locomotives, and heavy duty vehicles for the Port of Seattle and Port of Tacoma, respectively.

**Table ES.8: Port of Seattle 2011 Emission Reductions, tpy**

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Ocean-going vessels	38.5	0.8	2.3	371.0	23.5	18.8	19.1	1,778
Harbor craft	4.8	0.0	0.0	56.1	3.3	3.0	3.3	0
Cargo handling equipment	91.8	7.8	15.4	0.0	2.7	2.6	2.7	0
Locomotives	2.6	0.0	0.0	20.0	0.1	0.1	0.1	137
Heavy duty vehicles	135.9	1.3	0.0	0.0	8.2	7.3	8.2	0
<b>Total</b>	<b>273.6</b>	<b>9.4</b>	<b>17.7</b>	<b>447.1</b>	<b>37.7</b>	<b>31.8</b>	<b>33.3</b>	<b>1,915</b>

**Table ES.9: Port of Tacoma 2011 Port Direct Emission Reductions, tpy**

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Ocean-going vessels	21.4	0.5	1.3	132.7	8.5	6.8	6.1	1,159
Harbor craft	4.8	0.0	0.0	34.1	2.1	1.9	2.1	0
Cargo handling equipment	15.7	5.2	17.3	0.0	2.4	2.4	2.4	0
Locomotives	3.1	0.2	0.0	16.9	0.1	0.1	0.1	59
Heavy duty vehicles	58.2	0.8	0.0	0.0	3.6	3.2	3.6	0
<b>Total</b>	<b>103.1</b>	<b>6.6</b>	<b>18.7</b>	<b>183.7</b>	<b>16.7</b>	<b>14.3</b>	<b>14.3</b>	<b>1,218</b>

## **SECTION 1 INTRODUCTION**

This section describes the rationale behind the Puget Sound Maritime Air Emissions Inventory, introduces the Puget Sound Maritime Air Forum (Forum) that sponsored the effort, provides an overview of this and related efforts, describes maritime-related entities in the Puget Sound area, including ports, petroleum refineries, ferry terminals, and military installations, and discusses emission reduction efforts identified at these entities.

### **1.1 Reason for Study**

Comprehensive air quality planning requires quality emissions inventories as a foundation. An emissions inventory identifies and quantifies by means of engineering calculations the pollutants emitted by sources in a geographic area or airshed and their relative contributions to total emissions within that airshed. The emissions inventory is the foundation or baseline for other activities such as air quality analysis and strategy development.

This activity-based emissions inventory provides detailed information on the five major source categories associated with the marine activities, which are ocean-going vessels (OGVs), harbor vessels, cargo handling equipment (CHE), on-road heavy-duty vehicles (HDVs), and locomotive operations.

The maritime-related inventory must be viewed in context with the other sources of air emissions in the region. Maritime-related sources are one component of total air emissions sources present in the greater Georgia Basin/Puget Sound International Airshed. Other (non-marine) categories that contribute to emissions include point sources (refineries, manufacturing facilities, etc.), on-road mobile sources (cars, trucks, buses and motorcycles), non-road equipment (construction equipment, farming equipment, etc.), and stationary area sources (home wood heating, open burning, auto body shops etc.).

An emissions inventory by itself is a very useful tool to quantify mass emissions and track emission changes through time from a variety of sources of pollution in a geographic area and to help prioritize those sources for potential emission reductions. Furthermore, the regional emissions inventory, including the maritime-related portion, is a critical component of an overall air quality assessment and mitigation strategy development process employed by air regulatory agencies to ensure the area complies with local, state and national air quality standards.

In addition to assuring continued compliance with air quality standards, air agencies work to protect public health and the environment. Adverse health impacts can occur from toxic air emissions (e.g., diesel particulate matter) even if a region is in compliance with air quality standards. Environmental impacts such as visibility impairment can occur at levels significantly less than those standards. Since health impacts are directly related to the concentration and duration of public exposure to specific air pollutants, agencies use additional tools to help them understand the impacts of air pollution. Agencies operate air quality monitoring networks to measure ambient concentrations at representative locations. They also perform computer modeling based on local meteorological data to convert emissions inventory data to estimated ambient concentrations across specific areas. Air quality managers use the data from monitors and modeling to plan and select strategies that reduce emissions sufficiently to meet air quality standards and protect health and environmental goals everywhere in the greater airshed.

The greater Puget Sound region is a significant airshed encompassing a large population. A portion of the region located in Pierce County was designated as nonattainment with respect to U.S. Environmental Protection Agency's (EPA's) PM<sub>2.5</sub> National Ambient Air Quality Standard (NAAQS) in 2009 (known as the Tacoma, Pierce County Nonattainment Area).<sup>3</sup> The fine particle pollution (PM<sub>2.5</sub>) in the Tacoma, Pierce County nonattainment area comes mainly from smoke due to burning in fireplaces and wood stoves, but maritime activities also contribute a portion of fine particle pollution in the designated area. The Puget Sound Clean Air Agency (PSCAA) worked with a group of community stakeholders and developed a set of strategies to reduce the fine particle pollution in the nonattainment area. The recommended strategies included reducing wood smoke emissions through replacing older, highly-polluting wood stoves and increasing the amount of enforcement of residential burn bans. In addition, the stakeholders supported reductions in other sources of pollution, including maritime-related diesel equipment through cleaner fuels and cleaner equipment.

---

<sup>3</sup>In 2007, Ecology recommended to EPA that a portion of Pierce County, including Tacoma, be designated as nonattainment for PM<sub>2.5</sub> based on the 24hr standard applied to 2004-2006 Tacoma L-Street Monitoring data. EPA designated the area as nonattainment in 2009.



Diesel engines, like many other mobile, stationary, and area sources, are significant generators of criteria pollutants and toxic emissions. Excessive exposure to these pollutants can contribute to increased rates of lung cancer, chronic respiratory disease, impaired lung development in children, cardiovascular disease, and other health effects. Given the implications for public health, the reduction and minimization of these emissions are a top priority for the Forum. This emission inventory will support this effort by increasing the understanding of the emission contributions from the maritime-related sources, one component of the state's air quality concerns. Because the health impacts of toxic emissions can be proximity dependent, this inventory will contribute to a better understanding of where emission reductions could provide the best public health benefit. While the EPA has designated diesel emissions as a hazardous air pollutant, it is important to note that federal regulations are in places that require dramatically cleaner fuels and new diesel engines. In addition, in its Health Assessment Document for Diesel Engine Exhaust [EPA/600/8-90/057F May 2002, page ii, pdf p.3] EPA concludes that "long-term (i.e., chronic) inhalation exposure is likely to pose a lung cancer hazard to humans, as well as damage the lung in other ways depending on exposure."<sup>4</sup>

Forum participants are committed to proactively working to achieve early emissions reductions from maritime-related operations to protect public health and the environment.

The Forum proactively commissioned this 2011 air emissions inventory to document the progress made since 2005 in reducing Puget Sound maritime-related emissions and to better understand how the Forum may adjust its focus and continue its emission reduction efforts. During the inventory process, information on the nature, quantity, and sources of air pollutants released from maritime sources has been collected. As the understanding of maritime-related emissions sources improves, the maritime community will be better able to design, implement, and evaluate the effectiveness of fact-based air pollution control strategies and deliver air quality benefits to the region.

---

<sup>4</sup> Email correspondence, Wayne Elson, Office of Air, Waste, and Toxics, EPA and Ron Stuart, Project Manager, Port of Tacoma, September 6, 2012.

## 1.2 Scope of Study

The scope of the study is described in terms of the pollutants quantified, the year of operations used as the basis of emission estimates (2011), the included and excluded source categories, and the geographical extent.

### 1.2.1 Pollutants

Exhaust emissions of the following pollutants are estimated:

- Criteria pollutants, surrogates, and precursors
  - Oxides of nitrogen (NO<sub>x</sub>)
  - Sulfur dioxide (SO<sub>2</sub>)
  - Particulate matter (PM) (10-micron, 2.5-micron)
  - Volatile organic compounds (VOCs)
  - Carbon monoxide (CO)
- Toxic<sup>5</sup> air pollutant, diesel particulate matter (DPM), which is the particulate matter emitted from diesel internal combustion engines
- Greenhouse gases
  - Carbon dioxide equivalent (CO<sub>2</sub>e)

---

<sup>5</sup>In 1998, the California Air Resources Board (CARB) identified diesel particulate matter as a toxic air contaminant. CARB, Resolution 98-35, 27 August 1998. See: <http://www.arb.ca.gov/regact/diesltac/res98-35.pdf>.

Table 1.1: Pollutant Description

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
<p><b>Ozone (O<sub>3</sub>)*</b> is a pungent-smelling, colorless gas produced in the atmosphere when nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC) chemically react under sunlight. The highest O<sub>3</sub> levels occur on hot summer afternoons. This inventory does not include O<sub>3</sub> because it is not directly emitted; this inventory does include the O<sub>3</sub> precursors nitrogen oxides and volatile organic compounds.</p>	<p>The region has not violated national ambient standards for O<sub>3</sub> since 1992, and in 1996 the region was re-designated to “attainment” status by EPA. O<sub>3</sub> levels have not decreased significantly. Concentrations often exceed, but don't violate, standards a few times each summer.</p>	<p>Most O<sub>3</sub>-causing NO<sub>x</sub> and VOCs come from the transportation sector: cars and light trucks, marine vessels, and heavy-duty diesel vehicles. Other sources include gasoline-powered yard equipment, gasoline refueling, industrial solvents, and auto-body paint shops, among others. Natural emissions from biogenic (vegetation) sources also contribute to O<sub>3</sub> formation.</p>	<p>Exposure to ground-level O<sub>3</sub> can reduce lung function, cause respiratory irritation, aggravate asthma symptoms, and weaken the immune system. O<sub>3</sub> has environmental impacts as well; studies show that O<sub>3</sub> can damage agricultural crops and forests.</p>
<p><b>Oxides of Nitrogen (NO<sub>x</sub>)</b> is the generic term for a group of highly reactive gases; all of which contain nitrogen and oxygen in varying amounts. Most NO<sub>x</sub> are colorless and odorless. <b>Nitrogen dioxide (NO<sub>2</sub>)*</b> is one form of NO<sub>x</sub>. NO<sub>2</sub>, along with particles in the air can often be seen as a reddish-brown layer over many urban areas.</p>	<p>NO<sub>2</sub> levels are below federal air quality standards in the Puget Sound Region. See above for information about the role of NO<sub>x</sub> in O<sub>3</sub> formation.</p>	<p>NO<sub>x</sub> form when fuel is burned at high temperatures, as in a combustion process. The primary manmade sources of NO<sub>x</sub> are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. Other sources include industrial boilers and processes, home heaters, and gas stoves. NO<sub>x</sub> can also be formed naturally.</p>	<p>Exposure to NO<sub>2</sub> has been connected to a range of respiratory diseases and infections. NO<sub>2</sub> plays an essential role in the photochemical reactions that produce O<sub>3</sub>, the major component in smog. NO<sub>x</sub> can react with other compounds in the air to form tiny particles adding to PM concentrations.</p>
<p>* Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.</p>			

Table 1.1: Pollutant Description (cont'd)

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
<b>Volatile organic compounds (VOC)</b> VOC are included in the emissions inventory because they are an ozone ingredient, see ozone information above	No ambient standards. VOCs are not classified as criteria pollutants but can contribute to the formation of ozone.	See ozone information above.	In addition to contributing to the formation of ozone, some VOC are air toxics which can contribute to a wide range of adverse health effects.
<b>Carbon monoxide (CO)</b> Carbon monoxide is a colorless, odorless, toxic gas commonly formed when carbon-containing fuel is not burned completely. Motor vehicles are the predominant source of carbon monoxide in the Puget Sound region.	CO levels are well below federal standards and no longer considered a pollutant of concern in the Puget Sound area. This region was designated as "attainment" status in 1996 and has not violated the carbon monoxide standard since 1990.	CO forms during incomplete combustion of fuels. The majority of CO comes from on and off road vehicle engine exhaust. Other contributing CO source categories in the Puget Sound region include woodstoves and fireplaces, outdoor burning and industrial sources.	CO combines with hemoglobin in red blood cells and decreases the oxygen-carrying capacity of the blood. CO weakens heart contractions, reducing the amount of blood pumped through the body. It can affect brain and lung function. People with heart disease and pregnant women are especially at risk.
<b>Sulfur dioxide (SO<sub>2</sub>)*</b> is a colorless, corrosive gas produced by burning fuel containing sulfur, such as coal and oil, and by industrial processes such as smelters, paper mills, power plants and steel manufacturing plants. Sulfur dioxide (SO <sub>2</sub> )* is one form of SO <sub>x</sub> .	SO <sub>2</sub> levels in the Puget Sound region are well below federal standards.	Over the past decade the area has experienced a significant decrease in SO <sub>2</sub> from sources such as pulp mills, cement plants, and smelters. Additionally, levels of sulfur in diesel and gasoline fuels are decreasing due to federal regulations set by the Environmental Protection Agency.	SO <sub>2</sub> is associated with a variety of respiratory diseases. Inhalation of SO <sub>2</sub> can cause increased airway resistance by constricting lung passages. Some of the SO <sub>2</sub> become sulfate particles in the atmosphere adding to measured PM levels.
<b>* Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.</b>			

Table 1.1: Pollutant Description (cont'd)

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
<p><b>Particulate Matter (PM<sub>10</sub> * &amp; PM<sub>2.5</sub>*)</b> refers to tiny, discrete solid or aerosol particles in the air. Dust, dirt, soot, and smoke are considered particulate matter (PM). Two types of PM are included in this emissions inventory: PM<sub>10</sub>, which consists of particles measuring up to 10 micrometers in diameter; and PM<sub>2.5</sub>, which consists of fine particles measuring 2.5 micrometers in diameter or smaller.</p>	<p>The region is in attainment with federal air quality standards for PM<sub>10</sub>. Excess wood smoke in the winter caused a portion of Pierce County around Tacoma to be designated nonattainment for the 24-hr PM<sub>2.5</sub> standard.</p>	<p>In the winter, most PM comes from wood burning in fireplaces and wood stoves particularly in residential neighborhoods. During the summer, vehicle exhaust (cars, trucks, buses, among others) are the predominant sources of fine particles in urban areas. In rural areas, land-clearing burning and backyard burning of yard waste contribute to summer time levels.</p>	<p>Fine particles are a concern because their very tiny size allows them travel more deeply into lungs, increasing the potential for health risks. Exposure to PM<sub>2.5</sub> is linked with respiratory disease, decreased lung function, asthma attacks, heart attacks and premature death. Home PM, such as diesel particulate matter, and smoke from wood and waste burning, are classified as toxic due to the concentrations of harmful chemicals bound to the particles.</p>
<p><b>Diesel Particulate Matter (DPM)</b> is a significant component of PM. Diesel exhaust also includes more than 40 substances that are listed as hazardous pollutants. DPM is considered a surrogate for the effects of both the PM and gaseous component of diesel exhaust. Because of their microscopic size, DPM can become trapped in the small airways of the lungs.</p>	<p>No ambient standards - Air agencies have made it a priority to lower DPM emissions as soon and as much as is practical due to its relative toxicity, even though the total tons of DPM in this and other inventories are usually much lower than other pollutants.</p>	<p>Sources of diesel emissions include diesel-powered trucks, buses and cars (on-road sources); diesel-powered marine vessels, construction equipment, trains and aircraft support equipment (non-road sources).</p>	<p>DPM has been shown to contribute up to 80% of the carcinogenic health risk related to the portion of outdoor air pollutants classified as “toxics”. DPM is linked with health effects typical of all PM, including heart problems, aggravated asthma, chronic bronchitis and premature death.</p>
<p><b>* Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.</b></p>			

Table 1.1: Pollutant Description (cont'd)

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
<p><b>Greenhouse Gases (GHG)</b> included in this emissions inventory are carbon dioxide, methane, and nitrous oxide. Additional gases that are not significantly emitted by maritime-related sources or included in this inventory also contribute to climate change.</p>	<p>No ambient standards</p>	<p>GHG come from both natural processes and human activities, although increases of human-made GHG are most responsible for disrupting the balance of the atmosphere. Most GHG come from transportation and electricity generation.</p>	<p>Climate change, also referred to as global warming, occurs when excessive amounts of GHG accumulate in our atmosphere. These gases trap heat, causing the temperature of the earth to rise.</p>
<p>* Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.</p>			

#### *1.2.2 Temporal Extent*

The activity year for the Puget Sound Maritime Air Emissions Inventory is calendar year 2011. To the extent practicable, the emission estimates are based on activities that occurred during this period. If information specific to 2011 was not available, reasonable estimates of operational characteristics were developed; these cases are identified.

#### *1.2.3 Emission Source Categories*

The Puget Sound Maritime Air Emissions Inventory includes the following source categories:

- Ocean-going vessels
- Harbor vessels, including commercial harbor vessels, government (non-military) vessels, and recreational vessels
- Cargo handling equipment
- Locomotives
- Heavy-duty vehicles
- Fleet vehicles

#### *1.2.4 Geographical Extent*

The Puget Sound Maritime Air Emissions Inventory covers activities within delineated geographical areas depending on emission source type. In general, the area covered includes the U.S. portions of the Georgia Basin/Puget Sound International Airshed, as illustrated in Figure 1.1. The Georgia Basin airshed comprises mostly the Canadian portion of the Georgia Basin/Puget Sound International Airshed, plus Whatcom and San Juan Counties and the southern coastline of the Strait of Juan de Fuca in Washington State, while the Puget Sound airshed encompasses the counties to the south of Whatcom County in Washington State (see Figure 1.2). The solid red line is the boundary of the Georgia Basin/Puget Sound International Airshed.

The 2011 and 2005 emissions inventory domain, as agreed by Steering Committee decision, is the area bounded by the black dotted line to north and the red line to the south, as illustrated in Figure 1.1. The emissions inventory domain includes the U.S. portions Georgia Basin/Puget Sound International Airshed as well as the entire Straits of Juan de Fuca and the waters east of Vancouver Island (stopping at the U.S./Canada Boarder to the north). The specific emissions inventory over-water domain is detailed in Section 3.2.

For 2011, the Port of Tacoma and Port of Seattle increased the resolution from the previous report to get a better understanding of port-related emissions by allocating them into three geographical zones, compared to one zone in 2005. For comparison purposes the 2011 and 2005 emissions were allocated into the following three geographical zones for their port-specific emissions and comparisons:

- Port - emissions within port terminals and adjacent waterways
- Air district – emissions within the PSCAA boundaries (Pierce, King, Kitsap, and Snohomish Counties)
- Airshed – emission within the inventory domain

The other participating ports, their port specific emissions and comparisons are consistent with the 2005 approach.

Figure 1.1: Georgia Basin/Puget Sound International Airshed





The following twelve counties are located within the emissions inventory domain or airshed and some U.S. maritime-related activities for the six emissions source categories operating in these counties are included in the inventory, as shown in Figure 1.2:

- Clallam County
- Island County
- Jefferson County
- King County
- Kitsap County
- Mason County
- Pierce County
- San Juan County
- Skagit County
- Snohomish County
- Thurston County
- Whatcom County

**Figure 1.2: Puget Sound Counties and Major Ports**



The major ports in the inventory domain include:

- Port of Anacortes in Skagit County
- Port of Everett in Snohomish County
- Port of Olympia in Thurston County
- Port of Seattle in King County
- Port of Tacoma in Pierce County

The Port of Port Angeles and Port of Bellingham declined participation in the 2011 inventory update.

An overview of the geographical extent for each of the source categories is provided below.

#### *Ocean-going Vessels*

For OGVs, data was collected for the greater Puget Sound area and associated waterways, and the Strait of Juan de Fuca out to the JA buoy (located at the entrance to the Strait of Juan de Fuca).

Emissions have been estimated from OGVs that arrived at a U.S. berth from sea or departed to sea from a U.S. berth, regardless of whether the vessels traveled on the U.S. side or the Canadian side of the international border. For OGVs that shifted to Canadian berths, or shifted from Canadian berths to U.S. berths, this inventory includes emissions only in U.S. waters. Guidelines were established for both emissions inventories to follow for all vessel trips that transit through the over-water international boundary (see Section 3.2). After completion of the emission estimates, the results will be shared between Environment Canada and the Forum on a geographically specified basis, to allow appropriate allocation for modeling and other purposes.

#### *Harbor Vessels*

The geographical scope for harbor vessels is the same as for OGVs. Emissions from vessels such as ferries that routinely cross the international border have been estimated for the U.S. portions of their routes. Emissions from U.S.-based harbor vessels that traverse the Strait of Juan de Fuca are estimated regardless of whether the vessels travel on the U.S. side or the Canadian side of the international border, using the same approach as for OGVs.

#### *Cargo Handling Equipment*

The geographical scope for cargo handling equipment is the ports and associated terminals or other facilities on which they operate (for example, near-dock railroad switching yards).

#### *Locomotives*

Emissions from switching and line-haul locomotives were estimated for on-dock rail yards, off-dock rail yards, intermodal yards, the rail lines linking these facilities, and off-terminal port-related locomotive emissions to the edge of the study area.

### *Heavy-duty Vehicles*

Emissions from heavy-duty on-road trucks hauling cargo were estimated for queuing at terminal entry gates, traveling and idling within the terminals, queuing at the terminal exit gates, and on-road port-related activity from point of pick-up in the case of port-bound cargo and to the first drop or the edge of the study area in the case of cargo outbound from a port.

Idling emissions from buses that transport cruise line customers between airports and/or hotels and the cruise terminals were also included in the HDV source category. Emissions were estimated for idling at terminal drop-offs or pick-ups, consistent with the 2005 PSEI. Trips to and from the airport and/or hotels were not included in the emission estimates.

### *Fleet Vehicles*

Fleet vehicles consist primarily of light-duty vehicles and some on-terminal heavy-duty vehicles not associated with direct cargo movement. There are three categories of fleet vehicles: terminal fleet vehicles, cruise terminal vehicles, and import/export vehicles. There were approximately 805 terminal fleet vehicles were used on cargo terminals in 2011. Emissions from personal vehicles that are owned by employees and are not used in terminal operations were not included in the inventory.

## **1.3 Background Air Quality Conditions and Regulations**

This section presents changes to air quality conditions and regulations since the development of the 2005 Puget Sound Maritime Air Emissions Inventory. The air quality changes include designation of PM<sub>2.5</sub> nonattainment status for Tacoma, located in Pierce County. There have also been changes to federal and state regulations such as EPA cleaner fuel regulations and Washington State updates to general regulation for air pollution sources and reporting of GHG emissions.

### *1.3.1 Air Quality Conditions*

Areas that have experienced persistent air quality problems are designated by the EPA as nonattainment areas. The federal Clean Air Act requires additional air pollution controls in these areas. Each nonattainment area is declared for a specific pollutant; however, nonattainment areas for different pollutants may overlap each other or share common boundaries. At the time of this 2011 study, the only nonattainment area is Tacoma, Pierce County for PM<sub>2.5</sub>.

In 2009, Tacoma, Pierce County was designated by EPA as a PM<sub>2.5</sub> nonattainment area. The nonattainment designation was a result of a stronger air pollution limit set by the EPA in 2006 and spikes in fine particle pollution levels during the winter that violate the limit. The fine particle pollution in Tacoma, Pierce County is due to smoke from fireplaces, wood stoves, industrial sources, and exhaust from motor vehicles such as cars, trucks, buses, and ships. The Department of Ecology and PSCAA have worked with a community-based task force to evaluate possible solutions to improving air quality and prepared a report with the air task force findings<sup>6</sup>.

---

<sup>6</sup> PSCAA, *Tacoma-Pierce County Clean Air Task Force Report and Recommendations to Puget Sound Clean Air Agency*, December 2011.

Finally, on April 30, 2012, EPA finalized a rule that redirects the implementation of the 2008 National Ambient Air Quality Standards (NAAQS) for ozone including the 0.075 ppb 8-hour ozone standards requirement in 2032<sup>7</sup>. The more stringent ozone standard may result in the region being designated as nonattainment for ozone.

### 1.3.2 Washington State Regulations

On March 1, 2011, the Department of Ecology adopted the final rule to Chapter 173-400 WAC – General regulation for air pollution sources. The amendments brought the rule into compliance with the EPA regulations including standards for excess emissions; major stationary sources located in nonattainment areas, and updated the date of federal regulations adopted by reference. The rule set a new exemption level for GHG and PM<sub>2.5</sub> emissions in addition to housekeeping updates, corrections and changes.

On December 1, 2010, the Department of Ecology adopted Chapter 173-441 WAC-Reporting of Emissions of Greenhouse Gases. The rule became effective January 1, 2011 and the reporting requirement began January 1, 2012. The rule adopts mandatory GHG reporting for facilities that emit at least 10,000 metric tons of GHG per year in Washington and for suppliers of liquid motor vehicle fuel that supply products equivalent to at least 10,000 metric tons of CO<sub>2</sub> per year in Washington.

### 1.3.3 Federal Regulations

EPA regulations governing the sulfur contents in the highway diesel fuel, fuel used in non-road equipment and locomotive, and marine diesel fuel play a significant impact in the 2011 PSEI emissions. Since 2005, the following changes have occurred:

- A 15 parts per million (ppm) sulfur specification, known as ultra-low sulfur diesel (ULSD), was phased in for highway diesel fuel from 2006-2010.
- Low sulfur (500 ppm) and ULSD fuel are being phased in for non-road, locomotive, and marine engines from 2007-2014.

EPA also finalized other regulations which are summarized below.

#### *EPA's Final Regulation – Control of Emissions of Air Pollution from Locomotive and Marine Compression Ignited Engines Less than 30 Liters Per Cylinder*

On March 14, 2008, the EPA finalized a three part program designed to dramatically reduce emissions from marine diesel engines with displacement (i.e. swept volume) less than 30 liters per cylinder. EPA lists the following categories for compression ignition diesel marine engines based on engine displacement per cylinder:

- Category 1: less than 5 liters
- Category 2: equal to 5, less than 30 liters

---

<sup>7</sup>EPA, <http://www.epa.gov/glo/actions.html>.

The EPA regulation impacts some marine propulsion engines and the marine auxiliary engines used on vessels. When fully implemented, this rule will cut PM emissions from these engines by as much as 90% and NO<sub>x</sub> emissions by as much as 80%.

The regulations introduced two tiers of standards – Tier 3 and Tier 4 – which apply to both new and remanufactured marine diesel engines, as follows:

- *Newly-built engines:* Tier 3 standards apply to engines used in commercial, recreational and auxiliary power applications (including those below 37 kW that were previously covered by non-road engine standards). The emission standards for newly-built engines are phasing in, beginning in 2009. Tier 4 standards apply to engines above 600 kW (800 hp) on commercial vessels based on the application of high-efficiency catalytic after-treatment technology, phasing in beginning in 2014.
- *Remanufactured engines:* The standards apply to commercial marine diesel engines above 600 kW when these engines are remanufactured and will take effect as soon as certified systems become available.

*EPA's Emission Standards for Marine Diesel Engines Above 30 Liters per Cylinder (Category 3 Engines)*

EPA is pursuing two parallel, related actions for establishing emission standards for Category 3 marine diesel engines: (1) EPA is a member of the United States delegation that participated in negotiations at the International Maritime Organization (IMO) with regard to amendments to Annex VI that were adopted in October 2008, including additional NO<sub>x</sub> limits for new engines, additional sulfur content limits for marine fuel, methods to reduce PM emissions, NO<sub>x</sub> and PM limits for existing engines, and volatile organic compounds (VOCs) limits for tankers; (2) In January 2003, EPA adopted Tier 1 standards for Category 3 marine engines, which went into effect in 2004, establishing NO<sub>x</sub> standards based upon internationally negotiated emissions rates and readily available emissions-control technology. In December 2009, EPA finalized emission standards for Category 3 marine diesel engines installed on U.S. flagged vessels as well as marine fuel sulfur limits which are equivalent to the amendments adapted by the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI in 2008. The final regulation establishes stricter standards for NO<sub>x</sub>, in addition to standards for hydrocarbons and carbon monoxide.

The final near-term Tier 2 NO<sub>x</sub> standards for newly built engines applied beginning in 2011 and required more efficient use of current engine technologies, including engine timing, engine cooling, and advanced computer controls. The Tier 2 standards will result in a 15% to 25% NO<sub>x</sub> reduction below the current Tier 1 levels. The final long-term Tier 3 standards for newly built engines will apply beginning in 2016 in Emission Control Areas and will require the use of high efficiency emission control technology such as selective catalytic reduction to achieve NO<sub>x</sub> reductions 80% below the current levels. These standards are part of EPA's coordinated strategy for addressing emissions from ocean-going vessels. This strategy also includes implementation of recent amendments to MARPOL Annex VI and designation of U.S. coasts as an Emission Control Area.

*EPA's Emission Standards for Harbor Vessel Engines*

On March 14, 2008, EPA finalized the latest regulation establishing new emission standards for new Category 1 and Category 2 diesel engines rated over 50 horsepower (hp) used for propulsion in most harbor vessels. The new Tier 3 engine standards began phasing in starting in 2009. The more stringent Tier 4 engine standards (based on the application of high-efficiency catalytic after-treatment technologies) will phase in beginning in 2014 and will apply only to commercial marine diesel engines greater than 800 hp. The regulation also includes requirements for remanufacturing commercial marine diesel engines greater than 800 hp.

*Emission Standards for Non-road Diesel Powered Equipment*

The EPA's Tier 1, Tier 2, Tier 3, and Tier 4 (interim Tier 4 and final) emission standards for non-road diesel engines require compliance with progressively more stringent standards for hydrocarbon, CO, DPM, and NO<sub>x</sub>. Tier 4 standards for non-road diesel powered equipment complement the 2007+ on-road heavy-duty engine standards which require 90% reductions in DPM and NO<sub>x</sub> compared to current levels. In order to meet these standards, engine manufacturers will produce new engines with advanced emissions control technologies similar to those already in place for on-road heavy-duty diesel vehicles. These standards for new engines are being phased in starting with smaller engines in 2008 until all but the very largest diesel engines meet NO<sub>x</sub> and PM standards in 2015. Currently, the interim Tier 4 standards include a 90% reduction in PM and a 60% reduction in NO<sub>x</sub>.

*EPA's Emission Standards for New and Remanufactured Locomotives and Locomotive Engines- Latest Regulation Finalized on 14 March 2008<sup>8</sup>*

In March 1998, EPA adopted Tier 0 (1973-2001), Tier 1 (2002-2004), and Tier 2 (2005+) emission standards applicable to newly manufactured and remanufactured railroad locomotives and locomotive engines. These standards require compliance with progressively more stringent standards for emissions of hydrocarbon, CO, NO<sub>x</sub>, and DPM. Although the most stringent standard, Tier 2, results in over 40% reduction in NO<sub>x</sub> and 60% reduction in DPM compared to Tier 0, the full potential of these reductions will not be realized in the next five years because of the long life of diesel locomotive engines.

In March 2008, EPA finalized the regulation, "Control of Emissions of Air Pollution from Locomotive and Marine Compression Ignited Engines Less than 30 Liters per Cylinder." When fully implemented, this rule will cut PM emissions from these engines by as much as 90% and NO<sub>x</sub> emissions by as much as 80%.

---

<sup>8</sup>EPA, <http://www.epa.gov/otaq/regs/nonroad/420f08004.htm>.

The regulation introduces two tiers of standards – Tier 3 and Tier 4 – which apply to new locomotives as well as standards for remanufactured locomotives, as follows:

- *Newly-Manufactured Locomotives:* The new Tier 3 emission standards will achieve 50% reduction in PM beyond the current Tier 2 standards and will become effective in 2012. The longer term Tier 4 emission standards which are based on the application of high efficiency catalytic after-treatment technologies for NO<sub>x</sub> and PM will become effective in 2015 and will achieve over 80% reduction in PM and NO<sub>x</sub> compared with the current Tier 2 standards.
- *Remanufactured Locomotives:* The regulation also establishes emission standards for remanufactured Tier 0, 1, and 2 locomotives which would achieve approximately 50% reduction in PM and up to 20% reduction in NO<sub>x</sub>.

#### *Emission Standards for New 2007+ On-road Heavy-Duty Vehicles*

This regulation requires HDV engine manufacturers to meet a 0.01 gram per brake horsepower-hour (g/bhp-hr) PM standard starting in 2007, which is 90% lower than the 2004 PM standard of 0.1 g/bhp-hr. The regulation requires a phase-in of a 0.2 g/bhp-hr NO<sub>x</sub> standard between 2007 and 2010. Since 2010, all engines have been required to meet the 0.2 g/bhp-hr NO<sub>x</sub> standard, which represents a greater than 90% reduction compared to the 2004 NO<sub>x</sub> standard of 2.4 g/bhp-hr. It is assumed that between 2007 and 2010, on average, manufacturers produced HDV engines meeting a PM standard of 0.01 g/bhp-hr and a NO<sub>x</sub> standard of 1.2 g/bhp-hr. The latter is referred to as the 2007 interim standard.

#### *1.3.4 International Regulations*

International regulations relating to ocean-going vessels come out of the IMO under the MARPOL convention, as discussed below.

##### *MARPOL Annex VI*

The worldwide fuel sulfur limitations under MARPOL Annex VI was lowered to 3.5% beginning in 2012 and 0.5% as early as 2020, but no later than 2025 (subject to a fuel availability study to be conducted in 2018). New NO<sub>x</sub> engine emission standards require vessels constructed after 2011 to meet Tier 2 levels (14.4 gm-NO<sub>x</sub>/kW-hr); a reduction of 20% from current levels. Vessels constructed after 2016 are required to meet Tier 3 levels (3.4 gram-NO<sub>x</sub>/kilowatt-hour [kW-hr]); a reduction of 80% below current Tier 1 standards.

##### *North American Emission Control Area*

The North American Emission Control Area (ECA) extends 200nm of shore of the United States and Canada. ECA Phase I began August 1, 2012 requiring 1.0% sulfur fuel oil for all vessels operating within the ECA. This will reduce sulfur oxide emissions by over 60% and particulate by over 75%.

ECA Phase II requirements begin on January 1, 2015. Phase 2 requires 0.1 sulfur fuel oil for all vessels operating within the ECA. This will reduce sulfur oxide (SO<sub>x</sub>) emissions by 99% and particulate by 75%.

MARPOL Annex VI also requires that vessels constructed after 2016 and operating within the ECA meet Tier 3 NO<sub>x</sub> levels; an 80% reduction in oxides of nitrogen (NO<sub>x</sub>) from current Tier 1 levels.

#### 1.4 Emission Reduction Strategies

Emission reduction strategies identified during the inventory process are listed below for participating ports and maritime partners.

##### 1.4.1 BNSF Railway Company (BNSF)

BNSF has implemented a number of strategies system-wide to reduce emissions from rail operations. BNSF is committed to improving air quality across its system. The railway has been aggressively acquiring new locomotives and retiring older and less efficient ones. Between 2005 and the end of 2011, BNSF acquired 2,071 Tier II cleaner-burning and fuel-efficient locomotives.

*BNSF is also reducing emissions by:*

- Installing idle control mechanisms on switch engines, including auxiliary power units, diesel-driven heating system, and automatic start-stop technology on locomotives. Approximately 90% of the fleet has these systems.
- Increasing the number of cleaner-burning locomotives.
- Reducing train resistance (drag) through low torque bearings.
- Adjusting train speeds.
- Implementing the wheel/rail lubrication (especially on curved track and turnouts) to reduce friction and aerodynamic drag – rail lubrication extends rail and wheel life and increases fuel efficiency
- Implementing an operator incentive program to reward operators who save locomotive fuel
- Performing routine stack opacity tests on locomotives to ensure engines are in good operating condition.
- Monitoring the performance of locomotive engineers and rewards them for good fuel savings (and emissions) operations
- Working with several manufacturers on systems to aid in optimizing train operations.

*BNSF is also reducing emissions at intermodal yards by:*

- Being the first U.S. rail carrier to install electrically-powered wide-span cranes. These cranes produce zero emissions on site while generating power each time they lower a load. Additionally, the wide span design of these new cranes also reduces the numbers of diesel trucks (hostlers) for shuttling containers within the intermodal facility, reducing emissions and improving fuel efficiency. This system is currently operating at the Seattle International Gateway (SIG) Intermodal Facility.
- Installing semi-automated gate system for trucks as they enter and exit SIG Intermodal Facility, thereby reducing truck idling time and emissions by 50%.



#### 1.4.2 Port of Everett

The Port of Everett has implemented several emission reduction initiatives.

- Operated more than 20% of its cargo handling equipment (14 of 62 pieces) on non-diesel fuels, including six electric forklifts, five propane forklifts, and three gasoline forklifts.
- Purchased and took delivery, in 2006, of an electric vehicle for use by the Harbor Attendant in marina operations, replacing a fossil-fuel vehicle. The Global Electric vehicle is ideally suited for slow-speed, stop-and-go type travel.
- Obtained a local government heavy-duty diesel retrofit grant in 2006 from the Department of Ecology to retrofit a fleet vehicle with emission control technology. The Port retrofitted its boom truck with this grant.
- Specified the use of an electric rail mounted gantry crane for cargo at the Rail/Barge Transfer facility, instead of a diesel-powered crane.
- Obtained two electric gantry cranes in 2003, which are operating at Pacific Terminal.
- Developed an Environmental Management System (EMS) in 2008 through an American Association of Port Authorities-sponsored training program. The EMS program serves the purpose of integrating and managing existing environmental programs, including air emissions.

#### 1.4.3 Port of Olympia

The Port of Olympia has included the following Seaport (and some Port-wide) air quality elements:

- Used ultra-low sulfur diesel fuel in Port machinery.
- Received grant money in 2007 from the Olympic Region Clean Air Agency (ORCAA) to retrofit a log loader with a catalytic muffler.
- Purchased two electric vehicles and one hybrid vehicle.
- Installed an electric vehicle charging station adjacent to the seaport.
- Implemented a commute trip reduction policy offering alternative work schedules; partial reimbursement on monthly public transit tickets and in accordance with the Bicycle Commuter Benefits Act, providing monetary benefit to employees who bike to work.
- Encourage non-vehicle transportation by purchasing one men's and one women's bicycle for the use of interoffice commuting and errands. Bicycle racks are available around the public facilities.
- Built a 1.2 mile pedestrian path (East Bay Trail) adjacent to the seaport that connects restaurants, the Swantown Marina, Swantown Boatworks and other facilities.

#### 1.4.4 Port of Seattle

The Port of Seattle has implemented a variety of projects and programs, and is participating in several collaborative projects, to reduce emissions from maritime sources.

*Freight Mobility Emission Reduction Strategies*

The Port of Seattle has implemented a number of emission reduction strategies related to freight mobility:

- Completed radio frequency identification (RFID) pilot project with Stevedoring Services of America to equip 1,200-1,500 trucks with RFID tags and Terminal 18 with RFID readers, which can be used to reduce gate wait times and improve terminal efficiency.
- Terminal operators have initiated cargo handling equipment fleet modernization programs and are encouraged to purchase equipment with 2007 on-road standard engines.
- Coordinated draw bridge openings with truckers so they can route accordingly to minimize idling.
- Piloted computer tracking systems at cargo terminals to quickly locate containers and thus reduce truck wait times.
- Provided electric plug-ins instead of diesel units for refrigerated containers on the docks.
- Purchased bigger cranes to load and unload more efficiently, so ships are at the dock for less time.
- Partnered in a regional anti-idling effort.

*Clean Trucks Program*

- Adopted requirements for drayage trucks entering port terminals to have 1994 or newer engines, as of January 1, 2011. All trucks entering port terminals must be enrolled in the Port's Drayage Truck Registry, which documents these newer, cleaner trucks that service Seattle container terminals. A model year 1994 truck is 2.5 to 6 times cleaner than older trucks. Through a buy-back, scrap and replacement effort, and other fleet turnover, all pre-1994 engine trucks retired from the fleet as of January 2011.
- Begun planning for installation of RFID at all terminal in-gates, as well as a conversion from the clean truck sticker program to use of RFID tags. The tags will provide a way to gather more accurate information on trucks accessing the port terminal. The RFID program will be rolled out in 2012.
- Implemented Clean Truck benchmarks requiring 80% of all trucks entering Port of Seattle facilities to meet emission standards for engine-year 2007 by the end of 2015.
- Launched a truck scrappage and replacement program between November of 2007 and July 2011 resulting in the scrappage of 280 pre-1994 trucks.

*Cargo Handling Equipment Diesel Emissions Reduction Project*

- Received a grant from the Washington State Department of Ecology (WDOE) to initiate a pilot program to install idle reduction equipment on cargo handling equipment.
- Implemented retrofits (retrofit, replace, repower, repair, refuel) for diesel-powered vehicles and equipment.
- Purchased 169 diesel oxidation catalysts (DOCs) to retrofit cargo handling equipment. This represents all eligible cargo handling equipment that is operated on the container terminals and reduced DPM emissions from this equipment by 25%.

- Encouraged voluntary use of cleaner and alternative fuels.
- Implemented education and outreach programs to equipment owners/operators on strategies for reducing emissions.

#### *Ocean-Going Vessel Emission Reduction Efforts*

- Through its At-Berth Clean Fuels program, the Port of Seattle, in collaboration with the PSCAA, has provided incentives to shipping and cruise lines that burn reduced sulfur distillate fuel while at berth. Since 2009, this program has eliminated 626 metric tons of sulfur emissions. Out of 791 “frequent callers” vessel calls in 2011, 73% used cleaner fuels or shore power while at berth.
- The Port initiated the Green Gateway Partners’ Awards which are given to selected cruise and container lines. In order to be eligible for an award, applicants must either participate in the ABC Fuel program or plug into shore power, and demonstrate environmental stewardship initiatives above and beyond existing regulations.

#### *Cruise Ships Emissions Reduction Efforts*

- *Cruise Vessel Shore Power Project* - Most Princess Cruises and Holland America Line cruise vessels home ported in Seattle now turn off their engines and “plug in” at berth effectively reducing emissions to zero while at the dock. If not using shore power, cruise ships are required through Port tariffs to burn a maximum 1.5% sulfur fuel while at berth. Several cruise lines continue to participate in the ABC Fuels program and burn fuel with 0.5% or lower sulfur content at berth.
- *Cruise Vessel Seawater Scrubber Study* - Holland America Line and Krystallon completed their sea water scrubber technology demonstration project after more than five years. The scrubber was installed on one of the five engines aboard the *Zaandam* in April 2007 to reduce sulfur and particulate matter from engine exhaust. The *Zaandam* was an important test-bed for sea water scrubbing technology and this project demonstrated that sea water scrubbing is a viable technology for removing sulfur dioxide and particulate matter from marine diesel engine exhaust. After project completion, the scrubber was decommissioned because its limited application could not sufficiently provide for ECA compliance.
- *North West & Canada Cruise Ship Association Use of Low Sulfur Fuel* - The members of the North West & Canada Cruise Association (NWCCA) have committed to procure and use low sulfur fuel while at berth in Seattle and at sea in Washington, British Columbia and in Alaska waters. In support of this study, NWCCA has received reports on fuel purchases from all the lines operating out of Seattle and reviewed those reports. NWCCA will continue to procure and burn low sulfur fuel while operating in the Pacific Northwest.

#### *Port Administration*

- Received a grant from the WDOE to retrofit all eligible heavy-duty diesel equipment at Seaport Maintenance with diesel oxidation catalysts.
- Installed Stage II Vapor Recovery Equipment at the Seaport Maintenance refueling station.
- Made biodiesel available at the Shilshole Bay Marina Fuel Dock, and boaters are encouraged by the Port to use it.

- Encouraged cleaner vehicle purchases. A hybrid electric vehicle is used for high vehicle-miles-traveled mail runs between Port facilities, and the Seaport Environmental Program staff replaced fleet minivans with hybrid vehicles.
- Implemented an award-winning employee trip reduction program.
- Built bike and pedestrian paths across and adjacent to terminals.
- Created programs to educate Port employees, tenants, and customers regarding actions they can take to protect air quality.

#### *1.4.5 Port of Tacoma*

The Port of Tacoma has been actively pursuing projects to make immediate reductions in emissions from maritime-related sources. These include:

- The Port of Tacoma has been using ULSD fuel in port-operated equipment since 2005. This practice preceded EPA mandated use of ULSD fuel in non-road equipment by five years reducing diesel particulate emissions by 50%. Since 2008 the Port has been using biodiesel and is currently using 5% Biodiesel blend in port-operated diesel equipment.
- Since 2004, the Port of Tacoma's ocean carrier customers have voluntarily switched to the use of low sulfur distillate in the auxiliary engines for ocean going vessels while at berth. Between 2008 and 2011, 35% to 50% of frequently calling vessels routinely used low sulfur fuel reducing their diesel particulate emission by approximately 60%.
- In 2011, the Port installed EPA-verified diesel particulate filters (DPFs) on 13 port-owned and operated straddle carriers. The Port received a \$490,000 WDOE's Clean Diesel Grant to fund the retrofits. The diesel particulate filters reduce emissions in excess of 85%.
- Prior to 2011, six Port of Tacoma heavy-duty forklifts were powered by old two cycle Detroit diesel engines. With assistance from \$145,000 WDOE's Clean Diesel Grant, they were repowered with new low emission EPA Tier 3 diesel engines reducing particulate emission by nearly 1 ton per year.
- Between 2007 and 2011, Port of Tacoma's terminal operator tenants received over \$525,000 in EPA and Ecology grant findings to install EPA-verified diesel particulate filters on 22 heavy-duty diesel cargo handling equipment reducing emissions in excess of 85% and 65 diesel oxidation catalysts reducing emissions by 25%.
- Since 2005 Port of Tacoma terminal operator tenants installed EPA-verified diesel oxidation catalysts on over 100 heavy-duty diesel cargo handling equipment reducing diesel particulate emissions in excess of 25%.
- The Port of Tacoma Clean Drayage Truck Program was established in 2008 to ban old diesel drayage trucks from serving marine terminals at the Port. In 2010, pre-1994 drayage trucks were banned from the port terminals reducing diesel particulate emissions between 1-2 tons per year. The port is currently working with the trucking community to ban pre-2007 trucks by 2017. The City of Tacoma, in collaboration with the Port of Tacoma, the Clean Air Agency, and WDOE, launched a Truck Scrappage Program in 2011. The goal of the program is to replace 135 regional trucks with newer low emission engine trucks. This program will work in synergy with the Port of Tacoma Clean Truck Program to further reduce drayage truck emissions at the Port.

- The Port and WDOE have collaborated to develop and implement a voluntary idle reduction program that reduces diesel engine idle time for vehicles and equipment operating on Port properties.

#### *Totem Ocean Trailer Express Terminal*

- In 2010, the Port of Tacoma partnered with Totem Ocean Trailer Express (TOTE) to provide ship-side retrofits and install a shorepower infrastructure at the TOTE Terminal. The shorepower project received \$1.4 million EPA grant and leveraged funds through in-kind contributions from the Port of Tacoma and direct matching fund from TOTE. TOTE contributed \$283,000 in matching funds in addition to \$891,000 that has already been expended for the purchase of ship-side equipment.
- TOTE is currently conducting a diesel particulate filter retrofit trial on one diesel yard truck. Demonstration of a successful Level 3 retrofit on their equipment is may lead to further installations of diesel particulate filters on the fleet of over 30 yard trucks.

#### *Evergreen Marine at Pierce County Terminal (PCT)*

- The Evergreen Marine, the leaseholder at Pierce County Terminal installed diesel particulate filters on two side picks reducing diesel particulate emissions from these units by over 85%.
- Since 2004, all Evergreen Marine vessels have switched to using lower sulfur distillate in their vessel's auxiliary engines while at berth at the Pierce County Terminal.

#### *APM Terminal*

- APM Terminal retired the majority of their older, non-tiered engine cargo handling equipment and replaced new yard trucks with cleaner on-road engines.
- APM Terminal, with assistance from a PSCAA grant and a WDOE Clean Diesel Grant, retrofitted 36 pieces of heavy-duty cargo handling equipment with diesel oxidation catalysts, reducing diesel particulate emissions by 25%.

#### *Husky Terminal*

- Since 2006, all Kawasaki Kisen Kaisha (K-Line) vessels have switched to using lower sulfur distillate in their vessel's auxiliary engines while at berth at the Husky Terminal.
- Husky Terminal & Stevedoring has installed diesel particulate filters on seven top picks and one yard truck reducing diesel particulate emissions by over 85%.

#### *Washington United Terminal*

- Washington United Terminal (WUT) retrofitted 4 reach stackers, 2 top picks and 10 yard trucks with diesel particulate filters. The terminal also replaced an additional 6 yard trucks and 1 top pick with low emission EPA Tier 4 units.
- WUT is conducting an idle reduction equipment trial expected to significantly reduce diesel equipment idling and emissions from equipment cold starts.

#### *Horizon Lines*

- Horizon Lines replaced 30 model year 2000 drayage trucks with fleet of 30 new Tier 4 Class 8 trucks reducing diesel particulate emissions by over 85%.

#### *Pacific Rail Service*

- PRS with assistance from a Department of Ecology Grant retrofitted 11 pieces of cargo handling equipment with diesel oxidation catalysts reducing diesel particulate emissions by 25%.

#### *Northwest Container Services*

- Northwest Containers has retrofitted two reach stackers with diesel particulate filters reducing diesel particulate emissions by over 85%.

#### *TEMCO Grain Terminal*

- In 2011 three switching locomotives at the TEMCO were equipped with Automatic Engine Start Stop devices to limit excess idling. In addition to reducing GHG emissions the project eliminated approximately 3.4 tons per year of particulate emissions.

#### *1.4.6 Tacoma Public Utilities – Locomotives*

- Since July 2006, ULSD has been used in the locomotives for switching operations at the Port of Tacoma. In the port sector, use of regular low-sulfur fuel containing up to 500 ppm sulfur in switching operation is standard; the use of ULSD eliminates up to 97% of sulfur oxides emission from the yard switching operations.
- Tacoma Rail partnered with PSCAA in 2007 to install idle reduction equipment on their locomotives. By 2011 Tacoma Rail reduced its fleet from 18 to 14 locomotives and installed idle reduction equipment on all but two locomotives. Tacoma Rail has saved more than 440,000 gallons of diesel fuel and reduced greenhouse gas emissions by 209 tons since 2007.
- Tacoma Rail partnered with EPA and PSCAA to retire three circa 1950's locomotives and replace them with remanufactured locomotives equipped with EPA Tier 2 and Tier 3 compliant diesel engines. The repower project reduces NOx by 30 tons per year, CO by 25 tons per year, PM by 2 tons per year, and hydrocarbons (HC) by close to 7 tons per year.

#### *1.4.7 Union Pacific*

- Union Pacific limits train speeds and shut down idle locomotives to save fuel. The locomotive shutdowns can save 15-24 gallons of fuel per locomotive, per day.
- All new Union Pacific locomotives have automatic stop-start equipment that eliminates unnecessary idling, and the company is retrofitting older locomotives with this technology as well. More than 70% of Union Pacific's locomotive fleet is now outfitted with automatic stop-start equipment.
- Union Pacific is performing additional aerodynamic tests and evaluations of the Aero Wedge, an aerodynamic structure placed on the top of the first rail car of a double-stack container train. Preliminary results from wind tunnel, computer and test track analyses are promising for fuel savings and corresponding emissions reductions.

- Union Pacific created and pioneered genset locomotive technology and has 165 genset locomotives in its system-wide fleet at present.

#### *1.4.8 Washington State Ferries*

Since 2002, Washington State Ferries (WSF) has worked to reduce maritime air emissions through both internal programs and collaborative projects to upgrade engine equipment, convert to clean fuels and implement operational changes.

#### *Engine Equipment Upgrades*

In 2002, WSF initiated a program of engine equipment upgrades throughout the fleet to meet MARPOL standards. This effort has included upgrading fuel injectors, upgrading or replacing main engines and replacing ship-service generators. Upgrades completed include fuel injectors for 44 Electro-Motive-Diesel (EMD) engines, 12 General Electric engine replacements and 30 ship-service generator replacements.

#### *Clean Fuels*

In 2003, WSF began an ongoing process of evaluating, and adopting when practicable, the use of cleaner fuels in the ferry fleet.

- 2003 - Conducted preliminary operational and emissions tests of low sulfur diesel, ULSD and biodiesel.
- 2004 - Converted entire ferry fleet to low sulfur diesel.
- 2004 and 2005 - Undertook pilot test of B20 biodiesel (in partnership with PSCAA and Seattle City Light).
- 2004 and 2005 - Undertook pilot test of ULSD (in partnership with the PSCAA and the EPA).
- 2006 - Partnered with PSCAA and Seattle City Light on a biodiesel research project and second biodiesel pilot test.
- 2006 - Started conversion of the ferry fleet to ULSD.

#### *Operational Fuel Conservation Measures*

The majority (89%) of the ferry fleet power down main and auxiliary engines, and connect to shore-power during tie-up at night.

A WSF working group, focused on fuel conservation efforts fleet-wide, is exploring the following initiatives:

- Route profiling, identifying optimum speeds to meet schedules and save fuel.
- Positive restraint system while vessel is in dock alleviating need to run engines while loading/unloading.
- Reducing to two engine operation on certain vessel classes.
- Reducing on-board fuel storage to minimize weight load.
- Installation of heat recovery systems that would alleviate need for heating boilers.





## SECTION 2 SUMMARY RESULTS

This section presents the summary results for the 2011 Puget Sound Maritime Air Emissions Inventory. Detailed information and data on each source category, including the methodology for developing the emission estimates presented here, are provided in subsequent sections. Section 2.1 presents the results, Section 2.2 provides regional comparisons of the maritime-related emissions presented in this report to the agency regional emissions, Section 2.3 presents the emissions associated with selected entities, such as ports and petroleum facilities and comparisons of maritime and non-maritime related emissions for HDV and locomotives for the PSCAA Region, and Section 2.4 presents concluding remarks.

### 2.1 Results

This section presents the findings by source category (2.1.1) and by regional clean air agency and county (2.1.2).

#### 2.1.1 U.S. Maritime-Related Emissions by Source Category

The U.S. maritime-related source categories include all activities associated with U.S. related maritime operations and include the following source categories:

- Ocean-going vessels (including hotelling, maneuvering, and transiting modes)
- Harbor vessels (including commercial harbor vessels, government vessels, and recreational vessels)
- Cargo handling equipment
- Locomotives (including switch and line-haul operations)
- Heavy-duty vehicles (including on-terminal and first drop activities within the inventory domain)
- Fleet vehicles (including terminal fleet vehicles, cruise terminal vehicles, and import/export vehicles)

Table 2.1 and Figures 2.1 and 2.2 present the 2011 total (all sources inventoried) U.S. maritime-related airshed emissions by source category. Figures 2.3 through 2.10 illustrate the contribution of the various source categories to the maritime-related emissions for NO<sub>x</sub>, VOC, CO, SO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, DPM and greenhouse gases, respectively. Greenhouse gases are presented in CO<sub>2</sub>e for carbon dioxide, nitrous oxide, and methane, combined.

Table 2.1: 2011 Total Airshed Emissions, tpy

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
OGV, transit	9,424	363	840	7,333	616	493	593	452,613
OGV, hotelling & maneuvering	2,234	79	196	4,376	264	211	118	285,028
Harbor vessels	7,050	1,124	9,672	5	292	272	278	481,123
Locomotives	1,264	80	200	11	45	41	45	75,289
Cargo handling equipment	594	37	297	1	33	32	33	64,275
Heavy-duty vehicles	2,340	143	666	3	55	44	55	375,071
Fleet vehicles	6	3	34	0	0	0	0	2,828
<b>Total</b>	<b>22,912</b>	<b>1,830</b>	<b>11,905</b>	<b>11,729</b>	<b>1,304</b>	<b>1,092</b>	<b>1,122</b>	<b>1,736,226</b>

Figure 2.1: 2011 Total Airshed Emissions, tpy

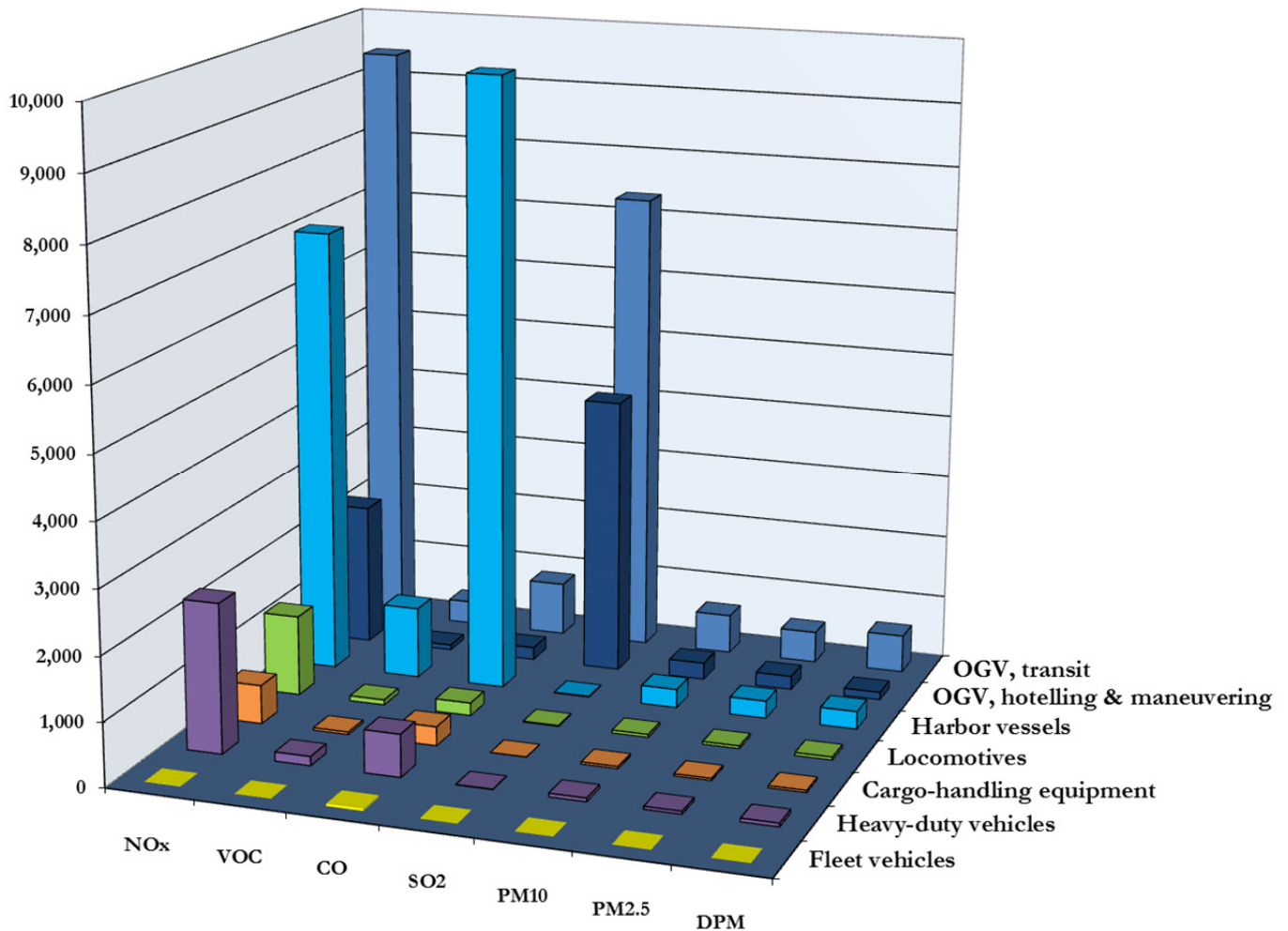
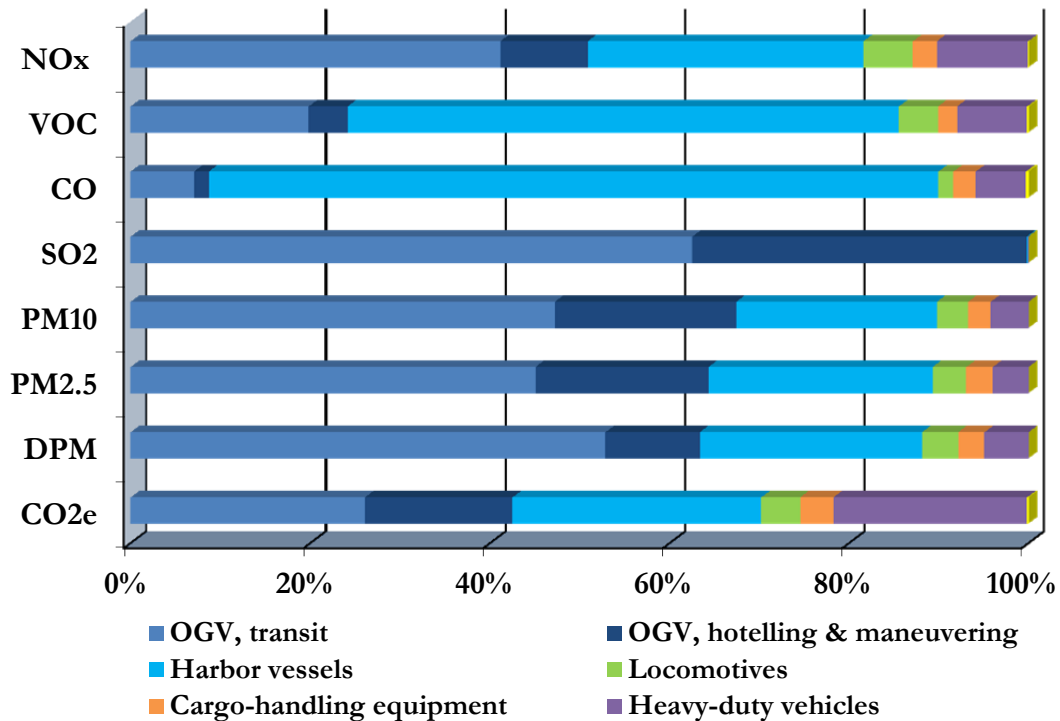


Table 2.2: Contribution of 2011 Total Airshed Emissions by Source Category

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling & maneuvering	10%	4%	2%	37%	20%	19%	11%	16%
OGV, transit	41%	20%	7%	62%	47%	45%	53%	26%
Harbor vessels	31%	61%	81%	0%	22%	25%	25%	28%
Locomotives	5%	4%	2%	0%	3%	4%	4%	4%
Cargo handling equipment	<3%	<2%	<2%	0%	<2%	<3%	<3%	<4%
Heavy-duty vehicles	10%	8%	6%	0%	4%	4%	5%	22%
Fleet vehicles	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Figure 2.2: Contribution of 2011 Total Airshed Emissions by Source Category



In the pie charts below, Figures 2.3 through 2.10, the fleet vehicles percentage is so small that it is hardly visible. Due to space constraints, it is not labeled in the pie charts.

Figure 2.3: 2011 Total Airshed NO<sub>x</sub> Emissions by Source Category

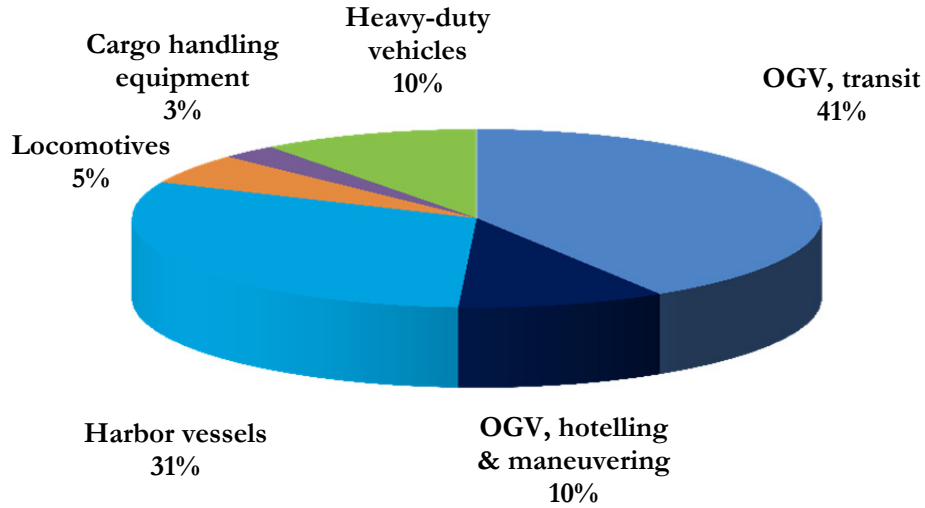


Figure 2.4: 2011 Total Airshed VOC Emissions by Source Category

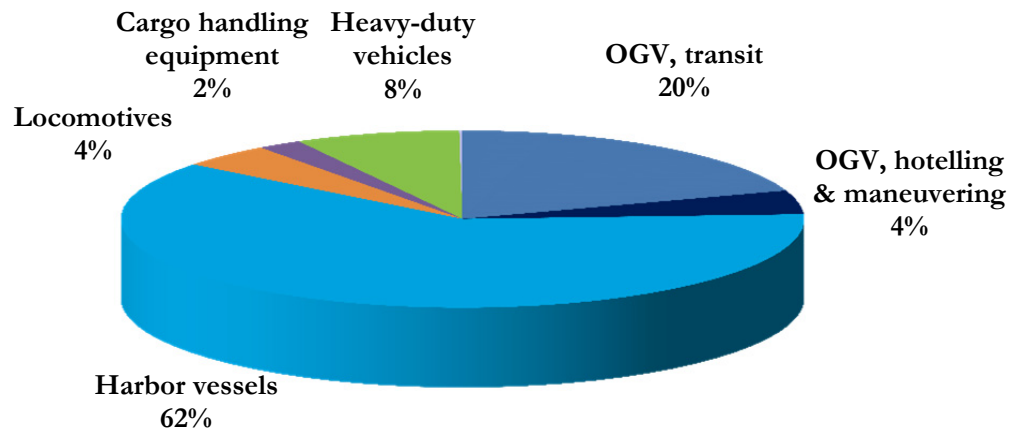


Figure 2.5: 2011 Total Airshed CO Emissions by Source Category

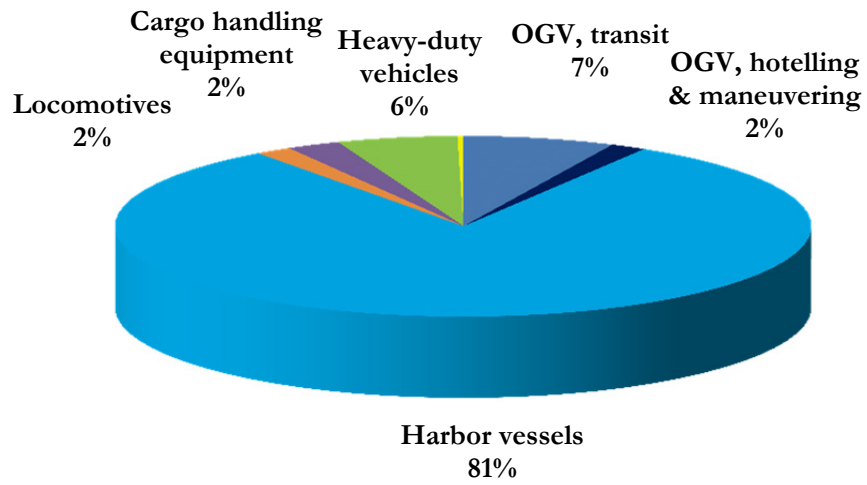


Figure 2.6: 2011 Total Airshed SO<sub>2</sub> Emissions by Source Category

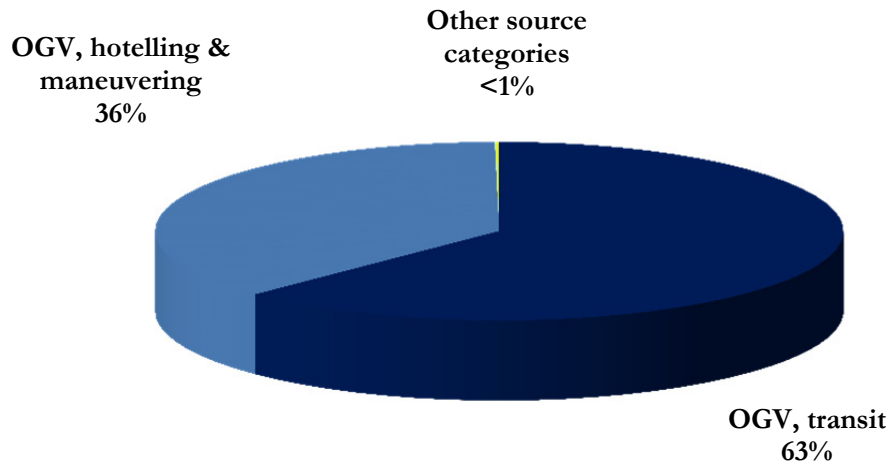


Figure 2.7: 2011 Total Airshed PM<sub>10</sub> Emissions by Source Category

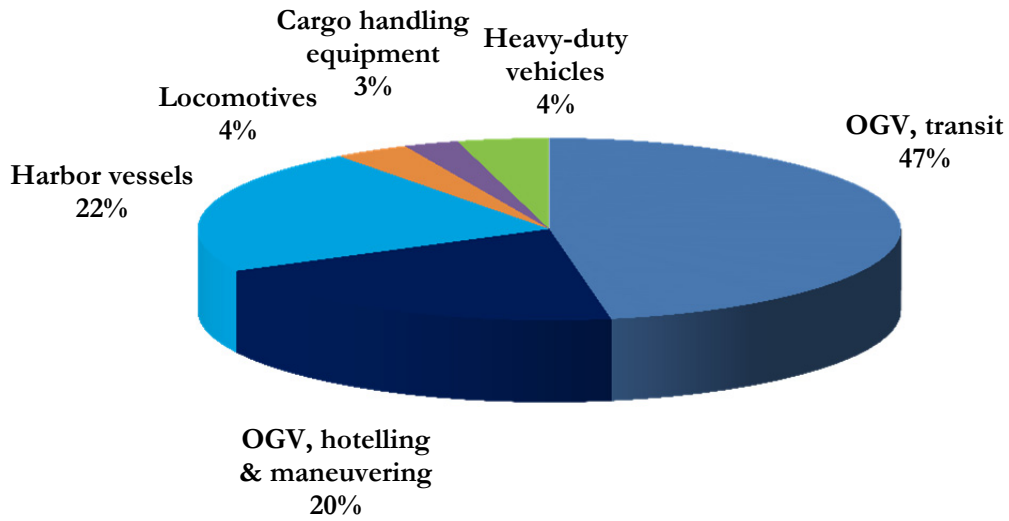


Figure 2.8: 2011 Total Airshed PM<sub>2.5</sub> Emissions by Source Category

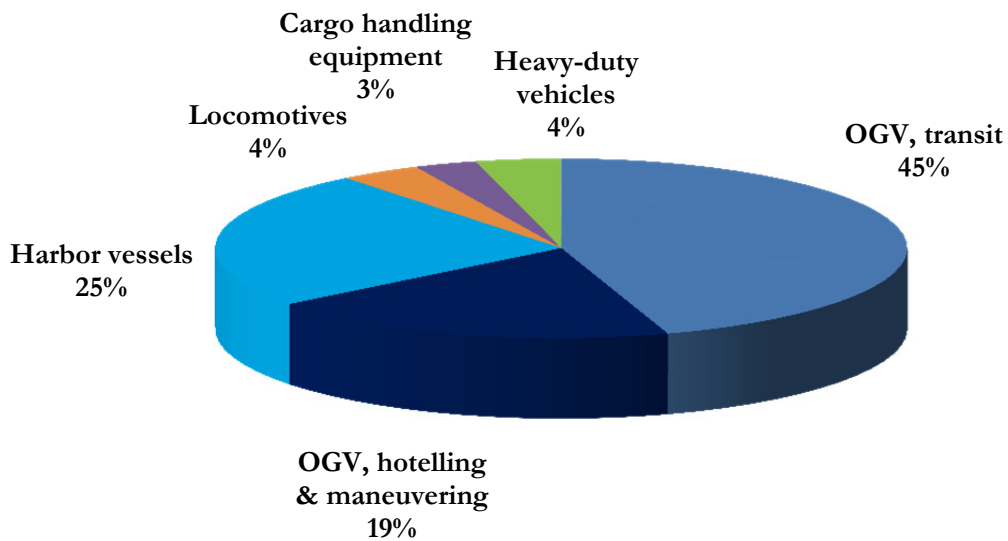


Figure 2.9: 2011 Total Airshed DPM Emissions by Source Category

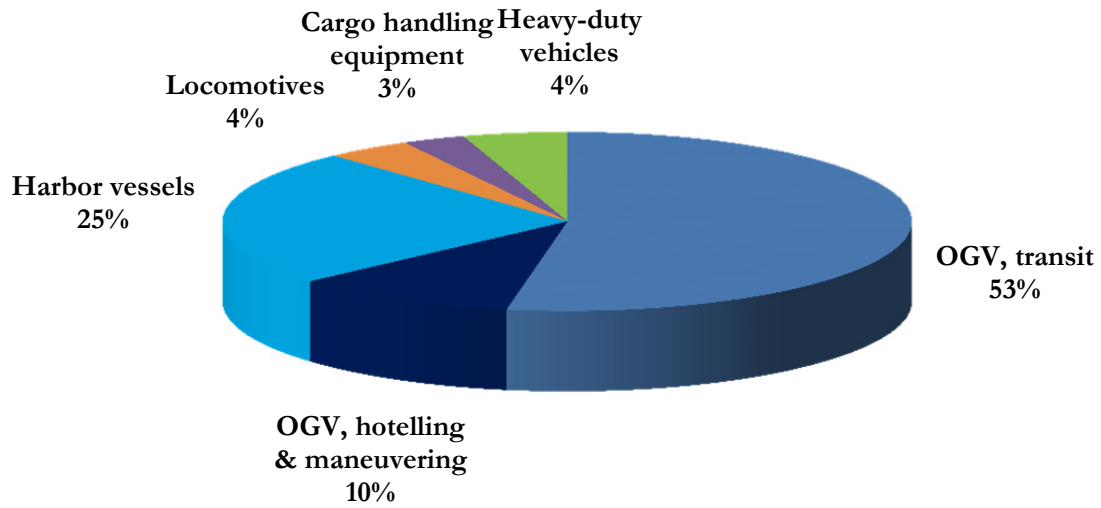
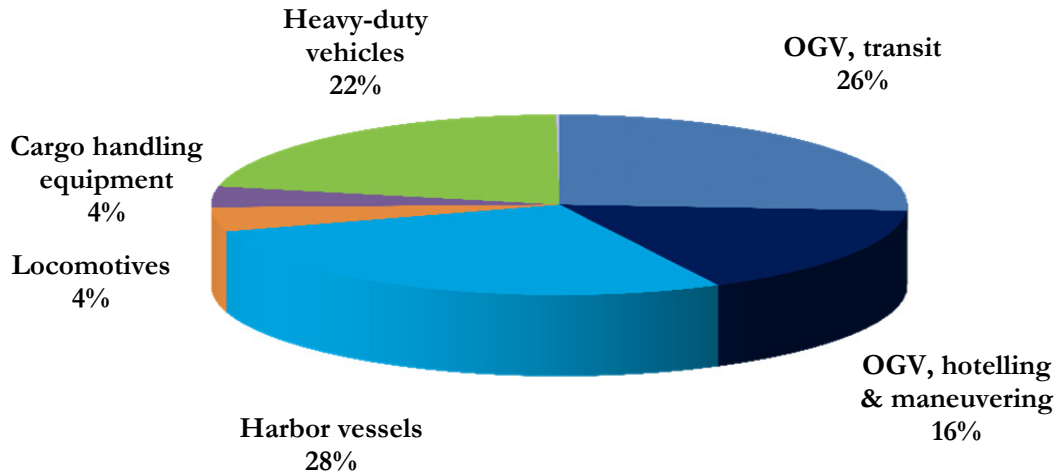


Figure 2.10: 2011 Total Airshed CO<sub>2</sub>e Emissions by Source Category



2.1.2 Maritime Emission by Regional Clean Air Agency

Table 2.3 presents maritime-related emissions by regional clean air agency jurisdiction. Figures 2.11 through 2.18 illustrate emissions by regional clean air agency for NO<sub>x</sub>, VOC, CO, SO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, DPM, and greenhouse gases, respectively. The regional clean air agencies, their acronyms as used in the tables that follow, and the counties within their jurisdictions are:

- Northwest Clean Air Agency (NWCAA) – Island, Skagit, Whatcom, San Juan
- Olympic Region Clean Air Agency (ORCAA) – Clallam, Jefferson, Mason, Thurston
- Puget Sound Clean Air Agency (PSCAA) – Pierce, King, Kitsap, and Snohomish

Maritime-related emissions for San Juan County are included in the totals for the Northwest Clean Air Agency (NWCAA) even though the air program in San Juan County is administered by the WDOE. Pacific and Grays Harbor Counties, which are in the ORCAA jurisdiction, are outside the Puget Sound airshed and this emissions inventory study area.

**Table 2.3: 2011 Total Airshed Emissions by Regional Clean Air Agency, tpy**

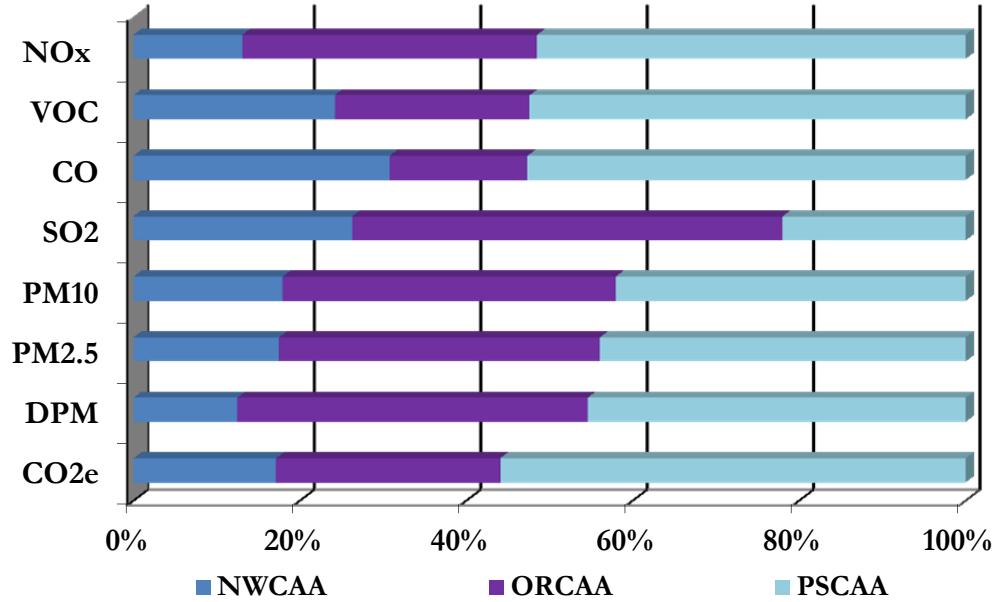
Agency	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
NWCAA	2,988	442	3,663	3,076	233	191	140	296,048
ORCAA	8,074	428	1,970	6,056	521	421	472	465,699
PSCAA	11,851	959	6,271	2,597	550	480	510	974,479
<b>Total</b>	<b>22,912</b>	<b>1,830</b>	<b>11,905</b>	<b>11,729</b>	<b>1,304</b>	<b>1,092</b>	<b>1,122</b>	<b>1,736,226</b>

*Note: Total recreational vessel emissions were allocated based on the location of the marinas and the air district in which the marina is located in, consistent with 2005 allocation approach.*



The 2011 maritime-related emissions are distributed 13-31% for NWCAA, 16-52% for ORCAA, and 22-56% for PSCAA, depending on pollutant.

Figure 2.11: Distribution of Total Airshed Emissions by Regional Clean Air Agency



## 2.2 Emission Comparison, 2011 vs 2005

Table 2.4 compares the 2011 and 2005 ship inbound activity<sup>9</sup>, cargo throughput in twenty-foot-equivalents (TEU), and total cargo tonnage in metric tons (tonnes) for the Ports of Anacortes, Everett, Olympia, Seattle, and Tacoma. Due to the worldwide economic downturn, the overall activity and throughput was down in 2011 for most of the Puget Sound Ports when compared to 2005. Two major container ports in Puget Sound, the Port of Seattle and Port of Tacoma, had lower vessel call counts and TEU throughput. The exceptions are the Port of Everett and Port of Olympia, which increased their vessel calls and tonnage in 2011 as compared to 2005. Overall, the ship inbound activity decreased 9%, TEU decreased 15% and tonnage decreased slightly by 1%.

**Table 2.4: 2011 vs 2005 Port Activity Comparison**

Port	2011 Inbound Activities	2005 Inbound Activities	2011 Throughput (TEU)	2005 Throughput (TEU)	2011 Cargo (tonnes)	2005 Cargo (tonnes)
Anacortes	38	29	na	na	na	na
Everett	103	47	20,918	9,561	152,995	103,757
Olympia	26	20	0	903	711,536	129,512
Seattle	1,136	1,197	2,033,535	2,087,929	22,762,678	20,564,860
Tacoma	875	1,093	1,488,795	2,070,000	17,270,252	20,400,000
<b>Total</b>	<b>2,178</b>	<b>2,386</b>	<b>3,543,248</b>	<b>4,168,393</b>	<b>40,897,461</b>	<b>41,198,129</b>
<b>Change, %</b>	<b>-9%</b>		<b>-15%</b>		<b>-1%</b>	

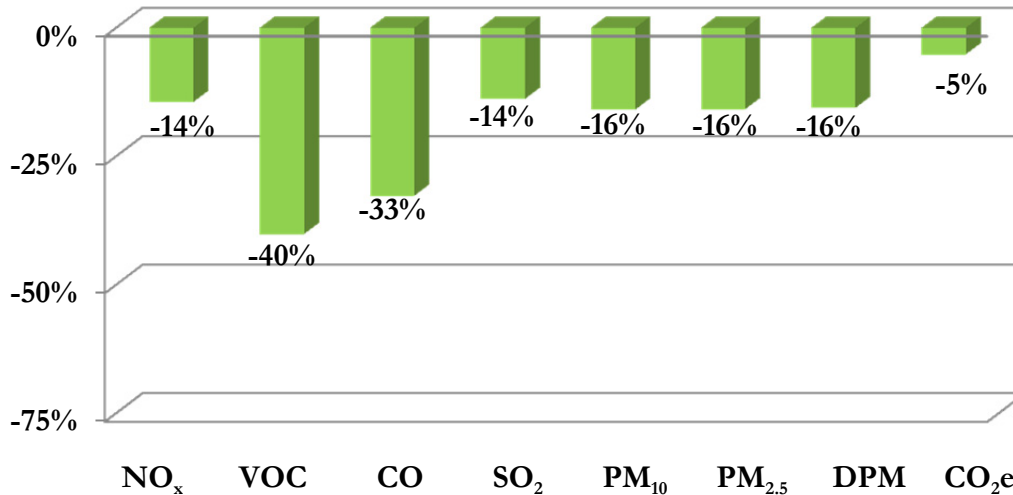
<sup>9</sup>Inbound activity counts are based on MarEx data and only include ocean-going vessel counts arriving directly from sea and shifts from other ports in the inventory domain to the designated port. Barge calls are not included in the ocean-going vessel inbound activity.

Table 2.5 and Figure 2.12 compares the total 2011 maritime-related airshed emissions to 2005 airshed emissions. Airshed emissions reductions ranged from 5% CO<sub>2</sub>e to 40% VOC in 2011 as compared to 2005.

**Table 2.5: 2011 vs 2005 Total Airshed Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	22,912	1,830	11,905	11,729	1,304	1,092	1,122	1,736,226
2005	26,790	3,060	17,686	13,621	1,552	1,298	1,329	1,831,684
<b>Change, tpy</b>	<b>-3,877</b>	<b>-1,230</b>	<b>-5,781</b>	<b>-1,892</b>	<b>-248</b>	<b>-206</b>	<b>-208</b>	<b>-95,457</b>
<b>Change, %</b>	<b>-14%</b>	<b>-40%</b>	<b>-33%</b>	<b>-14%</b>	<b>-16%</b>	<b>-16%</b>	<b>-16%</b>	<b>-5%</b>

**Figure 2.12: 2011 vs 2005 Total Airshed Emissions Change**



*Note: 2005 emissions were recalculated using the same methods used for the 2011 emission estimates. The above figure accounts for these changes so that a direct comparison can be made between 2011 vs 2005.*

For some of the source categories, the emissions calculation methodology was different in 2011 than in 2005 due to improvements or updates to data collection or modeling methods. In order to compare 2011 emissions to 2005 emissions, for those source categories with methodology changes, the 2005 emissions were updated with the 2011 emissions modeling parameter changes, or were otherwise adjusted, in order to compare the directly. For example, 2005 cargo handling equipment and harbor vessel emissions were recalculated to include the updated 2011 load factors. Thus, the 2005 emissions included in this report are different from the published emissions in the 2005 PSEI report, but are more compatible with the 2011 estimates.

Table 2.6 summarizes the maritime related emissions by source category. The ocean-going vessel emissions decreased due to decreased vessel calls, use of shore power, and use of lower sulfur fuel by some vessels/shipping lines while at berth. For harbor vessels, which include commercial harbor, government (non-military), and recreational vessels, VOC and CO emissions decreased because the majority of VOC and CO is contributed by recreational vessels which have lower 2011 emissions due to assumed fleet turn over by the EPA model used to calculate emissions. The EPA's assumed fleet turnover was used because information on actual makeup of the fleet in the Puget Sound region was not available. The harbor vessel SO<sub>2</sub> and PM emissions decreased due to the use of ULSD. Emissions of NO<sub>x</sub>, DPM and CO<sub>2</sub> increased due to the increased activity for commercial harbor vessels especially for category 2 engines and assumed fleet turnover of recreation vessels with 2-stroke engines to 4-stroke engines by the EPA model used to calculate emissions. Locomotive emissions decreased due to lower throughput, improved fuel efficiency, and cleaner locomotive engines. Cargo handling equipment emissions decreased due to decreased activity, use of ULSD, emission reduction retrofits such as DPFs and diesel oxidation catalysts (DOCs), and equipment turnover. Heavy-duty vehicles emissions decreased, except for CO<sub>2</sub>e, which remained essentially the same in 2011 as in 2005. The heavy-duty vehicles emissions decrease is due to fleet turnover, the implementation of the clean truck programs by the Ports of Tacoma and Seattle, and the use of ULSD. For fleet vehicles, the varying emission changes are due to the different fleet mix, reported activity levels, and vehicle fuel types included in the two inventories.

Table 2.6: 2011 vs 2005 Total Airshed Emissions by Source Category, tpy

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
Ocean-going vessels	11,658	442	1,036	11,709.00	879.65	703.72	711.12	737,640
Harbor vessels	7,050	1,124	9,672	5.34	291.52	271.64	277.72	481,123
Locomotives	1,264	80	200	10.51	45.15	41.35	45.15	75,289
Cargo handling equipment	594	37	297	0.60	32.60	31.70	32.60	64,275
Heavy-duty vehicles	2,340	143	666	3.40	55.00	43.50	55.00	375,071
Fleet vehicles	6	3	34	0.05	0.09	0.08	0.04	2,828
<b>Total</b>	<b>22,912</b>	<b>1,830</b>	<b>11,905</b>	<b>11,728.90</b>	<b>1,304.01</b>	<b>1,092.00</b>	<b>1,121.63</b>	<b>1,736,226</b>
<b>2005</b>								
Ocean-going vessels	14,551	509	1,200	12,923.71	1,030.66	822.51	841.99	812,391
Harbor vessels	6,228	2,207	14,455	380.17	293.72	270.58	259.54	450,134
Locomotives	2,156	109	269	168.60	59.11	54.39	59.11	98,495
Cargo handling equipment	832	81	814	61.84	54.89	53.25	54.64	79,581
Heavy-duty vehicles	3,012	148	899	86.70	114.00	97.60	114.00	387,846
Fleet vehicles	10	5	50	0.04	0.08	0.08	0.08	3,237
<b>Total</b>	<b>26,790</b>	<b>3,060</b>	<b>17,686</b>	<b>13,621.05</b>	<b>1,552.46</b>	<b>1,298.41</b>	<b>1,329.37</b>	<b>1,831,684</b>
<b>% Change</b>								
Ocean-going vessels	-20%	-13%	-14%	-9%	-15%	-14%	-16%	-9%
Harbor vessels	13%	-49%	-33%	-99%	-1%	0%	7%	7%
Locomotives	-41%	-27%	-25%	-94%	-24%	-24%	-24%	-24%
Cargo handling equipment	-29%	-54%	-64%	-99%	-41%	-40%	-40%	-19%
Heavy-duty vehicles	-22%	-3%	-26%	-96%	-52%	-55%	-52%	-3%
Fleet vehicles	-34%	-48%	-31%	24%	8%	3%	-47%	-13%
<b>Total</b>	<b>-14%</b>	<b>-40%</b>	<b>-33%</b>	<b>-14%</b>	<b>-16%</b>	<b>-16%</b>	<b>-16%</b>	<b>-5%</b>

### 2.3 Port and Petroleum Facility Summaries

This section includes summaries of U.S. maritime-related emissions associated with the Ports of Anacortes, Everett, Olympia, Seattle, Tacoma, and the petroleum facilities group. For these summaries, the source category emissions were tabulated to be consistent with the 2005 PSEI report format, with the specifics for each port described below.

For the Port of Anacortes, Port of Everett, Port of Olympia, and petroleum facilities comparisons, the source category emissions are tabulated similar to the 2005 report, as follows:

- Port – emissions within port terminals, adjacent rail yards, and adjacent waterways
  - Ocean-going vessel emissions (hotelling and maneuvering activities)
  - Harbor vessel emissions (includes only 10% of total recreational vessel emissions related to port-owned marinas – Ports of Anacortes, Everett, and Olympia)
  - Cargo handling equipment emissions
  - Locomotive emissions (switching activities on-terminal and adjacent rail yards)
  - Heavy-duty vehicle emissions (queuing and on-terminal activities)
  - Fleet vehicle emissions (on-terminal activities)

The following were not included in the Port of Anacortes, Port of Everett, Port of Olympia, and petroleum facilities summaries:

- Ocean-going vessels transiting mode emissions and emissions from activities that are not directly associated with the operations at port terminals or petroleum facilities.
- Harbor vessel emissions from activities that are not directly associated with the operations at Ports of or Anacortes, Everett, or Olympia terminals or petroleum facilities.
- Line-haul locomotive emissions (line-haul activities were not identified at these ports).
- Heavy-duty vehicles on-road emissions outside the ports' terminals.

For 2011, the Port of Seattle and Port of Tacoma increased the resolution from the previous report to get a better understanding of port-related emissions allocating them into three geographical zones, compared to one zone in 2005. For comparison purposes the 2011 and 2005 emissions were allocated into the following three geographical zones:

- Port - emissions within port terminals, adjacent rail yards, and adjacent waterways
  - Ocean-going vessel emissions (hotelling and maneuvering activities)
  - Harbor vessel emissions (port-related commercial harbor and government vessel activities)
  - Harbor vessel emissions (10% of total recreational vessel emissions related to port-owned marinas)
  - Cargo handling equipment emissions

- Locomotive emissions (switching and line haul activities)
- Heavy-duty vehicle emissions (queuing and on-terminal activities)
- Fleet vehicle emissions (on-terminal activities)
  
- Air District - emissions within PSCAA four county boundary (Pierce, King, Kitsap, and Snohomish Counties)
  - Ocean-going vessel emissions (hotelling, maneuvering, and transit emissions)
  - Harbor vessel emissions (port-related commercial harbor and government vessel activities)
  - Harbor vessel emissions (50% of total recreational vessel emissions related to port-owned marinas)
  - Cargo handling equipment emissions
  - Locomotive emissions
  - Heavy-duty vehicle emissions
  - Fleet vehicle emissions
  
- Airshed – emissions within the entire emissions inventory domain
  - Ocean-going vessel emissions (hotelling, maneuvering, and transit emissions)
  - Harbor vessel emissions (port-related commercial harbor and government vessel activities)
  - Harbor vessel emissions (100% of recreational vessel emissions related to port-owned marinas)
  - Cargo handling equipment emissions
  - Locomotive emissions
  - Heavy-duty vehicle emissions
  - Fleet vehicle emissions

The following were not included in the Port of Seattle and Port of Tacoma summaries:

- Ocean-going vessel emissions from activities that are not directly associated with the operations at either the Port of Tacoma or Port of Seattle terminals.
- Harbor vessel emissions from activities that are not directly associated with the operations at either the Port of Tacoma or Port of Seattle terminals

Each port above is highlighted in the following subsections.

2.3.1 Port of Anacortes

Table 2.7 and Figures 2.13 presents 2011 emissions associated with the Port of Anacortes.

**Table 2.7: Port of Anacortes 2011 Port Emissions, tpy**

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	9.5	0.3	0.8	11.37	0.82	0.65	0.66	653
OGV, maneuvering	0.1	0.0	0.0	0.06	0.01	0.00	0.01	3
Recreational vessels	3.4	3.7	36.4	0.01	0.08	0.08	0.02	420
Locomotives	na	na	na	na	na	na	na	na
Cargo handling equipment	0.4	0.1	1.4	0.00	0.00	0.00	0.00	22
Heavy-duty vehicles	0.1	0.0	0.1	0.00	0.00	0.00	0.00	8
Terminal fleet vehicles	0.1	0.0	0.4	0.00	0.00	0.00	0.00	22
<b>Total</b>	<b>13.5</b>	<b>4.1</b>	<b>39.0</b>	<b>11.43</b>	<b>0.91</b>	<b>0.74</b>	<b>0.69</b>	<b>1,129</b>

**Figure 2.13: Port of Anacortes 2011 Port Emissions**

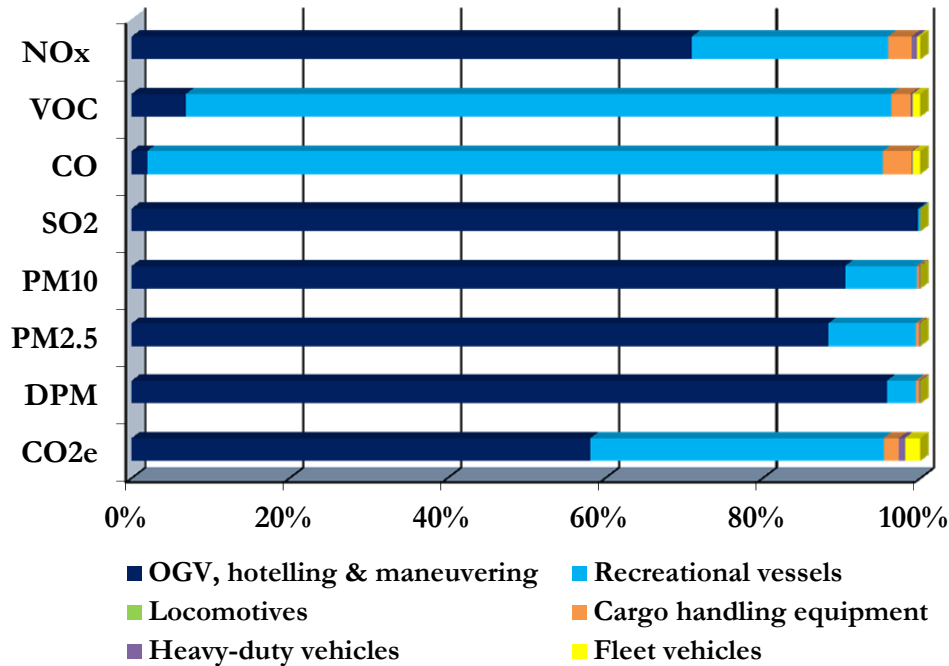




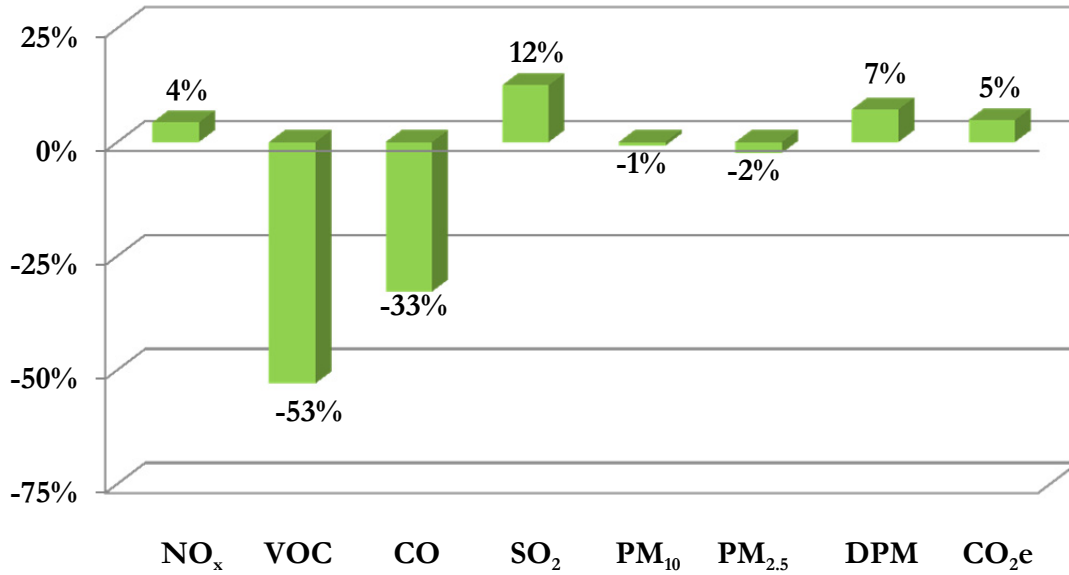
Table 2.8 presents 2011 and 2005 emissions comparison for the Port of Anacortes. For Port of Anacortes, there are no switching locomotive emissions associated with the port, thus not applicable or “na” for locomotives.

**Table 2.8: Port of Anacortes 2011 vs 2005 Port Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	9.57	0.29	0.77	11.427	0.822	0.657	0.663	657
Recreational vessels	3.35	3.69	36.39	0.007	0.081	0.075	0.024	420
Locomotives	na	na	na	na	na	na	na	na
Cargo handling equipment	0.40	0.10	1.40	0.000	0.003	0.003	0.003	22
Heavy-duty vehicles	0.10	0.01	0.06	0.000	0.001	0.001	0.001	8
Terminal fleet vehicles	0.06	0.04	0.40	0.000	0.001	0.001	0.000	22
<b>Total</b>	<b>13.48</b>	<b>4.13</b>	<b>39.02</b>	<b>11.434</b>	<b>0.907</b>	<b>0.737</b>	<b>0.691</b>	<b>1,129</b>
<b>2005</b>								
OGV, hotelling & maneuvering	8.62	0.26	0.70	10.054	0.731	0.585	0.603	577
Recreational vessels	3.87	8.41	56.40	0.091	0.171	0.159	0.029	453
Locomotives	na	na	na	na	na	na	na	na
Cargo handling equipment	0.24	0.04	0.40	0.019	0.010	0.009	0.009	15
Heavy-duty vehicles	0.14	0.01	0.09	0.003	0.003	0.003	0.003	13
Terminal fleet vehicles	0.06	0.06	0.48	0.000	0.000	0.000	0.000	19
<b>Total</b>	<b>12.92</b>	<b>8.77</b>	<b>58.06</b>	<b>10.166</b>	<b>0.914</b>	<b>0.755</b>	<b>0.644</b>	<b>1,077</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	11%	11%	11%	14%	12%	12%	10%	14%
Recreational vessels	-13%	-56%	-35%	-93%	-53%	-52%	-19%	-7%
Locomotives	na	na	na	na	na	na	na	na
Cargo handling equipment	68%	174%	252%	-98%	-70%	-69%	-69%	43%
Heavy-duty vehicles	-28%	-13%	-36%	-100%	-66%	-63%	-66%	-36%
Terminal fleet vehicles	-8%	-30%	-17%	na	na	na	na	18%
<b>Total</b>	<b>4%</b>	<b>-53%</b>	<b>-33%</b>	<b>12%</b>	<b>-1%</b>	<b>-2%</b>	<b>7%</b>	<b>5%</b>

Figure 2.14 presents the Port of Anacortes's port emissions change for 2011 vs 2005.

**Figure 2.14: Port of Anacortes 2011 vs 2005 Port Emissions Change**



2.3.2 Port of Everett

Table 2.9 and Figure 2.15 present emissions associated with the Port of Everett.

**Table 2.9: Port of Everett 2011 Port Emissions, tpy**

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	46	1	4	52.60	3.88	3.11	3.30	3,019
OGV, maneuvering	1	0	0	0.71	0.06	0.05	0.06	41
Recreational vessels	8	8	83	0.02	0.18	0.17	0.05	956
Locomotives	62	5	9	0.50	2.20	2.00	2.20	3,298
Cargo handling equipment	23	2	25	0.01	2.30	2.20	2.30	1,375
Heavy-duty vehicles	0	0	0	0.00	0.00	0.00	0.00	12
Terminal fleet vehicles	1	1	7	0.00	0.01	0.01	0.00	273
<b>Total</b>	<b>141</b>	<b>18</b>	<b>128</b>	<b>53.85</b>	<b>8.64</b>	<b>7.53</b>	<b>7.92</b>	<b>8,972</b>

**Figure 2.15: Port of Everett 2011 Port Emissions**

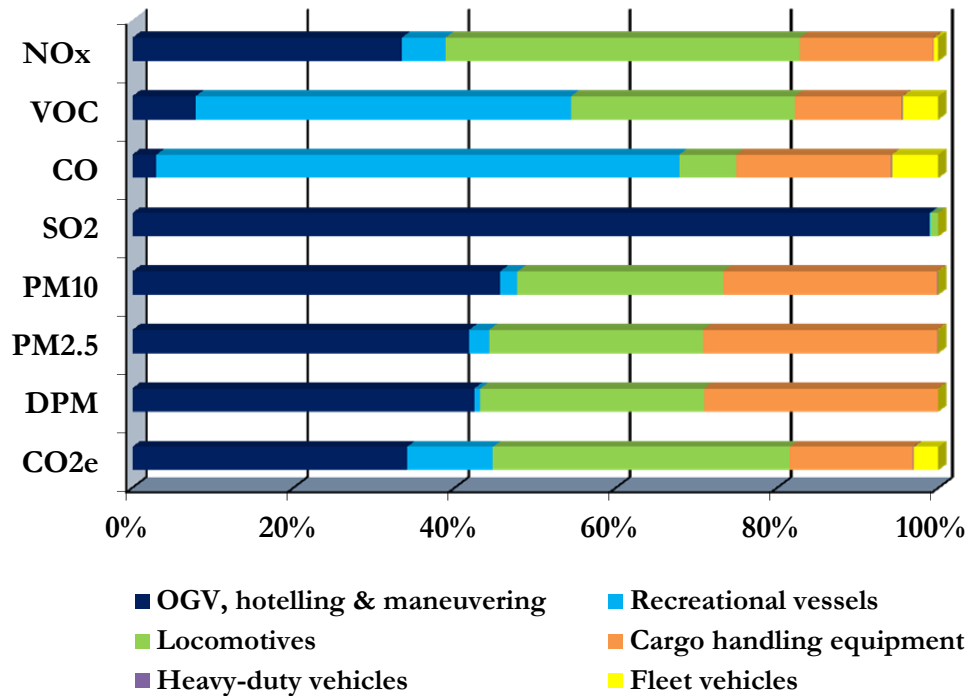


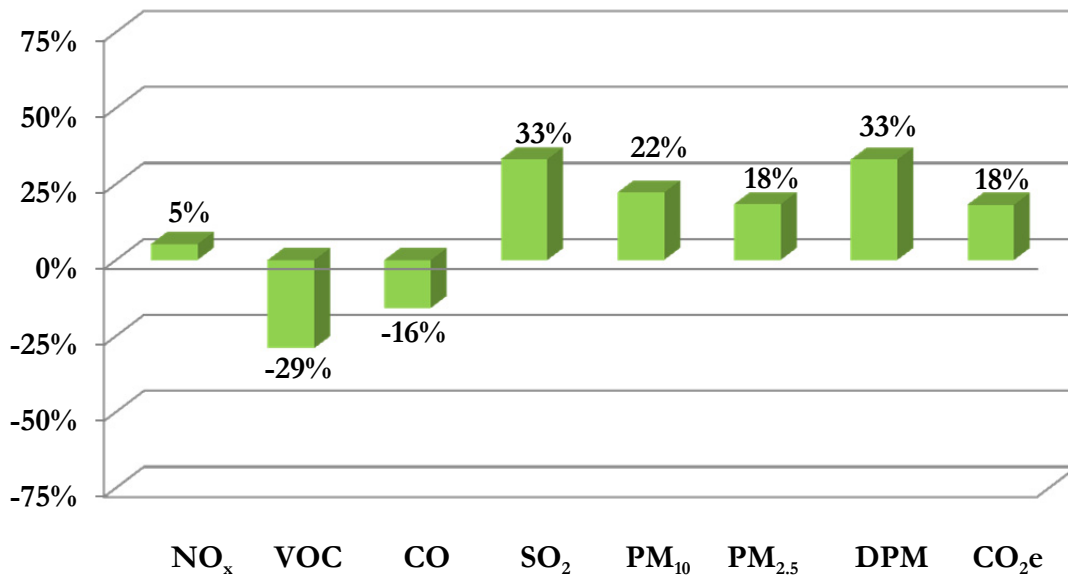
Table 2.10 presents 2011 and 2005 emissions comparison for the Port of Everett.

**Table 2.10: Port of Everett 2011 vs 2005 Port Emissions Comparison, tpy**

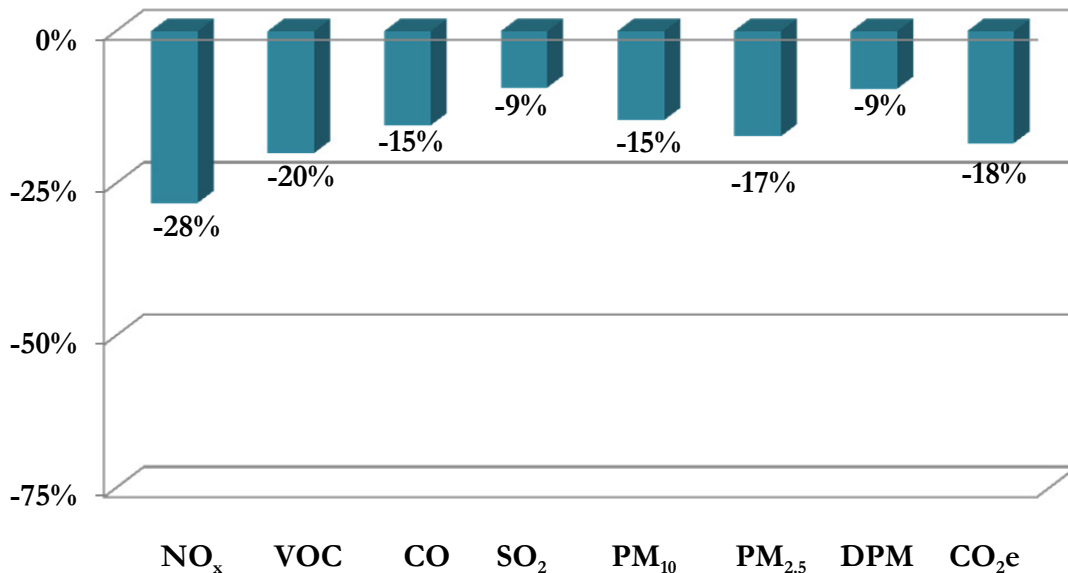
	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	47.2	1.4	3.8	53.31	3.94	3.15	3.36	3,059
Recreational vessels	7.6	8.4	82.8	0.02	0.18	0.17	0.05	956
Locomotives	62.1	5.0	9.0	0.50	2.20	2.00	2.20	3,298
Cargo handling equipment	23.4	2.4	24.6	0.01	2.30	2.20	2.30	1,375
Heavy-duty vehicles	0.1	0.0	0.1	0.00	0.00	0.00	0.00	12
Terminal fleet vehicles	0.8	0.8	7.4	0.00	0.01	0.01	0.00	273
<b>Total</b>	<b>141.2</b>	<b>18.0</b>	<b>127.7</b>	<b>53.85</b>	<b>8.64</b>	<b>7.53</b>	<b>7.92</b>	<b>8,972</b>
<b>2005</b>								
OGV, hotelling & maneuvering	21.7	0.7	1.7	33.64	2.20	1.76	1.38	1,983
Recreational vessels	7.9	17.2	115.6	0.19	0.35	0.33	0.06	929
Locomotives	79.8	4.6	8.4	4.91	2.03	1.87	2.03	3,057
Cargo handling equipment	23.0	2.4	22.1	1.66	2.46	2.38	2.45	1,406
Heavy-duty vehicles	1.0	0.1	0.7	0.02	0.02	0.02	0.02	90
Terminal fleet vehicles	0.7	0.4	3.1	0.01	0.01	0.01	0.01	126
<b>Total</b>	<b>134.2</b>	<b>25.4</b>	<b>151.6</b>	<b>40.42</b>	<b>7.07</b>	<b>6.36</b>	<b>5.95</b>	<b>7,590</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	117%	114%	121%	59%	79%	79%	143%	54%
Recreational vessels	-4%	-51%	-28%	-92%	-48%	-47%	-10%	3%
Locomotives	-22%	8%	7%	-90%	8%	7%	8%	8%
Cargo handling equipment	2%	1%	11%	-99%	-6%	-8%	-6%	-2%
Heavy-duty vehicles	-88%	-88%	-91%	-100%	-90%	-95%	-90%	-87%
Terminal fleet vehicles	8%	96%	138%	0%	-10%	-20%	-78%	116%
<b>Total</b>	<b>5%</b>	<b>-29%</b>	<b>-16%</b>	<b>33%</b>	<b>22%</b>	<b>18%</b>	<b>33%</b>	<b>18%</b>

Figure 2.16 presents the Port of Everett’s port emissions change for 2011 vs 2005, while Figure 2.17 presents a simple metric of tons of emissions (excluding port-related recreational vessels) per 10,000 tonnes of cargo in 2011 and 2005. The port tons of emissions per 10,000 tonnes of cargo decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005.

**Figure 2.16: Port of Everett 2011 vs 2005 Port Emissions Change**



**Figure 2.17: Port of Everett 2011 vs 2005 Port Emissions 10,000 Tonnes of Cargo Change**



2.3.3 Port of Olympia

Table 2.11 and Figures 2.18 present emissions associated with the Port of Olympia.

Table 2.11: Port of Olympia 2011 Port Emissions, tpy

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	7.39	0.24	0.63	13.18	0.84	0.67	0.50	771
OGV, maneuvering	0.16	0.00	0.01	0.14	0.01	0.01	0.01	8
Recreational vessels	2.35	2.58	25.48	0.00	0.06	0.05	0.02	294
Locomotives, near-port	3.70	0.20	0.40	0.00	0.10	0.10	0.10	164.0
Cargo handling equipment	42.90	2.70	17.40	0.04	2.60	2.50	2.60	4,408
Heavy-duty vehicles, on-terminal	0.09	0.00	0.06	0.00	0.00	0.00	0.00	8
Terminal fleet vehicles	0.01	0.00	0.03	0.00	0.00	0.00	0.00	2
<b>Total</b>	<b>56.58</b>	<b>5.73</b>	<b>44.02</b>	<b>13.37</b>	<b>3.61</b>	<b>3.34</b>	<b>3.23</b>	<b>5,654</b>

Figure 2.18: Port of Olympia 2011 Port Emissions

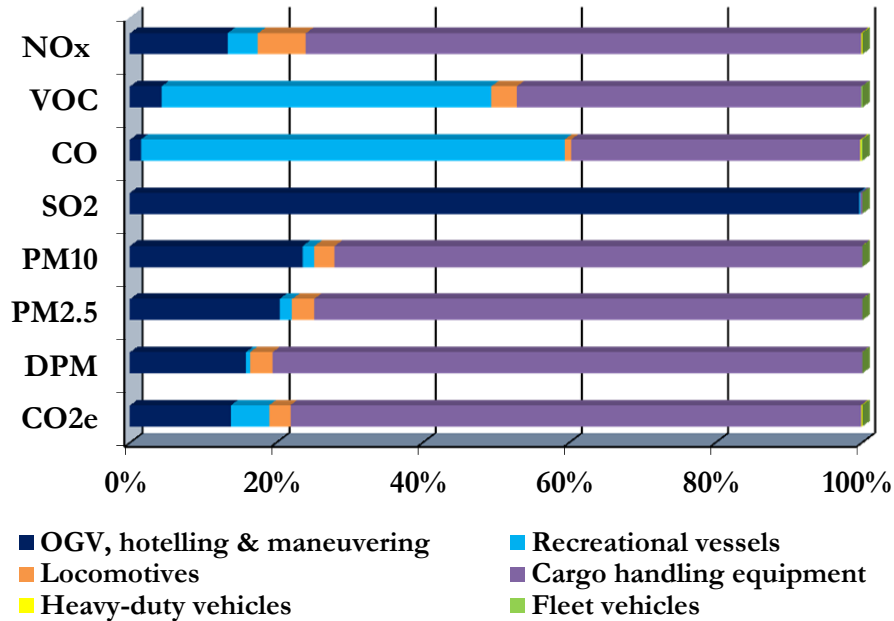


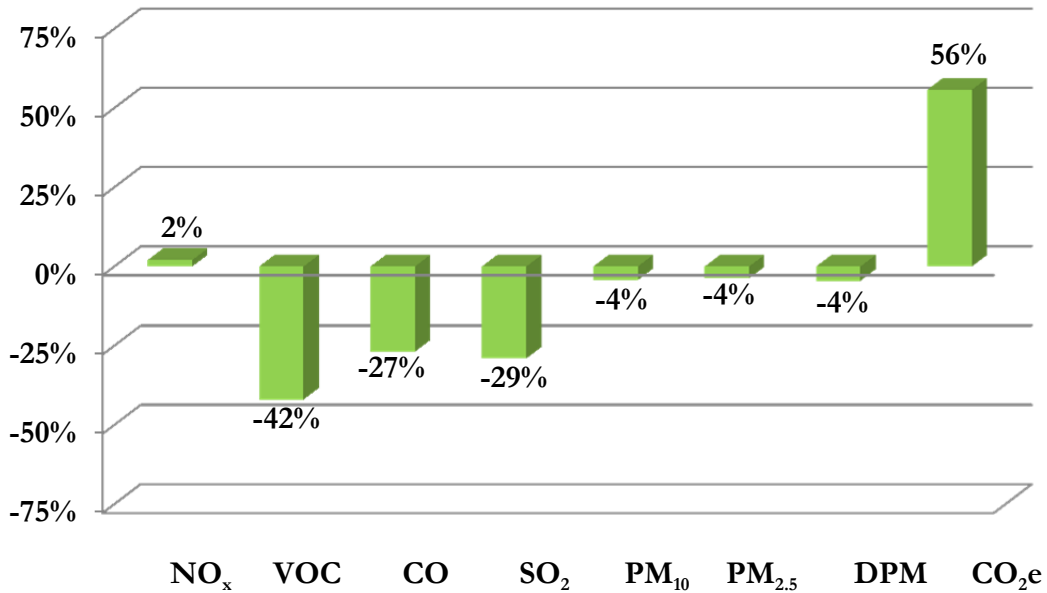
Table 2.12 presents 2011 and 2005 emissions comparison for the Port of Olympia.

**Table 2.12: Port of Olympia 2011 vs 2005 Port Emissions Comparison, tpy**

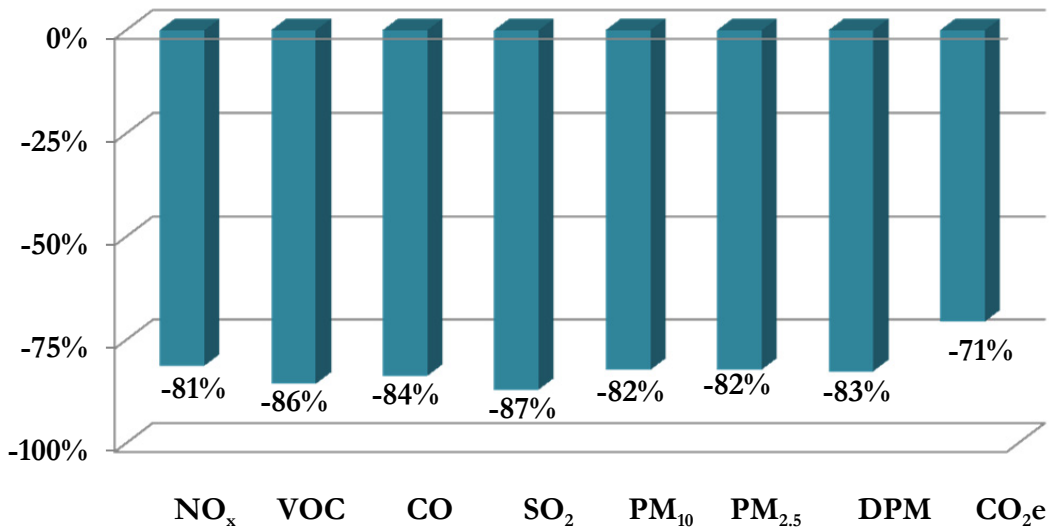
	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	7.5	0.2	0.6	13.33	0.853	0.682	0.511	779
Recreational vessels	2.3	2.6	25.5	0.00	0.056	0.053	0.017	294
Locomotives	3.7	0.2	0.4	0.00	0.100	0.100	0.100	164
Cargo handling equipment	42.9	2.7	17.4	0.04	2.600	2.500	2.600	4,408
Heavy-duty vehicles	0.1	0.0	0.1	0.00	0.001	0.001	0.001	8
Terminal fleet vehicles	0.0	0.0	0.0	0.00	0.000	0.000	0.000	2
<b>Total</b>	<b>56.6</b>	<b>5.7</b>	<b>44.0</b>	<b>13.37</b>	<b>3.610</b>	<b>3.336</b>	<b>3.229</b>	<b>5,654</b>
<b>2005</b>								
OGV, hotelling & maneuvering	10.7	0.3	0.8	14.60	0.990	0.792	0.700	846
Recreational vessels	2.7	5.9	39.5	0.06	0.120	0.111	0.021	317
Locomotives	15.0	0.9	1.6	0.92	0.381	0.350	0.381	574
Cargo handling equipment	25.8	2.7	17.5	3.23	2.256	2.188	2.253	1,774
Heavy-duty vehicles	1.3	0.1	0.9	0.02	0.027	0.025	0.027	119
Terminal fleet vehicles	na	na	na	na	na	na	na	na
<b>Total</b>	<b>55.5</b>	<b>9.9</b>	<b>60.2</b>	<b>18.84</b>	<b>3.773</b>	<b>3.466</b>	<b>3.381</b>	<b>3,630</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-30%	-22%	-23%	-9%	-14%	-14%	-27%	-8%
Recreational vessels	-13%	-56%	-35%	-93%	-53%	-52%	-19%	-7%
Locomotives	-75%	-77%	-75%	-100%	-74%	-71%	-74%	-71%
Cargo handling equipment	66%	0%	0%	-99%	15%	14%	15%	148%
Heavy-duty vehicles	-93%	-100%	-93%	-100%	-96%	-96%	-96%	-93%
Terminal fleet vehicles	na	na	na	na	na	na	na	na
<b>Total</b>	<b>2%</b>	<b>-42%</b>	<b>-27%</b>	<b>-29%</b>	<b>-4%</b>	<b>-4%</b>	<b>-4%</b>	<b>56%</b>

Figure 2.19 presents the Port of Olympia’s port emissions change for 2011 vs 2005, while Figure 2.20 presents a simple metric of tons of emissions (excluding port-related recreational vessels) per 10,000 tonnes of cargo in 2011 and 2005. The port tons of emissions per 10,000 tonnes of cargo significantly decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005.

**Figure 2.19: Port of Olympia 2011 vs 2005 Port Emissions Change**



**Figure 2.20: Port of Olympia 2011 vs 2005 Port Emissions per 10,000 Tonnes of Cargo Metric Change**





2.3.4 Port of Seattle

Table 2.13 and Figures 2.21 present the 2011 port emissions associated with the Port of Seattle operations.

Table 2.13: Port of Seattle 2011 Port Emissions, tpy

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	679	22	59	551.53	42.38	33.90	33.32	51,492
OGV, maneuvering	69	4	8	48.98	5.31	4.25	5.30	2,986
OGV, transit	0	0	0	0.00	0.00	0.00	0.00	0
Harbor vessels	334	22	72	0.21	13.24	12.21	13.04	20,415
Recreational vessels	6	6	61	0.01	0.14	0.13	0.04	708
Locomotives	290	20	45	2.54	10.50	9.60	10.50	16,828
Cargo handling equipment	306	18	158	0.30	16.70	16.20	16.70	34,561
Heavy-duty vehicles	68	6	38	0.07	0.82	0.76	0.82	7,038
Terminal fleet vehicles	3	1	12	0.02	0.03	0.03	0.02	1,053
<b>Total</b>	<b>1,754</b>	<b>99</b>	<b>454</b>	<b>603.65</b>	<b>89.13</b>	<b>77.08</b>	<b>79.74</b>	<b>135,083</b>

Figure 2.21: Port of Seattle 2011 Port Emissions Contribution by Source Category

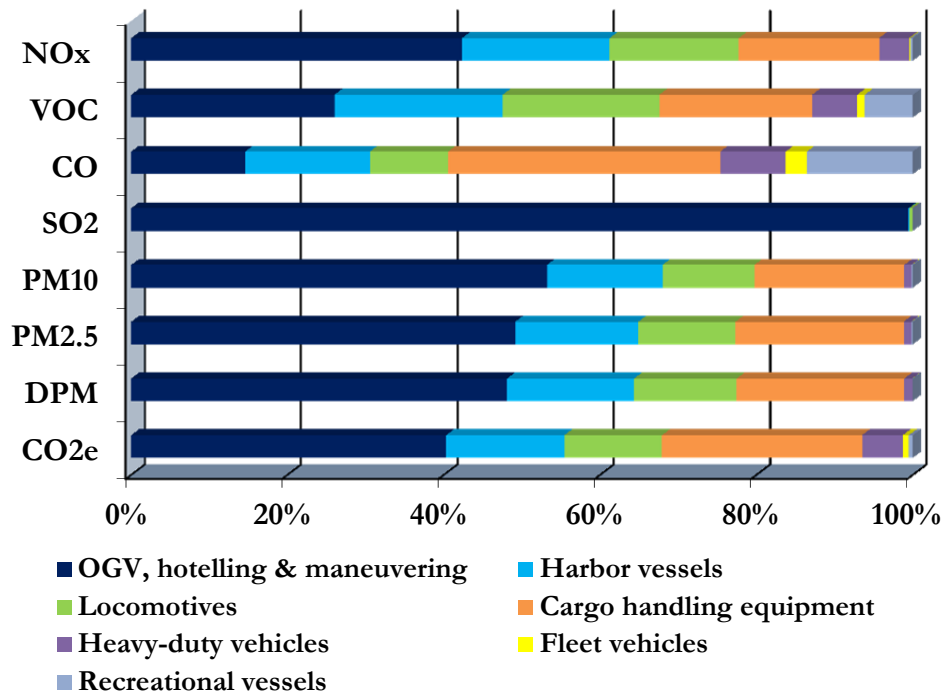


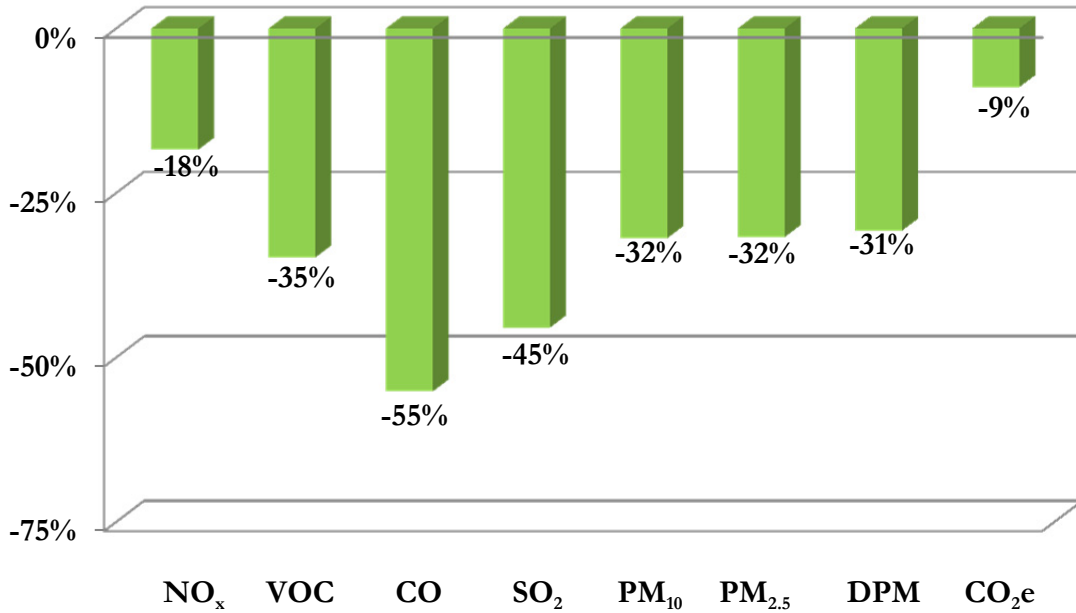
Table 2.14 presents 2011 and 2005 port emissions comparisons for the Port of Seattle.

**Table 2.14: Port of Seattle 2011 vs 2005 Port Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
<b>2011</b>								
OGV, hotelling & maneuvering	748	26	66	600.51	47.69	38.15	38.62	54,479
OGV, transit	0	0	0	0.00	0.00	0.00	0.00	0
Commercial harbor vessels	334	22	72	0.21	13.24	12.21	13.04	20,415
Recreational vessels	6	6	61	0.05	0.14	0.14	0.04	708
Locomotives	290	20	45	2.54	10.50	9.60	10.50	16,828
Cargo handling equipment	306	18	158	0.30	16.70	16.20	16.70	34,561
Heavy-duty vehicles	68	6	38	0.07	0.82	0.76	0.82	7,038
Terminal fleet vehicles	3	1	12	0.02	0.03	0.03	0.02	1,053
<b>Total</b>	<b>1,754</b>	<b>99</b>	<b>454</b>	<b>603.69</b>	<b>89.12</b>	<b>77.09</b>	<b>79.75</b>	<b>135,083</b>
<b>2005</b>								
OGV, hotelling & maneuvering	861	28	72	978.73	73.84	59.08	58.86	60,474
OGV, transit	0	0	0	0.00	0.00	0.00	0.00	0
Commercial harbor vessels	316	22	66	33.74	13.79	12.71	13.58	18,073
Recreational vessels	7	15	104	0.17	0.31	0.29	0.05	832
Locomotives	448	25	55	40.22	13.27	12.21	13.27	20,561
Cargo handling equipment	418	51	616	52.27	27.62	26.80	27.40	38,135
Heavy-duty vehicles	96	8	67	1.82	1.99	1.83	1.99	8,884
Terminal fleet vehicles	5	3	31	0.02	0.02	0.02	0.02	1,403
<b>Total</b>	<b>2,151</b>	<b>152</b>	<b>1,012</b>	<b>1,106.95</b>	<b>130.85</b>	<b>112.93</b>	<b>115.18</b>	<b>148,362</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-13%	-7%	-8%	-39%	-35%	-35%	-34%	-10%
OGV, transit	na	na	na	na	na	na	na	na
Commercial harbor vessels	6%	-1%	9%	-99%	-4%	-4%	-4%	13%
Recreational vessels	-20%	-60%	-41%	-71%	-55%	-52%	-14%	-15%
Locomotives	-35%	-19%	-18%	-94%	-21%	-21%	-21%	-18%
Cargo handling equipment	-27%	-64%	-74%	-99%	-40%	-40%	-39%	-9%
Heavy-duty vehicles	-29%	-28%	-43%	-96%	-59%	-59%	-59%	-21%
Terminal fleet vehicles	-43%	-70%	-60%	20%	67%	60%	-19%	-25%
<b>Total</b>	<b>-18%</b>	<b>-35%</b>	<b>-55%</b>	<b>-45%</b>	<b>-32%</b>	<b>-32%</b>	<b>-31%</b>	<b>-9%</b>

Figure 2.22 presents the Port of Seattle’s port emissions changes 2011 vs 2005, while Figures 2.23 and 2.24 present the 2011 and 2005 change in a simple metric of TEU and cargo emissions efficiency, expressed in tons of emissions per 10,000 TEU and 10,000 tonnes of cargo basis, respectively. It should be noted that although port-related recreational vessel emissions are included in Table 2.14, they are not included in Figures 2.22, 2.23, and 2.24 because they are not associated with the movement of cargo and that port-related cruise ship emissions are included in these simple metrics.

**Figure 2.22: Port of Seattle 2011 vs 2005 Port Emissions Change**



**Figure 2.23: Port of Seattle 2011 vs 2005 Port Emissions per 10,000 TEU Change**

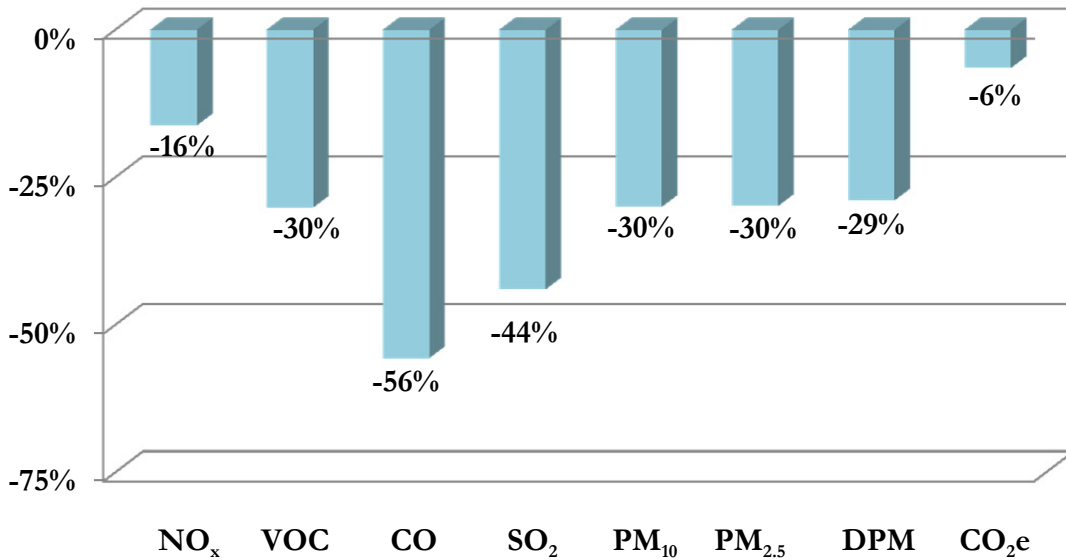


Figure 2.24: Port of Seattle 2011 vs 2005 Port Emissions per 10,000 Tonnes of Cargo Change

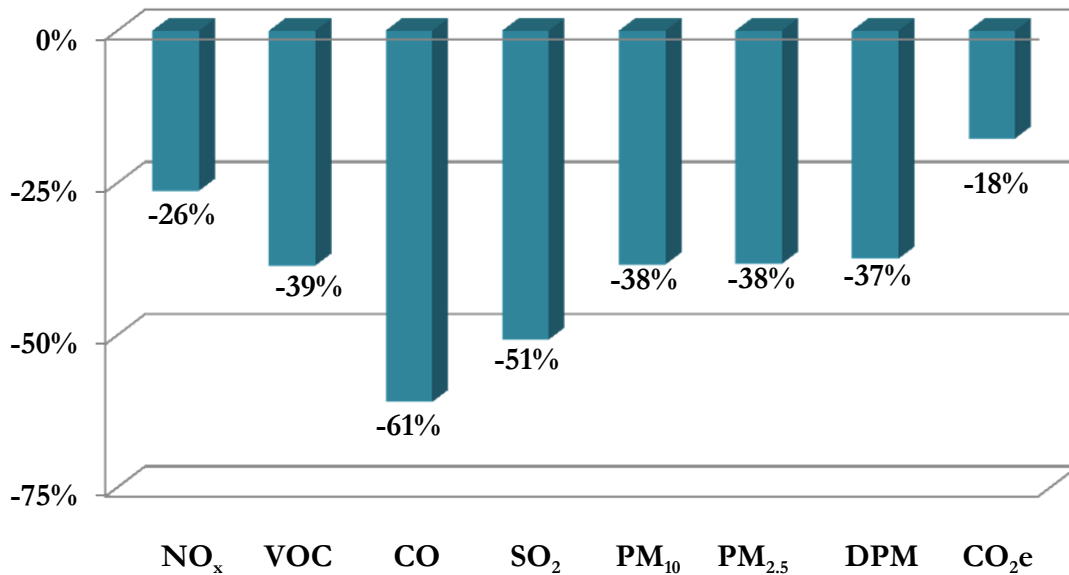


Table 2.15 presents the Port of Seattle's 2011 air district emissions by source category.

Table 2.15: Port of Seattle 2011 Air District Emissions, tpy

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	679	22	59	552	42	34	33	51,492
OGV, maneuvering	69	4	8	49	5	4	5	2,986
OGV, transit	570	22	52	449	38	30	37	29,033
Commercial harbor vessels	371	23	77	0	15	14	14	22,474
Recreational vessels	28	31	307	0	1	1	0	3,541
Locomotives	617	38	100	6	23	21	23	37,829
Cargo handling equipment	306	18	158	0	17	16	17	34,561
Heavy-duty vehicles	1,052	70	331	2	20	18	20	171,303
Terminal fleet vehicles	3	1	12	0	0	0	0	1,053
<b>Total</b>	<b>3,695</b>	<b>230</b>	<b>1,103</b>	<b>1,058</b>	<b>160</b>	<b>138</b>	<b>149</b>	<b>354,274</b>

Table 2.16 presents a per-county resolution of the Port of Seattle's 2011 ocean-going vessel emissions in the PSCAA air district.

**Table 2.16: Port of Seattle 2011 Air District OGV Emissions by County by Mode, tpy**

County	Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
King	hotelling & maneuvering	748	26	66	601	48	38	39	54,479
	transit	152	6	15	119	10	8	10	7,597
Kitsap	transit	382	14	34	302	25	20	24	19,672
Pierce	transit	4	0	1	2	0	0	0	143
Snohomish	transit	33	1	3	26	2	2	2	1,622
<b>Total</b>		<b>1,318</b>	<b>49</b>	<b>118</b>	<b>1,050</b>	<b>85</b>	<b>68</b>	<b>75</b>	<b>83,512</b>

Table 2.17 presents the 2011 airshed emissions associated with the Port of Seattle.

**Table 2.17: Port of Seattle 2011 Airshed Emissions, tpy**

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	679	22	59	552	42	34	33	51,492
OGV, maneuvering	69	4	8	49	5	4	5	2,986
OGV, transit	4,106	158	366	3,151	265	212	258	202,078
Commercial harbor vessels	418	24	82	0	16	15	16	25,048
Recreational vessels	57	62	614	0	1	1	0	7,083
Locomotives	679	42	111	6	25	23	25	41,797
Cargo handling equipment	306	18	158	0	17	16	17	34,561
Heavy-duty vehicles	1,270	83	390	2	25	23	25	206,887
Terminal fleet vehicles	3	1	12	0	0	0	0	1,053
<b>Total</b>	<b>7,586</b>	<b>414</b>	<b>1,799</b>	<b>3,760</b>	<b>397</b>	<b>328</b>	<b>380</b>	<b>572,986</b>

Table 2.18 presents 2011 and 2005 airshed emissions comparison for the Port of Seattle.

**Table 2.18: Port of Seattle 2011 vs 2005 Airshed Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
<b>2011</b>								
OGV, hotelling & maneuvering	748	26	66	600.51	47.69	38.15	38.62	54,479
OGV, transit	4,106	158	366	3,150.77	264.57	211.66	257.71	202,078
Commercial harbor vessels	418	24	82	0.25	16.43	15.15	16.23	25,048
Recreational vessels	57	62	614	0.11	1.36	1.27	0.40	7083
Locomotives	680	42	111	6.15	24.85	22.85	24.85	41,870
Cargo handling equipment	306	18	158	0.30	16.70	16.20	16.70	34,561
Heavy-duty vehicles	1,270	83	390	1.81	25.27	22.55	25.27	206,887
Terminal fleet vehicles	3	1	12	0.02	0.03	0.03	0.02	1,053
<b>Total</b>	<b>7,588</b>	<b>414</b>	<b>1,799</b>	<b>3,759.93</b>	<b>396.90</b>	<b>327.86</b>	<b>379.80</b>	<b>573,059</b>
<b>2005</b>								
OGV, hotelling & maneuvering	861	28	72	978.73	73.84	59.08	58.86	60,474
OGV, transit	5,639	198	461	3,521.17	336.38	269.11	327.21	226,887
Commercial harbor vessels	534	26	96	55.46	22.36	20.59	22.14	29,737
Recreational vessels	71	154	1,035	1.67	3.14	2.91	0.54	8317
Locomotives	1,026	52	131	84.31	28.90	26.59	28.90	47,898
Cargo handling equipment	418	51	616	52.27	27.62	26.80	27.40	38,135
Heavy-duty vehicles	1,506	75	465	42.94	53.60	48.25	53.60	192,389
Terminal fleet vehicles	5	3	31	0.02	0.02	0.02	0.02	1,403
<b>Total</b>	<b>10,060</b>	<b>587</b>	<b>2,907</b>	<b>4,736.54</b>	<b>545.87</b>	<b>453.34</b>	<b>518.69</b>	<b>605,240</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-13%	-7%	-8%	-39%	-35%	-35%	-34%	-10%
OGV, transit	-27%	-20%	-21%	-11%	-21%	-21%	-21%	-11%
Commercial harbor vessels	-22%	-8%	-14%	-100%	-27%	-26%	-27%	-16%
Recreational vessels	-20%	-60%	-41%	-93%	-57%	-56%	-26%	-15%
Locomotives	-34%	-19%	-15%	-93%	-14%	-14%	-14%	-13%
Cargo handling equipment	-27%	-64%	-74%	-99%	-40%	-40%	-39%	-9%
Heavy-duty vehicles	-16%	10%	-16%	-96%	-53%	-53%	-53%	8%
Terminal fleet vehicles	-43%	-70%	-60%	20%	67%	60%	-19%	-25%
<b>Total</b>	<b>-25%</b>	<b>-29%</b>	<b>-38%</b>	<b>-21%</b>	<b>-27%</b>	<b>-28%</b>	<b>-27%</b>	<b>-5%</b>

Figure 2.25 presents the Port of Seattle’s airshed emissions change for 2011 vs 2005, while Figures 2.26 and 2.27 present the 2011 and 2005 change in a simple metric of TEU and cargo emissions efficiency, expressed in tons of emissions per 10,000 TEU and 10,000 tonnes of cargo basis, respectively. It should be noted that port-related recreational vessel emissions are not included because they are not associated with the movement of cargo and that port-related cruise ship emissions are included in these simple metrics.

Figure 2.25: Port of Seattle 2011 vs 2005 Airshed Emissions Change

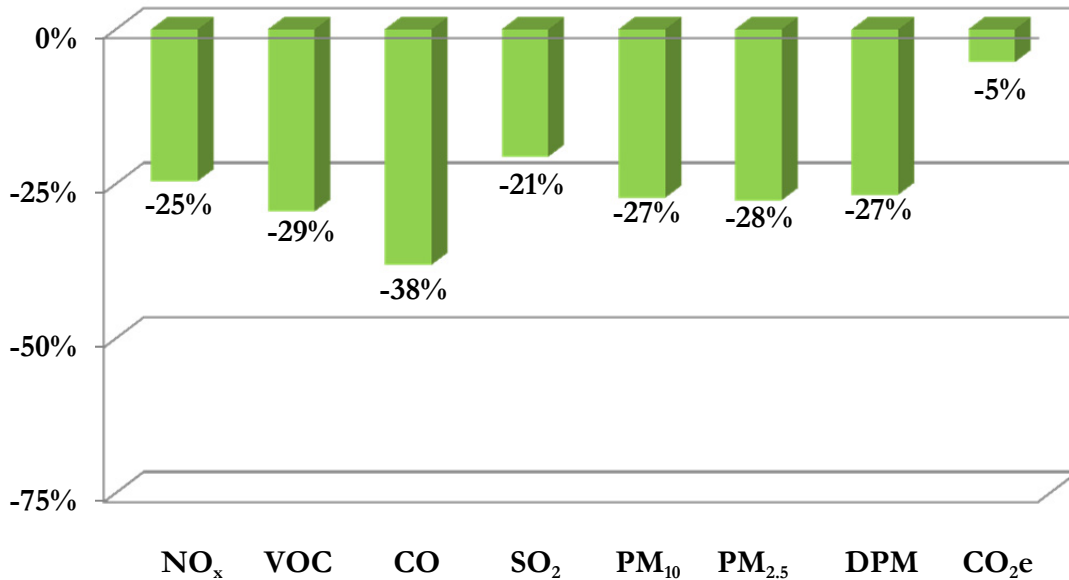


Figure 2.26: Port of Seattle 2011 vs 2005 Airshed Emissions per 10,000 TEU Change

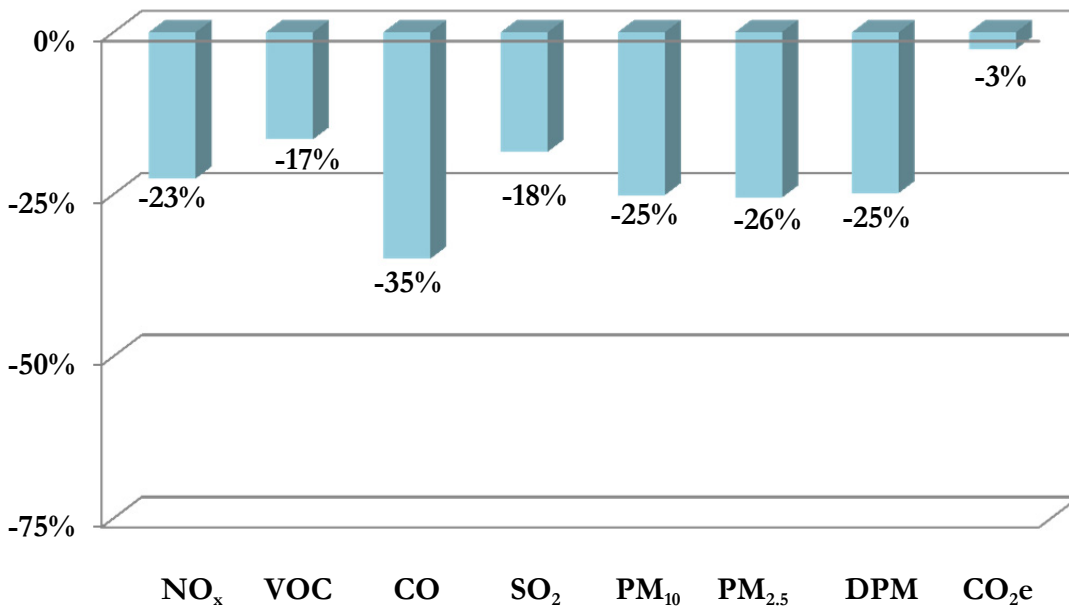
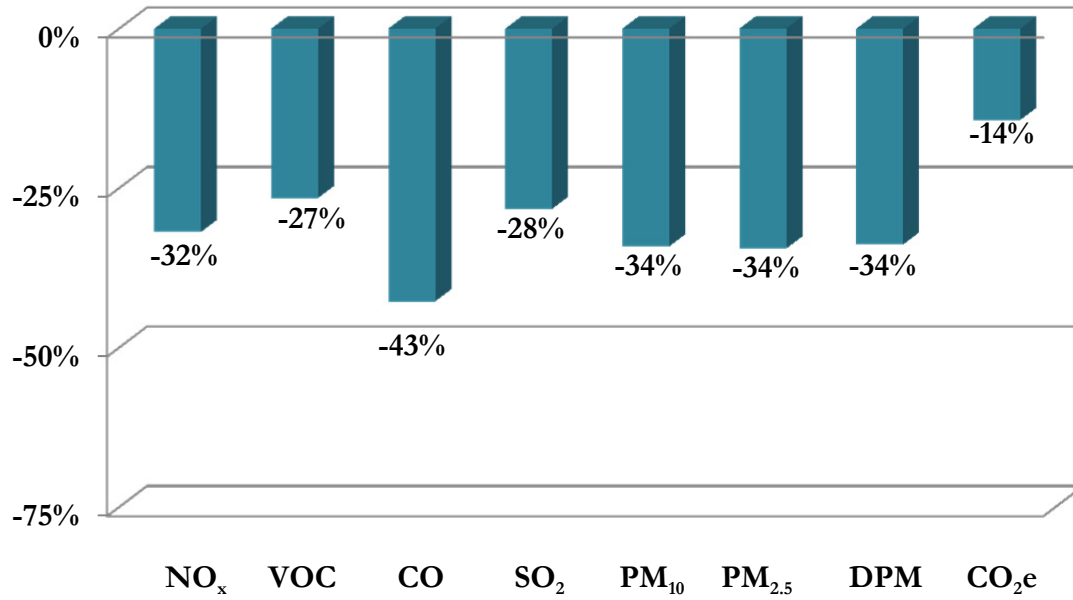


Figure 2.27: Port of Seattle 2011 vs 2005 Airshed Emissions per 10,000 Tonnes of Cargo Change





2.3.5 Port of Tacoma

Table 2.19 and Figures 2.28 represent port emissions associated with the Port of Tacoma.

Table 2.19: Port of Tacoma 2011 Port Emissions, tpy

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	339	11	28	381	26	21	18	28,582
OGV, maneuvering	36	1	3	30	3	2	3	1,690
OGV, transit	0	0	0	0	0	0	0	0
Commercial harbor vessels	291	10	44	0	12	11	12	17,485
Locomotives	364	25	54	2	12	11	12	20,015
Cargo handling equipment	206	13	88	0	10	10	10	22,486
Heavy-duty vehicles	24	2	13	0	0	0	0	2,505
Terminal fleet vehicles	3	1	14	0	0	0	0	1,429
<b>Total</b>	<b>1,263</b>	<b>62</b>	<b>245</b>	<b>413</b>	<b>64</b>	<b>55</b>	<b>56</b>	<b>94,192</b>

Figure 2.28: Port of Tacoma 2011 Port Emissions

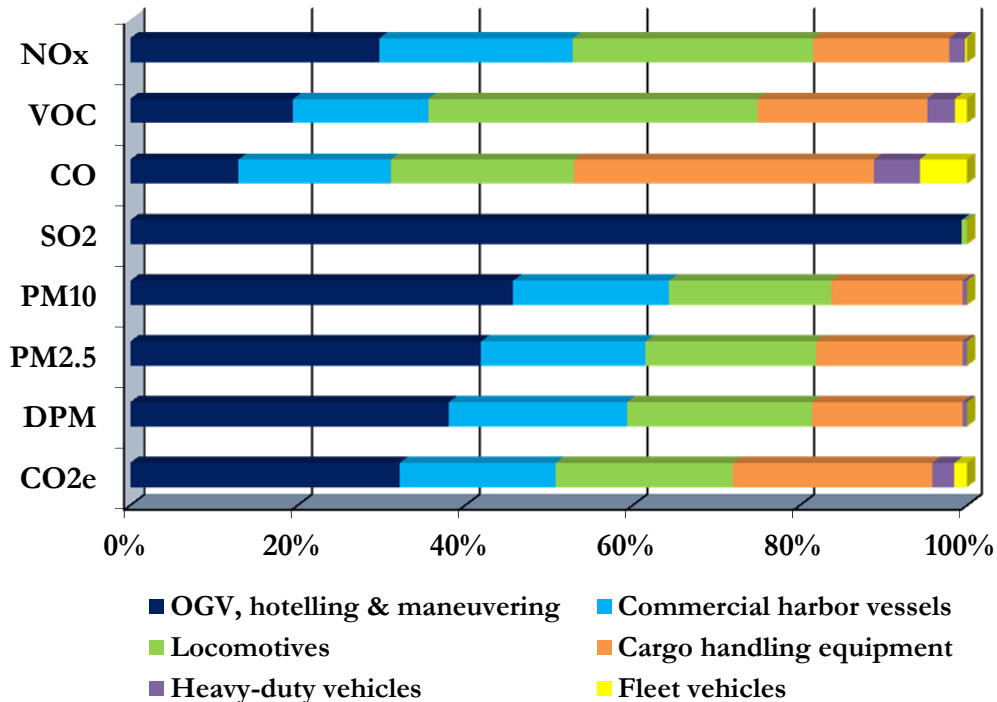


Table 2.20 presents 2011 and 2005 emissions comparison for the Port of Tacoma.

**Table 2.20: Port of Tacoma 2011 vs 2005 Port Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	375	12	32	410.18	29.00	23.20	21.12	30,273
OGV, transit	0	0	0	0.00	0.00	0.00	0.00	0
Commercial harbor vessels	291	10	44	0.16	11.82	10.88	11.82	17,485
Locomotives	364	25	54	2.37	12.35	11.35	12.35	20,015
Cargo handling equipment	206	13	88	0.20	10.00	9.70	10.00	22,486
Heavy-duty vehicles	24	2	13	0.02	0.29	0.27	0.29	2,505
Terminal fleet vehicles	3	1	14	0.02	0.04	0.04	0.02	1,429
<b>Total</b>	<b>1,263</b>	<b>62</b>	<b>245</b>	<b>412.96</b>	<b>63.50</b>	<b>55.44</b>	<b>55.60</b>	<b>94,192</b>
<b>2005</b>								
OGV, hotelling & maneuvering	645	21	54	676.17	47.05	37.64	33.79	47,465
OGV, transit	0	0	0	0.00	0.00	0.00	0.00	0
Commercial harbor vessels	278	6	38	29.45	12.20	11.23	12.20	15,815
Locomotives	589	33	71	45.66	17.09	15.72	17.09	25,500
Cargo handling equipment	370	26	160	5.40	22.92	22.26	23.01	38,646
Heavy-duty vehicles	21	2	13	0.42	0.46	0.42	0.46	2,049
Terminal fleet vehicles	4	2	15	0.02	0.04	0.04	0.04	1,689
<b>Total</b>	<b>1,907</b>	<b>88</b>	<b>352</b>	<b>757.13</b>	<b>99.76</b>	<b>87.31</b>	<b>86.59</b>	<b>131,163</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-42%	-41%	-41%	-39%	-38%	-38%	-38%	-36%
OGV, transit	na	na	na	na	na	na	na	na
Commercial harbor vessels	4%	64%	17%	-99%	-3%	-3%	-3%	11%
Locomotives	-38%	-25%	-24%	-95%	-28%	-28%	-28%	-22%
Cargo handling equipment	-44%	-51%	-45%	-96%	-56%	-56%	-57%	-42%
Heavy-duty vehicles	16%	21%	-1%	-95%	-37%	-36%	-37%	22%
Terminal fleet vehicles	-36%	-45%	-9%	33%	0%	-5%	-50%	-15%
<b>Total</b>	<b>-34%</b>	<b>-30%</b>	<b>-30%</b>	<b>-45%</b>	<b>-36%</b>	<b>-37%</b>	<b>-36%</b>	<b>-28%</b>

Figure 2.29 presents the Port of Tacoma’s port emissions change for 2011 vs 2005, while Figures 2.30 and 2.31 present the change in port emission efficiencies on a ton of emissions per TEU and tonnes of cargo basis, respectively. Due to a notable decrease in containers volume in 2011 while throughput of non-containerized cargo increased during the same time, the emission based on a tonnes of cargo may be a better representation of emissions related efficiencies.

Figure 2.29: Port of Tacoma 2011 vs 2005 Port Emissions Change

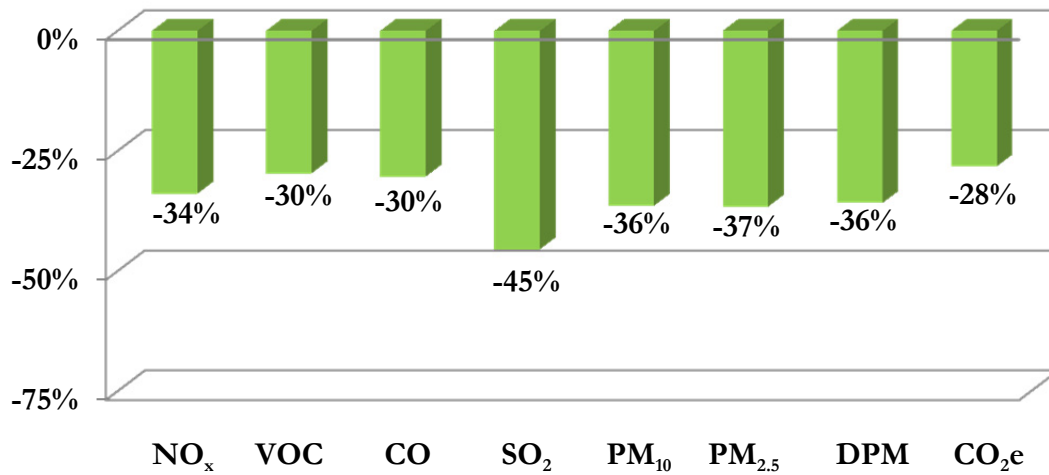


Figure 2.30: Port of Tacoma 2011 vs 2005 Port Emissions per 10,000 TEU Change

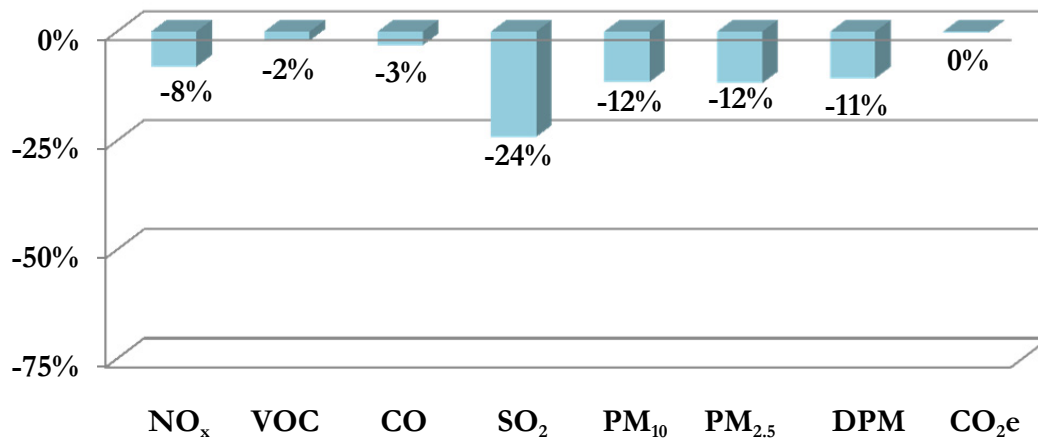


Figure 2.31: Port of Tacoma 2011 vs 2005 Port Emissions per 10,000 Tonnes of Cargo Change

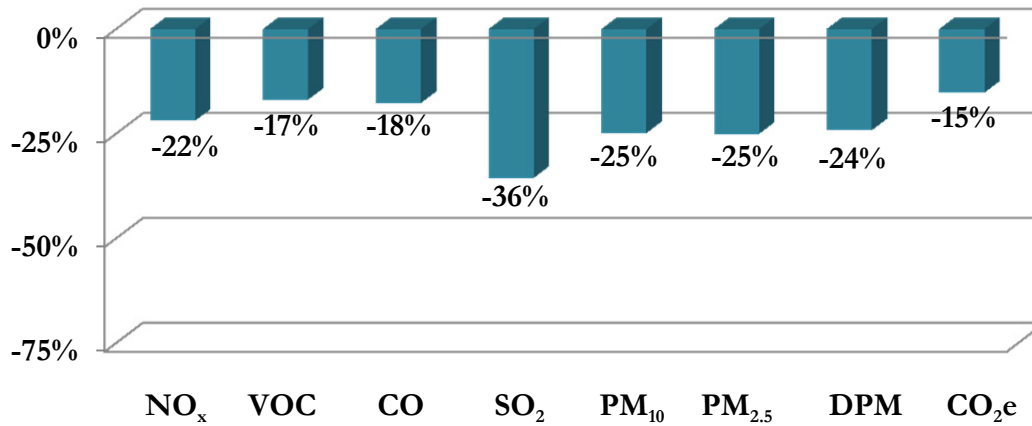


Table 2.21 presents the air district zone emissions associated with the Port of Tacoma.

Table 2.21: Port of Tacoma 2011 Air District Zone Emissions, tpy

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	339	11	28	381	26	21	18	28,582
OGV, maneuvering	36	1	3	30	3	2	3	1,690
OGV, transit	738	28	64	579	49	39	46	34,676
Commercial harbor vessels	291	10	44	0	12	11	12	17,485
Locomotives	489	32	75	4	17	15	17	28,067
Cargo handling equipment	206	13	88	0	10	10	10	22,486
Heavy-duty vehicles	730	41	184	1	13	12	13	114,620
Terminal fleet vehicles	3	1	14	0	0	0	0	1,429
<b>Total</b>	<b>2,831</b>	<b>136</b>	<b>502</b>	<b>994</b>	<b>130</b>	<b>111</b>	<b>119</b>	<b>249,035</b>

Table 2.22 presents in greater resolution the Port of Tacoma's OGV emissions for the four counties in the air district zone.

**Table 2.22: Port of Tacoma 2011 Air District Zone OGV Emissions by County, tpy**

County	Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
King	transit	283	11	24	224	19	15	18	13,411
Kitsap	transit	428	16	37	335	28	23	27	20,044
Pierce	hotelling & maneuvering	375	12	32	410	29	23	21	30,273
	transit	13	1	2	9	1	1	1	548
Snohomish	transit	14	1	1	11	1	1	1	673
<b>Total</b>		<b>1,113</b>	<b>40</b>	<b>96</b>	<b>989</b>	<b>78</b>	<b>62</b>	<b>67</b>	<b>64,948</b>

Table 2.23 presents the airshed zone emissions associated with the Port of Tacoma.

**Table 2.23: Port of Tacoma 2011 Airshed Emissions, tpy**

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	339	11	28	381	26	21	18	28,582
OGV, maneuvering	36	1	3	30	3	2	3	1,690
OGV, transit	3,257	122	280	2,562	216	173	203	153,472
Commercial harbor vessels	291	10	44	0	12	11	12	17,485
Locomotives	520	33	80	4	18	16	18	30,030
Cargo handling equipment	206	13	88	0	10	10	10	22,486
Heavy-duty vehicles	895	51	229	1	17	15	17	141,618
Terminal fleet vehicles	3	1	14	0	0	0	0	1,429
<b>Total</b>	<b>5,546</b>	<b>241</b>	<b>768</b>	<b>2,977</b>	<b>303</b>	<b>249</b>	<b>281</b>	<b>396,792</b>

Table 2.24 presents 2011 and 2005 airshed emissions comparison for the Port of Tacoma.

**Table 2.24: Port of Tacoma 2011 vs 2005 Airshed Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	375	12	32	410.18	29.00	23.20	21.12	30,273
OGV, transit	3,257	122	280	2,561.76	216.39	173.12	202.75	153,472
Commercial harbor vessels	291	10	44	0.16	11.82	10.88	11.82	17,485
Locomotives	520	33	80	3.87	18.05	16.45	18.05	30,030
Cargo handling equipment	206	13	88	0.20	10.00	9.70	10.00	22,486
Heavy-duty vehicles	895	51	229	1.24	17.37	15.48	17.37	141,618
Terminal fleet vehicles	3	1	14	0.02	0.04	0.04	0.02	1,429
<b>Total</b>	<b>5,546</b>	<b>241</b>	<b>768</b>	<b>2,977.43</b>	<b>302.68</b>	<b>248.86</b>	<b>281.13</b>	<b>396,792</b>
<b>2005</b>								
OGV, hotelling & maneuvering	645	21	54	676.17	47.05	37.64	33.79	47,465
OGV, transit	4,069	143	332	2,736.89	245.01	196.01	234.39	166,921
Commercial harbor vessels	278	6	38	29.45	12.20	11.23	12.20	15,815
Locomotives	1,035	52	128	78.45	27.80	25.58	27.80	46,082
Cargo handling equipment	370	26	160	5.40	22.92	22.26	23.01	38,646
Heavy-duty vehicles	1,307	63	376	37.79	47.49	42.58	47.49	168,846
Terminal fleet vehicles	4	2	15	0.02	0.04	0.04	0.04	1,689
<b>Total</b>	<b>7,709</b>	<b>312</b>	<b>1,103</b>	<b>3,564.18</b>	<b>402.52</b>	<b>335.33</b>	<b>378.72</b>	<b>485,463</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-42%	-41%	-41%	-39%	-38%	-38%	-38%	-36%
OGV, transit	-20%	-15%	-15%	-6%	-12%	-12%	-13%	-8%
Commercial harbor vessels	4%	64%	17%	-99%	-3%	-3%	-3%	11%
Locomotives	-50%	-36%	-37%	-95%	-35%	-36%	-35%	-35%
Cargo handling equipment	-44%	-51%	-45%	-96%	-56%	-56%	-57%	-42%
Heavy-duty vehicles	-32%	-20%	-39%	-97%	-63%	-64%	-63%	-16%
Terminal fleet vehicles	-36%	-45%	-9%	33%	0%	-5%	-50%	-15%
<b>Total</b>	<b>-28%</b>	<b>-23%</b>	<b>-30%</b>	<b>-16%</b>	<b>-25%</b>	<b>-26%</b>	<b>-26%</b>	<b>-18%</b>

Figure 2.32 presents the Port of Tacoma’s airshed emissions change for 2011 vs 2005, while Figures 2.33 and 2.34 present the change in airshed emission efficiencies on a ton of emissions per 10,000 TEU and 10,000 tonnes of cargo basis, respectively. Due to a notable decrease in containers volume in 2011 while throughput of non-containerized cargo increased during the same time, the emission based on a tonnes of cargo may be a better representation of emissions related efficiencies.

Figure 2.32: Port of Tacoma 2011 vs 2005 Airshed Emissions Change

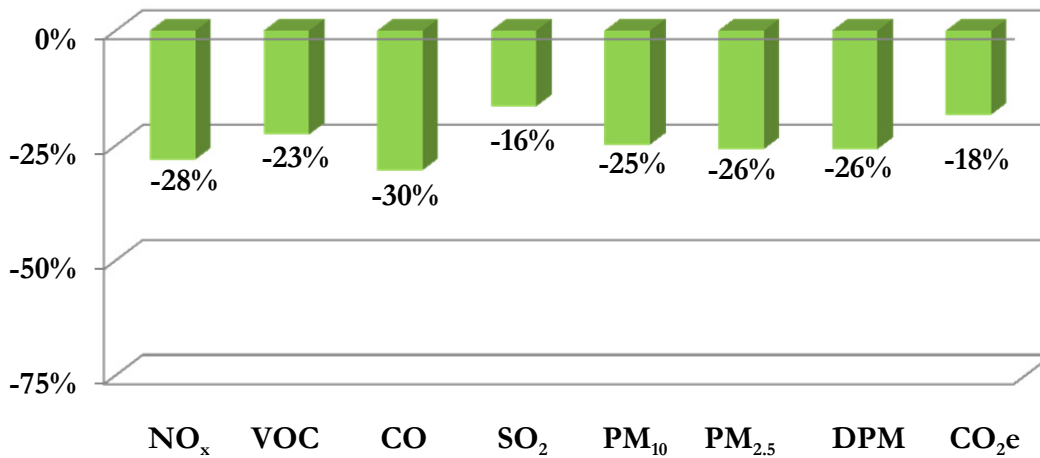


Figure 2.33: Port of Tacoma 2011 vs 2005 Airshed Emissions per 10,000 TEU Change

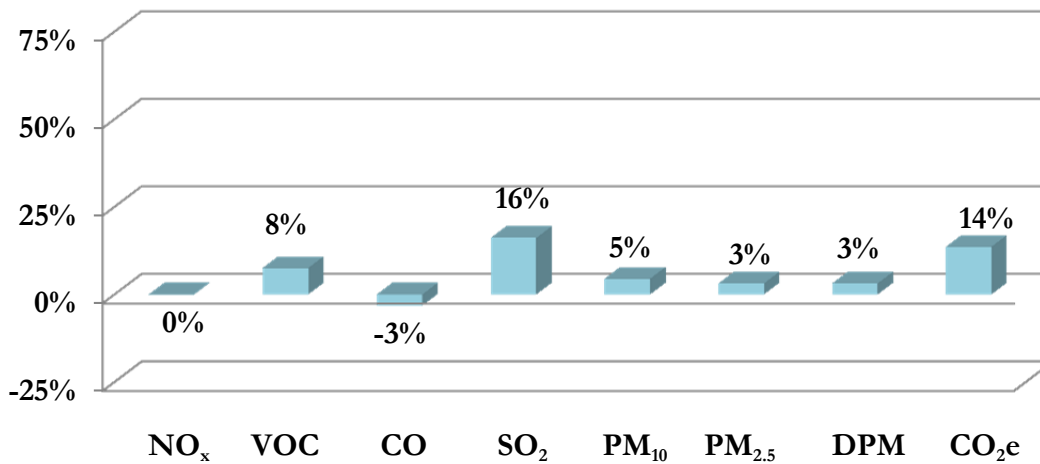
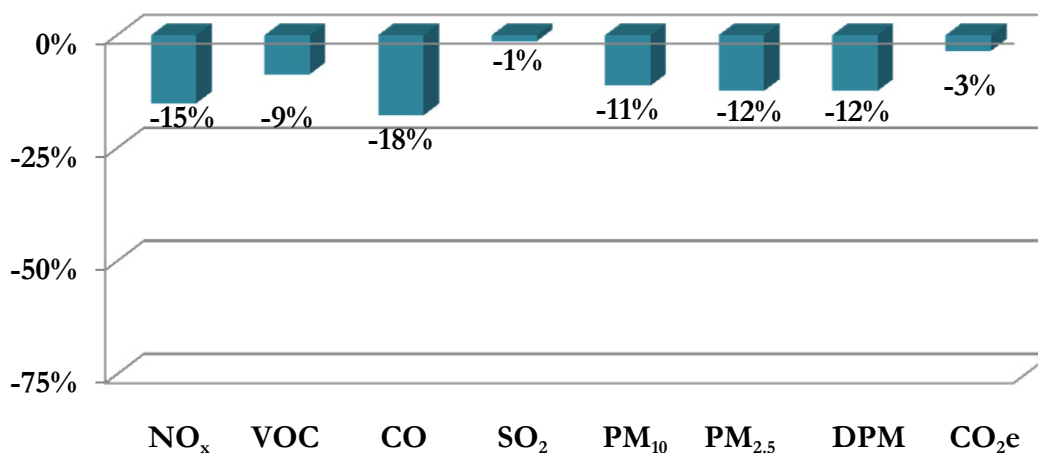


Figure 2.34: Port of Tacoma 2011 vs 2005 Airshed Emissions 10,000 Tonnes of Cargo Change



### 2.3.6 Petroleum Facilities

Table 2.25 presents emissions associated with the petroleum facilities, which involves only ocean going vessels. For this inventory, that is the only source category that was included for refinery related emissions and is the most significant since there are no recreational vessels associated with the refineries and cargo handling equipment are minimal due to nature of liquid bulk.

Table 2.25: Refinery Related 2011 Port Emissions, tpy

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
OGV, hotelling	669	25	59	2,360	127	102	32	140,710
OGV, maneuvering	29	2	4	21	2	2	2	1,213
Recreational vessels	na	na	na	na	na	na	na	na
Locomotives	na	na	na	na	na	na	na	na
Cargo handling equipment	na	na	na	na	na	na	na	na
Heavy-duty vehicles	na	na	na	na	na	na	na	na
Terminal fleet vehicles	na	na	na	na	na	na	na	na
<b>Total</b>	<b>698</b>	<b>27</b>	<b>63</b>	<b>2,381</b>	<b>130</b>	<b>104</b>	<b>34</b>	<b>141,923</b>



## SECTION 3 OCEAN-GOING VESSELS

Section 3 provides an overview of the ocean-going vessels calling at U.S. maritime facilities located within the Georgia Basin/Puget Sound International Airshed. A description of the methodology used to estimate emissions is provided in this section, as well as the emission estimates for this source category.

### 3.1 Source Category Description and Operational Characteristics

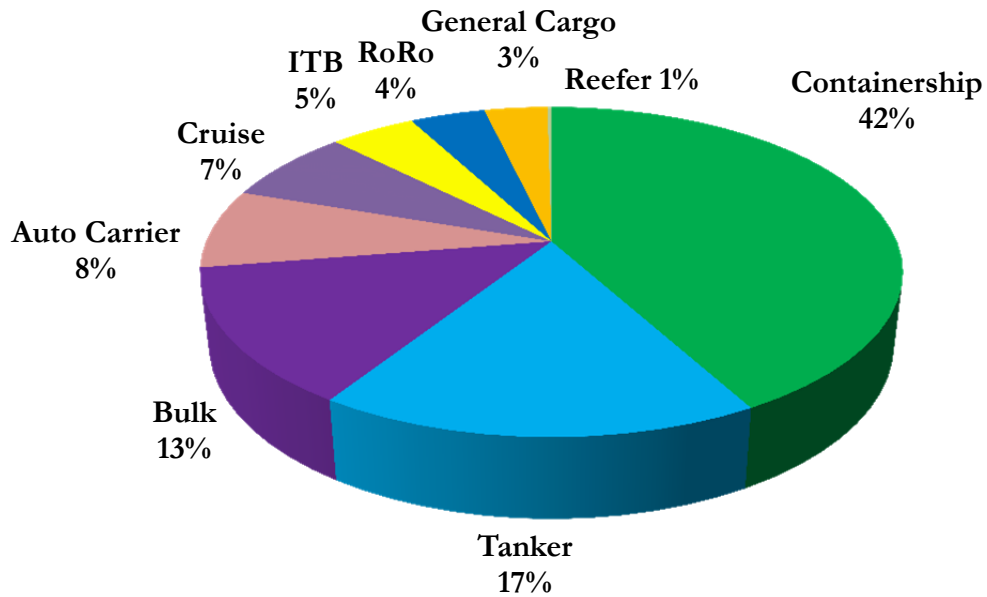
The ocean-going vessel source category typically consists of cargo carrying vessels equipped with large marine propulsion engines known as slow speed engines. These are in contrast to harbor vessels, which are typically equipped with medium speed and high speed propulsion engines, which are discussed in Section 4. Ocean-going vessels are categorized by the following main vessel types for purposes of this emissions inventory:

- Auto carriers
- Bulk carriers
- Containerships
- Passenger cruise vessels
- General cargo vessels
- Integrated tug-barge (ITB) and articulated tug-barge (ATB)
- Miscellaneous vessels
- Refrigerated vessels (Reefers)
- Roll-on/roll-off vessels (RoRo)
- Tankers

The main vessel types are further subdivided for more accurate emissions estimates, as needed. Military vessels, such as aircraft carriers, U.S. Coast Guard vessels, and submarines, are not included in the inventory due to security considerations.

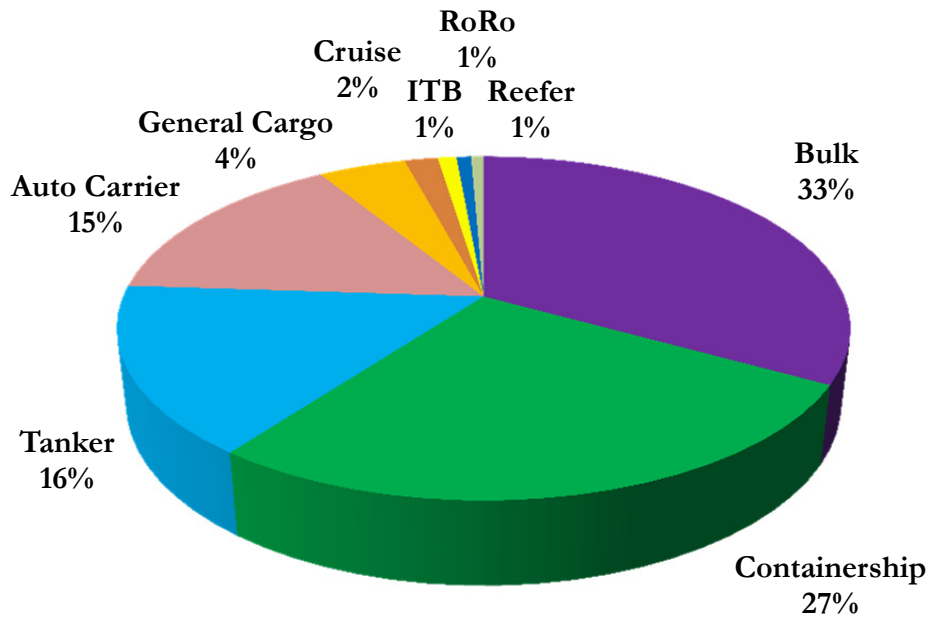
Based on 2011 Marine Exchange of Puget Sound (MarEx) data (see Section 3.3.1), there were a total of 2,705 inbound calls of ocean-going vessels making 1,422 shifts in the Puget Sound region in 2011. Containerships made the majority (~42%) of the calls followed by tankers (~17%), bulk carriers (~13%), auto carriers (~8%), cruise vessels (~7%), RoRo (~4%), and general cargo vessels (~3%). Ocean-going tugboats (ITB and ATB only) account for ~5% of the total calls. The reefer vessels account for less than 1% of the vessels. Figure 3.1 presents the percentage of ocean-going vessels for the inbound calls in 2011 in Puget Sound.

Figure 3.1: Puget Sound 2011 Distribution of OGV by Inbound Calls



There were a total of 910 discrete vessels that called the Puget Sound study area in 2011. Figure 3.2 presents the distribution of discrete vessels by vessel type.

Figure 3.2: Puget Sound 2011 Distribution of Discrete OGV Types



Most OGVs are foreign flagged ships, whereas harbor vessels are almost exclusively domestic. Approximately 94% of the OGVs that visited Puget Sound in 2011 were registered outside the U.S. Although only 6% of the individual OGVs are registered in the U.S., they comprise 27% of all calls. This is most likely because the U.S.-flagged OGVs make shorter, more frequent stops within Puget Sound. Some examples of U.S. vessels that make more than one stop are tankers and ocean-going tugboats.

Figure 3.3 presents the distribution of the ships' registered country or flag by the number of calls. Figure 3.4 presents the distribution of the ships' registered country or flag by discrete vessel. The remaining 35% of "other" ships represents 317 discrete ships from 32 countries. The remaining 24% of "other" vessel calls represents 663 calls from 32 other countries.

Figure 3.3: 2011 Distribution of Ships' Flags by Vessel Call

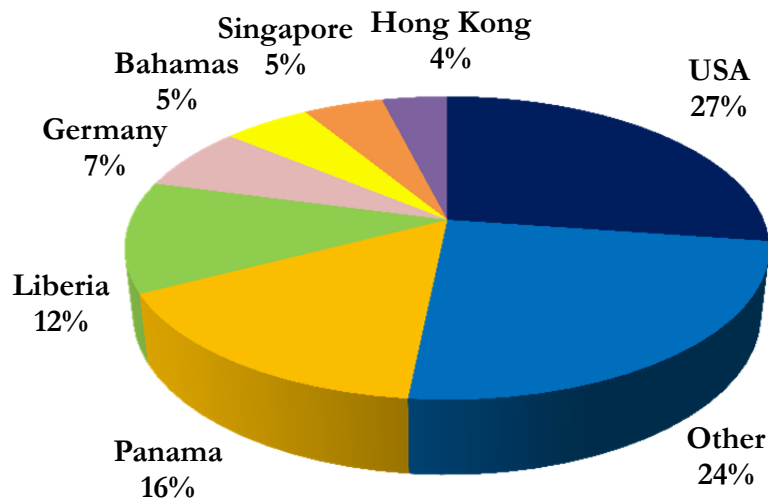
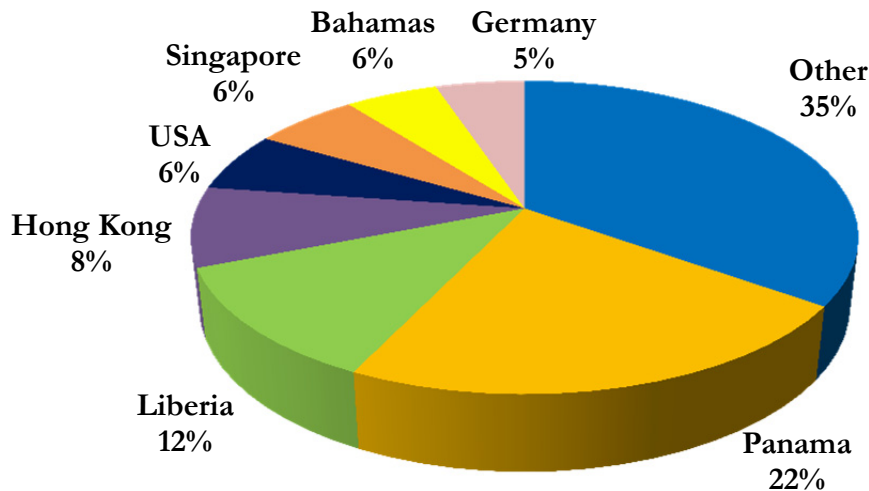


Figure 3.4: 2011 Distribution of Ships' Flags by Discrete Vessel



### *3.1.1 Auto Carriers*

Transportation of imported vehicles is the primary use of the auto carrier, although a few domestic vehicles are exported overseas. Auto carriers are very similar in design to RoRos (discussed below) because they have drivable ramps. Both can have substantial ventilation systems so as to prevent vehicle fuel vapors from pooling in the lower decks, which could present a major risk for explosion or fire. Emissions related to vessel cargo are outside the scope of the study. Auto carriers are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs. Figure 3.5 presents a typical car carrier.

**Figure 3.5: Auto Carrier**



### *3.1.2 Bulk Carriers*

Bulk carriers have open holds with giant hatches to carry dry goods that can be loaded from a conveyor belt and chute, such as coal, coke, salt, sugar, cement, gypsum, lime mix, agricultural products, alumina, and other similar fine-grained commodities that can be poured, scooped or augured. Bulk carriers span the range between small “tramp” ships and the Panamax (approximately 50,000+ deadweight tonnes (1,000 kilograms) or DWT) and Capesize (approximately 140,000+ DWT) bulk carriers that can also haul containers as well as general cargo. Bulk carriers are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs. Figure 3.6 presents a typical bulk carrier.

**Figure 3.6: Bulk Carrier**



### *3.1.3 Containerships*

Ships that carry 20- and 40-foot containers on their decks are known as containerships. These ships are the fastest, largest, and most common OGVs in Puget Sound. These vessels are primarily used by shipping lines to transport retail goods across the Pacific Rim, mostly originating in Asia. Because of their efficiency as a mode of ocean transportation, containership traffic will continue to grow. Cargo types include almost everything that can be made to fit in the 20- or 40-foot containers. The container business operates on tight margins and high volume so OGVs need to be fast and efficient to compete in the market place, thus the trend to newer, larger containerships. The container vessels have been divided into ten subtypes based on their TEU capacity, between 1,000 and 10,000+ TEU. Figure 3.7 presents a typical containership.

**Figure 3.7: Containership**



### *3.1.4 Passenger Cruise Vessels*

There is a significant passenger cruise service operating from the Port of Seattle. In 2011, shore power was provided for both Holland America Line and Princess Cruises at Terminal 91. Cruise vessels are known not only for their speed but also their heavy auxiliary engine demands, since they often provide heating and electricity for over 1,000 to 3,000 passengers at a time. Cruise vessels vary significantly in overall size, onboard auxiliary power, engine configuration, fuel type and characteristics, and frequency of calls. Typically, newer cruise ships work on a diesel-electric configuration with some using turbines to generate electricity, while older cruise ships use direct drive and auxiliary engines. Figure 3.8 presents a passenger cruise vessel.

**Figure 3.8: Cruise Vessels**



### *3.1.5 General Cargo Vessels*

Like the bulk carriers, general cargo ships tend to be slower. They can carry diverse cargoes such as steel, palletized goods, turbines, a few containers (usually on the top deck), large excavating machinery, and other heavy loads. Most general cargo ships have electric boom cranes for loading and unloading. General cargo ships are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs. Figure 3.9 presents a general cargo vessel.

**Figure 3.9: General Cargo Vessel**





### *3.1.6 Ocean-Going Tugboats*

Ocean-going towboats and tugboats, which are considered harbor vessels, are not included in this section and are discussed in Section 4 of this report. ITB and ATB vessels, however, are included in this section since they are seen as a specialized single vessel. The barge stern is notched to accept a special tug which can be rigidly connected to the barge in the form of a normal ship's hull. The tugboats, like all other ocean-going tugs, are typically configured with two propulsion engines and separate auxiliary engines to supply electrical needs. ITB and ATB may have larger horsepower in their engines than the typical ocean-going tug. Figure 3.10 presents an integrated tug and barge.

**Figure 3.10: Integrated Tug and Barge**



### *3.1.7 Refrigerated Vessels*

Refrigerated vessels, often called “reefers,” are dominated by fruit carriers, which require cooling to prevent cargo spoilage. These are similar to bulk or general cargo carriers, but these ships typically carry fruits, vegetables, meats, and other perishable cargos. Most of the cargo is stored below deck on pallets or transported inside refrigerated containers that are placed on top of the closed cargo hold. Reefers are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs for the vessel and the refrigeration units. Figure 3.11 presents a typical refrigerated vessel.

**Figure 3.11: Refrigerated Vessel**



### *3.1.8 RoRo Vessels*

These OGVs are similar to the automobile carrier but can accommodate larger wheeled equipment such as excavators, bulldozers, trucks, and loaders. RoRo ships are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs. Figure 3.12 presents a typical RoRo vessel.

**Figure 3.12: RoRo Vessel**



### *3.1.9 Tanker Vessels*

The tanker activity in Puget Sound is comprised mainly of crude oil tankers, as well as a few chemical tankers. Tankers range from approximately 12,000 to over 190,000 DWT. Tankers are typically configured with direct drive propulsion engines, separate auxiliary engines to supply electrical needs, and large boilers that power steam plants to power discharge pumps. The tankers have been divided into subcategories of tanker by size. All tankers calling the Puget Sound fall into one of the following size categories depending on their DWT:

- Handysize—up to 50,000 DWT
- Panamax - 50,000 to 80,000 DWT
- Aframax - 80,000 to 120,000 DWT
- Suezmax - 120,000 to 200,000 DWT

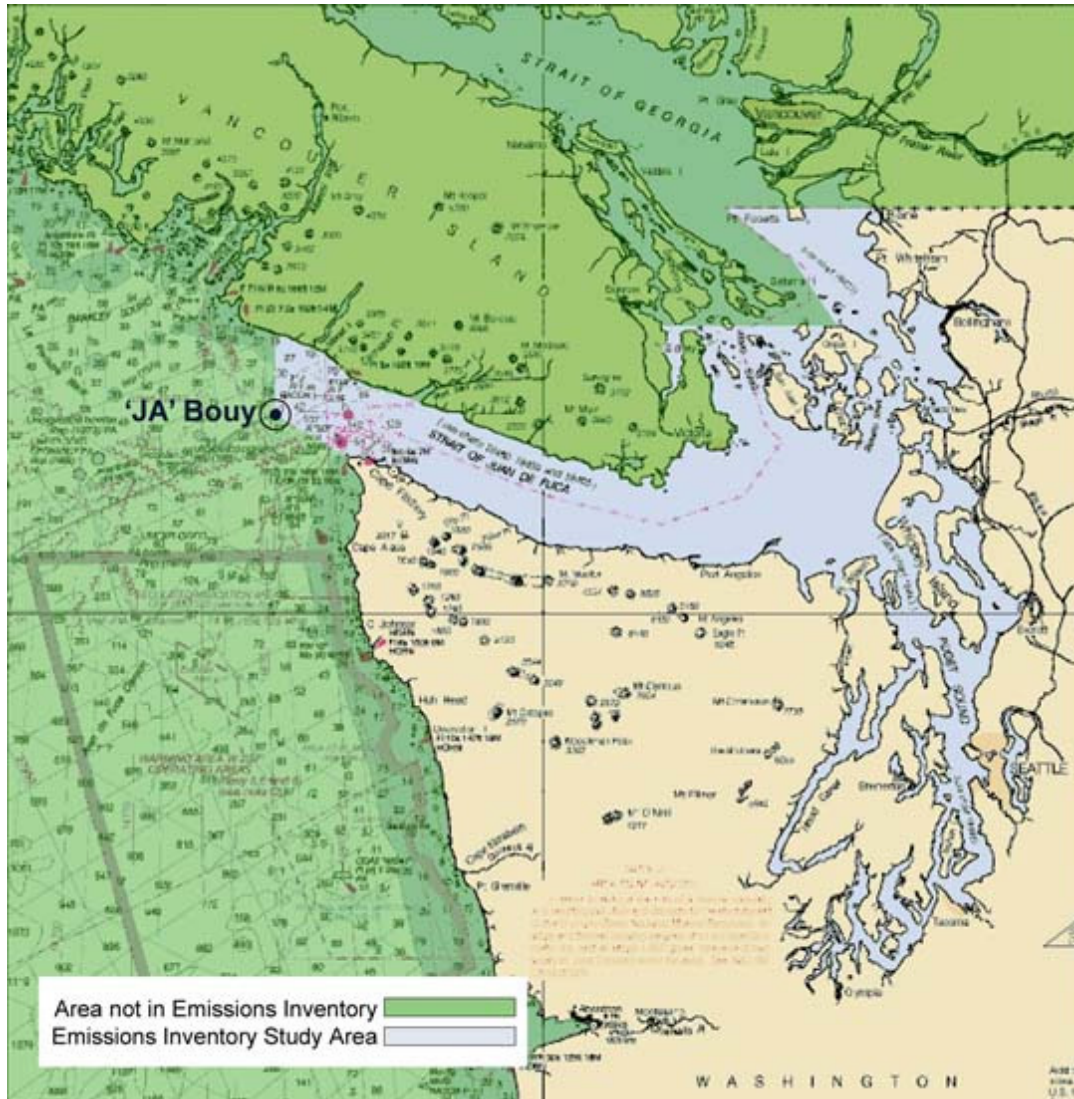
**Figure 3.13: Tanker**



### 3.2 Geographical Delineation

The geographical area for ocean-going vessels for the 2011 emissions inventory includes a portion the Georgia Basin/Puget Sound International Airshed as presented in Figure 3.14.

Figure 3.14: 2011 OGV Inventory Boundary



This area includes the twelve counties and six ports described in Section 1.2.4. Other maritime facilities within the geographical boundary are included in this inventory. These facilities include privately-owned facilities, anchorages, ferry terminals and smaller ports in the study area. There are also oil and chemical facilities in the study area located in Cherry Point, Ferndale, March Point, Point Wells, Sandy Point, and Vendovi Island.

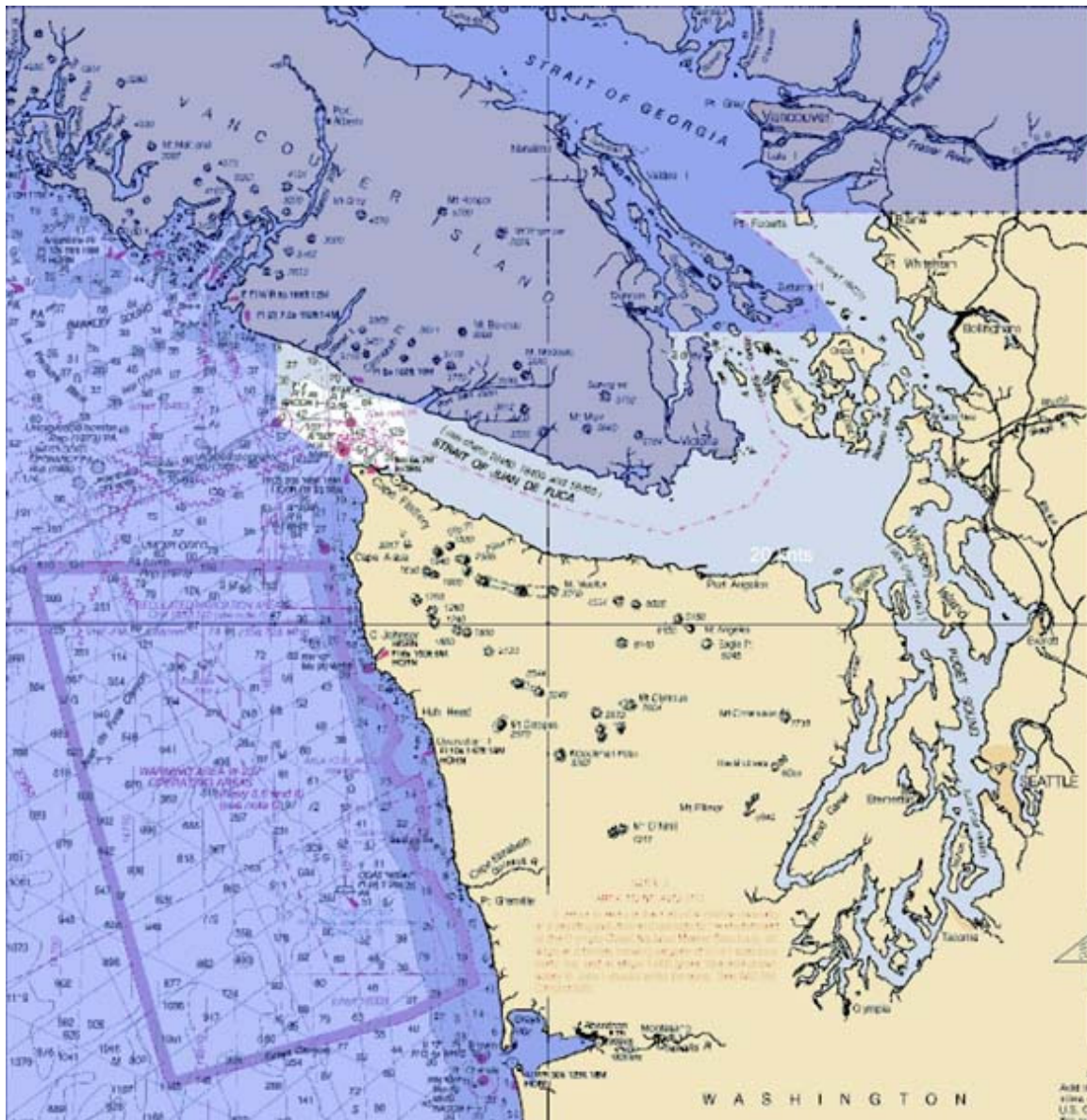
Data from the MarEx (see Section 3.3.2) and the Vessel Traffic System (VTS) was used to determine the shipping routes for the purposes of this study within the inventory's geographical area. During the 2005 inventory, the British Columbia Chamber of Shipping (BCCOS) conducted an emissions inventory associated with OGVs calling at Canadian ports in the Georgia Basin/Puget Sound International Airshed. The inventory was coordinated with Environment Canada and the Vancouver-Fraser Port Authority (now known as Port Metro Vancouver), and others, as well as the Forum to assure quality and consistency and avoid duplication and omissions between the two inventories. Using the MarEx data, it was determined that there were five general types of common routing. In an effort to reduce double counting or omissions of ship activity and emissions, an agreement was reached on which inventory would account for which emissions and where those emissions would be counted. The same agreed approach was used for 2011 and is detailed below.

Inbound and outbound vessels travel on specific VTS travel lanes. Since the U.S./Canadian border generally lies between the inbound and outbound vessel travel lanes (i.e., inbound lane lies on the U.S. side of the border, while the outbound lane lies on the Canadian border in Strait of San Juan de Fuca), the agreement included discussion on inbound and outbound transit emissions. Figure 3.15 presents the U.S./Canadian border in the Strait of San Juan de Fuca and the domain captured by U.S. maritime-related activities.

The agreements reached for the five general types of trans-boundary routing included are:

- 1) All inbound ship transits from sea buoy (JA Buoy) to the arrival point be assigned with U.S. or Canadian transit leg for the whole transit based on the arrival point. For example, a vessel that transits from sea to a U.S. marine facility will be assigned as a U.S. transit regardless of which side of the international boundary the ship transits.
  
- 2) All outbound ship transits from the last departure point to the sea buoy (JA Buoy) will be assigned with U.S. or Canadian transit legs for the whole transit based on the departure point. For example, a vessel that leaves a U.S. maritime facility and transits out to sea will be assigned a U.S. transit regardless of which side of the international boundary the ships transits.

Figure 3.15: 2011 OGV Inventory Boundary – JA Buoy to/from U.S. Marine Facilities



3) All ship transits between Victoria, Canada and a U.S. port will be split between both inventories in the following ways as shown in Figure 3.16:

***Victoria ->U.S. Marine Facility***

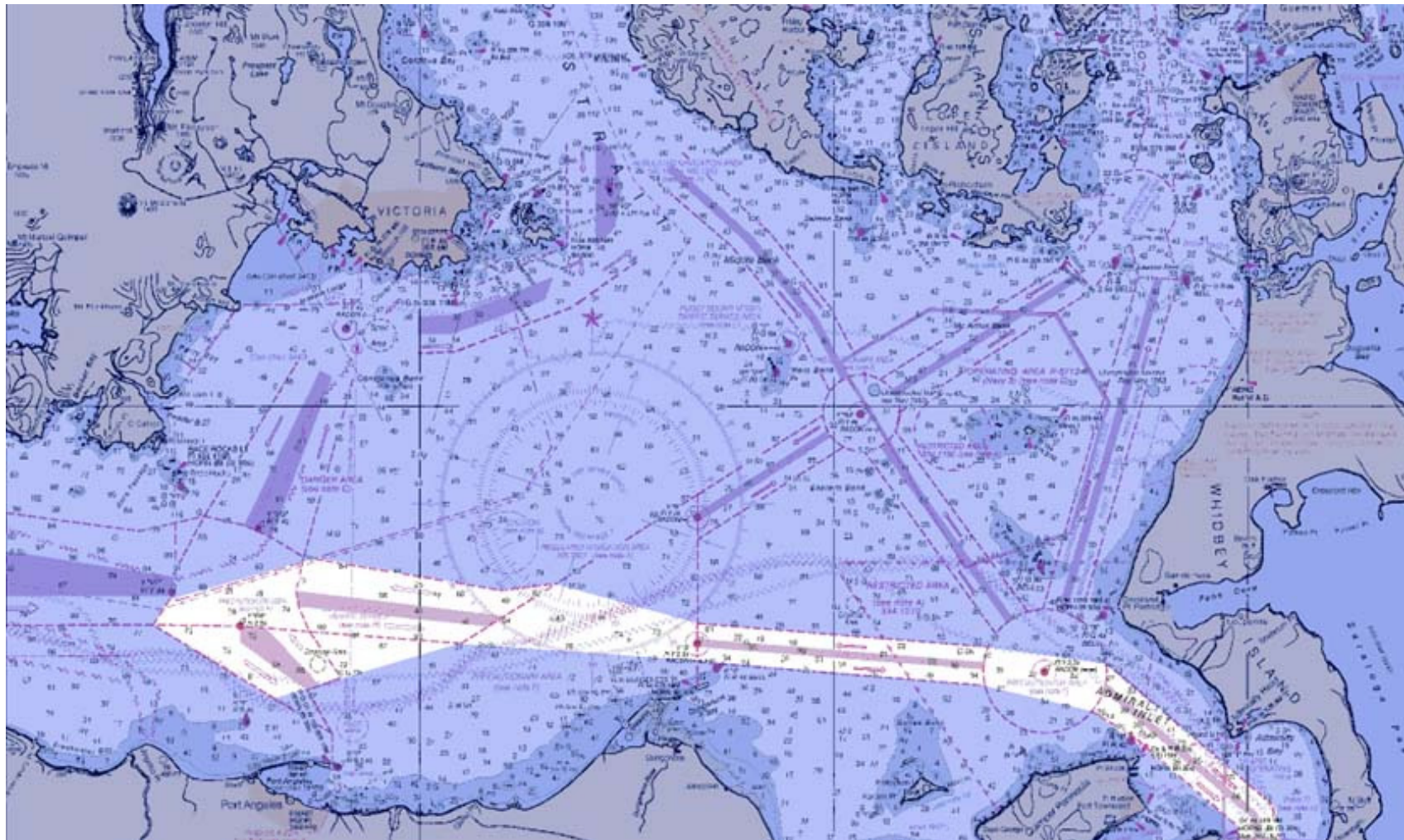
- a) The BCCO inventory will estimate emissions from Victoria Harbor to the international boundary in the Strait of Juan de Fuca (en-route to Port Angeles to pick up a U.S. Pilot).
- b) The Puget Sound Maritime Air Emissions Inventory will estimate emissions from the international boundary to the pickup of U.S. Pilots (north of Port Angeles) and to the arrival point.

***U.S. Port -> Victoria***

- a) The Puget Sound Maritime Air Emissions Inventory will estimate emissions from the departure point to Port Angeles (to drop off Pilots) and north to the international boundary (heading to Victoria).
- b) The BCCO inventory will estimate emissions on the Canadian side international boundary to Victoria Harbor.

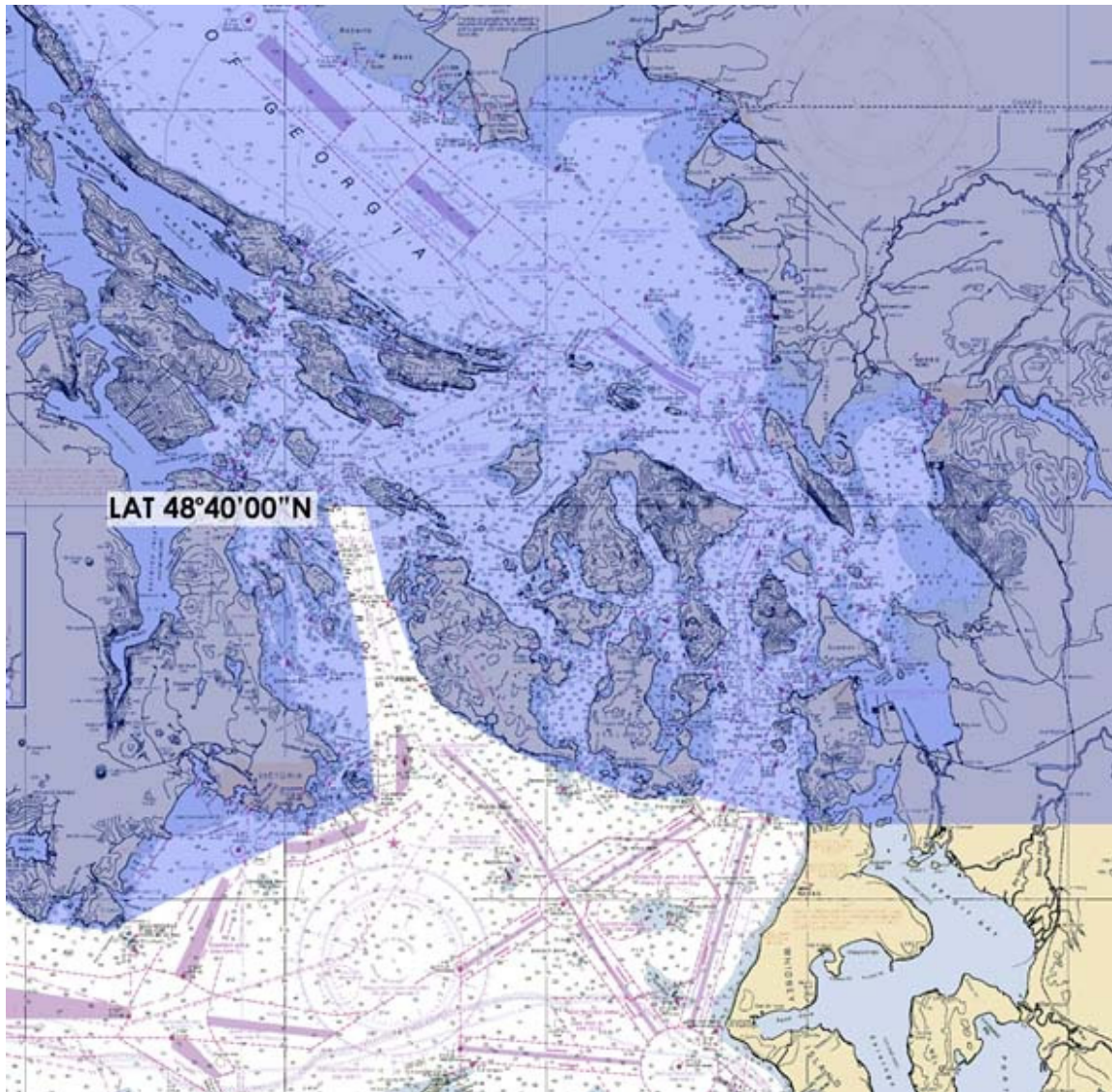


**Figure 3.16: 2011 OGV Inventory Boundary – Victoria to/from U.S. Marine Facilities**



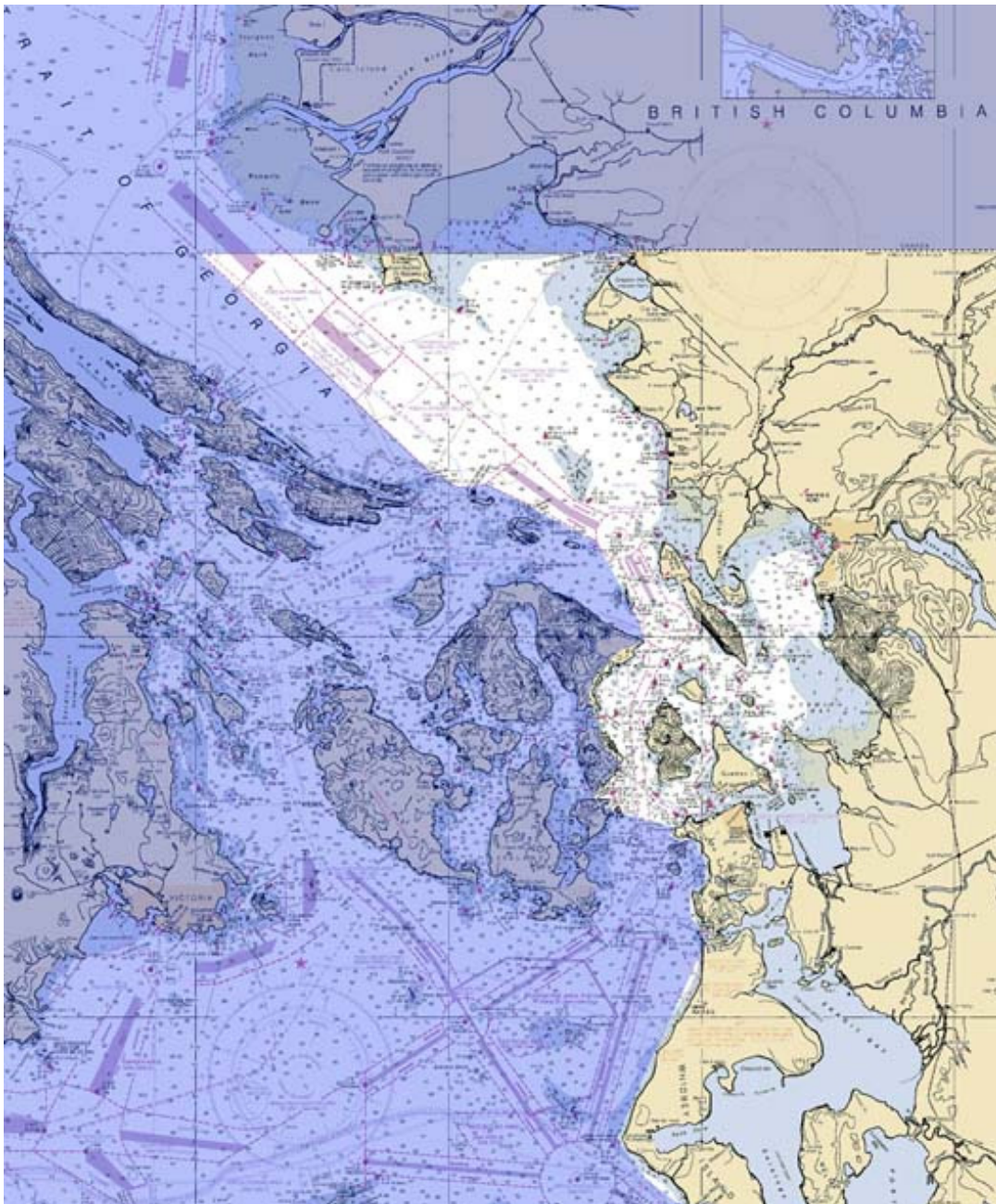
4) All non-tanker ships transiting between a Canadian marine facility (other than Victoria) and a U.S. marine facility), in either direction, will be divided at latitude  $48^{\circ} 40' 00''$  north in the Haro Strait. All emissions north of this line will be included in the BCCO inventory and all emissions south of this line will be included in the Puget Sound Maritime Air Emissions Inventory, as shown in Figure 3.17.

**Figure 3.17: 2011 OGV Inventory Boundary – Vancouver to/from U.S. Marine Facilities**



5) All tanker ships calling to or from Anacortes, Cherry Point, Ferndale, and March Point, to Vancouver, British Columbia will be divided at latitude  $48^{\circ} 55' 08''$  in the shipping lanes located in the Strait of Georgia. All emissions south of this line will be included in the Puget Sound Maritime Air Emissions Inventory and all emissions north of this line will be included in the BCCO inventory, as shown in Figure 3.18.

**Figure 3.18: 2011 OGV Inventory Boundary – Vancouver to/from Anacortes, Cherry Point, Ferndale, March Point, and Sandy Point**



For 2011, the Port of Tacoma and Port of Seattle increased the resolution from the previous report to get a better understanding of port-related emissions by allocating them into three geographical zones, compared to one zone in 2005. For comparison purposes the 2011 and 2005 emissions were allocated into the following three geographical zones for their port-specific emissions and comparisons:

- Port - emissions within port terminals and adjacent waterways
- Air district – emissions within the PSCAA boundaries (Pierce, King, Kitsap, and Snohomish Counties)
- Airshed – emission within the inventory domain

The other participating ports, their port specific emissions and comparisons are consistent with the 2005 approach.

### **3.3 Data and Information Acquisition**

In the development of the 2005 inventory, there was an extensive data collection effort undertaken relating to OGVs. The routing system was developed, ship operational profiles developed, and other information relating to ship parameters and operations were collected. The 2011 update inventory utilizes the 2005 information as a foundation with updates relating to 2011 operations. There were several sources used to compile the data necessary to define activities and operational profiles which are then used to estimate emissions. These sources included:

- 2005 Puget Sound Maritime Air Emissions Inventory
- MarEx
- Lloyd's Register of Ships
- Puget Sound Pilots
- Vessel operational data

Each data source is detailed in the following subsections.

#### *3.3.1 2005 Puget Sound Maritime Air Emissions Inventory*

The 2011 update builds on the foundation established for the 2005 inventory. The following elements were incorporated and updated:

- Puget Sound system vessel routing and speeds by category (fast, medium, slow)
- Vessel operational profiles
- Spatial allocation of emissions by county and clean air agency
- Berth specific operational profiles
- Port maneuvering profiles
- Reduced speed zones, where applicable

The 2005 data was updated with data from the Marine Exchange, Puget Sound Pilots, vessel operators/owners, and other operational data sources.

### *3.3.2 Marine Exchange of Puget Sound (MarEx)*

The MarEx is a non-profit organization established in 1981 to provide comprehensive communication services for the maritime industry. MarEx maintains a complete database that captures information on every vessel arriving in Puget Sound. It is a founding member of the Maritime Information Service of North America, which is the national organization of the marine exchanges.

MarEx provided 2011 activity data that included: vessel IMO numbers, arrival, shift, and departure dates and times, route information, and berth information. Starcrest took this information and developed unique voyage numbers linking data points into inbound, shift, and outbound activities. Starcrest associated the proper routing and associated port with each activity. From the berth/anchorage arrival and departure records, hotelling times at berths and anchorages were established. This information was then used to estimate all vessel related emissions during transit, maneuvering, and hotelling operational modes.

### *3.3.3 Lloyd's Register of Ships*

The information source commonly known as Lloyd's Register of Ships<sup>10</sup> (Lloyd's) is considered to be the leading resource for obtaining ship characteristics such as tonnage, vessel speed, propulsion engine power, propulsion configuration, age, and other parameters. The company is known as a classification society for the purpose of insuring many of the vessels on an international basis. The data are quite complete for vessels classified by Lloyd's; however, for other ships using a different insurance certification authority, the data are less complete and/or accurate. Lloyd's was used for obtaining information such as main engine power and vessel speed ratings because it is the best available source of such information. Lloyd's data sets for auxiliary engines and boilers are mostly incomplete and other data were used to enhance these source categories. The company IHS has the rights to Lloyd's ship data and sells data containing information on commercial marine vessels, which includes ocean-going vessels.

---

<sup>10</sup> Lloyd's, *Lloyd's Register of Ships*, January 2012.

#### 3.3.4 Puget Sound Pilots

The Puget Sound Pilots (PSP) provided information on operational changes associated with ship movements since 2005. During the 2005 inventory process, the PSP provided detailed route speed information for various types of ships and details on wake reduction areas. The PSP was engaged to identify any operational changes in the Puget Sound system from 2005 to 2011. The PSP stated that operations were fairly consistent, with some local changes associated with 2011 compared to 2005 which include:

- Inbound large container ships were typically slower just north of Point No Point to Elliott Bay to reduce impact of wake waves. The routing from 2005 was checked for the affected segments and the change in speed was within 1 to 2 knots. This change was not implemented due to the near alignment of the 2005 data.
- Cruise ship departures were typically slower from Elliott Bay to Edmonds due to high numbers of recreational vessels during the summer months in the Puget Sound. This change was not included in the inventory which means that some of the cruise ship emissions along this reach are overestimated. Starcrest does not believe that this overestimate is significant compared to all cruise ship emissions.
- Inbound speeds from the ocean to Port Angeles were typically slightly slower due to slow steaming by the shipping lines trying to save on fuel prices. The percentage of vessels slowing down during this portion of the reach was not known and the MarEx data typically started at Port Angeles. To remain conservative, the speeds were not adjusted in 2011 and therefore most likely providing an overestimate of ship transit emissions in this reach. Starcrest believes that the magnitude of the overestimate will depend on the number of vessels slowing down and by how much.

#### 3.3.5 Vessel Operational Data

Vessel operational data focuses on the operational profiles relating to main engines, auxiliary engines, and auxiliary boilers. A number of sources were used to update these parameters.

The Port of Tacoma and the Port of Seattle provided information relating to 2011 shore power events and fuel switching at-berth relating to their emissions reduction efforts under their CAS.

Main engine operational profiles developed in 2005 were reviewed and used for main engine operation. The most significant of these profiles is at the Ports of Seattle and Tacoma where various narrow channels and restricted waterways require tugs to move the ships without main engine assist. These profiles were used in 2011 as they are still valid.

Auxiliary engine data by operational mode is typically the most difficult data to source as it is not published by traditional data providers. Starcrest has been conducting Vessel Boarding Programs (VBPs) in various ports for the past 13 years including Puget Sound ports, Port of Los Angeles, Port of Long Beach, Port of Houston Authority, and Port Authority of New York & New Jersey. The data collected since the 2005 report data has been significant. During the 2011, limited funding was available to update vessel specific information. The most robust datasets published, which also share several common vessels, are the data presented in the Port of Long Beach (POLB) and Port of Los Angeles (POLA) inventories.

For the 2011 PSEI, the 2010 published data for both POLB and POLA was averaged and used. In addition, specific data collected from Holland America Lines, Maersk, TOTE, Evergreen, K-Line, and CMA-CGM was used.

Based on various vessel boardings conducted by Starcrest since the 2005 inventory, it has been identified that the auxiliary boilers on most ships are not used when main engine loads are at or above 20%. This is due to waste heat recovery systems on ships that take the hot engine exhaust from the main engine and use it to heat water. The resulting rule for auxiliary boilers for most ships is if the main engine load is above 20% then the boilers are considered off. Therefore, most boiler emissions occur during maneuvering and at-berth/at-anchorage modes. This change has been implemented for the 2011 update.

Further information on operational profiles is provided in Section 3.4.

### **3.4 Operational Profiles**

The operational profiles for OGVs are based on vessel activity and routing, as discussed below.

#### *3.4.1 Vessel Activity*

Vessel activity is defined as the number of ship trips by trip type and segment. Trip types include arrivals, departures, and shifts. Shifts are vessel movements from one berth within the Puget Sound area to another. The MarEx data was processed to identify arrivals, departures and shifts in a logical sequence. Arrivals were assumed to come from the “last port of call” or from the sea. For departures, vessels were assumed to depart from the designated port and pier and travel to the “next port of call” or travel out to sea. Shifts which involved trips internal to the area of study were processed as being from the last arrival to the next departure. One result of the data processing was the creation of three variables: trip origin, trip destination, and elapsed time (for hotelling estimates).

There are a variety of definitions for “ship call” or “vessel call”. For the purpose of this report, the basic definition of a ship call is an arrival from the sea, Canada or another port to a berth or anchorage. Inbound calls to anchorages associated with maritime facilities are also included, and thus the number of calls described in this report may not completely match the port statistics on ship calls for 2011. The arrivals, as determined by this study, approximate the true number of ship calls, but underestimates the number of terminal calls typically reported for port statistics, which include shifts or movements within a port facility. This study separates shifts from arrivals and departures since shifts do not have a “transit” component as do arrivals and departures. Ship movements are tracked as to:

- Arrivals (vessels arriving from the sea or from another facility to a terminal).
- Departures (vessels leaving a terminal to go out to sea or to another facility).
- Shift (vessels that move within the Puget Sound to another terminal, berth, anchorage, or from one port to another port within the airshed domain).
- Total movements (sum of all the above).

While many vessels make only one arrival and departure at a time, some vessels make multiple terminal calls within a port or maritime facility. There are two broad categories of shifts:

- Inter-port shifts – movements within a port from one terminal or berth to another.
- Anchorage shifts – movements between a terminal and anchorage. One example is: a vessel went to a terminal, loaded a partial load, went to anchorage, and then came back to the terminal to complete loading.
- Intra-port shifts – shifts from one port to another port in the airshed domain.



Table 3.1 presents the arrivals, departures, shifts and total movements for the Puget Sound study area in 2011 by vessel type. Due to the complexity of the study area, the number of inbound and outbound trips does not match. For example, in Table 3.1, the total inbound trips are less than the total outbound trips. This is because vessels that shifted from another dock, anchorage or terminal within the port(s) or maritime facilities are counted as shifts instead of arrivals from the sea or another port or maritime facility.

**Table 3.1: 2011 OGV Movements by Vessel Type**

Vessel Type	Inbound	Outbound	Shift	Movements
Auto Carrier	210	213	18	441
Bulk	341	342	293	976
Bulk - Heavy Load	3	2	6	11
Bulk - Self Discharging	16	17	14	47
Bulk - Wood Chips	1	1	0	2
Container - 1000	223	223	17	463
Container - 2000	142	142	26	310
Container - 3000	45	45	1	91
Container - 4000	141	141	6	288
Container - 5000	243	243	9	495
Container - 6000	115	115	51	281
Container - 7000	87	86	1	174
Container - 8000	137	136	8	281
Container - 9000	2	2	0	4
Container - 10000	1	1	0	2
Cruise	196	196	0	392
General Cargo	94	95	56	245
ITB	127	126	216	469
Reefer	6	6	7	19
RoRo	112	110	2	224
Tanker - Aframax	56	54	129	239
Tanker - Chemical	169	169	144	482
Tanker - Handysize	38	39	47	124
Tanker - Panamax	22	22	32	76
Tanker - Suezmax	179	174	340	693
<b>Total</b>	<b>2,706</b>	<b>2,700</b>	<b>1,423</b>	<b>6,829</b>

Figure 3.19 presents the distribution of 2011 inbound calls by facility type, with 73% of the inbound calls were to the six main public ports in the area. Other maritime facilities, such as privately-owned terminals and anchorages throughout the study area had 13% of the inbound calls in 2011. Petroleum terminals and their associated anchorages had 14% of the inbound calls in 2011.

**Figure 3.19: 2011 OGV Inbound Calls by Facility Type**

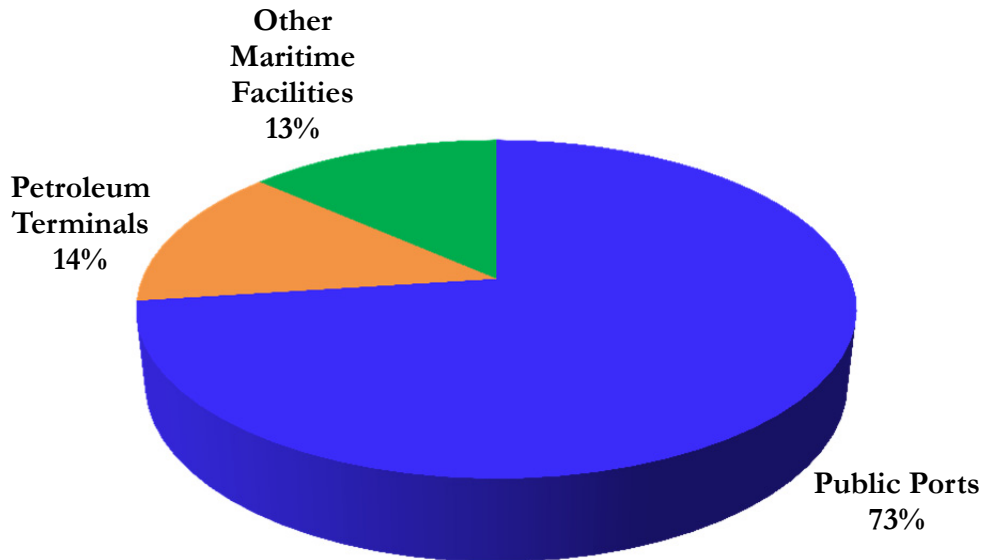
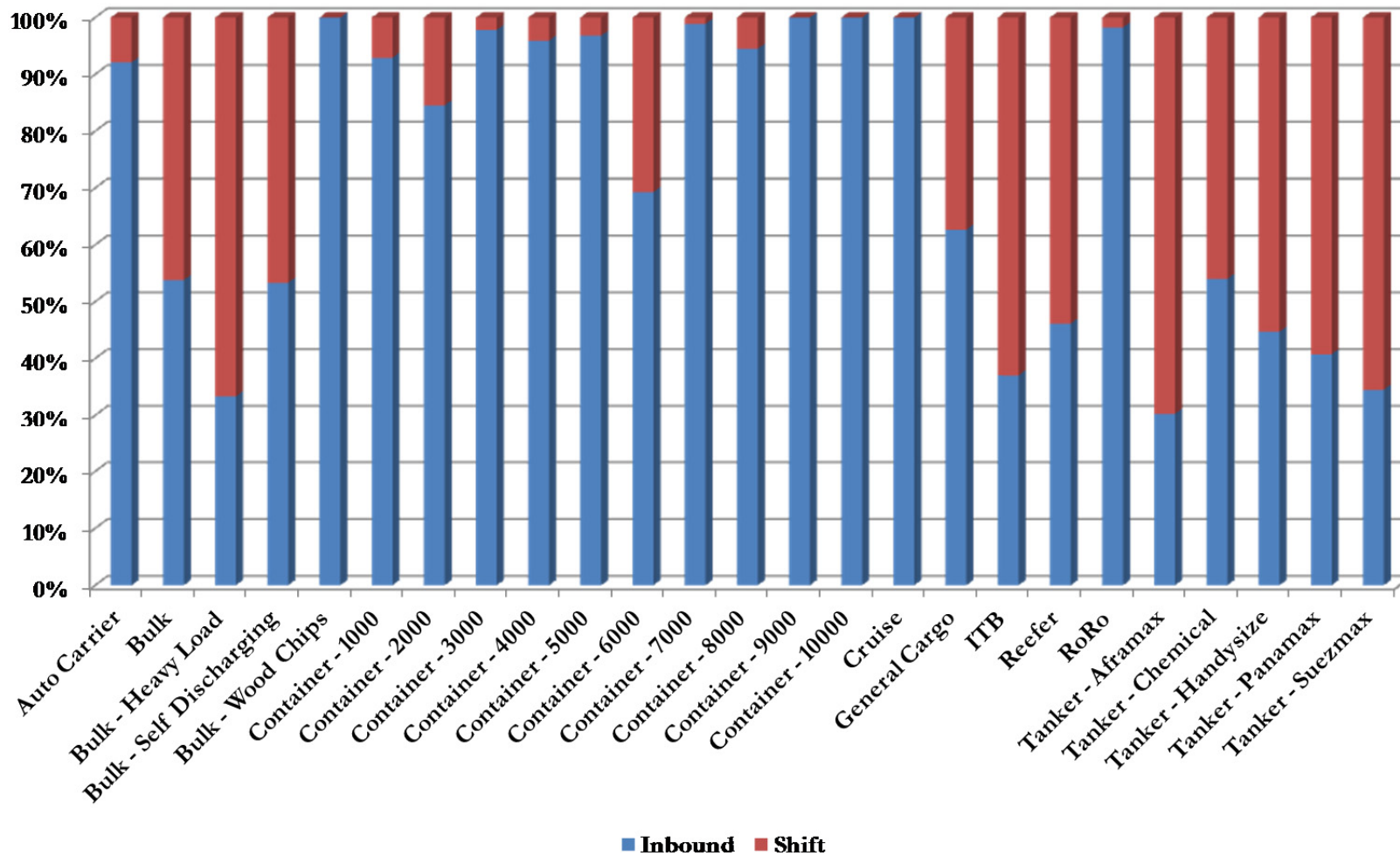


Figure 3.20 presents the distribution of shift vs inbound calls by vessel type. Tankers, ocean tugboats, bulk vessels and miscellaneous vessels have a higher percentage of shifts than other vessel types. Tankers tend to use more anchorages and therefore shift from anchorage to oil and chemical terminals instead of coming straight from the sea to the terminal. Bulk vessels make more than one stop at terminals within a port to load and unload their cargo.

Figure 3.20: 2011 Distribution of OGV Shifts vs Inbound Calls by Vessel Type



#### *3.4.2 Vessel Routing*

Vessel routing is the underlying geographic element on which the emissions estimates are based. Using the 2011 MarEx of Puget Sound data, distinct trip routes were derived. There were a total of 156 distinct ship routes in the MarEx data. As shown in Table 3.2, 148 distinct ship routes were within the study area and scope.

The term “port” in the following tables refers to any stop made by a vessel and does not necessarily refer to a public port. In Table 3.2, routes that have the same “from port” and “to port” (i.e., Everett to Everett) are included for shifts within the port. Vessels may make a movement or shift within the port from one terminal to another or from an anchorage to a terminal.

Due to the routing complexity of the region and the multiple movements, including arrivals, departures and shifts, some routes may have reciprocal routes included in Table 3.2 (i.e., Tacoma to Seattle and Seattle to Tacoma), while others may not. For example, Anacortes to Seattle is listed, but there is no reciprocal Seattle to Anacortes route listed. This indicates that in 2011, vessels may have traveled from Anacortes to Seattle, but there were no movements from Seattle to Anacortes. The distinct routes are from the 2011 MarEx data and depict the movements made that year.

**Table 3.2: OGV Vessel Routes Used in Puget Sound Maritime Air Emissions Inventory**

From Port	To Port	From Port	To Port	From Port	To Port
ANACORTES	CHERRY POINT	OLYMPIA	OUT SEA	TACOMA	CHERRY POINT
ANACORTES	FERNDALE	OLYMPIA	SEATTLE	TACOMA	MARCH POINT
ANACORTES	MARCH POINT	OUT SEA	ANACORTES	TACOMA	OLYMPIA
ANACORTES	OUT SEA	OUT SEA	BELLINGHAM	TACOMA	OUT SEA
ANACORTES	PORT ANGELES	OUT SEA	BREMERTON	TACOMA	PORT ANGELES
ANACORTES	SEATTLE	OUT SEA	CHERRY POINT	TACOMA	QUARTERMASTER HBR
ANACORTES	VENDOVISLAND	OUT SEA	EVERETT	TACOMA	SEATTLE
BELLINGHAM	BELLINGHAM	OUT SEA	FERNDALE	TACOMA	TACOMA
BELLINGHAM	CHERRY POINT	OUT SEA	INDIAN ISLAND	TACOMA	VANCOUVER BC
BELLINGHAM	MARCH POINT	OUT SEA	MANCHESTER	TACOMA	VENDOVISLAND
BELLINGHAM	OUT SEA	OUT SEA	MARCH POINT	VANCOUVER BC	ANACORTES
BELLINGHAM	PORT ANGELES	OUT SEA	OLYMPIA	VANCOUVER BC	BELLINGHAM
BELLINGHAM	SEATTLE	OUT SEA	POINT WELLS	VANCOUVER BC	CHERRY POINT
BREMERTON	TACOMA	OUT SEA	PORT ANGELES	VANCOUVER BC	EVERETT
CHERRY POINT	BELLINGHAM	OUT SEA	PORT TOWNSEND	VANCOUVER BC	INDIAN ISLAND
CHERRY POINT	FERNDALE	OUT SEA	QUARTERMASTER HBR	VANCOUVER BC	MARCH POINT
CHERRY POINT	MANCHESTER	OUT SEA	SANDY POINT	VANCOUVER BC	PORT ANGELES
CHERRY POINT	MARCH POINT	OUT SEA	SEATTLE	VANCOUVER BC	QUARTERMASTER HBR
CHERRY POINT	OUT SEA	OUT SEA	TACOMA	VANCOUVER BC	SANDY POINT
CHERRY POINT	PORT ANGELES	OUT SEA	VENDOVISLAND	VANCOUVER BC	SEATTLE
CHERRY POINT	SEATTLE	OUT SEA	YUKON HARBOR	VANCOUVER BC	TACOMA
CHERRY POINT	TACOMA	POINT WELLS	MARCH POINT	VANCOUVER BC	VENDOVISLAND
CHERRY POINT	VANCOUVER BC	POINT WELLS	OUT SEA	VENDOVISLAND	ANACORTES
CHERRY POINT	VENDOVISLAND	POINT WELLS	PORT ANGELES	VENDOVISLAND	BELLINGHAM
EVERETT	EVERETT	PORT ANGELES	ANACORTES	VENDOVISLAND	CHERRY POINT
EVERETT	OUT SEA	PORT ANGELES	BELLINGHAM	VENDOVISLAND	FERNDALE
EVERETT	PORT ANGELES	PORT ANGELES	CHERRY POINT	VENDOVISLAND	MARCH POINT
EVERETT	SEATTLE	PORT ANGELES	EVERETT	VENDOVISLAND	OUT SEA
EVERETT	VANCOUVER BC	PORT ANGELES	FERNDALE	VENDOVISLAND	SEATTLE
FERNDALE	CHERRY POINT	PORT ANGELES	INDIAN ISLAND	VENDOVISLAND	TACOMA
FERNDALE	MARCH POINT	PORT ANGELES	MARCH POINT	VENDOVISLAND	VANCOUVER BC
FERNDALE	OUT SEA	PORT ANGELES	OUT SEA	VICTORIA	PORT ANGELES
FERNDALE	PORT ANGELES	PORT ANGELES	POINT WELLS	VICTORIA	SEATTLE
FERNDALE	SANDY POINT	PORT ANGELES	PORT ANGELES	YUKON HARBOR	OUT SEA
FERNDALE	TACOMA	PORT ANGELES	SANDY POINT		
FERNDALE	VANCOUVER BC	PORT ANGELES	SEATTLE		
FERNDALE	VENDOVISLAND	PORT ANGELES	TACOMA		
INDIAN ISLAND	MANCHESTER	PORT ANGELES	VANCOUVER BC		
INDIAN ISLAND	OUT SEA	PORT ANGELES	VENDOVISLAND		
MANCHESTER	CHERRY POINT	PORT TOWNSEND	SEATTLE		
MANCHESTER	MARCH POINT	QUARTERMASTER HBR	OUT SEA		
MANCHESTER	OUT SEA	QUARTERMASTER HBR	TACOMA		
MANCHESTER	PORT ANGELES	SANDY POINT	CHERRY POINT		
MANCHESTER	SEATTLE	SANDY POINT	FERNDALE		
MARCH POINT	ANACORTES	SEATTLE	CHERRY POINT		
MARCH POINT	CHERRY POINT	SEATTLE	EVERETT		
MARCH POINT	FERNDALE	SEATTLE	FERNDALE		
MARCH POINT	MARCH POINT	SEATTLE	MANCHESTER		
MARCH POINT	OUT SEA	SEATTLE	MARCH POINT		
MARCH POINT	POINT WELLS	SEATTLE	OLYMPIA		
MARCH POINT	PORT ANGELES	SEATTLE	OUT SEA		
MARCH POINT	QUARTERMASTER HBR	SEATTLE	PORT ANGELES		
MARCH POINT	SEATTLE	SEATTLE	SEATTLE		
MARCH POINT	TACOMA	SEATTLE	TACOMA		
MARCH POINT	VANCOUVER BC	SEATTLE	VANCOUVER BC		
MARCH POINT	VENDOVISLAND	SEATTLE	VENDOVISLAND		
MARCH POINT	VICTORIA	SEATTLE	VICTORIA		

As shown in Table 3.3 eight distinct routes were outside the scope of the inventory.

**Table 3.3: OGV Routes Not Included in Puget Sound Maritime Air Emissions Inventory**

Port	Destination
ABERDEEN	ABERDEEN
ABERDEEN	OUT TO SEA
ABERDEEN	VANCOUVER BC
OUT TO SEA	ABERDEEN
OUT TO SEA	WESTPORT
VANCOUVER BC	ABERDEEN
VANCOUVER BC	WESTPORT
WESTPORT	ABERDEEN

In 2005, the trip combinations were applied to specific routes using nautical chart software Maptech Offshore Navigator, v5.07. Each unique trip, inbound or outbound, was mapped and then divided into logical trip segments. These segments were aligned by precautionary zones, places where ships could take different routes, speed reduction zones, curves or bends in the fairway, major channel markers, and county lines. Any updates to the routing for 2011 were done using ArcGIS, v9.3.1. The route coordinates and segments from 2005 were plotted in ArcGIS and updates were made to accommodate new facilities or adjust route speeds. For an added level of assurance, the routing segments were reviewed with the Puget Sound Pilots and modified based on their input.<sup>11</sup> As an example of trip segmentation, the Port of Everett to out to sea route is discussed in more detail. In this effort, there was one trip route and 21 trip segments or links using the partitioning techniques described earlier. For the Port of Everett to the out to sea route:

- The shortest segment was 0.8 nautical miles (miles)
- The longest segment was 34.1 miles (the Strait of San Juan de Fuca)
- The average segment was 5.7 miles

Each port-to-port combination was modeled differently, depending also on whether it was inbound or outbound. Service speeds (knots) for each vessel were taken from Lloyd's data. Reduced speeds were assigned for each vessel type, depending on whether they were:

- Fast – containerhips, auto carriers, and cruise ships
- Medium – reefers and RoRos
- Slow – tankers and all other vessel types

<sup>11</sup> Meeting between Captain Frantz (Andy) Coe, Puget Sound Pilots, and Bruce Anderson and Rose Muller, Starcrest, 10April 2012. Puget Sound Pilots, <http://www.pspilots.org>.

Although there is no industry standard that assigns ranges for speed category, in general, fast vessels are considered to have a maximum speed range of 20 to 25 knots, while slow vessels have a maximum speed range of 17 knots or less, and the medium speed vessels fall between the speed ranges of 17 to 20 knots.

For the maneuvering, a list of destinations for each port area was derived from the 2011 MarEx data. Some of the destinations listed in the following tables may not be property of the ports listed. These include port-owned berths, private facilities, and anchorages that are located near that port. Tables 3.4 through 3.11 list the destinations by port area, as provided by MarEx:

**Table 3.4: 2011 OGV Anacortes Destinations**

Port	Destination
ANACORTES	CURTIS WHARF
ANACORTES	PORT DOCK 1
ANACORTES	PORT DOCK 2

**Table 3.5: 2011 OGV Everett Destinations**

Port	Destination
EVERETT	1-NORTH
EVERETT	1-SOUTH
EVERETT	3-NORTH
EVERETT	3-SOUTH
EVERETT	ANCHOR
EVERETT	DOLPHIN BERTH
EVERETT	HEWITT
EVERETT	PACIFIC TERM
EVERETT	SOUTH TERMINAL

**Table 3.6: 2011 OGV Olympia Destinations**

Port	Destination
OLYMPIA	PORT DOCK 2
OLYMPIA	PORT DOCK 3

**Table 3.7: 2011 OGV Port Angeles Destinations**

Port	Destination
PORT ANGELES	1-NORTH
PORT ANGELES	ANCHOR
PORT ANGELES	T PIER

**Table 3.8: 2011 OGV Tacoma Destinations**

Port	Destination	Port	Destination
TACOMA	3	TACOMA	PCT-A
TACOMA	3-SOUTH	TACOMA	PCT-A&B
TACOMA	4	TACOMA	PCT-B
TACOMA	4-A	TACOMA	TEMCO
TACOMA	4-A&B	TACOMA	TOTE
TACOMA	7-A	TACOMA	WA UNITED 1
TACOMA	7-B	TACOMA	WA UNITED 2
TACOMA	7-D	TACOMA	WEYCO Log 1
TACOMA	ANCHOR	TACOMA	WEYCO Log 2
TACOMA	BLAIR-A	TACOMA - PRIVATE	PNW TERMINAL
TACOMA	BLAIR-A&B	TACOMA - PRIVATE	SCHNITZER
TACOMA	BLAIR-B	TACOMA - PRIVATE	SOUND OIL
TACOMA	BLAIR-E	TACOMA - PRIVATE	SPERRY
TACOMA	BLAIR-EAST	TACOMA - PRIVATE	US OIL
TACOMA	MAERSK	TACOMA - PRIVATE	VIGOR MARINE



For the Seattle area, there are four anchorages (EBE, EBW, SCE, and SCW) not listed in the Table 3.9, but are included in this study.

**Table 3.9: 2011 OGV Seattle Destinations**

<b>Port</b>	<b>Destination</b>	<b>Port</b>	<b>Destination</b>
SEATTLE	105	SEATTLE	86
SEATTLE	15	SEATTLE	90-1
SEATTLE	18-1	SEATTLE	90-7
SEATTLE	18-2	SEATTLE	90-I
SEATTLE	18-3	SEATTLE	91-E
SEATTLE	18-4	SEATTLE	91-I
SEATTLE	20-1	SEATTLE - PRIVATE	17
SEATTLE	25-NORTH	SEATTLE - PRIVATE	BP
SEATTLE	30-NORTH	SEATTLE - PRIVATE	CTG
SEATTLE	30-SOUTH	SEATTLE - PRIVATE	GLACIER
SEATTLE	46	SEATTLE - PRIVATE	KINDER MORGAN
SEATTLE	5-CENTER	SEATTLE - PRIVATE	LAFARGE
SEATTLE	5-NORTH	SEATTLE - PRIVATE	SHELL
SEATTLE	5-SOUTH	SEATTLE - PRIVATE	VIGOR-H
SEATTLE	66-2		

Table 3.10 lists “other ports” destinations. The term “other ports” refers to any stop made by a vessel not included in the main port areas and does not necessarily refer to a public port. Some of these “ports” may not be typical vessel stops, (e.g., Blake Island) but were listed in the MarEx and therefore included in the routing for completeness.

**Table 3.10: 2011 OGV Other Ports Destinations**

<b>Port</b>	<b>Destination</b>
BELLINGHAM	ANCHOR
BELLINGHAM	COLD STORAGE
BELLINGHAM	PORT DOCK 1
BELLINGHAM	PORT DOCK 2
BREMERTON	PSNS
CHERRY POINT	BP
CHERRY POINT	PORT DOCK 2
FERNDALE	INTALCO
FERNDALE	PHILLIPS
FERNDALE	SHELL
INDIAN ISLAND	AMMO
MANCHESTER	FUEL
MARCH POINT	ANCHOR
MARCH POINT	SHELL
MARCH POINT	TESORO
POINT WELLS	ANCHOR
POINT WELLS	PARAMOUNT
PORT TOWNSEND	ANCHOR
QUARTERMASTER HBR	ANCHOR
SANDY POINT	ANCHOR
SEA	NA
VENDОВI ISLAND	ANCHOR
VENDОВI ISLAND	PORT DOCK 2
VENDОВI ISLAND	WEST HYLEBOS 2
YUKON HARBOR	ANCHOR

The Foss Shipyard, Lake Union, Salmon Bay and Northlake piers listed in Table 3.11 are located in Lake Washington which is outside the scope of this study and were not included in the inventory. There were only a few trips made to these piers.

**Table 3.11: 2011 Excluded Piers in Lake Washington**

Port	Pier
LWSC	FOSS SHIPYAR
LWSC	LAKE UNION
LWSC	NORTHLAKE
LWSC	SALMON BAY

### 3.5 Emission Reduction Technologies Identified

In 2011, slide fuel valves were used by 330 known vessels that called in the Puget Sound. Slide fuel valves lead to better combustion, less smoke, and lower fuel consumption, resulting in reduced overall NO<sub>x</sub> and PM emissions. Propulsion engines manufactured by MAN B&W that have a build year of 2004 or greater are considered to have slide valves. Since the use of slide valves is not called out specifically in the information available for each vessel, the inventory may not have captured all the vessels with slide valves that called at Puget Sound maritime facilities in 2011. The emission reduction estimates for the slide valves have been reported by MAN B&W as based on their diesel engine<sup>12</sup> emission measurements. The reductions are:

- 30% reduction for NO<sub>x</sub>
- 25% reduction for PM

At the Port of Seattle, Holland America Line, Carnival and Princess Line cruise vessels used shore power during the 2011 cruise season at Terminal 91. At the Port of Tacoma, all vessels operated by Totem Ocean Trailer Express which called at TOTE terminal also used shore power in 2011. These vessels had zero emissions while using shore power at berth. For all vessels that used shore power, a minimum of 1.5 hours was used for hotelling time to allow time for vessels to plug in.

Holland America Line and Westwood Shipping vessels have maintained their ‘Clean Class’ or ‘Environmental Notation’ designations from 2005, allowing for lower NO<sub>x</sub> emission factors to be applied on specific vessels (See Section 3.6.4 and Table 3.14).

<sup>12</sup>Port of Los Angeles, [http://www.portoflosangeles.org/pdf/2010\\_Air\\_Emissions\\_Inventory.pdf](http://www.portoflosangeles.org/pdf/2010_Air_Emissions_Inventory.pdf).

The Port of Seattle and the Port of Tacoma both had vessel calls which utilized lower sulfur marine gas oil/marine diesel oil while at berth. Many shipping and cruise lines visiting the Port of Seattle participated in the At-Berth Clean (ABC) Fuels program. In 2011, there were 375 vessel calls that used low-sulfur fuel while at berth under the ABC Fuels program. See section 3.6.10 for a full listing of participating lines. At the Port of Tacoma, any vessels operated by Evergreen, as well as all K-line container vessels, switched to low-sulfur fuel while at berth. The use of low-sulfur fuel allows for SO<sub>2</sub> and PM emissions reductions.

### 3.6 Emissions Estimating Methodology

In developing an activity-based emissions inventory for marine vessels, emissions are estimated as a function of vessel power demand (expressed in kW-hrs) multiplied by an emission factor, where the emission factor is expressed in terms of grams per kilowatt-hour (g/kW-hr). Emission factors and emission factor adjustments for low propulsion engine load were then applied to the various activity data.

Equation 3.1

$$E = \text{Energy} \times EF \times FCF$$

Where:

E = emissions from the engine(s) that are included in the “Energy” term discussed below, usually calculated as grams of emissions per unit of time (e.g., per year), but converted to tons of emissions by dividing by 453.6 grams per pound and 2,000 pounds per ton.

Energy = energy demand, in kW-hrs, calculated using Equation 3.2 below as the energy output of the engine (or engines) over the period of time covered by the estimate.

EF = emission factor, usually expressed in terms of g/kW-hr, discussed in more detail in Section 3.6.4.

FCF = fuel correction factor (unitless), used to account for other fuels used and fuel switching, discussed in Section 3.6.10.

The ‘Energy’ term of the equation is where most of the location-specific information is used. Energy is calculated using Equation 3.2:

Equation 3.2

$$\text{Energy} = MCR \times LF \times A$$

Where:

MCR = maximum continuous rated engine power, kW

LF = load factor (unitless)

A = activity, hours

The emissions estimation section discusses the methodology used for propulsion engines (Sections 3.6.1 to 3.6.6), auxiliary engines (Sections 3.6.7 and 3.6.8) and auxiliary boilers (Section 3.6.9). Propulsion engines are also referred to as main engines.

Incinerators are not included in the emissions estimates because incinerators are not used within the study area. Interviews with the vessel operators and marine industry, in general, report that vessels do not use their incinerators while at berth or near coastal waters. The PSCAA requires a permit to operate an incinerator on an ocean-going vessel within their jurisdiction and no permits have been issued to date.

### 3.6.1 Propulsion Engine Maximum Continuous Rated Power

MCR power is defined as the manufacturer's tested engine power; for this study, it is assumed that the Lloyd's 'Power' value is the MCR power. The international specification is to report MCR in kilowatts, and it is related to the highest power available from a ship engine during average cargo and sea conditions. However, operating a vessel at 100% of its MCR power is very costly from a fuel consumption and engine maintenance perspective, so most operators limit their maximum power to about 80% of MCR.

### 3.6.2 Propulsion Engine Load Factor

Load factor is expressed as the ratio of a vessel's power output at a given speed to the vessel's MCR power. At maximum power (100% MCR) and maximum speed, the load is 100%. Service speed is 94% of the maximum speed.<sup>13</sup> As suggested above, at normal service speed, a ship probably has a load factor of close to 80%. Every vessel has a different maximum, service, and intermediate speeds (the range is 2% to 83% load on the engine). For the purpose of computation, actual speeds from Lloyd's data are used. For intermediate speeds (2% - 83% load), the Propeller Law<sup>14</sup> is used to estimate ship propulsion engine loads, based on the theory that propulsion power varies by the cube of speed.

Equation 3.3

$$LF = (Speed_{Actual} / Speed_{Maximum})^3$$

Where:

LF = load factor, percent

Speed<sub>Actual</sub> = actual speed, knots

Speed<sub>Maximum</sub> = maximum speed, knots

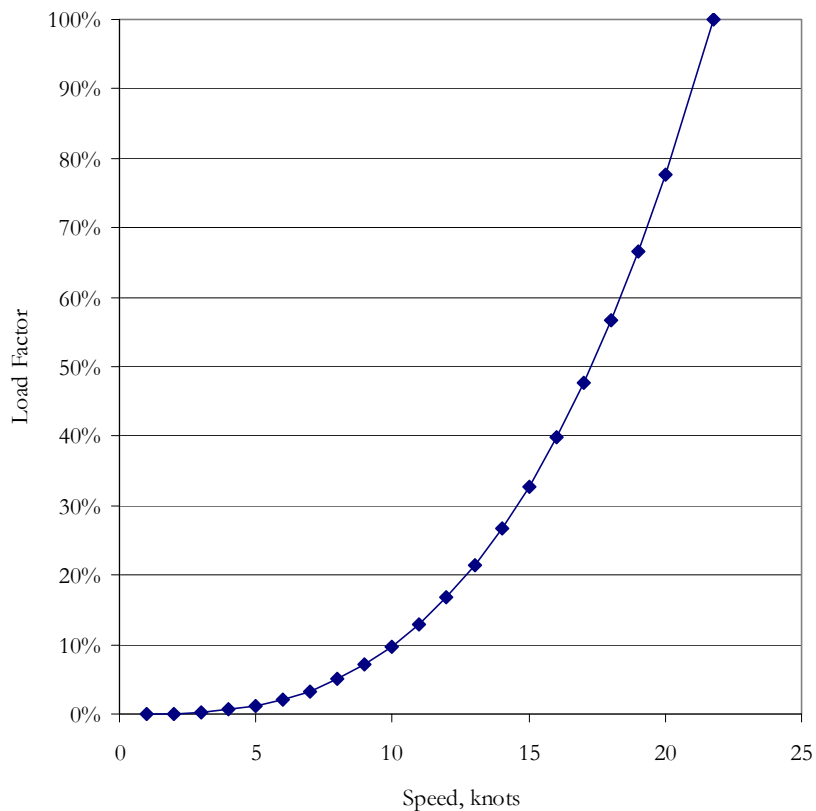
<sup>13</sup>Starcrest, 2005.

<sup>14</sup> Man B & W, *Basic Principles of Ship Propulsion*.

The output from Equation 3.3 is illustrated in Figure 3.21, showing the load factor curve of a hypothetical ship with 20,000 kW main engine power and a top speed of 22 knots at that power output. The shape of the curve illustrates why vessels typically operate at less than their MCR power – at the top of the curve, the increase in power is much greater than the increase in speed, meaning that the vessel uses comparatively more power (and fuel) to obtain a small increase in speed.

As an example, at a speed of 20 knots, the hypothetical vessel’s engine would be operating with a load factor of 75%  $[(20/22)^3 = 0.75, \text{ or } 75\%]$ . At 21 knots the load factor would be 87%  $[(21/22)^3 = 0.87, \text{ or } 87\%]$ . That’s an increase of 12% of the vessel’s power output for a 1-knot increase in speed. At the lower end of the speed range, at a speed of 10 knots, the hypothetical vessel’s engine would be operating with a load factor of 9%  $[(10/22)^3 = 0.09, \text{ or } 9\%]$ . At 9 knots the load factor would be 7%  $[(9/22)^3 = 0.07, \text{ or } 7\%]$ ; this would give a 1-knot speed increase at an increase of only 2% of the vessel’s power output. At 6 knots the load factor would be 2%  $[(6/22)^3 = 0.02, \text{ or } 2\%]$ .

**Figure 3.21: Propeller Law Curve of Power Demand**



### 3.6.3 Propulsion Engine Time in Mode

Time in mode or activity is measured in hours of operation. The transit times were estimated by dividing the distance traveled by ship speed. The distance and ship speed are from the routing data discussed in Section 3.4.

Equation 3.4

$$\mathbf{Activity = D/Speed_{Actual}}$$

Where:

Activity = activity, hours

D = distance, nautical miles

Speed<sub>Actual</sub> = actual ship speed, knots

In addition to transit time, there are also maneuvering and hotelling times that are used. For maneuvering time, the same Equation 3.4 is used to calculate time during maneuvering. For hotelling time, departure time was subtracted from the arrival time to estimate hours of hotelling for both at berth and anchorage.

### 3.6.4 Propulsion Engine Emission Factors

The main engine emission factors used in this study were reported in a 2002 Entec study<sup>15</sup>, except for the PM emission factor. The source and value of each emission factor for the main engines is discussed in this section.

Vessels are assumed to operate their main engines on residual oil (RO) which is intermediate fuel oil (IFO) or one with similar specifications with an average sulfur constant of 2.7%. Exceptions are made for those vessels that are known to use a different fuel other than residual fuel, such as those vessels participating in fuel switch incentive programs. For vessels using a different fuel, a fuel correction factor is applied in the equation and this is discussed in a separate subsection.

Three vessel technologies are reported:

- Slow speed diesel engines, having maximum engine speeds less than 130 revolutions per minute (rpm) based on the EPA definition for ship engines as described in a 1999 Regulatory Impact Analysis (RIA).<sup>16</sup>
- Medium speed diesel engines, having maximum engine speeds over 130 rpm (and typically greater than 400 rpm).
- Gas and steam boiler turbines.

---

<sup>15</sup> Entec, *Quantification of Emissions from Ships Associated with Ship Movements between Ports in the European Community, Final Report*, July 2002.

<sup>16</sup> EPA, *Control of Emissions from Marine Diesel Engines, Regulatory Impact Analysis*, November 1999.

The emission factors for main engines using residual fuel are listed in Table 3.12. The emission factors are listed by model year for slow and medium speed engines to list the Tier 1 (2000-2010) and Tier 2 (2011-2015) NO<sub>x</sub> emission factor. The Tier 2 engines were determined by using the keel laid dates from Lloyd's data.

**Table 3.12: Emission Factors for OGV Main Engines Using RO, g/kW-hr**

Engine	Model Year	NO <sub>x</sub>	HC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM
Slow speed diesel	≤ 1999	18.1	0.6	1.4	10.5	1.5	1.2	1.5
Medium speed diesel	≤ 1999	14.0	0.5	1.1	11.5	1.5	1.2	1.5
Slow speed diesel	2000 - 2010	17.0	0.6	1.4	10.5	1.5	1.2	1.5
Medium speed diesel	2000 - 2010	13.0	0.5	1.1	11.5	1.5	1.2	1.5
Slow speed diesel	2011 - 2015	14.4	0.6	1.4	10.5	1.5	1.2	1.5
Medium speed diesel	2011 - 2015	10.5	0.5	1.1	11.5	1.5	1.2	1.5
Gas turbine	All	6.1	0.1	0.2	16.5	0.05	0.04	0.0
Steamship	All	2.1	0.1	0.2	16.5	0.8	0.6	0.0

The emission factors for greenhouse gases are listed in Table 3.13. The sources for the CO<sub>2</sub>, N<sub>2</sub>O and methane (CH<sub>4</sub>) emissions factors is the IVL 2004 report.

**Table 3.13: GHG Emission Factors for OGV Main Engines Using RO, g/kW-hr**

Engine	Model Year	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
Slow speed diesel	all	620	0.031	0.012
Medium speed diesel	all	683	0.031	0.010
Gas turbine	all	970	0.08	0.002
Steamship	all	970	0.08	0.002

#### *NO<sub>x</sub> Emission Factor*

The IMO established ocean-going vessel propulsion engine standards in Annex VI and engine manufacturers have been in compliance with the NO<sub>x</sub> Technical Code since 2000. The engine standards are baseline standards to prevent back sliding on emission levels from 2000 and newer engine models. In this study, the 17.0 g/kW-hr NO<sub>x</sub> emission factor (Tier 1) is used for slow speed vessels built in year 2000 to 2010; while 14.4 g/kW-hr NO<sub>x</sub> emission factor (Tier 2) is used for slow speed vessels with a keel laid date of 2011 and newer.



Medium speed engine standards under the IMO program are based on engine rpm. For medium speed engines built in year 2000 to 2010, the 13.0 g/kW-hr NO<sub>x</sub> emission factor is used; while those engines with keel laid date of 2011 and newer use a NO<sub>x</sub> emission factor of 10.5 g/kW-hr. Engine manufacturers design their engines to emit well below the calculated standards, but it is difficult to establish an “in-use” average without the benefit of measurements.

*Emission Factors for Clean Class or Environmental Notation*

Classification societies have introduced environmental standards for vessels and also provide independent verification of shipboard environmental performance. Vessels are assigned an environmental notation once they meet certain environmental requirements. The notation may vary by name and requirement depending on the class society providing the service. Based on interviews in previous inventory with ship owners and engine test data certified on their environmental notation, vessels from two shipping lines, Holland America Line (HAL) and Westwood Shipping, were given a lower NO<sub>x</sub> emission factor. Table 3.14 lists the NO<sub>x</sub> emission factors used for these vessels.

**Table 3.14: NO<sub>x</sub> Emission Factors for Engines on Specific Vessels, g/kW-hr**

Engine	NO <sub>x</sub>
HAL vessels with medium speed diesel	10
Westwood vessels with slow speed diesel	12.1
Westwood vessels with medium speed diesel	9.4

*CO Emission Factor*

CO emission factors were developed from information provided in the Entec 2002 appendices because they are not explicitly stated in the text. They were confirmed with IVL Swedish Environmental Research Institute Ltd.<sup>17</sup>

<sup>17</sup> IVL Swedish Environmental Research Institute Ltd., 16 January 2004 e-mail correspondence with C.H. Wells, Starcrest Consulting Group, LLC. (IVL 2004)

#### *PM Emission Factor*

Recent discussions with EPA have cited PM emission factors in the range of 0.99 to 1.11 g/kW-hr for slow and medium speed engines. In order to be consistent with EPA and the concurrent BCCO inventory, an average emission factor of 1.0 g/kW-hr was used for this study. The PM emission factor is derived from the results of an equation that is based on PM and sulfate relationship<sup>18</sup> since the factor is not explicitly listed in the Entec study. California Air Resource Board (CARB) is using 1.5 g/kW-hr for the PM emission factor in their state emissions inventories, but this value is not being used outside of California. PM<sub>10</sub> is assumed to be 100% of PM and fine particulate matter, PM<sub>2.5</sub>, was estimated to be 80% of PM<sub>10</sub><sup>19</sup>. For internal combustion diesel engines, the same PM<sub>10</sub> emission factor is used for DPM. For other types of engines that do not meet the definition of internal combustion, such as steam boilers and gas turbines, diesel particulate matter is zero.

#### *SO<sub>2</sub> Emission Factor*

The SO<sub>2</sub> emission factor is dependent on the fuel used; the baseline emission factor for Puget Sound is based on a sulfur content of 2.7%, which is an average for residual fuel. If lower sulfur fuel content is used, fuel correction factors are applied, as discussed in Section 3.6.10.

#### *3.6.5 Varying Emission Factors for Low Loads for Propulsion Engines*

This section addresses emission factors for propulsion engines powered by compression ignition engines. The discussion does not include steamships or ships having gas turbines because Energy and Environmental Analysis, Inc. (EEIA), in a study conducted for EPA, observed a rise in emissions for diesel engines only.<sup>20</sup>

In general terms, diesel-cycle engines are not as efficient when operated at low loads or very high loads. The EEIA study established a formula for calculating emission factors for low engine load conditions, such as those encountered during harbor maneuvering and when traveling slowly at sea, such as in the reduced speed zone. While mass emissions (e.g., pounds per hour) tend to go down as vessel speeds and engine loads decrease, the emission factors (e.g., g/kW-hr) increase. This is based on observations that compression-cycle combustion engines are less efficient at low loads. Low load emission factor equations were developed from EPA emission factors for marine vessels at full load.

---

<sup>18</sup> EPA, *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Compression Ignition Engines*, April 2004.

<sup>19</sup> Lyyranen, *Aerosol Characterization in Medium-Speed Diesel Engines Operating with Heavy Fuel Oils*, Journal of Aerosol Science, 1999.

<sup>20</sup> EEIA, *Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data*, February 2000. (EEIA 2000)

These equations work well to describe the low-load effect where emission rates can increase, based on a limited set of data from Lloyd’s Maritime Program and the U.S. Coast Guard. It was first cited in a study conducted for the EPA in 2002 by ENVIRON.<sup>21</sup> The equation is based on the variables provided in Table 3.15.

**Table 3.15: Low-Load Emission Factor Regression Equation Variables**

Pollutant	Exponent	Intercept (b)	Coefficient (a)
PM	1.5	0.25	0.0059
NO <sub>x</sub>	1.5	10.45	0.1255
CO	1.0	0.15	0.8378
VOC	1.5	0.39	0.0667

The equations were used for the entire spectrum of load factors from 1% to 20% for each pollutant, as follows:

Equation 3.5

$$y = a(\text{fractional load}) - x + b$$

Where:

y = emissions in g/kW-hr

a = coefficient

b = intercept

x = exponent (negative)

fractional load = derived by the Propeller Law

The EEIA 2000 equations were used to generate emission factors at loads between one and 20% main engine power. Each of the 20 EEIA factors was divided by the emission factor at 20% EEAI load. This resulted in numbers greater than or equal to one, since emissions increased as load decreased. At 20% load, the value was exactly 1.0 since it was divided into itself. These numbers are called low-load adjustment factors (LLA). The LLA multipliers were then applied to any at sea emission factor. The database then computes the resulting emission factor for each pollutant.

Alternative methods were explored, such as using the EEAI equations to span the entire spectrum between 1% and 100% load, using revised emission factors as the intercept (the starting place at 100% load). Unfortunately, such adjustments cause the shape of the graphed curves to change, and such changes could not be validated with empirical or measurement results. Thus the low load adjustments are used in a relative sense, based on the original published data.

<sup>21</sup> EPA, *Commercial Marine Inventory Development*, July 2002.

The low load adjustment multipliers are reported in Table 3.16.

**Table 3.16: Low-Load Adjustment Multipliers for Emission Factors**

Load	NO <sub>x</sub>	CO	HC	PM
2%	4.63	9.68	21.18	7.29
3%	2.92	6.46	11.68	4.33
4%	2.21	4.86	7.71	3.09
5%	1.83	3.89	5.61	2.44
6%	1.60	3.25	4.35	2.04
7%	1.45	2.79	3.52	1.79
8%	1.35	2.45	2.95	1.61
9%	1.27	2.18	2.52	1.48
10%	1.22	1.96	2.20	1.38
11%	1.17	1.79	1.96	1.30
12%	1.14	1.64	1.76	1.24
13%	1.11	1.52	1.60	1.19
14%	1.08	1.41	1.47	1.15
15%	1.06	1.32	1.36	1.11
16%	1.05	1.24	1.26	1.08
17%	1.03	1.17	1.60	1.06
18%	1.02	1.11	1.18	1.04
19%	1.01	1.05	1.11	1.02
20%	1.00	1.00	1.00	1.00

### 3.6.6 Propulsion Engine Maneuvering Loads

Maneuvering is the transition between transit and docking or vice versa. Maneuvering includes docking and a small amount of harbor transit which is transit from/to the main channel. Main engines during maneuvering tend to use a small percentage of total power, especially when coasting on the way into port. During docking, when the ship is being positioned against the wharf, the assist tugboats do most of the work. Emissions from assist tugs are included in the harbor vessel section of this report. Estimation of main engine maneuvering loads is the composite of several factors, such as:

- Variable loads for inbound and outbound segments
- Variable transit maneuvering time dependent on distance and speed
- 2% load during docking

The docking aspect is routine with the exception that some ships require extra backing and turning, either on entry or exit. Maneuvering times vary by port, terminal, and ship type.

Docking requires about 2% load on the main engines,<sup>22</sup> but the harbor transit load has to be calculated by the Propeller Law. The transit main engine loads are below 20% during the harbor transit mode, therefore the low load adjustments are also applied to the emission factors. Results are then weighted together by percentage of time in docking and harbor transit modes. Results are shown in Table 3.17.

**Table 3.17: Composite Maneuvering Load Factors**

Vessel Type	Load In	Load Out
Auto Carrier	0.04	0.06
Bulk	0.04	0.05
Containership	0.03	0.03
Cruise	0.03	0.04
General Cargo	0.03	0.04
ITB	0.04	0.06
Reefer	0.02	0.03
RoRo	0.02	0.02
Tanker	0.03	0.05

Load in is an arrival to the harbor and load out is a departure from a dock or pier. The load out is higher than load in because the engine power is used to leave the dock, while the vessel usually coasts in on arrival.

### 3.6.7 Auxiliary Engine Emission Factors

The process of estimating emissions from auxiliary engines is generally the same as for main engines, with differing details. One main difference is that the load factor is not calculated but rather is estimated from reports in the technical literature (i.e., Entec 2002 and IVL 2004 studies) and from discussions with experts such as ships' engineers. Calculating auxiliary engine load factors from empirical data is theoretically possible but would require detailed fuel consumption data that is not typically available.

<sup>22</sup>Starcrest 2005.

The Entec auxiliary engine emission factors used in this study are presented in Tables 3.18 and 3.19 for medium speed engines using residual fuel oil. CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> emission factors are obtained from IVL 2004 report.

**Table 3.18: Auxiliary Engine Emission Factors, g/kW-hr**

Engine	Model Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM
Medium speed diesel	≤ 1999	14.7	0.5	1.1	12.3	1.0	0.8	1.0
Medium speed diesel	2000 - 2010	13.0	0.5	1.1	12.3	1.0	0.8	1.0
Medium speed diesel	2011 - 2015	10.5	0.5	1.1	12.3	1.0	0.8	1.0

**Table 3.19: Greenhouse Gas Emission Factors for Auxiliary Engines, g/kW-hr**

Engine	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
Medium speed diesel	683	0.031	0.008

It is assumed that vessels operate their auxiliary engines on residual fuel oil with an average sulfur content of 2.7%. If it is known that a vessel switches fuel while in Puget Sound to a lower sulfur fuel, a fuel correction factor is used. The fuel correction factors are discussed in Section 3.6.10.

### 3.6.8 Auxiliary Engine Defaults

As explained earlier, auxiliary engine information is usually not provided to Lloyd's by vessel owners since it is not required by IMO or the classification societies, thus Lloyd's data contains minimal auxiliary engine information. For 2011, the 2010 published data for the Port of Los Angeles and the Port of Long Beach was averaged and used to generate profiles or defaults for the purpose of "gap filling" when there was missing data.

Vessels do not use the total auxiliary engine installed power when at sea, during hotelling and during maneuvering. For each mode and vessel type, a different number of engines may be used and at varying loads depending on several factors, such as temperature and number of reefers onboard. Hotelling load is primarily what is needed to meet the power needs of the lights, heating/ventilation/air conditioning systems, communications, computers, ship cranes, pumps, reefer load, and various other power demands while the vessel is at dock. Maneuvering generally requires the highest auxiliary load mode for OGVs in order to provide power to the bow thrusters that are used intermittently. Transit periods, or "at sea mode," generally requires the lowest auxiliary loads, as additional auxiliary power is not required for maneuvering. Many vessels also have shaft generators and exhaust turbine generators that help provide power to the ship with greater fuel efficiency than auxiliary generators.

From the inception of the Vessel Boarding Program, the average or typical number of auxiliary engines used and the corresponding load at sea, during maneuvering and at berth, have been studied to gain a better understanding of the how the auxiliary engines are used in relation to the total number and total power installed. The load default in kilowatts is based on the percent load, which takes into account the average number of actual engines used and their load. Another way to view auxiliary engine load is the kilowatts actually used as a fraction of the total power available. For example, a 1,000 TEU container vessel equipped with three auxiliary engines may use just one of them at berth at 60% load. The resulting total hotelling load is 0.33 multiplied by 0.6, which equals 0.2 or 20%. The 0.33 figure represents one of the three engines in use, while the 0.6 represents the 60% load on that engine. Table 3.20 summarizes the total power and load defaults used for this study by vessel subtype.

**Table 3.20: 2011 Auxiliary Engine Power and Load Defaults, kW**

Vessel Type	Sea	Maneuvering	Hotelling
Auto Carrier	514	1,541	876
Bulk	266	705	157
Bulk - Self Discharging	439	1,163	258
Bulk - Heavy Load	231	610	136
Bulk - Wood Chips	266	705	157
Container - 1000	492	1,556	536
Container - 2000	723	1,916	945
Container - 3000	710	2,382	965
Container - 4000	1,162	2,973	1,196
Container - 5000	1,185	4,356	1,202
Container - 6000	1,554	4,815	1,461
Container - 7000	1,446	4,360	1,325
Container - 8000	1,576	4,769	1,449
Container - 9000	1,498	4,551	1,383
Container - 10000	1,767	2,617	887
Cruise	na	na	na
General Cargo	506	1,339	655
ITB	89	234	115
Reefer	467	1,402	900
RoRo	514	1,541	890
Tanker - Aframax	720	990	780
Tanker - Chemical	682	937	739
Tanker - Handysize	504	693	546
Tanker - Panamax	604	830	654
Tanker - Suezmax	702	965	761

The maneuvering load defaults for auxiliary engines are set to 100%, but can be assigned an alternate value in the vessel routing table. This is to account for the complex nature of the routing and the variability of auxiliary engine loads while maneuvering different sections of the Puget Sound.

### *3.6.9 Auxiliary Boilers*

In addition to the auxiliary engines that are used to generate electricity for on-board uses, most OGVs have one or more boilers used for fuel heating and for producing hot water. These boilers are not typically used during transit at sea because most vessels are equipped with exhaust heat recovery systems ("economizers") that use heat from the main engine's exhaust for their hot water needs. The auxiliary boilers are used when the main engine exhaust flow and/or temperature fall below what is needed for the economizer to provide adequate heat, such as during maneuvering and when the main engines are shut down at berth or when main engine loads drop below 20%. Defaults, based on 2010 published auxiliary boiler energy, for each vessel type are presented in Table 3.21. The cruise ships and tankers (except for diesel electric tankers) have much higher auxiliary boiler usage rates than the other vessel types. Cruise ships have higher boiler usage due to the number of passengers and the need for hot water. Tankers' boilers provide steam for steam-powered liquid pumps, inert gas for storage tanks, and heat to keep fuel warm for pumping.



Table 3.21: 2011 Auxiliary Boiler Energy Defaults, kW

Vessel Type	Sea	Maneuvering	Hotelling
Auto Carrier	0	250	250
Bulk	0	134	134
Bulk - Self Discharging	0	130	130
Bulk - Heavy Load	0	137	137
Bulk - Wood Chips	0	134	134
Container - 1000	0	263	263
Container - 2000	0	300	300
Container - 3000	0	517	517
Container - 4000	0	554	554
Container - 5000	0	675	675
Container - 6000	0	623	623
Container - 7000	0	479	479
Container - 8000	0	572	572
Container - 9000	0	572	572
Container - 10000	0	572	572
Cruise	0	1,549	1,549
General Cargo	0	134	134
ITB	0	0	0
Reefer	0	338	338
RoRo	0	275	275
Tanker - Aframax	0	371	2,750
Tanker - Chemical	0	371	2,750
Tanker - Handysize	0	371	2,750
Tanker - Panamax	0	371	2,750
Tanker - Suezmax	0	371	3,000

### 3.6.10 Fuel Correction Factors

Fuel correction factors are used to account for variations in fuel parameters between different types of fuel, so these variations can be accounted for in the emission estimates. As discussed earlier, emission factors were given for engines using residual fuel with an average 2.7% sulfur content. Table 3.22 lists the fuel correction factors used for most vessels in this study, which are based on fuel correction factors used in the San Pedro Bay Clean Air Action Plan.<sup>23</sup>

**Table 3.22: Fuel Correction Factors**

Fuel Used	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
HFO (2.7% S)	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.00	1.00	1.00
HFO (1.5% S)	1.00	1.00	1.00	0.555	0.82	0.82	0.82	1.00	1.00	1.00
MGO (0.5% S)	0.94	1.00	1.00	0.185	0.25	0.25	0.25	1.00	0.94	1.00
MDO (1.5% S)	0.94	1.00	1.00	0.555	0.47	0.47	0.47	1.00	0.94	1.00
MGO (0.1% S)	0.94	1.00	1.00	0.037	0.17	0.17	0.17	1.00	0.94	1.00
MGO (0.3% S)	0.94	1.00	1.00	0.111	0.21	0.21	0.21	1.00	0.94	1.00
MGO (0.4% S)	0.94	1.00	1.00	0.148	0.23	0.23	0.23	1.00	0.94	1.00

In 2011, there were 375 vessel calls at the Port of Seattle that participated in the At-Berth Clean (ABC) Fuels program. Participating vessels committed to using marine gas oil/marine diesel oil with less than 0.5% S while at berth. There were also several vessels that were not part of the ABC Fuel program but switched fuel at the Port Angeles pilot station and used low-sulfur fuel all the way into Port. Participating shipping and cruise lines include:

- Hapag Lloyd
- American Presidents Line
- China Ocean Shipping Company
- Hamburg Sud
- Maersk Line
- Matson Navigation
- Orient Overseas Container Line
- Royal Caribbean
- Celebrity Cruises
- Norwegian Cruise Line

Due to the variability of fuel sulfur content listed in actual fuel switch data obtained from the ABC Fuels program, vessel activity specific fuel correction factors were calculated and used in the emission calculations for these vessels.

<sup>23</sup>Port of Los Angeles and Port of Long Beach, *San Pedro Bay Clean Air Action Plan*, 2006.

Evergreen Line vessels, and some K-line vessels, which also called at the Port of Tacoma, used low-sulfur fuel with less than 0.5% S while at berth. Cruise ship lines that did not participate in the ABC Fuels program used residual fuel with an average of 1.5% S.

### 3.6.11 Other Correction Factors

Slide valve correction factors (see Section 3.5) are 0.70 for NO<sub>x</sub> and 0.75 for PM<sup>24</sup>.

## 3.7 Data Facts and Findings

Information gathered during the data collection process is summarized in this subsection. Table 3.23 lists the 910 discrete vessels that visited the Puget Sound study area in 2011 by vessel type.

**Table 3.23: 2011 OGVs by Vessel Type**

Vessel Type	Discrete Vessel Count
Auto Carrier	138
Bulk	294
Bulk - Heavy Load	2
Bulk - Self Discharging	4
Bulk - Wood Chips	1
Container - 1000	23
Container - 2000	24
Container - 3000	8
Container - 4000	45
Container - 5000	58
Container - 6000	29
Container - 7000	18
Container - 8000	39
Container - 9000	2
Container - 10000	1
Cruise	16
General Cargo	42
ITB	9
Reefer	6
RoRo	7
Tanker - Aframax	28
Tanker - Chemical	55
Tanker - Handysize	14
Tanker - Panamax	18
Tanker - Suezmax	29
<b>Total</b>	<b>910</b>

<sup>24</sup>Port of Los Angeles, *Inventory of Air Emissions*, 2010.

Although the study is for all maritime facilities, the following data findings are for the main ports. The average vessel characteristics listed in the tables were not used for estimating emissions since actual values were used on a per engine and vessel basis. The purpose of the average vessel characteristic tables included in this subsection is to summarize the data for the readers.

### 3.7.1 Port of Anacortes Data Findings

Table 3.24 summarizes the vessel movements for Port of Anacortes in 2011.

**Table 3.24: Port of Anacortes 2011 OGV Movements**

Vessel Type	Inbound	Outbound	Shift	Total Movements
Bulk	5	4	2	11
General Cargo	2	3	1	6
ITB	17	1	11	29
<b>Total</b>	<b>24</b>	<b>8</b>	<b>14</b>	<b>46</b>

Table 3.25 presents the average vessel and engine characteristics by vessel type for those vessels that called at the Port of Anacortes in 2011.

**Table 3.25: Port of Anacortes 2011 OGV Type Characteristics**

Vessel Type	Year Built	DWT (tonnes)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Bulk	2002	36,492	6,847	746	128
General Cargo	1999	20,005	8,121	1,333	149
ITB	2002	364	6,851	na	435

Table 3.26 presents the vessel movements for Port of Port Angeles in 2011. It should be noted that Port of Port Angeles did not participate in the 2011 PSEI, but the vessel data was available and thus included in this section.

The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

**Table 3.26: Port of Port Angeles 2011 OGV Movements**

Vessel Type	Inbound	Outbound	Shift	Total Movements
Auto Carrier	0	0	1	1
Bulk	32	8	8	48
Bulk - Self Discharging	1	1	4	6
Container - 2000	0	1	1	2
Container - 5000	0	1	1	2
General Cargo	5	0	1	6
ITB	1	0	2	3
Reefer	0	0	2	2
RoRo	0	1	1	2
Tanker - Aframax	0	1	1	2
Tanker - Chemical	4	1	4	9
Tanker - Handysize	0	1	0	1
Tanker - Panamax	1	0	0	1
Tanker - Suezmax	4	15	14	33
<b>Total</b>	<b>48</b>	<b>30</b>	<b>40</b>	<b>118</b>

Table 3.27 presents the average vessel and engine characteristics by vessel type for those vessels that called at the Port of Port Angeles in 2011.

**Table 3.27: Port of Port Angeles 2011 OGV Type Characteristics**

Vessel Type	Year Built	Main Engine DWT (tonnes)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Auto Carrier	2000	20,144	14,123	na	29
Bulk	2004	44,318	7,654	227	76
Bulk - Self Discharging	1975	33,797	8,517	2,380	21
Container - 2000	1999	30,135	12,240	na	15
Container - 5000	2002	67,009	57,199	na	3
General Cargo	2000	22,507	7,607	na	70
ITB	2002	630	6,767	na	27
Reefer	1993	11,181	11,950	na	9
RoRo	2003	22,437	52,198	na	2
Tanker - Aframax	2005	115,525	14,313	na	165
Tanker - Chemical	2006	40,274	8,685	349	116
Tanker - Handysize	2000	47,037	8,683	1,519	0
Tanker - Panamax	2007	74,875	13,548	2,400	14
Tanker - Suezmax	1996	151,325	22,947	na	300

### 3.7.2 Port of Everett Data Findings

Table 3.28 presents the vessel movements for Port of Everett in 2011. The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

**Table 3.28: Port of Everett 2011 OGVMovements**

Vessel Type	Inbound	Outbound	Shift	Total Movements
Bulk	1	3	2	6
Container - 1000	9	0	0	9
Container - 2000	16	0	1	17
General Cargo	52	30	12	94
ITB	0	0	1	1
RoRo	9	9	0	18
<b>Total</b>	<b>87</b>	<b>42</b>	<b>16</b>	<b>145</b>

Table 3.29 presents the average vessel and engine characteristics by vessel type for those vessels that called at the Port of Everett in 2011.

**Table 3.29: Port of Everett 2011 OGV Type Characteristics**

Vessel Type	Year Built	Main Engine DWT (tonnes)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Bulk	2004	45,179	7,182	547	61
Container - 1000	2008	27,418	18,634	na	80
Container - 2000	1998	30,197	12,512	na	74
General Cargo	2000	28,619	10,435	72	199
ITB	2002	na	6,767	na	2,595
RoRo	1997	12,262	5,051	na	236

### 3.7.3 Port of Olympia Data Findings

Table 3.30 presents the vessel movements for Port of Olympia in 2011. The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

**Table 3.30: Port of Olympia 2011 OGV Movements**

Vessel Type	Inbound	Outbound	Shift	Total Movements
Bulk	22	23	4	49
<b>Total</b>	<b>22</b>	<b>23</b>	<b>4</b>	<b>49</b>

Table 3.31 presents the average vessel and engine characteristics by vessel type for those vessels that called at the Port of Olympia in 2011.

**Table 3.31: Port of Olympia 2011 Average OGV Type Characteristics**

Vessel Type	Year Built	Main Engine DWT (tonnes)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Bulk	2,006	32,945	6,750	63	209

3.7.4 Port of Seattle Data Findings

Table 3.32 presents the vessel movements for Port of Seattle in 2011. The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

**Table 3.32: Port of Seattle 2011 OGV Movements**

Vessel Type	Inbound	Outbound	Shift	Total Movements
Bulk	0	74	99	173
Bulk - Heavy Load	2	2	6	10
Container - 1000	108	116	15	239
Container - 2000	73	89	24	186
Container - 3000	29	30	1	60
Container - 4000	111	115	6	232
Container - 5000	124	126	5	255
Container - 6000	17	68	51	136
Container - 7000	83	81	1	165
Container - 8000	130	135	8	273
Container - 9000	2	2	0	4
Container - 10000	1	1	0	2
Cruise	196	196	0	392
General Cargo	14	39	26	79
ITB	0	1	4	5
Tanker - Chemical	0	5	0	5
<b>Total</b>	<b>890</b>	<b>1,080</b>	<b>246</b>	<b>2,216</b>



Table 3.33 presents the average vessel and engine characteristics by vessel type for those vessels that called at the Port of Seattle in 2011.

**Table 3.33: Port of Seattle 2011 OGV Type Characteristics**

<b>Vessel Type</b>	<b>Year Built</b>	<b>DWT (tonnes)</b>	<b>Main Engine Power (kW)</b>	<b>Aux Engine Power (kW)</b>	<b>Hotelling Time (hours)</b>
Bulk	2003	69,669	9,609	510	99
Bulk - Heavy Load	1998	14,302	6,614	na	172
Container - 1000	1999	25,048	18,665	1,029	254
Container - 2000	2002	33,232	18,874	655	209
Container - 3000	1985	33,860	30,474	na	596
Container - 4000	1998	63,363	40,446	1,307	156
Container - 5000	2001	67,695	52,012	939	217
Container - 6000	2004	78,785	62,920	3,060	139
Container - 7000	2003	95,841	68,913	na	194
Container - 8000	2008	104,941	68,368	3,245	205
Container - 9000	2003	107,550	61,739	5,760	33
Container - 10000	2009	116,440	68,639	13,188	32
Cruise	2001	9,767	64,211	1,101	159
General Cargo	2002	43,871	13,170	na	264
ITB	2005	214	4,876	na	280
Tanker - Chemical	1999	28,212	6,904	330	0

Figures 3.22, 3.23, and 3.24 presents the 2011 Port of Seattle average ocean-going vessel model year, DWT, and engine power (main and auxiliary), respectively

Figure 3.22: Port of Seattle 2011 OGV Model Year, by Vessel Type

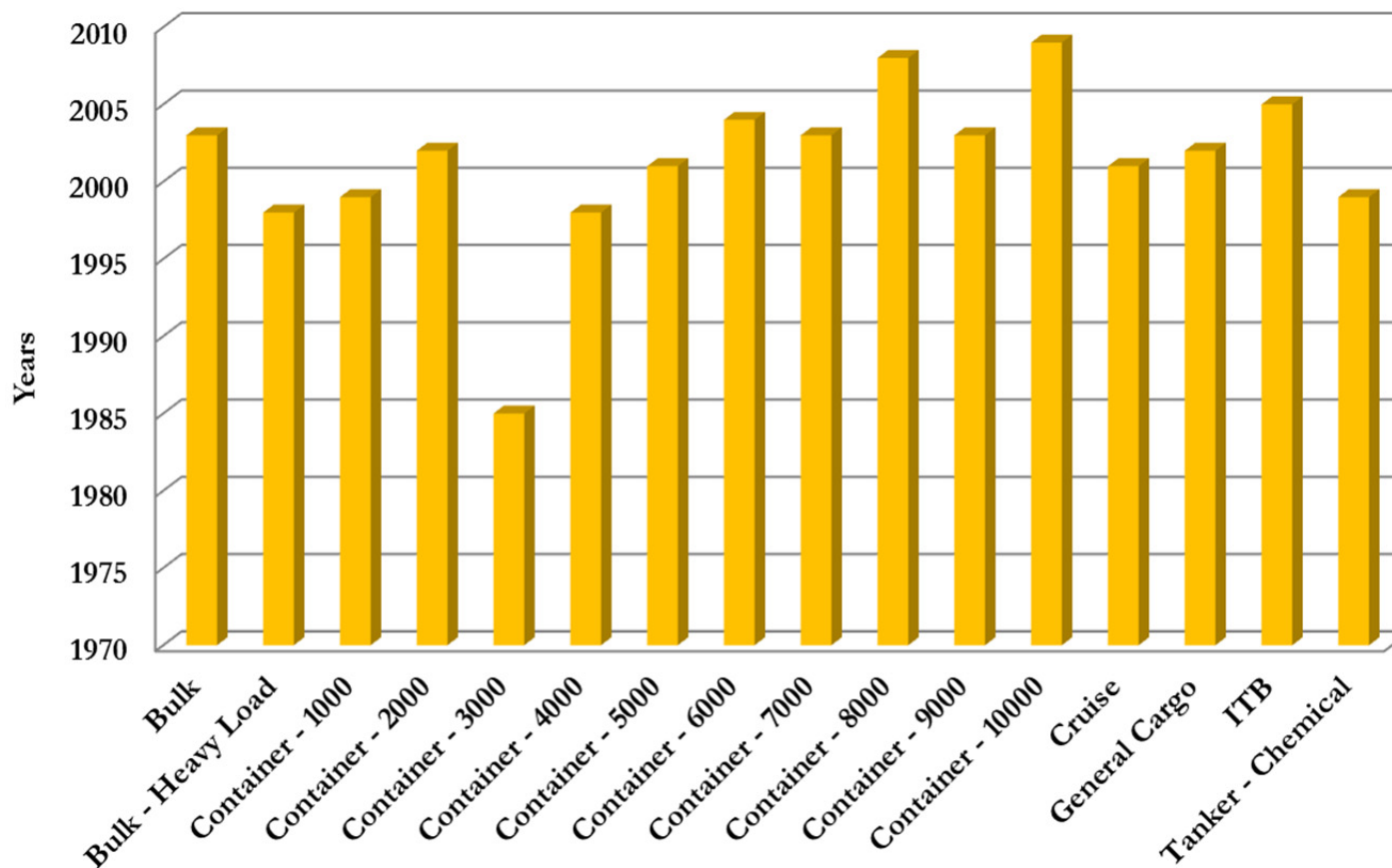


Figure 3.23: Port of Seattle 2011 OGV DWT by Vessel Type

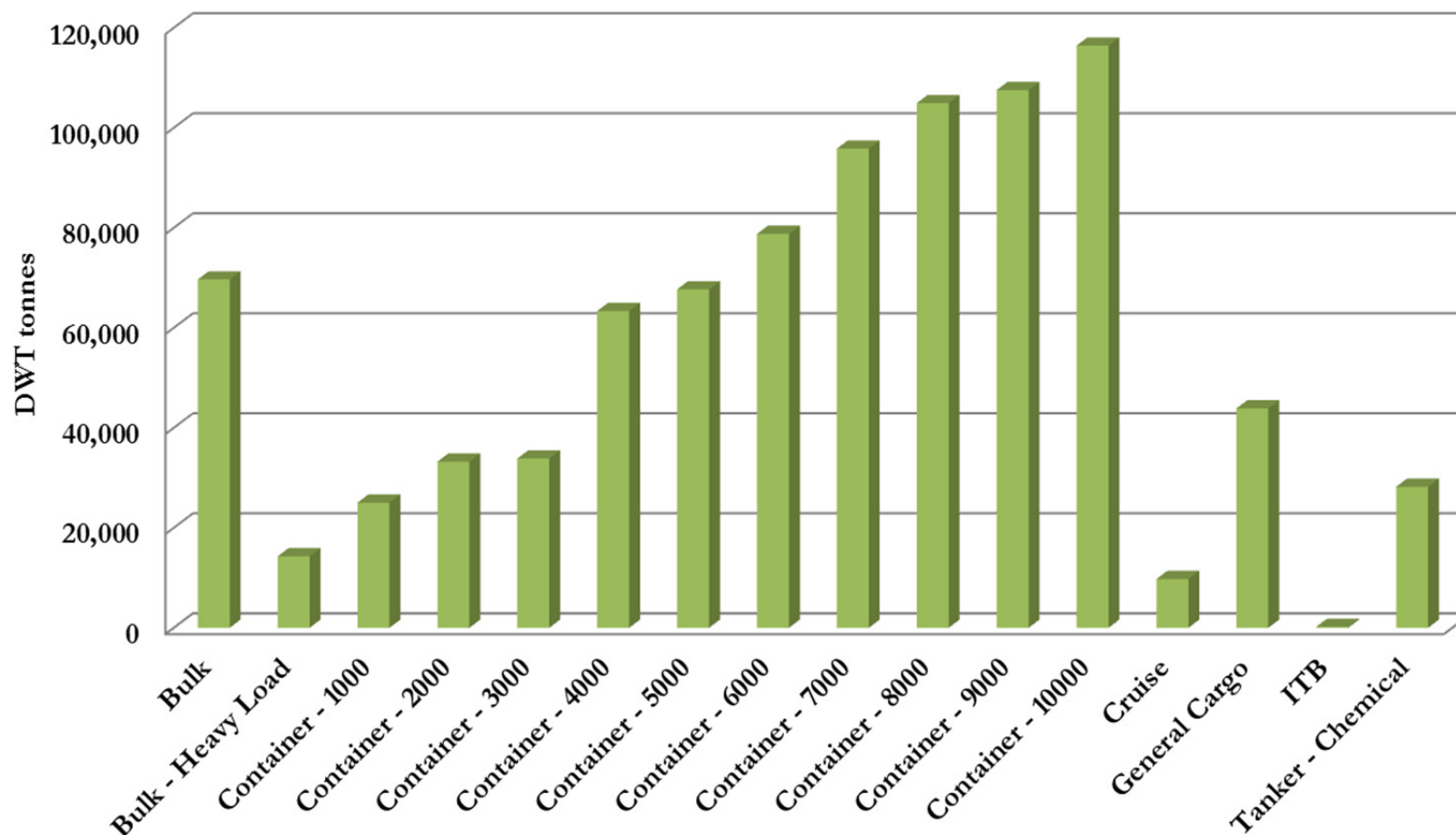
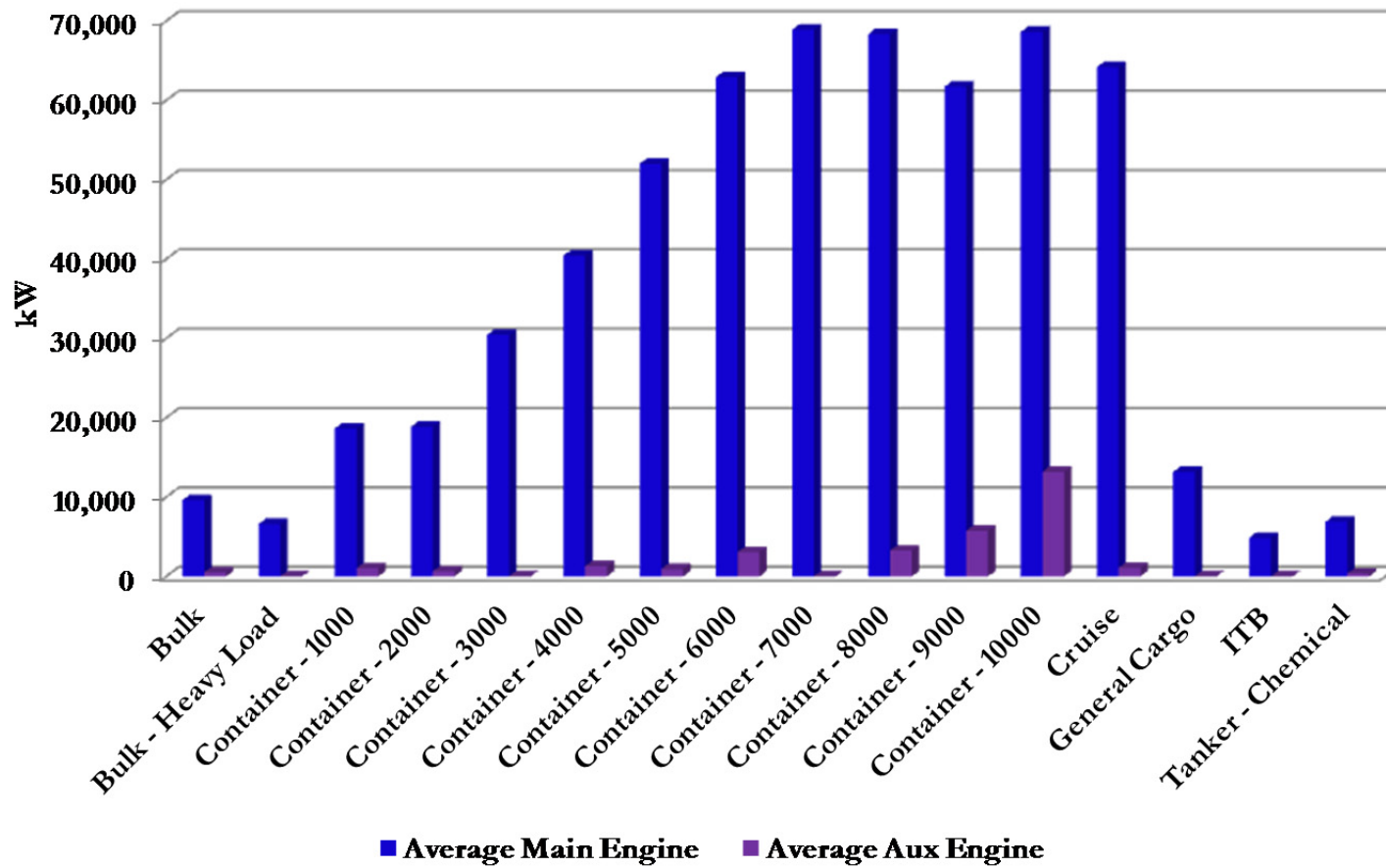


Figure 3.24: Port of Seattle 2011 OGV Main and Auxiliary Engine Power by Vessel Type, kW



3.7.5 Port of Tacoma Data Findings

Table 3.34 presents the vessel movements for Port of Tacoma in 2011. The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

**Table 3.34: Port of Tacoma 2011 OGV Movements**

Vessel Type	Inbound	Outbound	Shift	Total Movements
Auto Carrier	196	211	16	423
Bulk	18	105	103	226
Bulk - Self Discharging	6	6	1	13
Container - 1000	105	104	0	209
Container - 2000	50	50	0	100
Container - 3000	15	15	0	30
Container - 4000	26	25	0	51
Container - 5000	114	115	3	232
Container - 6000	97	46	0	143
Container - 7000	4	4	0	8
General Cargo	4	5	1	10
ITB	0	0	1	1
RoRo	101	100	1	202
Tanker - Chemical	9	13	3	25
Tanker - Suezmax	0	0	1	1
<b>Total</b>	<b>745</b>	<b>799</b>	<b>130</b>	<b>1,674</b>

Table 3.35 presents the average vessel and engine characteristics by vessel type for those vessels that called at the Port of Tacoma in 2011.

**Table 3.35: Port of Tacoma Average 2011 OGV Type Characteristics**

Vessel Type	Year Built	DWT (tonnes)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Auto Carrier	1998	19,459	13,582	1,159	37
Bulk	2002	63,407	8,823	431	110
Bulk - Self Discharging	1977	44,452	9,322	2,605	72
Container - 1000	1985	21,288	17,390	na	972
Container - 2000	1979	31,322	20,963	na	583
Container - 3000	1995	46,176	30,269	na	255
Container - 4000	2003	55,097	39,957	999	138
Container - 5000	2001	66,120	52,936	66	202
Container - 6000	2004	76,033	58,914	927	241
Container - 7000	2006	78,714	54,941	6,280	29
General Cargo	2004	14,691	6,045	754	83
ITB	2008	428	2,985	na	10
RoRo	2002	22,134	50,864	17	71
Tanker - Chemical	2006	20,597	6,385	127	26
Tanker - Suezmax	2002	141,740	22,087	na	213

Figures 3.25, 3.26, and 3.27 presents the 2011 Port of Tacoma average ocean-going vessel model year, DWT, and engine power (main and auxiliary), respectively

Figure 3.25: Port of Tacoma Average 2011 OGV Model Year, by Vessel Type

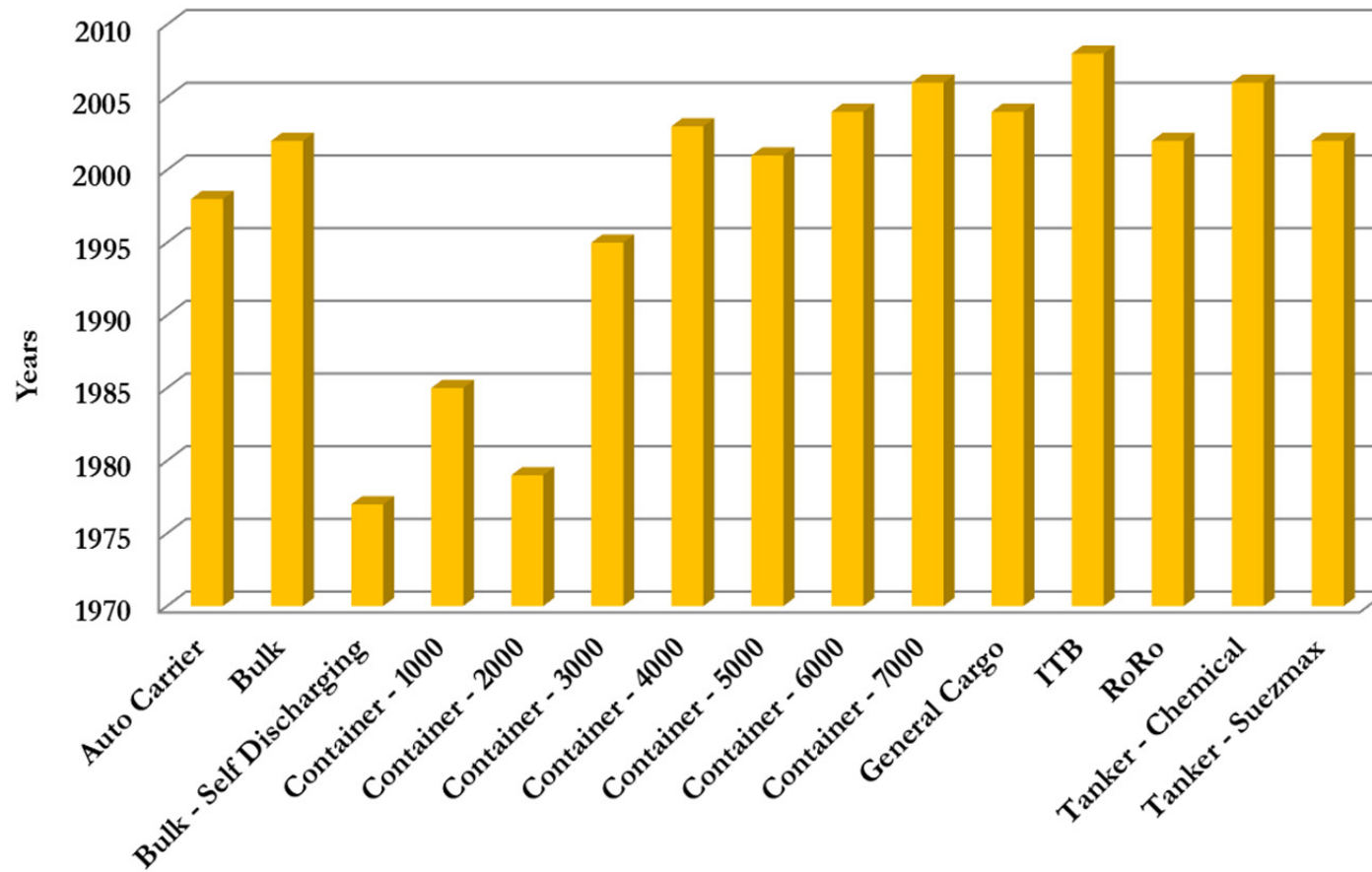


Figure 3.26: Port of Tacoma Average 2011 OGV DWT by Vessel Type

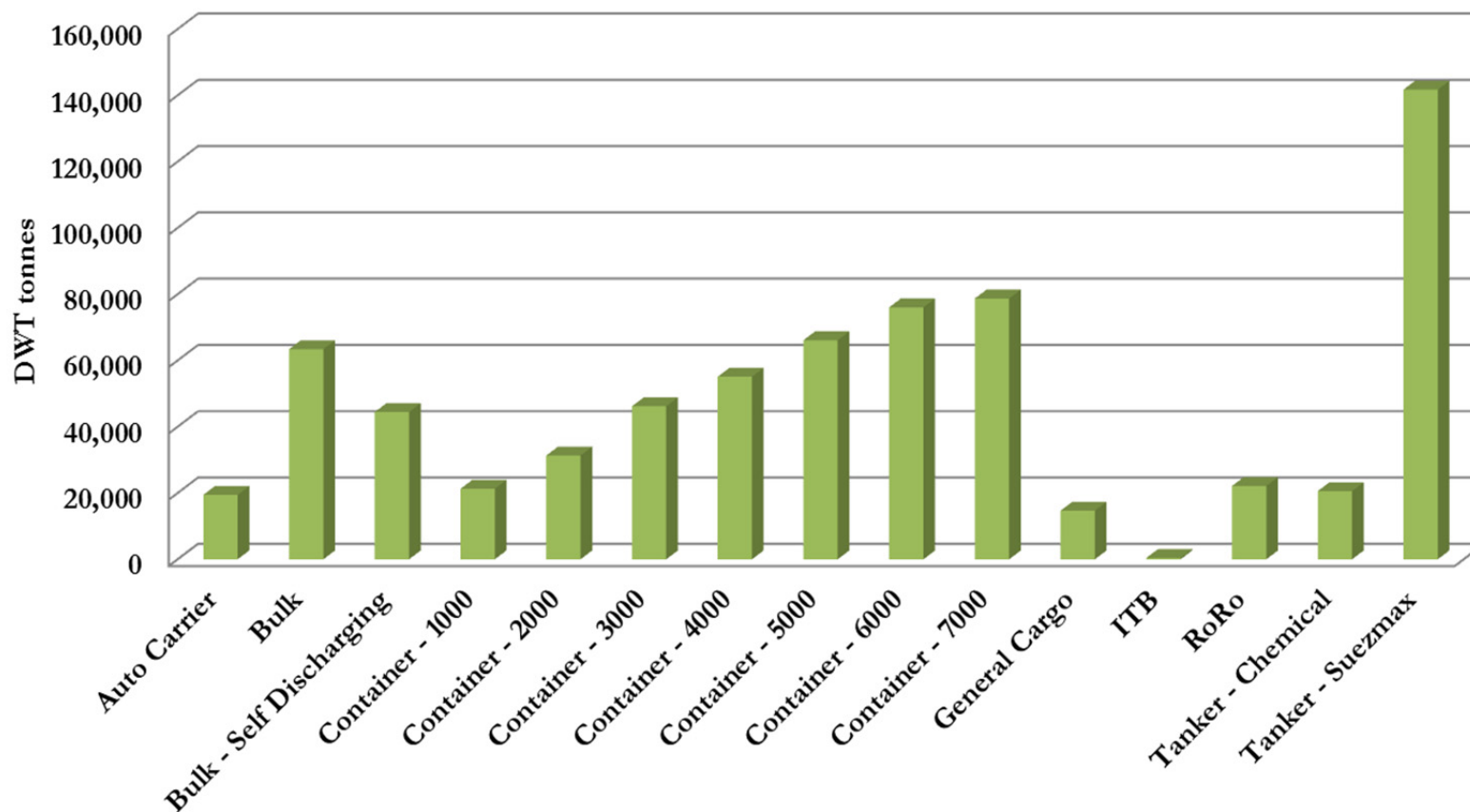
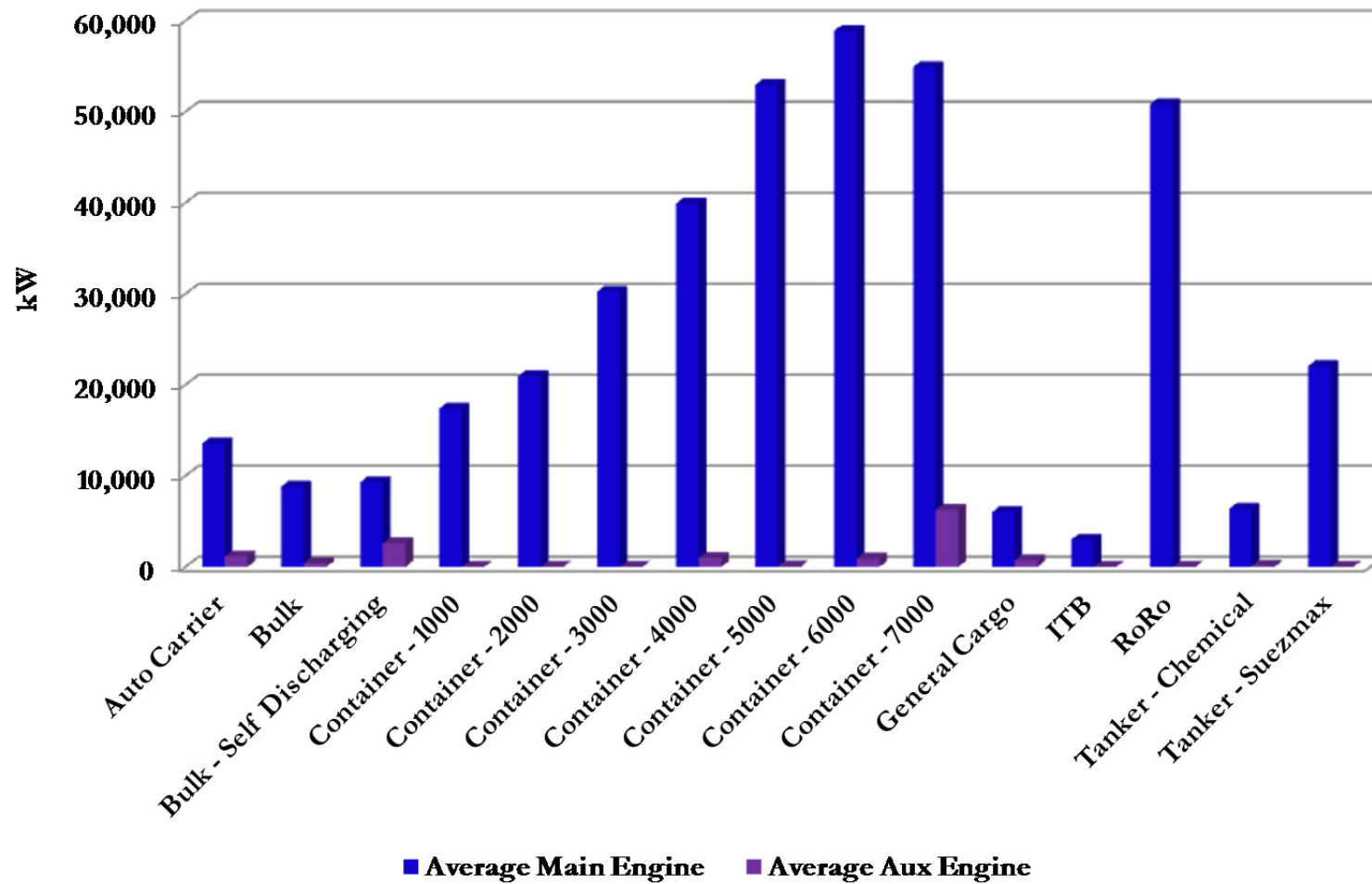




Figure 3.27: Port of Tacoma Average 2011 OGV Main and Auxiliary Engine Power by Vessel Type, kW



3.7.6 Tankers in Puget Sound

Table 3.36 presents the vessel movements for tankers in Puget Sound in 2011. The number of inbound and outbound trips does not match due to shifts tankers make from one dock to another within a facility or from anchorage to a dock. Arrivals are strictly defined as a vessel arriving from the sea or another maritime facility and do not include shifts from a dock within the facility or anchorage near the facility.

**Table 3.36: 2011 Tanker Movements**

Associated Port	Inbound	Outbound	Shift	Total Movements
Bellingham	2	0	1	3
Cherry Point	108	102	148	358
Ferndale	50	7	42	99
Indian Island	1	0	0	1
Manchester	6	3	6	15
March Point	116	142	225	483
Point Wells	3	1	3	7
Port Angeles	118	155	141	414
Sandy Point	4	0	1	5
Seattle	12	10	14	36
Tacoma	14	33	43	90
Vendovi Island	30	5	68	103
<b>Total</b>	<b>464</b>	<b>458</b>	<b>692</b>	<b>1,614</b>

The MarEx of Puget Sound data was used for tankers, as for all other vessels in the area due to its detailed information on arrivals, departures and shifts.

### 3.8 Emission Estimates

The 2011 ocean-going vessel emissions for Puget Sound are summarized in this section. Tables 3.37 through 3.48 include the transit, maneuvering, and hotelling emission estimates for all vessel movements in the study area.

Table 3.37 presents the 2011 ocean-going vessel criteria pollutant emission by county and regional air agency in tons per year. The links in the routing were cut at the county lines so that all links within a county could be easily divided up by county and their respective emissions summarized.

**Table 3.37: 2011 Total OGV Airshed Emissions by County and Regional Clean Air Agency, tpy**

County	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Island	878.1	33.2	76.9	683.4	57.4	45.9	55.3	42,648
San Juan	174.1	7.1	16.4	141.1	11.6	9.3	11.5	8,418
Skagit	542.6	20.4	48.5	1,633.3	90.6	72.5	28.0	97,344
Whatcom	216.1	8.9	20.2	617.0	35.0	28.0	11.7	36,737
<b>Total NWCAA</b>	<b>1,810.9</b>	<b>69.6</b>	<b>162.0</b>	<b>3,074.8</b>	<b>194.6</b>	<b>155.7</b>	<b>106.4</b>	<b>185,148</b>
Clallam	6,295.6	242.1	560.8	5,487.9	437.7	350.1	392.1	336,717
Jefferson	711.5	27.0	62.7	550.8	46.1	36.9	44.4	34,357
Mason	0.3	0.0	0.0	0.2	0.0	0.0	0.0	13
Thurston	10.3	0.4	0.9	15.1	1.0	0.8	0.7	887
<b>Total ORCAA</b>	<b>7,017.7</b>	<b>269.5</b>	<b>624.4</b>	<b>6,054.0</b>	<b>484.8</b>	<b>387.9</b>	<b>437.2</b>	<b>371,973</b>
King	1,316.4	48.1	117.2	1,135.1	89.6	71.7	74.5	86,922
Kitsap	925.3	35.0	81.3	756.7	62.0	49.6	57.9	46,890
Pierce	481.6	16.4	41.5	578.4	40.2	32.2	28.0	40,168
Snohomish	106.3	3.7	9.2	110.0	8.3	6.7	7.1	6,539
<b>Total PSCAA</b>	<b>2,829.7</b>	<b>103.1</b>	<b>249.2</b>	<b>2,580.2</b>	<b>200.2</b>	<b>160.2</b>	<b>167.5</b>	<b>180,520</b>
<b>Total</b>	<b>11,658.2</b>	<b>442.2</b>	<b>1,035.6</b>	<b>11,709.0</b>	<b>879.6</b>	<b>703.7</b>	<b>711.1</b>	<b>737,640</b>

Table 3.38 presents the 2011 ocean-going vessel criteria pollutant emission by vessel type. The values include the transit, maneuvering, and hotelling emission estimates for all vessel movements in the study area. DPM emissions are lower than PM<sub>10</sub> emissions for ocean-going vessels, especially tankers, because boilers do not meet the definition of an internal combustion engine and therefore do not have DPM emissions associated with them. Tankers typically have higher boiler loads at berth while unloading, so they will have higher PM<sub>10</sub> emissions and the difference between PM<sub>10</sub> and DPM emissions will be greater.

**Table 3.38: 2011 Total OGV Airshed Emissions by Vessel Type, tpy**

Vessel Type	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Auto Carrier	571.4	20.2	47.9	397.5	34.8	27.9	33.9	23,573
Bulk	863.2	33.3	78.8	766.4	59.8	47.9	53.5	45,455
Bulk - Heavy Load	6.2	0.2	0.5	5.4	0.4	0.4	0.4	323
Bulk - Self Discharging	21.1	0.7	1.6	15.4	1.3	1.1	1.2	911
Bulk - Wood Chips	1.0	0.1	0.1	0.9	0.1	0.1	0.1	54
Container1000	661.0	23.5	55.3	617.9	46.9	37.6	36.9	37,556
Container2000	262.8	10.0	23.5	412.6	26.1	20.9	14.1	25,353
Container3000	239.9	8.0	18.8	136.0	13.1	10.5	12.6	9,665
Container4000	775.8	28.2	66.2	500.3	44.9	35.9	43.4	33,651
Container5000	1,397.3	50.6	119.0	891.7	80.8	64.7	78.6	61,079
Container6000	812.4	32.1	75.7	613.4	51.2	41.0	49.0	38,893
Container7000	610.2	24.8	57.8	426.1	36.5	29.2	36.0	27,704
Container8000	692.1	29.0	68.1	552.4	44.4	35.5	42.4	35,116
Container9000	17.2	0.6	1.4	11.5	1.0	0.8	1.0	687
Container10000	4.6	0.2	0.5	4.4	0.3	0.3	0.3	259
Cruise	1,442.2	51.8	122.4	1,213.9	99.5	79.6	98.0	90,483
General Cargo	211.3	8.0	19.5	205.9	16.8	13.4	15.7	12,117
ITB	132.6	4.9	11.2	119.2	10.2	8.2	10.2	7,068
Reefer	15.4	0.5	1.2	14.3	1.1	0.9	1.0	835
RoRo	752.2	28.7	63.5	683.5	58.5	46.8	57.5	41,088
Tanker - Aframax	303.6	12.1	28.5	669.3	39.3	31.4	16.8	39,878
Tanker - Chemical	464.0	19.9	46.6	959.0	56.5	45.2	26.8	57,116
Tanker - Handysize	125.0	4.6	10.7	242.5	14.6	11.7	6.4	14,489
Tanker - Panamax	95.9	3.9	9.1	237.5	13.5	10.8	5.0	14,172
Tanker - Suezmax	1,180.0	46.4	107.4	2,011.8	127.7	102.2	70.3	120,116
<b>Total</b>	<b>11,658.2</b>	<b>442.2</b>	<b>1,035.6</b>	<b>11,709.0</b>	<b>879.6</b>	<b>703.7</b>	<b>711.1</b>	<b>737,640</b>

Table 3.39 presents the total 2011 OGV emissions by engine type. The engines include main (i.e., propulsion) engines, auxiliary engines and auxiliary boilers. The main engines are used during transit and maneuvering. Auxiliary engines are used during transit, maneuvering and hotelling. Hotelling can be at a berth or at an anchorage. All vessels, except the ocean tugboats, have auxiliary boilers. Auxiliary boilers are assumed to be used during maneuvering and hotelling, but not used during transit since vessels are equipped with an exhaust gas recovery system or “economizer” that uses main engine exhaust for heating purposes. DPM is zero for auxiliary boilers since boilers do not meet the definition of a compression ignition internal combustion engine.

**Table 3.39: 2011 Total OGV Airshed Emissions by Engine Type, tpy**

Vessel Type	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Main Engine	8,878.0	350.2	797.0	6,824.6	574.9	459.9	552.1	421,867
Auxiliary Engine	2,382.3	72.9	200.6	1,894.7	159.0	127.2	159.0	126,697
Auxiliary Boiler	397.9	19.0	38.0	2,989.7	145.7	116.6	0.0	189,076
<b>Total</b>	<b>11,658.2</b>	<b>442.2</b>	<b>1,035.6</b>	<b>11,709.0</b>	<b>879.6</b>	<b>703.7</b>	<b>711.1</b>	<b>737,640</b>

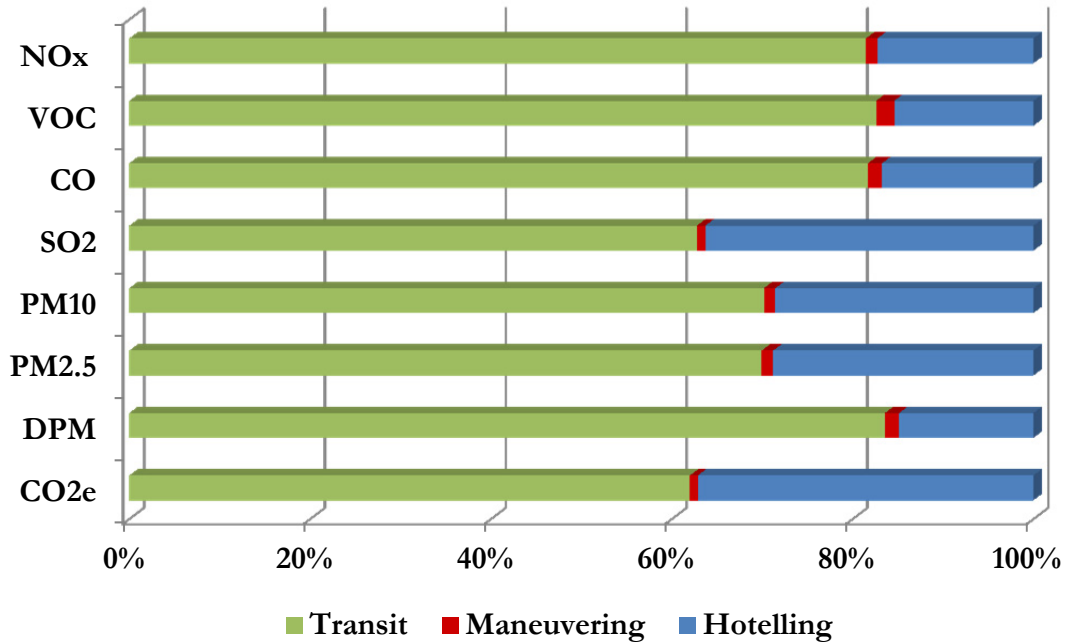
Table 3.40 presents the total 2011 OGV emissions by mode in Puget Sound in tons per year. The transit includes all transits within the study area. Hotelling and maneuvering is for all movements within the study area, including public and private facilities and anchorages.

**Table 3.40: 2011 Total OGV Airshed Emissions by Mode, tpy**

Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Transit	9,423.9	362.8	839.6	7,333.2	615.8	492.6	593.0	452,613
Maneuvering	146.8	8.8	16.1	109.2	11.2	9.0	11.2	6,436
Hotelling	2,087.5	70.6	180.0	4,266.5	252.6	202.1	106.9	278,591
<b>Total</b>	<b>11,658.2</b>	<b>442.2</b>	<b>1,035.6</b>	<b>11,709.0</b>	<b>879.6</b>	<b>703.7</b>	<b>711.1</b>	<b>737,640</b>

Figure 3.28 presents the 2011 distribution of ocean-going vessels emissions for criteria pollutants by transit, maneuvering and hotelling mode. The figure presents that 65% to 80% of the emissions occur during transit; less than 5% occur during maneuvering, and 12% to 35% occur while the vessel is at berth.

**Figure 3.28: 2011 Distribution of Total OGV Airshed Emissions by Transit, Maneuvering, and Hotelling Mode**



### 3.8.1 Main Port Emission Estimates

This subsection presents the emissions associated with the main ports in Puget Sound for maneuvering and hotelling. The emissions by port do not include the transit emissions within Puget Sound. The maneuvering emissions include a short transit time in the harbor area near the port and the docking into the berth for arrivals. The maneuvering emissions include the maneuvering for all movements (i.e., arrivals, departures and shifts). The hotelling emissions include emissions while the vessel is at berth.

The port emissions do not include any anchorages or private facilities near the Port area, only the port-controlled terminals. Emissions at the anchorages near the ports were not attributed to the ports because the vessels that stopped at anchorage may not have called at the public port. For example, vessels may stop to refuel at anchorages near Port Angeles before continuing on their transit, but do not call at the Port of Port Angeles terminals.

Table 3.41 presents the port maneuvering and hotelling emission estimates associated with the Port of Anacortes.

**Table 3.41: Port of Anacortes 2011 OGV Port Emissions by Mode, tpy**

Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Hotelling	9.5	0.3	0.8	11.4	0.8	0.7	0.7	653
Maneuvering	0.1	0.0	0.0	0.1	0.0	0.0	0.0	4
<b>Total</b>	<b>9.6</b>	<b>0.3</b>	<b>0.8</b>	<b>11.4</b>	<b>0.8</b>	<b>0.7</b>	<b>0.7</b>	<b>657</b>

Table 3.42 lists the port maneuvering and hotelling emission estimates associated with the Port of Port Angeles.

**Table 3.42: Port of Port Angeles 2011 OGV Port Emissions by Mode, tpy**

Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Hotelling	61.0	2.2	5.3	195.0	10.7	8.6	3.1	11,609
Maneuvering	0.9	0.0	0.1	0.8	0.1	0.1	0.1	47
<b>Total</b>	<b>61.9</b>	<b>2.2</b>	<b>5.4</b>	<b>195.9</b>	<b>10.8</b>	<b>8.6</b>	<b>3.2</b>	<b>11,656</b>

Table 3.43 lists the port maneuvering and hotelling emission estimates associated with the Port of Everett.

**Table 3.43: Port of Everett 2011 OGV Port Emissions by Mode, tpy**

Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Hotelling	46.4	1.4	3.8	52.6	3.9	3.1	3.3	3,019
Maneuvering	0.8	0.0	0.1	0.7	0.1	0.0	0.1	41
<b>Total</b>	<b>47.2</b>	<b>1.4</b>	<b>3.8</b>	<b>53.3</b>	<b>3.9</b>	<b>3.2</b>	<b>3.4</b>	<b>3,059</b>

Table 3.44 lists the port maneuvering and hotelling emission estimates associated with the Port of Everett.

**Table 3.44: Port of Olympia 2011 OGV Port Emissions by Mode, tpy**

Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Hotelling	7.4	0.2	0.6	13.2	0.8	0.7	0.5	771
Maneuvering	0.2	0.0	0.0	0.1	0.0	0.0	0.0	8
<b>Total</b>	<b>7.5</b>	<b>0.2</b>	<b>0.6</b>	<b>13.3</b>	<b>0.9</b>	<b>0.7</b>	<b>0.5</b>	<b>779</b>

Table 3.45 lists the port maneuvering and hotelling emission estimates associated with the Port of Seattle.

**Table 3.45: Port of Seattle 2011 OGV Port Emissions by Mode, tpy**

Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Hotelling	679.0	21.8	58.7	551.5	42.4	33.9	33.3	51,492
Maneuvering	69.2	4.4	7.5	49.0	5.3	4.3	5.3	2,986
<b>Total</b>	<b>748.3</b>	<b>26.2</b>	<b>66.2</b>	<b>600.5</b>	<b>47.7</b>	<b>38.2</b>	<b>38.6</b>	<b>54,479</b>

Table 3.46 lists the port maneuvering and hotelling emission estimates associated with the Port of Tacoma.

**Table 3.46: Port of Tacoma 2011 OGV Port Emissions by Mode, tpy**

Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Hotelling	339.4	10.6	28.3	380.5	26.4	21.1	18.5	28,582
Maneuvering	35.8	1.5	3.4	29.7	2.6	2.1	2.6	1,690
<b>Total</b>	<b>375.2</b>	<b>12.1</b>	<b>31.7</b>	<b>410.2</b>	<b>29.0</b>	<b>23.2</b>	<b>21.1</b>	<b>30,273</b>



### 3.8.2 Petroleum Facilities Emission Estimates

Emissions associated with the petroleum facilities in Puget Sound include only those for maneuvering and hotelling. The maneuvering emissions include the maneuvering for all movements (i.e., arrivals, departures and shifts). The hotelling emissions include emissions while the vessel is at berth. The terminals and anchorages associated with the petroleum facilities in the study area are located at:

- Cherry Point
- Ferndale
- March Point
- Anchorages near Point Wells, Sandy Point, Vendovi Island

Table 3.47 presents the port maneuvering and hotelling emission estimates associated with the petroleum facilities.

**Table 3.47: Petroleum Facilities 2011 OGV Port Emissions by Mode, tpy**

Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Hotelling	668.2	24.7	59.0	2,359.6	127.3	101.8	31.9	140,710
Maneuvering	29.2	2.1	3.7	21.0	2.3	1.8	2.3	1,213
<b>Total</b>	<b>697.4</b>	<b>26.8</b>	<b>62.7</b>	<b>2,380.7</b>	<b>129.6</b>	<b>103.7</b>	<b>34.2</b>	<b>141,923</b>

### 3.8.3 Other Maritime Facilities Emission Estimates

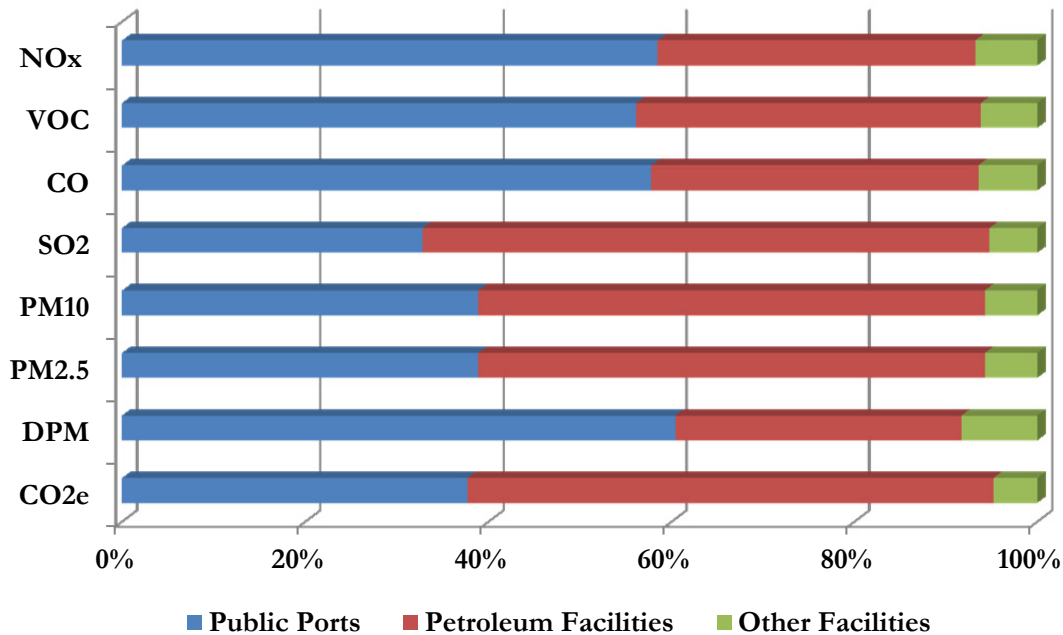
Table 3.48 presents the port maneuvering and hotelling emission estimates associated with the other maritime facilities. The maneuvering emissions include the maneuvering for all movements (i.e., arrivals, departures and shifts). The hotelling emissions include emissions while the vessel is at berth.

**Table 3.48: Other Maritime Facilities 2011 OGV Port Emissions by Mode, tpy**

Mode	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Hotelling	131.8	4.1	10.8	196.7	13.0	10.4	8.7	11,586
Maneuvering	5.2	0.3	0.6	3.8	0.4	0.3	0.4	221
<b>Total</b>	<b>137.0</b>	<b>4.4</b>	<b>11.3</b>	<b>200.5</b>	<b>13.4</b>	<b>10.8</b>	<b>9.1</b>	<b>11,807</b>

Figure 3.29 presents the 2011 distribution of maneuvering and hotelling emissions for the main public ports, petroleum facilities, and other maritime facilities. Approximately 55% of the NO<sub>x</sub>, VOC, CO and DPM maneuvering and hotelling emissions are associated with public ports, about 35% of emissions are associated with petroleum facilities, and about 10% are associated with the other maritime facilities. For the PM<sub>10</sub>, PM<sub>2.5</sub> and SO<sub>2</sub> emissions, approximately 35% of the emissions are associated with public ports, 55% of the emissions are associated with petroleum facilities, and 10% are associated with other maritime facilities. Petroleum facilities may have a higher percentage of PM<sub>10</sub>, PM<sub>2.5</sub> and SO<sub>2</sub> emissions than the other pollutants due to the higher boiler loads needed during unloading.

**Figure 3.29: 2011 Distribution of Other Maritime Facilities Port Emissions**



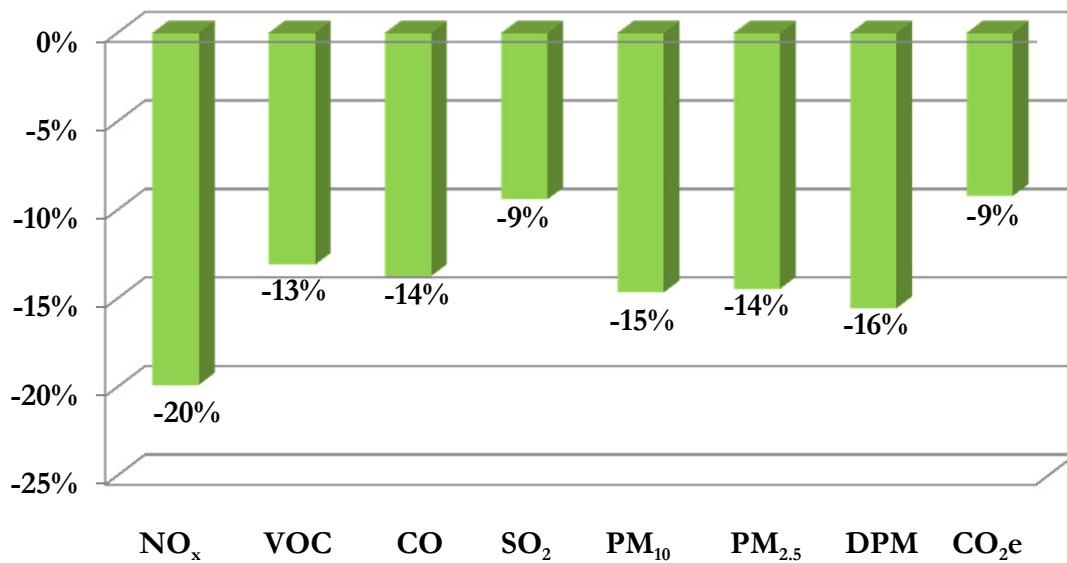
### 3.9 Emission Comparison, 2011 vs 2005

The OGV emission calculation methodology used in the 2011 inventory is similar to the methodology used in 2005. There were changes in how emissions were allocated based on the three additional zones added for 2011. Table 3.49 compares the total OGV emissions, which show a 9% to 20% reduction for 2011 emissions as compared to 2005. The emission reductions are greater than the 8% decrease in inbound vessel movement seen in 2011 from 2005 due to the emission reduction policies at Port of Tacoma and Port of Seattle for shore power and fuel switching at berth by participating shipping lines. Figure 3.30 presents the changes in 2011 from that in 2005. Table 3.50 presents the changes in OGV inbound movements in 2011 vs 2005.

Table 3.49: 2011 vs 2005 Total OGV Airshed Emissions Comparison, tpy

Emissions	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	11,658.2	442.2	1,035.6	11,709.0	879.6	703.7	711.1	737,640
2005	14,551.4	508.8	1,200.4	12,923.7	1,030.7	822.5	842.0	812,391
<b>Change, tpy</b>	<b>-2,893.1</b>	<b>-66.6</b>	<b>-164.8</b>	<b>-1,214.7</b>	<b>-151.0</b>	<b>-118.8</b>	<b>-130.9</b>	<b>-74,751</b>
<b>Change, %</b>	<b>-20%</b>	<b>-13%</b>	<b>-14%</b>	<b>-9%</b>	<b>-15%</b>	<b>-14%</b>	<b>-16%</b>	<b>-9%</b>

Figure 3.30: 2011 vs 2005 Total OGV Airshed Emissions Change



Note: 2005 emissions were recalculated using the same methods used for the 2011 emission estimates. The above figure accounts for these changes so that a direct comparison can be made between 2011 vs 2005.

Table 3.50: 2011 vs 2005 Total OGV Inbound Movements Comparison

Year	Inbound Movements
2011	4,128
2005	4,281
<b>Change, %</b>	<b>-4%</b>



## **SECTION 4 HARBOR VESSELS**

Section 4 provides an overview of the harbor vessels operating in Puget Sound, describes the methodology used to estimate emissions, and summarizes the emission estimates for this source category.

### **4.1 Source Description**

The harbor vessels designation is used to identify vessels that are not in the ocean-going vessel category. These vessels typically spend the majority of the time in the Puget Sound and/or coastal region and do not routinely make trans-Pacific crossings. Harbor vessels are divided into three groups: commercial harbor vessels, government (non-military) vessels, and recreational vessels.

Commercial harbor and government vessels included in this inventory are divided into the following vessel types:

- Assist and escort tugboats
- Harbor and ocean tugboats
- Government (non-military) vessels
- Work boats
- Commercial fishing vessels
- Ferry vessels
- Excursion vessels
- Tank barges

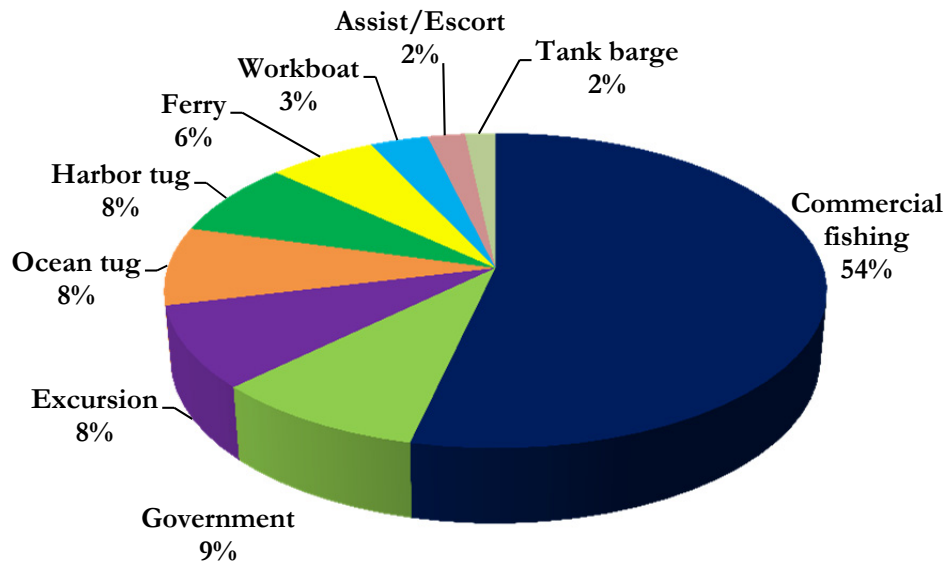
A description of each vessel type and operational profiles are further described for each vessel type in Section 4.4. Recreational vessels are presented in this section, but separately from the commercial harbor and government vessels (see Section 4.8). Table 4.1 presents the number of commercial harbor and government vessels inventoried for the Puget Sound in 2011 for each vessel type (this number does not include recreational vessels, see Section 4.8).

Table 4.1: 2011 Commercial Harbor and Government Vessel Counts by Vessel Type

Type	Vessel Count
Assist/Escort	15
Commercial fishing	380
Excursion	60
Ferry	43
Government	65
Harbor tug	54
Ocean tug	57
Tank barge	12
Workboat	23
<b>Total</b>	<b>709</b>

Figure 4.1 presents the distribution of commercial harbor and government vessels inventoried for Puget Sound in 2011. Emission contribution by vessel type is presented in Figure 4.2 in section 4.7.

Figure 4.1: 2011 Commercial Harbor and Government Vessels Count by Vessel Type



Data for all engines for all vessels was not available for the 2011 inventory and it was decided to keep the 2005 data when the 2011 data was not available. Data was collected for about 264 vessels in 2011 out of the 709 vessels included in the inventory. For the remaining vessels, if 2011 data was not collected, it was assumed that the vessel information stayed the same as what was collected and used in 2005. With the data collected for 2011 and 2005 for vessels that remained in the 2011 inventory, about 1% of the engines were missing activity hours, horsepower or model year which is required for emission estimate calculations. Where data was available for engine model year, horsepower, and activity hours, the actual values were used as inputs to the emission model. For those vessels for which data was unavailable, the average engine model year, horsepower, and activity hours for vessels of that type were used as inputs to the emission model, consistent with the 2005 approach.

Recreational vessels are privately owned watercraft used for pleasure boating and are not associated with commercial or cargo related activities. Recreational vessels are included in the inventory as many of the ports have marinas that are used by recreational vessels (see Section 4.8).

## **4.2 Geographical Delineation**

The geographical area in which the harbor vessels operate is similar to that of the area for ocean-going vessels. This area includes the U.S. portions of the Georgia Basin/Puget Sound International Airshed, as shown in Figure 1.1, and the twelve counties and six ports described in Section 1.2.4. Emissions from harbor vessels that routinely cross the international border are estimated for the U.S. portions of their operations. Emissions from U.S. based harbor vessels that traverse the Strait of Juan de Fuca are estimated regardless of whether the vessels travel on the U.S. side or the Canadian side of the international border, the same approach as for ocean-going vessels.

## **4.3 Data and Information Acquisition**

To collect data for the commercial harbor and government vessels inventory, vessel owners and operators were identified and contacted on key operating parameters. The operating parameters of interest included the following:

- Vessel type
- Number, type and horsepower (or kilowatts) of main engine(s)
- Number, type and horsepower (or kilowatts) of auxiliary engines
- Hours of operation in Puget Sound for 2011
- Information on percentage of time operating within Puget Sound regions
- Annual fuel consumption
- Engine model year, and if engines on vessel had been replaced
- Emission reduction strategies including but not limited to: alternative fuels, retrofits with after-treatment, and shore power

Individual vessel data was not collected for recreational vessels. The number of slips, moorage balls, and transient dock space relating to the various private and public marinas was collected.

#### **4.4 Operational Profiles**

Commercial harbor vessel companies and government harbor vessel entities were identified and contacted to obtain the operating parameters of their vessels. Tables 4.2 and 4.3 summarize the main and auxiliary engine data respectively for the vessel. A main engine may also be referred to as a propulsion engine since it is normally used for propulsion. Auxiliary engines may also be referred to as diesel generators. While in transit, most harbor vessels only use one auxiliary engine along with the main engine(s). The activity hours for all engines are reflected in this inventory.

Data for all engines for all vessels was not available for the 2011 inventory and it was decided to keep the 2005 data when the 2011 data was not available. Using the 2005 data made the comparison be more apples to apples and it also minimized the data gap for estimating 2011 emissions. About 1% of the engines were missing activity hours, horsepower or model year which is required for emission estimate calculations. Where data was available for engine model year, horsepower, and activity hours, the actual values were used as inputs to the emission model. For those vessels for which data was unavailable, the average engine model year, horsepower, and activity hours for all vessels of that type were used as inputs to the emission model.

Tank barges are not self-propelled, thus they do not have propulsion engines, but do have auxiliary engines. The 12 tank barges included in the inventory have a total of 39 auxiliary engines combined.

In 2011, the entire diesel powered harbor vessel fleet used ULSD.



Table 4.2: 2011 Commercial Harbor and Government Vessel Propulsion Engines Inventory

Harbor Vessel Type	Vessel Count	Engine Count	Model year			Horsepower			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Assist/Escort	15	32	1975	2010	1994	1,500	4,100	2,616	2,480	6,948	3,135
Commercial fishing	380	733	1913	2002	1976	110	6,200	718	48	144	49
Excursion	60	96	1970	2009	1992	85	2,990	433	10	3,000	879
Ferry	43	98	1959	2011	1996	250	4,400	1,973	0	6,836	4,420
Government	63	99	1940	2009	1991	10	3,500	1,002	40	2,700	838
Harbor tug	54	94	1944	2004	1979	135	3,600	856	0	5,000	1,540
Ocean tug	57	113	1966	2004	1981	365	5,100	2,156	0	5,000	498
Pilot boat	2	4	1999	2001	2000	1,100	1,100	1,100	763	834	799
Tank barge	12	0	na	na	na	na	na	na	na	na	na
Workboat	23	38	1955	2011	1984	45	1,910	453	0	7,360	840
<b>Total</b>	<b>709</b>	<b>1,307</b>									

Table 4.3: 2011 Commercial Harbor and Government Vessel Auxiliary Engines Inventory

Harbor Vessel Type	Vessel Count	Engine Count	Model year			Horsepower			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Assist/Escort	15	34	1982	2010	1999	74	550	203	83	5,870	3,122
Commercial fishing	380	370	1913	2002	1976	100	900	298	48	144	49
Excursion	60	29	1974	2011	1992	13	150	43	60	2,000	697
Ferry	43	82	1959	2011	1997	13	1,210	378	0	7,015	2,110
Ferry boilers	na	35	1959	2004	1998	60	60	60	0	3,000	1,238
Government	63	28	1940	2007	1966	19	1,555	237	7	2,700	535
Harbor tug	54	74	1945	2006	1982	10	230	102	0	7,685	1,647
Ocean tug	57	126	1966	2011	1984	70	240	147	0	7,132	457
Pilot boat	2	4	1999	2001	2000	43	50	47	327	357	342
Tank barge	12	39	1980	2001	1990	80	240	185	18	3,586	1,087
Workboat	23	13	1967	2005	1982	130	318	197	0	1,403	321
<b>Total</b>	<b>709</b>	<b>834</b>									

The following subsections provide a brief description, counts, and operating highlights for each type of commercial harbor and government vessels included in the inventory.

#### *4.4.1 Assist and Escort Tugboats*

The main function of assist and escort tugboats is to assist ocean-going vessels in making turns, reducing speed, providing propulsion, and docking. The tugboats assist the OGVs to maneuver during arrival, departure and shifts from berth.

There are approximately 15 tugboats from two companies that primarily provide assist and escort services in Puget Sound. These tugboats may be assigned to a certain port or geographical area to lessen the transit time between jobs. The largest tugs are used for Puget Sound tanker escort service in Anacortes region where the oil terminals are mainly located.

Most of the tugboats have twin-screw propulsion engines. The horsepower per engine ranged from 1,500 hp to 4,100 hp with an average of 2,616 hp. The annual operating hours for main engines ranged from 2,480 hours to 6,948 hours, with an average of 3,135 hours. The main engine model years ranged from 1975 to 2010, with an average model year of 1994.

Most of the assist tugboats have two auxiliary engines to supply on-board power, but only one auxiliary engine is used at a time. The activity hours in this inventory reflect the interchangeable use of auxiliary engines. The horsepower for each auxiliary engine ranged from 74 hp to 550 hp, with an average of 203 hp. The annual operating hours ranged from 83 hours to 5,870 hours, with an average of 3,122 hours. The auxiliary engine model years ranged from 1982 to 2010, with an average of 1999.

#### *4.4.2 Harbor and Ocean Tugboats*

In Puget Sound, tugboats, towboats and push-boats are mainly referred to as harbor tugs or ocean tugs, depending where they do the work. Harbor tugs mainly stay within Puget Sound and ocean tugs mainly work outside the Puget Sound boundary and may transit in and out of their home facility a few times per year. Only the hours spent in Puget Sound were included in the inventory. The inventory includes 54 harbor tugs and 57 ocean tugs.

Most of the harbor tugboats have twin-screw propulsion engines, although some are single-screw. The horsepower of each engine ranged from 135 hp to 3,600 hp, with an average of 856 hp. The annual operating hours for main engines ranged from zero to 5,000 hours, with an average of 1,540 hours. The main engine model years ranged from 1944 to 2004, with an average model year of 1979.

The harbor tugboats have one or two auxiliary engines. The horsepower for each auxiliary engine ranged from 10 hp to 230 hp, with an average of 102 hp. The annual operating hours ranged from zero hours to 7,685 hours, with an average of 1,647 hours. The auxiliary engine model years ranged from 1945 to 2006, with an average model year of 1982.

The ocean tugboats have twin-screw propulsion engines. The horsepower of each engine ranged from 365 hp to 5,100 hp with an average of 2,156 hp. The annual operating hours for main engines ranged from zero to 5,000 hours, with an average of 498 hours. The main engine model years ranged from 1966 to 2004, with an average model year of 1981.

The harbor tugboats have one or two auxiliary engines. The horsepower for each auxiliary engine ranged from 70 hp to 240 hp, with an average of 147 hp. The annual operating hours ranged from zero hours to 7,132 hours, with an average of 457 hours. The auxiliary engine model years ranged from 1966 to 2011, with an average model year of 1984.

#### *4.4.3 Commercial Fishing Vessels*

Commercial fishing vessels are vessels dedicated to procuring fish and other seafood such as crab for the purpose of sale. In many cases operations are seasonal. There are numerous vessels classified as fishing vessels in Puget Sound. They range from the smaller fishing charter vessels to the larger commercial fishing vessels that go to Alaska. Seiners, crabbers, trollers, trawlers, longliners and gillnetters are included in this category along with their associated processing ships where the fish can be processed while at sea. The larger fishing vessels generally make one or two trips out to Alaska or the Bering Sea and into Puget Sound per year. While at dock, these vessels use shore power. Charter vessels, which are largely used for recreational fishing excursions, are not included in the commercial fishing vessel category but instead are included as excursion vessels.

The Puget Sound Vessel Traffic Services (VTS) data for commercial fishing vessels was used to update the commercial fishing vessels that transited Puget Sound in 2011. The VTS data included the vessel name and vessel identification number only and did not include specific engine data such as horsepower, model year or activity hours. The VTS file was similar to one received in 2005 that was used for the 2005 commercial fishing vessel category, so the data collection methodology was consistent with 2005. For the 2011 inventory, the 2011 VTS file was compared to the 2005 data for vessel name and vessel count. The vessel names/IDs listed in both 2011 and 2005 commercial fishing vessel inventory, were kept as well as the same assumptions made in 2005 for the horsepower, model year and activity hours. New vessel names in 2011 were added to the commercial fishing vessel inventory while those vessels in 2005 that were not listed in the 2011 VTS file were dropped from the 2011 commercial fishing inventory. As in 2005, the model year of the vessel was researched for the new 2011 vessels through the United States Coast Guard (USCG) Maritime information exchange<sup>25</sup>. For the new 2011 vessels added, similar assumptions as in 2005 were made for horsepower, model year and activity hours.

---

<sup>25</sup>See [www.sgmix.uscg.mil/psix/psixsearch.aspx](http://www.sgmix.uscg.mil/psix/psixsearch.aspx)

In summary, the average commercial fishing vessels included in the 2011 Puget Sound inventory typically have two main engines and one auxiliary engine. Main engine power ranged from 110 hp to 6,200 hp with an average of 718 hp. The annual operating hours for main engines ranged from 48 hours to 144 hours, with an average of 49 hours. The low hours are due to the fact that these vessels do not fish in Puget Sound and only transit time was included. While in port, the main engines are turned off. In comparison to the other vessel types, the population for commercial fishing vessels is larger but the actual hours used are lower than the other vessel types. The main engines had a model year range from 1913 to 2002, with an average model year of 1976. The 1913 year found in the USCG database is more likely the vessel year instead of the engine model year. This could not be verified with the vessel owner; *therefore the year is listed but not included in the average for commercial fishing average model year.*

#### 4.4.4 Ferry Vessels

Ferry vessels are self-propelled vessels that carry more than six passengers. Ferry vessels include the large ferries operated by Washington State Ferries (WSF) along with a few local ferries in the Puget Sound area. The WSF vessels have medium speed propulsion engines; several auxiliary engines used mainly for house load; one emergency generator not normally used but tested once a month; and one or two small auxiliary boilers used during the colder months of the year. In this respect, their engines are similar to the ocean-going vessels; however, they are considered harbor vessels since they only operate within Puget Sound. The ferries in the inventory each have at least two main engines. The engine power ranged from 250 to 4,400 hp, averaging 1,973 hp. The annual operating hours ranged from zero hours to 6,836 hours, with an average of 4,420 hours. The engine model years ranged from 1959 to 2011, with an average model year of 1996.

The horsepower for each auxiliary engine ranged from 13 hp to 1,210 hp, with an average of 378 hp. The annual operating hours ranged from zero hours to 7,015 hours, with an average of 2,110 hours. The auxiliary engines model years ranged from 1959 to 2011, with an average model year of 1997.

#### 4.4.5 Excursion Vessels

Excursion vessels are smaller than ferry vessels and are used for harbor cruises, dining cruises, whale watching and other specialty cruises. Included with the excursion vessels are charter vessels that may be used for half day, whole day or multiple day fishing trips. In the Puget Sound area, there are numerous excursion vessel companies that own one or two vessels.

Excursion vessels have one to two main engines. Main engine power ranged from 85 hp to 2,990 hp, with an average of 433 hp. The annual operating hours for main engines ranged from 10 hours to 3,000 hours, with an average of 879 hours. The main engines had a model year range from 1970 to 2009, with an average model year of 1992.

Excursion vessels have either one or no auxiliary engines. The power for each auxiliary engine ranged from 13 hp to 150 hp, with an average of 43 hp. The annual operating hours ranged from 60 hours to 2,000 hours, with an average of 697 hours. The auxiliary engine model years ranged from 1974 to 2011, with an average model year of 1992.

#### *4.4.6 Government Vessels*

Pilot boats, Coast Guard vessels, National Oceanic and Atmospheric Administration research vessels, police patrol boats and fireboats, are included in this vessel type. A total of 63 government vessels are included in the inventory, in addition to two pilot boats. Although the pilot boats are not considered government vessels, they share the same load factors for emissions estimation purposes.

Government vessels have one or two main engines. Engine power ranged from 10 hp to 3,500 hp with an average of 1,002 hp. The annual operating hours from main engines ranged from 40 hours to 2,700 hours, with an average of 838 hours. The main engines had model years ranging from 1940 to 2009, with an average of model year of 1991.

The engine power for each auxiliary engine ranged from 19 hp to 1,555 hp, with an average of 237 hp. The annual operating hours ranged from seven hours to 2,700 hours, with an average of 535 hours. The auxiliary engines had a model year range from 1940 to 2007, with an average model year of 1966.

The two pilot boats have two main engines and two auxiliary engines with relatively new fuel-efficient engines. The horsepower of the main engines is 1,100 hp each. The main engine activity hours averaged 799. The auxiliary engines have an average of 47 hp and were used an average of 342 hours.

#### *4.4.7 Work Boats*

Work boats perform numerous duties within the harbor, such as utility inspection, surveying, spill/response, training and construction. There are a total of 23 workboats.

The workboats in the inventory for the most part have one main engine with a horsepower range of 45 hp to 1,910 hp, and an average of 453 hp. The annual operating hours for main engines ranged from zero hours to 7,360 hours, with an average of 840 hours. The main engines had a model year range from 1955 to 2011, with an average model year of 1984.

Workboats have either one or no auxiliary engines. The horsepower for each auxiliary engine ranged from 130 hp to 318 hp, with an average of 197 hp. The annual operating hours ranged from zero hours to 1,403 hours, with an average of 321 hours. The auxiliary engines had model years ranging from 1967 to 2005, with an average model year of 1982.

### **4.5 Emission Reduction Initiatives Identified**

In 2011, all of the diesel-powered commercial harbor craft used ULSD. The suppliers in the Puget Sound region started supplying exclusively ULSD one year ahead of schedule of the phased-in EPA Nonroad Diesel Rule for locomotive and marine diesel fuel due to early ULSD production by U.S. Oil. This reduction has been included in the 2011 inventory.

A small percentage of companies repowered some of their vessels at their own expense or with assistance from federal grants. The reductions due to these repowers are included in the 2011 inventory.

In 2008, the federal Inland Marine and Locomotive Rule came into effect. It requires that when commercial harbor craft marine engines meeting certain criteria are overhauled, an EPA certified kit that reduces PM emissions by at least 25% must be installed. In the absence of a program to track the installation of these kits, these emission reductions are not included in the 2011 inventory.

## 4.6 Emissions Estimating Methodology

### 4.6.1 Emission Equations

The basic equation used to estimate harbor vessels emissions is:

Equation 4.1

$$E = kW \times Act \times LF \times EF \times FCF$$

Where:

- E = emission, g/year
- kW = kilowatts
- Act = activity, hours/year
- LF = load factor
- EF = emission factor, g/kW-hr
- FCF = fuel correction factor

The EPA emission factors are in g/kW-hr, therefore engine horsepower was converted to kilowatts by dividing the horsepower by 1.341 (one horsepower is equal to 0.746 kilowatts). The activity hours represent estimated annual hours of use in 2011 within the Puget Sound. The total annual hours were used to calculate harbor vessels emissions. The calculated emissions were converted to tons per year by dividing the emissions by 907,200 (which is 2,000 lb/ton x 453.6 g/lb).

### 4.6.2 Emission Factors for Diesel Engines

The emission factors for harbor vessels are based on marine engine standards (i.e., Tier 0 to Tier 3) and their respective EPA engine categories. In addition, EPA identified three categories for commercial marine vessel main propulsion engines and auxiliary engines:

- Category 1: 1-5 liters per cylinder displacement
- Category 2: 5-30 liters per cylinder displacement
- Category 3: over 30 liters per cylinder displacement

Most commercial harbor vessels have Category 1 engines, except for some of the larger tugboats and larger commercial fishing vessels, which have Category 2 engines. In Puget Sound, approximately 90% of the harbor vessels inventoried had EPA Category 1 engines. The other 10% had EPA Category 2 engines.

The majority, 87%, of the diesel marine engines in this inventory have Tier 0 unregulated engines; the rest of the engines meet Tier 1, Tier 2 or Tier 3 engine standards. The various marine engine standards are listed below.

- Tier 0 marine engines are unregulated, older engines (1999 and prior)
- Tier 1 marine engine standards are voluntary under MARPOL Annex VI NO<sub>x</sub> limits (model year 2000+)
- Tier 2 marine engine standards have been promulgated (mainly 2004+ model year engines and 2007+ for larger engines)
- Tier 3 marine engine standards (2009+ for 37 kW and smaller engines)

In summary, the use of a specific emission factor is dependent on engine power, engine model year, and engine cylinder displacement. The source of emission factors is listed in Table 4.4.

**Table 4.4: Source of Emission Factors**

<b>Engine Standard</b>	<b>EPA Eng Category</b>	<b>Source of Emission Factor</b>
Tier 0	Cat 1	1999 EPA RIA
Tier 0	Cat 2	2002 Entec
Tier 1	Cat 1	1999 EPA RIA, IMO NO <sub>x</sub>
Tier 1	Cat 2	2002 Entec, IMO NO <sub>x</sub>
Tier 2	Cat 1	1999 EPA RIA
Tier 2	Cat 2	2002 Entec, 1999 EPA RIA 40 CFR <sup>26</sup> Part 94, Table 1 of
Tier 3	Cat 1	1042.101

The emission factors used for this study are listed in Table 4.5 for diesel-fueled main propulsion and auxiliary engines. The emission factors units are in grams per kilowatt-hour.

<sup>26</sup> CFR - Code of Federal Regulations



Table 4.5: Harbor Vessel Emission Factors for Diesel Engines, g/kW-hr

kW Range	Year Range	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
<b>Tier 0 Engines</b>									
0 to 8	<2000	11.0	0.27	2.0	1.3	0.90	690	0.02	0.09
8 to 19	<2000	11.0	0.27	2.0	1.3	0.90	690	0.02	0.09
19 to 37	<1999	11.0	0.27	2.0	1.3	0.90	690	0.02	0.09
37 to 76	<2000	10.0	0.27	1.7	1.3	0.40	690	0.02	0.09
76 to 131	<2000	10.0	0.27	1.5	1.3	0.40	690	0.02	0.09
131 to 226	<2000	10.0	0.27	1.5	1.3	0.30	690	0.02	0.09
226 to 451	<2000	10.0	0.27	1.5	1.3	0.30	690	0.02	0.09
451 to 561	<2000	10.0	0.27	1.5	1.3	0.30	690	0.02	0.09
561 to 1,001	<2000	10.0	0.27	1.5	1.3	0.30	690	0.02	0.09
1,000+	<2000	13.0	0.27	2.5	1.3	0.30	690	0.02	0.09
Cat 2 Engines	<2000	13.2	0.50	1.1	1.3	0.72	690	0.02	0.09
<b>Tier 1 Engines</b>									
0 to 8	2000-2005	10.23	0.27	2.0	1.3	0.9	690	0.02	0.09
8 to 19	2000-2005	9.23	0.27	2.0	1.3	0.8	690	0.02	0.09
19 to 37	2000-2004	9.23	0.27	2.0	1.3	0.8	690	0.02	0.09
37 to 76	2000-2004	9.80	0.27	1.7	1.3	0.4	690	0.02	0.09
76 to 131	2000-2004	9.80	0.27	1.5	1.3	0.4	690	0.02	0.09
131 to 226	2000-2004	9.80	0.27	1.5	1.3	0.3	690	0.02	0.09
226 to 451	2000-2004	9.80	0.27	1.5	1.3	0.3	690	0.02	0.09
451 to 561	2000-2004	9.80	0.27	1.5	1.3	0.3	690	0.02	0.09
561 to 1,001	2000-2004	10.0	0.27	1.5	1.3	0.3	690	0.02	0.09
1,000+	2000-2007	9.80	0.27	2.5	1.3	0.3	690	0.02	0.09
Cat 2 Engines	2000-2007	9.80	0.50	1.1	1.3	0.72	690	0.02	0.09
<b>Tier 2 Engines</b>									
0 to 8	2005-2009	7.23	0.27	5.0	1.3	0.8	690	0.02	0.09
8 to 19	2005-2009	7.23	0.27	5.0	1.3	0.8	690	0.02	0.09
19 to 37	2004-2009	7.23	0.27	5.0	1.3	0.6	690	0.02	0.09
37 to 76	2004-2013	6.80	0.27	5.0	1.3	0.3	690	0.02	0.09
76 to 131	2004-2013	6.80	0.27	5.0	1.3	0.3	690	0.02	0.09
131 to 226	2004-2013	6.80	0.27	5.0	1.3	0.3	690	0.02	0.09
226 to 451	2004-2013	6.80	0.27	5.0	1.3	0.3	690	0.02	0.09
451 to 561	2004-2013	6.80	0.27	5.0	1.3	0.3	690	0.02	0.09
561 to 1,001	2004-2013	6.80	0.27	5.0	1.3	0.3	690	0.02	0.09
1,000+	2007-2013	6.80	0.27	5.0	1.3	0.3	690	0.02	0.09
Cat 2 Engines	2007-2013	9.80	0.50	5.0	1.3	0.5	690	0.02	0.09
<b>Tier 3 Engines</b>									
0 to 8	2009+	7.23	0.27	5.0	1.3	0.4	690	0.02	0.09
8 to 19	2009+	7.23	0.27	5.0	1.3	0.4	690	0.02	0.09
19 to 37	2009+	7.23	0.27	5.0	1.3	0.3	690	0.02	0.09

#### 4.6.3 Fuel Correction Factors for Diesel Alternatives

Fuel correction factors, shown in Table 4.6, were applied to the vessels using ULSD, which are consistent with the factors used in 2005. The emission factors used for this study and listed in Table 4.5, are based on use of EPA non-road diesel fuel and thus need to be adjusted to account for alternative fuels.

**Table 4.6: Fuel Correction Factors**

Fuel	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
ULSD	1.00	1.00	1.00	0.005	0.86	1.00	1.00	1.00

#### 4.6.4 Emission Factors for Gasoline Engines

Two percent of the commercial harbor vessels are powered with gasoline engines. These are mainly government vessels, such as patrol boats with 2-stroke and 4-stroke gasoline engines. The emission factors for gasoline engines are different than those described previously for diesel engines. The emission factor units, taken from EPA's guidance for recreational marine exhaust emission factors,<sup>27</sup> were converted from g/bhp-hr to g/kW-hr. Evaporative emissions from gasoline engines are not included since they are insignificant for the small number of gasoline-powered commercial harbor vessels in this inventory. The emission factor for particulate matter is listed in Table 4.7. PM<sub>10</sub> is 100% of PM, PM<sub>2.5</sub> is 92%<sup>28</sup> of PM, and DPM is zero for gasoline.

**Table 4.7: Harbor Vessel Emission Factors for Gasoline Engines, g/kW-hr**

Power (kW)	Stroke	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
7 to 12	2	2.6	229.0	314.7	3.1	3.9	2376	0.06	0.13
12 to 19	2	2.6	189.0	273.8	3.2	3.1	2298	0.06	0.13
19 to 30	2	2.6	149.1	273.8	2.9	3	1980	0.05	0.11
30 to 37	2	2.6	143.8	273.8	2.8	2.8	1902	0.05	0.11
37 to 75	2	2.6	137.5	273.8	2.3	2.5	1632	0.04	0.09
75 to 130	2	2.6	124	273.8	2.3	2.5	1584	0.04	0.09
75 to 130	4	7.3	7.8	182.9	2.5	0.1	1321	0.03	0.07
131 to 745	4	7.3	7.8	188.7	2.4	0.1	1251	0.03	0.07

<sup>27</sup> EPA, *Exhaust Emission Factors for Nonroad Engine Modeling: Spark Ignition*, December 2005.

<sup>28</sup> EPA, *NONROAD*.

#### 4.6.5 Fuel Correction Factors for Gasoline Engines

The SO<sub>2</sub> emission factor is based on S content of 330 ppm. In 2011, the average S content of the gasoline fuel was 30 ppm. Therefore a fuel correction of .091 was applied to estimate SO<sub>2</sub> emissions.

#### 4.6.6 Engine Load Factors

Engine load factors represent the load applied to an engine or the percentage of rated engine power that is applied during the engine's operation. Depending on the duration of the period being estimated, the load factor can represent an hourly average, daily average, or annual average load applied to an engine while it is in operation. Table 4.8 summarizes the annual average engine load factors that were used in this inventory for the harbor craft vessel types for their propulsion and auxiliary engines.

**Table 4.8: Load Factors**

Harbor Vessel Type	Propulsion Engine	Source	Auxiliary Engine	Source
Assist and Escort	0.31	2001 POLA EI	0.43	EPA NONROAD
Harbor Tug	0.31	2001 POLA EI	0.43	EPA NONROAD
Ocean Tug	0.68	EPA NONROAD	0.43	EPA NONROAD
Commercial Fishing	0.30	EPA NONROAD	0.30	EPA NONROAD
Ferry	0.34	WSF 2011 data	0.43	EPA NONROAD
Excursion	0.42	EPA NONROAD	0.43	EPA NONROAD
Government	0.51	EPA NONROAD	0.43	EPA NONROAD
Pilot Boat	0.51	EPA NONROAD	0.43	EPA NONROAD
Tank Barge	na	na	0.43	EPA NONROAD
Workboat	0.38	CARB	0.32	CARB

The 31% engine load factor for assist/escort and harbor tugboats is based on actual vessel engine load readings published in the 2001 *Port of Los Angeles Baseline Air Emissions Inventory*. The 43% engine load factor used for the auxiliary engines is obtained from the EPA NONROAD model guidance<sup>29</sup> which used some direct measurements and has been used in previous studies.<sup>30</sup> The ferry's 34% engine load factor is based on data provided by Washington State Ferries engineers. The workboat propulsion and auxiliary engine load factors are from California Air Resources' *Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, Appendix B*. All other load factors are from EPA NONROAD.

<sup>29</sup> EPA, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, December 2002.

<sup>30</sup> Starcrest, *Update to the Commercial Marine Inventory for Texas to Review Emission Factors, Consider a Ton-mile EI Method, and Revise Emissions for the Beaumont-Port Arthur Nonattainment Area*, January 2004.

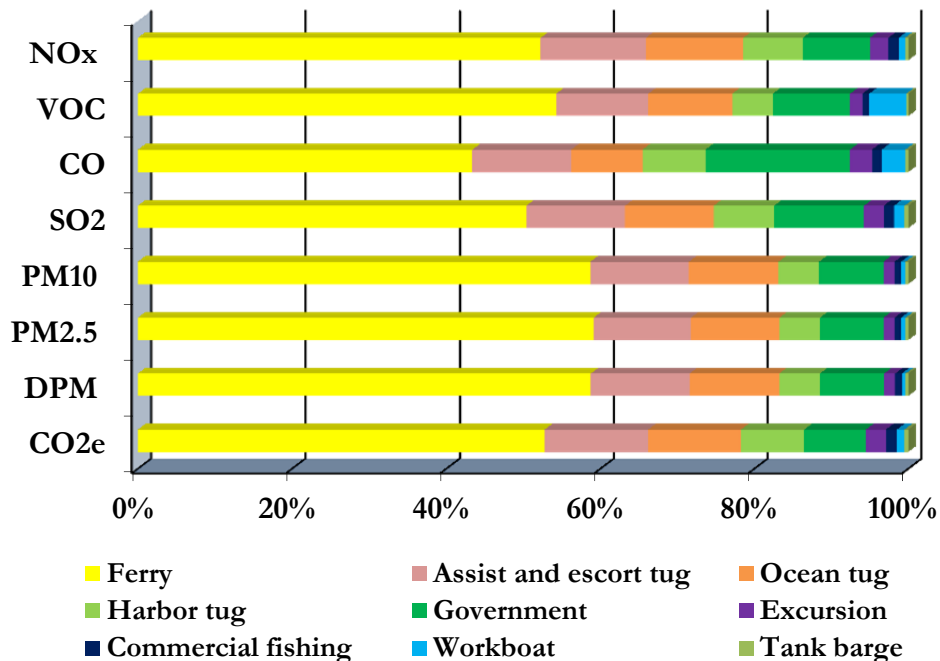
#### 4.7 Commercial Harbor and Government (non military) Vessel Emissions Estimates

The 2011 harbor vessel emissions for Puget Sound are summarized in this section. Table 4.9 presents the 2011 harbor vessel emissions by vessel type for Puget Sound in tons per year (tpy). Figure 4.2 presents that almost half of the commercial harbor and government vessel emissions are attributable to ferries, followed by assist tugs, ocean tugs and government vessels.

**Table 4.9: 2011 Commercial Harbor and Government Vessel Emissions by Vessel Type, tpy**

Type	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Assist/Escort	855.1	29.6	130.9	0.5	34.9	32.1	34.9	51,236
Commercial fishing	84.2	2.2	13.1	0.1	2.3	2.2	2.3	5,448
Excursion	151.4	3.9	29.0	0.1	3.9	3.7	3.9	9,900
Ferry	3,266.0	134.0	443.1	1.9	159.8	150.0	159.8	201,112
Government	543.3	24.8	192.0	0.4	22.8	20.9	22.7	30,543
Harbor tug	483.0	13.1	83.6	0.3	14.4	13.4	14.4	31,370
Ocean tug	791.4	26.9	94.7	0.4	31.7	29.2	31.7	45,973
Tank barge	27.7	0.7	4.2	0.0	1.0	0.9	1.0	1,936
Workboat	50.9	11.9	31.3	0.1	1.6	1.5	1.4	3,758
<b>Total</b>	<b>6,253.0</b>	<b>247.2</b>	<b>1,021.9</b>	<b>3.7</b>	<b>272.3</b>	<b>253.7</b>	<b>272.1</b>	<b>381,275</b>

**Figure 4.2: 2011 Commercial Harbor and Government Vessel Emissions by Vessel Type**



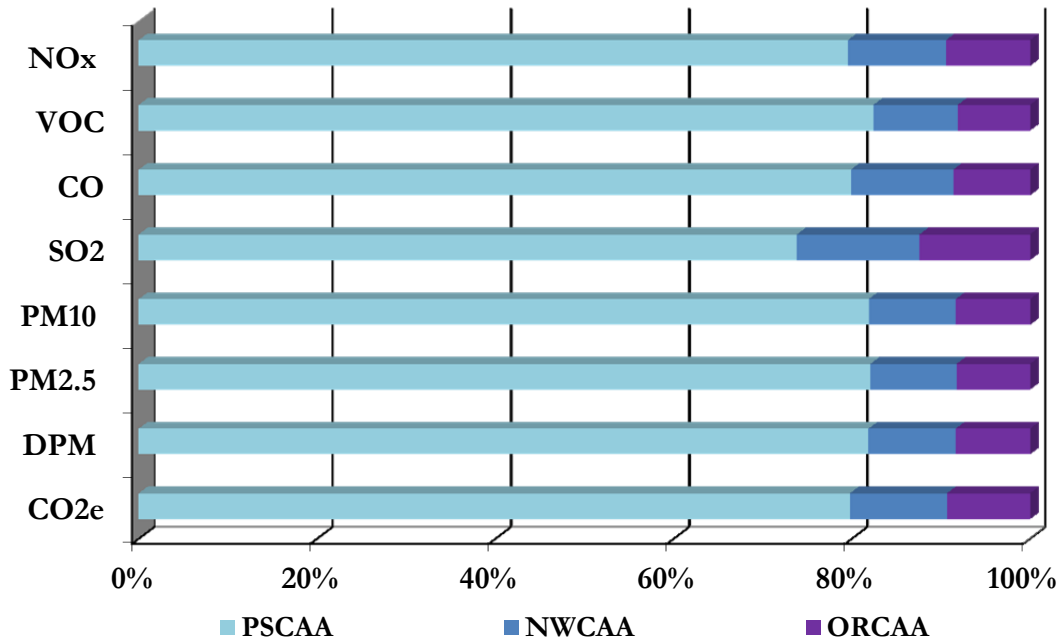
First, the emissions were estimated by regional clean air agency jurisdictions, as described in Section 2.1.2, based on discussions with vessel owners. They were then subdivided by county based on knowledge of where the various vessels types transit.

The emission results for each of the three regional clean air agency regions covered by this inventory are summarized in Table 4.10. Figure 4.3 illustrates that approximately 80% of the commercial harbor and government vessel emissions are in PSCAA region.

**Table 4.10: 2011 Commercial Harbor and Government Vessel Emissions by Regional Clean Air Agency, tpy**

Clean Air Agency	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
NWCAA	680.2	23.4	117.5	0.6	26.6	24.5	26.6	41,543
ORCAA	603.3	20.1	88.1	0.5	22.7	20.9	22.7	35,615
PSCAA	4,969.5	203.7	816.2	3.0	223.0	208.3	222.8	304,117
<b>Total</b>	<b>6,253.0</b>	<b>247.2</b>	<b>1,021.9</b>	<b>4.0</b>	<b>272.3</b>	<b>253.7</b>	<b>272.1</b>	<b>381,275</b>

**Figure 4.3: 2011 Commercial Harbor and Government Vessel Emissions by Regional Clean Air Agency**



The emission results for each of the 12 counties covered by this inventory are summarized in Table 4.11 by county. The same methodology used in the 2005 PSEI report for allocating the emissions by county was used. Percentages were used for five zones (ORCAA, PSCAA1, PSCAA2, PSCAA3, and NWCAA) based on the general amount of time spent in each zone. Island, San Juan, Skagit, and Whatcom Counties are included in the NWCAA zone and the emissions are divided equally among these four counties. Clallam, Jefferson, Mason, and Thurston Counties are included in the ORCAA zone with the following emissions distribution: 80% for Clallam, 0% for Jefferson, 10% for Mason, and 10% for Thurston. PSCAA1 zone is Pierce County. PSCAA2 zone emission distribution is 75% King County and 25% Kitsap County. PSCAA3 zone is Snohomish County.

**Table 4.11: 2011 Commercial Harbor and Government Vessel Emissions by County, tpy**

County	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Clallam	482.7	16.1	70.5	0.4	18.2	16.7	18.2	28,492
Island	170.1	5.8	29.4	0.1	6.7	6.1	6.7	10,386
Jefferson	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
King	1,958.5	85.3	318.6	1.2	89.4	83.6	89.2	119,139
Kitsap	652.8	28.4	106.2	0.4	29.8	27.9	29.7	39,713
Mason	60.3	2.0	8.8	0.0	2.3	2.1	2.3	3,561
Pierce	802.2	27.9	153.4	0.5	30.9	28.5	30.9	48,802.6
San Juan	170.1	5.8	29.4	0.1	6.7	6.1	6.7	10,386
Skagit	170.1	5.8	29.4	0.1	6.7	6.1	6.7	10,386
Snohomish	1,555.9	62.2	238.0	0.9	72.9	68.3	72.9	96,462.2
Thurston	60.3	2.0	8.8	0.0	2.3	2.1	2.3	3,561
Whatcom	170.1	5.8	29.4	0.1	6.7	6.1	6.7	10,386
<b>Total</b>	<b>6,253.0</b>	<b>247.2</b>	<b>1,021.9</b>	<b>4.0</b>	<b>272.3</b>	<b>253.7</b>	<b>272.1</b>	<b>381,275</b>

#### 4.8 Recreational Vessels

Recreational vessels were included into the original 2005 inventory for the sake of completeness and because several of the participating ports owned public marinas. The number of recreational vessels was determined based on the methodology used in 2005 which assumed that the number of vessels at public and private marinas equaled the number of slips plus extra dock space that some marinas have available (conservatively high assumption). Vessel numbers were then allocated between sailing and motorized recreational vessels and emissions estimated. The same approach was taken in 2011, based on the 2005 methods.

Due to limited funds only a small number public and private marinas were contacted in 2011 for slip count numbers to determine if the number of slips changed significantly since 2005. For 2011, there were 23,771 slips identified compared to 24,387 slips in 2005. For the few marinas that provided occupancy rates for 2011, which included some public and private marinas in the Everett, Seattle and Tacoma areas, the occupancy rate was used and averaged about 84% for private marinas and 87% for public marinas in 2011. For those public and private marinas not contacted in 2011, which were the majority of the marinas, the 2005 vessel counts were used with assumption that there were no changes in the number of slips or occupancy since 2005. The most typical uses for recreational vessels are fishing, cruising, swimming, sightseeing, entertaining, water skiing, etc.

Table 4.12 lists of the public marinas associated with public port authorities included in this study. For purposes of estimating vessel numbers and calculating emissions, slip count was considered to be the same as vessel count, although in actuality a slip may moor more than one vessel, also slips are sometimes unoccupied.

**Table 4.12: 2011 Public Marina Vessel Counts by Associated Port and County**

Marina	County	Associated Port	Total Vessel Count
John Wayne Marina	Clallam	Port Angeles	280
Port Angeles Boat Haven	Clallam	Port Angeles	520
Port of Everett Marina	Snohomish	Port of Everett	2,050
12th Street Yacht Basin	Snohomish	Port of Everett	225
Cap Sante Boat Haven	Skagit	Port of Anacortes	1,000
Blaine Harbor	Whatcom	Port of Bellingham	629
Squalicum	Whatcom	Port of Bellingham	1,415
Bremerton	Kitsap	Port of Bremerton	45
Port Orchard	Kitsap	Port of Bremerton	375
Port of Brownsville	Kitsap	Port of Brownsville	335
Coupeville Wharf	Island	Port of Coupeville	340
Edmonds Marina	Snohomish	Port of Edmonds	292
Friday Harbor	San Juan	Port of Friday Harbor	500
Keyport Marina	Kitsap	Port of Keyport	28
Cove Marina	Kitsap	Port of Kingston	300
Swantown	Thurston	Port of Olympia	700
Point Hudson	Jefferson	Port of Port Townsend	45
Boat Haven	Jefferson	Port of Port Townsend	475
Herb Beck Marina	Jefferson	Port of Port Townsend	50
Poulsbo Marina	Kitsap	Port of Poulsbo	400
Fishermen's Terminal	King	Port of Seattle	165
Harbor Island	King	Port of Seattle	65
Shilshole Bay Marina	King	Port of Seattle	1,411
Bell Harbor Marina	King	Port of Seattle	45
Shelton Marina	Mason	Port of Shelton	50
La Conner Marina	Skagit	Port of Skagit	460
Ole & Charlie's	Pierce	Port of Tacoma	70
			<b>12,270</b>



Table 4.13 lists the marinas owned by private and other non-port, public entities included in this study. The slip count included permanent slips, transient slips, moorage balls, and transient dock space. The dock space was converted from linear feet to number of vessels by dividing by 15 feet, an assumed average length for recreational vessels in the area.

**Table 4.13: 2011 Private Marinas and Other Non-Port Public Entities Vessel Counts by County**

<b>Marina</b>	<b>Location</b>	<b>County</b>	<b>Total Vessel Count</b>
La Push Marina	La Push	Clallam	92
Port of Neah Bay	Neah Bay	Clallam	303
City of Langlely Boat Harbor	Langlely	Island	67
Deception Pass Marina	Oak Harbor	Island	70
Oak Harbor Marina	Oak Harbor	Island	404
Pleasant Harbor Marina	Brinnon	Jefferson	312
Port Hadlock Marina	Port Hadlock	Jefferson	164
City of des Moines Marina	Des Moines	King	915
Eagle Harbor Marina	Bainbridge Is.	King	107
Elliott Bay Marina	Seattle	King	1,200
Fairview Marina	Seattle	King	157
Harbour Village Marina	Kenmore	King	137
Hood Canal Marina (Alderbrook)	Union	King	100
Port Washington Marina	Bremerton	King	81
Sagstad Marina	Seattle	King	40
Salmon Bay Marina	Seattle	King	168
Bainbridge Island Marina	Bainbridge Is.	Kitsap	173
Harbour Marina	Bainbridge Is.	Kitsap	50
Liberty Bay Marina	Poulsbo	Kitsap	177
Point Hudson Marina	Port Townsend	Kitsap	150
Port Ludlow Marina	Port Ludlow	Kitsap	353
Port Orchard Yacht Club	Port Orchard	Kitsap	78
Seabeck Marina	Seabeck	Kitsap	125
Winslow Wharf Marina	Bainbridge Is.	Kitsap	239
Jarrell's Cove Marina	Shelton	Mason	20

**Table 4.13: 2011 Private Marinas and Other Non-Port Public Entities Vessel Counts by County (cont'd)**

Marina	Location	County	Total Vessel Count
Arabella's Landing	Gig Harbor	Pierce	103
Breakwater Marina	Tacoma	Pierce	123
Chinook Landing Marina	Tacoma	Pierce	210
Crow's Nest Marina	Tacoma	Pierce	109
Dock Street Marina	Tacoma	Pierce	0
Fair Harbor Marina	Grapeview	Pierce	78
Foss Harbor Marina	Tacoma	Pierce	344
Foss Waterway Marina	Tacoma	Pierce	50
Longbranch Marina	Longbranch	Pierce	86
Murphy's Landing	Gig Harbor	Pierce	85
Narrows Marina	Tacoma	Pierce	26
Peninsula Yacht Basin	Gig Harbor	Pierce	100
Point Defiance Boathouse Marina	Tacoma	Pierce	0
Port of Allyn	Allyn	Pierce	10
Blakely Island Marina	Blakely Island	San Juan	45
Cayou Quay Marina	Deer Harbor	San Juan	118
Deer Harbor Marina	Deer Harbor	San Juan	125
Islands Marina Center	Lopez Island	San Juan	100
Lopez Islander Resort & Marina	Lopez Island	San Juan	110
Quartermaster Yacht Club	Burton	San Juan	65
Roche Harbor Resort & Marina	Roche Harbor	San Juan	377
Rosario Resort Marina	Eastbound	San Juan	35
Skyline Marina	Anacortes	San Juan	600
Snug Harbor Marina Resort	Friday Harbor	San Juan	72
Stuart Island		San Juan	83
Sucia Island		San Juan	95
West Beach Resort & Marina	Eastbound	San Juan	55
West Sound Marina	Orcas Island	San Juan	157
Anchor Cove Marina	Anacortes	Skagit	166
LaConner City Floats	LaConner	Skagit	7
Lovric's Landing	Anacortes	Skagit	87
Shelter Bay Marina	LaConner	Skagit	330
12th St Yacht Basin	Everett	Snohomish	155
Boston Harbor Marina	Olympia	Thurston	110
Zittles Marina	Olympia	Thurston	200
Fisherman's Cove Marina	Bellingham	Whatcom	58
Point Roberts Marina	Point Roberts	Whatcom	1,048
Semiahmoo Marina	Blaine	Whatcom	296
			<b>11,501</b>

EPA's NONROAD model was used to estimate recreational vessel emissions for outboard gasoline engines, inboard gasoline engines and inboard diesel engines. The same 2005 average horsepower, listed in Table 4.14, was used for each engine type for recreational vessels in 2011. Since there is no actual data on the engine power, the same assumptions were used from the baseline inventory. Evaporative emissions from the gasoline engines are included in the emissions estimates. The only data used from 2011 was the updated vessel count.

**Table 4.14: 2011 Recreational Vessel Fuel and Average Horsepower by Vessel Type**

Vessel Type	Fuel	Power (hp)
Vessel outboard engines , runabouts	Gasoline	40
Vessel inboard engines , cabin boats	Gasoline	150
Vessels inboard engines	Gasoline	70
Vessel inboard Engines	Diesel	400
Sailboat auxiliary outboard engines	Gasoline	6
Sailboat auxiliary inboard engines	Diesel	34

Table 4.15 presents the 2011 total recreational vessel airshed emissions by county in tons per year. These emissions include vessels utilizing port-owned marinas, private marinas, and marinas of other non-port, public entities.

**Table 4.15: 2011 Recreational Vessel Airshed Emissions by County, tpy**

County	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Clallam	39.8	43.9	432.5	0.1	1.0	0.9	0.3	4,992
Island	31.9	35.1	346.0	0.1	0.8	0.7	0.2	3,994
Jefferson	31.9	35.1	346.0	0.1	0.8	0.7	0.2	3,994
King	151.4	166.6	1,643.6	0.3	3.6	3.4	1.1	18,971
Kitsap	95.6	105.2	1,038.1	0.2	2.3	2.2	0.7	11,982
Mason	2.4	2.6	26.0	0.0	0.1	0.1	0.0	300
Pierce	47.8	52.6	519.0	0.1	1.2	1.1	0.3	5,991
San Juan	87.6	96.5	951.6	0.2	2.1	2.0	0.6	10,983
Skagit	71.7	78.9	778.5	0.1	1.7	1.6	0.5	8,986
Snohomish	87.6	96.5	951.6	0.2	2.1	2.0	0.6	10,983
Thurston	33.5	36.8	363.3	0.1	0.8	0.8	0.2	4,194
Whatcom	115.5	127.2	1,254.3	0.2	2.8	2.6	0.8	14,478
<b>Total</b>	<b>796.6</b>	<b>877.0</b>	<b>8,650.5</b>	<b>1.6</b>	<b>19.2</b>	<b>17.9</b>	<b>5.6</b>	<b>99,848</b>

Table 4.16 presents the total 2011 recreational vessel airshed emissions for only port-owned marinas in tons per year. These values are included in the total recreational vessel emissions reported in the prior table, but are listed separately here for the benefit of port authorities who are interested in emissions for a marina associated with their respective port.

**Table 4.16: 2011 Recreational Vessel Airshed Emissions by Public Marina and Associated Port, tpy**

Marina	Associated Port	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
John Wayne Marina	Port Angeles	9.4	10.3	101.9	0.0	0.2	0.2	0.1	1,176
P. A. Boat Haven	Port Angeles	17.4	19.2	189.3	0.0	0.4	0.4	0.1	2,184
Port of Everett Marina	Port of Everett	68.7	75.6	746.1	0.1	1.7	1.5	0.5	8,612
12th Street Yacht Basin	Port of Everett	7.5	8.3	81.9	0.0	0.2	0.2	0.1	945
Cap Sante Boat Haven	Port of Anacortes	33.5	36.9	363.9	0.1	0.8	0.8	0.2	4,201
Blaine Harbor	Port of Bellingham	21.1	23.2	228.9	0.0	0.5	0.5	0.1	2,642
Squalicum	Port of Bellingham	47.4	52.2	515.0	0.1	1.1	1.1	0.3	5,944
Bremerton	Port of Bremerton	1.5	1.7	16.4	0.0	0.0	0.0	0.0	189
Port Orchard	Port of Bremerton	12.6	13.8	136.5	0.0	0.3	0.3	0.1	1,575
Port of Brownsville	Port of Brownsville	11.2	12.4	121.9	0.0	0.3	0.3	0.1	1,407
Coupeville Wharf	Port of Coupeville	11.4	12.5	123.7	0.0	0.3	0.3	0.1	1,428
Edmonds Marina	Port of Edmonds	9.8	10.8	106.3	0.0	0.2	0.2	0.1	1,227
Friday Harbor	Port of Friday Harbor	16.8	18.4	182.0	0.0	0.4	0.4	0.1	2,100
Keyport Marina	Port of Keyport	0.9	1.0	10.2	0.0	0.0	0.0	0.0	118
Cove Marina	Port of Kingston	10.1	11.1	109.2	0.0	0.2	0.2	0.1	1,260
Swantown	Port of Olympia	23.5	25.8	254.8	0.0	0.6	0.5	0.2	2,941
Point Hudson	Port of Port Townsend	1.5	1.7	16.4	0.0	0.0	0.0	0.0	189
Boat Haven	Port of Port Townsend	15.9	17.5	172.9	0.0	0.4	0.4	0.1	1,995
Herb Beck Marina	Port of Port Townsend	1.7	1.8	18.2	0.0	0.0	0.0	0.0	210
Poulsbo Marina	Port of Poulsbo	13.4	14.8	145.6	0.0	0.3	0.3	0.1	1,680
Fishermen's Terminal	Port of Seattle	5.5	6.1	60.1	0.0	0.1	0.1	0.0	693
Harbor Island	Port of Seattle	2.2	2.4	23.7	0.0	0.1	0.0	0.0	273
Shilshole Bay Marina	Port of Seattle	47.3	52.1	513.5	0.1	1.1	1.1	0.3	5,928
Bell Harbor Marina	Port of Seattle	1.5	1.7	16.4	0.0	0.0	0.0	0.0	189
Shelton Marina	Port of Shelton	1.7	1.8	18.2	0.0	0.0	0.0	0.0	210
La Conner Marina	Port of Skagit	15.4	17.0	167.4	0.0	0.4	0.3	0.1	1,932
Ole & Charlie's	Port of Tacoma	2.3	2.6	25.5	0.0	0.1	0.1	0.0	294
<b>Total</b>		<b>411.2</b>	<b>452.7</b>	<b>4,465.6</b>	<b>0.8</b>	<b>9.9</b>	<b>9.3</b>	<b>2.9</b>	<b>51,545</b>

#### 4.9 Emission Comparison, 2011 vs 2005

The emissions calculation methodology was similar to the methodology used in 2005, with the exception of updated load factors used in 2011. Table 4.17 lists the vessel and engine types that had updated load factors in 2011 based on updated factors, better information provided by vessel operators, or other applicable studies. The other harbor vessel load factors remained the same as 2005 and the complete list of 2011 load factors are listed previously in Table 4.8.

For harbor vessel emissions comparison, the 2005 emissions were adjusted for the updated load so that the emissions would be comparable.

**Table 4.17: 2011 vs 2005 Load Factor Changes**

Harbor Vessel Type	Engine Type	2011 LF	2005 LF
Harbor Tug	Propulsion	0.31	0.68
Ferry	Propulsion	0.34	0.76
Excursion	Propulsion	0.42	0.76
Workboat	Propulsion	0.38	0.45
Workboat	Auxiliary	0.32	0.43

Table 4.18 presents an 11% increase in activity in 2011 as compared to 2005. The vessel count did not change significantly.

**Table 4.18: 2011 vs 2005 Harbor Vessel Count Comparison**

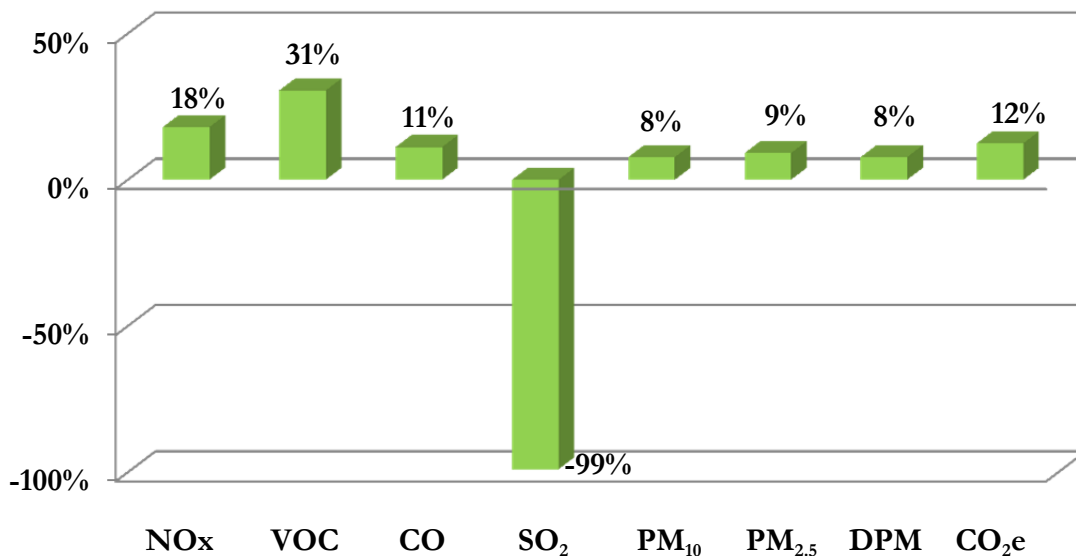
Year	Activity (hp hr)	Count
2011	664,138,311	709
2005	594,442,588	704
<b>Change, %</b>	<b>12%</b>	<b>1%</b>

Table 4.19 and Figure 4.4 present the total net change in emissions for total harbor craft, including tank barges, in 2011 as compared to 2005. With the exception of SO<sub>2</sub> emissions, the harbor craft emissions increased for all pollutants by 6% to 28% in 2011 when compared to 2005. The increase in emissions, with the exception for SO<sub>x</sub>, is due to a number of reasons. The activity increased 12% (see Table 4.20) in 2011 and the fleet changed from 2005 for some of the vessel types and there was an increase in category 2 engines which have higher emission factors than category 1 engines. The NO<sub>x</sub> and VOC increase is greater than the activity increase and this reflects the fact that there was an increase in category 2 engines which have higher NO<sub>x</sub>, VOC, and PM emission rates than Category 1 engines. The increase in PM and DPM is less than the activity increase and this reflects the reduction that occurred due to the use of ULSD, but there was still an increase in PM emissions due to the increased activity and rise in category 2 engine count. The SO<sub>2</sub> emissions decreased significantly in 2011 due to the availability and use of ULSD in 2011 by the vessels with diesel engines one year ahead of the EPA mandated marine and locomotive low sulfur diesel fuel requirement.

**Table 4.19: 2011 vs 2005 Commercial Harbor and Government Vessel Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	6,253.0	247.2	1,021.9	3.7	272.3	253.7	272.1	381,275
2005	5,299.7	189.4	919.1	358.3	252.7	232.5	252.5	338,949
<b>Change, tpy</b>	<b>953.3</b>	<b>57.8</b>	<b>102.8</b>	<b>-354.6</b>	<b>19.6</b>	<b>21.2</b>	<b>19.6</b>	<b>42,326</b>
<b>Change, %</b>	<b>18%</b>	<b>31%</b>	<b>11%</b>	<b>-99%</b>	<b>8%</b>	<b>9%</b>	<b>8%</b>	<b>12%</b>

**Figure 4.4: 2011 vs 2005 Commercial Harbor and Government Vessel Emissions Change**



Note: 2005 emissions were recalculated using the same methods used for the 2011 emission estimates. The above figure accounts for these changes so that a direct comparison can be made between 2011 vs 2005.

Table 4.20 presents the changes in activity (hp-hr) by vessel type. The changes in activity are due to both changes in activity hours and engine horsepower. The activity is calculated by multiplying the horsepower times the activity hours times the load factor. For 2005 activity, the updated 2011 load factors were used in order to do the comparison.

**Table 4.20: 2011 vs 2005 Harbor Vesel Activity Change**

Type	2005	2011	% Change
	hp-hr	hp-hr	
Assist/Escort	81,212,373	89,289,023	10%
Commercial fishing	10,558,042	9,493,618	-10%
Excursion	16,962,842	17,248,062	2%
Ferry	314,514,283	350,485,994	11%
Government	32,032,977	52,947,794	65%
Harbor tug	45,559,880	54,657,979	20%
Ocean tug	86,344,802	80,122,263	-7%
Tank barge	3,006,689	3,373,361	12%
Workboat	4,250,700	6,520,218	53%

The government activity doubled in 2011, as presented in Table 4.21, due to the data collected in 2011 which added vessels to the government fleet and increased the government engine count by about 28 engines from what was included in the 2005 inventory.

**Table 4.21: 2011 vs 2005 Commercial Harbor and Government Vessel Average Operational Hours Comparison**

Type	Propulsion Engine			Auxiliary Engine		
	2005 (hours)	2011 (hours)	Percent	2005 (hours)	2011 (hours)	Percent
Assist/ Escort	2,673	3,135	17%	3,644	3,122	-14%
Commercial fishing	49	49	-1%	49	49	-1%
Excursion	862	879	2%	607	697	15%
Ferry	3,695	4,420	20%	1,836	2,110	15%
Government	654	838	28%	664	535	-19%
Harbor tug	1540	1,540	0%	1024	1,647	61%
Ocean tug	498	498	0%	498	457	-8%
Pilot boat	2,675	799	-70%	1,000	342	-66%
Tank barge	na	na	na	na	1,087	na
Workboat	554	840	52%	577	321	-44%

Table 4.22 compares the average engine horsepower for propulsion and auxiliary engine.

**Table 4.22: 2011 vs 2005 Commercial Harbor and Government Vessel Average Engine Horsepower by Engine and Vessel Type, hp**

Type	Propulsion Engine			Auxiliary Engine		
	2005 (hp)	2011 (hp)	Percent	2005 (hp)	2011 (hp)	Percent
Assist/Escort	2,123	2,616	23%	134	203	51%
Commercial fishing	750	718	-4%	na	298	na
Excursion	432	433	0%	43	43	1%
Ferry	1,845	1,973	7%	363	378	4%
Government	880	1,002	14%	143	237	66%
Harbor tug	856	856	0%	86	102	19%
Ocean tug	2,156	2,156	0%	133	147	10%
Pilot boat	1,100	1,100	0%	47	47	0%
Tank barge	na	na	na	na	185	na
Workboat	376	453	20%	173	197	14%

Table 4.23 presents the average engine model year and age in 2011 and 2005 for propulsion engines.

**Table 4.23: 2011 vs 2005 Commercial Harbor and Government Vessel Average Propulsion Engine Model Year by Vessel Type**

Type	2005 MY (year)	2011 MY (year)	2005 Age	2011 Age
Assist/Escort	1986	1994	19	17
Commercial fishing	1973	1976	32	35
Excursion	1992	1992	13	19
Ferry	1996	1996	9	15
Government	1990	1991	15	20
Harbor tug	1979	1979	26	32
Ocean tug	1981	1981	24	30
Pilot boat	2000	2000	5	11
Tank barge	na	na	na	na
Workboat	1983	1984	22	27



Table 4.24 presents the average engine model year and age in 2011 and 2005 for auxiliary engines.

**Table 4.24: 2011 vs 2005 Commercial Harbor and Government Vessel Average Auxiliary Engine Model Year by Vessel Type**

Type	2005 MY (year)	2011 MY (year)	2005 Age	2011 Age
Assist/Escort	1985	1999	20	12
Commercial fishing	1973	1976	32	35
Excursion	na	1992	na	19
Ferry	1994	1997	11	14
Government	1945	1966	60	45
Harbor tug	1977	1982	28	29
Ocean tug	1982	1984	23	27
Pilot boat	2000	2000	5	11
Tank barge	na	1990	na	21
Workboat	1976	1982	29	29

For the recreational vessel emission comparison, the 2005 emission estimates were re-modeled used the NONROAD2008a model to be comparable to the 2011 emissions. The original 2005 emissions were based on the NONROAD2005c model. The differences between 2011 vs 2005 in Table 4.25 are due to the following contributing factors: 1) 3% decrease in the number of recreational vessels (see Table 4.26); 2) the use of ULSD in 2011 by diesel powered recreational vessels and the use of lower sulfur gasoline in 2011 by gasoline powered recreational vessels; 3) the improvement of gasoline and marine diesel engine standards, which came into effect in 2007 for Tier 2 gasoline engines and 2006-2009 for Tier 2 marine diesel engines; and lastly, and 4) fleet turnover assumed by the NONROAD2008a model.

The contributing factors resulted in range of 10% to 93% emission reduction for recreational vessels as presented in Table 4.25.

**Table 4.25: 2011 vs 2005 Recreational Vessels Emissions Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	797	877	8,651	2	19	18	6	99,848
2005	928	2,018	13,536	22	41	38	7	111,184
<b>Change (tpy)</b>	<b>-131</b>	<b>-1,141</b>	<b>-4,885</b>	<b>-20</b>	<b>-22</b>	<b>-20</b>	<b>-1</b>	<b>-11,336</b>
<b>Change (%)</b>	<b>-14%</b>	<b>-57%</b>	<b>-36%</b>	<b>-93%</b>	<b>-53%</b>	<b>-53%</b>	<b>-20%</b>	<b>-10%</b>

Table 4.26 presents that recreational vessel count decreased 3% in 2011 as compared to 2005.

**Table 4.26: 2011 vs 2005 Recreational Vessels Count Comparison**

<b>Year</b>	<b>Vessel Count</b>
2011	23,771
2005	24,390
<b>Change (tpy)</b>	<b>-619</b>
<b>Change (%)</b>	<b>-3%</b>

## **SECTION 5 CARGO HANDLING EQUIPMENT**

Section 5 provides an overview of the cargo-handling and related equipment found at Puget Sound ports. A description of the methodology used to estimate emissions is provided in this section, as well as the emission estimates for this source category.

### **5.1 Source Description**

Cargo handling equipment includes equipment used to move cargo (containers, general cargo, and bulk cargo) to and from marine vessels, railcars, and on-road trucks. This includes cranes, straddle carriers, yard tractors, top and side handlers, forklifts, and other related equipment found in smaller quantities, such as various loaders, sweepers, backhoes, aerial lifts, pallet jacks, and generator sets. The equipment typically only operates at marine terminals or at rail yards and is assumed not to operate on public roadways or land. This inventory includes cargo handling equipment using diesel, gasoline, propane or electricity. Although the inventory's primary focus is diesel equipment, the total count includes zero-emitting electrical equipment.

As shown in Tables 5.1 and 5.2 and Figures 5.1 and 5.2, a total of 1,196 pieces of equipment were inventoried, including 117 electric-powered pieces. Over one-third of the equipment was yard tractors (35%), and 22% was forklifts. Each port's equipment is summarized in detail in Section 5.4.

For Table 5.1, electric equipment includes: crane, forklift, manlift, truck, pallet jacks, and compressor. The other category includes: backhoe, car loader, compressor, crane, generator, light tower, log shovel, log handler, log stacker, manlift, reach stacker, skid steer loader, truck, welder, and sweeper.

**Table 5.1: 2011 CHE Distribution by Type**

Equipment	Count
Yard Tractor	418
Forklift	267
Top Handler	95
Straddle Carrier	78
Loader	42
Electric Equipment	117
Other	179
<b>Total</b>	<b>1,196</b>

**Figure 5.1: 2011 CHE Count Distribution**

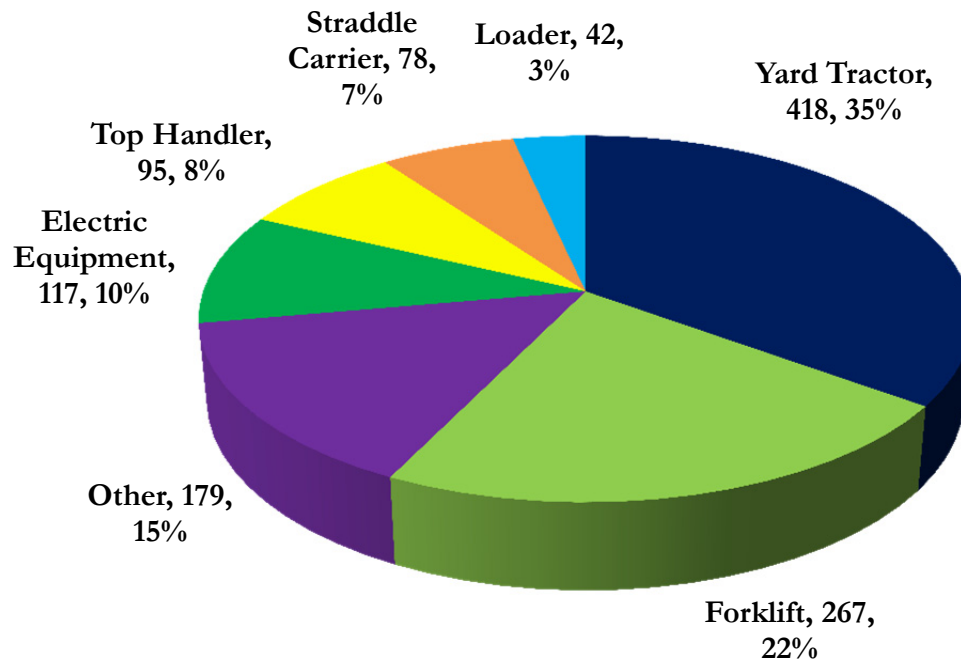
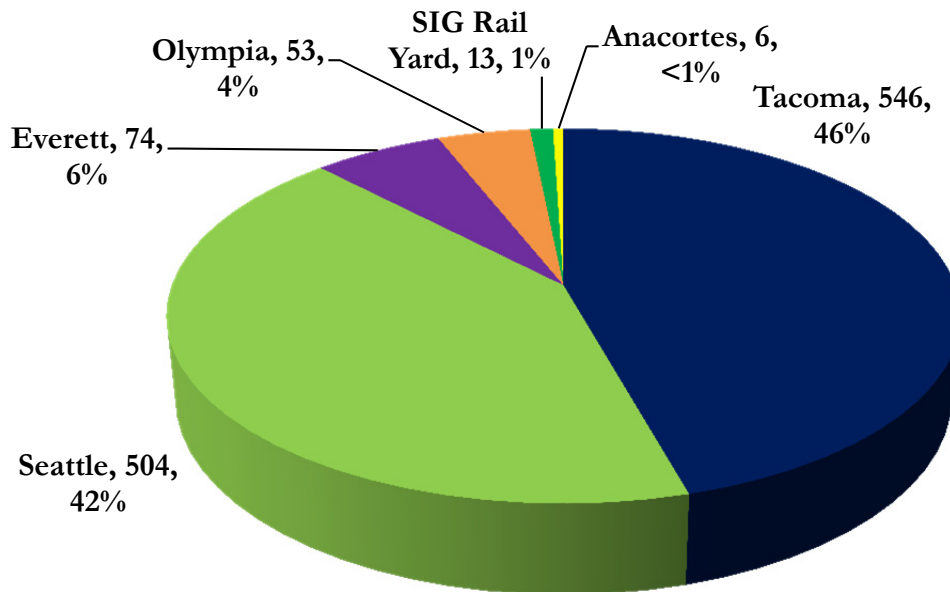


Table 5.2: 2011 CHE Distribution by Port

Port	Petroleum		Total Count
	Fueled	Electric	
Anacortes	6	0	6
Everett	68	6	74
Olympia	53	0	53
Seattle	446	58	504
Tacoma	493	53	546
BNSF SIG Rail Yard	13	0	13
<b>Total</b>	<b>1,079</b>	<b>117</b>	<b>1,196</b>

Note: SIG - Seattle International Gateway

Figure 5.2: 2011 CHE Distribution by Port



### 5.1.1 Crane

The crane category encompasses various types of cranes, such as overhead, gantry, stacking, and container cranes found at the ports. Crane photos are courtesy of the Port of Tacoma's Website Photo Gallery.

The container crane, shown in Figure 5.3 and otherwise known as dockside, ship to shore, or quayside crane, is electrical and is used mainly at container terminals to load/unload the vessels.

**Figure 5.3: Container Crane**



The rubber tired gantry (RTG) crane, shown in Figure 5.4 is also known as a transtainer. The diesel-powered RTG crane moves containers to and from the container stacks.

**Figure 5.4: Rubber Tired Gantry Crane**



### 5.1.2 Forklift

Forklifts or lift trucks, shown in Figure 5.5, are the second most common piece of equipment found at the ports, after the yard tractor. They vary in capacity and engine size and can have diesel, gasoline or propane engines or electric motors.

**Figure 5.5: Forklift**



### 5.1.3 Side Handler

Side picks, side handlers, side loaders, and empty container handlers, shown in Figure 5.6, describe the cargo handling equipment that typically move and stack the empty containers at a terminal. The side handlers in this inventory are diesel-powered.

**Figure 5.6: Side Handler**



#### *5.1.4 Straddle Carrier*

A straddle carrier, shown in Figure 5.7, is specialized equipment that removes the containers from delivering trucks by straddling the chassis and lifting the container using an overhead crane. The straddle carrier then drives away with the container. The straddle carriers in this inventory are diesel-powered.

**Figure 5.7: Straddle Carrier**



#### *5.1.5 Top Handler*

The top loader or top handler, shown in Figure 5.8, moves, stacks and loads containers using an overhead telescopic boom. The top handler has higher horsepower and lifting capacity than the side handler. The top handlers in this inventory are diesel-powered.

**Figure 5.8: Top Handler**





### 5.1.6 Yard Tractor

The majority of the pieces of cargo handling equipment in the inventory are yard tractors, also known as terminal tractors, yard hustlers, yard trucks, or hostlers and shown in Figure 5.9. The typical non-road yard tractor is a close relative of the on-road truck tractor chassis; however, most terminal yard tractors have a non-road engine that does not meet the EPA standards required to be registered for public roads. Some terminals may use yard tractors that are specifically purchased with on-road engines. Yard tractors are used throughout the terminal to move containers to and from the ship and to move containers within the terminal. Yard tractors are also used for intermodal rail container transfers. Equipment and emissions from intermodal rail yards are included in the rail section.

**Figure 5.9: Yard Tractor**



## 5.2 Geographical Delineation

The geographical extent for the cargo handling equipment is the marine terminals and facilities associated with the following Puget Sound ports:

- Port of Anacortes
- Port of Everett
- Port of Olympia
- Port of Seattle
- Port of Tacoma
- BNSF SIG Rail Yard
- Argo Rail Yard

### **5.3 Data and Information Acquisition**

Data was collected from terminal owners, equipment operators, and others having firsthand knowledge of either equipment details or operational parameters. Additional information was requested after the initial data review. The collected information was compared with information acquired during the 2005 emissions inventory process in order to provide an order-of-magnitude “reasonableness check” on the quality of the data.

The data collection approach focused on equipment details and operational profiles (activity data). The data is summarized by port and discussed in the following subsections. Some examples of equipment details that were collected include such parameters as:

- Equipment type (e.g., yard tractor)
- Rated power (primarily horsepower)
- Equipment manufacturer and model year
- Engine make, model, model year, and technology
- Type of fuel used (e.g., ULSD, gasoline, liquefied petroleum gas or LPG)
- Emission reduction technology (e.g., DOC, DPF)

Where data was unavailable, reasonable assumptions based on similar equipment in the inventory were used. Default values by port, engine type and equipment type were assigned when the activity hour, horsepower, or model year was unavailable.

The Port of Port Angeles declined participation in the inventory update. In 2005, the Port of Port Angeles operated a small number of forklifts and log handlers (11 pieces of equipment) for less than 500 hours annually. Cargo handling equipment usage at the Port of Port Angeles is considered insignificant and excluded from the 2011 cargo-handling emission totals.

### **5.4 Operational Profiles**

This section summarizes the equipment inventory at each port. It provides equipment characteristics such as the average, minimum and maximum engine power, model year and estimated annual operating hours for the port as a whole and also for each facility or entity within the port. Each facility has an assigned identification number to maintain confidentiality regarding terminal-specific information on count and types of equipment. The majority of the pieces of equipment have diesel engines, unless noted otherwise in the tables under equipment name. All of the diesel-powered equipment used ULSD in 2011. For the following characteristic tables, count column is for equipment count.

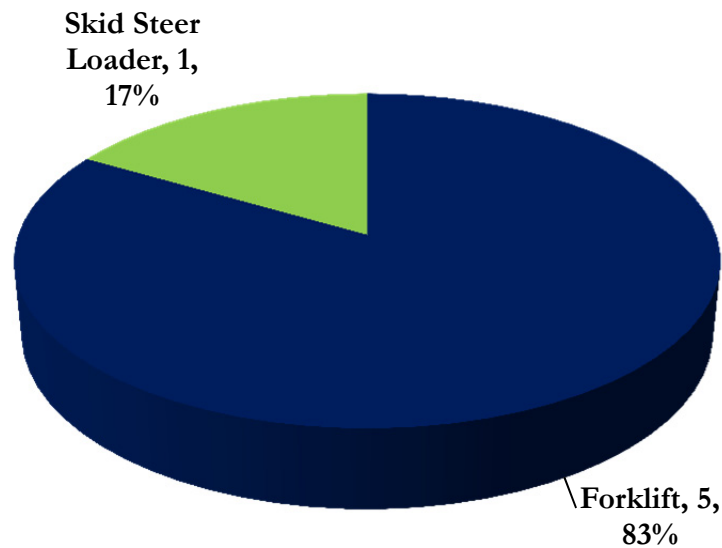
5.4.1 Port of Anacortes

The Port of Anacortes is primarily an export port that handles bulk and break-bulk cargoes such as logs and petroleum coke.<sup>31</sup> Table 5.3 summarizes the equipment count by type, engine power, model year, and estimated annual operating hours. Figure 5.9 presents the distribution of the six pieces of equipment operated at the Port of Anacortes in 2011. There were five forklifts, accounting for 83% of the equipment inventory. The remaining equipment was a skid steer loader.

Table 5.3: Port of Anacortes 2011 CHE Characteristics

Equipment	Engine Type	Count	Power (hp)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Forklift	Diesel	1	200	200	200	1982	1982	1982	5	5	5
Skid Steer Loader	Diesel	1	150	150	150	1991	1991	1991	22	22	22
Forklift	Propane	4	50	200	100	1963	1995	1976	18	71	42
<b>Total</b>		<b>6</b>									

Figure 5.10: Port of Anacortes 2011 CHE Counts and Distribution by Type



<sup>31</sup> Port of Anacortes, <http://www.portofanacortes.com>.

#### 5.4.2 Port of Everett

The Port of Everett's primary exports are containers, heavy machinery and materials to support gold mining efforts in Russia, agricultural products and wind energy cargoes and agricultural products. Primary imports are aerospace parts, cement, wind energy components, heavy machinery, rolling cargoes and containerized cargoes. The Port uses cargo handling equipment for its eight shipping terminals, multi-purpose warehouse, and its marina operation. Port tenant operations include a shipyard, tug operations, and a bulk unloading facility for cement. There are a total of 77 pieces of equipment at the Port of Everett.

Table 5.4 summarizes the equipment count by type, engine power, model year and estimated annual operating hours for equipment inventoried at the Port of Everett. Figure 5.11 presents the distribution of the 74 pieces of equipment operated at the Port Everett in 2011.

**Table 5.4: Port of Everett 2011 CHE Characteristics**

Equipment	Engine Type	Count	Power (hp)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Backhoe	Diesel	1	63	63	63	1988	1988	1988	300	300	300
Crane	Diesel	3	160	330	247	1968	2000	1987	150	280	193
Forklift	Diesel	16	50	175	115	1974	1995	1983	32	300	185
Generator	Diesel	3	71	602	294	1992	2006	1999	50	150	100
Light tower	Diesel	1	25	25	25	1991	1991	1991	300	300	300
Loader	Diesel	11	101	400	260	1970	1991	1980	100	2,000	620
Log shovel	Diesel	2	177	177	177	1994	2001	1998	1,000	1,500	1,250
Reach stacker	Diesel	2	200	200	200	1995	1995	1995	400	400	400
Sweeper	Diesel	1	36	36	36	1987	1987	1987	300	300	300
Top Handler	Diesel	1	200	200	200	1993	1993	1993	25	25	25
Truck	Diesel	1	210	210	210	1992	1992	1992	350	350	350
Yard Tractor	Diesel	11	175	175	175	1984	1995	1988	200	350	239
Forklift	Electric	6	na	na	na	1994	1994	1994	0	0	0
Forklift	Gasoline	6	76	175	109	1953	1974	1963	200	250	217
Manlift	Gasoline	1	82	82	82	1998	1998	1998	300	300	300
Welder	Gasoline	1	76	76	76	1968	1968	1968	250	250	250
Compressor	Gasoline	1	50	50	50	1978	1978	1978	250	250	250
Forklift	Propane	5	93	93	93	1982	1982	1982	300	300	300
Loader	Propane	1	25	25	25	1968	1968	1968	100	100	100
<b>Total</b>		<b>74</b>									

**Figure 5.11: Port of Everett 2011 CHE Counts and Distribution by Type**

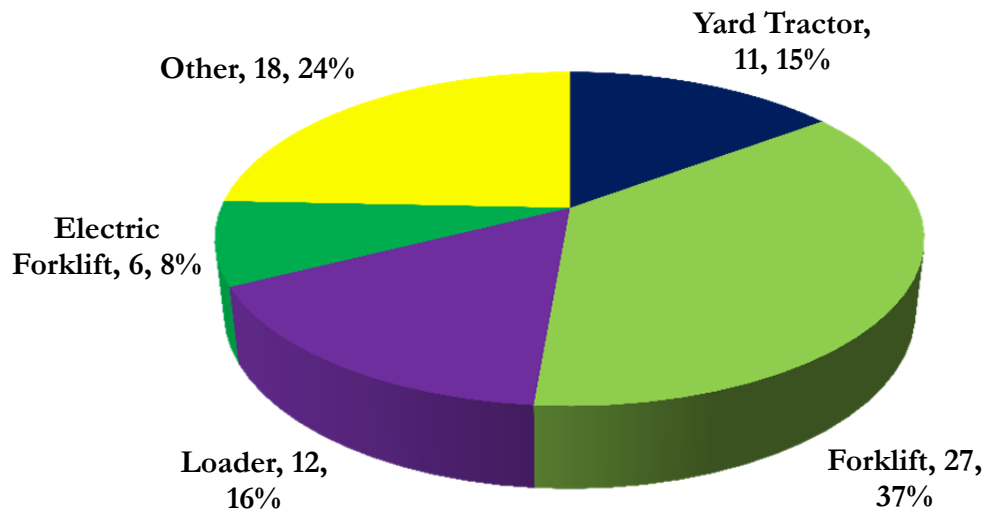


Table 5.5 summarizes by terminal, the equipment count, engine power, model year and estimated annual operating hours for equipment inventoried at the Port of Everett.

**Table 5.5: Port of Everett 2011 CHE Characteristics by Terminal**

Equipment	Engine Type	Count	Power (hp)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
<b>PSE010</b>											
Backhoe	Diesel	1	63	63	63	1988	1988	1988	300	300	300
Crane	Diesel	3	160	330	247	1968	2000	1987	150	280	193
Forklift	Diesel	4	85	175	130	1974	1976	1975	250	300	275
Generator	Diesel	3	71	602	294	1992	2006	1999	50	150	100
Light tower	Diesel	1	25	25	25	1991	1991	1991	300	300	300
Loader	Diesel	3	101	101	101	1970	1974	1972	200	200	200
Sweeper	Diesel	1	36	36	36	1987	1987	1987	300	300	300
Truck	Diesel	1	210	210	210	1992	1992	1992	350	350	350
Forklift	Electric	6	na	na	na	1994	1994	1994	0	0	0
Forklift	Gasoline	6	76	175	109	1953	1974	1963	200	250	217
Manlift	Gasoline	1	82	82	82	1998	1998	1998	300	300	300
Welder	Gasoline	1	76	76	76	1968	1968	1968	250	250	250
Compressor	Gasoline	1	50	50	50	1978	1978	1978	250	250	250
Forklift	Propane	5	93	93	93	1982	1982	1982	300	300	300
Loader	Propane	1	25	25	25	1968	1968	1968	100	100	100
<b>Total</b>		<b>38</b>									
<b>PSE020</b>											
Loader	Diesel	8	177	400	300	1973	1991	1983	100	2,000	725
Log shovel	Diesel	2	177	177	177	1994	2001	1998	1,000	1,500	1,250
<b>Total</b>		<b>10</b>									
<b>PSE030</b>											
Forklift	Diesel	6	75	150	100	1984	1990	1985	32	175	110
Top Handler	Diesel	1	200	200	200	1993	1993	1993	25	25	25
Yard Tractor	Diesel	7	175	175	175	1986	1993	1987	225	350	261
<b>Total</b>		<b>14</b>									
<b>PSE040</b>											
Forklift	Diesel	6	50	150	121	1975	1995	1987	200	200	200
Reach Stacker	Diesel	2	200	200	200	1995	1995	1995	400	400	400
Yard Tractor	Diesel	4	175	175	175	1984	1995	1990	200	200	200
<b>Total</b>		<b>12</b>									

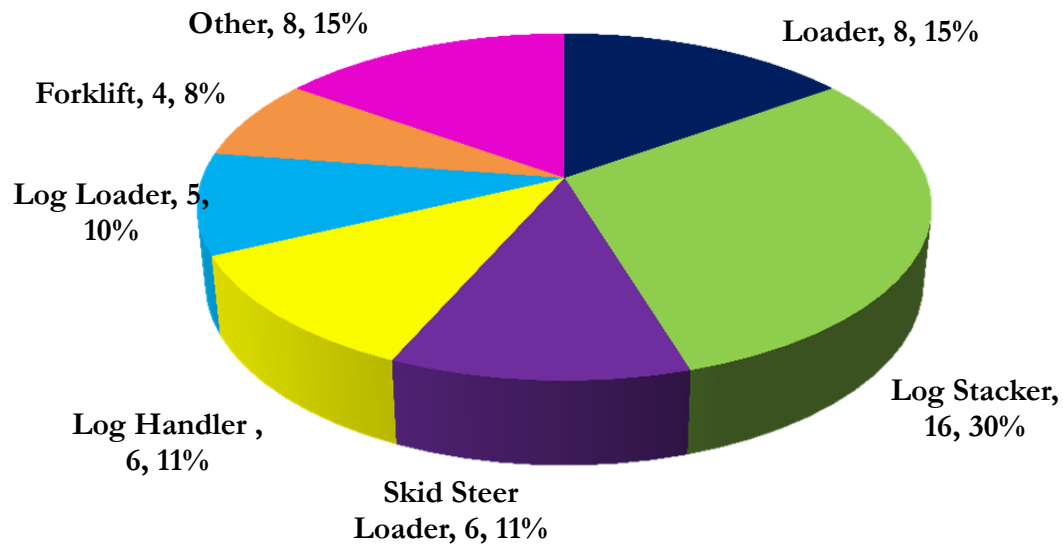
5.4.3 Port of Olympia

The Port of Olympia has a 60-acre terminal with three deep-water berths that handle break-bulk, roll-on/roll-off, and forest products. Table 5.6 summarizes the equipment count by type, engine power, model year and estimated annual operating hours for the equipment inventory. Figure 5.12 presents the distribution of the 53 pieces of equipment operated at the Port of Olympia in 2011.

Table 5.6: Port of Olympia 2011 CHE Characteristics

Equipment	Engine Type	Count	Power (horsepower)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Backhoe	Diesel	1	65	65	65	1991	1991	1991	na	na	na
Crane	Diesel	1	100	100	100	na	na	na	20	20	20
Forklift	Diesel	3	104	159	122	2001	2001	2001	54	85	65
Loader	Diesel	8	197	415	363	1985	2000	1993	0	738	248
Sweeper	Diesel	2	210	230	220	1999	2010	2005	8	531	270
Truck	Diesel	2	400	460	430	1991	1995	1993	50	250	150
Log Loader	Diesel	5	120	197	172	2000	2011	2007	na	na	na
Log Stacker	Diesel	16	375	500	432	1987	2011	2000	500	2,000	1,311
Skid Steer Loader	Diesel	6	51	210	154	1994	2007	1999	75	300	188
Log Handler	Diesel	6	200	200	200	2000	2001	2001	100	1,800	1,083
Forklift	Propane	1	120	120	120	na	na	na	250	250	250
Manlift	Propane	1	87	87	87	1997	1997	1997	71	71	71
Sweeper	Propane	1	130	130	130	2002	2002	2002	2	2	2
<b>Total</b>		<b>53</b>									

Figure 5.12: Port of Olympia 2011 CHE Counts and Distribution by Type



#### *5.4.4 Port of Seattle*

The Port of Seattle's marine cargo facilities handle worldwide trade, grain exports and the cruise industry. The majority of the Port's trade is with Asia/Pacific nations and the Alaska market. Section 1 discusses each terminal and facility at the Port of Seattle. Port-owned equipment that may be used at more than one facility is also included in the inventory.

Cargo handling equipment used at the four container facilities:

- Terminal 5
- Terminal 18
- Terminal 30
- Terminal 46

Three bulk facilities:

- Terminal 115
- Pier 86
- Terminal 91

Two cruise terminals (combined for Puget Sound Maritime Air Emissions Inventory purposes):

- Terminal 91
- Pier 66

Table 5.7 presents the equipment count by type, engine power, model year and estimated annual operating hours for equipment inventoried at the Port of Seattle. Figure 5.13 presents the distribution of the 504 pieces of equipment operated at the Port Seattle in 2011.



Table 5.7: Port of Seattle 2011 CHE Characteristics

Equipment	Engine Type	Count	Power (horsepower)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Car Loader	Diesel	1	150	150	150	2001	2001	2001	365	365	365
Crane	Diesel	8	130	130	130	1992	1998	1997	60	720	484
Forklift	Diesel	66	85	335	163	1961	2008	1996	20	2,063	391
Generator	Diesel	3	210	364	287	2001	2003	2002	28	102	58
Reach stacker	Diesel	2	330	350	340	2002	2008	2005	na	na	na
RTG	Diesel	6	620	947	838	1995	2005	2002	na	na	na
Side Handler	Diesel	8	152	205	197	1995	2006	2002	350	1,826	1,196
Top Handler	Diesel	73	250	335	305	1995	2008	2002	371	4,300	2,385
Yard Tractor	Diesel	206	173	240	187	1974	2008	2004	0	3,998	1,555
Crane	Electric	27	na	na	na	na	na	na	na	na	na
Forklift	Electric	9	na	na	na	1975	1998	1987	0	324	157
Pallet Jacks	Electric	22	na	na	na	na	na	na	480	610	539
Car Loader	Gasoline	1	150	150	150	1989	1989	1989	121	121	121
Forklift	Gasoline	5	100	100	100	1988	1993	1990	5	222	147
Generator	Gasoline	2	5	20	13	2005	2005	2005	5	5	5
Car Loader	Propane	5	150	150	150	1981	1989	1984	14	30	23
Forklift	Propane	60	85	215	94	1966	2006	1994	30	800	578
<b>Total</b>		<b>504</b>									

Figure 5.13: Port of Seattle 2011 CHE Counts and Distribution by Type

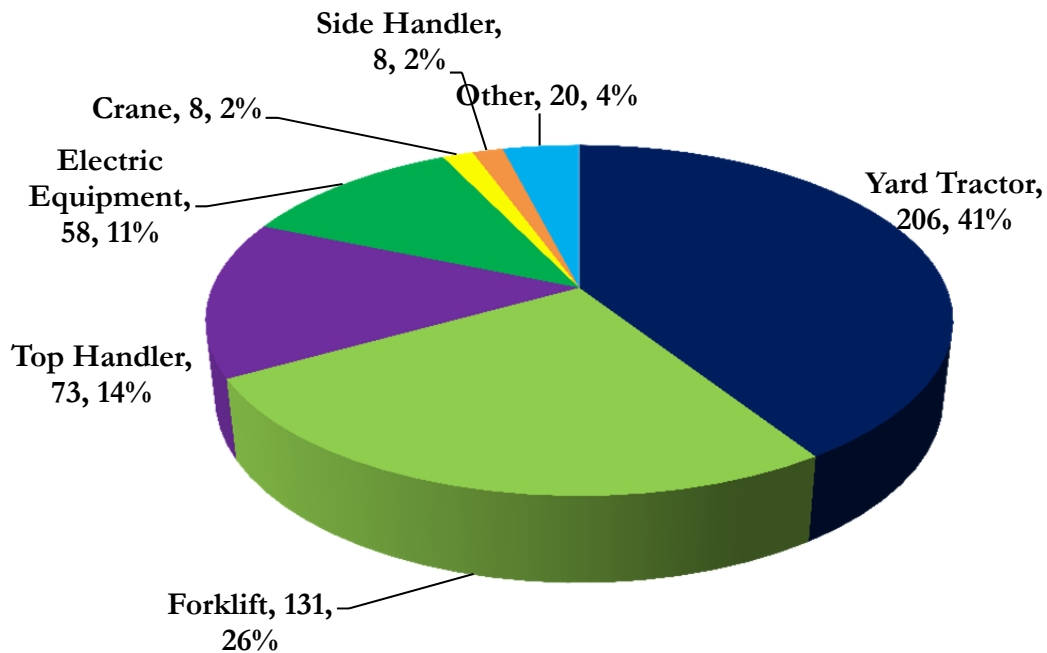


Table 5.8 summarizes by terminal, the equipment count, engine power, model year and estimated annual operating hours for equipment inventoried at the Port of Seattle

**Table 5.8: Port of Seattle 2011 CHE Characteristics by Terminal**

Equipment	Engine Type	Count	Power (horsepower)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
<b>PSS010</b>											
Car Loader	Diesel	1	150	150	150	2001	2001	2001	365	365	365
Forklift	Diesel	10	200	200	200	1961	1992	1975	20	259	87
Generator	Diesel	3	210	364	287	2001	2003	2002	28	102	58
Forklift	Electric	2	na	na	na	1975	1978	1977	24	25	25
Car Loader	Gasoline	1	150	150	150	1989	1989	1989	121	121	121
Forklift	Gasoline	5	100	100	100	1988	1993	1990	5	222	147
Generator	Gasoline	2	5	20	13	2005	2005	2005	5	5	5
Car Loader	Propane	5	150	150	150	1981	1989	1984	14	30	23
Forklift	Propane	7	100	100	100	1976	1994	1988	35	340	108
<b>Total</b>		<b>36</b>									
<b>PSS020</b>											
Crane	Diesel	8	130	130	130	1992	1998	1997	60	720	484
Forklift	Diesel	3	85	150	107	1991	1995	1992	20	60	47
Forklift	Electric	5	na	na	na	na	na	na	240	324	274
Pallet Jacks	Electric	22	na	na	na	na	na	na	480	610	539
Forklift	Propane	22	85	85	85	1987	2005	1997	480	610	510
<b>Total</b>		<b>60</b>									
<b>PSS030</b>											
Forklift	Diesel	16	120	335	223	1993	2008	2002	na	na	na
Reach Stacker	Diesel	2	330	350	340	2002	2008	2005	na	na	na
Yard Tractor	Diesel	3	225	235	228	1974	1999	1991	na	na	na
<b>Total</b>		<b>21</b>									
<b>PSS040</b>											
Forklift	Diesel	1	100	100	100	1995	1995	1995	1,000	1,000	1,000

Table 5.8: Port of Seattle 2011 CHE Characteristics by Terminal (cont'd)

Equipment	Engine Type	Count	Power (horsepower)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
<b>PSS050</b>											
Forklift	Diesel	16	85	200	127	1982	2006	2002	na	na	na
RTG crane	Diesel	6	620	947	838	1995	2005	2002	na	na	na
Side Handler	Diesel	5	200	205	204	2001	2006	2004	882	1,826	1,459
Top Handler	Diesel	31	335	335	335	2003	2007	2006	1,282	3,190	2,182
Yard Tractor	Diesel	65	173	173	173	2005	2008	2006	0	3,998	2,116
Container Crane	Electric	10	na	na	na	na	na	na	na	na	na
<b>Total</b>		<b>133</b>									
<b>PSS060</b>											
Forklift	Diesel	3	85	190	120	2004	2005	2004	na	na	na
Side Handler	Diesel	2	200	200	200	2001	2001	2001	824	1,095	960
Top Handler	Diesel	11	250	335	278	1996	2005	2000	371	2,343	1,065
Yard Tractor	Diesel	25	173	174	174	2002	2005	2003	0	1,537	793
Container Crane	Electric	6	na	na	na	na	na	na	na	na	na
<b>Total</b>		<b>47</b>									
<b>PSS070</b>											
Forklift	Diesel	8	100	175	124	1970	2005	1999	120	2,063	363
Side Handler	Diesel	1	152	152	152	1995	1995	1995	350	350	350
Top Handler	Diesel	18	250	250	250	1995	2005	1997	1,570	3,280	2,157
Yard Tractor	Diesel	30	174	240	188	2000	2007	2003	1,270	2,473	1,955
Container Crane	Electric	5	na	na	na	na	na	na	na	na	na
Forklift	Propane	3	100	100	100	1966	1994	1975	30	190	96
<b>Total</b>		<b>65</b>									
<b>PSS080</b>											
Forklift	Diesel	9	125	215	155	1978	1997	1993	800	800	800
Top Handler	Diesel	13	330	330	330	1997	2008	2004	4,300	4,300	4,300
Yard Tractor	Diesel	83	174	210	200	1996	2008	2004	1,200	1,200	1,200
Container Crane	Electric	6	na	na	na	na	na	na	na	na	na
Forklift	Electric	2	na	na	na	1998	1998	1998	na	na	na
Forklift	Propane	28	85	215	100	1982	2006	1994	800	800	800
<b>Total</b>		<b>141</b>									

#### 5.4.5 Port of Tacoma

The Port of Tacoma handles Pacific Rim trade along with waterborne commerce between Alaska and the other states. The Port encompasses 2,500 acres of land and handles containerized cargo, automobiles, bulk and general cargo. The Port and tenants own and operate the equipment at the following facilities:

- APM Terminal
- Husky Terminal
- Olympic Container Terminal
- Pierce County Terminal
- Temco Grain Terminal
- Terminal 7
- TOTE Terminal
- WUT Terminal
- Formark Log Yard
- Holbrook Log Yard
- Pacific Rail Services

This section includes the cargo handling equipment used at the on-dock rail and intermodal yards at the Port of Tacoma.

Table 5.9 presents the equipment count by type, engine power, model year and estimated annual operating hours for equipment inventoried at Port of Tacoma. In 2011, there were a total of 546 pieces of equipment at the Port.

**Figure 5.14: Port of Tacoma 2011 CHE Counts and Distribution by Type**

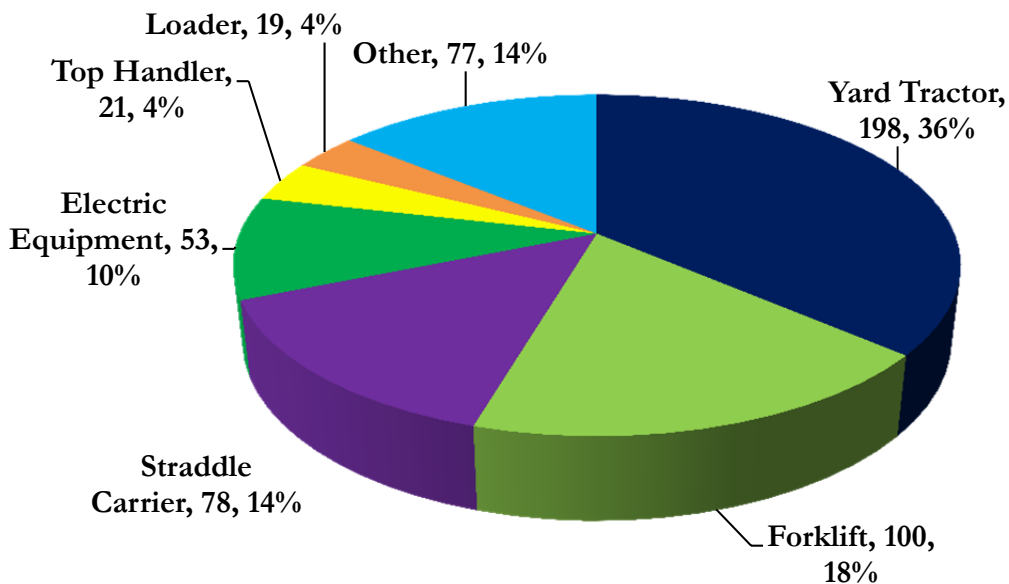


Table 5.9: Port of Tacoma 2011 CHE Characteristics

Equipment	Engine Type	Count	Power (horsepower)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Backhoe	Diesel	3	65	350	255	1985	1998	1991	65	271	168
Forklift	Diesel	57	50	375	156	1964	2011	1993	0	2,100	302
Generator	Diesel	3	50	50	50	1982	1997	1992	0	0	0
Loader	Diesel	19	51	440	274	1986	2011	1998	na	na	na
Manlift	Diesel	3	185	185	185	2005	2011	2007	54	146	100
Reach Stacker	Diesel	12	325	375	345	1998	2006	2001	9	2,000	831
RTG	Diesel	6	300	300	300	1984	2005	1993	0	78	35
Side Handler	Diesel	12	210	228	212	1998	2006	2003	171	1,244	563
Sweeper	Diesel	3	50	205	143	1994	2004	1999	82	219	154
Top Handler	Diesel	21	250	365	310	1993	2010	2002	11	2,243	1,168
Truck	Diesel	9	150	210	180	1972	2000	1991	4	203	57
Yard Tractor	Diesel	197	110	245	191	1987	2009	2002	0	2,550	817
Compressor	Diesel	6	10	10	10	1977	2004	1989	4	61	27
Straddle Carrier	Diesel	78	185	455	358	1991	2008	2003	0	3,666	1,713
Crane	Electric	45	na	na	na	1941	2005	1985	0	195	5
Forklift	Electric	3	na	na	na	1988	1988	1988	285	1,199	606
Manlift	Electric	1	na	na	na	2005	2005	2005	0	0	0
Truck	Electric	1	na	na	na	2001	2001	2001	0	0	0
Compressor	Electric	3	na	na	na	1974	2003	1990	0	0	0
Generator	Gasoline	8	50	100	60	1982	2011	2001	0	1,264	208
Manlift	Gasoline	4	30	60	50	1984	2004	1992	25	226	89
Truck	Gasoline	2	130	130	130	1999	2003	2001	47	1,665	856
Yard Tractor	Gasoline	1	110	110	110	2003	2003	2003	65	65	65
Compressor	Gasoline	4	10	10	10	1996	2001	1999	0	0	0
Forklift	Propane	43	45	155	77	1971	2009	1988	0	981	195
Manlift	Propane	1	60	60	60	2000	2000	2000	218	218	218
Sweeper	Propane	1	50	50	50	1989	1989	1989	8	8	8
<b>Total</b>		<b>546</b>									

Table 5.10 summarizes by terminal, the equipment count, engine power, model year and estimated annual operating hours for equipment inventoried at the Port of Tacoma.

**Table 5.10: Port of Tacoma 2011 CHE Characteristics by Terminal**

Equipment	Engine Type	Count	Power (horsepower)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
<b>PST010</b>											
Backhoe	Diesel	2	350	350	350	1985	1998	1992	65	271	168
Forklift	Diesel	27	174	375	202	1977	2011	1991	0	497	74
Generator	Diesel	3	50	50	50	1982	1997	1992	0	0	0
Manlift	Diesel	2	na	na	na	2006	2011	2009	54	146	100
Truck	Diesel	7	na	na	na	1984	2000	1993	4	203	57
Yard Tractor	Diesel	2	110	110	110	1987	1991	1989	16	43	30
Compressor	Diesel	6	10	10	10	1977	2004	1989	4	61	27
Straddle Carrier	Diesel	28	185	185	185	1991	2008	2001	0	2,330	1,235
Sweeper	Diesel	2	50	175	113	1994	2004	1999	82	219	151
Crane	Electric	38	na	na	na	1941	2001	1981	0	195	6
Manlift	Electric	1	na	na	na	2005	2005	2005	0	0	0
Truck	Electric	1	na	na	na	2001	2001	2001	0	0	0
Compressor	Electric	3	na	na	na	1974	2003	1990	0	0	0
Generator	Gasoline	8	50	100	60	1982	2011	2001	0	1,264	208
Manlift	Gasoline	3	60	60	60	1984	2004	1994	52	226	110
Truck	Gasoline	2	130	130	130	1999	2003	2001	47	1,665	856
Yard Tractor	Gasoline	1	110	110	110	2003	2003	2003	65	65	65
Compressor	Gasoline	4	10	10	10	1996	2001	1999	0	0	0
Forklift	Propane	23	60	80	65	1971	1989	1981	0	109	25
Manlift	Propane	1	60	60	60	2000	2000	2000	218	218	218
Sweeper	Propane	1	50	50	50	1989	1989	1989	8	8	8
<b>Total</b>		<b>165</b>									
<b>PST020</b>											
Forklift	Diesel	2	180	180	180	2005	2005	2005	83	276	180
Side Handler	Diesel	8	210	210	210	2005	2006	2005	395	1,244	683
Yard Tractor	Diesel	4	180	180	180	2005	2006	2005	200	929	602
Straddle Carrier	Diesel	50	455	455	455	2004	2005	2004	660	3,666	1,982
Crane	Electric	7	na	na	na	2005	2005	2005	0	0	0
Forklift	Propane	6	155	155	155	2005	2005	2005	89	269	198
<b>Total</b>		<b>77</b>									

Table 5.10: Port of Tacoma 2011 CHE Characteristics by Terminal (cont'd)

Equipment	Engine Type	Count	Power (horsepower)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
<b>PST030</b>											
Forklift	Diesel	5	57	57	57	1982	2006	2000	41	2,100	1,007
RTG Crane	Diesel	6	300	300	300	1984	2005	1993	0	78	35
Top Handler	Diesel	11	300	300	300	1996	2006	2003	105	2,243	1,504
Yard Tractor	Diesel	46	173	174	174	2004	2006	2005	85	2,017	938
<b>Total</b>		<b>68</b>									
<b>PST040</b>											
Yard Tractor	Diesel	33	210	220	211	1994	2009	1999	160	1,032	454
<b>PST050</b>											
Forklift	Diesel	6	120	185	142	2003	2006	2004	106	232	163
Manlift	Diesel	1	185	185	185	2005	2005	2005	99	99	99
Reach Stacker	Diesel	4	330	335	334	1998	2006	2004	9	262	113
Sweeper	Diesel	1	205	205	205	2000	2000	2000	162	162	162
Top Handler	Diesel	1	330	330	330	2002	2002	2002	11	11	11
Yard Tractor	Diesel	36	174	245	224	2000	2005	2004	0	1,246	675
Forklift	Propane	1	120	120	120	1988	1988	1988	4	4	4
<b>Total</b>		<b>50</b>									
<b>PST055</b>											
Forklift	Diesel	9	50	100	73	1976	2009	1991	73	542	316
Top Handler	Diesel	2	330	330	330	2000	2007	2004	407	1,271	839
Yard Tractor	Diesel	12	174	174	174	2006	2006	2006	1,500	1,500	1,500
Forklift	Electric	3	55	55	55	1988	1988	1988	285	1,199	606
Forklift	Propane	9	55	55	55	1988	2009	1994	352	981	616
<b>Total</b>		<b>35</b>									
<b>PST060</b>											
Forklift	Diesel	2	130	130	130	1964	1999	1982	30	54	42
Reach Stacker	Diesel	6	330	375	360	1998	2001	1999	615	1,321	921
Side Handler	Diesel	1	228	228	228	1998	1998	1998	171	171	171
Top Handler	Diesel	3	365	365	365	2005	2010	2007	474	1,787	1,254
Yard Tractor	Diesel	53	174	215	184	1998	2008	2001	149	2,550	1,003
<b>Total</b>		<b>65</b>									

Table 5.10: Port of Tacoma 2011 CHE Characteristics by Terminal (cont'd)

Equipment	Engine Type	Count	Power (horsepower)			Model Year			Annual Hours		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
<b>PST070</b>											
Forklift	Diesel	4	70	200	108	1967	1998	1982	53	1,501	483
Side Handler	Diesel	3	210	210	210	2000	2000	2000	185	642	374
Top Handler	Diesel	1	300	300	300	1995	1995	1995	60	60	60
Yard Tractor	Diesel	3	174	174	174	2001	2001	2001	272	857	567
<b>Total</b>		<b>11</b>									
<b>PST080</b>											
Forklift	Propane	1	na	na	na	2002	2002	2002	660	660	660
<b>PST100</b>											
Top Handler	Diesel	3	250	335	278	1993	1994	1993	480	1,500	820
Yard Tractor	Diesel	8	148	160	157	2003	2008	2006	1,300	1,300	1,300
Manlift	Gasoline	1	30	30	30	1987	1987	1987	25	25	25
Forklift	Propane	1	45	45	45	1989	1989	1989	24	24	24
<b>Total</b>		<b>13</b>									
<b>PST110</b>											
Loader	Diesel	4	na	na	na	1986	1990	1988	na	na	na
Truck	Diesel	1	150	150	150	1972	1972	1972	na	na	na
Forklift	Propane	1	na	na	na	1989	1989	1989	na	na	na
<b>Total</b>		<b>6</b>									
<b>PST120</b>											
Backhoe	Diesel	1	65	65	65	1991	1991	1991	na	na	na
Loader	Diesel	15	51	440	274	1987	2011	2004	na	na	na
Truck	Diesel	1	210	210	210	1995	1995	1995	na	na	na
<b>Total</b>		<b>17</b>									
<b>PST130</b>											
Forklift	Diesel	2	165	165	165	1990	1998	1994	2,000	2,000	2,000
Reach Stacker	Diesel	2	325	325	325	2001	2001	2001	2,000	2,000	2,000
Forklift	Propane	1	80	80	80	1997	1997	1997	200	200	200
<b>Total</b>		<b>5</b>									



## 5.5 Emission Reduction Technologies Identified

For cargo handling equipment operated at the Puget Sound ports in 2011, emission control measures include the use of electric equipment, diesel oxidation catalyst retrofits, diesel particulate filter retrofits, and on-road engines in place of non-road engines. Table 5.11 summarizes the count of emission reduction technologies for cargo handling equipment.

**Table 5.11: 2011 CHE Count of Emission Reduction Technologies**

<b>Port</b>	<b>Electric</b>	<b>Diesel Oxidation Catalyst</b>	<b>Diesel Particulate Filter</b>	<b>On-road Engine</b>
Anacortes	0	0	0	0
Everett	6	0	0	0
Olympia	0	1	0	5
Seattle	58	164	5	67
Tacoma	53	117	48	42
BNSF SIG Rail Yard	0	0	0	0
<b>Total</b>	<b>117</b>	<b>282</b>	<b>53</b>	<b>114</b>

## 5.6 Emissions Estimating Methodology

Cargo handling equipment emissions were estimated using the NONROAD2008a emissions estimating model<sup>32</sup>, a tool developed by EPA to estimate fleet emissions of non-road equipment. As an overview, the NONROAD model estimates the emissions for a population of equipment as being:

Equation 5.1

$$E_{MY} = EF \times HP \times LF \times A \times CF$$

Where:

$E_{MY}$  = emissions from a given model year of equipment

EF = emission factor

HP = maximum rated horsepower, hp

LF = load factor, dimensionless

A = activity, hours of use per year

CF = control factor for emission reduction technologies or on-road engines. Control factors represent the remaining emissions after a control has been added to an engine. For example, if a control technology provides a 20% reduction in emissions the CF = 0.8.

In 2011, all diesel equipment used ULSD fuel with 15 ppm sulfur content. Equipment with zero hours of operational use in 2011, due to new purchases or other reasons, as well as electric equipment, are included in the inventory count, but do not have emissions associated with them.

The marine terminal equipment identified by survey was categorized into the most closely corresponding NONROAD equipment type, shown in Table 5.12, which presents equipment types by Source Classification Code (SCC), load factor, and NONROAD category common name. The categorizations from the previous inventory were replicated for the purpose of this inventory as much as possible. For the 2011 PSEI, the same load factors are used as those found in the 2005 PSEI, with the exception of the load factor for diesel yard tractors. The 0.59 EPANONROAD load factor is based on a 1997 study<sup>33</sup> prepared for the EPA. For the 2011 PSEI, a load factor of 0.39 is used for diesel yard tractors based on a 2008 study<sup>34</sup> prepared for the Port of Los Angeles and Port of Long Beach by Starcrest Consulting Group, LLC. The 0.39 load factor is based on the analysis of eighty five yard tractors that work at port terminals and is reflective of typical operating parameters of yard tractors in a port environment. Load data was downloaded from the vehicles' computers and more than a year's worth of data was collected for the 85 yard tractors. The California Air Resources Board, as part of the Port's Emissions Inventory Technical Working Group, reviewed and approved the 0.39 load factor for yard tractors in cargo handling equipment emissions inventory development in California. This load factor is the most current and appropriate load factor representing diesel yard tractors in port operations.

<sup>32</sup> EPA, <http://www.epa.gov/otaq/nonrdmdl.htm>.

<sup>33</sup> EPA, *Evaluation of Power Systems Research (PSR) Nonroad Population Data Base*, 1997.

<sup>34</sup> Ports of Los Angeles and Long Beach, San Pedro Bay Ports Yard Tractor Load Factor Study, December 2008.

Table 5.12: NONROAD Engine Source Categories

Equipment Type	SCC	Load Factor	NONROAD Category
Backhoe	2270002066	0.21	Tractors/Loaders/Backhoe
Car Loader, diesel	2265003050	0.43	Other Industrial Equipment
Car Loader, gasoline	2270003040	0.54	Other Industrial Equipment
Car Loader, propane	2265003040	0.54	Other Industrial Equipment
Compressor, diesel	2270006015	0.43	Air compressor
Compressor, gasoline	2265006015	0.56	Air compressor
Crane	2270002045	0.43	Crane
Forklift, diesel	2270003020	0.59	Forklift
Forklift, gasoline	2265003020	0.3	Forklift
Forklift, propane	2267003020	0.30	Forklift
Generator, diesel	2270006005	0.43	Generator
Generator, gasoline	2265006005	0.68	Generator
Light Tower	2270002027	0.43	Signal Boards/Light plant
Loader, diesel	2270002060	0.59	Rubber Tired Loader
Skid Steer Loader, diesel	2270002072	0.21	Skid Steer Loader
Skid Steer Loader, propane	2267002072	0.58	Skid Steer Loader
Manlift, diesel	2270003010	0.21	Aerial Lifts
Manlift, gasoline	2265003010	0.46	Aerial Lifts
Manlift, propane	2267003010	0.46	Aerial Lifts
Reach Stacker	2270003020	0.59	Forklift
Side Handler	2270003020	0.59	Forklift
Top Handler	2270003020	0.59	Forklift
RTG Crane	2270003050	0.21	Other Material Handling Equipment
Straddle Carrier	2270003050	0.21	Other Material Handling Equipment
Sweeper, diesel	2270003030	0.43	Sweeper / scrubber
Sweeper, propane	2267003030	0.71	Sweeper / scrubber
Truck, diesel	2270002051	0.59	Non-road Truck
Truck, propane	2265002051	0.70	Non-road Truck
Welder	2265006025	0.21	Welder
Yard Tractor	2270003070	0.39	Terminal Tractor

Since the NONROAD model outputs emissions for a limited set of pollutants, post-processing is required to develop emission estimates for VOC, PM<sub>2.5</sub>, DPM, CH<sub>4</sub>, and N<sub>2</sub>O. VOC correction factors were applied based on fuel type.<sup>35</sup> For purposes of this analysis, total particulate matter is set equal to PM<sub>10</sub>, and PM<sub>2.5</sub> is calculated as 97% of PM<sub>10</sub> for diesel fueled equipment, and 100% of PM<sub>10</sub> for other equipment.<sup>36</sup> Diesel particulate matter includes the emissions from those vehicles fueled by diesel fuel only, as opposed to those fueled by propane or gasoline. Post-processing factors were applied to NONROAD emissions for emission control measures and are discussed in section 5.6.1. The N<sub>2</sub>O and CH<sub>4</sub> factors are discussed in section 5.6.2 below.

#### 5.6.1 Emission Control Factors

Control factors are applied to equipment that have an emissions control device or technology applied such that there is a reduction in emissions. Control factors represent the remaining emissions after a control has been added to an engine. For example, if a control technology provides a 40% reduction in emissions the CF = 0.6.

Table 5.13 summarizes the emission control factors used in the emissions calculations for the various emission control measures implemented at the major Puget Sound ports. The DOC and DPF control factors are based on EPA verified technology. Since factors may vary by technology and manufacturer, for the purpose of this analysis, the factors are the same as those found in EPA's Diesel Emissions Quantifier<sup>37</sup>. The Diesel Emissions Quantifier is an interactive tool that can help evaluate clean diesel projects and options by estimating emission reductions. Table 5.14 presents the control factors for the use of on-road engines in non-road applications.

**Table 5.13: Emission Control Factors for CHE Retrofits**

Technology or Fuel	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM
Diesel oxidation catalyst	1.00	0.50	0.60	1.00	0.80
Diesel particulate filter	1.00	0.10	0.10	1.00	0.15

<sup>35</sup> EPA 2005.

<sup>36</sup> EPA 2003.

<sup>37</sup> EPA, [www.epa.gov/cleandiesel/quantifier/](http://www.epa.gov/cleandiesel/quantifier/)

Table 5.14: Emission Control Factors for On-road Engines

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	CO <sub>2</sub>
1999	0.58	0.34	1.00	1.00	0.26	1.00
2000	0.58	0.34	1.00	1.00	0.25	1.00
2005	0.40	0.34	1.00	1.00	0.57	1.00
2006 (up to 175 hp)	0.42	0.34	1.00	1.00	0.45	1.00
2006 (176-300)	0.42	0.34	1.00	1.00	0.067	1.00
2007-2011	0.42	0.34	1.00	1.00	0.067	1.00

Emission control factors were also applied to cargo handling equipment with on-road engines, such as yard tractors and trucks with on-road engines that operate at the terminals. The on-road engine control factors vary by model year and horsepower.

#### 5.6.2 Greenhouse Gas Emission Factors

The NONROAD model outputs CO<sub>2</sub> emissions, but does not estimate CH<sub>4</sub> and N<sub>2</sub>O, thus alternative processing calculations were used to derive values for these greenhouse gases. The emission factors for CH<sub>4</sub> and N<sub>2</sub>O are based on fuel consumption (and are the same for gasoline and diesel fuel and in the absence of literature, assumed to be the same for propane)<sup>38</sup>:

- 0.0800 g N<sub>2</sub>O/kilogram (kg) fuel consumed
- 0.1800 g CH<sub>4</sub>/kilogram (kg) fuel consumed

However, fuel consumption data was not collected. In order to convert operational hours to volume of fuel consumed, a method was used to activate the fuel economy feature of the NONROAD model by locating it in the by-model-year-output and re-running the data file.<sup>39</sup> Fuel consumption was then transformed into pounds. Diesel is assumed to be 7.0 pounds per gallon and gasoline (along with propane) was assumed to be 6.2 pounds per gallon.<sup>40</sup>

Equation 5.2

$$Emissions, tpy = \frac{\left( FUELCONS, gal/yr \times fuel\ density, \frac{lb}{gal} \times 0.454 \frac{kg}{lb} \times EF, \frac{g}{kg} \right)}{\left( 453.6 \frac{g}{lb} \times 2,000 \frac{lb}{ton} \right)}$$

<sup>38</sup>EPA 2006

<sup>39</sup>This variable is called FUELCONS and the units are gallons per year (estimated by NONROAD). NONROAD estimates fuel consumption empirically and no actual fuel consumption data was used.

<sup>40</sup>Adapted from NREL 2006.

## 5.7 Emission Estimates

The cargo-handling emissions are summarized by port in Table 5.15.

**Table 5.15: 2011 CHE Total Emissions, tpy**

Port	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Anacortes	0.4	0.1	1.4	0.0	0.0	0.0	0.0	22
Everett	23.4	2.4	24.6	0.0	2.3	2.2	2.3	1,375
Olympia	42.9	2.7	17.4	0.0	2.6	2.5	2.6	4,408
Seattle	305.5	18.4	158.0	0.3	16.7	16.2	16.7	34,561
Tacoma	205.9	12.6	88.0	0.2	10.0	9.7	10.0	22,486
<b>Port Total</b>	<b>578.2</b>	<b>36.2</b>	<b>289.3</b>	<b>0.6</b>	<b>31.6</b>	<b>30.7</b>	<b>31.6</b>	<b>62,852</b>
BNSF SIG Rail Yard	8.5	0.6	3.8	0.0	0.5	0.5	0.5	762
Argo Rail Yard	7.5	0.6	3.4	0.0	0.5	0.5	0.5	661
<b>PSEI Total</b>	<b>594.2</b>	<b>37.4</b>	<b>296.5</b>	<b>0.6</b>	<b>32.6</b>	<b>31.7</b>	<b>32.6</b>	<b>64,275</b>

### 5.7.1 Port of Anacortes Emission Estimates

Table 5.16 presents Port of Anacortes' cargo handling equipment emission estimates.

**Table 5.16: Port of Anacortes 2011 CHE Emissions by Terminal, tpy**

Terminal	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
PSA010	0.4	0.1	1.4	0.0	0.0	0.0	0.0	22

### 5.7.2 Port of Everett Emission Estimates

Table 5.17 presents Port of Everett's cargo handling equipment emission estimates by terminal.

**Table 5.17: Port of Everett 2011 CHE Emissions, tpy**

Terminal	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
PSE010	5.3	0.9	16.2	0.0	0.3	0.3	0.3	329
PSE020	13.5	1.0	6.4	0.0	1.6	1.5	1.6	810
PSE030	2.3	0.2	0.9	0.0	0.2	0.2	0.2	103
PSE040	2.3	0.2	1.1	0.0	0.2	0.2	0.2	133
<b>Total</b>	<b>23.4</b>	<b>2.4</b>	<b>24.6</b>	<b>0.0</b>	<b>2.3</b>	<b>2.2</b>	<b>2.3</b>	<b>1,375</b>

5.7.3 Port of Olympia Emission Estimates

Table 5.18 presents Port of Olympia's cargo handling equipment emission estimates by terminal.

**Table 5.18: Port of Olympia 2011 CHE Emissions, tpy**

Terminal	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
PSO010	3.7	0.2	1.8	0.0	0.2	0.2	0.2	311
PSO020	16.9	0.9	6.2	0.0	1.2	1.1	1.2	1,768
PSO030	22.4	1.5	9.4	0.0	1.3	1.2	1.3	2,329
<b>Total</b>	<b>43.0</b>	<b>2.6</b>	<b>17.4</b>	<b>0.0</b>	<b>2.7</b>	<b>2.5</b>	<b>2.7</b>	<b>4,408</b>

5.7.4 Port of Seattle Emission Estimates

Table 5.19 presents Port of Seattle's cargo handling equipment emission estimates by terminal.

**Table 5.19: Port of Seattle 2011 CHE Emissions, tpy**

Terminal	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
PSS010	2.6	0.4	7.1	0.0	0.1	0.1	0.1	144
PSS020	4.1	0.7	14.7	0.0	0.1	0.1	0.1	335
PSS030	10.3	0.8	4.0	0.0	0.7	0.7	0.7	1,039
PSS040	0.4	0.1	0.4	0.0	0.1	0.1	0.1	39
PSS050	118.4	6.4	36.1	0.1	6.0	5.8	6.0	14,239
PSS060	19.1	0.8	4.3	0.0	0.9	0.8	0.9	2,068
PSS070	60.1	2.9	20.3	0.1	3.6	3.5	3.6	5,741
PSS080	90.5	6.4	71.1	0.1	5.3	5.1	5.2	10,957
<b>Total</b>	<b>305.5</b>	<b>18.4</b>	<b>158.0</b>	<b>0.3</b>	<b>16.7</b>	<b>16.2</b>	<b>16.7</b>	<b>34,561</b>

5.7.5 Port of Tacoma Emission Estimates

Table 5.20 presents Port of Tacoma's cargo handling equipment emission estimates by terminal.

**Table 5.20: Port of Tacoma 2011 CHE Emissions, tpy**

Terminal	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
PST010	23.6	1.5	18.5	0.0	0.9	0.9	0.9	2,211
PST020	64.2	5.0	32.6	0.1	3.3	3.2	3.3	7,201
PST030	32.3	1.9	7.3	0.0	1.6	1.5	1.6	3,633
PST040	7.4	0.5	2.0	0.0	0.4	0.3	0.4	759
PST050	8.2	0.3	2.3	0.0	0.4	0.4	0.4	1,403
PST055	4.5	0.5	6.4	0.0	0.3	0.3	0.3	698
PST060	29.8	1.0	5.5	0.0	1.0	1.0	1.0	3,346
PST070	3.0	0.2	0.8	0.0	0.2	0.2	0.2	260
PST080	0.2	0.0	0.8	0.0	0.0	0.0	0.0	12
PST100	6.6	0.3	2.2	0.0	0.3	0.3	0.3	626
PST110	5.7	0.5	2.9	0.0	0.5	0.5	0.5	348
PST120	13.3	0.7	4.9	0.0	0.9	0.9	0.9	1,292
PST130	7.2	0.3	1.7	0.0	0.3	0.2	0.3	699
<b>Total</b>	<b>205.9</b>	<b>12.6</b>	<b>88.0</b>	<b>0.2</b>	<b>10.0</b>	<b>9.7</b>	<b>10.0</b>	<b>22,486</b>

**5.8 Emission Comparison, 2011 vs 2005**

The emission calculation methodology stayed the same in 2011, except for an update to the yard tractor load factor. 2005 yard tractor emissions were re-calculated using the fraction of the new load factor divided by the old load factor so that the emissions would be comparable to the 2011 emissions. Table 5.21 presents the total net change in emissions for cargo handling equipment in 2011 as compared to 2005 at the Puget Sound ports. Port-related emissions decreased for all pollutants by 21% to 99% in 2011 when compared to 2005 due to reduced equipment activity, implementation of emission reduction strategies (retrofits), fleet turnover and use of ULSD in 2011.

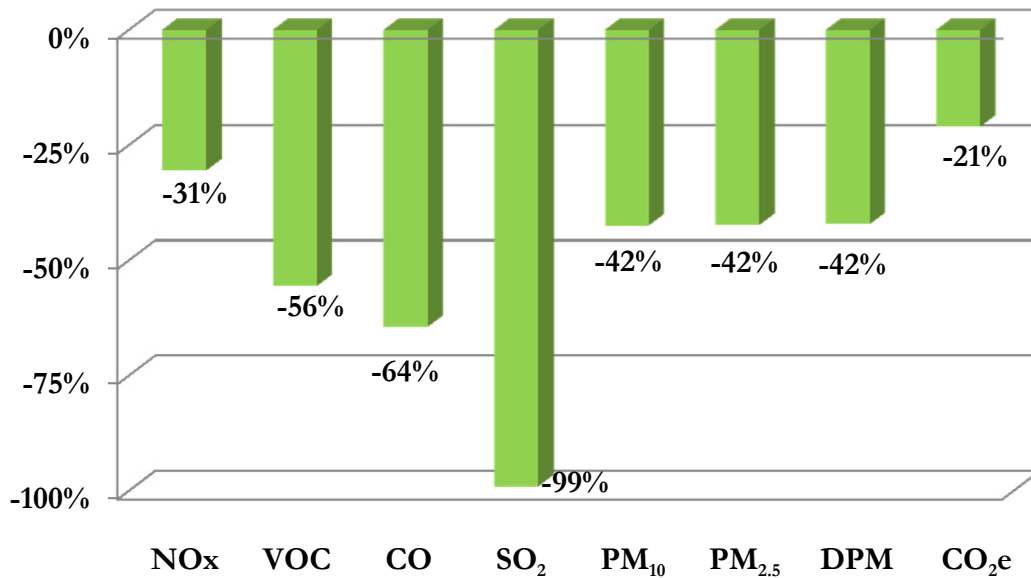
**Table 5.21: 2011 vs 2005 Port Total CHE Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	578.2	36.2	289.3	0.6	31.6	30.7	31.6	62,852
2005	832.1	81.4	813.7	61.8	54.9	53.2	54.6	79,581
<b>Change, tpy</b>	<b>-253.9</b>	<b>-45.2</b>	<b>-524.4</b>	<b>-61.2</b>	<b>-23.3</b>	<b>-22.5</b>	<b>-23.0</b>	<b>-16,729</b>
<b>Change, %</b>	<b>-31%</b>	<b>-56%</b>	<b>-64%</b>	<b>-99%</b>	<b>-42%</b>	<b>-42%</b>	<b>-42%</b>	<b>-21%</b>



Figure 5.15 compares the 2011 vs 2005 percent change in emissions for cargo handling equipment operations.

**Figure 5.15: 2011 vs 2005 Total CHE Emissions Change**



Note: 2005 emissions were recalculated using the same methods used for the 2011 emission estimates. The above figure accounts for these changes so that a direct comparison can be made between 2011 vs 2005.

Table 5.22 presents a 45% decrease in activity in 2011 as compared to 2005. The equipment count increased by 4% in 2011.

**Table 5.22: 2011 vs 2005 Total CHE Activity and Count Comparison**

Year	Activity (hp hr)	CHE Count
2011	100,280,404	1,196
2005	181,101,761	1,145
<b>Change, %</b>	<b>-45%</b>	<b>4%</b>



## **SECTION 6 LOCOMOTIVES**

Section 6 provides an overview of the railroad locomotives operating in and around the Puget Sound study area. A description of the methodology used to estimate emissions is provided in this section, as well as the emission estimates for this source category.

### **6.1 Source Description**

Locomotive operations are typically described in terms of two different types, line-haul and switching. Line-haul refers to the movement of cargo over long distances (e.g., cross-country) and occurs within a port, marine terminal, or rail yard as the initiation or termination of a line-haul trip, as cargo is either picked up for transport to destinations across the country or is dropped off for shipment overseas. Switching refers to the assembling and disassembling of trains, sorting of the railcars of inbound cargo trains into contiguous “fragments” for subsequent delivery to terminals, and the short distance hauling of rail cargo within a port or rail yard.

Locomotives used for line-haul operations are typically large, powerful diesel engines of 3,000 hp or more, while switch engines are smaller, typically having 1,200 to 3,000 hp. Older line-haul locomotives have often been converted to switch duty as newer line-haul locomotives with more horsepower become available. Rather than having finely adjustable throttle controls such as those used in automobiles and most powered equipment, locomotive throttles are operated in a series of discrete power steps called notches, which range from positions one through eight (with one being the lowest power setting and eight providing full power), plus an idle setting. Many locomotives also have a setting called dynamic braking, which is a means of slowing the locomotive using the drive system.

Emissions from locomotives transporting cargo to or from the ports on the rail lines outside the ports have also been estimated along with estimates of the emissions from line-haul locomotive activity in the region. These estimates have been coordinated to avoid double counting of emissions.

### **6.2 Geographical Delineation**

The geographical parameters of the emissions inventory summarized in this section for railroad-related sources include primarily the Port of Olympia, the Port of Seattle, the Port of Tacoma, and the Port of Everett, as well as several off-port rail yards: the Fife Yard in Tacoma (a storage and switching yard), the BNSF SIG Yard, the Argo Yard in Seattle, and rail operations associated with the Port of Everett. The BNSF SIG and Argo yards are intermodal yards (where cargo is transferred from or to railcars prior to or following international shipment). The off-terminal rail emissions were estimated for rail lines typically utilized in moving port-related cargo within the Puget Sound airshed. The covered areas and activities are consistent with the areas and activities addressed in the 2005 emissions inventory.

Two railroad companies provide line-haul rail services to the Puget Sound area ports, Union Pacific and BNSF.<sup>41</sup> These railroads are known as Class 1 railroads, a designation based on annual revenues.<sup>42</sup> The Class 1 railroads, of which there are currently seven in the U.S., are the largest of the railroads in terms of revenue. In addition, switching and terminal rail service is provided at the Port of Tacoma and the Port of Olympia by Tacoma Rail, a division of Tacoma Public Utilities. Figure 6.1 illustrates an overall view of the rail system within the State of Washington.<sup>43</sup> This map presents the Union Pacific's tracks running north and south from Seattle through Tacoma and south toward Portland, Oregon, whereas BNSF's tracks run north to Canada and east from Seattle and Tacoma to points in eastern Washington and further east.

Figure 6.1: State of Washington Rail System Map

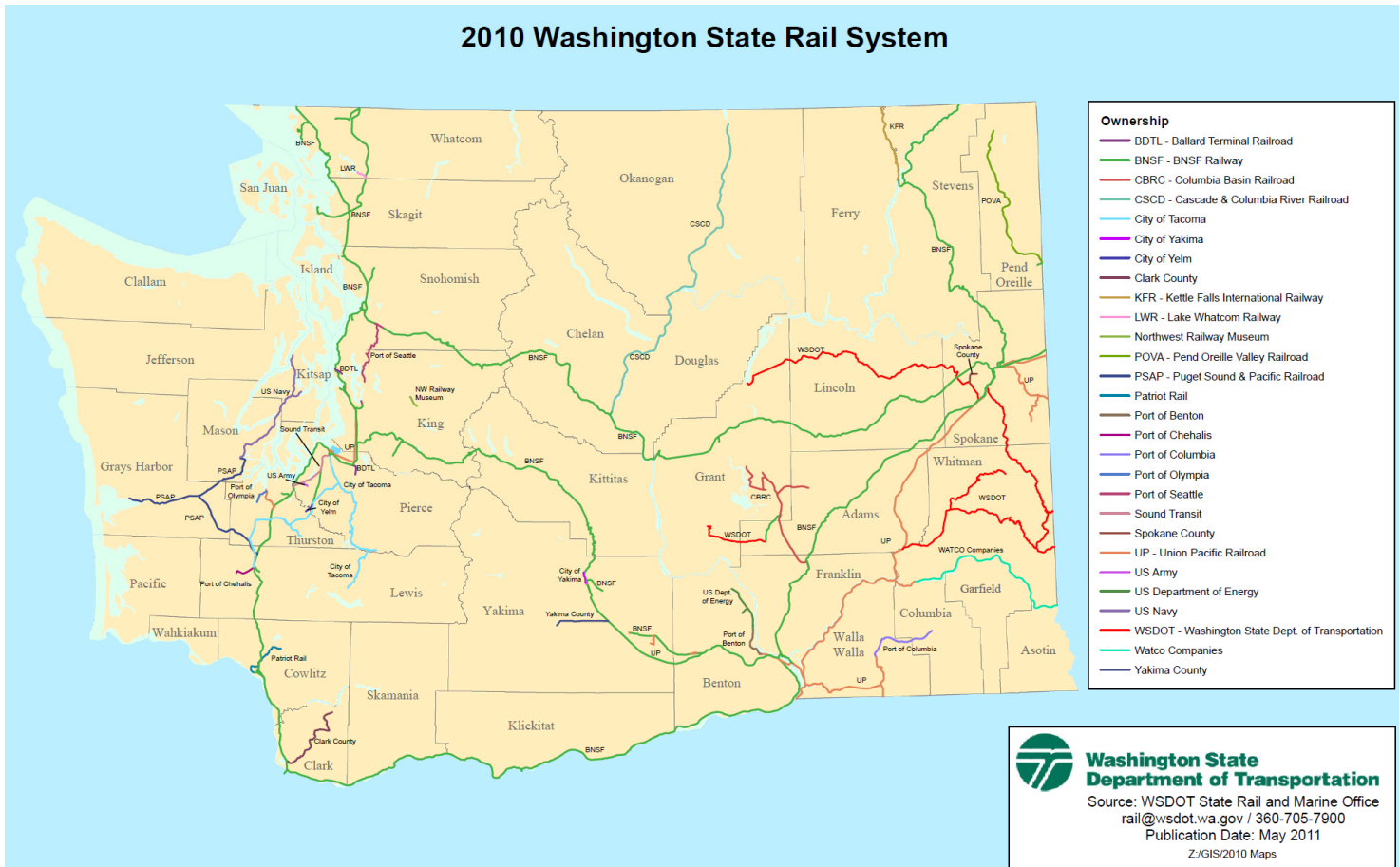


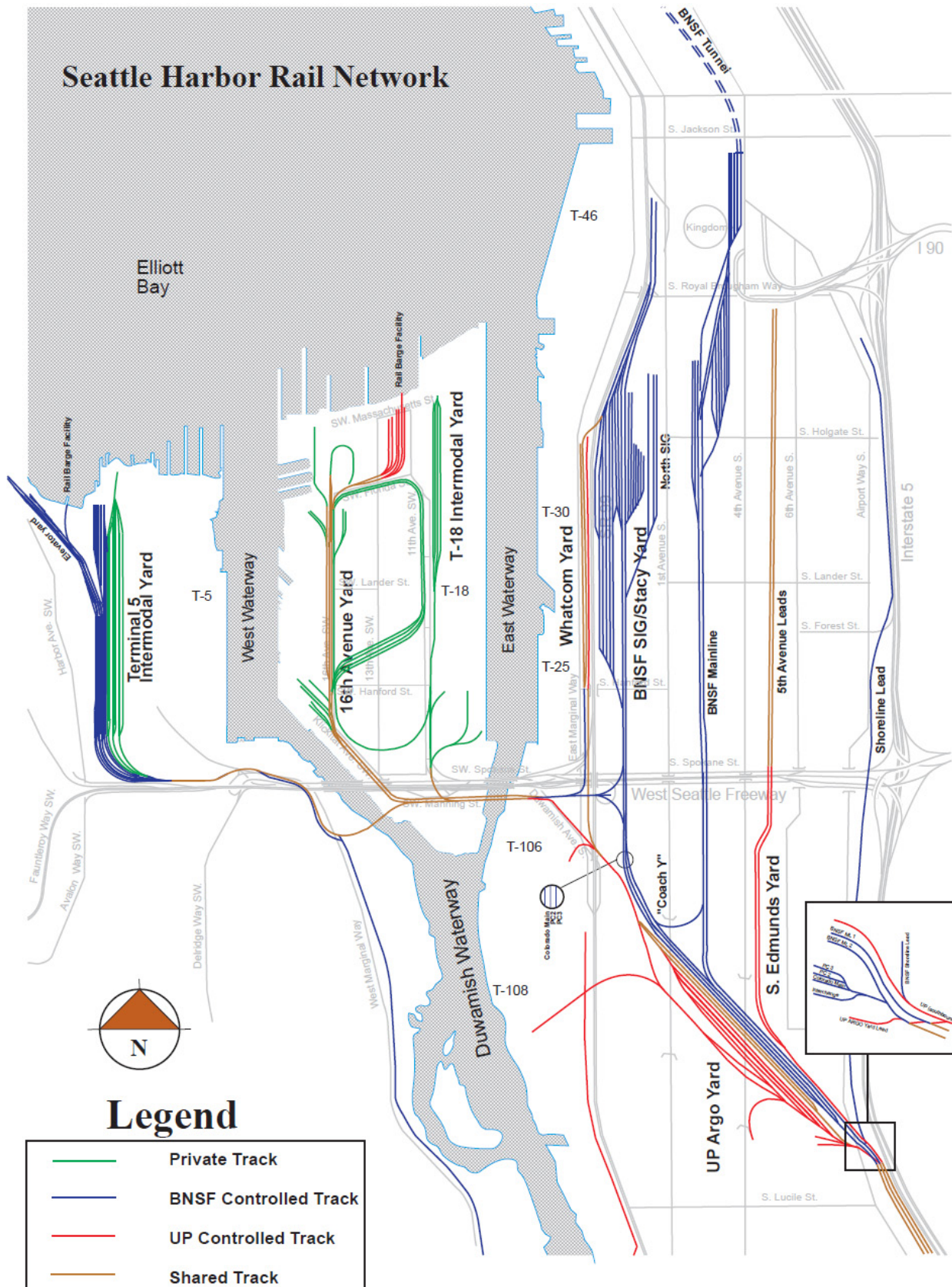
Figure 6.2 provides detail on the rail system within and near the Port of Seattle, while Figure 6.3 presents the Port of Tacoma's rail lines, and Figure 6.4 presents the Port of Olympia's rail lines. These graphics were provided by the respective ports.

<sup>41</sup>American Association of Railroads, <http://www.aar.org>.

<sup>42</sup>Railroad classes are based on annual revenues and the Class 1 railroads are the largest of the railroads in terms of revenue. There are currently seven Class 1 railroads in the U.S.

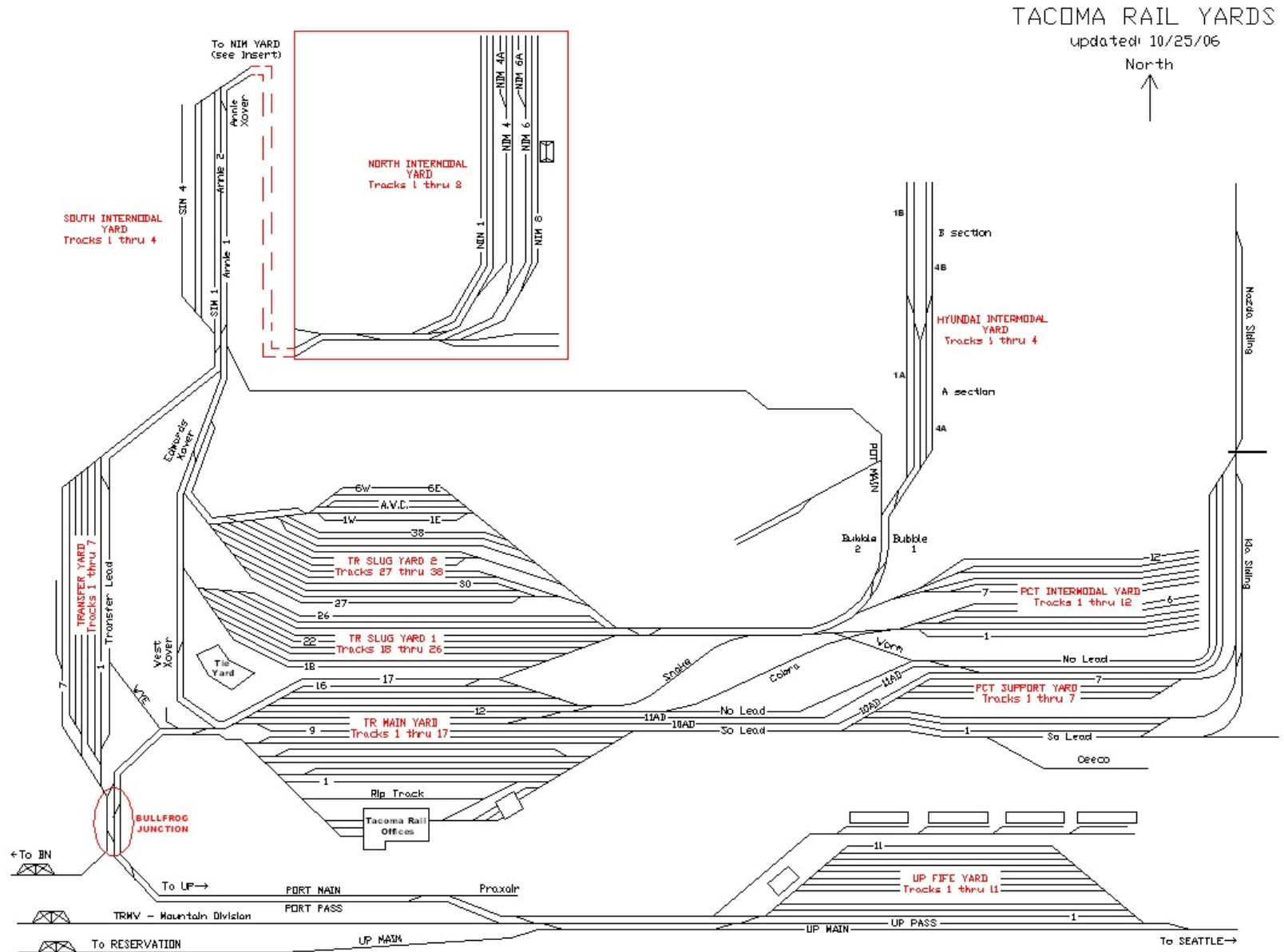
<sup>43</sup> Union Pacific, *Maps of the Union Pacific*, 2006.

Figure 6.2: Port of Seattle Harbor Rail System Map



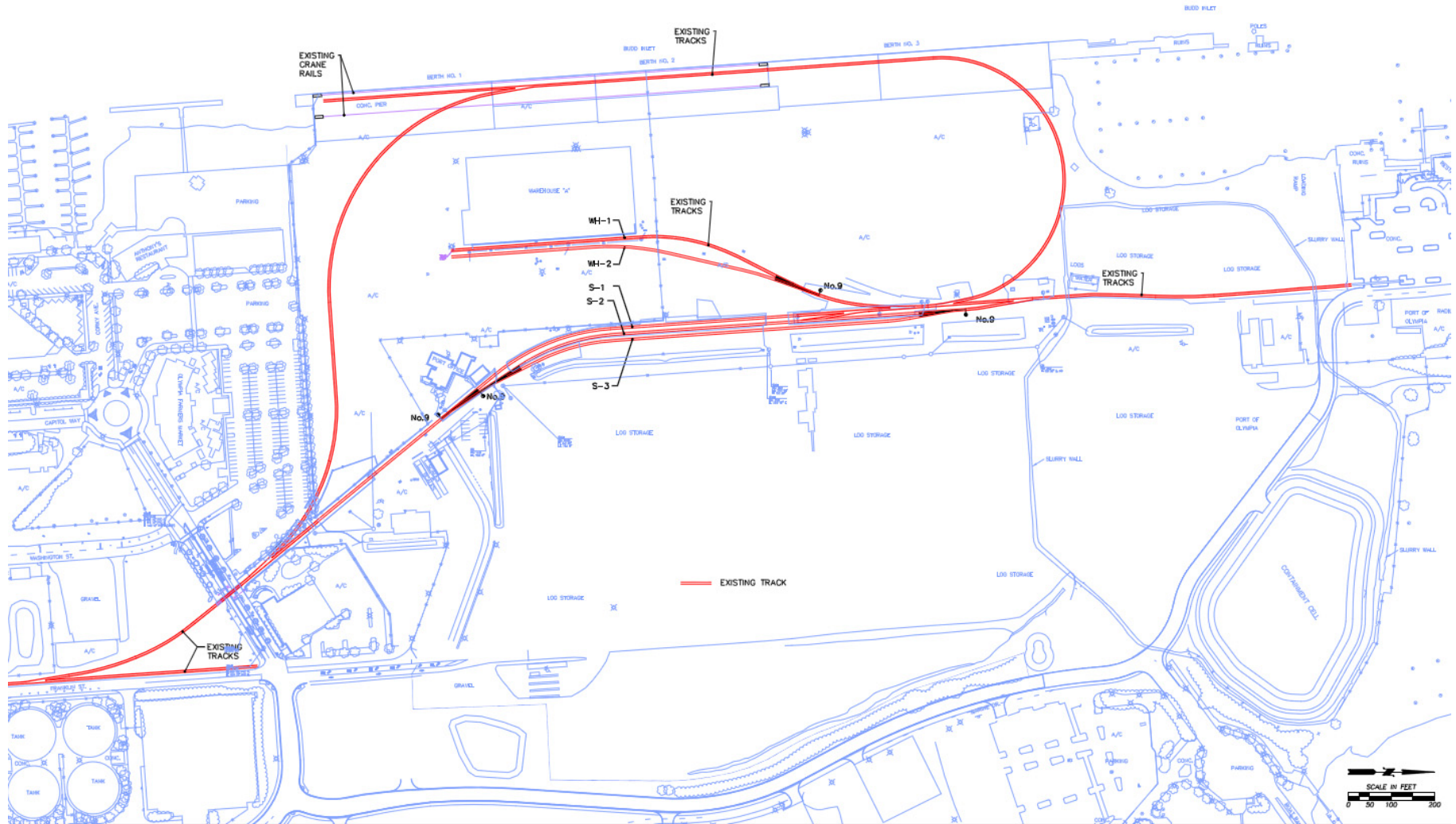
Summer 2005

Figure 6.3: Port of Tacoma Rail System Map



TACOMA RAIL YARDS  
updated: 10/25/06  
North  
↑

Figure 6.4: Port of Olympia Rail System Map



**PORT OF OLYMPIA**  
**RAIL INFRASTRUCTURE**

NO.	REVISION	DATE	BY	SCALE	1" = 100'	DATE	10/27/2009	DRAWING NO.
					DESIGNED BY:	CEB	DATE:	1
					DRAWN BY:	MFL/CDB	DATE:	
					APPROVED BY:		DATE:	
								RAWES.DWG

### 6.3 Data and Information Acquisition

The rail locomotive source category is comprised of two components: on-terminal activity and port-related off-port activity. The data collection processes for each are summarized below.

#### 6.3.1 On-Terminal

Information used to develop the emission estimates presented in this report was provided by the Class 1 railroads (BNSF and Union Pacific), the local railroad Tacoma Rail, grain terminal operators Louis Dreyfus and TEMCO, the Ports of Seattle and Tacoma, individuals with expertise in the local rail transportation system, and from the 2005 emissions inventory report and underlying data.

BNSF, a member of the Air Forum's Steering Committee, provided data on the number and percentage of line-haul locomotives that made calls to the Puget Sound ports in 2011. Union Pacific provided fuel consumption information for switching and line-haul activities by county within the State of Washington. The companies providing this information have designated it confidential material, so while the emission estimates are presented in the following subsections, the data underlying those estimates has not been released, and thus no supporting data is provided in the appendices. Tacoma Rail provided detailed information on their switching locomotives (e.g., make, model, year, and emissions tier level), fuel consumption information, and operational information such as the number of hours of operation during 2011.

The Ports of Seattle and Tacoma provided information on the number of trains and the amount of cargo entering and leaving their terminals in 2011, which was invaluable in estimating emissions from line-haul locomotives operating within and near the Ports. While specific data related to the Port of Everett were not available, emissions related to their rail operations are reflected in the area totals for Snohomish County, based on data provided by BNSF.

#### 6.3.2 Regional Port-Related

The regional port-related locomotive emission estimates have been based primarily on information provided by the railroads (BNSF and Union Pacific), the Port of Seattle, and the Port of Tacoma, in the form of fuel consumption information (by county), cargo movement information, and train arrival/departure records.



## 6.4 Operational Profiles

The railroad system is a nationwide enterprise consisting of national and local railroad companies that together serve to move a diverse variety of cargo over long distances. The activity and emission estimates presented in this section represent emissions from locomotive activities that take place within and between ports and the near-dock rail yards that handle port-related cargos. Port terminals that offer on-dock rail service, such as the Port of Seattle's Terminal 5, and most of Port of Tacoma's container terminals, are able to load cargo directly onto railcars, which are either taken from the terminal to destinations across the country or are moved to a rail yard for consolidation into a cross-country train. Near-dock services, such as offered at the Port of Tacoma's APM Terminal where on-port intermodal yards require the cargo to be moved a short distance off-terminal by truck before it is loaded onto railcars. In addition to these on-port rail-related activities, cargo can be moved between the ports and nearby rail yards, which may also handle cargo that is not related to port activity. The cargo movements are bi-directional, with cargo being brought into the ports by rail for export on ships as well as being transported from the ports to points around the country.

### 6.4.1 Line-Haul Locomotives

The Puget Sound area is served by two major Class 1 railway companies, BNSF and Union Pacific. The Port of Tacoma offers on-dock or near-dock rail service at four locations, the North Intermodal Rail Yard, the South Intermodal Rail Yard, the Hyundai Intermodal Rail Yard, and the Pierce County Intermodal Rail Yard. In each of these yards, containers are loaded onto railcars for rail shipment across the country or are unloaded from railcars for placement onto ships for export. As mentioned, the Port of Seattle's Terminal 5 offers on-dock rail service; the other Port of Seattle terminals move rail-bound cargo to one of the near-port rail yards operated by BNSF or Union Pacific. Cargo moving through the Port of Everett is transported by BNSF.

The number of locomotives that are assigned to pull each train varies with the weight of the train, and estimates were made of the number of locomotives used to pull each train. Typically, eastbound trains carry more cargo (imported goods) than westbound trains and the terrain is more challenging in the eastbound direction. Accordingly, the assumption was made, consistent with the 2005 emissions inventory calculations, that eastbound trains average four locomotives while westbound trains average three locomotives.

When a westbound train enters a port terminal or an off-port rail yard, the locomotives can be detached from the railcars and can depart in a fairly short period of time, leaving the railcars to be emptied of their cargo and to wait for reloading. Eastbound trains can be loaded and made ready before the locomotives that will pull them arrive. An eastbound train, however, must go through lengthy safety checks attached to the locomotives before it can depart. Because the line-haul railroads were not able to provide records of actual on-site times, estimates of one hour per train for westbound trains and two hours per train for eastbound trains were used in the emission calculations, consistent with the 2005 emissions inventory calculations.

The locomotives in line-haul service vary in their horsepower ratings. Data provided by BNSF on the horsepower and engine tier level of locomotives calling in 2011 indicates that the BNSF locomotives averaged approximately 4,300 hp. This is similar to 2005, when an average of 4,000 horsepower was used in developing emission estimates. Based on the information provided by BNSF, the value of 4,300 hp was chosen to represent the average rated power of locomotives servicing the Puget Sound ports in 2011.

Locomotives seldom operate at their peak horsepower ratings, so the average in-use horsepower of the locomotives was estimated to calculate horsepower-hours of activity, consistent with the emission factors, which are expressed in units of mass of emissions per horsepower-hour. The same approach was taken for the 2005 emissions inventory, in which information from a Regulatory Support Document (RSD) published by EPA in support of rulemaking<sup>44</sup> was used to estimate an average locomotive load factor of 28% in normal operation. This is less than ideal because it represents the average of normal overall line-haul locomotive activity, which includes cross-country travel as well as activity at each end of a trip, so the percentages of time in each notch setting may not accurately represent rail yard or port terminal activity. However, the RSD averages have been used in lieu of locally specific information or information specifically representing the activities at each end of a line-haul trip.

This average load factor was combined with the assumptions of average locomotive horsepower, number of locomotives per train, and annual number of arriving and departing trains to develop estimates of on-port locomotive horsepower-hours, as described in Section 6.6, Emissions Estimating Methodology.

#### 6.4.2 Switching Locomotives

In addition to moving line-haul trains into and out of the port areas, BNSF and Union Pacific operate switching locomotives in their rail yards. Switching activities are also performed by Tacoma Rail within and near the Port of Tacoma and the Port of Olympia. Switching consists of short distance moves of railcars and the assembly of trains in a pre-ordered sequence. A train is organized according to where the cargo in each railcar is destined and the nature of the cargo. There are safety requirements concerning whether certain materials can be in adjacent cars and by how many cars they must be separated, so railcars and groups of railcars are moved around a switching yard to appropriately organize the train as a whole.

The information provided by BNSF, Union Pacific, and Tacoma Rail was the annual amount of fuel used in their rail yard locomotives. Union Pacific cited an EPA estimate of 82,490 gallons of fuel per locomotive per year<sup>45</sup>, basing their overall estimate on the number of locomotives and their normal operating schedule. BNSF, for the 2005 emissions inventory, used an estimate of 50,000 gallons of fuel per yard locomotive, citing an internal yard equipment fuel study. The fuel usage was factored for 2011 based on the activity growth Union Pacific reported, for the period between 2011 and 2005, using the assumption that the two railroad companies experienced a similar change in activity levels. Tacoma Rail provided an estimate of the amount of fuel consumed annually by their locomotives.

---

<sup>44</sup> EPA, *Locomotive Emission Standards Regulatory Support Document*, revised, April 1998.

<sup>45</sup> EPA, *Procedures for Emission Inventory Preparation – Vol. IV: Mobile Source*, December 1992.

These annual fuel use amounts were converted to horsepower-hour estimates using a fuel consumption factor published by EPA, 15.2 horsepower-hours per gallon of fuel.<sup>46</sup> The horsepower-hour estimates were combined with emission factors expressed in terms of mass of emissions per horsepower-hour to estimate switching emissions.

## 6.5 Emission Reduction Technologies Identified

Tacoma Rail has implemented several emission reduction techniques over the past few years.<sup>47</sup> Twelve of fourteen of their switching locomotives are equipped with an idle reduction technology that reduces idling while keeping the locomotive's battery charged and its engine ready to run when needed. One of their switchers is a genset locomotive, powered by three small, Tier 3 diesel engine/electrical generator sets (gensets) that provide only the level of power needed for a particular job, saving fuel and lowering emissions. Two of Tacoma Rail's switchers have been repowered to meet Tier 2 emission levels, and all of their locomotives operate on ULSD fuel and have been equipped with improved fuel injectors that lower smoke and particulate emissions.

Three switching locomotives at the Port of Tacoma's TEMCO Grain Terminal and two at the Port of Seattle's Louis Dreyfus Grain Terminal were equipped with automatic engine startup-shutdown (AESS) devices to reduce idling and all of their locomotives operate on ULSD fuel. BNSF has also reported installing AESS devices.

In 2008, the federal Inland Marine and Locomotive Rule came into effect. It requires that when locomotive engines meeting certain criteria are overhauled, an EPA certified kit that reduces PM emissions by at least 25% must be installed. In the absence of a program to track the installation of these kits, these emission reductions are not included in the 2011 inventory.

## 6.6 Emissions Estimating Methodology

Emission estimation methodologies for the port and airshed port-related locomotive activities are summarized below.

### 6.6.1 Port Emissions – On-Terminal and Adjacent Rail Yards

A combination of emission estimation methods was used due to the differences in type and level of detail of the data that was obtained. For line-haul locomotives, horsepower-hour estimates were developed from the operating parameters described above, and emission factors expressed in terms of mass of emissions per horsepower-hour were used to estimate emissions. The following terms are multiplied in the basic calculation:

- Number of trains per year
- Average number of locomotives per train
- Average locomotive rated horsepower
- Average in-use locomotive load factor
- Average on-port time per train

<sup>46</sup>EPA, *Emission Factors for Locomotives*, April 2009.

<sup>47</sup> Tacoma Public Utilities, <http://www.mytpu.org/tacomarail/environment/eco-friendly-equipment.htm>

The equation can be summarized as:

Equation 6.1

$$\text{Activity} = \frac{\text{trains}}{\text{year}} \times \frac{\text{locomotives}}{\text{train}} \times \text{HP} \times \text{LF} \times \text{hours}$$

Where:

Activity = activity, hp-hr/year

The result is multiplied by a pollutant-specific emission factor in grams per horsepower-hour (and divided by 453.59 g/lb x 2,000 pounds [lbs]/ton) to calculate tons per year.

Equation 6.2

$$\text{Emissions, tpy} = \frac{\frac{\text{hp hr}}{\text{year}} \times \frac{\text{g}}{\text{hp hr}}}{\left(453.59 \frac{\text{g}}{\text{lb}} \times 2,000 \frac{\text{lbs}}{\text{ton}}\right)}$$

The switching locomotive emissions were developed from fuel consumption figures converted to horsepower-hour estimates using a fuel consumption factor published by EPA.<sup>48</sup> Emission factors specific to switching locomotives expressed in terms of mass of emissions per horsepower-hour were used with equation 6.2 above. For line-haul locomotives, information provided by one of the Class 1 railroads on their 2011 fleet mix was used to develop composite emission factors. The fleet mix information consisted of the number of locomotives of each emissions tier level that called at the Puget Sound ports during 2011. Composite emission factors were developed using the percentage of each tier level and tier-specific emission factors reported by EPA in the document cited above.

SO<sub>2</sub> emission factors were developed using a mass balance approach assuming all sulfur in the fuel is emitted as SO<sub>2</sub>. The standard non-road diesel used by line-haul locomotives was estimated to contain 234 ppm sulfur<sup>49</sup> and the ULSD used by Tacoma Rail was estimated to contain 15 ppm sulfur.

#### 6.6.2 Airshed Emissions

Airshed port-related locomotive emissions have been estimated using the 2011 fleet mix information and the tier-specific EPA emission factors noted above to develop fleet composite emission factors. Emission estimates for port-related locomotive activity were developed using fuel consumption estimates converted to horsepower-hours and the fleet composite emission factors. The railroads provided information on the tons of freight moved over specific portions of their trackage to and from the ports.

<sup>48</sup> EPA, *Emission Factors for Locomotives*, April 2009.

<sup>49</sup> EPA, *Final Regulatory Analysis: Control of Emissions from Nonroad Diesel Engines*, May 2004.

This freight information was paired with route-specific fuel consumption estimates developed for the 2005 emissions inventory, combined with average train weight information provided by the Port of Tacoma and adjusted for improvements in the railroads' operating fuel efficiency.<sup>50</sup> In sequence, estimates were made of the number of gross tons (weight of all cargo, rail equipment, and locomotives combined), gross ton-miles (freight transported a certain distance), gallons of fuel (from route-specific fuel consumption estimates), and horsepower-hours (using the EPA' recommended line-haul fuel consumption factor).<sup>51</sup> These estimates were made for each of the major port rail centers (the Port of Tacoma and the Port of Seattle) traveling inbound and outbound on both the northern and southern routes, on a county-specific basis. Emissions were estimated using the horsepower-hour estimates and the same emission factors used for on-terminal line-haul emissions.

## 6.7 Emission Estimates

Port-related locomotive emission estimates for port and airshed zones are presented below.

### 6.7.1 Port Emissions – On-Terminal and Adjacent Rail Yards

The 2011 maritime-related port emissions for the Puget Sound area are summarized in this section. Table 6.1 presents the estimates of 2011 criteria pollutant and greenhouse gas emissions from switching emissions on and near the Ports of Seattle, Tacoma, and Olympia, and switching activity in Snohomish County associated with the Port of Everett. Table 6.2 presents the estimates of 2011 criteria pollutant and greenhouse gas emissions from line-haul locomotives as they move maritime-related cargo within the Ports of Seattle and Tacoma, and within the near-port/adjacent rail yards in King and Pierce Counties that handle port cargo. Emissions from line-haul locomotive operations associated with the Ports of Olympia and Everett have not been included in these tables because sufficient information was not collected to differentiate maritime-related from other locomotive activities in the region.

**Table 6.1: 2011 Switching Locomotive Port Emissions, tpy**

Port	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Port of Seattle	162.4	13.0	23.6	1.3	5.8	5.3	5.8	8,619
Port of Tacoma	230.1	17.2	31.3	1.2	7.5	6.9	7.5	11,422
Snohomish Co.	62.1	5.0	9.0	0.5	2.2	2.0	2.2	3,298
Port of Olympia	3.7	0.2	0.4	0.002	0.1	0.1	0.1	164
<b>Total</b>	<b>458.3</b>	<b>35.4</b>	<b>64.3</b>	<b>3.0</b>	<b>15.6</b>	<b>14.3</b>	<b>15.6</b>	<b>23,503</b>

<sup>50</sup> Fuel efficiency improvements estimated using information contained in the R-1 reports filed by the Class 1 railroads with the Surface Transportation Board each year.

<sup>51</sup> EPA, *Emission Factors for Locomotives*, April 2009.

Table 6.2: 2011 Line-Haul Locomotive Port Emissions, tpy

Port	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Port of Seattle	127.8	7.1	21.6	1.2	4.7	4.3	4.7	8,209
Port of Tacoma	133.7	7.4	22.5	1.2	4.9	4.5	4.9	8,593
<b>Total</b>	<b>261.5</b>	<b>14.5</b>	<b>44.1</b>	<b>2.4</b>	<b>9.6</b>	<b>8.8</b>	<b>9.6</b>	<b>16,802</b>

6.7.2 Airshed Emissions Exclusive of Port Emissions

The 2011 maritime related line-haul locomotive airshed emissions for are summarized in this section. Table 6.3 presents estimated 2011 line-haul locomotive emissions associated with the Ports of Seattle and Tacoma, while Table 6.4 presents these emissions on a county-specific basis, based on the routes taken by the trains into and out of the inventory domain.

Table 6.3: 2011 Line-Haul Locomotive Airshed Emissions Exclusive of Port Emissions, tpy

Port	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Port of Seattle	388.5	21.4	65.4	3.6	14.3	13.2	14.3	24,969
Port of Tacoma	155.8	8.6	26.3	1.5	5.7	5.1	5.7	10,015
<b>Total</b>	<b>544.3</b>	<b>30.0</b>	<b>91.7</b>	<b>5.1</b>	<b>20.0</b>	<b>18.3</b>	<b>20.0</b>	<b>34,984</b>

Table 6.4: 2011 Line-Haul Locomotive Airshed Emissions by County Exclusive of Port Emissions, tpy

County	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Clallam	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Jefferson	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
King	190.9	10.5	32.2	1.8	7.0	6.4	7.0	12,269
Kitsap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Mason	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Pierce	57.1	3.1	9.6	0.5	2.1	1.9	2.1	3,670
San Juan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Skagit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Snohomish	204.1	11.3	34.4	1.9	7.5	6.9	7.5	13,114
Thurston	92.2	5.1	15.5	0.9	3.4	3.1	3.4	5,931
Whatcom	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>544.3</b>	<b>30.0</b>	<b>91.7</b>	<b>5.1</b>	<b>20.0</b>	<b>18.3</b>	<b>20.0</b>	<b>34,984</b>

## 6.8 Emission Comparison, 2011 vs 2005

Activity and emissions 2011 vs 2005 comparisons for locomotives are presented in this section. Table 6.5 presents a comparison of 2011 vs 2005 activity levels for locomotives in terms of annual horsepower-hours and fuel consumption in gallons.

**Table 6.5: 2011 vs 2005 Locomotive Activity and Fuel Consumption Comparison**

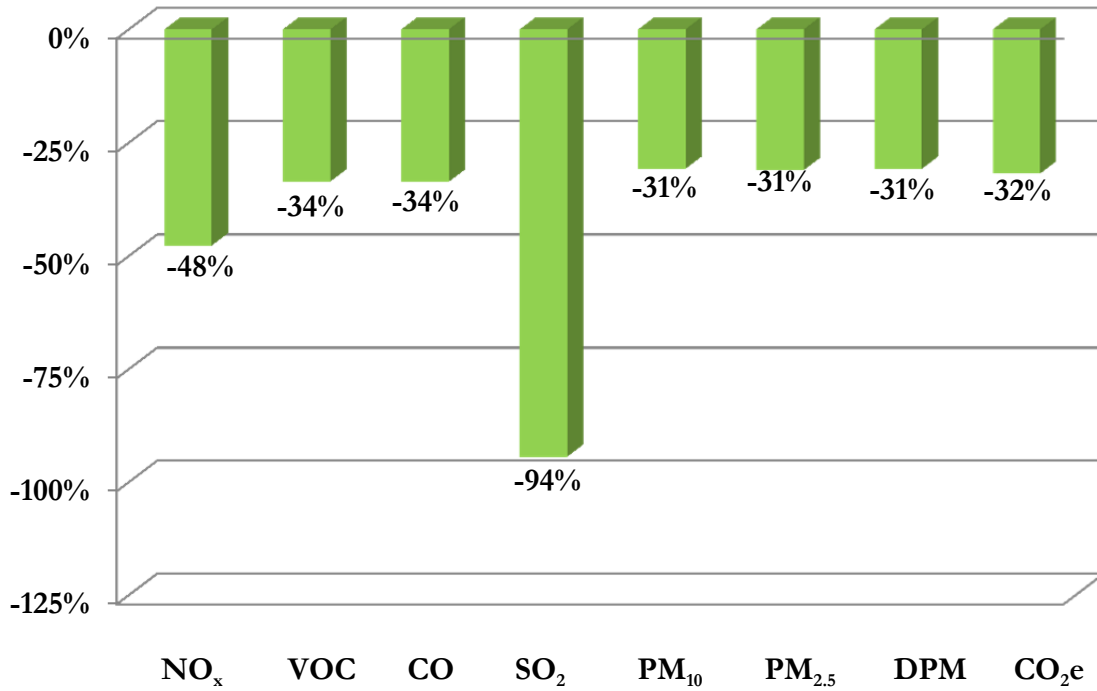
Year	Activity hp-hr	Fuel Usage gallons
2011	123,623,669	6,429,803
2005	178,616,613	9,013,083
<b>Change, %</b>	<b>-31%</b>	<b>-29%</b>

The 2011 vs 2005 comparison for locomotive airshed emissions is summarized in Table 6.6. Airshed emissions in 2011 were lower than 2005 emissions by 24% to 94%, primarily due to lower overall throughput, newer, lower emitting switching and line-haul locomotives, and improved fuel efficiency of locomotive operations. The large decrease in SO<sub>2</sub> emissions was a result of the continued lowering of the sulfur content of diesel fuels.

**Table 6.6: 2011 vs 2005 Locomotive Airshed Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	1,264	80	200	11	45	41	45	75,289
2005	2,416	120	302	188	65	60	65	110,431
<b>Change, tpy</b>	<b>-1,152</b>	<b>-40</b>	<b>-101</b>	<b>-177</b>	<b>-20</b>	<b>-19</b>	<b>-20</b>	<b>-35,142</b>
<b>Change, %</b>	<b>-48%</b>	<b>-34%</b>	<b>-34%</b>	<b>-94%</b>	<b>-31%</b>	<b>-31%</b>	<b>-31%</b>	<b>-32%</b>

Figure 6.5: 2011 vs 2005 Airshed Locomotive Emissions Change



Note: 2005 emissions were recalculated using the same methods used for the 2011 emission estimates. The above figure accounts for these changes so that a direct comparison can be made between 2011 vs 2005.



## SECTION 7 HEAVY-DUTY VEHICLES

Section 7 provides an overview of the emissions from on-road heavy-duty diesel-fueled vehicles that transport port-related cargo, and from buses that shuttle cruise passengers at the cruise terminals to and from the airport and area hotels. A description of the methodology used to estimate emissions is provided in this section, as well as the emissions estimates for this source category.

### 7.1 Source Description

Heavy-duty trucks are used extensively to move cargo to and from the terminals that serve as the bridge between land and sea transportation. Trucks deliver cargo to and from local and national destinations, and they also transfer cargo between terminals and off-port railcar loading facilities, an activity known as drayage. In the course of their daily operations, trucks are driven onto and through the terminals, where they deliver and/or pick up cargo. They are also driven on the public roads near ports and throughout the region. Marine cargo transportation by truck is a complex system because generally the vehicles and associated equipment, such as chassis and refrigeration gensets, are not under the direct control of the ports, their terminals, or most of the shippers who use the terminals. The vehicles are largely a combination of fleet vehicles owned by transport companies and independently owned and operated trucks.

This section details the estimated emissions from truck activities within the ports' terminals as they drop off or pick up cargo. The on-terminal cargo truck activities covered include idling at pre-gate queue lines prior to entering terminal gates, idling within the terminals, and travel within the terminals. Estimates of idling emissions from the heavy-duty diesel-fueled buses that transport cruise line passengers to and from the airport and hotels in the area are also included in the on-terminal HDV emissions, for the time that they idle during unloading and loading of cruise passengers. Emissions from trucks transporting cargo on the public roadways to or from the ports have been estimated by the Puget Sound Regional Council (PSRC) and the WDOE's Air Quality Section, and are presented in this section as representing regional port-related emissions.

The EPA on-road vehicle emission modeling software, MOBILE6.2 model, has been used to estimate emissions from these on-road mobile sources. Virtually all of these vehicles are diesel-fueled because of the economic and operational characteristics of diesel engines as opposed to engines fueled by gasoline or other fuels.

The most common configuration of HDVs in maritime freight service is the articulated tractor-trailer (truck and semi-trailer) having five axles, including the trailer axles. A common type of trailer in the study area is the container trailer or chassis, which is built to accommodate standard-sized cargo containers. Additional trailer types include tankers, boxes, and flatbeds. A tractor traveling without an attached trailer is called a “bobtail,” while a tractor pulling an unloaded container chassis is known simply as a “chassis.” These vehicles are all classified as HDVs regardless of their actual weight because the classification is based on gross vehicle weight rating (GVWR), which is a rating of the vehicle’s total potential weight including its carrying capacity. Because MOBILE6.2 does not distinguish between loaded and unloaded trucks, the emission estimates include all of the different configurations combined. This may result in a slight overestimation of emissions from the unloaded HDVs, but the inertial effects of the additional weight of a loaded truck would probably limit the overestimate to periods of acceleration.

Port-related, on-road trucking, known as drayage, is a unique subset of the overall truck activity that occurs in the Puget Sound region. Unlike long-haul trucking, which transports goods out of the region to remote destinations, drayage trucks drive short distances to deliver containers to and from terminals, intermodal yards, and local distribution centers. In Seattle, the intermodal yards are approximately one to two miles from the terminals, while the local distribution centers, concentrated in the Green River Valley area, are approximately 10 to 35 miles from the terminals; additionally, many port-related truck trips stay within the Duwamish Industrial Area. In Tacoma, the majority of containers bound to and from intermodal yards are transported via on-dock rail, while containers bound for the local distribution centers travel approximately 15 to 25 miles to the Green River Valley.

As examples of typical HDVs, Figure 7.1 presents a container truck transporting a container in a terminal, and Figure 7.2 presents a bobtail. The equipment images shown in the figures are not photographs of actual pieces of equipment used at the surveyed terminals but are for illustrative purposes only.

**Figure 7.1: Truck with Container**



Figure 7.2: Bobtail Truck



## 7.2 Geographical Delineation

The heavy-duty vehicle emissions were estimated separately for on-terminal and on-road port-related activity. The geographical extent of the on-terminal portion consists of the marine terminals footprint and associated facilities of the following Puget Sound area ports:

- Port of Anacortes
- Port of Everett
- Port of Olympia
- Port of Seattle
- Port of Tacoma
- BNSF SIG Rail Yard
- Argo Rail Yard

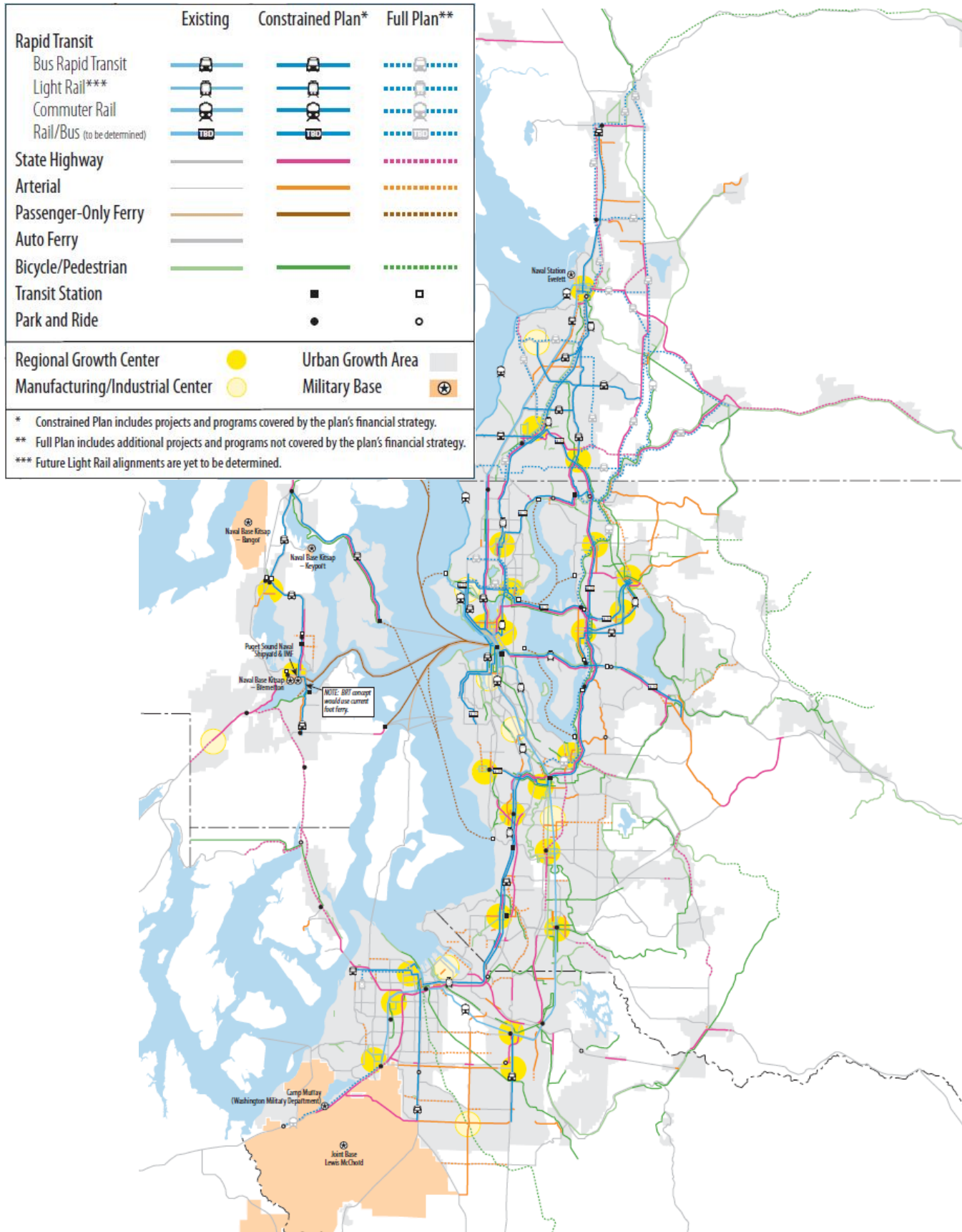
The locations of the ports and their respective marine terminals are illustrated in the figures in Section 1.

The geographical extent of the on-road port-related emissions is shown in Figure 7.3,<sup>52</sup> and is comprised of the public roadways and rail corridors within the Puget Sound airshed, including Clallam, Island, Jefferson, King, Kitsap, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom Counties. This includes trips between the terminals and the first pickup/drop or the boundary of the study area for cargo being transported in or out of the study area directly to or from the terminals, as well as trips between terminals and nearby rail yards. Queuing time for entering terminals is included in the on-terminal portion.

---

<sup>52</sup> Puget Sound Regional Council, *Destination 2040 Plan*, 2010.

Figure 7.3: Puget Sound Metropolitan Transportation System Map



### 7.3 Data and Information Acquisition

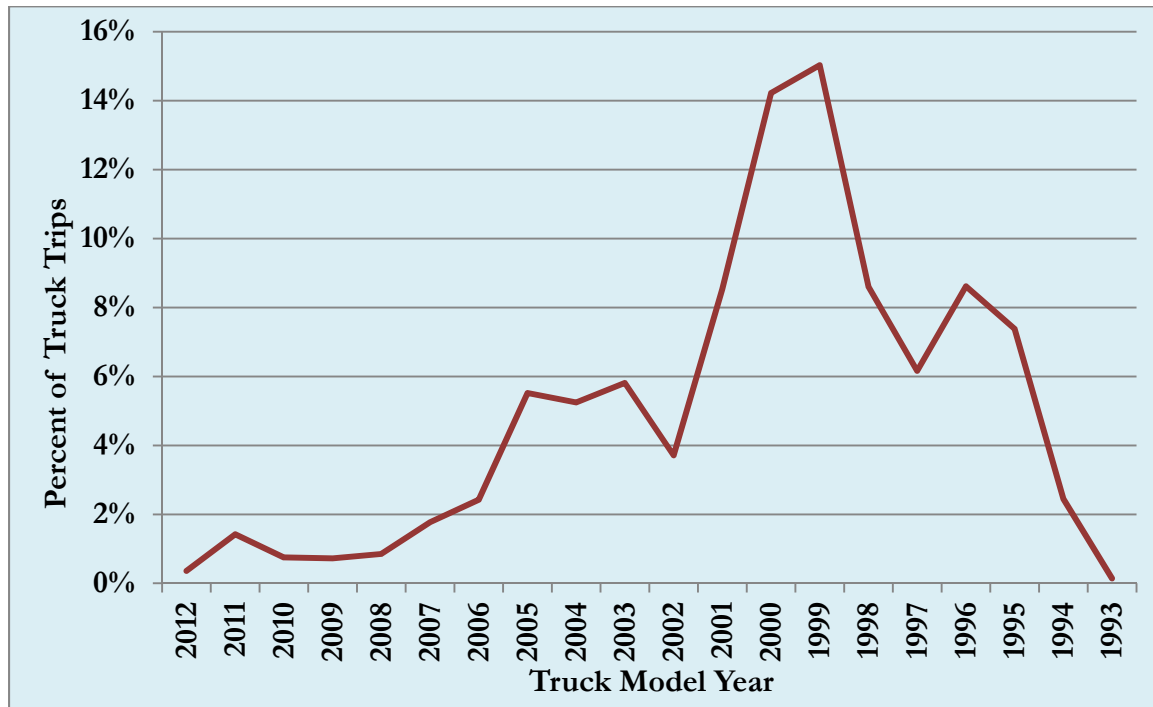
The HDV source category is comprised of two activity components: on-terminal and port-related on-road activity. The data collection methods for each are summarized below.

#### 7.3.1 On-Terminal

Terminal operators provided information on truck throughput for calendar year 2011, the terminal gate schedule (when trucks are admitted for drop-off or pick-up of cargo), the average speed and distance driven on-terminal, and the average amounts of time trucks wait at the entrance gate, the exit gate, and while loading/unloading.

The Port of Seattle, Port of Tacoma, and Port of Olympia provided model year information for 2011 consisting of the number of truck calls made by each model year of truck. This is important because vehicle emissions vary by model year, and newer model vehicles generally emit less than older vehicles. This represents an improvement over 2005, for which the Washington state vehicle registration distribution formed the basis of the model year distribution. The combined 2011 port-related model year distribution that takes into account the calls to all three ports that provided data is illustrated in Figure 7.4, which presents the percentage of truck trips by model year.

Figure 7.4: 2011 Heavy-Duty Vehicle Age Distribution



### 7.3.2 Regional Port-Related

The PSRC and the Washington Department of Ecology (WDOE) developed estimates of on-road HDV emissions within the Puget Sound area from trucks engaging in port-related freight movements. They based these estimates on their regional travel demand model and emission factors obtained from the MOBILE6.2 model, using the port-specific model year distribution discussed above. Details of their methodology are reported in a memorandum prepared by the PSRC and included in Appendix B.

## 7.4 Operational Profiles

The number of HDV trips through the terminals is a function of cargo throughput (or number of cruise passengers and frequency of cruises, for the buses). The vehicles have periods of idling during each trip, for example while waiting to enter the terminal or while waiting to drop off and/or pick up cargo. The vehicles also travel a certain distance within the terminal from entry gate to drop-off/pick-up locations, and to the exit gate. The amount of on-terminal idling depends in part on the mode of operation – idling is reduced if cargo is ready to be loaded upon the vehicle's arrival compared to operations in which a vehicle must wait for a loader to bring the cargo. On-terminal travel distance depends on the size of the terminal and on the route taken by the vehicles within the terminal. The bus idling times are for idling while queuing to park in designated areas and while loading or discharging passengers.

The operational information provided by the terminals has been summarized and is presented in Table 7.1. The values presented for idling times and driving distances are averages for each terminal, while the assumed speed for cargo terminals is the average reported from all terminals. The terminals identified as PSS020A and PSS020B are cruise terminals; emissions have been estimated from idling of buses as cruise passengers unload and load at the cruise terminals, but driving emissions have not been included to be consistent with the 2005 approach. The Port of Seattle discourages unnecessary bus idling by signage and communications with the companies involved. An example of the signage is shown in Figure 7.5.

Port-related on-road HDV's vehicle miles traveled (VMT) depends on the destination of the cargo being transported. Idling of HDV while in transit, such as at traffic signals, is included in the emission factors produced by the MOBILE6.2 model.

**Figure 7.5: Port of Seattle Cruise Terminal Anti-Idling Signage**

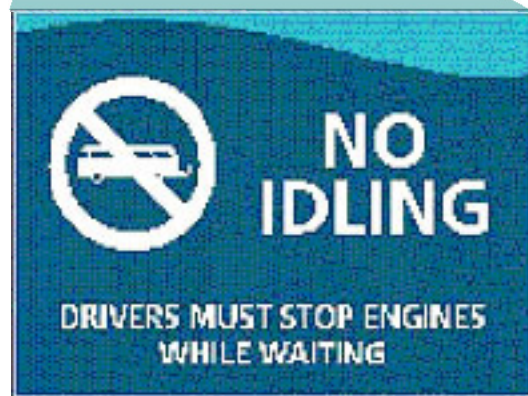


Table 7.1: 2011 On-Terminal HDV Operational Profiles

Terminal ID	Trips in 2011	Idling (hours)				Total Per Trip	Total All Trips	Avg. Speed (mph)	Driving		
		Gate In	Loading/Unloading	Gate Out	Total				Per Trip (hours)	Per Trip (miles)	All Trips (miles)
PSS070	301,444	0.17	0.43	0.05	0.65	195,939	15	0.07	1.00	301,444	
PSS050	643,666	0.33	0.27	0.08	0.68	437,693	15	0.12	1.75	1,126,416	
PSS060	88,717	0.23	0.15	0.10	0.48	42,584	15	0.13	1.90	168,562	
PSS080	320,268	0.07	0.32	0.03	0.42	134,513	15	0.07	1.00	320,268	
PSS030	38,480	0.05	0.08	0.00	0.13	5,002	10	0.05	0.50	19,240	
PSS020A	6,619	0.00	0.17	0.00	0.17	1,125	na	na	na	na	
PSS020B	3,115	0.00	0.17	0.00	0.17	530	na	na	na	na	
PST070	91,800	0.08	0.18	0.00	0.26	23,868	15	0.02	0.28	25,704	
PST030	54,670	0.17	0.32	0.08	0.57	31,162	10	0.10	0.95	51,937	
PST050	144,300	0.08	0.23	0.08	0.39	56,277	15	0.07	1.00	144,300	
PST020	208,000	0.08	0.26	0.00	0.34	70,720	15	0.04	0.66	137,280	
PST040	92,880	0.00	0.21	0.00	0.21	19,505	15	0.05	0.68	63,158	
PST060	126,971	0.17	0.19	0.08	0.44	55,867	15	0.10	1.53	194,266	
PST100	75,000	0.00	0.07	0.02	0.09	6,750	25	0.04	1.04	78,000	
PST010	7,178	0.08	0.02	0.00	0.10	718	8	0.03	0.25	1,795	
PST090	4,061	0.08	0.20	0.04	0.32	1,300	15	0.03	0.50	2,031	
PST120	15,000	0.00	0.11	0.00	0.11	1,650	5	0.06	0.30	4,500	
PST110	10,125	0.07	0.30	0.00	0.37	3,746	10	0.02	0.24	2,430	
PST130	39,600	0.00	0.17	0.00	0.17	6,732	5	0.08	0.40	15,840	
PSA010	7,994	0.03	0.08	0.03	0.14	1,119	5	0.05	0.25	1,999	
PSE010	4,025	0.00	0.25	0.00	0.25	1,006	8	0.13	1.00	4,025	
PSO010	7,608	0.03	0.08	0.03	0.14	1,065	5	0.05	0.25	1,902	
BNSF SIG	217,264	0.11	0.33	0.03	0.47	102,114	15	0.07	1.00	217,264	
UP Argo	193,333	0.17	0.40	0.03	0.60	116,000	15	0.07	1.00	193,333	
<b>Totals</b>	<b>2,702,119</b>					<b>1,316,985</b>				<b>3,075,692</b>	
<b>Weighted averages</b>		<b>0.16</b>	<b>0.28</b>	<b>0.05</b>	<b>0.49</b>		<b>15</b>	<b>0.08</b>	<b>1.14</b>		



## 7.5 Emission Reduction Technologies Identified

In 2011, the diesel trucks and buses addressed in this section used ULSD with a sulfur content of 15 ppm or less since this is the fuel available nation-wide for on-road vehicle use. This diesel fuel sulfur control program significantly reduces sulfate and particulate emissions by a nominal amount. Fleet turnover to newer vehicles with 2007 and newer engine model years has also had an effect on reducing overall HDV emissions. Both the Port of Tacoma and Port of Seattle have banned trucks with engines older than 1994 from calling at their terminals.

## 7.6 Emissions Estimating Methodology

The methodologies for estimating the on-terminal and port-related on-road HDV emissions are presented below.

### *Emission Factors*

The MOBILE6.2 model was used to calculate emission factors for HDVs. The MOBILE6.2 vehicle types<sup>53</sup> most representative of the trucks covered by this section, HDDV8A<sup>54</sup> and HDDV8B, were used to develop the composite emission factors for heavy-duty trucks. The composites were based on the MOBILE6.2 emission factors for the two classes apportioned according to the MOBILE6.2 mileage distribution for each of the classes.

The MOBILE6.2 model estimates vehicle emissions in terms of grams per mile, and these estimates are specific to the vehicles' model year and average speed. The emission factors presented in Tables 7.2 and 7.3 include the on-terminal emission factors specific to each terminal based on the reported average speed on each terminal, and represent the overall model year distribution of the three ports that provided data, as discussed above in subsection 7.3, Data and Information Acquisition. The emission factors for on-road travel vary by speed, and are included as average grams-per-mile for driving emissions in Table 7.2. The emission factors by speed are included in Appendix B. Emission factors for methane and nitrous oxide were developed from EPA's national greenhouse gas emissions inventory report.<sup>55</sup> Idling emission factors were developed to account for the on-terminal idling periods. These factors were developed according to previous EPA guidance based on the 2.5 miles per hour (mph) emission factors (in g/miles) multiplied by 2.5.<sup>56</sup> On-road idling emission factors are not included because the on-road emission factors include a normal amount of in-traffic idling.

---

<sup>53</sup> EPA, *User's Guide to MOBILE6.1 and MOBILE6.2 Mobile Source Emission Factor Model*, EPA420-R-03-010, 2003. See: <http://www.epa.gov/otaq/models/mobile6/420r03010.pdf>.

<sup>54</sup> HDDV - heavy-duty diesel vehicle

<sup>55</sup>EPA 2006. See Annex 3, Table A-95.

<sup>56</sup> EPA, *Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation*, EPA420-R-04-013, August 2004. See: <http://www.epa.gov/otaq/models/mobile6/420r04013.pdf>.

Table 7.2: HDV Emission Factors – Driving, g/mile

Terminal ID	Avg. Speed (mph)	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
PSS070	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PSS050	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PSS060	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PSS080	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PSS030	10	14.1942	1.1752	6.8697	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PSS020A	na	na	na	na	na	na	na	na	na	na	na
PSS020B	na	na	na	na	na	na	na	na	na	na	na
PST070	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST030	10	14.1942	1.1752	6.8697	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST050	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST020	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST040	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST060	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST100	25	10.4167	0.6485	2.9587	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST010	8	14.8553	1.2555	7.6424	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST090	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST120	5	16.8378	1.4968	9.9626	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST110	10	14.1942	1.1752	6.8697	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PST130	5	16.8378	1.4968	9.9626	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PSA010	5	16.8378	1.4968	9.9626	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PSE010	8	14.8553	1.2555	7.6424	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
PSO010	5	16.8378	1.4968	9.9626	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
BNSF SIG	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
UP Argo	15	12.3866	0.9427	4.9567	0.0150	0.1876	0.1727	0.1876	1,602	0.0048	0.0051
<b>Weighted Avg</b>	<b>15</b>	<b>12.4822</b>	<b>0.9557</b>	<b>5.0977</b>	<b>0.0149</b>	<b>0.1869</b>	<b>0.1721</b>	<b>0.1869</b>	<b>1,596</b>	<b>0.0048</b>	<b>0.0051</b>

Table 7.3: HDV Emission Factors – Idling, g/hour

Terminal ID	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
PSS070	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PSS050	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PSS060	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PSS080	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PSS030	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PSS020A	41.5150	2.0430	23.8380	0.0545	0.3440	0.3165	0.3440	5,845	0.0120	0.0128
PSS020B	41.5150	2.0430	23.8380	0.0545	0.3440	0.3165	0.3440	5,845	0.0120	0.0128
PST070	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST030	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST050	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST020	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST040	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST060	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST100	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST010	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST090	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST120	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST110	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PST130	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PSA010	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PSE010	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
PSO010	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
BNSF SIG	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
UP Argo	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
<b>Weighted Avg</b>	<b>46.4500</b>	<b>4.2497</b>	<b>30.4849</b>	<b>0.0374</b>	<b>0.4686</b>	<b>0.4314</b>	<b>0.4686</b>	<b>4,012</b>	<b>0.0120</b>	<b>0.0128</b>

The general form of the equation for estimating vehicle emissions is:

Equation 7.1

$$E = (EF_d \times A_d) + (EF_i \times A_i)$$

Where:

- E = mass of emissions per defined period
- $EF_d$  = driving emission factor (g/mile)
- $A_d$  = driving activity (miles driven during the defined period)
- $EF_i$  = idling emission factor (g/hour)
- $A_i$  = idling activity (idling during the defined period)

Emissions were estimated by multiplying the miles driven or hours idling on each terminal by the relevant emission factor.

#### *Port Emissions*

Emissions from HDVs operating within the terminals and idling adjacent to the terminals were estimated by multiplying the miles driven, the hours of idling on each terminal, and the hours idling waiting to get into the terminal by the relevant emission factor representing the average speed and the overall model year distribution of the trucks calling at the terminals.

#### *Airshed Emissions*

The PSRC also used the EPA MOBILE6.2 model to estimate airshed emissions from port-related HDVs, consistent with the methodology used by Starcrest for the on-terminal calculations. The three largest ports in the Puget Sound region (Ports of Everett, Seattle and Tacoma) are located in Snohomish, King, and Pierce Counties, respectively, have the highest off-terminal port-related HDV activity levels in the study area and were the focus of the PSRC's modeling efforts.

The PSRC used their latest Travel Demand Model, which simulates all the travel in the airshed on an average weekday, to develop the weekday on-road port-related truck VMT for 2011. Among the vehicle classes modeled are heavy-duty trucks. The truck trip-ends are generated from estimates of employment, distributed using "typical" distributions of trip lengths, and assigned to the regional road system along with all other vehicles (personal vehicles, and light and medium trucks). PSRC's use of the latest travel demand model improved VMT estimates for 2011. In order to provide for reasonably reliable comparison between 2011 and 2005, 2005 HDV emissions were adjusted to account for the up to date methodologies. The primary difference between the 2011 and 2005 modeling is that the later modeling produces higher estimates of VMT for a given volume of cargo throughput. The 2005 emissions were adjusted to take into account these higher VMT estimates. Another difference is that the 2005 emission estimates included more weight classes of trucks than the 2011 estimates – for 2011 only the heaviest classes of trucks (HDDV8a and 8b) have been included because these classes make up the great majority of truck visits. The 2005 estimates of truck emissions were recalculated to include only the HDDV8A and 8b classes of trucks. For these reasons, the 2005 HDV emissions displayed later in this report do not correspond directly with the numbers in the 2005 PSEI report.

The updated travel demand model includes improvements with specific information provided by the Ports, thus, there was no need to make additional adjustments to the model output. Since 2010 is an existing model analysis year in the travel demand model, and since it was determined that there would be little to no differences in port-related VMT between 2010 and 2011, the PSRC decided to use the 2010 analysis year as a surrogate for the 2011 emissions inventory data. Truck trips to and from the Ports of Everett, Seattle, and Tacoma and the corresponding distances and travel times were extracted from the 2010 model run. The other ends of the trips were aggregated to the following geographies:

- Distribution Centers – all analysis zones in the Green River Valley, from Renton to Sumner
- Interstate 5 South – at the Nisqually River
- Interstate 90 at Snoqualmie Pass
- Interstate 5 North – at the Skagit/Snohomish County line
- All other external stations
- Remainder of King County
- Snohomish County
- Remainder of Pierce County
- Kitsap County
- Rail yards

As noted previously, additional documentation prepared by the PSRC is included in Appendix B. The regional port-related emission estimates developed by the PSRC and the WDOE are specific to the counties within the PSCAA area, consisting of King, Kitsap, Pierce, and Snohomish Counties. Consistent with the 2005 emissions inventory methodology, emissions from truck activities in other counties in the inventory area were extrapolated from the PSCAA emissions using the ratios of port-related HDV to total HDV emissions to develop scaling factors. For example, if VOC emissions from port-related HDVs in the PSCAA area made up 7% of all HDV emissions in the PSCAA area, then each county's overall VOC emissions (from HDVs) would be multiplied by 7% to estimate the county-level port-related VOC emissions from HDVs. The overall county-specific HDV emissions used in developing the county-level extrapolations are from the WDOE's 2005 Air Emissions Inventory,<sup>57</sup> the most recent complete set of county-level HDV emissions.

---

<sup>57</sup>WA Dept. of Ecology, 29 August 2006.

The regional port-related emission estimates developed by the PSRC and the WDOE are specific to the counties within the PSCAA area, consisting of King, Kitsap, Pierce, and Snohomish Counties. Consistent with the 2005 emissions inventory methodology, emissions from truck activities in other counties in the inventory area were extrapolated from the PSCAA emissions using the ratios of port-related HDV to total HDV emissions to develop scaling factors. For example, if VOC emissions from port-related HDVs in the PSCAA area made up 7% of all HDV emissions in the PSCAA area, then each county's overall VOC emissions (from HDVs) would be multiplied by 7% to estimate the county-level port-related VOC emissions from HDVs. The overall county-specific HDV emissions used in developing the county-level extrapolations are from the WDOE 2005 Air Emissions Inventory,<sup>58</sup> the most recent complete set of county-level HDV emissions.

### **7.7 Emission Estimates**

For HDV emissions estimates in this section, there are two geographical domains:

- Port – includes heavy-duty vehicle emissions on-terminal and in queues on-terminal and adjacent to the terminal
- Airshed – includes heavy-duty vehicle emissions beyond the port domain to the airshed boundary. Emissions are estimated for the first drop or last pick-up from/to the terminals.

It should be noted that the estimates in Sections 7.7.1 and 7.7.2 are exclusive due to the method differences described in the previous sections.

---

<sup>58</sup>WA Dept. of Ecology, 29 August 2006.

7.7.1 HDV Port Emissions

The 2011 heavy-duty vehicle port emissions are summarized in this section. Table 7.4 summarizes the port heavy-duty vehicle emission estimates for criteria pollutants and for greenhouse gases.

**Table 7.4: 2011 Total HDV Port Emissions by Terminal, tpy**

Terminal ID	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
PSS070	14.16	1.23	8.24	0.013	0.163	0.150	0.163	1,399
PSS050	37.80	3.22	20.87	0.037	0.459	0.422	0.459	3,926
PSS060	4.48	0.38	2.35	0.005	0.057	0.052	0.057	486
PSS080	11.26	0.96	6.27	0.011	0.136	0.125	0.136	1,161
PSS030	0.56	0.04	0.32	0.000	0.007	0.006	0.007	56
PSS020A	0.05	0.00	0.03	0.000	0.000	0.000	0.000	7
PSS020B	0.02	0.00	0.01	0.000	0.000	0.000	0.000	3
PST070	1.57	0.14	0.94	0.001	0.017	0.016	0.017	151
PST030	2.41	0.22	1.44	0.002	0.027	0.025	0.027	230
PST050	4.85	0.41	2.68	0.004	0.059	0.054	0.059	504
PST020	5.49	0.47	3.13	0.005	0.065	0.060	0.065	555
PST040	1.86	0.16	1.01	0.002	0.023	0.021	0.023	198
PST060	5.51	0.46	2.94	0.005	0.069	0.064	0.069	590
PST100	1.25	0.09	0.48	0.001	0.019	0.018	0.019	168
PST010	0.07	0.00	0.04	0.000	0.000	0.000	0.000	6
PST090	0.10	0.01	0.05	0.000	0.001	0.001	0.001	9
PST120	0.16	0.02	0.11	0.000	0.002	0.002	0.002	15
PST110	0.23	0.02	0.15	0.000	0.003	0.002	0.003	21
PST130	0.63	0.06	0.40	0.000	0.006	0.006	0.006	58
PSA010	0.10	0.01	0.06	0.000	0.001	0.001	0.001	8
PSE010	0.12	0.01	0.06	0.000	0.002	0.001	0.002	12
PSO010	0.09	0.00	0.06	0.000	0.001	0.001	0.001	8
BNSF SIG	8.20	0.71	4.62	0.008	0.098	0.090	0.098	835
UP Argo	8.58	0.74	4.96	0.008	0.100	0.092	0.100	855
<b>Total</b>	<b>109.6</b>	<b>9.4</b>	<b>61.2</b>	<b>0.1</b>	<b>1.3</b>	<b>1.2</b>	<b>1.3</b>	<b>11,261</b>

Tables 7.5 and 7.6 present the contribution between running (driving) and idling port emissions for heavy-duty trucks.

**Table 7.5: 2011 Total HDV Port Emissions - Driving by Terminal, tpy**

Terminal ID	Total Miles	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
PSS070	301,444	4.12	0.31	1.65	0.005	0.062	0.057	0.062	533
PSS050	1,126,416	15.38	1.17	6.15	0.019	0.233	0.214	0.233	1,991
PSS060	168,562	2.30	0.18	0.92	0.003	0.035	0.032	0.035	298
PSS080	320,268	4.37	0.33	1.75	0.005	0.066	0.061	0.066	566
PSS030	19,240	0.30	0.02	0.15	0.000	0.004	0.004	0.004	34
PSS020A	na	na	na	na	na	na	na	na	na
PSS020B	na	na	na	na	na	na	na	na	na
PST070	25,704	0.35	0.03	0.14	0.000	0.005	0.005	0.005	45
PST030	51,937	0.81	0.07	0.39	0.001	0.011	0.010	0.011	92
PST050	144,300	1.97	0.15	0.79	0.002	0.030	0.027	0.030	255
PST020	137,280	1.87	0.14	0.75	0.002	0.028	0.026	0.028	243
PST040	63,158	0.86	0.07	0.35	0.001	0.013	0.012	0.013	112
PST060	194,266	2.65	0.20	1.06	0.003	0.040	0.037	0.040	343
PST100	78,000	0.90	0.06	0.25	0.001	0.016	0.015	0.016	138
PST010	1,795	0.03	0.00	0.02	0.000	0.000	0.000	0.000	3
PST090	2,031	0.03	0.00	0.01	0.000	0.000	0.000	0.000	4
PST120	4,500	0.08	0.01	0.05	0.000	0.001	0.001	0.001	8
PST110	2,430	0.04	0.00	0.02	0.000	0.001	0.000	0.001	4
PST130	15,840	0.29	0.03	0.17	0.000	0.003	0.003	0.003	28
PSA010	1,999	0.04	0.00	0.02	0.000	0.000	0.000	0.000	4
PSE010	4,025	0.07	0.01	0.03	0.000	0.001	0.001	0.001	7
PSO010	1,902	0.04	0.00	0.02	0.000	0.000	0.000	0.000	3
BNSF SIG	217,264	2.97	0.23	1.19	0.004	0.045	0.041	0.045	384
UP Argo	193,333	2.64	0.20	1.06	0.003	0.040	0.037	0.040	342
<b>Total</b>	<b>3,075,692</b>	<b>42.1</b>	<b>3.2</b>	<b>16.9</b>	<b>0.05</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>	<b>5,438</b>



Table 7.6: 2011 Total HDV Port Emissions - Idling by Terminal, tpy

Terminal ID	Total Hours	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
PSS070	195,939	10.04	0.92	6.59	0.008	0.101	0.093	0.101	866
PSS050	437,693	22.42	2.05	14.72	0.018	0.226	0.208	0.226	1,934
PSS060	42,584	2.18	0.20	1.43	0.002	0.022	0.020	0.022	188
PSS080	134,513	6.89	0.63	4.52	0.006	0.070	0.064	0.070	595
PSS030	5,002	0.26	0.02	0.17	0.000	0.003	0.002	0.003	22
PSS020A	1,125	0.05	0.00	0.03	0.000	0.000	0.000	0.000	7
PSS020B	530	0.02	0.00	0.01	0.000	0.000	0.000	0.000	3
PST070	23,868	1.22	0.11	0.80	0.001	0.012	0.011	0.012	106
PST030	31,162	1.60	0.15	1.05	0.001	0.016	0.015	0.016	138
PST050	56,277	2.88	0.26	1.89	0.002	0.029	0.027	0.029	249
PST020	70,720	3.62	0.33	2.38	0.003	0.037	0.034	0.037	313
PST040	19,505	1.00	0.09	0.66	0.001	0.010	0.009	0.010	86
PST060	55,867	2.86	0.26	1.88	0.002	0.029	0.027	0.029	247
PST100	6,750	0.35	0.03	0.23	0.000	0.003	0.003	0.003	30
PST010	718	0.04	0.00	0.02	0.000	0.000	0.000	0.000	3
PST090	1,300	0.07	0.01	0.04	0.000	0.001	0.001	0.001	6
PST120	1,650	0.08	0.01	0.06	0.000	0.001	0.001	0.001	7
PST110	3,746	0.19	0.02	0.13	0.000	0.002	0.002	0.002	17
PST130	6,732	0.34	0.03	0.23	0.000	0.003	0.003	0.003	30
PSA010	1,119	0.06	0.01	0.04	0.000	0.001	0.001	0.001	5
PSE010	1,006	0.05	0.00	0.03	0.000	0.001	0.000	0.001	4
PSO010	1,065	0.05	0.00	0.04	0.000	0.001	0.001	0.001	5
BNSF SIG	102,114	5.23	0.48	3.43	0.004	0.053	0.049	0.053	451
UP Argo	116,000	5.94	0.54	3.90	0.005	0.060	0.055	0.060	513
<b>Total</b>	<b>1,316,985</b>	<b>67.4</b>	<b>6.2</b>	<b>44.3</b>	<b>0.1</b>	<b>0.7</b>	<b>0.6</b>	<b>0.7</b>	<b>5,824</b>

7.7.2 HDV Airshed Emissions – Exclusive of Port Emissions

The PSRC estimated Class 8 heavy-duty vehicles emissions using MOBILE6.2 for the following pollutants: NO<sub>x</sub>, VOC, CO, SO<sub>2</sub>, CO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>. DPM estimates were not directly calculated by the model, but are considered equal to the PM<sub>10</sub> values because all particulate matter emitted from diesel engines is DPM. Table 7.7 provides the estimated annual emissions for the total port-related on-road HDV activity by county, while Table 7.8 summarizes the total airshed emissions by clean air agency region. The data provided by the PSRC assumes that port-related on-road HDV activity occurs seven days per week/365 days per year. In general, cargo terminals in the Puget Sound region operate only five days per week/260 days per year and operate on nights and weekends on an as-needed basis. The assumption of 365 days of activity results in a very conservative estimate of port-related on-road HDV activity in the Puget Sound region. The number of days of port-related on-road HDV activity was not scaled back in order to maintain consistency between the WDOE and PSRC data sets.

**Table 7.7: 2011 Total HDV Airshed Emissions by County Exclusive of Port Emissions, tpy**

County	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Clallam	27.9	1.7	7.6	0.0	0.7	0.5	0.7	4,558
Island	25.2	1.5	6.8	0.0	0.6	0.5	0.6	4,113
Jefferson	19.8	1.2	5.4	0.0	0.5	0.4	0.5	3,227
King	1,026.3	61.6	278.1	1.6	24.7	19.5	24.7	167,441
Kitsap	99.8	6.0	27.0	0.2	2.4	1.9	2.4	16,279
Mason	27.0	1.6	7.3	0.0	0.6	0.5	0.6	4,402
Pierce	377.0	22.6	102.1	0.6	9.1	7.2	9.1	61,496
San Juan	2.1	0.1	0.6	0.0	0.0	0.0	0.0	335
Skagit	75.9	4.6	20.6	0.1	1.8	1.4	1.8	12,391
Snohomish	327.6	19.7	88.8	0.5	7.9	6.2	7.9	53,447
Thurston	135.4	8.1	36.7	0.2	3.3	2.6	3.3	22,096
Whatcom	86.0	5.2	23.3	0.1	2.1	1.6	2.1	14,024
<b>Total</b>	<b>2,230</b>	<b>134</b>	<b>604</b>	<b>3</b>	<b>54</b>	<b>42</b>	<b>54</b>	<b>363,809</b>

**Table 7.8: Distribution of 2011 Total HDV Airshed Emissions by Clean Air Agency  
Exclusive of Port Emissions, tpy**

Region	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
NWCAA	189.2	11.4	51.3	0.2	4.5	3.5	4.5	30,863
ORCAA	210.1	12.6	57.0	0.2	5.1	4.0	5.1	34,283
PSCAA	1,830.7	109.9	496.0	2.9	44.1	34.8	44.1	298,663
<b>Total</b>	<b>2,230</b>	<b>134</b>	<b>604</b>	<b>3</b>	<b>54</b>	<b>42</b>	<b>54</b>	<b>363,809</b>

### 7.8 Emission Comparison, 2011 vs 2005

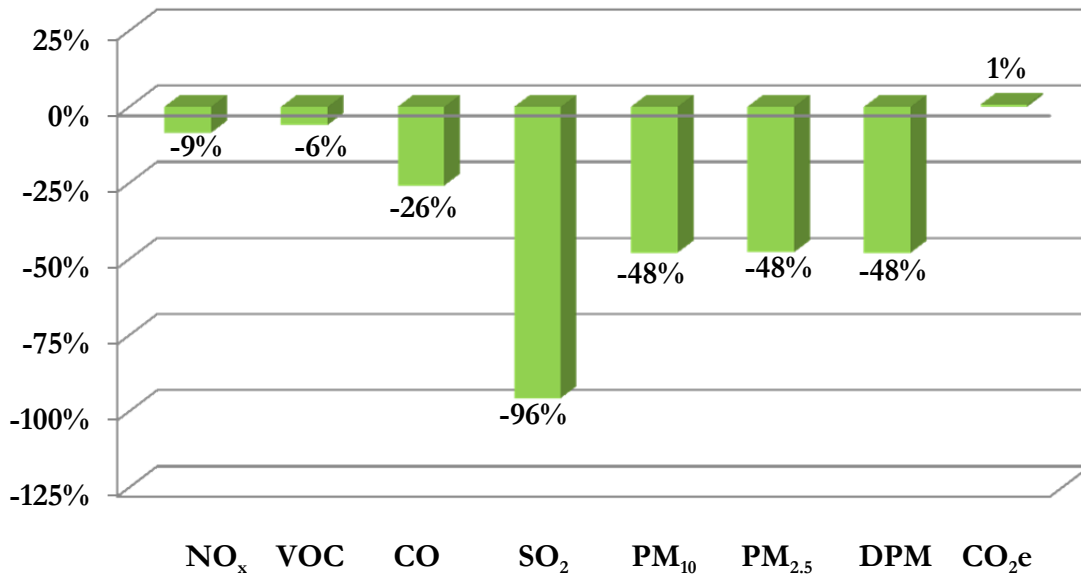
In this section, emissions in 2011 are compared back to emissions estimated in the 2005 inventory. Because of changes in estimating methodologies, adjustments have been made to the 2005 emission estimates to place them on an even footing with the 2011 estimates and allow for reasonably reliable comparisons. For this reason, the 2005 emissions displayed in the following tables do not correspond directly with the numbers in the 2005 PSEI report. The use of port-specific model year information instead of the state-wide distribution has not been accounted for, because there is no information on the actual 2005 model year distribution of trucks calling at the ports.

The 2011 vs 2005 comparison for total port heavy-duty vehicle emissions is summarized in Table 7.9 and the change 2011 vs 2005 is presented in Figure 7.6. With the exception of CO<sub>2e</sub> emissions, emissions in 2011 were lower than 2005 emissions by 6% to 96%. The on-terminal emissions are lower primarily due to the use of ULSD fuel and changes in the truck fleet caused by turnover during the six years between inventories and the “clean truck” programs implemented by the Ports of Tacoma and Seattle. The changes include both fewer old trucks and the presence of 2007 and newer trucks that were not on the market in 2005.

**Table 7.9: 2011 vs 2005 Total HDV Port Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	109.6	9.4	61.2	0.1	1.3	1.2	1.3	11,262
2005	119.9	10.0	82.6	2.3	2.5	2.3	2.5	11,178
<b>Change, tpy</b>	<b>-10.3</b>	<b>-0.6</b>	<b>-21.4</b>	<b>-2.2</b>	<b>-1.2</b>	<b>-1.1</b>	<b>-1.2</b>	<b>83</b>
<b>Change, %</b>	<b>-9%</b>	<b>-6%</b>	<b>-26%</b>	<b>-96%</b>	<b>-48%</b>	<b>-48%</b>	<b>-48%</b>	<b>1%</b>

Figure 7.6: 2011 vs 2005 Total HDV Port Emissions Change



On-terminal activity is fairly similar between the two years, as presented in Table 7.10. The VMT was 4% higher in 2011 than in 2005 and the total idling time was 3% lower. These relatively minor levels of change are reflected in the minimal 1% increase in CO<sub>2</sub>e emissions, since there has been little change in the fuel efficiency of on-road trucks over the past few years, and CO<sub>2</sub> emissions are directly related to fuel consumption.

Table 7.10: 2011 vs 2005 Total HDV Port VMT and Idling Hours Comparison

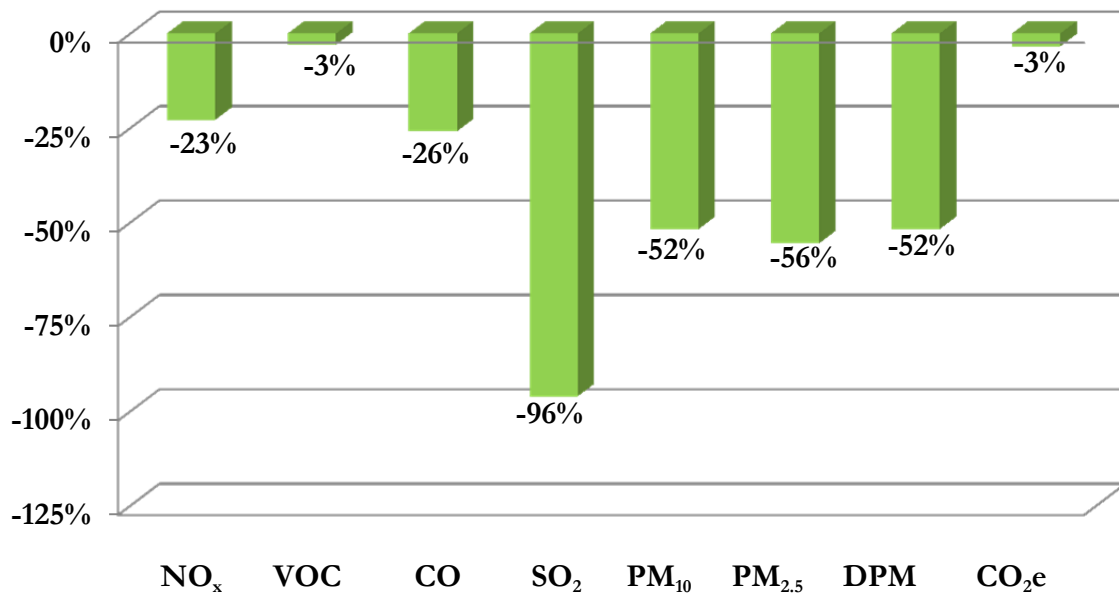
Year	VMT	Idling Hours
2011	3,075,692	1,316,985
2005	2,955,210	1,351,468
<b>Change, tpy</b>	<b>120,482</b>	<b>-34,483</b>
<b>Change, %</b>	<b>4%</b>	<b>-3%</b>

The 2011 vs 2005 comparison for on-road heavy-duty vehicle airshed emissions is summarized in Table 7.11. All of the pollutant emissions in 2011 were lower than in 2005. The substantial reduction in SO<sub>2</sub> emissions was due to the use of ULSD. Particulate emissions decreased due to the ports' clean truck programs, the effects of fleet turnover, and the use of ULSD.

**Table 7.11: 2011 vs 2005 Total HDV Airshed Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	2,230	134	604	3	54	42	54	363,809
2005	2,892	138	816	84	112	95	112	376,668
<b>Change, tpy</b>	<b>-662</b>	<b>-4</b>	<b>-212</b>	<b>-81</b>	<b>-58</b>	<b>-53</b>	<b>-58</b>	<b>-12,859</b>
<b>Change, %</b>	<b>-23%</b>	<b>-3%</b>	<b>-26%</b>	<b>-96%</b>	<b>-52%</b>	<b>-56%</b>	<b>-52%</b>	<b>-3%</b>

**Figure 7.7: 2011 vs 2005 Total Airshed HDV Emissions Change**



The 2011 and 2005 comparison for the total port and airshed, port-related heavy-duty vehicle emissions for Puget Sound is summarized in Table 7.12. In 2011, emissions decreased for all pollutants as compared to 2005.

**Table 7.12: 2011 vs 2005 Total HDV Port and Airshed Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	2,340	143	666	3	55	44	55	375,071
2005	3,010	148	896	87	114	98	114	387,633
<b>Change, tpy</b>	<b>-670</b>	<b>-5</b>	<b>-231</b>	<b>-83</b>	<b>-59</b>	<b>-54</b>	<b>-59</b>	<b>-12,562</b>
<b>Change, %</b>	<b>-22%</b>	<b>-3%</b>	<b>-26%</b>	<b>-96%</b>	<b>-52%</b>	<b>-55%</b>	<b>-52%</b>	<b>-3%</b>

**Figure 7.8: 2011 vs 2005 Total HDV Port and Airshed Emissions Change**

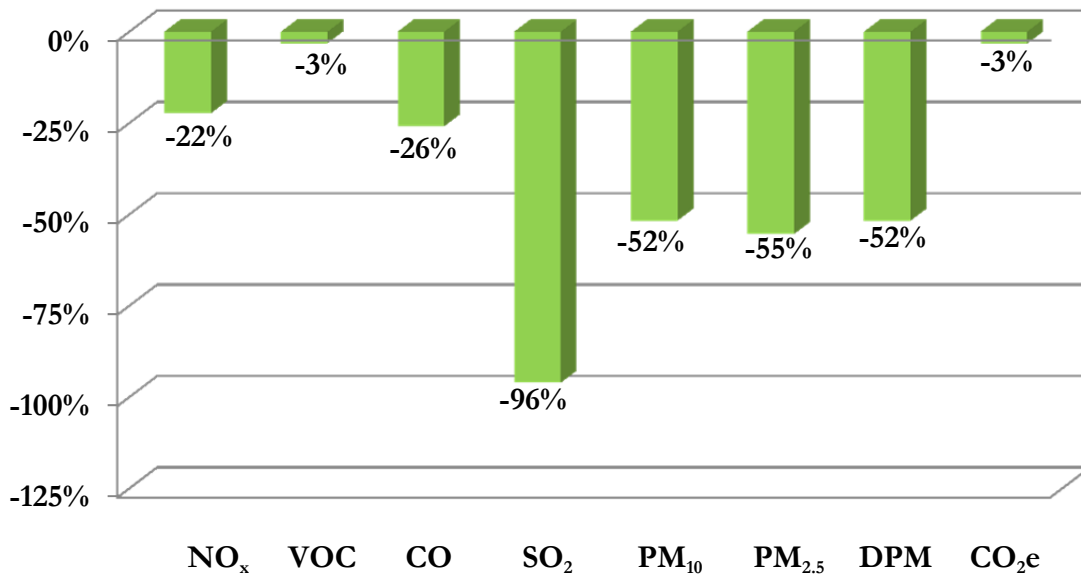
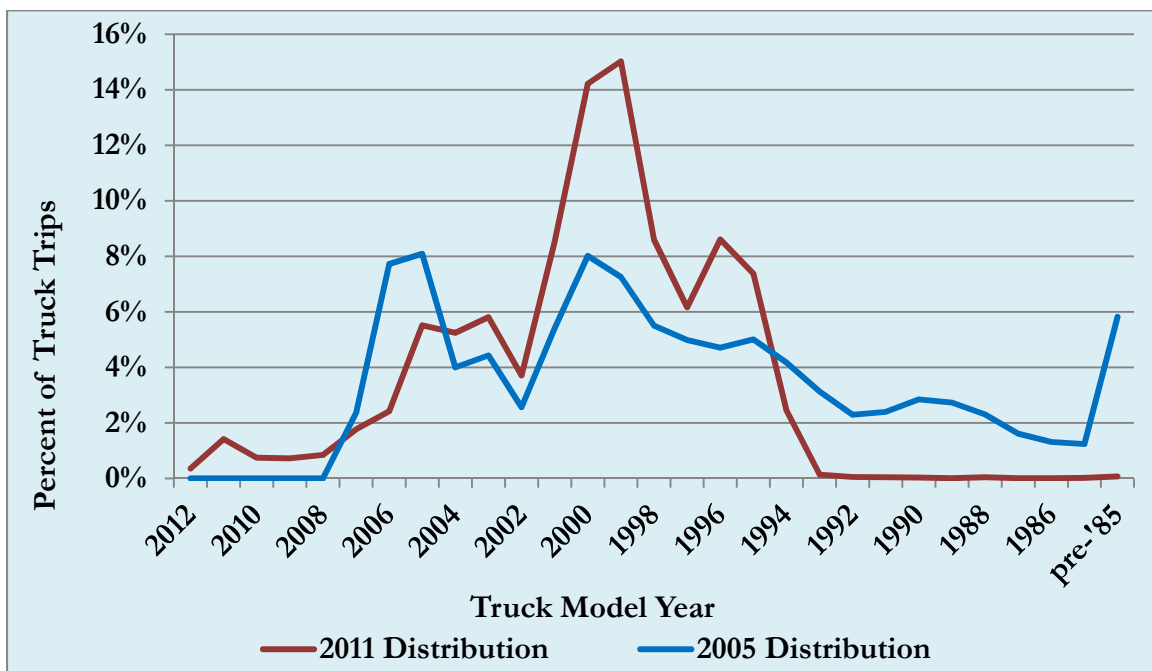


Figure 7.9 illustrates the differences in the heavy-duty vehicle model year distributions used for the 2011 and 2005 emissions inventories. Because the port truck-specific information was not available in 2005, the distribution was a general distribution of heavy-duty trucks operating in the Puget Sound area, not specific to port trucks. In 2011, the Ports of Seattle, Tacoma, and Olympia provided model year distribution information specific to trucks that called at the marine terminal truck gates at ports, providing a more accurate depiction of the distribution of port trucks by model year. It is apparent in the figure that the 2005 distribution included more gate calls by the older, high-emitting, pre-1994 trucks that have since been subject to the ports' truck programs. Albeit in small percentages, some much cleaner 2007 and newer trucks showed up in the 2011 distribution. These differences account for most of the reductions seen in the emission comparisons between 2011 and 2005.

Figure 7.9: 2011 and 2005 HDV Age Distributions







## SECTION 8 FLEET VEHICLES

Section 8 provides an overview of the fleet vehicle source category, which consists primarily of light-duty vehicles and some on-terminal heavy-duty vehicles. A description of the methodology used to estimate emissions is provided in this section, as well as the emission estimates for this source category.

### 8.1 Source Description

There are three categories of fleet vehicles that are included in the inventory, consistent with the 2005 approach:

- Terminal fleet vehicles - terminal-related vehicles owned and/or operated by the terminal operators and a Port that spend most of their time on the terminals and includes light-duty and heavy-duty vehicles. These vehicles include fueling trucks, shuttle/passenger, terminal cars/trucks, maintenance trucks, etc. Cargo related heavy-duty vehicles are reported in Section 7.
- Cruise terminal vehicles – vehicles that are found on cruise terminals which include privately owned vehicles owned by cruise passengers and commercial minivans picking up and dropping passengers. These are typically light-duty vehicles.
- Import/export vehicles - New import or export vehicles driven on or off ocean-going vessels at Port of Tacoma's Marshall Avenue Auto Terminal. These are typically passenger vehicles and light-duty trucks.

This section does not include emissions from:

- Commercial buses and taxis that drop off or pick up passengers at the cruise terminals. Commercial bus idling on or near cruise terminals associated the drop-off or pick-up of cruise passengers is reported in Section 7.
- Heavy-duty trucks that transport the new import or export vehicles to/from the Marshall Auto Terminal (reported in Section 7).
- Employee personal vehicles

The following marine terminals and facilities were included in the inventory:

- Port of Anacortes – terminal fleet vehicles
- Port of Everett – terminal fleet vehicles
- Port of Olympia – terminal fleet vehicles
- Port of Seattle – terminal fleet vehicles and cruise terminal vehicles
- Port of Tacoma – terminal fleet vehicles and import/export vehicles

## **8.2 Geographical Delineation**

The geographical extent for fleet vehicles is described below:

- Terminal fleet vehicles – on-terminal
- Cruise terminal vehicles – on-terminal and for Pier 66 adjacent related areas
- Import/export vehicles – on-terminal

## **8.3 Data and Information Acquisition**

The data collection approach focused on VMT in the geographical extents described in Section 8.2.

To determine activity for terminal fleet vehicles, one of two methods were used: 1) combining annual hours of operation and on-terminal speed limits to determine VMT or 2) reported VMT. For vehicles with no data available, VMT for other similar vehicles that had data were averaged and the averaged VMT was used. Please refer to section 8.4.1 for more information on terminal fleet vehicles.

To determine activity for cruise terminal vehicles, the following data was used: total passenger count and cruise ship call data by terminal. Please refer to section 8.4.2 for further information on cruise terminal vehicles.

To determine activity for import/export vehicles the following data was used: the annual vehicle throughput and average miles traveled on-terminal was collected. Please refer to section 8.4.3 for the count of import/export vehicles for 2011.

## **8.4 Operational Profiles**

Operational profiles are described in the following subsections:

- 8.4.1 Terminal fleet vehicles
- 8.4.2 Cruise terminal vehicles
- 8.4.3 Import/export vehicles

8.4.1 Terminal Fleet Vehicles

Terminal fleet vehicles consist of 805 passenger cars and trucks with a model year range of 1969 to 2012 (average model year, 2000). The 2011 mileage per vehicle ranged from zero to 40,665, with an inventory-wide average of 4,570. Table 8.1 shows the breakdown of the terminal fleet vehicles by terminal, number of vehicles, model year range and average, and fuel type.

Table 8.1: 2011 Terminal Fleet Vehicle Characteristics

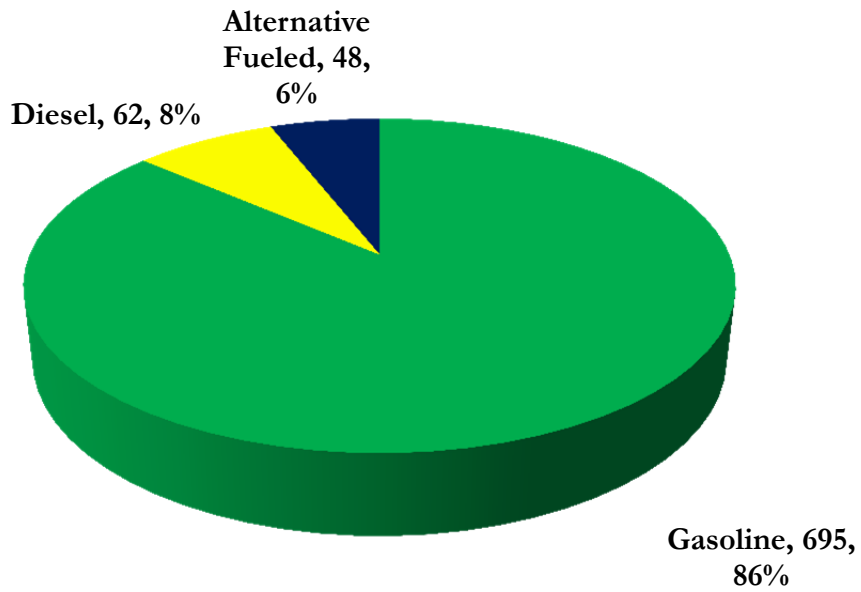
Terminal ID	Count	Fuel/Engine Type							Model Year		
		Gasoline	Diesel	Biodiesel	Hybrid	CNG	Propane	Electric	Min	Max	Avg
PSA010	12	12	0	0	0	0	0	0	1970	2011	1997
PSE010	65	64	1	0	0	0	0	0	1978	2008	1996
PSO010	14	14	0	0	0	0	0	0	1969	2005	1992
PSS010	214	162	5	26	18	2	0	1	1990	2012	2001
PSS050	126	115	11	0	0	0	0	0	1979	2007	1999
PSS060	9	9	0	0	0	0	0	0	1994	2006	2001
PSS080	55	55	0	0	0	0	0	0	1998	2008	2006
PST010	101	100	0	0	0	0	1	0	1979	2010	2001
PST020	33	31	2	0	0	0	0	0	2000	2005	2004
PST030	32	30	2	0	0	0	0	0	1979	2008	2000
PST040	21	3	18	0	0	0	0	0	1977	2004	1986
PST050	29	29	0	0	0	0	0	0	1990	2008	2004
PST055	4	4	0	0	0	0	0	0	1983	2004	1995
PST060	48	39	9	0	0	0	0	0	1999	2008	2004
PST070	14	14	0	0	0	0	0	0	1989	2007	1999
PST080	2	2	0	0	0	0	0	0	1998	2009	2004
PST100	5	5	0	0	0	0	0	0	2000	2005	2003
PST120	3	0	3	0	0	0	0	0	2000	2008	2004
PST130	5	1	4	0	0	0	0	0	1979	2010	2001
BNSF SIG Yard	13	6	7	0	0	0	0	0	1997	2008	2001
<b>Total</b>	<b>805</b>	<b>695</b>	<b>62</b>	<b>26</b>	<b>18</b>	<b>2</b>	<b>1</b>	<b>1</b>			

Table 8.2 and Figure 8.1 presents, the fuel-type distribution of terminal fleet vehicles inventoried.

**Table 8.2: 2011 Terminal Fleet Vehicle Count by Fuel Type**

Fuel Type	Count
Gasoline	695
Diesel, ULSD	62
Biodiesel, B20	26
Hybrid, gasoline	18
CNG	2
Propane	1
Electric	1

**Figure 8.1: 2011 Terminal Fleet Vehicle Fuel Type Distribution**



#### 8.4.2 Cruise Terminal Vehicles

There are two terminals that have associated cruise terminal vehicles are Port of Seattle's Pier 66 and Terminal 91.

A total of 885,949 passengers passed through the Port of Seattle cruise terminals in 2011 for 195 vessel cruises. It was assumed that 40%<sup>59</sup> of the passengers used personal vehicles (rather than commercial transportation) to get to the cruise terminals, and that each personal vehicle carried an average of three persons, for a total of 118,127 vehicles. Of the 195 cruises, 63 trips (32%) were from Pier 66 and 132 trips (68%) were from Terminal 91, thus 37,800 vehicles were assigned to Pier 66 and 80,326 vehicles were assigned to Terminal 91.

In addition to the passenger-owned vehicles, commercial minivans used to transport passengers were included in the inventory. It was estimated that there were 240 commercial minivan trips in 2011 and the distance traveled on-terminal (Pier 91) or adjacent to the terminal (Pier 66) was estimated to be 0.25 miles, with a speed of 15 mph. All commercial minivans were assumed to be gasoline-fueled.

It should be noted that all off-terminal vehicle miles traveled and associated emissions are accounted for by the PSRC and regional clean air agencies in their area emissions inventories. Annual trips related to cruise operations are a very small fraction of total regional vehicle miles traveled and thus are not calculated separately in this inventory.

#### 8.4.3. Import/Export Vehicles

The Port of Tacoma Marshall Avenue Auto Terminal 2011 throughput was 162,434 vehicles. Model years were assumed to be 2011 or later, and the vehicles were estimated to be driven two miles each. Ninety nine percent of the vehicles were assumed to be cars and one percent of the vehicles were assumed to be light trucks, as reported by the Port. All vehicles were assumed to be gasoline fueled.

### 8.5 Emission Reduction Technologies Identified

Approximately six percent of the terminal fleet vehicles (48) are alternatively fueled and thus emission benefits overall are anticipated to be nominal. The alternatively fueled terminal fleet vehicles included: 26 vehicles that use biodiesel, 18 hybrid vehicles, 1 electric vehicle, 2 vehicles that use natural gas and 1 propane.

---

<sup>59</sup>Consistent with data reported by Heffron Transportation, Inc., *Transportation Technical Report for Draft EIS Cruise Terminal at Terminal 91*, 14 September 2006.

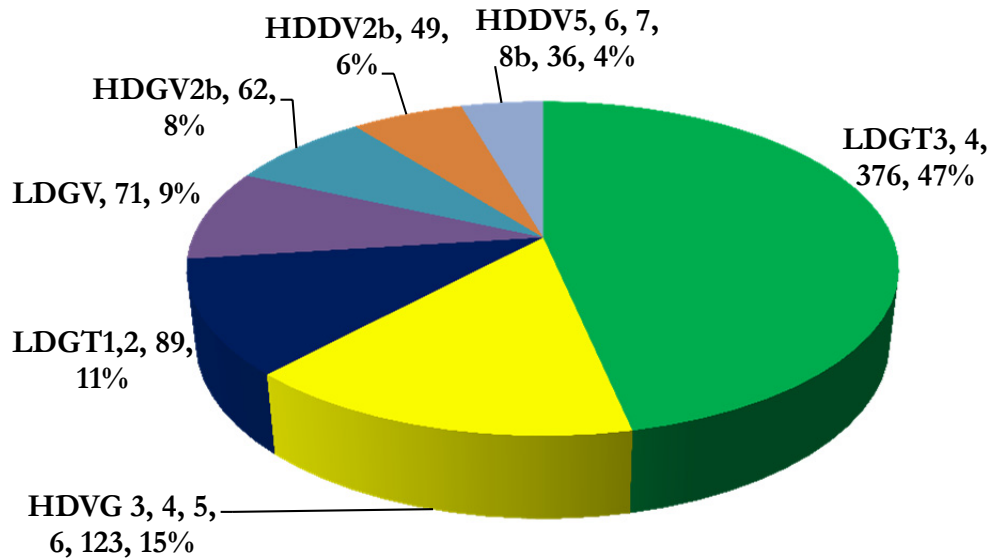
### 8.6 Emissions Estimating Methodology

The EPA MOBILE6.2 model was used to calculate vehicle emissions as described in Section 7.6. Table 8.3 and Figure 8.2 presents the 2012 terminal fleet vehicles types based on the MOBILE 6.2 vehicle classifications.

**Table 8.3: 2011 Terminal Fleet Vehicle MOBILE6.2 Classifications**

Vehicle Classification	GVWR (lbs)	Model Abbreviation	Count
Light-Duty Gasoline Trucks	6,001 to 8,500	LDGT3 and 4	376
Light-Duty Gasoline Trucks	0 – 6,000	LDGT1 and 2	89
Heavy-Duty Gasoline Vehicles	8,501 – 10,000	HDGV2b	62
Light-Duty Gasoline Vehicles	Passenger Cars	LDGV	71
Heavy-Duty Gasoline Vehicles	10,001 – 26,000	HDGV3, 4, 5 and 6	123
Heavy-Duty Diesel Vehicles	16,001 – 33,000	HDDV5, 6, 7 and 8b	36
Heavy-Duty Diesel Vehicles	8,501 – 10,000	HDDV2b	49

**Figure 8.2: 2011 Terminal Fleet Vehicle MOBILE6.2 Classifications**



While detailed information was not available for all terminal fleet vehicles, approximately 47% percent of these vehicles are light-duty gasoline fueled trucks with GVWR of 6,001-8,500 lbs. Approximately 11% are similar, but smaller, trucks with a GVWR of up to 6,000 lbs. About 15% are heavy-duty gasoline fueled vehicles with a GVWR of 10,001 – 26,000 lbs. Approximately 9% percent of the vehicles are passenger cars, and the remainder of the fleet consists of heavy-duty vehicles, both gasoline and diesel-fueled.

Thirty-nine terminal fleet vehicles (less than 5% of the total) had model years ranging from 1969 to 1986. These model years were reassigned to 1987, the earliest year that MOBILE6.2 can accommodate, since the model includes only the previous 25 years.

For cruise terminal vehicle, MOBILE6.2 was used to compute a fleet average emission rate for each pollutant, since vehicle model years were not available. These composite factors are weighted averages of the emission factors associated with the model years in the registration data provided by the Seattle Department of Transportation.

The emission factors for nitrous oxides (N<sub>2</sub>O) and methane (CH<sub>4</sub>) are presented in Tables 8.4 (alternative fuels) and 8.5 (gasoline and diesel fuels).<sup>60</sup>

**Table 8.4: Alternative Fueled LDV and HDV Emissions Factors for N<sub>2</sub>O and CH<sub>4</sub>, g/mile**

Vehicle Type	Fuel Type	N <sub>2</sub> O	CH <sub>4</sub>
LDV	Propane	0.008	0.038
LDV	Ethanol	0.076	0.043
HDV	Propane	0.150	0.108

**Table 8.5: Gasoline and Diesel Fueled LDV and HDV Emissions Factors for N<sub>2</sub>O and CH<sub>4</sub>, g/mile**

Model Year	Light-Duty Vehicles				Heavy-Duty Vehicles					
	Gasoline		Diesel		Gasoline		Diesel			
	Passenger Car	LDV	Passenger Car	LDV	All	All	All	All	All	All
	N <sub>2</sub> O	CH <sub>4</sub>	N <sub>2</sub> O	CH <sub>4</sub>	N <sub>2</sub> O	CH <sub>4</sub>	N <sub>2</sub> O	CH <sub>4</sub>	N <sub>2</sub> O	CH <sub>4</sub>
2004-2011	0.0036	0.0173	0.0066	0.0163	0.015	0.0105	0.0134	0.0333	0.0048	0.0051
1994-2003	0.0429	0.0271	0.0871	0.0452	na	na	0.175	0.0655	0.0048	0.0051
1987-1993	0.0647	0.0704	0.1056	0.0776	na	na	0.2135	0.263	0.0048	0.0051

<sup>60</sup>EPA 2006.

## 8.7 Emission Estimates

This section summarizes fleet vehicle related emissions as described above. The 2011 Terminal fleet and cruise terminal vehicles emissions are presented in Table 8.6.

**Table 8.6: 2011 Total Terminal Fleet Vehicle Emissions by Terminal, tpy**

Terminal	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
PSA010	0.06	0.04	0.40	0.000	0.001	0.001	0.000	22
PSE010	0.79	0.80	7.38	0.005	0.009	0.008	0.002	273
PSO010	0.01	0.00	0.03	0.000	0.000	0.000	0.000	2
PSS050	1.32	0.63	6.79	0.007	0.020	0.018	0.014	403
PSS060	0.04	0.02	0.30	0.000	0.000	0.000	0.000	20
PSS080	0.16	0.08	1.50	0.004	0.002	0.001	0.000	220
BNSF SIG Yard	0.17	0.03	0.38	0.001	0.003	0.003	0.002	50
PSS020	0.01	0.01	0.13	0.000	0.000	0.000	0.000	5
PSS010	1.12	0.23	3.62	0.007	0.013	0.012	0.003	405
PST050	0.18	0.08	1.80	0.004	0.003	0.003	0.000	192
PST080	0.03	0.00	0.07	0.000	0.000	0.000	0.000	16
PST120	0.02	0.00	0.01	0.000	0.001	0.001	0.001	6
PST055	0.01	0.00	0.03	0.000	0.000	0.000	0.000	2
PST030	0.12	0.07	0.84	0.001	0.001	0.001	0.000	47
PST130	0.12	0.02	0.20	0.001	0.001	0.001	0.000	56
PST070	0.02	0.01	0.10	0.000	0.000	0.000	0.000	6
PST020	0.07	0.03	0.52	0.001	0.001	0.001	0.000	39
PST100	0.03	0.01	0.18	0.000	0.000	0.000	0.000	14
PST040	0.14	0.04	0.25	0.000	0.007	0.006	0.007	12
PST010	0.71	0.33	4.37	0.006	0.007	0.007	0.000	321
PST060	1.34	0.35	5.56	0.012	0.022	0.020	0.014	719
<b>Total</b>	<b>6.4</b>	<b>2.8</b>	<b>34.5</b>	<b>0.048</b>	<b>0.090</b>	<b>0.083</b>	<b>0.042</b>	<b>2,828</b>



Table 8.7 presents the import/export vehicle emissions for the Port of Tacoma's Marshall Avenue Auto Terminal.

**Table 8.7: 2011 Import/Export Vehicle Emissions, tpy**

Class	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Cars	0.0076	0.0146	0.1784	0.0024	0.0013	0.0012	0.0000	131
Light trucks	0.0002	0.0002	0.0022	0.0000	0.0000	0.0000	0.0035	2
<b>Total</b>	<b>0.0078</b>	<b>0.0148</b>	<b>0.1806</b>	<b>0.0024</b>	<b>0.0013</b>	<b>0.0012</b>	<b>0.0035</b>	<b>133</b>

### 8.8 Emission Comparison, 2011 vs 2005

The 2011 and 2005 comparison for terminal fleet vehicles and cruise terminal vehicles are summarized in Table 8.8. In 2011, despite an increase in terminal fleet vehicle counts from 2005, there was a reduction for NO<sub>x</sub>, VOC, CO, DPM and GHG emissions. PM and SO<sub>2</sub> emissions increased. The varying emission changes could be due to different fleet mix of gasoline, propane and diesel powered vehicles as compared to 2005 based on a more complete data set in 2011. The reductions are due to a newer and cleaner fleet and use of hybrid vehicles and alternative fuel, such as biodiesel.

**Table 8.8: Terminal Fleet Vehicle 2011 vs 2005 Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	6.4	2.8	34.5	0.048	0.090	0.083	0.042	2,828
2005	9.8	5.4	49.8	0.039	0.083	0.080	0.079	3,237
<b>Change, tpy</b>	<b>-3.4</b>	<b>-2.6</b>	<b>-15.3</b>	<b>0.009</b>	<b>0.007</b>	<b>0.003</b>	<b>-0.037</b>	<b>-409</b>
<b>Change, %</b>	<b>-34%</b>	<b>-48%</b>	<b>-31%</b>	<b>24%</b>	<b>8%</b>	<b>3%</b>	<b>-47%</b>	<b>-13%</b>

Table 8.9 summarizes the terminal fleet vehicle count and there was a 31% increase in 2011 as compared to 2005. In particular, the vehicle fleet's count increased 16% for the Port of Seattle and 38% for the Port of Tacoma.

**Table 8.9: Terminal Fleet Vehicle 2011 vs 2005 Count Comparison**

Year	Fleet Count
2011	805
2005	614
<b>Change</b>	<b>191</b>
<b>Change, %</b>	<b>31%</b>



## **SECTION 9 EMISSIONS COMPARISON BY PORT**

This section summarizes maritime-related emissions associated with the Ports of Everett, Olympia, Seattle, and Tacoma. The Port of Anacortes elected not to provide information relating to cargo throughputs and other data needed for this section; therefore they are not included in Section 9. Comparisons are provided between the 2011 emission estimates and emissions previously estimated for 2005.

For the Port of Everett and Port of Olympia specific comparisons, the source category emissions are tabulated similar to the 2005 report, as follows:

- Port – emissions within port terminals, adjacent rail yards, and adjacent waterways
  - Ocean-going vessel emissions (hotelling and maneuvering activities)
  - Harbor vessel emissions (10% of total recreational vessel emissions related to port-owned marinas – Ports of Everett and Olympia)
  - Cargo handling equipment emissions
  - Locomotive emissions (on-terminal and adjacent rail yards switching activities)
  - Heavy-duty vehicle emissions (queuing and on-terminal activities)
  - Fleet vehicle emissions (on-terminal activities)

The following were not included in the Port of Everett, Port of Olympia, and petroleum facilities summaries:

- Ocean-going vessels transiting mode emissions and emissions from activities that are not directly associated with the operations at port terminals or petroleum facilities.
- Harbor vessel emissions from activities that are not directly associated with the operations at Ports of Everett or Olympia terminals or petroleum facilities.
- Line-haul locomotive emissions (line-haul activities were not identified at these ports).
- Heavy-duty vehicles on-road emissions outside the ports' terminals.

For 2011, the Port of Seattle and Port of Tacoma increased the resolution from the previous report to get a better understanding of port-related emissions allocating them into three geographical zones, compared to one zone in 2005. For comparison purposes the 2011 and 2005 emissions were allocated into the following three geographical zones:

- Port –emissions within port terminals, adjacent rail yards, and adjacent waterways
  - Ocean-going vessel emissions (hotelling and maneuvering activities)
  - Harbor vessel emissions (port-related commercial harbor and government vessel activities)
  - Harbor vessel emissions (10% of total recreational vessel emissions related to port-owned marinas)
  - Cargo handling equipment emissions
  - Locomotive emissions (switching and line haul activities)

- Heavy-duty vehicle emissions (queuing and on-terminal activities)
- Fleet vehicle emissions (on-terminal activities)
  
- Air District – all port-related emissions within PSCAA four county boundary (Pierce, King, Kitsap, and Snohomish Counties)
  - Ocean-going vessel emissions (hotelling, maneuvering, and transit emissions)
  - Harbor vessel emissions (port-related commercial harbor and government vessel activities)
  - Harbor vessel emissions (50% of total recreational vessel emissions related to port-owned marinas)
  - Cargo handling equipment emissions
  - Locomotive emissions
  - Heavy-duty vehicle emissions
  - Fleet vehicle emissions
  
- Airshed – all port-related emissions within the entire emissions inventory domain
  - Ocean-going vessel emissions (hotelling, maneuvering, and transit emissions)
  - Harbor vessel emissions (commercial harbor and government vessel activities)
  - Harbor vessel emissions (100% of the recreational vessel emissions related to port-owned marinas)
  - Cargo handling equipment emissions
  - Locomotive emissions
  - Heavy-duty vehicle emissions
  - Fleet vehicle emissions

The following were not included in the Port of Seattle and Port of Tacoma summaries:

- Ocean-going vessel emissions from activities that are not directly associated with the operations at either the Port of Tacoma or Port of Seattle terminals.
- Harbor vessel emissions from activities that are not directly associated with the operations at either the Port of Tacoma or Port of Seattle terminals

In some cases, the methods used to estimate emissions for a source category or part of a source category in the 2005 PSEI were changed or updated for the 2011 PSEI to reflect improvements in data, methodologies, or calculations. In such cases, the 2005 emissions were recalculated using the 2011 methodology, or otherwise appropriately adjusted to account for the changes, in order to provide a valid basis for comparison. The comparisons are presented as 2011 and 2005 emission estimates in tons per year, the difference between years in tons per year, and the difference as a percentage increase or decrease. The percentage differences are indicative of the trend and magnitude of the changes occurring between 2011 and 2005.

## 9.1 Emissions Calculation and Allocation Methodology Changes

Changes in emission calculation methodologies are discussed below for each source category:

### *Ocean-Going Vessels*

The ocean-going vessel emission calculation methodology used in the 2011 inventory is similar to the methodology used in 2005. The maneuvering and hotelling allocations are slightly different in 2011 due to refinements in the resolution of vessel movements associated with modes of operation, thus the 2005 maneuvering and hotelling allocations were adjusted to match 2011 for comparison.

In 2005, port-related ocean-going vessel emissions were allocated to only to the port zone (in adjacent waters). As mentioned in Sections 2.2 and 9.1, in 2011, the Port of Tacoma and Seattle are reporting port-related emissions in the three geographical zones (port, air district, airshed), which resulted in a refinement of allocating 2005 emissions for each port. The 2005 total ocean-going vessel emissions for each port did not change, only refinements to the allocations based on the new zones.

### *Harbor Vessels*

The commercial harbor vessel emissions for assist tugs, tank barges, and port-owned vessels were included for the respective Port of Seattle and Port of Tacoma comparisons only.

The emissions calculation methodology was similar to the methodology used in 2005, with the exception of updated load factors used in 2011. The load factors for harbor tug, ferry, excursion vessel and workboat were updated in 2011 based on updated information from Washington State Ferries for the ferry load factor, EPA NONROAD for excursion vessel load factor, and the latest POLA and POLB emissions inventories<sup>61</sup> for workboat load factor. For commercial harbor vessel emissions comparison, the 2005 emissions were adjusted for the updated load factor so that the emissions would be comparable.

A similar methodology was used for recreational vessels in 2011 and 2005. The same assumptions for percent of engine type (diesel, gasoline 2-stroke, gasoline 4-stroke) and engine size were used in both inventories. For recreational vessels, NONROAD2008a was used to estimate 2011 and 2005 emissions. This was done to allow for a direct comparison.

In 2005, port-related commercial harbor and government vessels were not included in the port specific breakouts. For 2011, the port-related commercial harbor and government vessel emissions are allocated within the applicable new geographical zones.

For recreational vessels, in 2005 all recreational vessel emissions from port-owned marinas were included with the specific port-related emissions. For 2011, recreational vessels from port owned marinas are broken out by the newly redefined geographical zones, as applicable and described above in Section 9.1, to make more direct comparisons within each zone.

---

<sup>61</sup> POLA: [http://www.portoflosangeles.org/pdf/2011\\_Air\\_Emissions\\_Inventory.pdf](http://www.portoflosangeles.org/pdf/2011_Air_Emissions_Inventory.pdf)  
POLB: <http://www.polb.com/civica/filebank/blobload.asp?BlobID=10194>

### *Cargo Handling Equipment*

The cargo handling equipment emission calculation methodology used in the 2011 inventory is similar to the methodology used in 2005. The one exception is the load factor used for diesel yard tractors. The 0.59 EPA NONROAD load factor was used in the 2005 EI and 0.39 was used in the 2011 EI based on a 2008 study of yard tractors operating in a port environment.<sup>62</sup> Thus, the 2005 emissions were re-calculated using the 2011 load factor for diesel yard tractors in order for the 2011 and 2005 emissions to be comparable.

There were no allocation changes for cargo handling equipment as the equipment does not operate outside the terminals.

### *Locomotives*

The only change in the locomotive emission calculation methodology used in the 2011 inventory as compared to the 2005 methodology is the use of an updated value for brake-specific fuel consumption (BSFC) that affects the estimates of CO<sub>2</sub> emissions. The EPA published an updated emission factor document in April 2009<sup>63</sup>. That document includes a different value for BSFC from the value used for the 2005 PSEI, which was based on prior EPA guidance. The result of the change is higher estimates of CO<sub>2</sub> emissions from switching locomotives than that in the 2005 PSEI report.

Allocations for 2005 did not change and 2011 port-related locomotive emissions for Port of Tacoma and Port of Seattle we allocated into the three geographic zones.

### *Heavy-Duty Vehicles*

Two changes were made to the emission calculation methodology for HDVs used in the 2011 inventory as compared to the 2005 methodology. One was an adjustment to on-road emission estimates to account for differences in the current regional travel demand model used by the PSRC to estimate on-road activity and emissions. The other was emission factor adjustments made to account for differences in the size categories of HDVs included in the composite emission factors. The 2011 emission factors are specific to the heaviest size categories of HDVs that are typical of the trucks that call on port terminals, while the 2005 emission factors had included smaller size categories that are less common in the fleet.

Allocations for 2005 did not change and 2011 port-related heavy-duty vehicle emissions for Port of Tacoma and Port of Seattle we allocated into the three geographic zones.

### *Fleet Vehicles – Terminal Fleet Vehicles*

Terminal fleet vehicles are the only fleet vehicles evaluated in this section as the focus is to look at vehicles residing on the terminals. There is no change in the terminal fleet vehicle emission calculation methodology used in the 2011 inventory as compared to the 2005 methodology.

---

<sup>62</sup> Ports of Los Angeles and Long Beach, *San Pedro Bay Ports Yard Tractor Load Factor Study*, December 2008.

<sup>63</sup> EPA, *Emission Factors for Locomotives*: EPA-420-F-09-025, Office of Transportation and Air Quality, April 2009

## 9.2 Port of Everett

In 2011, the TEU and tonnage in metric tons or tonnes of cargo increased compared to 2005 for the Port of Everett. In 2005, the Port added 3 new international shipping lines and in 2006, the Port recruited and signed an agreement with a cement company. These changes have brought increased activity to the Port and have resulted in TEU throughput doubling since 2005 and almost a 50% increase in cargo tonnage, as presented in Table 9.1.

**Table 9.1: Port of Everett 2011 vs 2005 TEU and Cargo Throughput Comparison**

Year	Container Throughput (TEU)	Cargo Throughput (tonnes)
2011	20,918	152,995
2005	9,561	103,757
<b>Change, %</b>	<b>119%</b>	<b>47%</b>

Metrics are used to track air emissions efficiencies of operations on emissions per unit of cargo throughput basis. Table 9.2 presents a simple metric of tons of emissions (excluding port-related recreational vessels) per 10,000 tonnes of cargo in 2011 and 2005. The port tons of emissions per 10,000 tonnes of cargo decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005.

**Table 9.2: Port of Everett 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	8.73	0.63	2.93	3.52	0.55	0.48	0.51	524
2005	12.17	0.79	3.47	3.88	0.65	0.58	0.57	642
<b>Change (%)</b>	<b>-28%</b>	<b>-20%</b>	<b>-15%</b>	<b>-9%</b>	<b>-15%</b>	<b>-17%</b>	<b>-9%</b>	<b>-18%</b>

The emissions-related efficiency improvements from 2011 vs 2005 range from 9% less DPM/CO emissions to 28% less NO<sub>x</sub>, on a ton of emissions per 10,000 tonnes cargo moved through the port basis. The 2011 vs 2005 emissions-related efficiency changes are presented by pollutant in graphical form in Figure 9.1.

**Figure 9.1: Port of Everett 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Change**

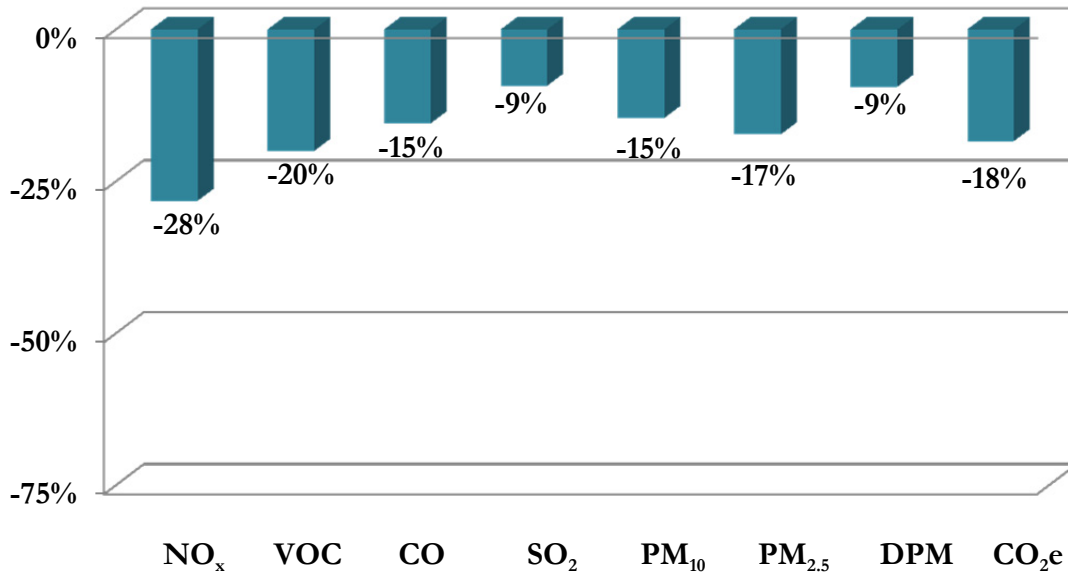




Table 9.3 presents a summary comparison of the 2011 and 2005 emissions by source category, with the 2005 emissions being recalculated or adjusted as discussed in Section 9.1. Each source category's emissions comparison for the Port of Everett is discussed in the following subsections.

**Table 9.3: Port of Everett 2011 vs 2005 Port Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	47.2	1.4	3.8	53.315	3.942	3.154	3.363	3,059
Recreational vessels	7.6	8.4	82.8	0.015	0.184	0.172	0.054	956
Locomotives	62.1	5.0	9.0	0.500	2.200	2.000	2.200	3,298
Cargo handling equipment	23.4	2.4	24.6	0.013	2.300	2.200	2.300	1,375
Heavy-duty vehicles	0.1	0.0	0.1	0.000	0.002	0.001	0.002	12
Terminal fleet vehicles	0.8	0.8	7.4	0.005	0.009	0.008	0.002	273
<b>Total</b>	<b>141.2</b>	<b>18.0</b>	<b>127.7</b>	<b>53.848</b>	<b>8.636</b>	<b>7.534</b>	<b>7.920</b>	<b>8,972</b>
<b>2005</b>								
OGV, hotelling & maneuvering	21.7	0.7	1.7	33.635	2.201	1.761	1.385	1,983
Recreational vessels	7.9	17.2	115.6	0.186	0.350	0.325	0.060	929
Locomotives	79.8	4.6	8.4	4.914	2.028	1.866	2.028	3,057
Cargo handling equipment	23.0	2.4	22.1	1.663	2.456	2.383	2.450	1,406
Heavy-duty vehicles	1.0	0.1	0.7	0.018	0.020	0.019	0.020	90
Terminal fleet vehicles	0.7	0.4	3.1	0.005	0.010	0.010	0.009	126
<b>Total</b>	<b>134.2</b>	<b>25.4</b>	<b>151.6</b>	<b>40.422</b>	<b>7.066</b>	<b>6.363</b>	<b>5.952</b>	<b>7,590</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	117%	114%	121%	59%	79%	79%	143%	54%
Recreational vessels	-4%	-51%	-28%	-92%	-48%	-47%	-10%	3%
Locomotives	-22%	8%	7%	-90%	8%	7%	8%	8%
Cargo handling equipment	2%	1%	11%	-99%	-6%	-8%	-6%	-2%
Heavy-duty vehicles	-88%	-88%	-91%	-100%	-90%	-95%	-90%	-87%
Terminal fleet vehicles	8%	96%	138%	0%	-10%	-20%	-78%	116%
<b>Total</b>	<b>5%</b>	<b>-29%</b>	<b>-16%</b>	<b>33%</b>	<b>22%</b>	<b>18%</b>	<b>33%</b>	<b>18%</b>

*Ocean-Going Vessels*

The hotelling and maneuvering ocean-going vessel emissions at the Port of Everett increased in 2011 as compared to 2005. Table 9.4 presents the OGV emissions comparison for 2011 and 2005. The increase in ocean-going vessel emissions is due to increases in the number of vessel activities and TEU throughput which doubled in 2011 as compared to 2005.

**Table 9.4: Port of Everett 2011 vs 2005 OGV Port Emissions Comparison, tpy**

Emissions	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	47.2	1.4	3.8	53.3	3.9	3.2	3.4	3,059
2005	21.7	0.7	1.7	33.6	2.2	1.8	1.4	1,983
<b>Change, tpy</b>	<b>25.5</b>	<b>0.8</b>	<b>2.1</b>	<b>19.7</b>	<b>1.7</b>	<b>1.4</b>	<b>2.0</b>	<b>1,076</b>
<b>Change, %</b>	<b>117%</b>	<b>114%</b>	<b>121%</b>	<b>59%</b>	<b>79%</b>	<b>79%</b>	<b>143%</b>	<b>54%</b>

The increase in emissions is directly related to the increase in ocean-going vessel activity as presented in Table 9.5. Inbound activity counts are based on MarEx data and only include ocean-going vessel counts arriving directly from sea and shifts from other ports in the inventory domain to the designated port. Barge calls are not included in the ocean-going vessel inbound activity.

**Table 9.5: Port of Everett 2011 vs 2005 OGV Activity Comparison**

Year	OGV
	Inbound Activity
2011	103
2005	47
<b>Change, %</b>	<b>119%</b>

*Harbor Vessels - Recreational Vessels*

Table 9.6 presents the recreational vessel emissions comparison for 2011 vs 2005. Most of the recreational vessel emissions decreased in 2011 when compared to 2005. This change is most likely due to the combination of use of lower sulfur fuel by diesel and gasoline engines and the emissions model assuming a cleaner fleet in 2011 than in 2005. Since there is no detailed information for the recreational vessel engines, the emissions model makes assumptions regarding the fleet mix. EPA has cleaner engine standards for gasoline engines, which reduced VOC, CO and PM in 2011.

For the Port of Everett, recreational vessel count increased 11% in 2011 due to the marina expansion.

**Table 9.6: Port of Everett 2011 vs 2005 Port Recreational Vessels Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	7.6	8.4	82.8	0.02	0.18	0.17	0.05	955.7
2005	7.9	17.2	115.6	0.19	0.35	0.33	0.06	928.7
<b>Change (tpy)</b>	<b>-0.3</b>	<b>-8.8</b>	<b>-32.8</b>	<b>-0.17</b>	<b>-0.17</b>	<b>-0.15</b>	<b>-0.01</b>	<b>27.1</b>
<b>Change (%)</b>	<b>-4%</b>	<b>-51%</b>	<b>-28%</b>	<b>-92%</b>	<b>-48%</b>	<b>-47%</b>	<b>-10%</b>	<b>3%</b>

*Cargo Handling Equipment*

Table 9.7 presents the emissions estimate comparison for calendar year 2011 and 2005 for cargo handling equipment in tons per year and as a percent change. Cargo handling equipment emissions decreased significantly for SO<sub>2</sub> due to the mandated use of ULSD in all diesel equipment. PM emissions also decreased as a result of using ULSD in 2011. Table 9.8 presents the activity and equipment count comparison for calendar year 2011 and 2005 for cargo handling equipment. NO<sub>x</sub>, VOC and CO each had a slight increase in emissions as the result of the activity increase shown in Table 9.8.

**Table 9.7: Port of Everett 2011 vs 2005 Port CHE Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	23.4	2.40	24.6	0.013	2.30	2.20	2.30	1,375
2005	23.0	2.38	22.1	1.663	2.46	2.38	2.45	1,406
<b>Change, tpy</b>	<b>0.4</b>	<b>0.02</b>	<b>2.5</b>	<b>-1.650</b>	<b>-0.16</b>	<b>-0.18</b>	<b>-0.15</b>	<b>-31</b>
<b>Change, %</b>	<b>2%</b>	<b>1%</b>	<b>11%</b>	<b>-99%</b>	<b>-6%</b>	<b>-8%</b>	<b>-6%</b>	<b>-2%</b>

**Table 9.8: Port of Everett 2011 vs 2005 CHE Activity and Equipment Count Comparison**

Year	Activity (hp-hr)	Count
2011	2,222,824	74
2005	2,163,785	62
<b>Change, %</b>	<b>3%</b>	<b>19%</b>

*Locomotives*

Table 9.9 presents the port emissions (on-terminal and adjacent rail yards) estimate comparison for calendar year 2011 and 2005 for switching locomotive emissions in tons per year and as a percent change. The port locomotive emissions are lower for most of the pollutants in 2011 than in 2005 due to a combination of improved fuel efficiency for the locomotives, and use of lower emissions locomotives. The lower emission locomotives are the result of the Class 1 railroads placing newer, lower emission locomotives into service throughout their fleets. CO and greenhouse gas emissions increased in 2011 as compared to 2005 due to increased throughput at the Port of Everett.

**Table 9.9: Port of Everett 2011 vs 2005 Port Locomotive Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	62	5	9	1	2	2	2	3,298
2005	80	5	8	5	2	2	2	3,057
<b>Change, tpy</b>	<b>-18</b>	<b>0</b>	<b>1</b>	<b>-4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>241</b>
<b>Change, %</b>	<b>-23%</b>	<b>0%</b>	<b>12%</b>	<b>-81%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>8%</b>

*Heavy-Duty Vehicles*

Table 9.10 presents the emissions estimate comparison for calendar year 2011 and 2005 for on-terminal heavy-duty vehicles in tons per year and as a percent change. The on-terminal heavy-duty vehicle emissions were reduced by 87-100% for all pollutants in 2011. This is due to the a lower number of truck trips and idling time, the use of ULSD, as reported by the Port, and newer trucks in 2011 as compared to the 2005 fleet.

**Table 9.10: Port of Everett 2011 vs 2005 Port HDV Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	0.12	0.01	0.06	0.00	0.002	0.001	0.002	12
2005	0.98	0.08	0.68	0.02	0.020	0.019	0.020	90
<b>Change, tpy</b>	<b>-0.86</b>	<b>-0.07</b>	<b>-0.62</b>	<b>-0.02</b>	<b>-0.02</b>	<b>-0.02</b>	<b>-0.02</b>	<b>-78</b>
<b>Change, %</b>	<b>-88%</b>	<b>-88%</b>	<b>-91%</b>	<b>-100%</b>	<b>-90%</b>	<b>-95%</b>	<b>-90%</b>	<b>-87%</b>

*Fleet Vehicles – Terminal Fleet Vehicles*

Table 9.11 presents the emissions estimate comparison for calendar year 2011 and 2005 for terminal fleet vehicles in tons per year and as a percent change. In 2011, there were a total of 65 terminal fleet vehicles inventoried which was more than the 39 inventoried in 2005. The increase in 2011 emissions for some of the pollutants may be due to the increase in the number of vehicles. The increase in CO emissions and decrease in PM emissions may be due to different engine types (gasoline, diesel, alternative-fueled) for 2011 and 2005 vehicle inventories.

**Table 9.11: Port of Everett 2011 vs 2005 Port Terminal Fleet Vehicles Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	0.8	0.8	7.4	0.005	0.009	0.008	0.002	273
2005	0.7	0.4	3.1	0.005	0.010	0.010	0.009	126
<b>Change, tpy</b>	<b>0.1</b>	<b>0.4</b>	<b>4.3</b>	<b>0.000</b>	<b>-0.001</b>	<b>-0.002</b>	<b>-0.007</b>	<b>146</b>
<b>Change, %</b>	<b>8%</b>	<b>95%</b>	<b>138%</b>	<b>0%</b>	<b>-10%</b>	<b>-20%</b>	<b>-78%</b>	<b>116%</b>

**9.3 Port of Olympia**

In 2011, no containers were handled at the Port of Olympia, but general cargo throughput increased fivefold between 2011 and 2005, as presented in Table 9.12.

**Table 9.12: Port of Olympia 2011 vs 2005 TEU and Tonnage Comparison**

Year	Container Throughput (TEU)	Cargo Throughput (tonnes)
2011	0	711,536
2005	903	129,512
<b>Change, %</b>	<b>-100%</b>	<b>449%</b>

Table 9.13 presents a simple metric of total tons of emissions per 10,000 tonnes of cargo in 2011 and 2005. The port tons of emissions per 10,000 tonnes of cargo decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005.

**Table 9.13: Port of Olympia 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	7.6	0.4	2.6	1.9	0.5	0.5	0.5	753
2005	40.7	3.1	16.0	14.5	2.8	2.6	2.6	2,558
<b>Change (%)</b>	<b>-81%</b>	<b>-86%</b>	<b>-84%</b>	<b>-87%</b>	<b>-82%</b>	<b>-82%</b>	<b>-83%</b>	<b>-71%</b>

The emissions-related efficiency improvements from 2011 vs 2005 range from 71% less CO<sub>2e</sub> emissions to 87% less SO<sub>2</sub>, on a ton of emissions per 10,000 tonnes cargo moved through the port basis. The 2011 vs 2005 emissions-related efficiency changes are presented by pollutant in graphical form in Figure 9.1.

**Figure 9.2: Port of Olympia 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Change**

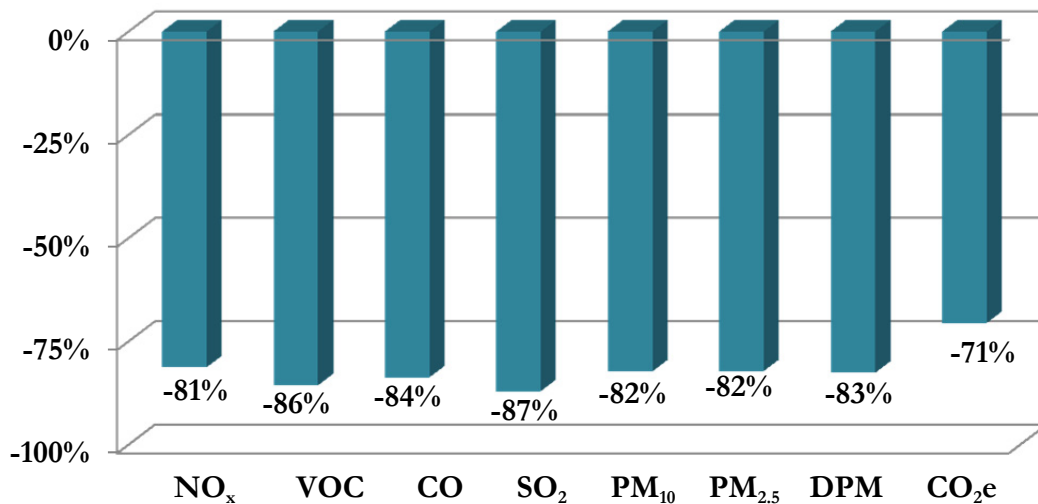


Table 9.14 presents a summary comparison of the 2011 and 2005 emissions by source category. Each source category emissions comparison for the Port of Olympia is discussed in the following subsections.

**Table 9.14: Port of Olympia 2011 vs 2005 Port Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	7.54	0.247	0.65	13.329	0.8525	0.682	0.511	779
Recreational vessels	2.35	2.583	25.48	0.005	0.0565	0.053	0.017	294
Locomotives, near-port	3.70	0.200	0.40	0.002	0.1000	0.100	0.100	164
Cargo handling equipment	42.90	2.700	17.40	0.039	2.6000	2.500	2.600	4,408
Heavy-duty vehicles, on-terminal	0.09	0.000	0.06	0.000	0.0010	0.001	0.001	8
Terminal fleet vehicles	0.01	0.004	0.03	0.000	0.0001	0.000	0.000	2
<b>Total</b>	<b>56.58</b>	<b>5.734</b>	<b>44.02</b>	<b>13.374</b>	<b>3.6101</b>	<b>3.336</b>	<b>3.229</b>	<b>5,654</b>
<b>2005</b>								
OGV, hotelling & maneuvering	10.72	0.316	0.84	14.595	0.9900	0.792	0.700	846
Recreational vessels	2.71	5.884	39.48	0.064	0.1196	0.111	0.021	317
Locomotives, near-port	14.98	0.869	1.58	0.923	0.3808	0.350	0.381	574
Cargo handling equipment	25.79	2.706	17.46	3.233	2.2559	2.188	2.253	1,774
Heavy-duty vehicles, on-terminal	1.26	0.105	0.85	0.024	0.0267	0.025	0.027	119
Terminal fleet vehicles	na	na	na	na	na	na	na	na
<b>Total</b>	<b>55.45</b>	<b>9.880</b>	<b>60.21</b>	<b>18.839</b>	<b>3.7730</b>	<b>3.466</b>	<b>3.381</b>	<b>3,630</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-30%	-22%	-23%	-9%	-14%	-14%	-27%	-8%
Recreational vessels	-13%	-56%	-35%	-93%	-53%	-52%	-19%	-7%
Locomotives, near-port	-75%	-77%	-75%	-100%	-74%	-71%	-74%	-71%
Cargo handling equipment	66%	0%	0%	-99%	15%	14%	15%	148%
Heavy-duty vehicles, on-terminal	-93%	-100%	-93%	-100%	-96%	-96%	-96%	-93%
Terminal fleet vehicles	na	na	na	na	na	na	na	na
<b>Total</b>	<b>2%</b>	<b>-42%</b>	<b>-27%</b>	<b>-29%</b>	<b>-4%</b>	<b>-4%</b>	<b>-4%</b>	<b>56%</b>

*Ocean-Going Vessels*

Table 9.15 presents the ocean-going vessel emissions comparison for 2011 and 2005. Hotelling and maneuvering ocean-going vessel emissions at the Port of Olympia decreased in 2011 as compared to 2005, while the ocean-going vessel activities increased (see Table 9.16). The difference may be due to different vessel types calling the Port in 2011 vs 2005, which has an effect on the engine size and load. Inbound activity counts are based on MarEx data and only include ocean-going vessel counts arriving directly from sea and shifts from other ports in the inventory domain to the designated port. Barge calls are not included in the ocean-going vessel inbound activity.

**Table 9.15: Port of Olympia 2011 vs 2005 Port OGV Emissions Comparison, tpy**

Emissions	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	7.5	0.2	0.6	13.3	0.9	0.7	0.5	779
2005	10.7	0.3	0.8	14.6	1.0	0.8	0.7	846
<b>Change, tpy</b>	<b>-3.2</b>	<b>-0.1</b>	<b>-0.2</b>	<b>-1.3</b>	<b>-0.1</b>	<b>-0.1</b>	<b>-0.2</b>	<b>-67</b>
<b>Change, %</b>	<b>-30%</b>	<b>-22%</b>	<b>-23%</b>	<b>-9%</b>	<b>-14%</b>	<b>-14%</b>	<b>-27%</b>	<b>-8%</b>

**Table 9.16: Port of Olympia 2011 vs 2005 OGV Activity Comparison**

Year	OGV Inbound Activity
2011	26
2005	20
<b>Change, %</b>	<b>30%</b>

*Harbor Vessels - Recreational Vessels*

Table 9.17 presents the recreation vessel emissions comparison for 2011 vs 2005. Most of the recreational vessel emissions decreased in 2011 when compared to 2005. This change is most likely due to the combination of use of lower sulfur fuel by diesel engines and the emissions model assuming a cleaner fleet in 2011 than in 2005. Since there is no detailed information for the recreational vessel engines, the emissions model makes assumptions regarding the fleet mix. EPA has cleaner engine standards for gasoline engines, which reduced VOC, CO and PM emissions in 2011.

For Port of Olympia, the recreational vessel count stayed the same in both inventory years.



**Table 9.17: Port of Olympia 2011 vs 2005 Port Recreational Vessel Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	2.35	2.58	25.48	0.005	0.056	0.053	0.017	294
2005	2.71	5.88	39.48	0.064	0.120	0.111	0.021	317
<b>Change (tpy)</b>	<b>-0.36</b>	<b>-3.30</b>	<b>-14.00</b>	<b>-0.059</b>	<b>-0.063</b>	<b>-0.058</b>	<b>-0.004</b>	<b>-23</b>
<b>Change (%)</b>	<b>-13%</b>	<b>-56%</b>	<b>-35%</b>	<b>-93%</b>	<b>-53%</b>	<b>-52%</b>	<b>-19%</b>	<b>-7%</b>

*Cargo Handling Equipment*

Table 9.18 presents the cargo handling equipment emissions estimate comparison for calendar year 2011 and 2005 in tons per year and as a percent change. Cargo handling equipment emissions decreased significantly for SO<sub>2</sub> due to the use of ULSD by all diesel equipment. The cargo handling equipment emissions increase for NO<sub>x</sub>, PM and CO<sub>2</sub>is due to the increased activity in 2011.

**Table 9.18: Port of Olympia 2011 vs 2005 Port CHE Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	42.9	2.7	17.4	0.04	2.6	2.5	2.6	4,408
2005	25.8	2.7	17.5	3.23	2.3	2.2	2.3	1,774
<b>Change, tpy</b>	<b>17.1</b>	<b>0.0</b>	<b>-0.1</b>	<b>-3.19</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>2,634</b>
<b>Change, %</b>	<b>66%</b>	<b>0%</b>	<b>0%</b>	<b>-99%</b>	<b>15%</b>	<b>14%</b>	<b>15%</b>	<b>148%</b>

Table 9.19 presents the activity and equipment count comparison for calendar year 2011 and 2005 for cargo handling equipment. The increase in activity and equipment count is reflective of the increased cargo tonnage in 2011 as compared to 2005.

**Table 9.19: Port of Olympia 2011 vs 2005 CHE Activity and Equipment Count Comparison**

Year	Activity (hp-hr)	Count
2011	7,314,297	53
2005	2,605,002	33
<b>Change, %</b>	<b>181%</b>	<b>61%</b>

*Locomotives*

Table 9.20 presents the port emissions (on-terminal and adjacent port areas) estimate comparison for calendar year 2011 and 2005 for switching locomotive emissions in tons per year and as a percent change. The port locomotive emissions are lower for all pollutants in 2011 due to a combination of improved fuel efficiency for the locomotives, and lower emissions locomotives.

**Table 9.20: Port of Olympia 2011 vs 2005 Port Locomotive Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	4	0.2	0.4	0.0	0.1	0.1	0.1	164
2005	15	0.9	1.6	0.9	0.4	0.4	0.4	574
<b>Change, tpy</b>	<b>-11</b>	<b>-0.7</b>	<b>-1.2</b>	<b>-0.9</b>	<b>-0.3</b>	<b>-0.3</b>	<b>-0.3</b>	<b>-410</b>
<b>Change, %</b>	<b>-75%</b>	<b>-77%</b>	<b>-75%</b>	<b>-100%</b>	<b>-74%</b>	<b>-71%</b>	<b>-74%</b>	<b>-71%</b>

*Heavy-Duty Vehicles*

Table 9.21 presents the emissions estimate comparison for calendar year 2011 and 2005 for port heavy duty vehicles in tons per year and as a percent change. The on-terminal heavy-duty vehicle emissions are lower for all pollutants in 2011. This is due to a lower number of truck trips, idling time, the use of ULSD, as reported by the Port, and newer truck fleet in 2011 as compared to 2005.

**Table 9.21: Port of Olympia 2011 vs 2005 Port HDV Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	0.090	0.000	0.060	0.000	0.001	0.001	0.001	8
2005	1.260	0.105	0.855	0.024	0.027	0.025	0.027	119
<b>Change, tpy</b>	<b>-1.170</b>	<b>-0.105</b>	<b>-0.795</b>	<b>-0.024</b>	<b>-0.026</b>	<b>-0.024</b>	<b>-0.026</b>	<b>-111</b>
<b>Change, %</b>	<b>-93%</b>	<b>-100%</b>	<b>-93%</b>	<b>-100%</b>	<b>-96%</b>	<b>-96%</b>	<b>-96%</b>	<b>-93%</b>

## 9.4 Port of Seattle

As part of the 2011 inventory update for the Port of Seattle, port-related port emissions were quantified with the similar approach used in 2005 and in addition port-related emissions were quantified for the entire airshed. To achieve a direct comparison, the 2005 data was recalculated using the 2011 emissions estimate methodology (as described in the previous sections and Section 10). In 2011, the TEU throughput of containers at the Port of Seattle decreased, the throughput of metric tons of cargo increased, and cruise passenger counts increased 29% as compared to that of 2005 and as presented in Table 9.22.

**Table 9.22: Port of Seattle 2011 vs 2005 TEU and Cargo Throughput Comparison**

Year	Container Throughput (TEU)	Cargo (tonnes)	Cruise Passengers
2011	2,033,535	22,762,678	885,949
2005	2,087,929	20,564,860	686,978
<b>Change, %</b>	<b>-3%</b>	<b>11%</b>	<b>29%</b>

The 2011 vs 2005 emissions and efficiency comparisons for the Port of Seattle are presented in subsections 9.4.1 2011 vs 2005 Port Emissions Comparisons and 9.4.2 2011 vs 2005 Airshed Emissions Comparisons below.

### 9.4.1 2011 vs 2005 Port Emissions Comparisons

Table 9.23 presents a simple metric of TEU emissions efficiency, expressed in port tons of emissions per 10,000 TEU, for 2011 and 2005. The port tons of emissions per 10,000 TEU decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005. It should be noted that port-related recreational vessel emissions are not included because they are not associated with the movement of cargo and that port-related cruise ship emissions are included in this simple metric.

**Table 9.23: Port of Seattle 2011 vs 2005 Port Tons of Emissions per 10,000 TEU Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	8.6	0.5	1.9	3.0	0.4	0.4	0.4	661
2005	10.3	0.7	4.3	5.3	0.6	0.5	0.6	707
<b>Change (%)</b>	<b>-16%</b>	<b>-30%</b>	<b>-56%</b>	<b>-44%</b>	<b>-30%</b>	<b>-30%</b>	<b>-29%</b>	<b>-6%</b>

The port emissions-related efficiency improvements from 2011 vs 2005 range from 6% less CO<sub>2</sub>e emissions to 54% less CO, on a ton of emissions per 10,000 TEU moved through the port basis. The 2011 vs 2005 emissions-related efficiency changes are presented by pollutant in graphical form in Figure 9.3.

**Figure 9.3: Port of Seattle 2011 vs 2005 Port Tons of Emissions per 10,000 TEU Change**

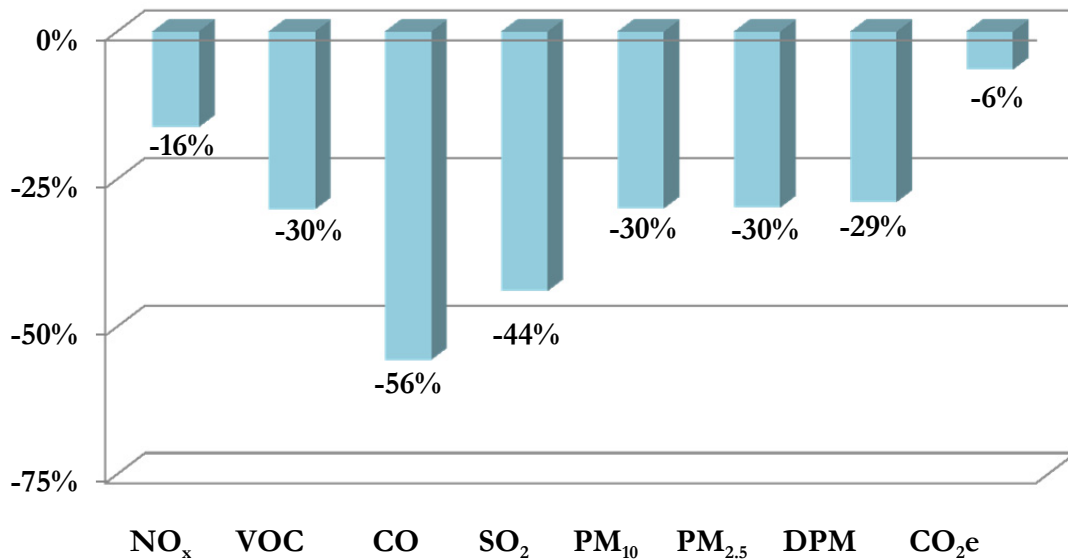


Table 9.24 presents a simple metric of cargo emissions efficiency, expressed in port tons of emissions per 10,000 tonnes of cargo, for 2011 and 2005. The port tons of emissions per 10,000 tonnes of cargo decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005. It should be noted that port-related recreational vessel emissions are not included because they are not associated with the movement of cargo and that port-related cruise ship emissions are included in this simple metric.

**Table 9.24: Port of Seattle 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	0.77	0.04	0.17	0.27	0.04	0.03	0.04	59
2005	1.04	0.07	0.44	0.54	0.06	0.05	0.06	72
<b>Change (%)</b>	<b>-26%</b>	<b>-39%</b>	<b>-61%</b>	<b>-51%</b>	<b>-38%</b>	<b>-38%</b>	<b>-37%</b>	<b>-18%</b>

The port cargo emissions efficiency improvements 2011 vs 2005 range from 17% less CO<sub>2</sub>e emissions to 60% less CO tons of emissions per 10,000 tonnes cargo moved through the port. The changes in the 2011 vs 2005 emissions normalized to cargo throughput for all pollutants are presented in graphical form in Figure 9.4.

**Figure 9.4: Port of Seattle 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Change**

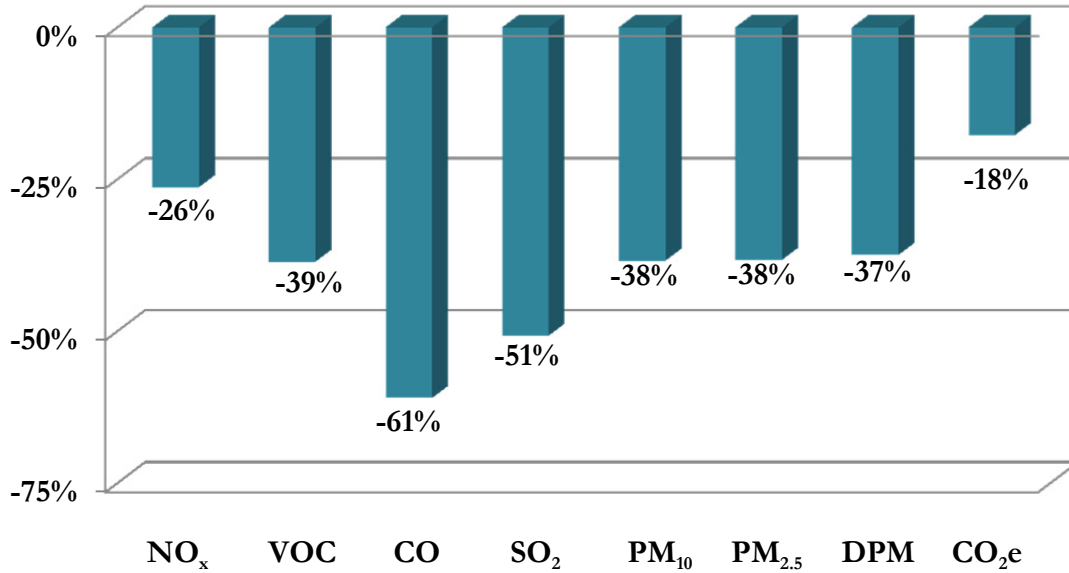


Table 9.25 presents a summary comparison of the 2011 vs 2005 Port Emissions by source category. Each source category emissions comparison for the Port of Seattle is discussed in the following subsections. For the Port of Seattle, harbor vessels below include port-owned and commercial harbor vessels.

**Table 9.25: Port of Seattle 2011 vs 2005 Port Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	748	26	66	600.51	47.69	38.15	38.62	54,479
OGV, transit	0	0	0	0.00	0.00	0.00	0.00	0
Harbor vessels	334	22	72	0.21	13.24	12.21	13.04	20,415
Recreational vessels	6	6	61	0.05	0.14	0.14	0.04	708
Locomotives	290	20	45	2.54	10.50	9.60	10.50	16,828
Cargo handling equipment	306	18	158	0.30	16.70	16.20	16.70	34,561
Heavy-duty vehicles	68	6	38	0.07	0.82	0.76	0.82	7,038
Terminal fleet vehicles	3	1	12	0.02	0.03	0.03	0.02	1,053
<b>Total</b>	<b>1,754</b>	<b>99</b>	<b>454</b>	<b>603.69</b>	<b>89.12</b>	<b>77.09</b>	<b>79.75</b>	<b>135,083</b>
<b>2005</b>								
OGV, hotelling & maneuvering	861	28	72	978.73	73.84	59.08	58.86	60,474
OGV, transit	0	0	0	0.00	0.00	0.00	0.00	0
Harbor vessels	316	22	66	33.74	13.79	12.71	13.58	18,073
Recreational vessels	7	15	104	0.17	0.31	0.29	0.05	832
Locomotives	448	25	55	40.22	13.27	12.21	13.27	20,561
Cargo handling equipment	418	51	616	52.27	27.62	26.80	27.40	38,135
Heavy-duty vehicles	96	8	67	1.82	1.99	1.83	1.99	8,884
Terminal fleet vehicles	5	3	31	0.02	0.02	0.02	0.02	1,403
<b>Total</b>	<b>2,151</b>	<b>152</b>	<b>1,012</b>	<b>1,106.95</b>	<b>130.85</b>	<b>112.93</b>	<b>115.18</b>	<b>148,362</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-13%	-7%	-8%	-39%	-35%	-35%	-34%	-10%
OGV, transit	na	na	na	na	na	na	na	na
Harbor vessels	6%	-1%	9%	-99%	-4%	-4%	-4%	13%
Recreational vessels	-20%	-60%	-41%	-71%	-55%	-52%	-14%	-15%
Locomotives	-35%	-19%	-18%	-94%	-21%	-21%	-21%	-18%
Cargo handling equipment	-27%	-64%	-74%	-99%	-40%	-40%	-39%	-9%
Heavy-duty vehicles	-29%	-28%	-43%	-96%	-59%	-59%	-59%	-21%
Terminal fleet vehicles	-43%	-70%	-60%	20%	67%	60%	-19%	-25%
<b>Total</b>	<b>-18%</b>	<b>-35%</b>	<b>-55%</b>	<b>-45%</b>	<b>-32%</b>	<b>-32%</b>	<b>-31%</b>	<b>-9%</b>

*Ocean-Going Vessels*

The ocean-going vessel hotelling and maneuvering port emissions at the Port of Seattle decreased for all pollutants in 2011 as compared to that in 2005. This is due to a combination of the decreased activity and emission reduction strategies used in 2011 to reduce vessel emissions while at berth. Some of the cruise vessels use shore power while at berth and other cruise and shipping lines participated in the At-Berth-Clean (ABC) Fuels Program and switched to low sulfur fuel use while at berth in 2011. Table 9.26 presents the ocean-going vessel emissions comparison for 2011 vs 2005, and Table 9.27 presents the change in vessel inbound activities. Inbound activity counts are based on MarEx data and only include ocean-going vessel counts arriving directly from sea and shifts from other ports in the inventory domain to the designated port. Barge calls are not included in the ocean-going vessel inbound activity.

**Table 9.26: Port of Seattle 2011 vs 2005 OGV Port Emissions Comparison, tpy**

Emissions	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	748.3	26.2	66.2	600.5	47.7	38.2	38.6	54,479
2005	860.7	28.2	72.2	978.7	73.8	59.1	58.9	60,474
<b>Change, tpy</b>	<b>-112.4</b>	<b>-2.0</b>	<b>-5.9</b>	<b>-378.2</b>	<b>-26.2</b>	<b>-20.9</b>	<b>-20.2</b>	<b>-5,995</b>
<b>Change, %</b>	<b>-13%</b>	<b>-7%</b>	<b>-8%</b>	<b>-39%</b>	<b>-35%</b>	<b>-35%</b>	<b>-34%</b>	<b>-10%</b>

**Table 9.27: Port of Seattle 2011 vs 2005 OGV Activity Comparison**

Year	OGV Inbound Activities
2011	1,136
2005	1,197
<b>Change, %</b>	<b>-5%</b>

*Harbor Vessels - Commercial Harbor and Government Vessels*

Table 9.28 presents the comparison for 2011 vs 2005 of port commercial harbor and government vessel emissions related to the Port. The NO<sub>x</sub>, CO and greenhouse emissions increased, while SO<sub>2</sub> emissions decreased and PM emission remained the same in 2011. The lower SO<sub>2</sub> emissions are due to the use of lower sulfur fuel in 2011. The increased NO<sub>x</sub> and CO emissions were due to increased assist tug and workboat activity for the Port of Seattle.

**Table 9.28: Port of Seattle 2011 vs 2005 Port Commercial Harbor and Government Vessel Emissions Comparison, tpy**

Type	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	334	22	72	0	13	12	13	20,415
2005	316	22	66	34	14	13	14	18,073
<b>Change (%)</b>	<b>6%</b>	<b>-1%</b>	<b>9%</b>	<b>-99%</b>	<b>-4%</b>	<b>-4%</b>	<b>-4%</b>	<b>13%</b>

*Harbor Vessels - Recreational Vessels*

Table 9.29 presents the comparison for 2011 vs 2005 of port recreational vessel emissions related to port-owned marinas. Again, it should be noted that it is assumed that 10% of the total recreational vessel emissions occurs in the port zone.

**Table 9.29: Port of Seattle 2011 vs 2005 Port Recreational Vessel Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2E</sub>
2011	5.7	6.2	61.4	0.01	0.14	0.13	0.04	708
2005	7.1	15.4	103.5	0.17	0.31	0.29	0.05	832
<b>Change (tpy)</b>	<b>-1.5</b>	<b>-9.2</b>	<b>-42.2</b>	<b>-0.16</b>	<b>-0.17</b>	<b>-0.16</b>	<b>-0.01</b>	<b>-123</b>
<b>Change (%)</b>	<b>-20%</b>	<b>-60%</b>	<b>-41%</b>	<b>-94%</b>	<b>-55%</b>	<b>-55%</b>	<b>-20%</b>	<b>-15%</b>



*Cargo Handling Equipment*

Table 9.30 presents the port emissions estimate comparison for calendar year 2011 and 2005 for cargo handling equipment in tons per year and as a percent change. Cargo handling equipment port emissions decreased significantly for SO<sub>2</sub> and this is due to the use of ULSD by all diesel equipment. PM emissions also decreased as a result of using ULSD in 2011. Note the port and airshed emissions for cargo handling equipment are the same, because equipment operations do not move beyond the port terminals. Cargo handling equipment emissions decreased for all pollutants as a result of the use of 164 DOCs, 5 DPFs, 7 on-road engines, and decreased activity. The equipment retrofits, DOCs and DPFs, lower VOC, CO, and PM emissions, while on-road engines lower NO<sub>x</sub>, VOC and PM emissions.

**Table 9.30: Port of Seattle 2011 vs 2005 Port CHE Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	305.5	18.4	158.0	0.3	16.7	16.2	16.7	34,561
2005	418.1	50.7	616.3	52.3	27.6	26.8	27.4	38,135
<b>Change, tpy</b>	<b>-112.6</b>	<b>-32.3</b>	<b>-458.3</b>	<b>-52.0</b>	<b>-10.9</b>	<b>-10.6</b>	<b>-10.7</b>	<b>-3,573</b>
<b>Change, %</b>	<b>-27%</b>	<b>-64%</b>	<b>-74%</b>	<b>-99%</b>	<b>-40%</b>	<b>-40%</b>	<b>-39%</b>	<b>-9%</b>

Table 9.31 presents the activity and equipment count comparison for calendar year 2011 and 2005 for cargo handling equipment. The activity and equipment count decreased in 2011 and could be due to the slight decrease in TEU throughput.

**Table 9.31: Port of Seattle 2011 vs 2005 CHE Activity and Equipment Count Comparison**

Year	Activity (hp-hr)	Count
2011	56,822,638	504
2005	64,089,026	514
<b>Change, %</b>	<b>-11%</b>	<b>-2%</b>

*Locomotives*

Table 9.32 presents the port emissions (on-terminal and adjacent rail yards) estimate comparison for calendar year 2011 and 2005 for line-haul and switching locomotive emissions in tons per year and as a percent change. The port locomotive emissions are lower for all pollutants in 2011 due to a combination of lower throughput, improved fuel efficiency for the locomotives, and lower emissions locomotives. The lower locomotive emissions are the result of turnover of the line-haul locomotive fleet to newer and cleaner locomotives.

**Table 9.32: Port of Seattle 2011 vs 2005 Port Locomotive Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	290	20	45	3	11	10	11	16,828
2005	448	25	55	40	13	12	13	20,561
<b>Change, tpy</b>	<b>-158</b>	<b>-5</b>	<b>-10</b>	<b>-38</b>	<b>-3</b>	<b>-3</b>	<b>-3</b>	<b>-3,733</b>
<b>Change, %</b>	<b>-35%</b>	<b>-19%</b>	<b>-18%</b>	<b>-94%</b>	<b>-21%</b>	<b>-21%</b>	<b>-21%</b>	<b>-18%</b>

*Heavy-Duty Vehicles*

Table 9.33 shows the port emissions estimate comparison for calendar year 2011 and 2005 for on-terminal heavy duty vehicles in tons per year and as a percent change. The on-terminal HDV emissions are lower for all pollutants in 2011. This is due to newer trucks calling the terminals, the use of ULSD, less on-terminal idling as reported by the terminals, and fewer reported truck trips, in 2011 compared with 2005.

**Table 9.33: Port of Seattle 2011 vs 2005 Port HDV Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	68.3	5.8	38.1	0.1	0.8	0.8	0.8	7,038
2005	96.5	8.1	67.4	1.8	2.0	1.8	2.0	8,884
<b>Change, tpy</b>	<b>-28.1</b>	<b>-2.3</b>	<b>-29.3</b>	<b>-1.8</b>	<b>-1.2</b>	<b>-1.1</b>	<b>-1.2</b>	<b>-1,845</b>
<b>Change, %</b>	<b>-29%</b>	<b>-28%</b>	<b>-43%</b>	<b>-96%</b>	<b>-59%</b>	<b>-59%</b>	<b>-59%</b>	<b>-21%</b>

*Fleet Vehicles – Terminal Fleet Vehicles*

Table 9.34 presents the emissions estimate comparison for calendar year 2011 and 2005 for terminal fleet vehicles in tons per year and as a percent change. In 2011, there were a total of 404 terminal fleet vehicles inventoried which was more than the 347 inventoried in 2005. With the exception of SO<sub>2</sub> and PM emissions which increased, some pollutant emissions are lower in 2011 as compared to 2005. This may be due to the lower reported activity levels by the terminals. Emissions from cruise terminal cars/minivans vehicles are not included in the comparison, as the focus of this section is to evaluate vehicles residing on the terminals.

**Table 9.34: Port of Seattle 2011 vs 2005 Port Fleet Vehicle Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	2.7	1.0	12.3	0.018	0.035	0.032	0.017	1,053
2005	4.7	3.2	30.9	0.015	0.021	0.020	0.021	1,403
<b>Change, tpy</b>	<b>-2.0</b>	<b>-2.2</b>	<b>-18.5</b>	<b>0.003</b>	<b>0.014</b>	<b>0.012</b>	<b>-0.004</b>	<b>-350</b>
<b>Change, %</b>	<b>-43%</b>	<b>-70%</b>	<b>-60%</b>	<b>20%</b>	<b>67%</b>	<b>60%</b>	<b>-19%</b>	<b>-25%</b>

*9.4.2 2011 vs 2005 Airshed Emissions Comparisons*

Quantifying the changes of Port of Seattle operations throughout the airshed (i.e. the entire emissions inventory geographical domain) is an improvement made during the 2011 update. Similar to the simple metric used for port emissions, this evaluation utilized data from the original 2005 inventory for comparison purposes to the 2011 activity and used 2011 methods for estimating emissions. Table 9.35 presents the Port of Seattle-related airshed TEU emissions efficiency, expressed in airshed tons of emissions per 10,000 TEU, changes from 2011 vs 2005. The airshed tons of emissions per 10,000 TEU decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005. It should be noted that port-related recreational vessel emissions are not included because they are not associated with the movement of cargo and that port-related cruise ship emissions are included in this simple metric.

**Table 9.35: Port of Seattle 2011 vs 2005 Airshed Tons of Emissions per 10,000 TEU Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	37.0	1.7	5.8	18.5	1.9	1.6	1.9	2,783
2005	47.8	2.1	9.0	22.7	2.6	2.2	2.5	2,859
<b>Change (%)</b>	<b>-23%</b>	<b>-17%</b>	<b>-35%</b>	<b>-18%</b>	<b>-25%</b>	<b>-26%</b>	<b>-25%</b>	<b>-3%</b>

The Port of Seattle-related airshed TEU emissions efficiency changes from 2011 vs 2005 range from 3% less CO<sub>2</sub>e emissions to 34% less CO emissions per 10,000 TEU moved through the port. The changes in the 2011 vs 2005 airshed emissions normalized to TEU throughput for all pollutants are presented in graphical form in Figure 9.5.

**Figure 9.5: Port of Seattle 2011 vs 2005 Airshed Tons of Emissions per 10,000 TEU Change**

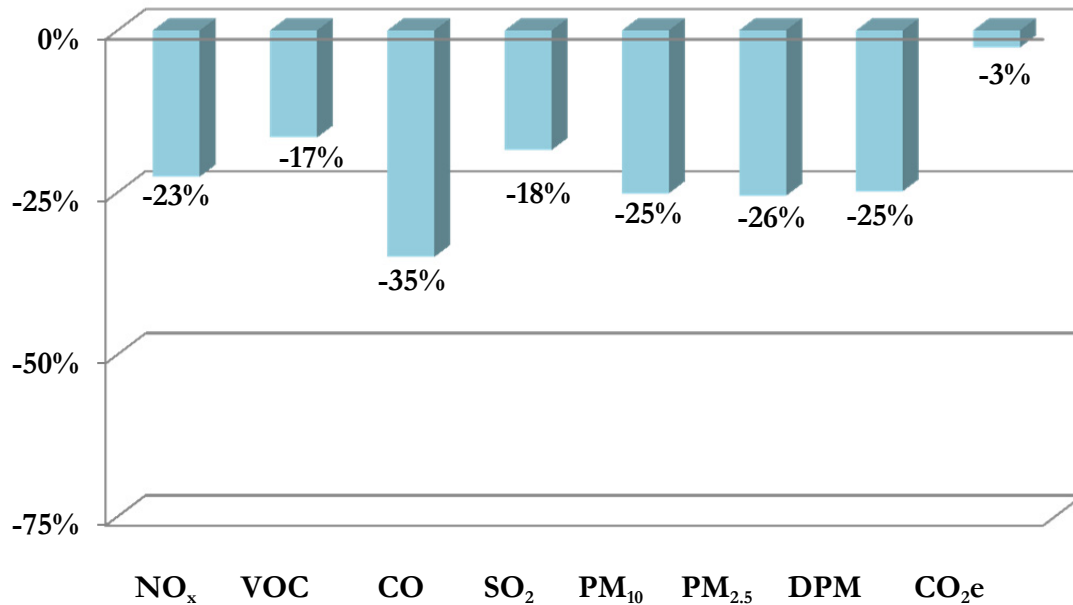


Table 9.36 presents the Port of Seattle-related airshed cargo emissions efficiency, expressed in airshed tons of emissions per 10,000 tonnes of cargo, for 2011 and 2005. The airshed tons of emissions per 10,000 tonnes of cargo decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005. It should be noted that port-related recreational vessel emissions are not included because they are not associated with the movement of cargo. Port-related cruise ship emissions are included in this simple metric because they are part of port operations.

**Table 9.36: Port of Seattle 2011 vs 2005 Airshed Tons of Emissions per 10,000 Tonnes of Cargo Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	3.3	0.2	0.5	1.7	0.2	0.1	0.2	249
2005	4.9	0.2	0.9	2.3	0.3	0.2	0.3	290
<b>Change (%)</b>	<b>-32%</b>	<b>-27%</b>	<b>-43%</b>	<b>-28%</b>	<b>-34%</b>	<b>-34%</b>	<b>-34%</b>	<b>-14%</b>

The Port of Seattle-related airshed cargo emissions efficiency improvements from 2011 vs 2005 range from 14% less CO<sub>2e</sub> emissions to 42% less CO emissions per 10,000 tonnes cargo moved through the port. The changes in the 2011 vs 2005 emissions normalized to cargo throughput for all pollutants are presented in graphical form in Figure 9.6.

**Figure 9.6: Port of Seattle 2011 vs 2005 Airshed Tons of Emissions per 10,000 Tonnes of Cargo Change**

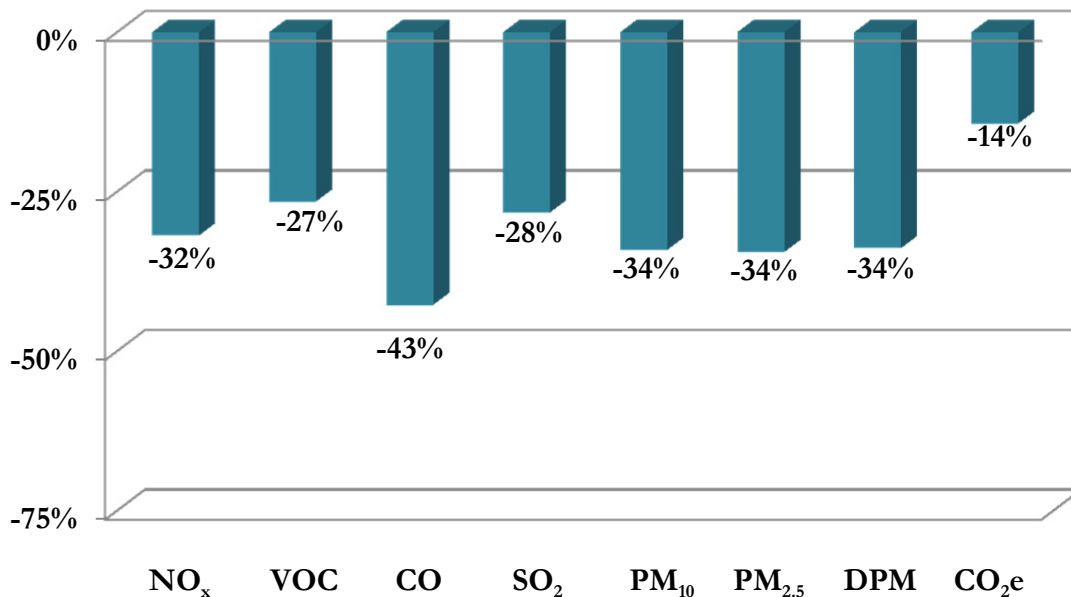


Table 9.37 presents a summary comparison of the Port of Seattle-related 2011 and 2005 airshed emissions by source category. The reasons behind the 2011 vs 2005 emissions changes for the airshed zone are generally the same as in the port comparisons in the previous subsection 9.4.1. For the Port of Seattle, harbor vessels below include port-owned and commercial harbor vessels.

**Table 9.37: Port of Seattle 2011 vs 2005 Airshed Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	748	26	66	600.51	47.69	38.15	38.62	54,479
OGV, transit	4,106	158	366	3,150.77	264.57	211.66	257.71	202,078
Harbor vessels	418	24	82	0.25	16.43	15.15	16.23	25,048
Recreational vessels	57	62	614	0.11	1.36	1.27	0.40	7083
Locomotives	680	42	111	6.15	24.85	22.85	24.85	41,870
Cargo handling equipment	306	18	158	0.30	16.70	16.20	16.70	34,561
Heavy-duty vehicles	1,270	83	390	1.81	25.27	22.55	25.27	206,887
Terminal fleet vehicles	3	1	12	0.02	0.03	0.03	0.02	1,053
<b>Total</b>	<b>7,588</b>	<b>414</b>	<b>1,799</b>	<b>3,759.93</b>	<b>396.90</b>	<b>327.86</b>	<b>379.80</b>	<b>573,059</b>
<b>2005</b>								
OGV, hotelling & maneuvering	861	28	72	978.73	73.84	59.08	58.86	60,474
OGV, transit	5,639	198	461	3,521.17	336.38	269.11	327.21	226,887
Harbor vessels	534	26	96	55.46	22.36	20.59	22.14	29,737
Recreational vessels	71	154	1,035	1.67	3.14	2.91	0.54	8317
Locomotives	1,026	52	131	84.31	28.90	26.59	28.90	47,898
Cargo handling equipment	418	51	616	52.27	27.62	26.80	27.40	38,135
Heavy-duty vehicles	1,506	75	465	42.94	53.60	48.25	53.60	192,389
Terminal fleet vehicles	5	3	31	0.02	0.02	0.02	0.02	1,403
<b>Total</b>	<b>10,060</b>	<b>587</b>	<b>2,907</b>	<b>4,736.54</b>	<b>545.87</b>	<b>453.34</b>	<b>518.69</b>	<b>605,240</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-13%	-7%	-8%	-39%	-35%	-35%	-34%	-10%
OGV, transit	-27%	-20%	-21%	-11%	-21%	-21%	-21%	-11%
Harbor vessels	-22%	-8%	-14%	-100%	-27%	-26%	-27%	-16%
Recreational vessels	-20%	-60%	-41%	-93%	-57%	-56%	-26%	-15%
Locomotives	-34%	-19%	-15%	-93%	-14%	-14%	-14%	-13%
Cargo handling equipment	-27%	-64%	-74%	-99%	-40%	-40%	-39%	-9%
Heavy-duty vehicles	-16%	10%	-16%	-96%	-53%	-53%	-53%	8%
Terminal fleet vehicles	-43%	-70%	-60%	20%	67%	60%	-19%	-25%
<b>Total</b>	<b>-25%</b>	<b>-29%</b>	<b>-38%</b>	<b>-21%</b>	<b>-27%</b>	<b>-28%</b>	<b>-27%</b>	<b>-5%</b>

## 9.5 Port of Tacoma

As part of the 2011 inventory update for the Port of Tacoma port-related emissions were quantified with the similar at-port methodology used in 2005. In addition, port-related emissions were quantified for the entire airshed zone. This was done for the 2005 data and recalculated using the 2011 emissions estimate methodology (as described in the previous sections and Section 10). In 2011, the cargo throughput in TEU and in metric tonnes for the Port of Tacoma decreased as compared to 2005, as presented in Table 9.38.

**Table 9.38: Port of Tacoma 2011 vs 2005 TEU and Cargo Throughput Comparison**

Year	Container Throughput (TEU)	Cargo Throughput (tonnes)
2011	1,488,795	17,270,252
2005	2,070,000	20,400,000
<b>Change, %</b>	<b>-28%</b>	<b>-15%</b>

The 2011 vs 2005 emissions and efficiency comparisons for the Port of Tacoma are presented in subsections 9.4.1 2011 vs 2005 port emissions comparisons and 9.4.2 2011 vs 2005 airshed emissions comparisons below.

### 9.5.1 2011 vs 2005 Port Emissions Comparisons

Table 9.39 presents a simple metric of TEU emissions efficiency, expressed in tons of emissions per 10,000 TEU, for 2011 and 2005. The port tons of emissions per 10,000 TEU decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005. It should be noted that port-related recreational vessel emissions are not included because they are not associated with the movement of cargo.

**Table 9.39: Port of Tacoma 2011 vs 2005 Port Tons of Emissions per 10,000 TEU Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	8.48	0.42	1.65	2.77	0.43	0.37	0.37	633
2005	9.21	0.43	1.70	3.66	0.48	0.42	0.42	634
<b>Change (%)</b>	<b>-8%</b>	<b>-2%</b>	<b>-3%</b>	<b>-24%</b>	<b>-12%</b>	<b>-12%</b>	<b>-10%</b>	<b>0%</b>

The port TEU emissions efficiency changes in 2011 vs 2005 range from 2% less VOC emissions to 24% less SO<sub>2</sub>, expressed in port tons of emissions per 10,000 TEU moved through the port. The changes in the 2011 vs 2005 emissions normalized to TEU throughput for all pollutants are presented in graphical form in Figure 9.7. Note there was no significant change in CO<sub>2</sub>e emissions from 2011 vs 2005. It should be noted that port-related recreational vessel emissions are not included because they are not associated with the movement of cargo.

**Figure 9.7: Port of Tacoma 2011 vs 2005 Port Tons of Emissions per 10,000 TEU Change**

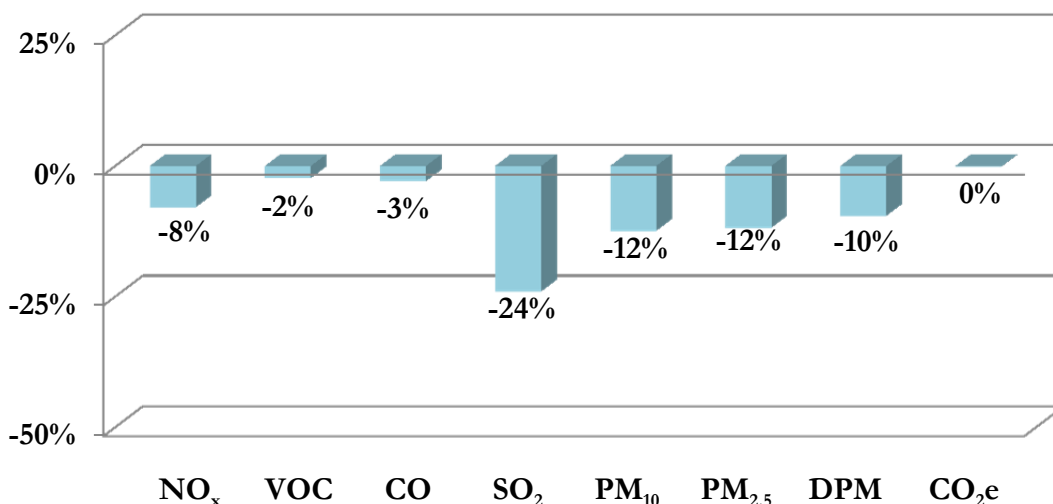


Table 9.40 presents a simple metric of port tons of emissions per 10,000 tonnes of cargo in 2011 and 2005. The port tons of emissions per 10,000 tonnes of cargo decreased in 2011, representing an improvement in air emissions-related efficiencies from 2005. It should be noted that port-related recreational vessel emissions are not included because they are not associated with the movement of cargo.

**Table 9.40: Port of Tacoma 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	0.73	0.036	0.14	0.24	0.04	0.03	0.03	54
2005	0.93	0.043	0.17	0.37	0.05	0.04	0.04	64
<b>Change (%)</b>	<b>-22%</b>	<b>-17%</b>	<b>-18%</b>	<b>-36%</b>	<b>-25%</b>	<b>-25%</b>	<b>-24%</b>	<b>-15%</b>



The port cargo emissions efficiency improvements 2011 vs 2005 range from 15% less CO<sub>2</sub>e emissions to 36% less SO<sub>2</sub> tons of emissions per 10,000 tonnes cargo moved through the port. The changes in the 2011 vs 2005 emissions normalized to cargo throughput for all pollutants are presented in graphical form in Figure 9.8.

**Figure 9.8: Port of Tacoma 2011 vs 2005 Port Tons of Emissions per 10,000 Tonnes of Cargo Change**

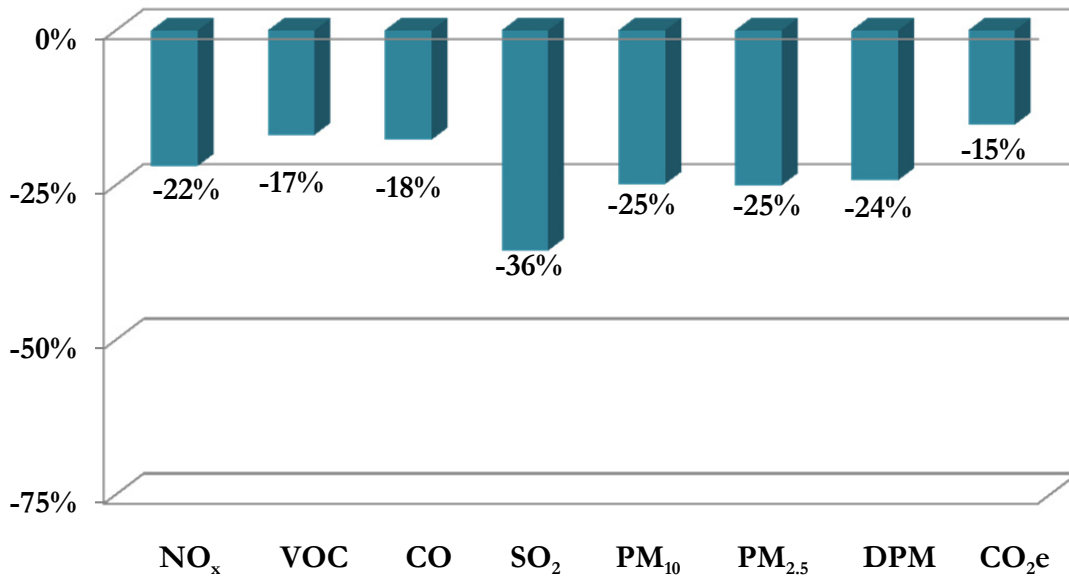


Table 9.41 provides a summary comparison of the 2011 and 2005 emissions by source category. Each source category emissions comparison for the Port of Tacoma is discussed in the following subsections. For the Port of Tacoma, there were no associated recreational or government (port-owned) harbor vessels.

**Table 9.41: Port of Tacoma 2011 vs 2005 Port Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
<b>2011</b>								
OGV, hotelling & maneuvering	375	12	32	410.18	29.00	23.20	21.12	30,273
OGV, transit	0	0	0	0.00	0.00	0.00	0.00	0
Commercial harbor vessels	291	10	44	0.16	11.82	10.88	11.82	17,485
Locomotives	364	25	54	2.37	12.35	11.35	12.35	20,015
Cargo handling equipment	206	13	88	0.20	10.00	9.70	10.00	22,486
Heavy-duty vehicles	24	2	13	0.02	0.29	0.27	0.29	2,505
Terminal fleet vehicles	3	1	14	0.02	0.04	0.04	0.02	1,429
<b>Total</b>	<b>1,263</b>	<b>62</b>	<b>245</b>	<b>412.96</b>	<b>63.50</b>	<b>55.44</b>	<b>55.60</b>	<b>94,192</b>
<b>2005</b>								
OGV, hotelling & maneuvering	645	21	54	676.17	47.05	37.64	33.79	47,465
OGV, transit	0	0	0	0.00	0.00	0.00	0.00	0
Commercial harbor vessels	278	6	38	29.45	12.20	11.23	12.20	15,815
Locomotives	589	33	71	45.66	17.09	15.72	17.09	25,500
Cargo handling equipment	370	26	160	5.40	22.92	22.26	23.01	38,646
Heavy-duty vehicles	21	2	13	0.42	0.46	0.42	0.46	2,049
Terminal fleet vehicles	4	2	15	0.02	0.04	0.04	0.04	1,689
<b>Total</b>	<b>1,907</b>	<b>88</b>	<b>352</b>	<b>757.13</b>	<b>99.76</b>	<b>87.31</b>	<b>86.59</b>	<b>131,163</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-42%	-41%	-41%	-39%	-38%	-38%	-38%	-36%
OGV, transit	na	na	na	na	na	na	na	na
Commercial harbor vessels	4%	64%	17%	-99%	-3%	-3%	-3%	11%
Locomotives	-38%	-25%	-24%	-95%	-28%	-28%	-28%	-22%
Cargo handling equipment	-44%	-51%	-45%	-96%	-56%	-56%	-57%	-42%
Heavy-duty vehicles	16%	21%	-1%	-95%	-37%	-36%	-37%	22%
Terminal fleet vehicles	-36%	-45%	-9%	33%	0%	-5%	-50%	-15%
<b>Total</b>	<b>-34%</b>	<b>-30%</b>	<b>-30%</b>	<b>-45%</b>	<b>-36%</b>	<b>-37%</b>	<b>-36%</b>	<b>-28%</b>

*Ocean-Going Vessels*

The ocean-going vessel hotelling and maneuvering port emissions at the Port of Tacoma decreased for all pollutants in 2011 as compared to that in 2005. This is partly due to decreased activity and partly due to the emission reduction strategies used in 2011 to reduce vessel emissions while at berth. Totem Ocean Trailer Express (TOTE) vessels used shore power while at berth –while two shipping lines, K-Line and Evergreen Marine, switched all of their vessels to low sulfur fuel while at berth in 2011. Table 9.42 presents the ocean-going vessel emissions comparison for 2011 vs 2005, and Table 9.43 presents the change in vessel inbound activities. Inbound activity counts are based on MarEx data and only include ocean-going vessel counts arriving directly from sea and shifts from other ports in the inventory domain to the designated port. Barge calls are not included in the ocean-going vessel inbound activity.

**Table 9.42: Port of Tacoma 2011 vs 2005 Port OGV Emissions Comparison, tpy**

Emissions	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	375.2	12.1	31.7	410.2	29.0	23.2	21.1	30,273
2005	644.8	20.5	53.8	676.2	47.0	37.6	33.8	47,465
<b>Change, tpy</b>	<b>-269.6</b>	<b>-8.4</b>	<b>-22.1</b>	<b>-266.0</b>	<b>-18.1</b>	<b>-14.4</b>	<b>-12.7</b>	<b>-17,192</b>
<b>Change, %</b>	<b>-42%</b>	<b>-41%</b>	<b>-41%</b>	<b>-39%</b>	<b>-38%</b>	<b>-38%</b>	<b>-38%</b>	<b>-36%</b>

**Table 9.43: Port of Tacoma 2011 vs 2005 OGV Activity Comparison**

Year	OGV
	Inbound Activity
2011	875
2005	1,093
<b>Change, %</b>	<b>-20%</b>

*Harbor Vessels - Commercial Harbor Vessels*

Table 9.44 presents the comparison for 2011 vs 2005 of port commercial harbor vessel emissions related to the Port. The lower SO<sub>2</sub> and particulate emissions are due to the use of lower sulfur fuel in 2011. The increases NO<sub>x</sub>, VOC, and CO<sub>2</sub>e are due to increased activity in 2011.

**Table 9.44: Port of Tacoma 2011 vs 2005 Port Commercial Harbor Vessel Emissions Comparison, tpy**

Type	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	291	10	44	0.2	11.8	10.9	11.8	17,485
2005	278	6	38	29.5	12.2	11.2	12.2	15,815
<b>Change (%)</b>	<b>4%</b>	<b>64%</b>	<b>17%</b>	<b>-99%</b>	<b>-3%</b>	<b>-3%</b>	<b>-3%</b>	<b>11%</b>

*Cargo Handling Equipment*

Table 9.45 presents the emissions estimate comparison for calendar year 2011 and 2005 for cargo handling equipment in tons per year and as a percent change. Cargo handling equipment emissions decreased for all pollutants as a result of decreased activity and the implementation of emission control strategies that included retrofits of 117 DOCs, 48 DPFs, and use of 42 on-road engines in non-road applications. The equipment retrofits with DOCs and DPFs lowered VOC, CO, and PM emissions, while the use on-road engines lowered NO<sub>x</sub>, VOC, and PM emissions.

**Table 9.45: Port of Tacoma 2011 vs 2005 Port CHE Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
2011	205.9	12.6	88.0	0.2	10.0	9.7	10.0	22,486
2005	370.3	25.6	160.2	5.4	22.9	22.3	23.0	38,646
<b>Change, tpy</b>	<b>-164.4</b>	<b>-13.0</b>	<b>-72.2</b>	<b>-5.2</b>	<b>-12.9</b>	<b>-12.6</b>	<b>-13.0</b>	<b>-16,160</b>
<b>Change, %</b>	<b>-44%</b>	<b>-51%</b>	<b>-45%</b>	<b>-96%</b>	<b>-56%</b>	<b>-56%</b>	<b>-57%</b>	<b>-42%</b>

Table 9.46 presents the activity and equipment count comparison for calendar year 2011 and 2005 for cargo handling equipment. The activity decreased in 2011 as a result of the decreased TEU and tonnage throughput. The equipment count increased due to some equipment being added in 2011 that was not included in 2005 and the fact that some equipment was kept in the inventory, even though it was not used.

**Table 9.46: Port of Tacoma 2011 vs 2005 CHE Activity and Equipment Count Comparison**

Year	Activity (hp-hr)	Count
2011	35,233,383	546
2005	68,330,199	518
<b>Change, %</b>	<b>-48%</b>	<b>5%</b>

*Locomotives*

Table 9.47 presents the port emissions (on-terminal and adjacent rail yards) estimate comparison for calendar year 2011 and 2005 for line-haul and switching locomotive emissions in tons per year and as a percent change. The port locomotive emissions are lower for all pollutants in 2011 due to a combination of lower throughput, improved fuel efficiency for the locomotives, and lower emissions locomotives. The lower emission locomotives are the result of turnover of the line-haul locomotive fleet to newer, cleaner locomotives and three lower emission locomotives that Tacoma Rail put into service during 2011.

**Table 9.47: Port of Tacoma 2011 vs 2005 Port Locomotive Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	364	25	54	2	12	11	12	20,015
2005	589	33	71	46	17	16	17	25,500
<b>Change, tpy</b>	<b>-225</b>	<b>-8</b>	<b>-17</b>	<b>-43</b>	<b>-5</b>	<b>-4</b>	<b>-5</b>	<b>-5,485</b>
<b>Change, %</b>	<b>-38%</b>	<b>-25%</b>	<b>-24%</b>	<b>-95%</b>	<b>-28%</b>	<b>-28%</b>	<b>-28%</b>	<b>-22%</b>

*Heavy-Duty Vehicles*

Table 9.48 presents the emissions estimate comparison for calendar year 2011 and 2005 for on-terminal heavy-duty vehicles in tons per year and as a percent change. The on-terminal heavy-duty vehicle emissions are lower for all pollutants in 2011 except for NO<sub>x</sub> and VOC, which are somewhat higher. The reductions are due to the use of ULSD and newer trucks calling the terminals in 2011 compared with 2005. The increases in emissions of NO<sub>x</sub> and VOC occurred because terminals reported overall higher numbers of truck trips (despite an overall drop in port throughput) and longer idling times. These increases in trips and idling also affected the reductions of the other pollutants, which would have decreased more had trips and idling remained the same. Driving and idling emissions of all pollutants were lower on a gram-per-mile and gram-per-hour basis in 2011 than in 2005, due to the fuel and truck fleet changes noted above.

The 2011 includes small number of port facilities that were placed in service after 2005 therefore not included in the 2005 EI. Estimated emissions from these facilities are not included in the 2011 emissions shown below, however they are included in the heavy-duty vehicle source category and overall emission estimates.

**Table 9.48: Port of Tacoma 2011 vs 2005 Port HDV Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	21.8	1.9	12.2	0.0	0.3	0.2	0.3	2,237
2005	20.8	1.7	13.5	0.4	0.5	0.4	0.5	2,049
<b>Change, tpy</b>	<b>1.0</b>	<b>0.2</b>	<b>-1.3</b>	<b>-0.4</b>	<b>-0.2</b>	<b>-0.2</b>	<b>-0.2</b>	<b>188</b>
<b>Change, %</b>	<b>5%</b>	<b>10%</b>	<b>-10%</b>	<b>-95%</b>	<b>-43%</b>	<b>-43%</b>	<b>-43%</b>	<b>9%</b>

*Fleet Vehicles – Terminal Fleet Vehicles*

Table 9.49 presents the emissions estimate comparison for calendar year 2011 and 2005 for terminal fleet vehicles in tons per year and as a percent change. In 2011, there were a total of 297 terminal fleet vehicles inventoried which was more than the 216 inventoried in 2005. All emissions, except for SO<sub>2</sub> emissions, are lower or the same in 2011 as compared to 2005. This may be due to lower activity by the vehicles inventoried. Emissions from import/export vehicles are not included in the comparison, as the focus of this section is to evaluate vehicles residing on the terminals.

**Table 9.49: Port of Tacoma 2011 vs 2005 Port Terminal Fleet Vehicles Emissions Comparison, tpy**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	2.8	0.9	13.9	0.024	0.043	0.040	0.022	1,429
2005	4.3	1.7	15.3	0.018	0.043	0.042	0.042	1,689
<b>Change, tpy</b>	<b>-1.5</b>	<b>-0.8</b>	<b>-1.4</b>	<b>0.006</b>	<b>0.000</b>	<b>-0.002</b>	<b>-0.021</b>	<b>-260</b>
<b>Change, %</b>	<b>-36%</b>	<b>-45%</b>	<b>-9%</b>	<b>33%</b>	<b>0%</b>	<b>-5%</b>	<b>-50%</b>	<b>-15%</b>

*9.5.2 2011 vs 2005 Airshed Emissions Comparisons*

Quantifying the changes of Port of Tacoma operations throughout the airshed zone (i.e. the entire emissions inventory geographical domain) is an improvement made during the 2011 update. This evaluation utilized data from the original 2005 inventory for comparison purposes to the 2011 activity and used 2011 methods for estimating emissions. Table 9.50 presents tons of emissions per 10,000 TEU in 2011 and 2005. While other non-containerized cargo activities increased at the Port of Tacoma, the containers throughput decreased significantly in 2011 as compared to that in 2005. As a result, the port-wide tons of emissions per 10,000 TEU increased in 2011 for most of the pollutants, with the exception of NO<sub>x</sub> which remained the same and CO which decreased.

**Table 9.50: Port of Tacoma 2011 vs 2005 Airshed Emissions, tons emissions per 10,000 TEU**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	37.2	1.6	5.2	20.0	2.0	1.7	1.9	2,665
2005	37.2	1.5	5.3	17.2	1.9	1.6	1.8	2,345
<b>Change (%)</b>	<b>0%</b>	<b>7%</b>	<b>-3%</b>	<b>16%</b>	<b>5%</b>	<b>3%</b>	<b>3%</b>	<b>14%</b>

The Port of Tacoma-related airshed TEU emissions efficiency changes from 2011 vs 2005 range from 3% less CO emissions to 16% more SO<sub>2</sub> emissions per 10,000 TEU moved through the port. The changes in the 2011 vs 2005 airshed emissions normalized to TEU throughput for all pollutants are presented in graphical form in Figure 9.9. The 2011 increases are due to the relationship between the number and types of ships calling the Port and the reduction in container throughput compared with 2005 conditions.

**Figure 9.9: Port of Tacoma 2011 vs 2005 Airshed Tons of Emissions per 10,000 TEU Change**

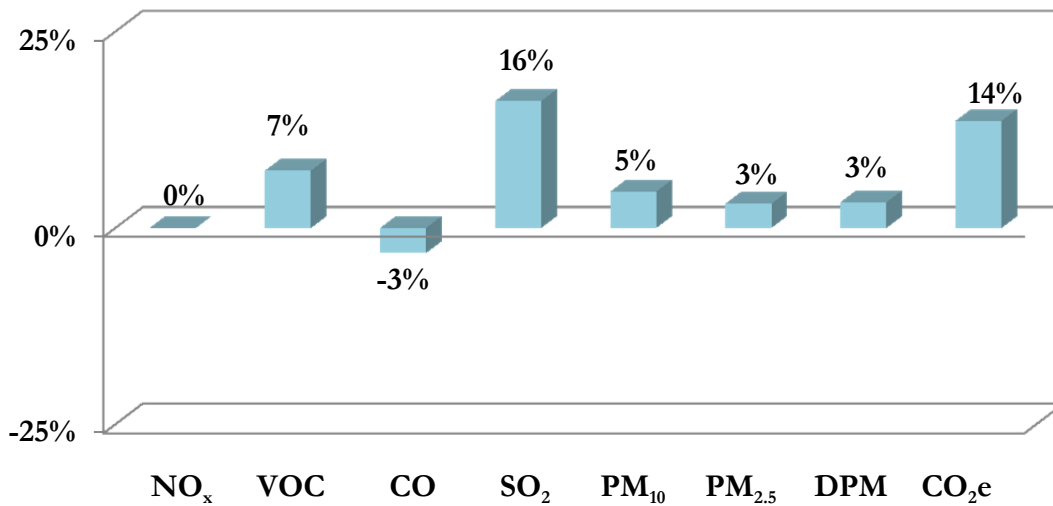


Table 9.51 presents the Port of Tacoma-related airshed cargo emissions efficiency, expressed in airshed tons of emissions per 10,000 tonnes of cargo (including both container and non-container cargo throughput), for 2011 and 2005. The efficiency improvements represent a meaningful improvement over this time and cargo is being handled and transported in a more effective manner, which resulted in reduced emissions per cargo tonnes handled by the port.

**Table 9.51: Port of Tacoma 2011 vs 2005 Airshed Tons of Emissions per 10,000 Tonnes of Cargo Comparison**

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
2011	3.2	0.1	0.4	1.7	0.2	0.1	0.2	230
2005	3.8	0.2	0.5	1.7	0.2	0.2	0.2	238
<b>Change (%)</b>	<b>-15%</b>	<b>-9%</b>	<b>-18%</b>	<b>-1%</b>	<b>-11%</b>	<b>-12%</b>	<b>-12%</b>	<b>-3%</b>



The Port of Tacoma-related airshed cargo emissions efficiency improvements from 2011 vs 2005 range from 1% less SO<sub>2</sub> emissions to 18% less CO, on an airshed emissions per 10,000 tonnes cargo moved through the port basis. The changes in the 2011 vs 2005 emissions normalized to cargo throughput for all pollutants are presented in graphical form in Figure 9.10.

**Figure 9.10: Port of Tacoma 2011 vs 2005 Airshed Tons of Emissions per 10,000 Tonnes of Cargo Change**

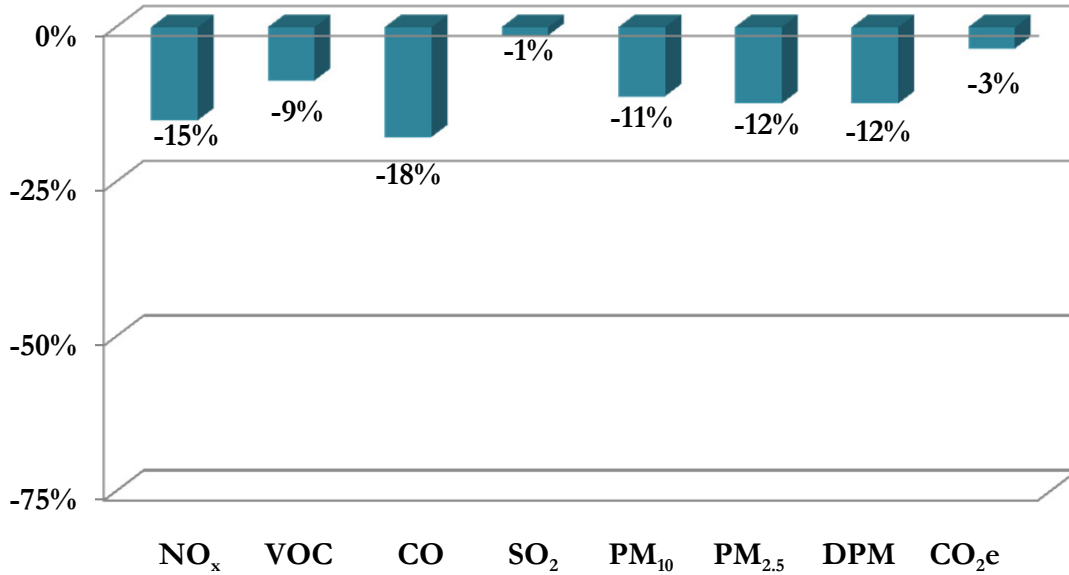


Table 9.52 provides a summary comparison of the 2011 and 2005 airshed emissions by source category. The reasons behind the 2011 vs 2005 emissions changes for the airshed zone are generally the same as outlined in the port comparisons in the previous subsection. For the Port of Tacoma, there were no associated recreational or government (port-owned) harbor vessels.

**Table 9.52: Port of Tacoma 2011 vs 2005 Airshed Emissions Comparison, tpy**

	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
<b>2011</b>								
OGV, hotelling & maneuvering	375	12	32	410.18	29.00	23.20	21.12	30,273
OGV, transit	3,257	122	280	2,561.76	216.39	173.12	202.75	153,472
Commercial harbor vessels	291	10	44	0.16	11.82	10.88	11.82	17,485
Locomotives	520	33	80	3.87	18.05	16.45	18.05	30,030
Cargo handling equipment	206	13	88	0.20	10.00	9.70	10.00	22,486
Heavy-duty vehicles	895	51	229	1.24	17.37	15.48	17.37	141,618
Terminal fleet vehicles	3	1	14	0.02	0.04	0.04	0.02	1,429
<b>Total</b>	<b>5,546</b>	<b>241</b>	<b>768</b>	<b>2,977.43</b>	<b>302.68</b>	<b>248.86</b>	<b>281.13</b>	<b>396,792</b>
<b>2005</b>								
OGV, hotelling & maneuvering	645	21	54	676.17	47.05	37.64	33.79	47,465
OGV, transit	4,069	143	332	2,736.89	245.01	196.01	234.39	166,921
Commercial harbor vessels	278	6	38	29.45	12.20	11.23	12.20	15,815
Locomotives	1,035	52	128	78.45	27.80	25.58	27.80	46,082
Cargo handling equipment	370	26	160	5.40	22.92	22.26	23.01	38,646
Heavy-duty vehicles	1,307	63	376	37.79	47.49	42.58	47.49	168,846
Terminal fleet vehicles	4	2	15	0.02	0.04	0.04	0.04	1,689
<b>Total</b>	<b>7,709</b>	<b>312</b>	<b>1,103</b>	<b>3,564.18</b>	<b>402.52</b>	<b>335.33</b>	<b>378.72</b>	<b>485,463</b>
<b>% Change</b>								
OGV, hotelling & maneuvering	-42%	-41%	-41%	-39%	-38%	-38%	-38%	-36%
OGV, transit	-20%	-15%	-15%	-6%	-12%	-12%	-13%	-8%
Commercial harbor vessels	4%	64%	17%	-99%	-3%	-3%	-3%	11%
Locomotives	-50%	-36%	-37%	-95%	-35%	-36%	-35%	-35%
Cargo handling equipment	-44%	-51%	-45%	-96%	-56%	-56%	-57%	-42%
Heavy-duty vehicles	-32%	-20%	-39%	-97%	-63%	-64%	-63%	-16%
Terminal fleet vehicles	-36%	-45%	-9%	33%	0%	-5%	-50%	-15%
<b>Total</b>	<b>-28%</b>	<b>-23%</b>	<b>-30%</b>	<b>-16%</b>	<b>-25%</b>	<b>-26%</b>	<b>-26%</b>	<b>-18%</b>

## **SECTION 10 CLEAN AIR STRATEGY EMISSION REDUCTIONS**

In 2007, the Ports of Seattle and Tacoma, along with the Port Metro Vancouver, British Columbia, developed the CAS in collaboration with regulatory air agencies, including Environment Canada, the PSCAA, the WDOE, and the United States Environmental Protection Agency. The CAS defines performance measures for reducing port-related air emissions.

As an addition to the 2011 Puget Sound Maritime Air Emissions Inventory, estimates have been developed of the emission reductions achieved in 2011 calendar year by the Port of Seattle and the Port of Tacoma through the implementation of CAS measures. This section provides the CAS emission reductions by port, by source category, and by Strategy measure. It should be noted that some emission reduction initiatives were implemented before 2011, but this section only provides emission reductions in calendar year 2011.

Emission reductions achieved during 2011 were estimated for the following CAS measures:

- Ocean-going vessels: shore power and fuel switching by vessels at berth in 2011.
- Harbor vessels: early use of ULSD fuel in 2011 by commercial harbor vessels linked to port operations, such as assist tugs and port-owned vessels.
- Cargo handling equipment: engine retrofits and fleet turnover either due to newer equipment or engine repowers.
- Heavy duty vehicles: Scrappage programs, retrofits, and ban of 1994 and older trucks calling at the port terminals.
- Locomotives: early use of ULSD in switching locomotives, idle reduction, and repowering of switching locomotives.

## 10.1 Port of Seattle

Table 10.1 summarizes the 2011 emission reductions for the Port of Seattle for ocean-going vessels, harbor vessels, cargo handling equipment, switching locomotives, and heavy-duty vehicles.

**Table 10.1: Port of Seattle 2011 Emission Reductions, tpy**

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Ocean-going vessels	38.51	0.84	2.29	371.00	23.51	18.81	19.10	1,778
Harbor craft	4.78	0.00	0.00	56.10	3.30	3.04	3.30	0
Cargo handling equipment	91.79	7.78	15.37	0.00	2.67	2.59	2.67	0
Locomotives	2.60	0.00	0.00	20.00	0.10	0.10	0.10	137
Heavy duty vehicles	135.94	1.32	0.00	0.00	8.16	7.28	8.16	0
<b>Total</b>	<b>273.61</b>	<b>9.94</b>	<b>17.66</b>	<b>447.10</b>	<b>37.74</b>	<b>31.82</b>	<b>33.33</b>	<b>1,915</b>

### 10.1.1 Ocean-Going Vessels

In 2009, the Port of Seattle launched the At-Berth Clean Fuels Incentive Program (ABC Fuels) which provides incentive for frequent callers to use less than 0.5% sulfur diesel fuel in auxiliary engines while at berth. In addition, some vessels voluntarily use shore power while at berth. The ocean-going vessels' emission reductions are due to approximately 375 vessel calls that switched fuel and 36 vessel calls for three cruise ships that used shore power while at berth in 2011. Table 10.2 presents the Port of Seattle OGV emission reductions.

**Table 10.2: Port of Seattle 2011 OGV Emission Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub> e
Shore Power	20.90	0.84	2.29	29.46	2.25	1.80	2.03	1,756
Fuel Switch	17.61	0.00	0.00	341.54	21.26	17.01	17.07	22
<b>Total</b>	<b>38.51</b>	<b>0.84</b>	<b>2.29</b>	<b>371.00</b>	<b>23.51</b>	<b>18.81</b>	<b>19.10</b>	<b>1,778</b>

### 10.1.2 Commercial Harbor Vessels

Emission reductions from assist tugs, Victoria Clipper, tank barges, and port-owned workboats are included in the reductions attributed to commercial harbor vessel associated with the Port of Seattle. In 2011, emission reduction measures included the use of ULSD for the full year by all 39 vessels associated with the Port, along with use of Tier 2 engines by three vessels that have been repowered. Table 10.3 presents the Port of Seattle 2011 commercial harbor vessel emission reductions.

**Table 10.3: Port of Seattle 2011 Commercial Harbor Vessel Emission Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Lower sulfur fuel	0.00	0.00	0.00	56.10	3.26	3.00	3.26	0.00
Tier 2 engines	4.78	0.00	0.00	0.00	0.04	0.04	0.04	0.00
<b>Total</b>	<b>4.78</b>	<b>0.00</b>	<b>0.00</b>	<b>56.10</b>	<b>3.30</b>	<b>3.04</b>	<b>3.30</b>	<b>0.00</b>

### 10.1.3 Cargo Handling Equipment

The Port of Seattle and its tenants have installed DOCs and DPFs retrofits on their equipment and have purchased cargo handling equipment with on-road engines that have resulted in emission reductions. The 2011 emission reductions are due to 167 retrofits, 67 pieces of equipment with on-road engines, and fleet modernization (the purchase of newer equipment with lower-emitting engines or engine repowers). There is no PM or DPM emissions reduction due to fleet modernization because the emissions factors for PM in EPA's NONROAD model do not vary for Tier 1 to Tier 3 engines. EPA's Tier I PM standards are equivalent to pre Tier 1 emission rates and even though Tier 2 PM standards are lower than Tier 1, due to uncertainties in PM emissions, there is no change in PM emission rates between Tier 1, 2, and 3 engines. Table 10.4 presents the Port of Seattle 2011 CHE emission reductions.

**Table 10.4: Port of Seattle 2011 CHE Emission Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Retrofit	0.00	4.80	15.37	0.00	1.86	1.80	1.86	0
On-road Engines	15.77	1.46	0.00	0.00	0.81	0.79	0.81	0
Fleet Turnover	76.01	1.53	0.00	0.00	0.00	0.00	0.00	0
<b>Total</b>	<b>91.79</b>	<b>7.78</b>	<b>15.37</b>	<b>0.00</b>	<b>2.67</b>	<b>2.59</b>	<b>2.67</b>	<b>0</b>

#### 10.1.4 Locomotives

The CAS includes numerous measures related to locomotive emissions, most of which are difficult to quantify in terms of emission reductions. The use of ULSD in switching locomotives produced a reduction of SO<sub>2</sub> emissions of approximately 94%, or 20 tons in 2011. Installation of idle reduction technologies in switching locomotives also resulted in emission reductions through the reduction of locomotive idling times. The Port's Louis Dreyfus terminal saw a 36% reduction in fuel consumption per ton of freight moved between 2010 and 2011 after installing such devices. Table 10.5 presents the Port of Seattle locomotive emission reductions.

**Table 10.5: Port of Seattle 2011 Locomotive Emission Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Idling reduction	2.60	0.00	0.00	0.00	0.10	0.10	0.10	137
Lower sulfur fuel	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0
<b>Total</b>	<b>2.60</b>	<b>0.00</b>	<b>0.00</b>	<b>20.00</b>	<b>0.10</b>	<b>0.10</b>	<b>0.10</b>	<b>137</b>

#### 10.1.5 Heavy-Duty Vehicles

The Port of Seattle implemented the “Scrappage and Retrofits for Air in Puget Sound” or ScRAPs program which provided a financial incentive to scrap pre-1994 MY drayage trucks. Since the beginning of 2011, all drayage trucks that entered the Port of Seattle container terminals have been required to be 1994 or newer in order to be allowed access to the container terminals. This combination of factors resulted in a newer overall truck fleet than would have called in the absence of these measures. Table 10.6 presents the Port of Seattle heavy-duty vehicle emission reductions which are due primarily to the Port's Clean Truck Program entry requirements which prohibits trucks, pre-1994 model year, from entering port terminals.

**Table 10.6: Port of Seattle 2011 HDV Emissions Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Fleet Change	135.94	1.32	0.00	0.00	8.16	7.28	8.16	0

## 10.2 Port of Tacoma

Table 10.7 summarizes the 2011 emission reductions for the Port of Tacoma for ocean-going vessels, harbor vessels, cargo handling equipment, switching locomotives, and heavy-duty vehicles.

**Table 10.7: Port of Tacoma 2011 Port Emission Reductions, tpy**

Source Category	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Ocean-going vessels	21.41	0.50	1.34	132.69	8.46	6.77	6.10	1,159
Harbor craft	4.78	0.00	0.00	34.10	2.07	1.90	2.07	0
Cargo handling equipment	15.66	5.20	17.34	0.00	2.43	2.36	2.43	0
Locomotives	3.09	0.17	0.00	16.90	0.12	0.12	0.12	59
Heavy duty vehicles	58.18	0.76	0.00	0.00	3.56	3.17	3.56	0
<b>Total</b>	<b>103.11</b>	<b>6.63</b>	<b>18.68</b>	<b>183.70</b>	<b>16.65</b>	<b>14.32</b>	<b>14.29</b>	<b>1,218</b>

### 10.2.1 Ocean-Going Vessels

In 2010, the Port of Tacoma completed a project to retrofit two TOTE RoRo ships and one port terminal for shore power. These two vessels, which call twice weekly, used shore power while at berth for every call they made to the Totem Ocean Trail Express terminal. In addition, two shipping lines, K-Line and Evergreen Marine, used distillate fuel with 0.5% sulfur for hotelling operations while at berth in 2011. Table 10.8 presents the Port of Tacoma OGV emission reductions.

**Table 10.8: Port of Tacoma 2011 OGV Emission Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Shore Power	15.73	0.50	1.34	20.01	1.43	1.15	1.15	1,150
Fuel Switch	5.68	0.00	0.00	112.69	7.03	5.62	4.95	9
<b>Total</b>	<b>21.41</b>	<b>0.50</b>	<b>1.34</b>	<b>132.69</b>	<b>8.46</b>	<b>6.77</b>	<b>6.10</b>	<b>1,159</b>

### 10.2.2 Harbor Vessels

Emission reductions from assist tugs and tank barges are included in the emission reductions achieved by Port of Tacoma related commercial harbor vessels. In 2011, the emission reduction measures included the use of ULSD for the full year by all 27 vessels associated with the Port along with the use of Tier 2 engines by three vessels that have been retrofit. Table 10.9 presents the Port of Tacoma 2011 commercial harbor vessel emission reductions.

**Table 10.9: Port of Tacoma 2011 Commercial Harbor Vessel Emission Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Lower sulfur fuel	0.00	0.00	0.00	34.10	2.03	1.86	2.03	0.00
Tier 2 engines	4.78	0.00	0.00	0.00	0.04	0.04	0.04	0.00
<b>Total</b>	<b>4.78</b>	<b>0.00</b>	<b>0.00</b>	<b>34.10</b>	<b>2.07</b>	<b>1.90</b>	<b>2.07</b>	<b>0.00</b>

### 10.2.3 Cargo Handling Equipment

The Port of Tacoma and its tenants have installed DOCs and DPFs retrofits on their equipment, repower CHE, and have purchased CHE with on-road engines that have resulted in emission reductions. The 2011 emission reductions are based on 165 retrofits, 20 pieces of equipment with on-road engines, 20 pieces of equipment with a combination of on-road engine and DOC retrofit, and fleet modernization (the purchase of newer equipment with lower-emitting engines or engine repowers). Table 10.10 presents the Port of Tacoma 2011 CHE emission reductions.

**Table 10.10: Port of Tacoma 2011 CHE Emission Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Retrofit	0.00	4.19	16.84	0.00	2.07	2.01	2.07	0.00
On-road Engines	3.61	0.29	0.00	0.00	0.23	0.22	0.23	0.00
Combination	3.79	0.39	0.51	0.00	0.13	0.13	0.13	0.00
Fleet Turnover	8.26	0.33	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total</b>	<b>15.66</b>	<b>5.20</b>	<b>17.34</b>	<b>0.00</b>	<b>2.43</b>	<b>2.36</b>	<b>2.43</b>	<b>0.00</b>



#### 10.2.4 Locomotives

The CAS includes numerous measures related to locomotive emissions, most of which are difficult to quantify in terms of emission reductions. The use of ULSD in switching locomotives produced a reduction of SO<sub>2</sub> emissions of approximately 94%, or 17 tons in 2011.

Since 2007, Tacoma Rail has partnered with local, state and federal agencies to install idle reduction equipment and retire older less efficient locomotives to improve efficiency and reduce emissions. Tacoma Rail currently has Automatic Engine Start Stop devices on 85% of their fleet. In 2011 Tacoma Rail replaced three non-tier locomotives manufactured between 1956 and 1960 with newer repowered locomotives that meet EPA Tier 2 emission standards. Combined with an anti-idle function, the project significantly reduced air pollutant emissions and fuel consumption. The project reduced emissions by 75% and fuel use by 40% for each locomotive replaced. An additional component of this project was installation of onboard wheel flange lubrication technology on the three locomotives which were replaced, as well as five additional switcher locomotives owned and operated by Tacoma Rail. The wheel flange lubricator systems are designed to reduce wheel/rail friction thereby improving fuel efficiency.

In 2011, three switching locomotives at TEMCO, the Port of Tacoma grain terminal, were equipped with Automatic Engine Start Stop devices to limit excess idling. In addition to reducing GHG emissions the project significantly reduced diesel particulate emissions.

It should be noted that since the repowers occurred during 2011, the reductions shown are not for a full year, but are actual emission reductions in 2011; reductions should be greater in future years. Table 10.11 also includes the SO<sub>2</sub> reduction due to the use of ULSD in 2011 and TEMCO's estimated reductions due to the idle reduction devices. TEMCO's reductions were estimated by the WDOE for the period from July 2011 when they were installed until July 2012. The figures presented below are prorated to represent 2011 reductions only. The reductions achieved by Tacoma Rail have not been quantified because specific fuel savings information is not available, but would be significantly higher than those achieved by TEMCO, based on their relative levels of activity.

**Table 10.11: Port of Tacoma 2011 Locomotives Emissions Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Repower	1.86	0.17	0.00	0.00	0.08	0.08	0.08	0
Lower sulfur fuel	0.00	0.00	0.00	16.90	0.00	0.00	0.00	0
Idling reduction	1.23	0.00	0.00	0.00	0.04	0.04	0.04	59
<b>Total</b>	<b>3.09</b>	<b>0.17</b>	<b>0.00</b>	<b>16.90</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>	<b>59</b>

*10.2.5 Heavy-Duty Vehicles*

The Port of Tacoma implemented a Drayage Truck Emission Improvement Program to reduce heavy-duty vehicle emissions. As part of the program, the Port of Tacoma implemented a clean truck sticker registry identifying trucks compliant with program standards, which include a requirement that trucks be of model year 1994 or newer. This resulted in a newer overall truck fleet than would have called in the absence of this program. Table 10.12 presents the 2011 Port of Tacoma emission reductions for heavy-duty vehicles.

**Table 10.12: Port of Tacoma 2011 HDV Emissions Reductions, tpy**

Measure	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2e</sub>
Fleet Change	58.18	0.76	0.00	0.00	3.56	3.17	3.56	0



**APPENDIX A – GLOSSARY**



**Air toxics** – Toxic air pollutants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious, chronic health effects, such as reproductive effects or birth defects, or adverse environmental effects.

**Alternative fuel** – Also known as “non-conventional fuels”, is any material or substance that can be used as a fuel, other than fossil fuels, or conventional fuels of petroleum (oil), coal, propane, and natural gas. The term "alternative fuels" usually refers to a source of which energy is renewable (See “renewable fuel”).

**Area source** – A general term for a source that is an aggregate of all emission sources within a defined spatial boundary. Though emissions from individual sources in an area are relatively small, collectively their emissions can be of concern - particularly where large numbers of sources are located in heavily populated areas.

**Auxiliary engine** – A small engine often used when a ship is in-transit, maneuvering, or hotelling.

**Baseline Air Emissions Inventory** – For a given air emission source category, a baseline inventory establishes a reference point with more detailed emission data than previously existed. An established baseline allows comparison with future inventories of similar precision to describe changes to the characteristics of the source category and intensity of the emissions.

**Brake-Specific Fuel Consumption** – A way to measure the efficiency of an engine by dividing rate of fuel consumption by the rate of power production.

**Bunker Fuel** – See “Fuel Oil”

**Cargo handling equipment (CHE)** – Equipment used to move cargo to and from marine vessels, railcars and trucks. This includes equipment such as cranes, rubber tired gantry cranes, terminal trucks, container handlers, bulk loaders, and forklifts.

**Cold Ironing** – Also called “Alternative Maritime Power” in application at the Port of Los Angeles and more generally referred to as “Shore Power.” This specifically refers to an electrical connection made between the vessel and the terminal to provide full or partial operational power during hotelling periods. The primary motivation for cold ironing has been as a method to reduce emissions from the exhausts of auxiliary engines that would normally operate during hotelling. “Cold iron” is a reference to when ships mainly used boilers to produce steam for propulsion, heat, and power. When the steam production was shut down, the iron in the boiler housing would go cold.

**Commercial vessel** – Any vessel involved in commercial trade or business.

**Criteria pollutants** – A regulatory term that refers specifically to six outdoor air pollutants for which EPA is required to develop National Ambient Air Quality Standards (NAAQS), as codified in the federal Clean Air Act. These six are carbon monoxide (CO), lead, nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM), ozone, and sulfur oxides.

**Deadweight tonnage** – Refers to the total amount of weight that a vessel is carrying, minus the actual weight of the vessel.

**Deterioration factor** – For use in emission or performance calculation, this number accounts for the effect of gradual wear in the internal engine components in the course of normal operation.

**Diesel** – In standard use, this refers to a specific fractional distillate of fuel oil that is used as fuel in a combustion-ignition (CI) engine. Practically, diesel can refer generally to any hydrocarbon-dense oil with relatively low volatility that can be used as a combustion fuel. In common maritime use, diesel can refer to several varieties of distillate fuels including “Marine Diesel Oil” (MDO, aka DMB or DMC) and “Marine Gas Oil” (MGO, aka DMA or DMX) as specified by ISO 8217. Diesel can also be referred to by its sulfur content, such as the case of LSD (low sulfur diesel with less than 500ppm sulfur) or ULSD.

**Diesel electric** – Refers to equipment that uses electric motive systems that rely on electricity from diesel generators.

**Diesel Oxidation Catalyst (DOC)** – A flow-through canister, fit to an engine exhaust pipe, containing a honeycomb-like structure or substrate. The substrate has a large surface area that is coated with an active catalyst layer. This layer contains a small, well dispersed amount of precious metals such as platinum or palladium. As exhaust gases pass over the catalyst, carbon monoxide, gaseous hydrocarbons and liquid hydrocarbon particles (unburned fuel and oil) are oxidized, thereby reducing harmful emissions.

**Diesel Particulate Matter (DPM)** – Refers to particulate components of combustion products that are directly emitted from diesel engines. These include soot (“elemental” or “black” carbon) and other aerosols that are complex aggregates of hydrocarbons, metals, silicates, and other chemicals. In recent years, DPM has been singled out as posing a carcinogenic risk to people who regularly work in proximity to diesel equipment over the course of many years.

**Diesel Particulate Filter (DPF)** – A filter installed on the exhaust pipe of diesel engine to physically separate particulate matter from the exhaust stream. Some filters are single use (disposable), while others are designed to burn off the accumulated particulate, either through the use of a catalyst (passive), or through an active technology, such as a fuel burner which heats the filter to soot combustion temperatures

**Economizer** – A heat exchanger that transfers heat from the exhaust stream to a water circulation system to produce steam. Often used when a vessel is in transit, an economizer can allow the regular diesel powered boiler to be shut off.

**Emission factor** – A number specific to an engine or system that describes the amount of a pollutant that is generated per unit of activity, e.g. mg/mile or g/hr

**Emulsified fuel** – A homogenized blend of water into diesel fuel that changes the fuel combustion characteristics and resulting emissions. This strategy is mainly employed to reduce NO<sub>x</sub> emissions but may also reduce PM and improve fuel economy.

**EPA NONROAD model** – NONROAD is a computer modeling program created and regularly updated by EPA that calculates past, present, and future emission inventories (i.e., tons of pollutant) for all non-road equipment categories except commercial marine, locomotives, and aircraft. For a specified geographic area, time period, and fuel type, the model estimates exhaust and evaporative hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO<sub>x</sub>), particulate matter (PM), sulfur dioxide (SO<sub>2</sub>), and carbon dioxide (CO<sub>2</sub>).

**Exhaust gas recirculation (EGR)** – A technique used in most gasoline and diesel powered engines to control emissions. Engine exhaust is mixed with engine intake air and recirculated through the combustion process. The result is a reduction in NO<sub>x</sub> emissions due to lower combustion temperatures and reduction of excess oxygen.

**Fine particulate matter** – See *Particulate Matter*

**Four-stroke engines** – The most common type of engine for cars and trucks. This engine uses the ‘Otto cycle’ and consists of four strokes. 1. intake stroke, 2. compression stroke, 3. power (ignition) stroke, and 4. exhaust stroke.

**Fuel correction factor (FCF)** – A number used in emission inventory models to reflect the impact on emissions of commercially dispensed fuel compared to fuel used during the certification process. These factors are derived as the ratio of the impact of the dispensed fuel to the impact of the certification fuel.

**Fuel Oil** – A general term for viscous liquid fuels used for powering engines. In the maritime industry the following classifications are used.

- **Marine gas oil (MGO)** – A purely distillate fuel (see “diesel”)
- **Marine diesel oil (MDO)** – A blend of gas oil and heavy fuel oil
- **Intermediate fuel oil (IFO)** – A blend of gas oil and heavy fuel oil, with less gas oil than marine diesel oil
- **Medium fuel oil (MDO)** – A blend of gas oil and heavy fuel oil, with less gas oil than intermediate fuel oil
- **Heavy fuel oil (HFO)** – Pure or nearly pure residual oil (bunker fuel)

**Fugitive emissions** – Emissions not created through a defined process or controlled by a dedicated system. These can be due to equipment leaks, evaporative processes, materials processing, and windblown disturbances

**GHG equivalent** – Similar to “carbon equivalent” this refers to a method by which air emissions are standardized for comparison based on their “global warming potential” (GWP) as greenhouse gases. Each greenhouse gas differs in its ability to absorb heat in the atmosphere so will be presented in units of carbon equivalents, which weighs each gas by its GWP relative to carbon dioxide. For example, methane traps over 21 times more heat per molecule than carbon dioxide, and nitrous oxide absorbs 310 times more heat per molecule than carbon dioxide.

**Greenhouse Gas** – Substances in the atmosphere that absorb radiated heat from the earth’s surface and also radiate heat back to the surface, causing a net retention of heat energy. Carbon dioxide, methane, and nitrous oxide are common examples.

**Gross vehicle weight rating** – The estimated total weight of a road vehicle that is loaded to capacity, including the weight of the vehicle, the passengers, fuel, cargo, and miscellaneous items. The rating allows the vehicle driver to know what routes are acceptable, depending on whether the roadways can accommodate a vehicle of the estimated weight.

**Harbor vessel** – A term that generally refers to vessels that do not make regular ocean passage. These include commercial fishing boats, tug boats, ferries, workboats, etc.; governmental (non-military) vessels such as ferries and other vessels; tank barges; and recreational vessels. For the purpose of this report, any vessel that is not an ocean-going vessel, recreational vessel, or tank barge, has been categorized as a commercial harbor vessel, government (non-military) vessels, tank barges, or recreational vessels.

**Heavy-duty vehicle** – A class 8 truck fueled by diesel and has a gross vehicle weight of 33,001 lbs or higher.

**Hotelling** – The period during which a vessel is secured at berth

**Hydrocarbon** – A chemical term referring to compounds that consists of carbon and hydrogen in various structures. Most common liquid fuels are primarily comprised of some form of hydrocarbon.



**Integrated tug/barge** – Any tug and barge combination with a specially designed connection system joining the two together. The combination allows the vessel to have increased sea keeping capabilities when compared to a separated tug and barge.

**Intermediate fuel oil (IFO)** – See *Fuel Oil*

**Intermodal Container Transfer Facility** – A rail yard that is located close to a port facility and is where a cargo transition between two different transportation modes (e.g. trucks, trains, or ships) occurs.

**Light-duty vehicle (LDV)** – Class 1 and 2 vehicles that can use gas or diesel fuel and have a gross vehicle weight of 6,000 lbs or less (class 1) or between 6,001 and 10,000 lbs (class 2).

**Liquefied Natural Gas (LNG)** – Natural gas that has been processed to remove impurities and heavy hydrocarbons and is then condensed into a liquid using extremely low temperature or high pressure.

**Liquefied Petroleum Gas (LPG)** – A mixture of hydrocarbon gases that are commonly used to fuel heating appliances and vehicles. The two most common forms of liquefied petroleum gas are propane and butane.

**Load Factor (LF)** – A ratio of an engine’s average actual power used to its maximum power rating.

**Low Sulfur Diesel (LSD)** – See “Diesel”

**Main line locomotives** – Also called “line-haul,” these are the largest class of locomotives and are designed for the heaviest loads, longest distances, and steepest grades.

**Main propulsion engine** – The engines on a vessel that are dedicated to movement of a ship over long distances.

**Marine Diesel Oil (MDO)** – See “Fuel Oil”

**Maximum continuous rating** – A value assigned to a piece of equipment by its manufacturer that sets a guideline for which the equipment can be operated for an unlimited period of time without damage.

**National Ambient Air Quality Standards (NAAQS)** – A term referring to a specific legal instrument under the federal Clean Air Act that creates enforceable limits to airborne concentrations of “criteria pollutants.” NAAQS are currently required for six substances (See “criteria pollutants”). NAAQS can be of two types: “Primary NAAQS” are designed to protect human health, including sensitive populations such as children, the elderly, and individuals suffering from respiratory disease. “Secondary” NAAQS are designed to protect public welfare (e.g., building facades, visibility, crops, and domestic animals).

**Non-Methane Organic Gas (NMOG)** – Organic gases that exclude methane but account for all other organic pollutants that form a foundation for the formation of ozone.

**Ocean-going vessel (OGV)** – Vessels that operate in open oceanic waters.

**Particulate Matter (PM)** – A general term for any substance, except pure water, that exists as a liquid or solid in the atmosphere under normal conditions and is of microscopic or sub-microscopic size but larger than molecular dimensions. Airborne PM can result from direct emissions of particles (primary PM) or from condensation of certain gases that have themselves been directly emitted or chemically transformed in the atmosphere (secondary PM). PM is often classified by size:

- **PM<sub>2.5</sub>** – Also known as “fine” particulate matter, PM<sub>2.5</sub> refers to the fraction of PM in a sample that is 2.5 microns in diameter or less. This size of PM is commonly associated with combustion and secondary PM.
- **PM<sub>10</sub>** – Also known as “coarse” particulate matter, PM<sub>10</sub> refers to the fraction of PM in a sample that is 10 microns in diameter or less.

**Polycyclic Aromatic Hydrocarbon (PAH)** – One of the first atmospheric species to be identified as carcinogenic. PAHs are formed during the incomplete combustion of organic matter, e.g. coal, oil, wood, and petroleum. PAHs consist of two or more fused benzene rings in various configurations that, by definition, contain only carbon and hydrogen.

**Polycyclic organic material** – Compounds containing polycyclic aromatic hydrocarbons and derivatives.

**Renewable Fuels** – Fuels derived from sources that are regenerative or for all practical purposes cannot be depleted.

**Residual oil** – “Residual Fuel Oil” or “Bunker Fuel” – See “Fuel Oil”.

**Roll-on/Roll-off (RoRo)** – A vessel featuring a built-in ramp for wheeled cargo to be ‘rolled-on’ and ‘rolled-off’ of the vessel.

**Rubber Tired Gantry (RTG) Crane** – A common piece of cargo handling equipment at marine terminals used to transfer containers from stacked storage to a vehicle.

**Selective Catalytic Reduction (SCR)** – A process where a gaseous or liquid reductant (most commonly ammonia or urea) is added to the flue or exhaust gas stream and absorbed onto a catalyst. The reductant reacts with NO<sub>x</sub> in the exhaust gas to form H<sub>2</sub>O (water vapor) and N<sub>2</sub> (nitrogen gas).

**Sea water scrubbing** – An exhaust treatment technique used on ships to reduce emissions by through physical and chemical interaction with sea water. When the exhaust comes in contact with the seawater, the SO<sub>2</sub> reacts with calcium carbonate to form a solid calcium sulfate and CO<sub>2</sub>. Scrubbers also function by physically scavenging particles and gases from the air.

**Shaft generators** – Provides electric power to a moving vessel by generating current from the rotation of the vessel’s drive shaft.

**Shore power** – See “Cold Ironing”

**Point source** – A single, stationary point source of emissions that is immovable for all practical purposes.

**Switching locomotive** – A locomotive that is used exclusively in a facility where rail cars are organized and assembled into trains.

**Total organic gases** – The sum of reactive and non-reactive organic gases in the air.

**Twenty-foot Equivalent Unit (TEU)** – A measure used for containerized cargo. One TEU is equivalent to one standard cargo container measured 20’ x 8’ x 8’6”.

**Two-stroke engines** – A type of internal combustion engine that completes the same four processes as a four-stroke engine (intake, compression, power, and exhaust) in only two strokes of the piston rather than four. This is accomplished by using the space below the piston for air intake and compression, thus allowing the chamber above the piston to be used for just the power and exhaust strokes. This results in a power stroke with every revolution of the crank, instead of every second revolution as in a four-stroke engine. For this reason, two-stroke engines provide high specific power, so they are valued for use in portable, lightweight applications. Two stroke diesel engines are common in large marine vessels.

**Ultra Low Sulfur Diesel (ULSD)** – See “diesel.”

**Volatile Organic Compound (VOC)** – A very broad term used to describe the entire set of vapor-phase atmospheric organic chemicals except CO and CO<sub>2</sub>.





**APPENDIX B - SUPPORTING DATA**



**APPENDIX B - SUPPORTING DATA**

**OCEAN-GOING VESSEL DATA**





**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
7825435	1980	14837	18.5	Auto Carrier	12356	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7917551	1981	28223	19.5	Auto Carrier	13496	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7917563	1981	28210	20	Auto Carrier	13500	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8016548	1982	28100	18.25	Auto Carrier	13500	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8018168	1982	17863	19.5	Auto Carrier	13542	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8107103	1982	41666	14.5	Auto Carrier	11180	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8204951	1984	44013	21	Auto Carrier	26921	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8204963	1984	44080	21	Auto Carrier	26921	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8204975	1984	43986	20.5	Auto Carrier	26919	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8320767	1985	28070	19.5	Auto Carrier	16980	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8321333	1985	28070	20	Auto Carrier	15190	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8415809	1985	13920	17.75	Auto Carrier	9179	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8517944	1986	12893	18.25	Auto Carrier	10591	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8602579	1987	15528	18	Auto Carrier	9000	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8607749	1987	14104	18.25	Auto Carrier	9650	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8608078	1988	23096	18	Auto Carrier	9445	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8608133	1987	9783	18	Auto Carrier	8870	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8608145	1987	9675	18.5	Auto Carrier	8870	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8608157	1987	12848	18	Auto Carrier	10597	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8608169	1987	12939	19.5	Auto Carrier	10591	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8612251	1987	14487	20.9	Auto Carrier	10298	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8612263	1987	14034	20.8	Auto Carrier	10298	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8616958	1987	15576	18.7	Auto Carrier	11511	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8709119	1987	9694	18	Auto Carrier	8871	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8709157	1987	12706	19.7	Auto Carrier	10592	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8712324	1988	18777	19	Auto Carrier	11694	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8718706	1988	12763	18	Auto Carrier	10592	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8912663	1988	12763	18.58	Auto Carrier	10592	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9053505	1994	17183	18.8	Auto Carrier	10813	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9056296	1994	14930	19	Auto Carrier	11916	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9070462	1994	13308	18	Auto Carrier	10371	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9077836	1995	14696	18.5	Auto Carrier	12269	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9082934	1995	15199	20.2	Auto Carrier	16358	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9088237	1996	13778	19.9	Auto Carrier	13899	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9088249	1997	12490	19.9	Auto Carrier	13899	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9103180	1994	18938	18.6	Auto Carrier	11695	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9110107	1995	15181	18.5	Auto Carrier	11475	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9121273	1996	48988	19.5	Auto Carrier	25000	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9122655	1997	28142	20.5	Auto Carrier	16358	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9122966	1997	21421	20.1	Auto Carrier	14314	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9138525	1998	28142	20.5	Auto Carrier	16358	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9150339	1998	14353	18.9	Auto Carrier	10592	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9150341	1998	14348	18.9	Auto Carrier	10592	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9153551	1998	15483	18	Auto Carrier	11416	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9158288	1998	22799	19	Auto Carrier	14123	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9158604	1997	21505	20.1	Auto Carrier	14314	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9166895	1998	13418	19	Auto Carrier	11916	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9169316	1999	16669	19.2	Auto Carrier	12357	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9174490	1998	22734	19.3	Auto Carrier	14121	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9175925	1998	14101	19	Auto Carrier	10592	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9177026	1999	12780	19.5	Auto Carrier	11060	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9177038	2000	12778	19.5	Auto Carrier	11060	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9177428	1998	21523	18.53	Auto Carrier	14123	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9181376	1999	15894	19	Auto Carrier	11622	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9182289	1999	21526	19.3	Auto Carrier	14121	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9185047	2000	14067	18.9	Auto Carrier	10592	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9185463	2000	16886	20	Auto Carrier	14123	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9188805	1999	10817	18.5	Auto Carrier	9989	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9189251	1999	28126	20.5	Auto Carrier	14710	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9191307	2000	39516	20	Auto Carrier	20940	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9191321	2000	39516	20	Auto Carrier	20940	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9203291	1998	21511	19	Auto Carrier	14314	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9209271	2000	17693	20	Auto Carrier	14638	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9209518	2000	20144	19	Auto Carrier	14123	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9210438	2000	21400	20.5	Auto Carrier	15520	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9213454	2000	20202	20	Auto Carrier	14121	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9231688	2001	10454	18.5	Auto Carrier	9989	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9238519	2001	17201	20	Auto Carrier	13940	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9238521	2001	17232	20	Auto Carrier	13940	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9240160	2003	28388	20.5	Auto Carrier	16358	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9252204	2003	19879	20	Auto Carrier	14160	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9252228	2003	19893	20	Auto Carrier	14160	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9267687	2003	19512	20	Auto Carrier	14160	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9273894	2004	20111	20	Auto Carrier	15540	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9283875	2004	20146	20	Auto Carrier	15540	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9289908	2006	12600	20	Auto Carrier	14220	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9289910	2006	12249	20	Auto Carrier	14220	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293571	2005	18947	20	Auto Carrier	15130	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293612	2004	19628	19.5	Auto Carrier	13895	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293624	2005	19628	19.5	Auto Carrier	13895	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293636	2004	19086	20.65	Auto Carrier	14315	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293648	2004	19080	20.65	Auto Carrier	12170	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293662	2005	19093	20.65	Auto Carrier	10360	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293894	2006	17713	20.7	Auto Carrier	15090	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293911	2005	17738	20.7	Auto Carrier	15090	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9302205	2005	19628	19.5	Auto Carrier	13240	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9303194	2006	18312	19.8	Auto Carrier	14280	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9303211	2006	18318	20.6	Auto Carrier	14280	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9310109	2006	19628	19.5	Auto Carrier	14315	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9319753	2006	19628	19.5	Auto Carrier	14315	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9325233	2007	18099	19.8	Auto Carrier	14280	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9332925	2007	18700	19	Auto Carrier	15820	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9334246	2008	15068	19.4	Auto Carrier	11440	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9338620	2007	18864	20	Auto Carrier	15540	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9338632	2008	12892	20	Auto Carrier	10999	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9338709	2007	22755	19.5	Auto Carrier	15540	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9338840	2008	18864	20	Auto Carrier	15130	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9338890	2009	14342	19.5	Auto Carrier	11334	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9339818	2007	18090	19.8	Auto Carrier	14280	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9339832	2008	17673	20	Auto Carrier	12640	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9358888	2008	12303	19.7	Auto Carrier	11060	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9361811	2008	12300	20	Auto Carrier	12640	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9361823	2008	12300	20	Auto Carrier	12640	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9362267	2006	17765	20	Auto Carrier	16360	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9367607	2009	17382	19.3	Auto Carrier	14120	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9372327	2007	15261	19.9	Auto Carrier	11560	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9372810	2009	17406	19.3	Auto Carrier	14120	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9375264	2008	22144	19.5	Auto Carrier	14315	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9377494	2008	30089	20.8	Auto Carrier	18080	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9377511	2008	30089	20.8	Auto Carrier	18080	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9381677	2008	17289	19.8	Auto Carrier	15090	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9384942	2007	22602	20.1	Auto Carrier	15540	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9391581	2009	21037	20	Auto Carrier	15820	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9392341	2010	15031	19.4	Auto Carrier	11441	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9395630	2011	13363	19.8	Auto Carrier	13560	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9397987	2008	18772	20.65	Auto Carrier	14315	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9398333	2009	22250	19.5	Auto Carrier	13240	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9402756	2008	12889	20	Auto Carrier	11620	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9403279	2010	14381	19.5	Auto Carrier	11336	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9403281	2010	14996	20	Auto Carrier	11440	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9426350	2009	21438	20	Auto Carrier	15544	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9426386	2009	17237	19.8	Auto Carrier	15092	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9432880	2008	12296	20	Auto Carrier	14220	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9432907	2008	12352	20	Auto Carrier	14220	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9442122	2010	11215	19.6	Auto Carrier	11620	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9442873	2008	18930	20	Auto Carrier	13260	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9477921	2009	20019	20	Auto Carrier	16360	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9481051	2011	12588	18	Auto Carrier	11060	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9481075	2011	10600	18	Auto Carrier	11060	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9494905	2009	17245	20.5	Auto Carrier	15090	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9515383	2011	41820	20.25	Auto Carrier	20100	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9519121	2009	22723	19.5	Auto Carrier	16360	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9531739	2010	21323	20.6	Auto Carrier	15544	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9544920	2011	17300	19.8	Auto Carrier	16360	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9553103	2010	22657	19.5	Auto Carrier	15540	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9554200	2010	19045	20	Auto Carrier	15100	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9584059	2010	18436	20	Auto Carrier	15130	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9610391	2011	18900	20	Auto Carrier	15820	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8307179	1984	38309	14	Bulk	5884	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8308991	1985	38888	14.5	Bulk	5884	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8319641	1984	38033	14	Bulk	6660	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8413473	1986	34142	14.1	Bulk	9540	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8517578	1987	68283	14	Bulk	8018	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8800327	1990	68789	14.5	Bulk	8994	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8801022	1990	68788	14	Bulk	9017	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8801785	1989	68676	14	Bulk	7205	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8901107	1990	69637	14	Bulk	8905	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8903234	1992	69451	14	Bulk	8910	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8905828	1991	65434	14.4	Bulk	9451	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9011923	1992	73505	13.7	Bulk	8005	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9013268	1991	69337	14.5	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9040376	1993	43415	13.7	Bulk	7025	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9041019	1994	70046	14.5	Bulk	9015	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9046916	1993	69555	13.5	Bulk	7414	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9047099	1994	69271	14	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9047104	1994	69283	14.5	Bulk	8798	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9055993	1994	69930		14 Bulk	8458	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9074016	1993	69153	14.8	Bulk	10246	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9074470	1994	69286		14 Bulk	11254	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9075735	1995	73034	14.5	Bulk	8676	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9077226	1995	68371		14 Bulk	7635	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9077903	1994	64214	13.5	Bulk	8555	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9086954	1996	69091	14.5	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9087192	1995	70677		14 Bulk	8312	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9103178	1994	45228	14.3	Bulk	7943	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9104081	1995	45712		14 Bulk	7171	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9104457	1994	68591	14.1	Bulk	7635	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9105396	1995	27308	14.1	Bulk	5370	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9107667	1995	45483	14.6	Bulk	8561	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9111943	1995	45320	14.3	Bulk	7392	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9112325	1996	73080	13.5	Bulk	8680	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9115523	1996	70165	14.8	Bulk	7723	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9118329	1996	45190	14.5	Bulk	7723	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9119971	1996	46664		14 Bulk	8165	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9120059	1996	70189	15.8	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9122849	1996	71662	14.5	Bulk	8701	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9123128	1996	70164	14.5	Bulk	8900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9126302	1997	45584		14 Bulk	6958	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9128221	1997	73049	14.76	Bulk	8682	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9128582	1995	69058	14.75	Bulk	9930	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9128922	1996	70252		14 Bulk	10916	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9131838	1997	72940	14.5	Bulk	8680	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9135523	1996	24800	14.3	Bulk	6179	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9138501	1997	74009	14.5	Bulk	8900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9138903	1997	32115	14.4	Bulk	7061	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9139256	1997	71572	14.3	Bulk	8701	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9139270	1996	70296		14 Bulk	9526	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9140009	1996	45681	14.5	Bulk	8562	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9147423	1998	73937	14.5	Bulk	8900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9149392	1998	47180	14.5	Bulk	7451	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9156278	1998	73018	14.5	Bulk	8673	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9156838	1997	73763		15 Bulk	8385	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9159438	1997	45363	14.3	Bulk	6333	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9159567	1997	73786	14.5	Bulk	8878	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9162045	1997	71369	14.5	Bulk	8532	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9163295	1998	74522	14.5	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9163465	1998	45766		14 Bulk	7172	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9168491	1998	45713		14 Bulk	7172	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9170274	1998	72493	14.5	Bulk	10224	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9170298	1998	70529	14.5	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9176670	2000	45710		14 Bulk	7172	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9180906	2000	75100	14.5	Bulk	10750	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9181039	1999	50327		14 Bulk	8090	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9185736	1999	73744	14.5	Bulk	8878	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9185748	1998	72465	14.2	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9186376	1998	27140		14 Bulk	6074	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9186778	1999	48221	14.5	Bulk	7282	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9189768	1999	74356	14.5	Bulk	9209	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9190640	2002	72863	14.5	Bulk	12269	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9207417	1999	73807	14	Bulk	8900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9207730	2000	74020	13.6	Bulk	8900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9207766	2001	75971	14	Bulk	9010	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9208502	2000	72917	15	Bulk	10412	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9211559	2000	28355	14	Bulk	5392	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9213753	2000	31824	14	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9214161	1999	74242	15	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9216248	2001	74401	14.5	Bulk	10952	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9216432	2001	74119	14.4	Bulk	8668	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9216444	2001	74119	14.4	Bulk	8668	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9216640	2001	75563	14	Bulk	9342	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9217216	2001	74297	14.7	Bulk	10224	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9217228	2001	74297	14.7	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9218167	2000	74269	14.5	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9218284	2001	73311	14.5	Bulk	8880	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9218301	2000	31877	13.5	Bulk	7060	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9218313	2000	31879	13.5	Bulk	7060	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9218791	2001	74540	14.5	Bulk	10952	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9219032	2001	74297	14.5	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9219044	2002	75000	14.5	Bulk	10224	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9219458	2000	46644	14.5	Bulk	7428	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9221190	2001	76099	14.5	Bulk	12269	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9221437	2001	73910	14.9	Bulk	10371	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9222625	2001	52224	14.5	Bulk	9467	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9224790	2002	74141	14.5	Bulk	10952	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9224984	2001	75121	14.8	Bulk	11160	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9224996	2001	75169	14.8	Bulk	11160	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9227649	2001	75121	14.5	Bulk	9800	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9227687	2001	73996	14.5	Bulk	9989	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9228069	2002	74204	14.5	Bulk	9974	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9229623	2002	74133	14.9	Bulk	11044	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9229635	2002	74133	14.9	Bulk	11044	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9230359	2002	73937	14.7	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9231303	2001	76623	15	Bulk	10320	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9231987	2003	50457	14.5	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9233351	2001	74272	14.1	Bulk	8827	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9235232	2001	74750	14	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9237280	2001	28287	14	Bulk	5390	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9245196	2002	52382	14.5	Bulk	8561	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9246619	2002	53094	15	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9249271	2003	53098	14	Bulk	7686	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9250701	2002	32474	14.3	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9251078	2002	32537	14.3	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9252058	2001	28492	13.5	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9252412	2003	75932	14.5	Bulk	8550	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9255593	2002	75162	14.5	Bulk	9260	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9256353	2001	28470	13.5	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9256872	2004	76015	14.5	Bulk	8550	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9260859	2002	28379	13.5	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9261798	2002	75007	14.5	Bulk	11290	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9262998	2003	32751	14.5	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9263069	2004	45181		14 Bulk	8313	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9263760	2002	28473	13.5	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9264441	2002	50508	14.5	Bulk	7900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9267077	2004	31893	14.3	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9267089	2004	31894	14.5	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9267405	2002	53553	15	Bulk	9481	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9268083	2003	31646	14.7	Bulk	7061	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9268916	2004	33745	14	Bulk	6230	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9272785	2003	52428	14.8	Bulk	7290	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9274551	2004	32754	13.5	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9274915	2004	52571	14.3	Bulk	7800	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9276171	2004	76878	14	Bulk	9318	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9276200	2004	28446	13.8	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9277644	2004	52810	14.5	Bulk	8580	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9277668	2004	52808	13.5	Bulk	8580	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9278648	2003	35552	14.6	Bulk	7081	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9279549	2004	75772	14.5	Bulk	8973	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9281437	2004	73880	14.5	Bulk	11111	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9281449	2004	73592	15	Bulk	11111	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9282613	2004	35313	14.2	Bulk	6656	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9284001	2004	32773	13.5	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9284245	2005	56056	14.5	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9284300	2004	56042	14.5	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9284879	2004	76466	14.5	Bulk	9350	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9285407	2003	34790	14	Bulk	7955	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9286956	2005	76286	14	Bulk	10500	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9287168	2005	76469	14.5	Bulk	8830	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9287170	2005	76440	14	Bulk	8830	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9287455	2004	74823	13.8	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9287778	2004	77684	14.6	Bulk	7356	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9290141	2005	75349	14.5	Bulk	11060	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9291092	2005	75744	14.5	Bulk	8973	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9291119	2005	75804	14.5	Bulk	8973	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9291121	2005	75409	14.5	Bulk	8973	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293105	2003	53125	14.5	Bulk	9477	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9293868	2005	29678	14.3	Bulk	6150	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9294501	2004	76704	14	Bulk	9230	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9296274	2005	33733	14.3	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9297929	2005	73691	14.4	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9298521	2005	52498	14.5	Bulk	7800	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9300178	2004	32573	14	Bulk	7080	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9300207	2004	32564	14.3	Bulk	5627	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9301055	2006	82790	14.5	Bulk	11000	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9301720	2005	55257	14.5	Bulk	8200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9302750	2004	76606	15	Bulk	10320	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9302786	2005	76619	14.5	Bulk	10320	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9303144	2006	75637	14	Bulk	8973	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9303376	2005	32642	14.3	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9304576	2006	76801	14	Bulk	11060	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9310616	2007	28709	14.5	Bulk	5900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9310757	2006	32588	14.3	Bulk	7780	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9311189	2008	75886	14	Bulk	9010	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9311402	2005	31871	14.5	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9311414	2006	31886	14.5	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9312339	2004	28433	13.5	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9313292	2011	82499	14.5	Bulk	10150	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9314624	2008	77061	14.5	Bulk	9319	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9314636	2008	77061	14.5	Bulk	9319	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9314648	2007	82282	14.5	Bulk	10959	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9316062	2006	76863	14.5	Bulk	9230	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9316218	2004	49400	14.5	Bulk	6880	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9316220	2004	55317	14.6	Bulk	8200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9317365	2007	54881	14.5	Bulk	8208	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9317482	2005	46619	14.3	Bulk	7024	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9317494	2007	55728	14.5	Bulk	8208	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9317523	2008	82338	14.5	Bulk	9377	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9317690	2006	37504	14.5	Bulk	7061	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9317781	2006	31896	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9317793	2007	31883	14.5	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9321914	2007	75511	14.5	Bulk	11077	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9326158	2008	77376	14.5	Bulk	8789	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9331543	2006	75375	14.5	Bulk	10220	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9331696	2009	53000	14.7	Bulk	9479	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9335886	2008	32114	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9336775	2007	32576	14	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9336799	2005	32816	13.5	Bulk	6620	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9338541	2007	32142	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9340063	2008	55624	14.5	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9342918	2006	76585	15.3	Bulk	10320	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9358838	2006	74483	14	Bulk	8990	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9362231	2006	76629	14	Bulk	10320	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9363065	2008	75228	14	Bulk	8992	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9364758	2008	76432	14.5	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9364813	2006	53452	15	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9367621	2007	28448	14	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9367633	2006	28442	13.5	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9370329	2008	29664	14.25	Bulk	6150	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9370393	2008	16383	13.8	Bulk	4635	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9377975	2008	33171	13.7	Bulk	6480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9377987	2008	33171	13.7	Bulk	6480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9377999	2008	33171	13.7	Bulk	6480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9378008	2009	33098	13.7	Bulk	6480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9379662	2008	31890	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9379674	2009	31922	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9379935	2009	33157	13.7	Bulk	6480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9381172	2006	76629	14	Bulk	12240	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9384863	2007	28416	14	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9387633	2008	75093	14	Bulk	11299	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9391610	2010	56548	14.5	Bulk	8890	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9397236	2009	31887	14.4	Bulk	7470	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9403097	2009	58803	14.5	Bulk	8400	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9403102	2009	58792	14.5	Bulk	8400	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9404455	2010	37852	14	Bulk	8730	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9404998	2010	55073	14.5	Bulk	8202	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9413690	2009	75123	14	Bulk	8990	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9414149	2009	83611	14	Bulk	13560	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9420291	2009	55444	14.6	Bulk	8201	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9422794	2011	37221	14.5	Bulk	7458	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9423530	2009	58701	14	Bulk	8400	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9424089	2010	31881	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9424091	2010	31887	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9424106	2010	31889	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9424118	2011	31888	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9424120	2011	31872	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9424132	2011	31858	14.4	Bulk	6840	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9425904	2010	58117	14.5	Bulk	8400	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9426116	2010	93337	14.1	Bulk	13560	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9426776	2010	61611	14.5	Bulk	8208	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9430856	2009	55582	14.5	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9433547	2009	57000	14.2	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9436721	2010	57573	14.5	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9441312	2010	57809	14.3	Bulk	8700	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9443396	2010	32875	13.7	Bulk	6480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9444924	2008	28333	14	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9445148	2008	28429	14	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9445203	2008	28342	13.5	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9452593	2010	79649	14	Bulk	11060	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9452622	2011	79602	14	Bulk	11060	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9454084	2010	58831	14.5	Bulk	8630	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9456238	2011	56770	14.7	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9456458	2010	56925	14.2	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9460318	2008	53450	13.5	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9465801	2009	75206	14	Bulk	8990	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9473341	2011	75200	14.5	Bulk	8833	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9473406	2009	33345	13.7	Bulk	6480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9473573	2010	35000	14	Bulk	7900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9475739	2010	33000	14.5	Bulk	7900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9479010	2010	55640	14.5	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9481441	2010	79471	14.5	Bulk	11900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9482483	2009	53390	14	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9483188	2009	55783	14.5	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9483827	2010	81000	14.4	Bulk	11060	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9486570	2010	37302	14	Bulk	7368	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9490777	2010	57970	14.3	Bulk	8700	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9492074	2011	79500	14	Bulk	11060	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9493638	2011	75618	14.5	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9494242	2010	56726	14.2	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9498901	2010	93282	14.1	Bulk	12240	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9512898	2011	82012	14.5	Bulk	14280	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9515682	2009	28291	14	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9515759	2010	56722	14.2	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9523146	2010	75566	14.5	Bulk	11900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9523251	2009	82123	14.5	Bulk	9710	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9530955	2011	36903	14.8	Bulk	7860	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9533347	2010	57000	14.2	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9533359	2010	56604	14.2	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)



**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9537733	2011	75491	14.5	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9542465	2010	74951	14.5	Bulk	9230	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9545508	2010	33663	14	Bulk	7900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9545510	2011	33723	14	Bulk	7900	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9548548	2009	76381	14.5	Bulk	10200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9550199	2010	28349	14	Bulk	6150	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9557056	2011	61654	14.5	Bulk	8208	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9563380	2010	35052	14	Bulk	9960	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9567427	2011	56745	14.2	Bulk	9960	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9573842	2011	61508	14.5	Bulk	8450	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9583598	2010	75500	14.5	Bulk	8833	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9584140	2011	57000	14.2	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9584592	2011	81582	14.5	Bulk	11200	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9589671	2011	81340	14.5	Bulk	11400	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9592886	2010	57000	14.2	Bulk	9480	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9604732	2011	28240	14.5	Bulk	5850	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8021971	1982	33748	15	Bulk - Heavy Load	10001	610		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9382841	2007	4579	13	Bulk - Heavy Load	4920	610		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7117278	1971	31364	16	Bulk - Self Discharging	9782	1163		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7925613	1981	37448	13	Bulk - Self Discharging	6620	1163		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8009571	1982	67208	14.5	Bulk - Self Discharging	11339	1163		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8105492	1983	74973	14.5	Bulk - Self Discharging	11327	1163		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9370783	2008	49549	14	Bulk - Wood Chips	8360	705		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7224306	1973	25651	22	Container1000	23538	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7602338	1978	24683	20	Container1000	23538	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7802718	1980	26350	20	Container1000	23538	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7908005	1983	30652	23.25	Container1000	31774	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8419142	1987	21282	20	Container1000	16814	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8419154	1987	20668	20	Container1000	16814	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8419166	1987	20668	20	Container1000	16814	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9117662	1995	14700	20	Container1000	10920	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9155377	2000	23992	18.3	Container1000	14325	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9202481	2000	21331	20	Container1000	15785	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9221059	2001	20631	19.5	Container1000	13530	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9256377	2003	23454	19.5	Container1000	15806	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9337597	2006	23690	19.5	Container1000	16660	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9344643	2007	28187	21.3	Container1000	19619	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9344679	2007	28219	21.3	Container1000	19619	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9344681	2007	28123	21.3	Container1000	19619	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9344693	2008	28186	21.3	Container1000	19619	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9348986	2007	23780	19.5	Container1000	12510	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9357846	2007	23745	19.5	Container1000	16663	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9362712	2008	25884	20.5	Container1000	16663	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9406960	2008	23711	19.5	Container1000	16660	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9435258	2008	23357	19.5	Container1000	16672	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9470961	2010	28632	21	Container1000	18080	1556		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9398436	2009	116440	24.8	Container10000	68639	2617		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7617890	1979	31213	21	Container2000	20963	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7617905	1980	31423	21	Container2000	20963	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9080998	1996	32355	19.8	Container2000	16860	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9110951	1995	34625	21.5	Container2000	22478	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9122394	1996	34671	22	Container2000	22795	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9162253	1998	30007		20 Container2000	12240	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9162265	1998	30007		20 Container2000	12240	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9173135	1999	30135		20 Container2000	12240	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9225407	2000	39128		22.5 Container2000	21735	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9240873	2002	34638		22.1 Container2000	24814	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9241451	2003	33825		22 Container2000	21560	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9243590	2003	35925		22.2 Container2000	21727	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9294549	2006	34704		22.1 Container2000	24830	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9305881	2005	33651		22.3 Container2000	20637	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9307841	2005	33082		22.6 Container2000	24533	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9311763	2006	37800		22 Container2000	21769	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9311787	2006	37800		22 Container2000	21769	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9320001	2005	33813		21.9 Container2000	21769	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9320037	2006	37929		21 Container2000	21769	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9336191	2007	34241		22 Container2000	21660	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9377133	2007	38070		21.85 Container2000	21769	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9400825	2008	33613		22.2 Container2000	21735	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9402639	2009	34194		22 Container2000	21660	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9440306	2010	41253		22.3 Container2000	25039	1916		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7907984	1982	30825		23.25 Container3000	31774	2382		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8718110	1989	49262		22 Container3000	30967	2382		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9001215	1995	45995		22.5 Container3000	30967	2382		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9071521	1994	45455		20.5 Container3000	20500	2382		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9110561	1995	45470		21 Container3000	20509	2382		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9118317	1996	45995		22.5 Container3000	30967	2382		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9253296	2003	48874		23.4 Container3000	31919	2382		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9334351	2007	41850		22.3 Container3000	26270	2382		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8613310	1988	60639		23 Container4000	42424	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8902539	1991	67686		23 Container4000	36499	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8902553	1991	67618		23 Container4000	36629	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8902565	1991	67684		23 Container4000	36629	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8902577	1992	65815		23 Container4000	36629	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9036909	1993	67680		23 Container4000	36509	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9038907	1993	67680		23.8 Container4000	36509	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9038919	1994	65815		23 Container4000	36499	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9077460	1995	66618		24.5 Container4000	43176	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9102148	1995	62905		24.5 Container4000	43839	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9102150	1995	62905		24.5 Container4000	43843	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9134244	1997	55604		25 Container4000	48634	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9143166	1998	50059		24 Container4000	36479	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9143544	1997	66771		24 Container4000	41129	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9143568	1998	66577		24 Container4000	41129	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9144756	1997	62693		24.5 Container4000	48630	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9144768	1998	62693		24.5 Container4000	48630	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9193288	2000	67145		24 Container4000	40039	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9193290	2000	67145		24 Container4000	40039	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9193317	2000	66975		24 Container4000	40039	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9200811	2000	66781		24 Container4000	40058	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9200823	2000	66818		24 Container4000	40058	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9232084	2002	58724		24 Container4000	41109	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9232101	2002	58724		24 Container4000	41106	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9236535	2003	58254		25 Container4000	43920	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9252230	2002	53554	24.5	Container4000	36774	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9262118	2003	50188	24.2	Container4000	36543	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9279965	2004	66694	24	Container4000	41106	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9279977	2004	66786	24	Container4000	41106	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9301847	2007	50500	23.3	Container4000	36559	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9310056	2005	52191	24.2	Container4000	36559	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9312561	2005	52191	24.2	Container4000	36479	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9312597	2006	52210	24.2	Container4000	36479	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9320398	2005	63638	24.2	Container4000	39969	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9320439	2006	63411	24	Container4000	39952	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9326768	2006	53682	24.25	Container4000	36559	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9351581	2008	50547	23.5	Container4000	36559	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9375496	2008	51752	23.5	Container4000	36526	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9387102	2006	65123	23.8	Container4000	45759	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9389382	2008	51733	24	Container4000	40039	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9389409	2009	51733	24.5	Container4000	40039	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9404194	2009	50574	24.5	Container4000	36559	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9431707	2010	50497	24.5	Container4000	36559	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9450571	2009	50500	23.3	Container4000	36559	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9492701	2011	58200	24.3	Container4000	43609	2973		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9110377	1996	68363	25.6	Container5000	55569	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9111383	1996	67298	25.6	Container5000	54794	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9111395	1996	67272	25.6	Container5000	54814	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9116577	1996	63388	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9116589	1996	62386	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9116591	1996	63388	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9116606	1997	63388	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9116618	1997	63388	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9120750	1997	69285	24.5	Container5000	43100	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9161778	1998	68955	25.6	Container5000	54899	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9168831	1999	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9168843	1999	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9168855	1999	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9168867	1999	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9168879	1999	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9169158	1999	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9169160	2000	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9188154	2000	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9196955	2000	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9196967	2000	63400	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9196979	2000	63388	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9196981	2001	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9196993	2001	63216	25	Container5000	48634	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9198264	2000	68413	25.9	Container5000	54945	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9198276	2000	68303	25.9	Container5000	54945	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9198288	2001	68413	25.9	Container5000	54925	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9200689	1999	68996	26.3	Container5000	54945	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9215646	2000	68263	26.3	Container5000	54945	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9222986	2001	68196	26.1	Container5000	54897	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9224532	2001	71366	25.1	Container5000	58839	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9246396	2001	68910	24.5	Container5000	43100	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9246401	2002	69107	24.5	Container5000	43100	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9247546	2001	67170	25	Container5000	57204	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9247558	2001	67170	25	Container5000	57200	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9247560	2001	67170	25.7	Container5000	57204	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9248150	2003	67979	26.3	Container5000	54899	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9260902	2002	67009	24.75	Container5000	57199	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9260914	2003	67009	24.7	Container5000	57199	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9267651	2002	67197	25	Container5000	57221	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9278088	2004	68280	26	Container5000	54899	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9281267	2004	68372	24.3	Container5000	41106	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9287900	2004	68150	23.8	Container5000	41106	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9288409	2004	67009	24.75	Container5000	57199	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9290440	2005	66478	25	Container5000	45777	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9290452	2005	66501	25	Container5000	45777	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9294800	2004	68280	26.5	Container5000	54899	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9295359	2005	67025	24.2	Container5000	45779	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9300312	2005	67209	25.6	Container5000	57203	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9302073	2006	71309	25	Container5000	62943	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9302102	2006	71283	25	Container5000	62943	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9302566	2006	68126	24	Container5000	41129	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9302580	2006	68135	24.3	Container5000	41106	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9305697	2006	71326	25	Container5000	58840	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9322475	2007	67986	24.3	Container5000	41129	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9322487	2007	68138	24.3	Container5000	36996	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9322499	2007	68009	24.3	Container5000	41129	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9437050	2010	65741	25	Container5000	40039	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9437062	2010	65710	25	Container5000	40039	4356		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9085522	1996	84900	25	Container6000	54839	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9085534	1996	84900	24.6	Container6000	54859	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9085546	1996	84900	24.6	Container6000	54839	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9085558	1996	84900	25	Container6000	54839	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9085560	1997	84900	25	Container6000	54839	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9107887	1997	90456	25	Container6000	54839	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9215828	2001	80551	26.4	Container6000	65929	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9215830	2001	80596	26.4	Container6000	65929	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9215842	2001	80494	26.4	Container6000	65929	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9215854	2001	80550	26.4	Container6000	65929	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9215866	2001	80551	26.4	Container6000	65929	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9241281	2002	75898	24.5	Container6000	48630	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9241293	2003	75898	24.5	Container6000	48634	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9241308	2002	75898	25	Container6000	48634	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9241310	2001	75898	25	Container6000	48634	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9241322	2002	75898	24.5	Container6000	48600	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9244922	2003	81577	26	Container6000	57074	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9244934	2003	81183	26	Container6000	57074	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9244946	2003	81094	26	Container6000	57074	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9247742	2003	81171	25	Container6000	61349	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9305647	2006	80262	25	Container6000	68519	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9307047	2005	72968	25	Container6000	62919	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9321017	2006	72968	26	Container6000	62919	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9323522	2007	80108	25	Container6000	68519	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9332884	2009	72982	25	Container6000	64198	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9385001	2009	72982	25	Container6000	62919	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9385013	2009	72982	25	Container6000	62919	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9385025	2009	72982	25	Container6000	62919	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9406647	2010	83217	25.6	Container6000	57198	4815		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9229829	2001	100006	25.3	Container7000	68639	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9229831	2002	100003	25.3	Container7000	68639	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9229843	2002	100016	25.3	Container7000	68639	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9229855	2003	100019	25.3	Container7000	68639	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9285653	2004	93643	25.2	Container7000	69619	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9285665	2004	93659	25.2	Container7000	68665	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9285677	2004	93572	25.2	Container7000	69619	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9285689	2004	93728	25.2	Container7000	69619	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9285691	2004	93638	25.2	Container7000	69619	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9290464	2005	93542	25.2	Container7000	68489	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9290476	2005	93545	25.2	Container7000	68489	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9290488	2005	93570	25.2	Container7000	68489	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9295218	2005	93594	25.2	Container7000	68489	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9295220	2005	93558	25.2	Container7000	68489	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9300403	2006	78716	25.3	Container7000	54941	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9300415	2006	78796	25.3	Container7000	54941	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9300453	2007	78612	25.3	Container7000	54941	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9300477	2008	78733	25.3	Container7000	54941	4360		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9198587	2000	104750	25	Container8000	54839	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9214903	2000	104750	25	Container8000	54839	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9260433	2003	109000	25	Container8000	63030	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9260445	2003	109000	25	Container8000	63035	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9260457	2004	109000	25	Container8000	63035	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9294989	2005	108180	25.3	Container8000	68489	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9294991	2005	108106	25.3	Container8000	68489	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9295244	2005	103800	25.21	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9295256	2005	103800	24.5	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9299783	2005	101818	24.5	Container8000	68655	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9305491	2006	101496	24.5	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9318046	2006	100680	24.5	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9318060	2006	101505	24.5	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9318101	2007	101477	24.5	Container8000	68646	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9320697	2007	103681	24.5	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9320702	2007	103631	24.5	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9337925	2008	102453	25	Container8000	68519	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9337949	2009	102418	25	Container8000	68519	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9343716	2007	103800	25.2	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9343728	2008	103567	25	Container8000	68529	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9343730	2008	103538	25.2	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9398395	2009	108574	25.6	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9398400	2009	108427	25.6	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9398424	2010	108574	25.6	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9433793	2011	101474	25.3	Container8000	68519	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9436355	2011	101386	25.3	Container8000	68519	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9448803	2011	102742	25.6	Container8000	68529	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9450375	2009	103845	25.6	Container8000	72239	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9450387	2009	103773	25.6	Container8000	72239	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9450399	2010	104015	25	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9450404	2010	104007	25	Container8000	57199	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9450428	2010	103646	25	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9450430	2010	103662	25	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9450442	2010	103995	25	Container8000	57199	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9450600	2010	107000	25.2	Container8000	72239	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9450612	2010	109021	25.2	Container8000	68519	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9461465	2010	102518	25.2	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9461491	2011	102455	25.2	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9461506	2011	102518	25.2	Container8000	68639	4769		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9146455	1998	104700	25	Container9000	54839	4551		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9342516	2008	110401	25.5	Container9000	68639	4551		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8708672	1990	2420	15	Cruise	5038	3500		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9066667	1995	4500	21	Cruise	36328	3500		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9072446	1995	7260	21.5	Cruise	29249	10500		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9116864	1997	8439	22.3	Cruise	50399	10500		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9156527	2000	6150	22	Cruise	10400	3500		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9188037	2000	7327	21	Cruise	5600	7000		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9188647	2001	7200	22	Cruise	62369	10500		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9189419	2000	11928	24	Cruise	71246	10500		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9189421	2001	11778	24	Cruise	71246	10500		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9192351	2001	8418	22	Cruise	63360	11000		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9195157	2001	7500	24.6	Cruise	58799	11000		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9221281	2003	10965	22	Cruise	10400	7000		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9226891	2004	10965	22	Cruise	10400	10000		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9226906	2005	10939	22	Cruise	63360	10500		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9228186	2004	14601	23	Cruise	60702	11000		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9342281	2006	10000	25	Cruise	72079	11000		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
5057931	1962	14579	20	General Cargo	14160	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7119678	1971	1383	13	General Cargo	1232	1339	134	HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8013027	1983	23024	17	General Cargo	15445	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8406717	1986	19763	17	General Cargo	15445	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8711318	1994	7346	14.6	General Cargo	5119	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8908088	1990	17175	16.2	General Cargo	7949	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9141211	1996	11285	14.7	General Cargo	5296	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9148116	1998	12950	15.6	General Cargo	8775	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9150731	1999	20427	14.2	General Cargo	6650	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9161168	1997	20406	16	General Cargo	8253	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9187033	1999	17539	15	General Cargo	7800	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9187045	1999	17539	15	General Cargo	7800	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9202041	1999	20144	16	General Cargo	8250	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9226035	2002	48000	17	General Cargo	13548	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9226047	2002	45000	17	General Cargo	13548	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9226059	2003	45851	17	General Cargo	13548	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9226061	2004	45000	17	General Cargo	13548	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9238818	2002	29980	18	General Cargo	15785	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9243758	2002	9122	14.7	General Cargo	4350	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9243825	2003	19465	14.25	General Cargo	7860	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9290050	2004	10385	14.8	General Cargo	4320	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9312157	2004	12711	15	General Cargo	5400	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9317042	2005	10650	13.2	General Cargo	3906	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9331593	2005	7492	16.5	General Cargo	6300	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9347035	2006	17349	15	General Cargo	7074	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9357212	2007	12782	15	General Cargo	5400	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9358046	2006	12812		14 General Cargo	5400	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9370135	2008	32221		14.3 General Cargo	6620	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9385087	2008	32271		14.3 General Cargo	6620	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9385491	2009	54204		14.5 General Cargo	8208	1339		134 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9402043	2007	12705		14 General Cargo	5400	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9432153	2011	30000		19.2 General Cargo	16520	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9435856	2009	17354		15 General Cargo	7074	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9449493	2009	33392		13.7 General Cargo	6480	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9449508	2009	32949		13.7 General Cargo	6480	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9453793	2010	12696		15 General Cargo	5400	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9501277	2010	12657		15 General Cargo	5400	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9504267	2008	7966		12.2 General Cargo	2970	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9511636	2010	10500		14.2 General Cargo	4320	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9530307	2010	33324		13.8 General Cargo	8730	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9530319	2010	33324		13.8 General Cargo	8726	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9569528	2010	6264		13 General Cargo	3000	1339		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9271119	2002	0		15 ITB	6767	234		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9275438	2002	0		15 ITB	6767	234		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9275878	2002	0		15 ITB	6825	234		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9277369	2002	945		15 ITB	6767	234		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9369411	2009	786		15 ITB	7999	234		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9398474	2006	835		15 ITB	6825	234		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9503160	2008	1282		13.5 ITB	9054	234		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9503847	2008	428		12 ITB	2985	234		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9542609	2011	600		15 ITB	8160	234		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8225711	1982	13879		17 Reefer	6620	1402		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8906963	1992	10588		21 Reefer	11400	1402		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8917596	1993	11733		20 Reefer	12500	1402		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9019119	1993	10629		21 Reefer	11400	1402		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9019121	1993	10629		20.91 Reefer	11400	1402		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9038933	1994	11822		19.2 Reefer	12500	1402		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7390117	1976	19480		21.5 RoRo	27216	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7420493	1975	16138		21 RoRo	22067	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8508369	1994	10517		13.8 RoRo	6540	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9157430	1997	13046		15 RoRo	5296	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9162394	1997	9518		14 RoRo	4193	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9232278	2003	22437		24 RoRo	52198	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9232280	2003	22437		24 RoRo	52198	1541		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9165530	1998	106553		15.1 Tanker - Aframax	12000	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9192260	2000	105856		15.1 Tanker - Aframax	14314	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9242120	2003	113033		15 Tanker - Aframax	14313	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9247792	2003	106500		15.15 Tanker - Aframax	12240	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9251810	2002	106500		15.15 Tanker - Aframax	12240	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9265641	2003	107081		14.6 Tanker - Aframax	13530	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9271327	2003	105845		14.3 Tanker - Aframax	11547	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9281009	2004	115048		14.7 Tanker - Aframax	14303	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9282479	2005	114809		15.7 Tanker - Aframax	15801	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9292503	2005	115515		15.3 Tanker - Aframax	14313	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9292515	2005	115525		15.3 Tanker - Aframax	14313	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9292993	2005	104499		15 Tanker - Aframax	13548	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9299721	2006	106004		14.8 Tanker - Aframax	13548	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9304825	2006	109266		14.5 Tanker - Aframax	13570	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9307152	2005	105712	15.25	Tanker - Aframax	12000	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9308857	2006	104955	15	Tanker - Aframax	13560	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9330599	2006	104866	14.2	Tanker - Aframax	13560	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9354301	2008	104535	15	Tanker - Aframax	15820	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9354313	2008	104542	15	Tanker - Aframax	15820	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9397808	2009	111402	15.45	Tanker - Aframax	14280	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9402316	2010	115123	15	Tanker - Aframax	13560	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9408530	2008	115462	15	Tanker - Aframax	13560	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9434890	2010	108835	14.5	Tanker - Aframax	13570	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9439539	2009	108760	15	Tanker - Aframax	13570	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9453999	2011	113968	15.5	Tanker - Aframax	14280	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9457593	2011	114542	15	Tanker - Aframax	13560	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9592238	2011	115669	15.5	Tanker - Aframax	13560	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9592252	2011	115674	15.7	Tanker - Aframax	13560	990		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
8800511	1990	40538	14	Tanker - Chemical	7830	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9145841	1996	45217	15.1	Tanker - Chemical	9989	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9157519	1997	16026	14.2	Tanker - Chemical	4891	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9161895	1998	19365	14.7	Tanker - Chemical	6179	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9168477	1998	19386	14.7	Tanker - Chemical	6179	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9230012	2001	16225	14	Tanker - Chemical	6300	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9241073	2004	46678	14	Tanker - Chemical	8310	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9248461	2002	24426	14.5	Tanker - Chemical	7980	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9263095	2003	19997	14.7	Tanker - Chemical	6230	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9278727	2004	25451	15.5	Tanker - Chemical	7080	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9281932	2005	51383	14.2	Tanker - Chemical	8561	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9299422	2005	29057	14	Tanker - Chemical	7150	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9301005	2005	51303	14.5	Tanker - Chemical	13560	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9304320	2005	19991	14.7	Tanker - Chemical	6150	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9304332	2005	19992	14.6	Tanker - Chemical	6150	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9307815	2005	50921	14.5	Tanker - Chemical	13560	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9307994	2007	46784	14.5	Tanker - Chemical	8555	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9308235	2006	19995	15	Tanker - Chemical	6230	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9331256	2006	19996	15	Tanker - Chemical	6230	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9333280	2006	47931	15.4	Tanker - Chemical	11060	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9340441	2007	19998	14.7	Tanker - Chemical	6150	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9343778	2006	19998	14.7	Tanker - Chemical	5296	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9345893	2006	19975	14.7	Tanker - Chemical	6230	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9349655	2007	20896	15.1	Tanker - Chemical	6150	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9353527	2007	46911	14.6	Tanker - Chemical	8580	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9353539	2007	46817	14.6	Tanker - Chemical	8580	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9353565	2009	46802	14.6	Tanker - Chemical	8700	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9353577	2009	46666	14.6	Tanker - Chemical	8700	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9353589	2010	46653	14.6	Tanker - Chemical	8700	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9353591	2010	46666	14.6	Tanker - Chemical	8700	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9353606	2011	46666	14.6	Tanker - Chemical	8580	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9360336	2007	47128	14.5	Tanker - Chemical	9480	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9388003	2008	46606	14	Tanker - Chemical	9960	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9391165	2009	19997	14.7	Tanker - Chemical	6480	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9392781	2009	47128	14.5	Tanker - Chemical	9480	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9393008	2008	19928	14.8	Tanker - Chemical	6230	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9396737	2008	50927	14.9	Tanker - Chemical	9480	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9407263	2008	73720	14.5	Tanker - Chemical	11299	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)



**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9407562	2009	48632		15 Tanker - Chemical	8580	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9408126	2010	48635		15 Tanker - Chemical	8580	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9408138	2010	48641		15 Tanker - Chemical	8580	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9411135	2009	37836		14.5 Tanker - Chemical	7860	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9422237	2010	46625		14.8 Tanker - Chemical	9480	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9425540	2010	50120		14.8 Tanker - Chemical	8580	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9426300	2009	26015		15.1 Tanker - Chemical	7080	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9426910	2009	19993		14.7 Tanker - Chemical	6480	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9430284	2010	46151		14.8 Tanker - Chemical	8598	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9436666	2008	40416		14 Tanker - Chemical	9480	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9439802	2009	50261		14.9 Tanker - Chemical	9480	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9478717	2010	50238		14.9 Tanker - Chemical	9480	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9490301	2010	26198		15.5 Tanker - Chemical	7470	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9490325	2011	26197		15.5 Tanker - Chemical	7450	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9494682	2011	47203		14.5 Tanker - Chemical	8598	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9499943	2008	12601		14.4 Tanker - Chemical	4200	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9597721	2011	21280		14.5 Tanker - Chemical	6150	937		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9118628	1997	46103		14.5 Tanker - Handysize	7944	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9149237	1998	47363		15 Tanker - Handysize	8310	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9149249	1998	47363		15 Tanker - Handysize	8310	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9183611	1999	46144		14.15 Tanker - Handysize	7679	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9183623	1999	46152		14.15 Tanker - Handysize	7679	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9221683	2000	47037		14.5 Tanker - Handysize	8683	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9354519	2007	45998		14.6 Tanker - Handysize	9267	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9363467	2009	45967		15.1 Tanker - Handysize	9267	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9367695	2008	47451		15.3 Tanker - Handysize	8580	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9367736	2008	47165		15 Tanker - Handysize	8580	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9402794	2010	47366		15.3 Tanker - Handysize	8580	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9451460	2010	46549		15.7 Tanker - Handysize	9480	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9459266	2011	45931		14.6 Tanker - Handysize	9480	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9555292	2010	47981		15 Tanker - Handysize	9480	693		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9031961	1993	66895		14.7 Tanker - Panamax	7963	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9035137	1993	66895		14.7 Tanker - Panamax	7963	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9252943	2003	71522		14.9 Tanker - Panamax	12440	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9254862	2003	70146		14.7 Tanker - Panamax	11444	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9256016	2003	68467		14.5 Tanker - Panamax	10002	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9281425	2005	74999		16 Tanker - Panamax	13539	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9288356	2005	70681		14.9 Tanker - Panamax	13548	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9301952	2006	74933		14.9 Tanker - Panamax	13548	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9301964	2007	74875		14.9 Tanker - Panamax	13548	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9307748	2006	54533		16.7 Tanker - Panamax	13700	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9307762	2007	54450		16.7 Tanker - Panamax	13700	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9342217	2008	76578		15.4 Tanker - Panamax	12268	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9351464	2007	73784		14.7 Tanker - Panamax	11299	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9382982	2009	74329		15.3 Tanker - Panamax	12240	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9407251	2007	73634		14.5 Tanker - Panamax	11299	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9425552	2010	50090		14.8 Tanker - Panamax	8580	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9433808	2011	50077		14.8 Tanker - Panamax	8580	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9433810	2011	50079		14.8 Tanker - Panamax	8580	830		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7408081	1978	124644		17 Tanker - Suezmax	22067	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
7408093	1979	125133		17 Tanker - Suezmax	22067	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9035010	1993	135829		15 Tanker - Suezmax	15447	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

**Puget Sound Emissions Inventory**  
**Ocean-Going Vessel Data**

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kw)	Aux Boiler Energy	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9087972	1995	149834	14.97	Tanker - Suezmax	15420	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9182746	1999	153015	13.5	Tanker - Suezmax	16916	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9193551	2001	141740	16.55	Tanker - Suezmax	22087	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9193563	2002	141740	16.55	Tanker - Suezmax	22087	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9206114	2003	141740	16.6	Tanker - Suezmax	22119	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9208069	2000	147080	14.62	Tanker - Suezmax	15403	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9230505	2002	159435	15.7	Tanker - Suezmax	18623	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9230892	2002	149921	15.5	Tanker - Suezmax	18624	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9233765	2003	159999	15.5	Tanker - Suezmax	18624	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9244063	2004	141740	16.5	Tanker - Suezmax	22087	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9244659	2004	193049	15.3	Tanker - Suezmax	25198	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9244661	2005	193049	15.3	Tanker - Suezmax	25198	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9244673	2005	193048	15.3	Tanker - Suezmax	25198	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9250660	2006	141740	16.5	Tanker - Suezmax	22087	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9253894	2002	149991	15	Tanker - Suezmax	12372	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9271432	2006	193048	15.3	Tanker - Suezmax	25198	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9297905	2005	158344	15.5	Tanker - Suezmax	18623	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9311610	2006	162397	15.5	Tanker - Suezmax	21727	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9315185	2007	163216	15.6	Tanker - Suezmax	18888	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9336971	2007	153015	15.8	Tanker - Suezmax	18479	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9411226	2009	158769	15.8	Tanker - Suezmax	18660	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9427627	2009	157048	15.1	Tanker - Suezmax	18660	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9436446	2010	158555	15.5	Tanker - Suezmax	18660	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9446374	2009	158319	15.5	Tanker - Suezmax	18660	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9586722	2011	158777	15.5	Tanker - Suezmax	18660	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)
9589748	2011	158658	15.5	Tanker - Suezmax	18660	965		0 HFO (2.7% S)	HFO (2.7% S)	HFO (2.7% S)

Legend

Modes

T - Transit Link

X - Transition between Transit & Maneuvering

M - Maneuvering Link

NPE - Near Port Emissions - Emissions assigned to the "port area"

**Puget Sound Emissions Inventory**  
**OGV-Routing: VICTORIA (NB1) to SEATTLE**  
 Lat/Long in WGS84 Datum

										Speed by Link (knots)																		
										Fast	Fast	Medium	Slow	Very Slow						CR-1	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2	CR-2	
															Bulkers					CR-1	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2	CR-2	
															Reefer	Tankers				CR-1	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2	CR-2	
															Container	RO/RO	Log				Speed	PL	SL	BL	Speed	PL	SL	BL
DRAFT	Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	knots	(MW)	(MW)	(MW)	knots	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)
	NB1_PortAngeles	Arrival	T	N	L1	VP_A_1	48° 13' 55" N 123° 30' 34" W	VP_A_2	48° 12' 05" N 123° 28' 55" W	2.1	Calallam	18	0	0	0	0	12	9.8	7.0	0.0	16.6	15.2	10.1	0.0				
	NB1_PortAngeles	Arrival	X	N	L2a	VP_A_2	48° 12' 05" N 123° 28' 55" W	PS_A_5	48° 09' 20" N 123° 23' 28" W	4.5	Calallam	16	0	0	0	0	12	9.8	7.0	0.0	16	15.2	9.0	0.0				
	Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09' 20" N 123° 23' 28" W	PS_A_6	48° 09' 58" N 123° 23' 25" W	0.6	Calallam	8	0	0	0	0	12	5.6	7.0	0.0	10	8.0	10.1	0.0				
	Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09' 58" N 123° 23' 25" W	PS_A_7	48° 11' 56" N 123° 06' 35" W	11.4	Calallam	18	0	0	0	0	12	9.8	7.0	0.0	18	14.0	10.1	0.0				
	Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11' 56" N 123° 06' 35" W	PS_A_8	48° 11' 11" N 122° 52' 23" W	9.5	Calallam	SS	0	0	0	0	12	9.8	7.0	0.0	19.8	15.2	10.1	0.0				
	Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11' 11" N 122° 52' 23" W	PS_A_9	48° 10' 57" N 122° 48' 01" W	2.9	Jefferson	SS	0	0	0	0	12	9.8	7.0	0.0	19.8	15.2	10.1	0.0				
	Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 57" N 122° 48' 01" W	PS_A_10	48° 06' 35" N 122° 40' 10" W	6.8	Jefferson	SS	0	0	0	0	12	9.8	7.0	0.0	19.8	15.2	10.1	0.0				
	Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 35" N 122° 40' 10" W	PS_A_11	48° 01' 08" N 122° 38' 08" W	5.6	Jefferson	SS	0	0	0	0	18	16.1	6.9	0.0	19.8	15.2	10.1	0.0				
	Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 08" N 122° 38' 08" W	PS_A_12	47° 57' 41" N 122° 35' 10" W	4.0	Island	SS	0	0	0	0	18	16.1	6.9	0.0	16.8	15.2	10.1	0.0				
	Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 41" N 122° 35' 10" W	PS_A_13	47° 56' 38" N 122° 32' 57" W	1.8	Island	19	0	0	0	0	18	16.1	6.9	0.0	16.8	15.2	10.1	0.0				
	Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 38" N 122° 32' 57" W	PS_A_14	47° 55' 17" N 122° 30' 06" W	2.3	Kitsap	18	0	0	0	0	18	16.1	6.9	0.0	16.8	15.2	10.1	0.0				
	Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 17" N 122° 30' 06" W	PS_A_15	47° 45' 54" N 122° 26' 45" W	9.7	Kitsap	17	0	0	0	0	16.5	16.1	6.9	0.0	16.6	15.2	10.1	0.0				
	Sea_Tacoma	Arrival	T	Y	L15	PS_A_15	47° 45' 54" N 122° 26' 45" W	PS_A_16	47° 39' 42" N 122° 28' 24" W	6.3	Kitsap	17	0	0	0	0	16.5	16.1	6.9	0.0	16.6	15.2	10.1	0.0				
	ElliottB_PS	Arrival	X	Y	L1a	PS_A_16	47° 39' 42" N 122° 28' 24" W	EB_A_2	47° 39' 21" N 122° 28' 02" W	0.4	Kitsap	16	0	0	0	0	16	7.2	6.9	0.0	16	12.0	10.1	0.0				
	ElliottB_PS	Arrival	X	Y	L2	EB_A_2	47° 39' 21" N 122° 28' 02" W	EB_A_3	47° 38' 16" N 122° 26' 36" W	1.5	King	15	0	0	0	0	15.5	7.2	6.9	0.0	15.5	12.0	10.1	0.0				
	ElliottB_PS	Arrival	M	Y	L3	EB_A_3	47° 38' 16" N 122° 26' 36" W	EB_A_4	47° 36' 52" N 122° 23' 21" W	2.6	King	15	0	0	0	0	15	7.2	6.9	0.0	15	12.0	10.1	0.0				
										Total Distance	72.1 nm	Note: SS - Service Speed																

**Puget Sound Emissions Inventory**

OGV-Routing: SEATTLE to VICTORIA (NB1)

Lat/Long in WGS84 Datum

											Speed by Link (knots)														
											Fast	Fast	Medium	Slow	Very Slow										
											Bulkers					CR-1	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2	CR-2		
											Reefer	Tankers				Speed	PL	SL	BL	Speed	PL	SL	BL		
DRAFT	Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container	RO/RO	Fishing	Log	Fishing	knots	(MW)	(MW)	(MW)	knots	(MW)	(MW)	(MW)
	ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36' 52'' N 122° 23' 21'' W	EB_D_2	47° 38' 22'' N 122° 26' 27'' W	2.6	King	14	0	0	0	0	0	13.5	13.2	7.0	0.0	13.5	12.1	10.1	0.0
	ElliottB_PS	Departure	X	Y	L2	EB_D_2	47° 38' 22'' N 122° 26' 27'' W	PS_D_10	47° 39' 42'' N 122° 27' 25'' W	1.5	King	18	0	0	0	0	0	17.5	19.2	7.0	0.0	16.5	16.1	9.0	0.0
	Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39' 42'' N 122° 27' 25'' W	PS_D_11	47° 41' 54'' N 122° 26' 47'' W	2.3	King	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41' 54'' N 122° 26' 47'' W	PS_D_12	47° 45' 52'' N 122° 25' 49'' W	4.0	Kitsap	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45' 52'' N 122° 25' 49'' W	PS_D_13	47° 46' 40'' N 122° 26' 04'' W	0.8	King	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46' 40'' N 122° 26' 04'' W	PS_D_14	47° 48' 06'' N 122° 26' 29'' W	1.5	Snohomis	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48' 06'' N 122° 26' 29'' W	PS_D_15	47° 52' 36'' N 122° 28' 08'' W	4.6	Kitsap	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52' 36'' N 122° 28' 08'' W	PS_D_16	47° 55' 34'' N 122° 29' 11'' W	3.1	Island	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34'' N 122° 29' 11'' W	PS_D_17	47° 57' 01'' N 122° 32' 03'' W	2.4	Island	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01'' N 122° 32' 03'' W	PS_D_18	47° 58' 07'' N 122° 34' 19'' W	1.9	Island	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07'' N 122° 34' 19'' W	PS_D_19	48° 02' 01'' N 122° 37' 40'' W	4.5	Island	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01'' N 122° 37' 40'' W	PS_D_20	48° 04' 48'' N 122° 38' 31'' W	2.8	Island	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48'' N 122° 38' 31'' W	PS_D_21	48° 06' 58'' N 122° 39' 13'' W	2.2	Jefferson	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 58'' N 122° 39' 13'' W	PS_D_22	48° 07' 51'' N 122° 40' 43'' W	1.3	Jefferson	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07' 51'' N 122° 40' 43'' W	PS_D_23	48° 11' 20'' N 122° 46' 47'' W	5.3	Island	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 20'' N 122° 46' 47'' W	PS_D_24	48° 11' 44'' N 122° 48' 45'' W	1.4	Island	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11' 44'' N 122° 48' 45'' W	PS_D_25	48° 11' 57'' N 122° 52' 19'' W	2.4	Jefferson	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11' 57'' N 122° 52' 19'' W	PS_D_26	48° 12' 45'' N 123° 06' 35'' W	9.5	Calallam	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
	Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12' 45'' N 123° 06' 35'' W	PS_D_27	48° 10' 33'' N 123° 23' 03'' W	11.2	Calallam	17	0	0	0	0	0	18	19.0	7.0	0.0	18	19.5	10.1	0.0
	Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10' 33'' N 123° 23' 03'' W	PS_D_28	48° 11' 21'' N 123° 23' 02'' W	0.8	Calallam	8	0	0	0	0	0	10	12.0	7.0	0.0	10	11.0	10.1	0.0
	Tacoma_Sea	Departure	X	N	L28a	PS_D_28	48° 11' 21'' N 123° 23' 02'' W	VP_D_1	48° 13' 18'' N 123° 26' 59'' W	3.2	Calallam	18	0	0	0	0	0	18	19.0	7.0	0.0	18	19.5	10.1	0.0
	PortAngeles_Victoria	Departure	T	N	L1	VP_D_1	48° 13' 18'' N 123° 26' 59'' W	VP_D_2	48° 14' 41'' N 123° 26' 36'' W	1.4	Calallam	SS	0	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0

Total Distance 70.7 nm Note: SS - Service Speed

**Puget Sound Emissions Inventory**  
**OGV-Routing: VICTORIA (NB1) to TACOMA**  
 Lat/Long in WGS84 Datum

Speed by Link (knots)  
 Fast Fast Medium Slow Very Slow

DRAFT Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Speed by Link (knots)			
												Fast	Fast	Medium	Slow
												Bulkers			
												Reefer	Tankers		
												Container	RO/RO	Log	
												Fishing	Fishing	Fishing	
NB1_PortAngeles	Arrival	T	N	L1	VP_A_1	48° 13' 55" N 123° 30' 34" W	VP_A_2	48° 12' 05" N 123° 28' 55" W	2.1	Calallam	18	0	0	0	0
NB1_PortAngeles	Arrival	X	N	L2a	VP_A_2	48° 12' 05" N 123° 28' 55" W	PS_A_5	48° 09' 20" N 123° 23' 28" W	4.5	Calallam	16	0	0	0	0
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09' 20" N 123° 23' 28" W	PS_A_6	48° 09' 58" N 123° 23' 25" W	0.6	Calallam	10	0	0	0	0
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09' 58" N 123° 23' 25" W	PS_A_7	48° 11' 56" N 123° 06' 35" W	11.4	Calallam	17	0	0	0	0
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11' 56" N 123° 06' 35" W	PS_A_8	48° 11' 11" N 122° 52' 23" W	9.5	Calallam	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11' 11" N 122° 52' 23" W	PS_A_9	48° 10' 57" N 122° 48' 01" W	2.9	Jefferson	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 57" N 122° 48' 01" W	PS_A_10	48° 06' 35" N 122° 40' 10" W	6.8	Jefferson	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 35" N 122° 40' 10" W	PS_A_11	48° 01' 08" N 122° 38' 08" W	5.6	Jefferson	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 08" N 122° 38' 08" W	PS_A_12	47° 57' 41" N 122° 35' 10" W	4.0	Island	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 41" N 122° 35' 10" W	PS_A_13	47° 56' 38" N 122° 32' 57" W	1.8	Island	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 38" N 122° 32' 57" W	PS_A_14	47° 55' 17" N 122° 30' 06" W	2.3	Kitsap	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 17" N 122° 30' 06" W	PS_A_15	47° 45' 54" N 122° 26' 45" W	9.7	Kitsap	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 54" N 122° 26' 45" W	PS_A_16	47° 39' 42" N 122° 28' 24" W	6.3	Kitsap	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39' 42" N 122° 28' 24" W	PS_A_17	47° 34' 32" N 122° 27' 32" W	5.2	Kitsap	18	0	0	0	0
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34' 32" N 122° 27' 32" W	PS_A_18	47° 31' 51" N 122° 26' 34" W	2.8	Kitsap	17	0	0	0	0
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31' 51" N 122° 26' 34" W	PS_A_19	47° 26' 44" N 122° 24' 45" W	5.3	King	16	0	0	0	0
Sea_Tacoma	Arrival	T	N	L19	PS_A_19	47° 26' 44" N 122° 24' 45" W	PS_A_20	47° 23' 09" N 122° 21' 56" W	4.1	King	17	0	0	0	0
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23' 09" N 122° 21' 56" W	PS_A_21	47° 19' 39" N 122° 27' 52" W	5.3	King	14	0	0	0	0
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19' 39" N 122° 27' 52" W	PS_A_22	47° 19' 10" N 122° 28' 05" W	0.5	King	10	0	0	0	0
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19' 10" N 122° 28' 05" W	PS_A_23	47° 18' 07" N 122° 27' 41" W	1.1	Pierce	10	0	0	0	0

Total Distance 91.8 nm  
 Note: SS - Service Speed  
 Note: Red numbers - engines off

**Puget Sound Emissions Inventory**  
**OGV-Routing: TACOMA to VICTORIA (NB1)**

Lat/Long in WGS84 Datum

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Auto	Reefer RO/RO	Bulkers Tankers Log	Fishing
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47° 18' 07'' N 122° 27' 41'' W	PS_D_3	47° 19' 20'' N 122° 27' 02'' W	1.3	Pierce	10	0	0	0	0
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19' 20'' N 122° 27' 02'' W	PS_D_4	47° 19' 54'' N 122° 26' 03'' W	0.9	Pierce	12	0	0	0	0
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19' 54'' N 122° 26' 03'' W	PS_D_5	47° 23' 04'' N 122° 20' 40'' W	4.8	King	16	0	0	0	0
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47° 23' 04'' N 122° 20' 40'' W	PS_D_6	47° 26' 56'' N 122° 23' 43'' W	4.4	King	17	0	0	0	0
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26' 56'' N 122° 23' 43'' W	PS_D_7	47° 34' 32'' N 122° 26' 30'' W	7.8	King	16	0	0	0	0
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34' 32'' N 122° 26' 30'' W	PS_D_8	47° 35' 55'' N 122° 26' 45'' W	1.4	King	17	0	0	0	0
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35' 55'' N 122° 26' 45'' W	PS_D_9	47° 37' 02'' N 122° 26' 56'' W	1.1	Kitsap	20	0	0	0	0
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37' 02'' N 122° 26' 56'' W	PS_D_10	47° 39' 42'' N 122° 27' 25'' W	2.7	King	22	0	0	0	0
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39' 42'' N 122° 27' 25'' W	PS_D_11	47° 41' 54'' N 122° 26' 47'' W	2.3	King	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41' 54'' N 122° 26' 47'' W	PS_D_12	47° 45' 52'' N 122° 25' 49'' W	4.0	Kitsap	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45' 52'' N 122° 25' 49'' W	PS_D_13	47° 46' 40'' N 122° 26' 04'' W	0.8	King	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46' 40'' N 122° 26' 04'' W	PS_D_14	47° 48' 06'' N 122° 26' 29'' W	1.5	Snohomish	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48' 06'' N 122° 26' 29'' W	PS_D_15	47° 52' 36'' N 122° 28' 08'' W	4.6	Kitsap	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52' 36'' N 122° 28' 08'' W	PS_D_16	47° 55' 34'' N 122° 29' 11'' W	3.1	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34'' N 122° 29' 11'' W	PS_D_17	47° 57' 01'' N 122° 32' 03'' W	2.4	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01'' N 122° 32' 03'' W	PS_D_18	47° 58' 07'' N 122° 34' 19'' W	1.9	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07'' N 122° 34' 19'' W	PS_D_19	48° 02' 01'' N 122° 37' 40'' W	4.5	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01'' N 122° 37' 40'' W	PS_D_20	48° 04' 48'' N 122° 38' 31'' W	2.8	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48'' N 122° 38' 31'' W	PS_D_21	48° 06' 58'' N 122° 39' 13'' W	2.2	Jefferson	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 58'' N 122° 39' 13'' W	PS_D_22	48° 07' 51'' N 122° 40' 43'' W	1.3	Jefferson	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07' 51'' N 122° 40' 43'' W	PS_D_23	48° 11' 20'' N 122° 46' 47'' W	5.3	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 20'' N 122° 46' 47'' W	PS_D_24	48° 11' 44'' N 122° 48' 45'' W	1.4	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11' 44'' N 122° 48' 45'' W	PS_D_25	48° 11' 57'' N 122° 52' 19'' W	2.4	Jefferson	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11' 57'' N 122° 52' 19'' W	PS_D_26	48° 12' 45'' N 123° 06' 35'' W	9.5	Calallam	SS	0	0	0	0
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12' 45'' N 123° 06' 35'' W	PS_D_27	48° 10' 33'' N 123° 23' 03'' W	11.2	Calallam	18	0	0	0	0
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10' 33'' N 123° 23' 03'' W	PS_D_28	48° 11' 21'' N 123° 23' 02'' W	0.8	Calallam	10	0	0	0	0
Tacoma_Sea	Departure	X	N	L28a	PS_D_28	48° 11' 21'' N 123° 23' 02'' W	VP_D_1	48° 13' 18'' N 123° 26' 59'' W	3.2	Calallam	14	0	0	0	0
PortAngeles_Victoria	Departure	T	N	L1	VP_D_1	48° 13' 18'' N 123° 26' 59'' W	VP_D_2	48° 14' 41'' N 123° 26' 36'' W	1.4	Calallam	16	0	0	0	0

Total Distance 91.1 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**  
**OGV-Routing: VICTORIA (NB1) to EVERETT**  
 Lat/Long in WGS84 Datum

Speed by Link (knots)  
 Fast Fast Medium Slow Very Slow

DRAFT Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer	Tankers			
												Container	RO/RO	Log	Fishing	Fishing
												Auto	Fishing	Fishing	Fishing	Fishing
NB1_PortAngeles	Arrival	T	N	L1	VP_A_1	48° 13' 55" N 123° 30' 34" W	VP_A_2	48° 12' 05" N 123° 28' 55" W	2.1	Calallam	18	0	0	0	0	
NB1_PortAngeles	Arrival	X	N	L2a	VP_A_2	48° 12' 05" N 123° 28' 55" W	PS_A_5	48° 09' 20" N 123° 23' 28" W	4.5	Calallam	16	0	0	0	0	
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09' 20" N 123° 23' 28" W	PS_A_6	48° 09' 58" N 123° 23' 25" W	0.6	Calallam	8	0	0	0	0	
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09' 58" N 123° 23' 25" W	PS_A_7	48° 11' 56" N 123° 06' 35" W	11.4	Calallam	19	0	0	0	0	
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11' 56" N 123° 06' 35" W	PS_A_8	48° 11' 11" N 122° 52' 23" W	9.5	Calallam	SS	0	0	0	0	
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11' 11" N 122° 52' 23" W	PS_A_9	48° 10' 57" N 122° 48' 01" W	2.9	Jefferson	SS	0	0	0	0	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 57" N 122° 48' 01" W	PS_A_10	48° 06' 35" N 122° 40' 10" W	6.8	Jefferson	SS	0	0	0	0	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 35" N 122° 40' 10" W	PS_A_11	48° 01' 08" N 122° 38' 08" W	5.6	Jefferson	SS	0	0	0	0	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 08" N 122° 38' 08" W	PS_A_12	47° 57' 41" N 122° 35' 10" W	4.0	Island	SS	0	0	0	0	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 41" N 122° 35' 10" W	PS_A_13	47° 56' 38" N 122° 32' 57" W	1.8	Island	SS	0	0	0	0	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 38" N 122° 32' 57" W	PS_A_14	47° 55' 17" N 122° 30' 06" W	2.3	Kitsap	SS	0	0	0	0	
PS_Everett	Arrival	X	N	L1a	PS_A_14	47° 55' 17" N 122° 30' 06" W	EV_A_2	47° 53' 08" N 122° 29' 06" W	2.3	Kitsap	18	0	0	0	0	
PS_Everett	Arrival	X	N	L2	EV_A_2	47° 53' 08" N 122° 29' 06" W	EV_A_3	47° 51' 05" N 122° 26' 26" W	2.7	Kitsap	17	0	0	0	0	
PS_Everett	Arrival	X	N	L3	EV_A_3	47° 51' 05" N 122° 26' 26" W	EV_A_4	47° 51' 50" N 122° 23' 43" W	2.0	Island	16	0	0	0	0	
PS_Everett	Arrival	T	N	L4	EV_A_4	47° 51' 50" N 122° 23' 43" W	EV_A_5	47° 52' 03" N 122° 22' 51" W	0.6	Snohomis	15	0	0	0	0	
PS_Everett	Arrival	T	Y	L5	EV_A_5	47° 52' 03" N 122° 22' 51" W	EV_A_6	47° 54' 06" N 122° 20' 54" W	2.4	Snohomis	15	0	0	0	0	
PS_Everett	Arrival	T	Y	L6	EV_A_6	47° 54' 06" N 122° 20' 54" W	EV_A_7	47° 56' 25" N 122° 19' 35" W	2.5	Snohomis	15	0	0	0	0	
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56' 25" N 122° 19' 35" W	EV_A_8	47° 57' 28" N 122° 19' 10" W	1.1	Snohomis	14	0	0	0	0	
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57' 28" N 122° 19' 10" W	EV_A_9	47° 58' 31" N 122° 16' 42" W	2.0	Snohomis	10	0	0	0	0	
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58' 31" N 122° 16' 42" W	EV_A_10	47° 58' 40" N 122° 14' 15" W	1.3	Snohomis	7	0	0	0	0	

Total Distance 68.5 nm Note: SS - Service Speed



## Puget Sound Emissions Inventory

OGV-Routing: VICTORIA (NB1) to PORT ANGELES

Lat/Long in WGS84 Datum

### DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Auto	Reefer	Bulkers	Tankers
NB1_PortAngeles	Arrival	T	N	L1	VP_A_1	48° 13' 55" N 123° 30' 34" W	VP_A_2	48° 12' 05" N 123° 28' 55" W	2.1	Calallam	18	0	0	0	0
NB1_PortAngeles	Arrival	X	Y	L2a	VP_A_2	48° 12' 05" N 123° 28' 55" W	PS_A_5	48° 09' 20" N 123° 23' 28" W	4.5	Calallam	16	0	0	0	0
Sea_PortAngeles	Arrival	M	Y	L1a	PS_A_5	48° 09' 20" N 123° 23' 28" W	PA_A_2	48° 09' 45" N 123° 23' 25" W	0.4	Calallam	10	0	0	0	0
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09' 45" N 123° 23' 25" W	PA_A_3	48° 08' 21" N 123° 22' 25" W	1.6	Calallam	8	0	0	0	0
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08' 21" N 123° 22' 25" W	PA_A_4	48° 08' 00" N 123° 23' 48" W	1.0	Calallam	6	0	0	0	0
Total Distance									9.6 nm	Note: SS - Service Speed					

**Puget Sound Emissions Inventory**

OGV-Routing: SEA to SEATTLE

Lat/Long in WGS84 Datum

															Speed by Link (knots)																
															Fast	Fast	Medium	Slow	Very Slow												
															Bulkers																
															Reefer	Tankers							CR-1	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2	CR-2	
															Container	RO/RO	Log							Speed	PL	SL	BL	Speed	PL	SL	BL
															Fishing	Fishing	Fishing							knots	(MW)	(MW)	(MW)	knots	(MW)	(MW)	(MW)
DRAFT	Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP I	End WP	ypoir	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	Speed	PL	SL	BL	Speed	PL	SL	BL							
	Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 2	PS_A_2	48° 2	10.7	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 2	PS_A_3	48° 1	35.9	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 1	PS_A_4	48° 1	15.4	Calallam	20	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0							
	Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 1	PS_A_5	48° 0	6.9	Calallam	16	15	12	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0							
	Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 0	PS_A_6	48° 0	0.6	Calallam	8	8	8	8	8	10.0	6.0	6.9	0.0	10.0	8.0	10.1	0.0							
	Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 0	PS_A_7	48° 1	11.4	Calallam	16	18	16	12	SS	17.0	15.0	6.9	0.0	18.0	14.0	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 1	PS_A_8	48° 1	9.5	Calallam	SS	SS	SS	SS	SS	19.0	18.4	6.9	0.0	19.8	15.2	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 1	PS_A_9	48° 1	2.9	Jefferson	SS	SS	SS	SS	SS	19.0	18.4	6.9	0.0	19.8	15.2	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 1	PS_A_10	48° 0	6.8	Jefferson	SS	SS	SS	SS	SS	19.0	18.4	6.9	0.0	19.8	15.2	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 0	PS_A_11	48° 0	5.6	Jefferson	SS	SS	SS	SS	SS	18.0	16.1	6.9	0.0	19.8	15.2	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 0	PS_A_12	47° 5	4.0	Island	SS	SS	SS	SS	SS	18.0	16.1	6.9	0.0	16.8	15.2	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 5	PS_A_13	47° 5	1.8	Island	SS	SS	SS	SS	SS	18.0	16.1	6.9	0.0	16.8	15.2	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 5	PS_A_14	47° 5	2.3	Kitsap	20	20	SS	SS	SS	18.0	16.1	6.9	0.0	16.8	15.2	10.1	0.0							
	Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 5	PS_A_15	47° 4	9.7	Kitsap	17	16	SS	SS	SS	16.5	16.1	6.9	0.0	16.6	15.2	10.1	0.0							
	Sea_Tacoma	Arrival	T	Y	L15	PS_A_15	47° 4	PS_A_16	47° 3	6.3	Kitsap	16	16	13	SS	SS	16.5	16.1	6.9	0.0	16.6	15.2	10.1	0.0							
	PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 3	EB_A_2	47° 3	0.4	Kitsap	16	15	13	9	8	16.0	7.2	6.9	0.0	16.0	12.0	10.1	0.0							
	PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 3	EB_A_3	47° 3	1.5	King	15	14	12	8	7	15.5	7.2	6.9	0.0	15.5	12.0	10.1	0.0							
	PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 3	EB_A_4	47° 3	2.6	King	15	12	11	6	6	15.0	7.2	6.9	0.0	15.0	12.0	10.1	0.0							
Total Distance										134.3 nm	Note: SS - Service Speed																				



**Puget Sound Emissions Inventory**

OGV-Routing: SEATTLE HARBOR

Lat/Long in WGS84 Datum

DRAFT

Route	To_Port	To_Pier	Arr/Dep	nk	Start WP	WP	End WP	Ending Waypoint	Lat/Lon	Dist.	County	Speed by Link (knots)												
												Fast	Fast	Medium	Slow	Very Slow	CR-1 Speed knots	CR-1 PL (MW)	CR-1 SL (MW)	CR-1 BL (MW)	CR-2 Speed knots	CR-2 PL (MW)	CR-2 SL (MW)	CR-2 BL (MW)
												Cruise	Auto	Fishing	Fishing	Fishing								
												Bulkers												
Reefer	Tankers	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2	CR-2																
PS_ElliottB	SEATTLE	5-SOUTH	Arrival	47	EB_A_4	47	EB_WC_1	47° 35' 52" N 122° 21' 37" W	1.54	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	5-SOUTH	Arrival	47	EB_WC_1	47	EB_WC_2	47° 35' 02" N 122° 21' 36" W	0.84	King	0	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	5-SOUTH	Arrival	47	EB_WC_2	47	EB_B_T5S	47° 34' 32" N 122° 21' 41" W	0.50	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	5-SOUTH	Departure	47	EB_B_T5S	47	EB_WC_2	47° 35' 02" N 122° 21' 36" W	0.50	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	5-SOUTH	Departure	47	EB_WC_2	47	EB_WC_1	47° 35' 52" N 122° 21' 37" W	0.84	King	0	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	5-SOUTH	Departure	47	EB_WC_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	1.54	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	KINDER	Arrival	47	EB_A_4	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	KINDER	Arrival	47	EB_EC_1	47	EB_B_KM	47° 35' 23" N 122° 20' 45" W	0.42	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	KINDER	Departure	47	EB_B_KM	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	0.42	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	KINDER	Departure	47	EB_EC_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-1	Arrival	47	EB_A_4	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-1	Arrival	47	EB_EC_1	47	EB_B_T181	47° 35' 18" N 122° 20' 45" W	0.51	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-1	Departure	47	EB_B_T181	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	0.51	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-1	Departure	47	EB_EC_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-2	Arrival	47	EB_A_4	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-2	Arrival	47	EB_EC_1	47	EB_B_T182	47° 35' 06" N 122° 20' 45" W	0.71	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-2	Departure	47	EB_B_T182	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	0.71	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-2	Departure	47	EB_EC_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-3	Arrival	47	EB_A_4	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-3	Arrival	47	EB_EC_1	47	EB_B_T183	47° 34' 55" N 122° 20' 45" W	0.89	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-3	Departure	47	EB_B_T183	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	0.89	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-3	Departure	47	EB_EC_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-4	Arrival	47	EB_A_4	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-4	Arrival	47	EB_EC_1	47	EB_B_T184	47° 34' 44" N 122° 20' 45" W	1.08	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-4	Departure	47	EB_B_T184	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	1.08	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-4	Departure	47	EB_EC_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-5	Arrival	47	EB_A_4	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	18-5	Arrival	47	EB_EC_1	47	EB_B_T185	47° 34' 34" N 122° 20' 45" W	1.24	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-5	Departure	47	EB_B_T185	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	1.24	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	18-5	Departure	47	EB_EC_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	20-1	Arrival	47	EB_A_4	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	20-1	Arrival	47	EB_EC_1	47	EB_B_T201	47° 34' 55" N 122° 20' 45" W	0.89	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	20-1	Departure	47	EB_B_T201	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	0.89	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	20-1	Departure	47	EB_EC_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	20-2	Arrival	47	EB_A_4	47	EB_EC_1	47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	

**Puget Sound Emissions Inventory**

OGV-Routing: SEATTLE HARBOR

Lat/Long in WGS84 Datum

DRAFT

Route	To_Port	To_Pier	Arr/Dep	nk	1	Start WP	WP	End WP	Ending Waypoint	Lat/Lon	Dist.	County	Speed by Link (knots)																
													Fast	Fast	Medium	Slow	Very Slow	Bulkers					CR-1	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2
													Cruise	Contain	Auto	Reefer	RO/RO	Fishing	Log	Fishing	Speed	PL	SL	BL	Speed	PL	SL	BL	
ElliottB_PS	SEATTLE	20-2	Departure	EB_B_T202	47	EB_EC_1			47° 35' 48" N 122° 20' 41" W	0.89	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	20-2	Departure	EB_EC_1	47	EB_D_1			47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	25-NORT	Arrival	EB_A_4	47	EB_EC_1			47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	25-NORT	Arrival	EB_EC_1	47	EB_EC_2			47° 34' 46" N 122° 20' 39" W	1.04	King	0	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	25-NORT	Arrival	EB_EC_2	47	EB_B_T25N			47° 34' 37" N 122° 20' 35" W	0.15	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	25-NORT	Departure	EB_B_T25N	47	EB_EC_2			47° 34' 46" N 122° 20' 39" W	0.15	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	25-NORT	Departure	EB_EC_2	47	EB_EC_1			47° 35' 48" N 122° 20' 41" W	1.04	King	0	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	25-NORT	Departure	EB_EC_1	47	EB_D_1			47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	25-SOUTH	Arrival	EB_A_4	47	EB_EC_1			47° 35' 48" N 122° 20' 41" W	2.08	King	0	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	25-SOUTH	Arrival	EB_EC_1	47	EB_EC_2			47° 34' 46" N 122° 20' 39" W	1.04	King	0	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	25-SOUTH	Arrival	EB_EC_2	47	EB_B_T25S			47° 34' 31" N 122° 20' 35" W	0.25	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	25-SOUTH	Departure	EB_B_T25S	47	EB_EC_2			47° 34' 46" N 122° 20' 39" W	0.25	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	25-SOUTH	Departure	EB_EC_2	47	EB_EC_1			47° 35' 48" N 122° 20' 41" W	1.04	King	0	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	25-SOUTH	Departure	EB_EC_1	47	EB_D_1			47° 36' 52" N 122° 23' 21" W	2.08	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	30-NORT	Arrival	EB_A_4	47	EB_EC_1			47° 35' 48" N 122° 20' 41" W	2.08	King	6	6	6	6	6	4	2	7	0.0	4	2.6	10.5	0.0					
PS_ElliottB	SEATTLE	30-NORT	Arrival	EB_EC_1	47	EB_EC_3			47° 35' 12" N 122° 20' 39" W	0.61	King	4	4	4	4	4	3	1	7	0.0	3	0.5	10.5	0.0					
PS_ElliottB	SEATTLE	30-NORT	Arrival	EB_EC_3	47	EB_B_T30N			47° 35' 07" N 122° 20' 35" W	0.09	King	2	2	2	2	2	2	1	7	0.0	2	0.4	10.5	0.0					
ElliottB_PS	SEATTLE	30-NORT	Departure	EB_B_T30N	47	EB_EC_3			47° 35' 12" N 122° 20' 39" W	0.09	King	3	2	2	2	2	3	7	7	0.0	3	6.0	10.1	0.0					
ElliottB_PS	SEATTLE	30-NORT	Departure	EB_EC_3	47	EB_EC_1			47° 35' 48" N 122° 20' 41" W	0.61	King	5	4	4	4	4	5	7	7	0.0	5	6.0	10.1	0.0					
ElliottB_PS	SEATTLE	30-NORT	Departure	EB_EC_1	47	EB_D_1			47° 36' 52" N 122° 23' 21" W	2.08	King	8	7	7	7	7	8	10	7	0.0	8	12.1	10.1	0.0					
PS_ElliottB	SEATTLE	30-SOUTH	Arrival	EB_A_4	47	EB_EC_1			47° 35' 48" N 122° 20' 41" W	2.08	King	8	6	6	6	6	4	2	7	0.0	4	2.6	10.5	0.0					
PS_ElliottB	SEATTLE	30-SOUTH	Arrival	EB_EC_1	47	EB_EC_3			47° 35' 12" N 122° 20' 39" W	0.61	King	4	4	4	4	4	3	1	7	0.0	3	0.5	10.5	0.0					
PS_ElliottB	SEATTLE	30-SOUTH	Arrival	EB_EC_3	47	EB_B_T30S			47° 34' 57" N 122° 20' 35" W	0.25	King	2	2	2	2	2	2	1	7	0.0	2	0.4	10.5	0.0					
ElliottB_PS	SEATTLE	30-SOUTH	Departure	EB_B_T30S	47	EB_EC_3			47° 35' 12" N 122° 20' 39" W	0.25	King	3	2	2	2	2	3	7	7	0.0	3	6.0	10.1	0.0					
ElliottB_PS	SEATTLE	30-SOUTH	Departure	EB_EC_3	47	EB_EC_1			47° 35' 48" N 122° 20' 41" W	0.61	King	5	4	4	4	4	5	7	7	0.0	5	6.0	10.1	0.0					
ElliottB_PS	SEATTLE	30-SOUTH	Departure	EB_EC_1	47	EB_D_1			47° 36' 52" N 122° 23' 21" W	2.08	King	8	7	7	7	7	8	10	7	0.0	8	12.1	10.1	0.0					
PS_ElliottB	SEATTLE	37	Arrival	EB_A_4	47	EB_FS_1			47° 36' 25" N 122° 21' 14" W	1.5	King	0	5	5	5	5	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	37	Arrival	EB_FS_1	47	EB_FS_2			47° 35' 43" N 122° 20' 32" W	0.84	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	37	Arrival	EB_FS_2	47	EB_B_T37			47° 35' 35" N 122° 20' 33" W	0.13	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	37	Departure	EB_B_T37	47	EB_FS_2			47° 35' 43" N 122° 20' 32" W	0.13	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	37	Departure	EB_FS_2	47	EB_FS_1			47° 36' 25" N 122° 21' 14" W	0.84	King	0	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	37	Departure	EB_FS_1	47	EB_D_1			47° 36' 52" N 122° 23' 21" W	1.5	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	46	Arrival	EB_A_4	47	EB_FS_1			47° 36' 25" N 122° 21' 14" W	1.5	King	0	5	5	5	5	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	46	Arrival	EB_FS_1	47	EB_FN_1			47° 35' 56" N 122° 20' 30" W	0.7	King	0	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0					
PS_ElliottB	SEATTLE	46	Arrival	EB_FN_1	47	EB_B_T46			47° 35' 50" N 122° 20' 27" W	0.11	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	46	Departure	EB_B_T46	47	EB_FN_1			47° 35' 56" N 122° 20' 30" W	0.11	King	0	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	46	Departure	EB_FN_1	47	EB_FS_1			47° 36' 25" N 122° 21' 14" W	0.7	King	0	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0					
ElliottB_PS	SEATTLE	46	Departure	EB_FS_1	47	EB_D_1			47° 36' 52" N 122° 23' 21" W	1.5	King	0	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0					

**Puget Sound Emissions Inventory**

OGV-Routing: SEATTLE HARBOR

Lat/Long in WGS84 Datum

DRAFT

Route	To_Port	To_Pier	Arr/Dep	nk	Start WP	WP	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)					CR-1 Speed knots	CR-1 PL (MW)	CR-1 SL (MW)	CR-1 BL (MW)	CR-2 Speed knots	CR-2 PL (MW)	CR-2 SL (MW)	CR-2 BL (MW)
											Fast	Fast	Medium	Slow	Very Slow								
											Cruise	Contain	Reefer RO/RO	Tankers Log Fishing	Fishing								
PS_ElliottB	SEATTLE	66-1	Arrival		EB_CT_1	47	EB_B_T661	47° 36' 39" N 122° 21' 00" W	0.13	King	2	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-1	Departure		EB_B_T661	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	0.13	King	2	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-1	Departure		EB_CT_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	1.66	King	7	0	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	66-2	Arrival		EB_A_4	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	1.66	King	6	0	6	6	6	4	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	66-2	Arrival		EB_CT_1	47	EB_B_T662	47° 36' 37" N 122° 20' 57" W	0.1	King	2	0	2	2	2	2	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-2	Departure		EB_B_T662	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	0.1	King	2	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-2	Departure		EB_CT_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	1.66	King	7	0	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	66-3	Arrival		EB_A_4	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	1.66	King	6	0	6	6	6	4	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	66-3	Arrival		EB_CT_1	47	EB_B_T663	47° 36' 36" N 122° 20' 54" W	0.08	King	2	0	2	2	2	2	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-3	Departure		EB_B_T663	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	0.08	King	2	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-3	Departure		EB_CT_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	1.66	King	7	0	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	66-4	Arrival		EB_A_4	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	1.66	King	6	0	6	6	6	4	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	66-4	Arrival		EB_CT_1	47	EB_B_T664	47° 36' 34" N 122° 20' 52" W	0.07	King	2	0	2	2	2	2	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-4	Departure		EB_B_T664	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	0.07	King	2	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-4	Departure		EB_CT_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	1.66	King	7	0	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	66-N	Arrival		EB_A_4	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	1.66	King	6	0	6	6	6	4	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	66-N	Arrival		EB_CT_1	47	EB_B_T66N	47° 36' 41" N 122° 21' 03" W	0.17	King	2	0	2	2	2	2	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-N	Departure		EB_B_T66N	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	0.17	King	2	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	66-N	Departure		EB_CT_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	1.66	King	7	0	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
<b>YACHTS ONLY</b>											Yachts only												
PS_ElliottB	SEATTLE	EB MARI	Arrival		EB_A_4	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	1.66	King	0	0	0	0	6	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	EB MARI	Arrival		EB_CT_1	47	EB_EM_1	47° 36' 33" N 122° 20' 44" W	0.14	King	0	0	0	0	2	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	EB MARI	Arrival		EB_EM_1	47	EB_B_EM	47° 36' 36" N 122° 20' 50" W	0.09	King	0	0	0	0	1	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	EB MARI	Departure		EB_B_EM	47	EB_EM_1	47° 36' 33" N 122° 20' 44" W	0.09	King	0	0	0	0	1	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	EB MARI	Departure		EB_EM_1	47	EB_CT_1	47° 36' 31" N 122° 20' 57" W	0.14	King	0	0	0	0	2	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	EB MARI	Departure		EB_CT_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	1.66	King	0	0	0	0	7	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	86	Arrival		EB_A_4	47	EB_GE_1	47° 37' 22" N 122° 22' 14" W	0.9	King	0	0	0	4	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	86	Arrival		EB_GE_1	47	EB_B_T86	47° 37' 25" N 122° 22' 14" W	0.04	King	0	0	0	2	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	86	Departure		EB_B_T86	47	EB_GE_1	47° 37' 22" N 122° 22' 14" W	0.04	King	0	0	0	2	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	86	Departure		EB_GE_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	0.9	King	0	0	0	5	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	90-3	Arrival		EB_A_4	47	EB_FE_1	47° 37' 26" N 122° 22' 45" W	0.69	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	
PS_ElliottB	SEATTLE	90-3	Arrival		EB_FE_1	47	EB_B_T903	47° 37' 47" N 122° 22' 46" W	0.35	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	
ElliottB_PS	SEATTLE	90-3	Departure		EB_B_T903	47	EB_FE_1	47° 37' 26" N 122° 22' 45" W	0.04	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	
ElliottB_PS	SEATTLE	90-3	Departure		EB_FE_1	47	EB_D_1	47° 36' 52" N 122° 23' 21" W	0.9	King	0	0	5	5	5	0	0	0	0.0	0	0.0	0.0	
PS_ElliottB	SEATTLE	90-3&7	Arrival		EB_A_4	47	EB_FE_1	47° 37' 26" N 122° 22' 45" W	0.69	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	
PS_ElliottB	SEATTLE	90-3&7	Arrival		EB_FE_1	47	EB_B_T9037	47° 37' 39" N 122° 22' 45" W	0.21	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	

**Puget Sound Emissions Inventory**

OGV-Routing: SEATTLE HARBOR

Lat/Long in WGS84 Datum

DRAFT

Route	To_Port	To_Pier	Arr/Dep	nk 1	Start WP	WP	End WP	Ending Waypoint	Lat/Lon	Dist.	County	Speed by Link (knots)					CR-1 Speed knots	CR-1 PL (MW)	CR-1 SL (MW)	CR-1 BL (MW)	CR-2 Speed knots	CR-2 PL (MW)	CR-2 SL (MW)	CR-2 BL (MW)
												Fast	Fast	Medium	Slow	Very Slow								
												Cruise	Contain	Reefer RO/RO	Tankers Log	Bulkers Fishing								
ElliottB_PS	SEATTLE	90-3&7	Departure		EB_FE_1	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	0.69	King	0	0	5	5	5	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	90-5	Arrival		EB_A_4	47	EB_FM_1	47° 37' 25" N	122° 22' 53" W	0.63	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	90-5	Arrival		EB_FM_1	47	EB_B_T905	47° 37' 47" N	122° 22' 51" W	0.37	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	90-5	Departure		EB_B_T905	47	EB_FM_1	47° 37' 25" N	122° 22' 53" W	0.37	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	90-5	Departure		EB_FM_1	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	0.63	King	0	0	5	5	5	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	90-5&7	Arrival		EB_A_4	47	EB_FM_1	47° 37' 25" N	122° 22' 53" W	0.63	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	90-5&7	Arrival		EB_FM_1	47	EB_B_T9057	47° 37' 48" N	122° 22' 55" W	0.38	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	90-5&7	Departure		EB_B_T9057	47	EB_FM_1	47° 37' 25" N	122° 22' 53" W	0.38	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	90-5&7	Departure		EB_FM_1	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	0.63	King	0	0	5	5	5	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	91-H&I	Arrival		EB_A_4	47	EB_FM_1	47° 37' 25" N	122° 22' 53" W	0.63	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	91-H&I	Arrival		EB_FM_1	47	EB_B_T91HI	47° 37' 48" N	122° 22' 55" W	0.38	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	91-H&I	Departure		EB_B_T91HI	47	EB_FM_1	47° 37' 25" N	122° 22' 53" W	0.38	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	91-H&I	Departure		EB_FM_1	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	0.63	King	0	0	5	5	5	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	91-J&K	Arrival		EB_A_4	47	EB_FM_1	47° 37' 25" N	122° 22' 53" W	0.63	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	91-J&K	Arrival		EB_FM_1	47	EB_B_T91JK	47° 37' 40" N	122° 22' 55" W	0.25	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	91-J&K	Departure		EB_B_T91JK	47	EB_FM_1	47° 37' 25" N	122° 22' 53" W	0.25	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	91-J&K	Departure		EB_FM_1	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	0.63	King	0	0	5	5	5	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	91-E&F	Arrival		EB_A_4	47	EB_FW_1	47° 37' 27" N	122° 23' 03" W	0.62	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	91-E&F	Arrival		EB_FW_1	47	EB_B_T91EF	47° 37' 42" N	122° 23' 02" W	0.24	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	91-E&F	Departure		EB_B_T91EF	47	EB_FM_1	47° 37' 25" N	122° 22' 53" W	0.25	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	91-E&F	Departure		EB_FM_1	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	0.63	King	0	0	5	5	5	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	ANCHOR	Arrival		EB_A_4	47	EB_AN_SCE	47° 37' 09" N	122° 22' 18" W	0.75	King	4	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	ANCHOR	Departure		EB_AN_SCE	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	0.75	King	4	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	ANCHOR	Arrival		EB_A_4	47	EB_AN_SCW	47° 37' 34" N	122° 24' 07" W	0.87	King	4	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	ANCHOR	Departure		EB_AN_SCW	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	0.87	King	4	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	ANCHOR	Arrival		EB_A_4	47	EB_AN_EBE	47° 35' 35" N	122° 22' 14" W	1.49	King	4	4	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	ANCHOR	Departure		EB_AN_EBE	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	1.49	King	5	5	5	5	5	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	ANCHOR	Arrival		EB_A_4	47	EB_AN_EBW	47° 35' 42" N	122° 21' 09" W	1.88	King	4.5	4.5	4.5	4.5	4.5	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	ANCHOR	Departure		EB_AN_EBW	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	1.88	King	6	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD	Arrival		EB_A_4	47	EB_WC_1	47° 35' 52" N	122° 21' 37" W	1.54	King	6	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE HARBOR

Lat/Long in WGS84 Datum

DRAFT

										Speed by Link (knots)													
										Fast	Fast	Medium	Slow	Very Slow									
										Bulkers													
										Reefer		Tankers			CR-1	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2		
										Contain	RO/RO	Fishing	Log	Fishing	Speed	PL	SL	BL	Speed	PL	SL	BL	
Route	To_Port	To_Pier	Arr/Dep	nk	1	Start WP	WP	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	knots	(MW)	(MW)	(MW)	knots	(MW)	(MW)	(MW)
PS_ElliottB	SEATTLE	TODD-4	Arrival			EB_TD_3	47	EB_B_TD4	47° 35' 17'' N 122° 21' 24'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-4	Departure			EB_B_TD4	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-4	Departure			EB_TD_3	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-4	Departure			EB_WC_1	47	EB_D_1	47° 36' 52'' N 122° 23' 21'' W	1.54	King	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-5	Arrival			EB_A_4	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	1.54	King	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-5	Arrival			EB_WC_1	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-5	Arrival			EB_TD_3	47	EB_B_TD5	47° 35' 17'' N 122° 21' 24'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-5	Departure			EB_B_TD5	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-5	Departure			EB_TD_3	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-5	Departure			EB_WC_1	47	EB_D_1	47° 36' 52'' N 122° 23' 21'' W	1.54	King	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-D	Arrival			EB_A_4	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	1.54	King	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-D	Arrival			EB_WC_1	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-D	Arrival			EB_TD_3	47	EB_B_TDD3	47° 35' 17'' N 122° 21' 24'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-D	Departure			EB_B_TDD3	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-D	Departure			EB_TD_3	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-D	Departure			EB_WC_1	47	EB_D_1	47° 36' 52'' N 122° 23' 21'' W	1.54	King	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-E	Arrival			EB_A_4	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	1.54	King	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-E	Arrival			EB_WC_1	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-E	Arrival			EB_TD_3	47	EB_B_TDE	47° 35' 17'' N 122° 21' 24'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-E	Departure			EB_B_TDE	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-E	Departure			EB_TD_3	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-E	Departure			EB_WC_1	47	EB_D_1	47° 36' 52'' N 122° 23' 21'' W	1.54	King	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-F	Arrival			EB_A_4	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	1.54	King	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-F	Arrival			EB_WC_1	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-F	Arrival			EB_TD_3	47	EB_B_TDF	47° 35' 17'' N 122° 21' 24'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-F	Departure			EB_B_TDF	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-F	Departure			EB_TD_3	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-F	Departure			EB_WC_1	47	EB_D_1	47° 36' 52'' N 122° 23' 21'' W	1.54	King	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-H	Arrival			EB_A_4	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	1.54	King	6	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-H	Arrival			EB_WC_1	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	TODD-H	Arrival			EB_TD_3	47	EB_B_TDH	47° 35' 17'' N 122° 21' 24'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-H	Departure			EB_B_TDH	47	EB_TD_3	47° 35' 26'' N 122° 21' 23'' W	0.15	King	2	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-H	Departure			EB_TD_3	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	0.47	King	3	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0
ElliottB_PS	SEATTLE	TODD-H	Departure			EB_WC_1	47	EB_D_1	47° 36' 52'' N 122° 23' 21'' W	1.54	King	7	7	7	7	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	LAFARGI	Arrival			EB_A_4	47	EB_WC_1	47° 35' 52'' N 122° 21' 37'' W	1.54	King	0	0	6	6	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	LAFARGI	Arrival			EB_WC_1	47	EB_WC_2	47° 35' 02'' N 122° 21' 36'' W	0.84	King	0	0	4	4	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	LAFARGI	Arrival			EB_WC_2	47	EB_WC_3	47° 34' 33'' N 122° 21' 35'' W	0.49	King	0	0	4	4	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	LAFARGI	Arrival			EB_WC_3	47	EB_DU_1	47° 34' 06'' N 122° 20' 59'' W	0.61	King	0	0	3	3	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	LAFARGI	Arrival			EB_DU_1	47	EB_DU_2	47° 33' 52'' N 122° 20' 50'' W	0.26	King	0	0	3	3	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	LAFARGI	Arrival			EB_DU_2	47	EB_DU_3	47° 33' 26'' N 122° 20' 38'' W	0.44	King	0	0	3	3	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	LAFARGI	Arrival			EB_DU_3	47	EB_DU_4	47° 33' 18'' N 122° 20' 34'' W	0.14	King	0	0	2	2	0	0	0	0.0	0	0.0	0.0	0.0
PS_ElliottB	SEATTLE	LAFARGI	Arrival			EB_DU_4	47	EB_B_1E	47° 33' 14'' N 122° 20' 34'' W	0.07	King	0	0	1	1	0	0	0	0.0	0	0.0	0.0	0.0



**Puget Sound Emissions Inventory**

OGV-Routing: SEATTLE HARBOR

Lat/Long in WGS84 Datum

**DRAFT**

										Speed by Link (knots)															
										Fast	Fast	Medium	Slow	Very Slow											
										Bulkers															
										Reefer		Tankers		CR-1		CR-1		CR-1		CR-2		CR-2		CR-2	
										Contain	RO/RO	Fishing	Fishing	Fishing	Speed	PL	SL	BL	Speed	PL	SL	BL			
Route	To_Port	To_Pier	Arr/Dep	nk	Start WP	WP	End WP	Ending Waypoint	Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	knots	(MW)	(MW)	(MW)	knots	(MW)	(MW)	(MW)		
ElliottB_PS	SEATTLE	LAFARGI	Departure		EB_B_1F	47	EB_DU_4	47° 33' 18" N	122° 20' 34" W	0.07	King	0	0	1	1	1	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	LAFARGI	Departure		EB_DU_4	47	EB_DU_3	47° 33' 26" N	122° 20' 38" W	0.14	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	LAFARGI	Departure		EB_DU_3	47	EB_DU_2	47° 33' 52" N	122° 20' 50" W	0.44	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	LAFARGI	Departure		EB_DU_2	47	EB_DU_1	47° 34' 06" N	122° 20' 59" W	0.26	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	LAFARGI	Departure		EB_DU_1	47	EB_WC_3	47° 34' 33" N	122° 21' 35" W	0.61	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	LAFARGI	Departure		EB_WC_3	47	EB_WC_2	47° 35' 02" N	122° 21' 36" W	0.49	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	LAFARGI	Departure		EB_WC_2	47	EB_WC_1	47° 35' 52" N	122° 21' 37" W	0.84	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	LAFARGI	Departure		EB_WC_1	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	1.54	King	0	0	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_A_4	47	EB_WC_1	47° 35' 52" N	122° 21' 37" W	1.54	King	0	0	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_WC_1	47	EB_WC_2	47° 35' 02" N	122° 21' 36" W	0.84	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_WC_2	47	EB_WC_3	47° 34' 33" N	122° 21' 35" W	0.49	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_WC_3	47	EB_DU_1	47° 34' 06" N	122° 20' 59" W	0.61	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_1	47	EB_DU_2	47° 33' 52" N	122° 20' 50" W	0.26	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_2	47	EB_DU_3	47° 33' 26" N	122° 20' 38" W	0.44	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_3	47	EB_DU_4	47° 33' 18" N	122° 20' 34" W	0.14	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_4	47	EB_DU_5	47° 33' 14" N	122° 20' 31" W	0.07	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_5	47	EB_B_GL	47° 33' 12" N	122° 20' 27" W	0.06	King	0	0	1	1	1	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_B_GL	47	EB_DU_5	47° 33' 14" N	122° 20' 31" W	0.06	King	0	0	1	1	1	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_5	47	EB_DU_4	47° 33' 18" N	122° 20' 34" W	0.07	King	0	0	1	1	1	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_4	47	EB_DU_3	47° 33' 26" N	122° 20' 38" W	0.14	King	0	0	1	1	1	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_3	47	EB_DU_2	47° 33' 52" N	122° 20' 50" W	0.44	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_2	47	EB_DU_1	47° 34' 06" N	122° 20' 59" W	0.26	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_1	47	EB_WC_3	47° 34' 33" N	122° 21' 35" W	0.61	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_WC_3	47	EB_WC_2	47° 35' 02" N	122° 21' 36" W	0.49	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_WC_2	47	EB_WC_1	47° 35' 52" N	122° 21' 37" W	0.84	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_WC_1	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	1.54	King	0	0	6	6	6	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_A_4	47	EB_WC_1	47° 35' 52" N	122° 21' 37" W	1.54	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_WC_1	47	EB_WC_2	47° 35' 02" N	122° 21' 36" W	0.84	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_WC_2	47	EB_WC_3	47° 34' 33" N	122° 21' 35" W	0.49	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_WC_3	47	EB_DU_1	47° 34' 06" N	122° 20' 59" W	0.61	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_1	47	EB_DU_2	47° 33' 52" N	122° 20' 50" W	0.26	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_2	47	EB_DU_3	47° 33' 26" N	122° 20' 38" W	0.44	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_3	47	EB_DU_4	47° 33' 18" N	122° 20' 34" W	0.14	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_4	47	EB_DU_5	47° 33' 14" N	122° 20' 31" W	0.07	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_5	47	EB_DU_6	47° 33' 03" N	122° 20' 25" W	0.2	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_6	47	EB_DU_7	47° 32' 54" N	122° 20' 21" W	0.15	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0	
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_7	47	EB_B_BP	47° 32' 49" N	122° 20' 15" W	0.11	King	0	0	1	1	1	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_B_BP	47	EB_DU_5	47° 33' 14" N	122° 20' 31" W	0.11	King	0	0	1	1	1	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_7	47	EB_DU_6	47° 33' 03" N	122° 20' 25" W	0.15	King	0	0	2	2	2	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_6	47	EB_DU_5	47° 33' 14" N	122° 20' 31" W	0.2	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_5	47	EB_DU_4	47° 33' 18" N	122° 20' 34" W	0.07	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_4	47	EB_DU_3	47° 33' 26" N	122° 20' 38" W	0.14	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_3	47	EB_DU_2	47° 33' 52" N	122° 20' 50" W	0.44	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_2	47	EB_DU_1	47° 34' 06" N	122° 20' 59" W	0.26	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_1	47	EB_WC_3	47° 34' 33" N	122° 21' 35" W	0.61	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_WC_3	47	EB_WC_2	47° 35' 02" N	122° 21' 36" W	0.49	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_WC_2	47	EB_WC_1	47° 35' 52" N	122° 21' 37" W	0.84	King	0	0	3	3	3	0	0	0	0.0	0	0.0	0.0	0.0	
ElliottB_PS	SEATTLE	BPB	Departure		EB_WC_1	47	EB_D_1	47° 36' 52" N	122° 23' 21" W	1.54	King	0	0	4	4	4	0	0	0	0.0	0	0.0	0.0	0.0	

Engines off during departure due to constricted waterway: Duamish River

**Puget Sound Emissions Inventory**

OGV-Routing: SEATTLE to SEA

Lat/Long in WGS84 Datum

														Speed by Link (knots)													
														Fast	Fast	Medium	Slow	Very Slow									
														Bulkers					CR-1	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2	CR-2	
														Container	Reefer	Tankers	Log	Fishing	Speed	PL	SL	BL	Speed	PL	SL	BL	
														Auto	RO/RO	RO/RO	Log	Fishing	knots	(MW)	(MW)	(MW)	knots	(MW)	(MW)	(MW)	(MW)
DRAFT	Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP L	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	knots	(MW)	(MW)	(MW)	knots	(MW)	(MW)	(MW)	(MW)		
	ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36'	EB_D_2	47° 38'	2.6	King	14	12	9	8	6	13.5	13.2	7.0	0.0	13.5	12.1	10.1	0.0			
	ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38'	PS_D_10	47° 39'	1.5	King	18	16	SS	SS	7	17.5	19.2	7.0	0.0	16.5	16.1	9.0	0.0			
	Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39'	PS_D_11	47° 41'	2.3	King	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41'	PS_D_12	47° 45'	4.0	Kitsap	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45'	PS_D_13	47° 46'	0.8	King	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46'	PS_D_14	47° 48'	1.5	Snohomish	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48'	PS_D_15	47° 52'	4.6	Kitsap	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52'	PS_D_16	47° 55'	3.1	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55'	PS_D_17	47° 57'	2.4	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57'	PS_D_18	47° 58'	1.9	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58'	PS_D_19	48° 02'	4.5	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02'	PS_D_20	48° 04'	2.8	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04'	PS_D_21	48° 06'	2.2	Jefferson	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06'	PS_D_22	48° 07'	1.3	Jefferson	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07'	PS_D_23	48° 11'	5.3	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11'	PS_D_24	48° 11'	1.4	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11'	PS_D_25	48° 11'	2.4	Jefferson	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11'	PS_D_26	48° 12'	9.5	Calallam	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0			
	Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12'	PS_D_27	48° 10'	11.2	Calallam	17	17	16	12	SS	18.0	19.0	7.0	0.0	18.0	19.5	10.1	0.0			
	Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10'	PS_D_28	48° 11'	0.8	Calallam	8	8	8	8	8	10.0	12.0	7.0	0.0	10.0	11.0	10.1	0.0			
	Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11'	PS_D_29	48° 14'	4.9	Calallam	15	14	12	SS	SS	21.0	27.3	7.0	0.0	22.0	29.3	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14'	PS_D_30	48° 15'	3.1	Calallam	19	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15'	PS_D_31	48° 17'	15.4	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17'	PS_D_32	48° 30'	34.1	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0			
	Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30'	PS_D_33	48° 30'	10.9	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0			

Total Distance 134.4 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: SEATTLE to EVERETT

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP	End WP	appoin	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Container	RO/RO	Bulkers	Reefer	Tankers
											Cruise	Auto	Fishing	Fishing	Fishing
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47°	EB_D_2	47° 38	2.6	King	0	12	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47°	PS_D_10	47° 39	1.5	King	0	16	SS	SS	7
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47°	PS_D_11	47° 41	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47°	PS_D_12	47° 45	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12a	PS_D_12	47°	ET_A_1	47° 46	0.8	King	0	SS	SS	SS	SS
Tacoma_Everett	Departure	T	N	L1	ET_A_1	47°	ET_A_2	47° 48	1.6	Snohomish	0	SS	SS	SS	SS
Tacoma_Everett	Departure	T	N	L2a	ET_A_2	47°	EV_A_5	47° 52	4.1	Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L5	EV_A_5	47°	EV_A_6	47° 54	2.4	Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	X	Y	L6	EV_A_6	47°	EV_A_7	47° 56	2.5	Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	X	Y	L7	EV_A_7	47°	EV_A_8	47° 57	1.1	Snohomish	0	14	12	SS	SS
PS_Everett	Arrival	M	Y	L8	EV_A_8	47°	EV_A_9	47° 58	2.0	Snohomish	0	10	10	10	8
PS_Everett	Arrival	M	Y	L9	EV_A_9	47°	EV_A_10	47° 58	1.3	Snohomish	0	7	6	6	5

Total Distance 26.1 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: EVERETT to SEATTLE

Lat/Long in WGS84 Datum

DRAFT

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Reefer Tankers				
													Container RO/RO Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing		
Everett_PS	Departure	M	Y	L1	EV_D_1	47° 58' 40" N 122° 14' 15" W	EV_D_2	47° 58' 51" N 122° 16' 44" W	1.7	Snohomish	0	4	4	4	3		
Everett_PS	Departure	M	Y	L2	EV_D_2	47° 58' 51" N 122° 16' 44" W	EV_D_3	47° 57' 44" N 122° 19' 42" W	2.3	Snohomish	0	10	10	10	5		
Everett_PS	Departure	X	Y	L3	EV_D_3	47° 57' 44" N 122° 19' 42" W	EV_D_4	47° 54' 11" N 122° 21' 32" W	3.8	Island	0	14	SS	SS	6		
Everett_PS	Departure	X	Y	L4	EV_D_4	47° 54' 11" N 122° 21' 32" W	EV_D_5	47° 52' 10" N 122° 23' 30" W	2.4	Island	0	17	SS	SS	SS		
Everett_PS	Departure	T	N	L5a	EV_D_5	47° 52' 10" N 122° 23' 30" W	ET_D_1	47° 51' 53" N 122° 23' 38" W	0.3	Island	0	19	SS	SS	SS		
Everett_Tacoma	Departure	T	N	L1	ET_D_1	47° 51' 53" N 122° 23' 38" W	ET_D_2	47° 46' 44" N 122° 26' 20" W	5.5	Snohomish	0	SS	SS	SS	SS		
Everett_Tacoma	Departure	T	N	L2a	ET_D_2	47° 46' 44" N 122° 26' 20" W	PS_A_15	47° 45' 54" N 122° 26' 45" W	0.9	Kitsap	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	Y	L15	PS_A_15	47° 45' 54" N 122° 26' 45" W	PS_A_16	47° 39' 42" N 122° 28' 24" W	6.3	Kitsap	0	SS	SS	SS	SS		
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39' 42" N 122° 28' 24" W	EB_A_2	47° 39' 21" N 122° 28' 02" W	0.4	Kitsap	0	15	13	9	8		
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39' 21" N 122° 28' 02" W	EB_A_3	47° 38' 16" N 122° 26' 36" W	1.5	King	0	14	12	8	7		
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38' 16" N 122° 26' 36" W	EB_A_4	47° 36' 52" N 122° 23' 21" W	2.6	King	0	12	11	6	6		
Total Distance									27.6 nm	Note: SS - Service Speed							

# Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to VANCOUVER (NB2)

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast    Fast    Medium    Slow    Very Slow**

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L <sub>z</sub>	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36'	EB_D_2	47° 38'	2.6	King	14	12	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38'	PS_D_10	47° 39'	1.5	King	18	16	SS	SS	7
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39'	PS_D_11	47° 41'	2.3	King	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41'	PS_D_12	47° 45'	4.0	Kitsap	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45'	PS_D_13	47° 46'	0.8	King	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46'	PS_D_14	47° 48'	1.5	Snohomish	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48'	PS_D_15	47° 52'	4.6	Kitsap	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52'	PS_D_16	47° 55'	3.1	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55'	PS_D_17	47° 57'	2.4	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57'	PS_D_18	47° 58'	1.9	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58'	PS_D_19	48° 02'	4.5	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02'	PS_D_20	48° 04'	2.8	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04'	PS_D_21	48° 06'	2.2	Jefferson	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06'	PS_D_22	48° 07'	1.3	Jefferson	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07'	PS_D_23	48° 11'	5.3	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11'	PS_D_24	48° 11'	1.4	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11'	PS_D_25	48° 11'	2.4	Jefferson	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11'	PS_D_26	48° 12'	9.5	Calallam	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12'	PS_D_27	48° 10'	11.2	Calallam	17	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10'	PS_A_6	48° 09'	0.8	Calallam	8	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09'	PS_A_7	48° 11'	11.4	Calallam	18	18	12	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11'	PS_A_8	48° 11'	9.5	Calallam	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8a	PS_A_8	48° 11'	PS_D_24	48° 11'	2.5	Jefferson	SS	SS	SS	SS	SS
AI_NB2	Departure	T	N	L1a	PS_D_24	48° 11'	AD_D_2	48° 13'	2.1	San Juan	18	18	17	16	SS
AI_NB2	Departure	T	N	L2	AD_D_2	48° 13'	AD_D_3	48° 19'	8.1	San Juan	16	16	15	15	SS
AI_NB2	Departure	T	N	L3	AD_D_3	48° 19'	AD_D_4	48° 24'	5.1	San Juan	15	15	15	15	SS
AI_NB2	Departure	T	N	L4	AD_D_4	48° 24'	AD_D_5	48° 29'	7.3	San Juan	15	15	15	15	SS
AI_NB2	Departure	T	N	L5	AD_D_5	48° 29'	AD_D_6	48° 34'	5.8	San Juan	15	15	15	15	SS
AI_NB2	Departure	T	N	L6	AD_D_6	48° 34'	AD_D_7	48° 40'	5.4	San Juan	15	15	15	15	SS

Total Distance 123.2 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to SEATTLE

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast**   **Fast**   **Medium**   **Slow**   **Very Slow**

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP	La WP	End WP	Waypoint	Dist.	County	Cruise	Speed by Link (knots)			Vessel Type		
													Auto	Fishing	RO/RO	Container	Reefer	Tankers
NB2_AI	Arrival	T	N	L1	AD_A_1	48° 40'	AD_A_2	48° 34'	5.2	San Juan	15	16	SS	SS	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L2	AD_A_2	48° 34'	AD_A_3	48° 29'	5.9	San Juan	15	SS	SS	SS	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L3	AD_A_3	48° 29'	AD_A_4	48° 27'	2.4	San Juan	15	SS	SS	SS	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L4	AD_A_4	48° 27'	AD_A_5	48° 25'	3.6	San Juan	15	SS	SS	SS	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L5	AD_A_5	48° 25'	AD_A_6	48° 22'	3.3	San Juan	15	SS	SS	SS	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L6	AD_A_6	48° 22'	AD_A_7	48° 20'	2.9	San Juan	15	SS	SS	SS	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L7	AD_A_7	48° 20'	AD_A_8	48° 12'	8.8	San Juan	15	SS	SS	SS	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L8a	AD_A_8	48° 12'	PS_D_25	48° 11'	0.9	Jefferson	15	SS	SS	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11'	PS_D_26	48° 12'	9.5	Calallam	18	SS	SS	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12'	PS_D_27	48° 10'	11.2	Calallam	16	16	12	SS	SS	SS	SS	
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10'	PS_A_6	48° 09'	0.8	Calallam	8	8	8	8	8	8	8	
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09'	PS_A_7	48° 11'	11.4	Calallam	18	18	16	12	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11'	PS_A_8	48° 11'	9.5	Calallam	SS	SS	SS	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11'	PS_A_9	48° 10'	2.9	Jefferson	SS	SS	SS	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10'	PS_A_10	48° 06'	6.8	Jefferson	SS	SS	SS	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06'	PS_A_11	48° 01'	5.6	Jefferson	SS	SS	SS	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01'	PS_A_12	47° 57'	4.0	Island	SS	SS	SS	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57'	PS_A_13	47° 56'	1.8	Island	SS	SS	SS	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56'	PS_A_14	47° 55'	2.3	Kitsap	SS	SS	SS	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55'	PS_A_15	47° 45'	9.7	Kitsap	SS	SS	SS	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	Y	L15	PS_A_15	47° 45'	PS_A_16	47° 39'	6.3	Kitsap	SS	SS	SS	SS	SS	SS	SS	
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39'	EB_A_2	47° 39'	0.4	Kitsap	18	16	SS	SS	8	8	8	
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39'	EB_A_3	47° 38'	1.5	King	14	12	10	9	7	7	7	
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38'	EB_A_4	47° 36'	2.6	King	12	10	6	6	6	6	6	

Total Distance 119.3 nm      Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: SEATTLE to NANIAMO (NB2)

Lat/Long in WGS84 Datum

DRAFT

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Reefer				
													Container				
													RO/RO				
													Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP La	WP Lo	End WP	Waypoint L	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36' N	122° 22' W	EB_D_2	47° 38' 22" N	2.6	King	14	12	9	8	6	
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38' 22" N	122° 42" W	PS_D_10	47° 39' 42" N	1.5	King	18	16	SS	SS	7	
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39' 42" N	122° 54" W	PS_D_11	47° 41' 54" N	2.3	King	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41' 54" N	122° 52" W	PS_D_12	47° 45' 52" N	4.0	Kitsap	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45' 52" N	122° 40" W	PS_D_13	47° 46' 40" N	0.8	King	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46' 40" N	122° 06" W	PS_D_14	47° 48' 06" N	1.5	Snohomish	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48' 06" N	122° 36" W	PS_D_15	47° 52' 36" N	4.6	Kitsap	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52' 36" N	122° 34" W	PS_D_16	47° 55' 34" N	3.1	Island	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34" N	122° 01" W	PS_D_17	47° 57' 01" N	2.4	Island	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01" N	122° 07" W	PS_D_18	47° 58' 07" N	1.9	Island	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07" N	122° 01" W	PS_D_19	48° 02' 01" N	4.5	Island	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01" N	122° 48" W	PS_D_20	48° 04' 48" N	2.8	Island	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48" N	122° 58" W	PS_D_21	48° 06' 58" N	2.2	Jefferson	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 58" N	122° 51" W	PS_D_22	48° 07' 51" N	1.3	Jefferson	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07' 51" N	122° 20" W	PS_D_23	48° 11' 20" N	5.3	Island	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 20" N	122° 44" W	PS_D_24	48° 11' 44" N	1.4	Island	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11' 44" N	122° 57" W	PS_D_25	48° 11' 57" N	2.4	Jefferson	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11' 57" N	122° 45" W	PS_D_26	48° 12' 45" N	9.5	Calallam	SS	SS	SS	SS	SS	
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12' 45" N	122° 33" W	PS_D_27	48° 10' 33" N	11.2	Calallam	17	17	16	12	SS	
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10' 33" N	122° 58" W	PS_A_6	48° 09' 58" N	0.8	Calallam	8	8	8	8	8	
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09' 58" N	122° 56" W	PS_A_7	48° 11' 56" N	11.4	Calallam	21	18	15	SS	SS	
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11' 56" N	122° 11" W	PS_A_8	48° 11' 11" N	9.5	Calallam	SS	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L8a	PS_A_8	48° 11' 11" N	122° 44" W	PS_D_24	48° 11' 44" N	2.5	Jefferson	SS	SS	SS	SS	SS	
AI_NB2	Departure	T	N	L1a	PS_D_24	48° 11' 44" N	122° 19" W	AD_D_2	48° 13' 19" N	2.1	San Juan	18	18	17	16	SS	
AI_NB2	Departure	T	N	L2	AD_D_2	48° 13' 19" N	122° 51" W	AD_D_3	48° 19' 51" N	8.1	San Juan	16	16	15	15	SS	
AI_NB2	Departure	T	N	L3	AD_D_3	48° 19' 51" N	122° 17" W	AD_D_4	48° 24' 17" N	5.1	San Juan	15	15	15	15	SS	
AI_NB2	Departure	T	N	L4	AD_D_4	48° 24' 17" N	122° 18" W	AD_D_5	48° 29' 18" N	7.3	San Juan	15	15	15	15	SS	
AI_NB2	Departure	T	N	L5	AD_D_5	48° 29' 18" N	122° 47" W	AD_D_6	48° 34' 47" N	5.8	San Juan	15	15	15	15	SS	
AI_NB2	Departure	T	N	L6	AD_D_6	48° 34' 47" N	122° 00" W	AD_D_7	48° 40' 00" N	5.4	San Juan	15	15	15	15	SS	

Total Distance 123.2 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to PORT ANGELES

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast    Fast    Medium    Slow    Very Slow**

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP	Lz	End WP	Waypoint	Dist.	County	Cruise	Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Container	Reefer	Bulkers		
													Auto	RO/RO	Tankers	Log	
													Fishing	Fishing	Fishing	Fishing	Fishing
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36'		EB_D_2	47° 38'	2.6	King	0	12	9	8	6	
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38'		PS_D_10	47° 39'	1.5	King	0	16	SS	SS	7	
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39'		PS_D_11	47° 41'	2.3	King	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41'		PS_D_12	47° 45'	4.0	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45'		PS_D_13	47° 46'	0.8	King	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46'		PS_D_14	47° 48'	1.5	Snohomish	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48'		PS_D_15	47° 52'	4.6	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52'		PS_D_16	47° 55'	3.1	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55'		PS_D_17	47° 57'	2.4	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57'		PS_D_18	47° 58'	1.9	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58'		PS_D_19	48° 02'	4.5	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02'		PS_D_20	48° 04'	2.8	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04'		PS_D_21	48° 06'	2.2	Jefferson	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06'		PS_D_22	48° 07'	1.3	Jefferson	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07'		PS_D_23	48° 11'	5.3	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11'		PS_D_24	48° 11'	1.4	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11'		PS_D_25	48° 11'	2.4	Jefferson	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11'		PS_D_26	48° 12'	9.5	Calallam	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	48° 12'		PS_D_27	48° 10'	11.2	Calallam	0	17	16	12	SS	
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	48° 10'		PA_A_2	48° 09'	0.6	Calallam	0	8	8	8	8	
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09'		PA_A_3	48° 08'	1.6	Calallam	0	8	8	8	7	
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08'		PA_A_4	48° 08'	1.0	Calallam	0	6	6	6	6	

Total Distance 68.5 nm

Note: SS - Service Speed



# Puget Sound Emissions Inventory

OGV-Routing: SEA to EVERETT

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast    Fast    Medium    Slow    Very Slow**

DRAFT

Route	Arr/Dep	Mode	NPM	Link ID	Start WP	g WP	L WP	End WP	Waypoint	Dist.	County	Cruise	Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Container	Reefer	Tankers		
													Auto	RO/RO	Log		
													Fishing	Fishing	Fishing		
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28	PS_A_2	48° 28'	10.72	Calallam	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28	PS_A_3	48° 13'	35.85	Calallam	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13	PS_A_4	48° 13'	15.36	Calallam	0	20	SS	SS	SS		
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13	PS_A_5	48° 09'	6.94	Calallam	0	16	15	12	SS		
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09	PS_A_6	48° 09'	0.6	Calallam	0	8	8	8	8		
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09	PS_A_7	48° 11'	11.4	Calallam	0	18	16	12	SS		
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11	PS_A_8	48° 11'	9.49	Calallam	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11	PS_A_9	48° 10'	2.92	Jefferson	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10	PS_A_10	48° 06'	6.82	Jefferson	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06	PS_A_11	48° 01'	5.62	Jefferson	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01	PS_A_12	47° 57'	3.97	Island	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57	PS_A_13	47° 56'	1.82	Island	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56	PS_A_14	47° 55'	2.33	Kitsap	0	SS	SS	SS	SS		
PS_Everett	Arrival	T	N	L1a	PS_A_14	47° 55	EV_A_2	47° 53'	2.26	Kitsap	0	SS	SS	SS	SS		
PS_Everett	Arrival	T	N	L2	EV_A_2	47° 53	EV_A_3	47° 51'	2.72	Kitsap	0	SS	SS	SS	SS		
PS_Everett	Arrival	T	N	L3	EV_A_3	47° 51	EV_A_4	47° 51'	1.97	Island	0	SS	SS	SS	SS		
PS_Everett	Arrival	T	N	L4	EV_A_4	47° 51	EV_A_5	47° 52'	0.62	Snohomish	0	SS	SS	SS	SS		
PS_Everett	Arrival	T	N	L5	EV_A_5	47° 52	EV_A_6	47° 54'	2.42	Snohomish	0	20	SS	SS	SS		
PS_Everett	Arrival	X	Y	L6	EV_A_6	47° 54	EV_A_7	47° 56'	2.49	Snohomish	0	18	SS	SS	SS		
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56	EV_A_8	47° 57'	1.07	Snohomish	0	14	14	12	SS		
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57	EV_A_9	47° 58'	1.95	Snohomish	0	10	10	10	9		
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58	EV_A_10	47° 58'	1.32	Snohomish	0	7	7	6	6		

Total Distance 130.68 nm      Note: SS - Service Speed

**Puget Sound Emissions Inventory**

**OGV-Routing: EVERETT HARBOR**

Lat/Long in WGS84 Datum

**DRAFT**

Route	To_Port	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	County	Speed by Link (knots)							
							Cruise	Fast	Medium	Slow	Very Slow			
PS_Everett	EVERETT	Arrival	L9	EV_A_10	47° 58' 40'' N 122° 14' 15'' W	Snohomish								
Everett_PS	EVERETT	Departure	L1	EV_D_1	47° 58' 40'' N 122° 14' 15'' W	Snohomish								

NOTE: All ARRIVAL harbor transits branch from EV\_A\_10

NOTE: All DEPARTURE harbor transits goto EV\_D\_1

Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Bulkers	Reefer	Tankers	Log	Fishing
Everett_1-North	EVERETT	1-NORTH	Arrival	L1a	EV_A_10	47° 58' 40'' N 122° 14' 15'' W	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	0.40	Snohomish	0	4	4	4	4	4		
Everett_1-North	EVERETT	1-NORTH	Arrival	L2	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	EV_H_2	47° 58' 54'' N 122° 13' 26'' W	0.23	Snohomish	0	2	2	2	2	2		
Everett_1-North	EVERETT	1-NORTH	Arrival	L3	EV_H_2	47° 58' 54'' N 122° 13' 26'' W	EV_B_1	47° 58' 52'' N 122° 13' 17'' W	0.11	Snohomish	0	1	1	1	1	1		

Total Distance 0.74 nm

1-North_Everett	EVERETT	1-NORTH	Departure	L3	EV_B_1	47° 58' 52'' N 122° 13' 17'' W	EV_H_2	47° 58' 54'' N 122° 13' 26'' W	0.11	Snohomish	0	1	1	1	1	1		
1-North_Everett	EVERETT	1-NORTH	Departure	L2	EV_H_2	47° 58' 54'' N 122° 13' 26'' W	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	0.23	Snohomish	0	2	2	2	2	2		
1-North_Everett	EVERETT	1-NORTH	Departure	L1a	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	EV_D_1	47° 58' 40'' N 122° 14' 15'' W	0.40	Snohomish	0	5	5	5	5	5		

Total Distance 0.74 nm

Everett_3-South	EVERETT	3-SOUTH	Arrival	L1a	EV_A_10	47° 58' 40'' N 122° 14' 15'' W	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	0.40	Snohomish	0	4	4	4	4	4		
Everett_3-South	EVERETT	3-SOUTH	Arrival	L2	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	EV_H_3	47° 58' 52'' N 122° 13' 30'' W	0.17	Snohomish	0	2	2	2	2	2		
Everett_3-South	EVERETT	3-SOUTH	Arrival	L3	EV_H_3	47° 58' 52'' N 122° 13' 30'' W	EV_B_2	47° 58' 50'' N 122° 13' 17'' W	0.14	Snohomish	0	1	1	1	1	1		

Total Distance 0.71 nm

3-South_Everett	EVERETT	3-SOUTH	Departure	L3	EV_B_2	47° 58' 50'' N 122° 13' 17'' W	EV_H_3	47° 58' 52'' N 122° 13' 30'' W	0.14	Snohomish	0	1	1	1	1	1		
3-South_Everett	EVERETT	3-SOUTH	Departure	L2	EV_H_3	47° 58' 52'' N 122° 13' 30'' W	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	0.17	Snohomish	0	2	2	2	2	2		
3-South_Everett	EVERETT	3-SOUTH	Departure	L1a	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	EV_D_1	47° 58' 40'' N 122° 14' 15'' W	0.40	Snohomish	0	5	5	5	5	5		

Total Distance 0.71 nm

Everett_Hewitt	EVERETT	HEWITT	Arrival	L1a	EV_A_10	47° 58' 40'' N 122° 14' 15'' W	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	0.40	Snohomish	0	4	4	4	4	4		
Everett_Hewitt	EVERETT	HEWITT	Arrival	L2	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	EV_H_4	47° 58' 50'' N 122° 13' 32'' W	0.13	Snohomish	0	2	2	2	2	2		
Everett_Hewitt	EVERETT	HEWITT	Arrival	L3	EV_H_4	47° 58' 50'' N 122° 13' 32'' W	EV_B_3	47° 58' 45'' N 122° 13' 22'' W	0.13	Snohomish	0	1	1	1	1	1		

Total Distance 0.66 nm

Hewitt_Everett	EVERETT	HEWITT	Departure	L3	EV_B_3	47° 58' 45'' N 122° 13' 22'' W	EV_H_4	47° 58' 50'' N 122° 13' 32'' W	0.13	Snohomish	0	1	1	1	1	1		
Hewitt_Everett	EVERETT	HEWITT	Departure	L2	EV_H_4	47° 58' 50'' N 122° 13' 32'' W	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	0.13	Snohomish	0	2	2	2	2	2		
Hewitt_Everett	EVERETT	HEWITT	Departure	L1a	EV_H_1	47° 58' 44'' N 122° 13' 39'' W	EV_D_1	47° 58' 40'' N 122° 14' 15'' W	0.40	Snohomish	0	5	5	5	5	5		

Total Distance 0.66 nm

PortAngeles_Tesoro	EVERETT	PACIFIC TERMINAL	Arrival	L1a	EV_A_10	47° 58' 40'' N 122° 14' 15'' W	EV_B_4	48° 58' 40'' N 122° 13' 25'' W	0.56	Snohomish	0	2	2	2	2	2		
Tesoro_PortAngeles	EVERETT	PACIFIC TERMINAL	Departure	L1a	EV_B_4	48° 58' 40'' N 122° 13' 25'' W	EV_D_1	47° 58' 40'' N 122° 14' 15'' W	0.56	Snohomish	0	3	3	3	3	3		

PortAngeles_Tesoro	EVERETT	SOUTH TERMINAL	Arrival	L1a	EV_A_10	47° 58' 40'' N 122° 14' 15'' W	EV_B_5	47° 58' 28'' N 122° 13' 45'' W	0.39	Snohomish	0	2	2	2	2	2		
Tesoro_PortAngeles	EVERETT	SOUTH TERMINAL	Departure	L1a	EV_B_5	47° 58' 28'' N 122° 13' 45'' W	EV_D_1	47° 58' 40'' N 122° 14' 15'' W	0.39	Snohomish	0	3	3	3	3	3		

PortAngeles_Tesoro	EVERETT	ANCHORAGE	Arrival	L1a	EV_A_10	47° 58' 40'' N 122° 14' 15'' W	EV_B_6	47° 58' 54'' N 122° 14' 37'' W	0.34	Snohomish	0	2	2	2	2	2		
Tesoro_PortAngeles	EVERETT	ANCHORAGE	Departure	L1a	EV_B_6	47° 58' 54'' N 122° 14' 37'' W	EV_D_1	47° 58' 40'' N 122° 14' 15'' W	0.34	Snohomish	0	3	3	3	3	3		

**Puget Sound Emissions Inventory**

OGV-Routing: EVERETT to SEA

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Auto	Fishing	Fishing	Fishing
Everett_PS	Departure	M	Y	L1	EV_D_1	47° 58' 40" N 122° 14' 15" W	EV_D_2	47° 58' 51" N 122° 16' 44" W	1.7	Snohomish	0	4	4	4	4
Everett_PS	Departure	M	Y	L2	EV_D_2	47° 58' 51" N 122° 16' 44" W	EV_D_3	47° 57' 44" N 122° 19' 42" W	2.3	Snohomish	0	10	10	10	9
Everett_PS	Departure	X	Y	L3	EV_D_3	47° 57' 44" N 122° 19' 42" W	EV_D_4	47° 54' 11" N 122° 21' 32" W	3.8	Island	0	16	14	SS	SS
Everett_PS	Departure	X	Y	L4	EV_D_4	47° 54' 11" N 122° 21' 32" W	EV_D_5	47° 52' 10" N 122° 23' 30" W	2.4	Island	0	20	17	SS	SS
Everett_PS	Departure	T	N	L5	EV_D_5	47° 52' 10" N 122° 23' 30" W	EV_D_6	47° 51' 21" N 122° 26' 29" W	2.2	Island	0	SS	SS	SS	SS
Everett_PS	Departure	T	N	L6a	EV_D_6	47° 51' 21" N 122° 26' 29" W	PS_D_16	47° 55' 34" N 122° 29' 11" W	4.6	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34" N 122° 29' 11" W	PS_D_17	47° 57' 01" N 122° 32' 03" W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01" N 122° 32' 03" W	PS_D_18	47° 58' 07" N 122° 34' 19" W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07" N 122° 34' 19" W	PS_D_19	48° 02' 01" N 122° 37' 40" W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01" N 122° 37' 40" W	PS_D_20	48° 04' 48" N 122° 38' 31" W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48" N 122° 38' 31" W	PS_D_21	48° 06' 58" N 122° 39' 13" W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 58" N 122° 39' 13" W	PS_D_22	48° 07' 51" N 122° 40' 43" W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07' 51" N 122° 40' 43" W	PS_D_23	48° 11' 20" N 122° 46' 47" W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 20" N 122° 46' 47" W	PS_D_24	48° 11' 44" N 122° 48' 45" W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11' 44" N 122° 48' 45" W	PS_D_25	48° 11' 57" N 122° 52' 19" W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11' 57" N 122° 52' 19" W	PS_D_26	48° 12' 45" N 123° 06' 35" W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12' 45" N 123° 06' 35" W	PS_D_27	48° 10' 33" N 123° 23' 03" W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10' 33" N 123° 23' 03" W	PS_D_28	48° 11' 21" N 123° 23' 02" W	0.8	Calallam	0	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11' 21" N 123° 23' 02" W	PS_D_29	48° 14' 13" N 123° 28' 57" W	4.9	Calallam	0	15	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14' 13" N 123° 28' 57" W	PS_D_30	48° 15' 21" N 123° 33' 17" W	3.1	Calallam	0	19	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15' 21" N 123° 33' 17" W	PS_D_31	48° 17' 36" N 123° 56' 06" W	15.4	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17' 36" N 123° 56' 06" W	PS_D_32	48° 30' 38" N 124° 43' 36" W	34.1	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30' 38" N 124° 43' 36" W	PS_D_33	48° 30' 43" N 125° 00' 00" W	10.9	Calallam	0	SS	SS	SS	SS

Total Distance 131.0 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**  
**OGV-Routing: EVERETT to VANCOUVER (NB2)**  
 Lat/Long in WGS84 Datum

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Auto	Reefer	Container RO/RO	Bulkers Tankers
											Fishing	Fishing	Fishing		
Everett_PS	Departure	M	Y	L1	EV_D_1	47° 58' 40" N 122° 14' 15" W	EV_D_2	47° 58' 51" N 122° 16' 44" W	1.7	Snohomish	0	4	4	4	4
Everett_PS	Departure	M	Y	L2	EV_D_2	47° 58' 51" N 122° 16' 44" W	EV_D_3	47° 57' 44" N 122° 19' 42" W	2.3	Snohomish	0	10	10	10	9
Everett_PS	Departure	X	Y	L3	EV_D_3	47° 57' 44" N 122° 19' 42" W	EV_D_4	47° 54' 11" N 122° 21' 32" W	3.8	Island	0	16	14	SS	SS
Everett_PS	Departure	X	Y	L4	EV_D_4	47° 54' 11" N 122° 21' 32" W	EV_D_5	47° 52' 10" N 122° 23' 30" W	2.4	Island	0	20	17	SS	SS
Everett_PS	Departure	T	N	L5	EV_D_5	47° 52' 10" N 122° 23' 30" W	EV_D_6	47° 51' 21" N 122° 26' 29" W	2.2	Island	0	SS	SS	SS	SS
Everett_PS	Departure	T	N	L6a	EV_D_6	47° 51' 21" N 122° 26' 29" W	PS_D_16	47° 55' 34" N 122° 29' 11" W	4.6	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34" N 122° 29' 11" W	PS_D_17	47° 57' 01" N 122° 32' 03" W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01" N 122° 32' 03" W	PS_D_18	47° 58' 07" N 122° 34' 19" W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07" N 122° 34' 19" W	PS_D_19	48° 02' 01" N 122° 37' 40" W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01" N 122° 37' 40" W	PS_D_20	48° 04' 48" N 122° 38' 31" W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48" N 122° 38' 31" W	PS_D_21	48° 06' 58" N 122° 39' 13" W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 58" N 122° 39' 13" W	PS_D_22	48° 07' 51" N 122° 40' 43" W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07' 51" N 122° 40' 43" W	PS_D_23	48° 11' 20" N 122° 46' 47" W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 20" N 122° 46' 47" W	PS_D_24	48° 11' 44" N 122° 48' 45" W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11' 44" N 122° 48' 45" W	PS_D_25	48° 11' 57" N 122° 52' 19" W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11' 57" N 122° 52' 19" W	PS_D_26	48° 12' 45" N 123° 06' 35" W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12' 45" N 123° 06' 35" W	PS_D_27	48° 10' 33" N 123° 23' 03" W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10' 33" N 123° 23' 03" W	PS_A_6	48° 09' 58" N 123° 23' 25" W	0.8	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09' 58" N 123° 23' 25" W	PS_A_7	48° 11' 56" N 123° 06' 35" W	11.4	Calallam	0	18	15	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11' 56" N 123° 06' 35" W	PS_A_8	48° 11' 11" N 122° 52' 23" W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8a	PS_A_8	48° 11' 11" N 122° 52' 23" W	PS_D_24	48° 11' 44" N 122° 48' 45" W	2.5	Jefferson	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L1a	PS_D_24	48° 11' 44" N 122° 48' 45" W	AD_D_2	48° 13' 19" N 122° 50' 53" W	2.1	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L2	AD_D_2	48° 13' 19" N 122° 50' 53" W	AD_D_3	48° 19' 51" N 122° 58' 00" W	8.1	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L3	AD_D_3	48° 19' 51" N 122° 58' 00" W	AD_D_4	48° 24' 17" N 123° 01' 52" W	5.1	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L4	AD_D_4	48° 24' 17" N 123° 01' 52" W	AD_D_5	48° 29' 18" N 123° 09' 56" W	7.3	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L5	AD_D_5	48° 29' 18" N 123° 09' 56" W	AD_D_6	48° 34' 47" N 123° 12' 43" W	5.8	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L6	AD_D_6	48° 34' 47" N 123° 12' 43" W	AD_D_7	48° 40' 00" N 123° 14' 28" W	5.4	San Juan	0	18	16	11	SS

Total Distance 119.8 nm

# Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to EVERETT

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	ng WP	La	End WP	Waypoint ID	Dist.	County	Cruise	Speed by Link (knots)			
													Auto	Fishing	Container	RO/RO
													Bulkers	Reefer	Tankers	Log
													Fishing	Fishing	Fishing	Fishing
NBndry_AI	Arrival	T	N	L1	AD_A_1	48° 40' 00"		AD_A_2	48° 34' 56"	5.2	San Juan	0	18	16	SS	SS
NBndry_AI	Arrival	T	N	L2	AD_A_2	48° 34' 56"		AD_A_3	48° 29' 20"	5.9	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L3	AD_A_3	48° 29' 20"		AD_A_4	48° 27' 27"	2.4	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L4	AD_A_4	48° 27' 27"		AD_A_5	48° 25' 07"	3.6	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L5	AD_A_5	48° 25' 07"		AD_A_6	48° 22' 36"	3.3	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L6	AD_A_6	48° 22' 36"		AD_A_7	48° 20' 00"	2.9	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L7	AD_A_7	48° 20' 00"		AD_A_8	48° 12' 48"	8.8	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L8a	AD_A_8	48° 12' 48"		PS_D_25	48° 11' 57"	0.9	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11' 57"		PS_D_26	48° 12' 45"	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12' 45"		PS_D_27	48° 10' 33"	11.2	Calallam	0	16	12	SS	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10' 33"		PS_A_6	48° 09' 58"	0.8	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09' 58"		PS_A_7	48° 11' 56"	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11' 56"		PS_A_8	48° 11' 11"	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11' 11"		PS_A_9	48° 10' 57"	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 57"		PS_A_10	48° 06' 35"	6.8	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 35"		PS_A_11	48° 01' 08"	5.6	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 08"		PS_A_12	47° 57' 41"	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 41"		PS_A_13	47° 56' 38"	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 38"		PS_A_14	47° 55' 17"	2.3	Kitsap	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L1a	PS_A_14	47° 55' 17"		EV_A_2	47° 53' 08"	2.3	Kitsap	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L2	EV_A_2	47° 53' 08"		EV_A_3	47° 51' 05"	2.7	Kitsap	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L3	EV_A_3	47° 51' 05"		EV_A_4	47° 51' 50"	2.0	Island	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L4	EV_A_4	47° 51' 50"		EV_A_5	47° 52' 03"	0.6	Snohomisl	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L5	EV_A_5	47° 52' 03"		EV_A_6	47° 54' 06"	2.4	Snohomisl	0	19	SS	SS	SS
PS_Everett	Arrival	X	Y	L6	EV_A_6	47° 54' 06"		EV_A_7	47° 56' 25"	2.5	Snohomisl	0	18	SS	SS	SS
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56' 25"		EV_A_8	47° 57' 28"	1.1	Snohomisl	0	14	14	12	SS
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57' 28"		EV_A_9	47° 58' 31"	2.0	Snohomisl	0	10	10	10	10
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58' 31"		EV_A_10	47° 58' 40"	1.3	Snohomisl	0	7	7	6	6

Total Distance 115.7 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to TACOMA

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer				
												Tankers				
												Log				
												Container RO/RO				
Route	Arr/Dep	Mode	NPM	Link ID	Start WP	ing WP	Lat,	End WP	'aypoin	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
ElliottBay_Tacoma	Departure	X	Y	L1	E_D_1	47° 36' 52''	EB_D_S1	47° 36'	1.7	King	0	14	12	10	9	
ElliottBay_Tacoma	Departure	X	Y	L2	EB_D_S1	47° 36' 19''	EB_D_S2	47° 35'	1.5	King	0	18	16	SS	SS	
ElliottBay_Tacoma	Departure	X	Y	L3a	EB_D_S2	47° 35' 06''	PS_A_17	47° 34'	0.7	Kitsap	0	20	SS	SS	SS	
Sea_Tacoma	Arrival	T	Y	L17	PS_A_17	47° 34' 32''	PS_A_18	47° 31'	2.8	Kitsap	0	17	16	13	SS	
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31' 51''	PS_A_19	47° 26'	5.3	King	0	16	16	13	SS	
Sea_Tacoma	Arrival	T	N	L19	PS_A_19	47° 26' 44''	PS_A_20	47° 23'	4.1	King	0	17	17	13	SS	
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23' 09''	PS_A_21	47° 19'	5.3	King	0	14	13	12	SS	
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19' 39''	PS_A_22	47° 19'	0.5	King	0	10	10	10	9	
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19' 10''	PS_A_23	47° 18'	1.1	Pierce	0	10	10	10	8	

Total Distance 22.9 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: TACOMA to SEATTLE

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast    Fast    Medium    Slow    Very Slow**

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP ]	End WP	aypoir	Dist.	County	Cruise	Auto	Speed by Link (knots)		
													Fast	Medium	Slow
												Bulkers			
												Container	Reefer	Tankers	
												RO/RO	Log		
												Fishing	Fishing	Fishing	
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47°	PS_D_3	47° 1	1.3	Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47°	PS_D_4	47° 1	0.9	Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47°	PS_D_5	47° 2	4.8	King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47°	PS_D_6	47° 2	4.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47°	PS_D_7	47° 3	7.8	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	Y	L7a	PS_D_7	47°	EB_A_S1	47° 3	2.2	King	0	17	16	SS	SS
Tacoma_ElliottBay	Arrival	X	Y	L1	EB_A_S1	47°	EB_A_4	47° 3	1.3	King	0	15	13	10	9

Total Distance 22.6 nm      Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: TACOMA to PORT ANGELES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Reefer Tankers				
											Container RO/RO Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP 1	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47° 1	PS_D_3	47° 19'	1.3	Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 1	PS_D_4	47° 19'	0.9	Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 1	PS_D_5	47° 23'	4.8	King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47° 2	PS_D_6	47° 26'	4.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 2	PS_D_7	47° 34'	7.8	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 3	PS_D_8	47° 35'	1.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 3	PS_D_9	47° 37'	1.1	Kitsap	0	20	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 3	PS_D_10	47° 39'	2.7	King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 3	PS_D_11	47° 41'	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 4	PS_D_12	47° 45'	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 4	PS_D_13	47° 46'	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 4	PS_D_14	47° 48'	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 4	PS_D_15	47° 52'	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 5	PS_D_16	47° 55'	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 5	PS_D_17	47° 57'	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 5	PS_D_18	47° 58'	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 5	PS_D_19	48° 02'	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 0	PS_D_20	48° 04'	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 0	PS_D_21	48° 06'	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 0	PS_D_22	48° 07'	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 0	PS_D_23	48° 11'	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 1	PS_D_24	48° 11'	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 1	PS_D_25	48° 11'	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 1	PS_D_26	48° 12'	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	48° 1	PS_D_27	48° 10'	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	48° 1	PA_A_2	48° 09'	0.6	Calallam	0	10	10	10	9
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 0	PA_A_3	48° 08'	1.6	Calallam	0	8	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 0	PA_A_4	48° 08'	1.0	Calallam	0	6	6	6	6

Total Distance 88.8 nm

Note: SS - Service Speed



# Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to TACOMA

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	1g WP	La	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
												Cruise	Auto	Fishing	Fishing	Fishing
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08' 0	PA_D_2	48° 08' 18	1.2	Calallam	0	6	6	6	6	
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08' 1	PA_D_3	48° 09' 36	1.5	Calallam	0	8	8	8	8	
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09' 3	PS_A_6	48° 09' 58	0.5	Calallam	0	10	10	10	9	
Sea_Tacoma	Arrival	X	Y	L6	PS_A_6	48° 09' 5	PS_A_7	48° 11' 56	11.4	Calallam	0	18	16	12	SS	
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11' 5	PS_A_8	48° 11' 11	9.5	Calallam	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11' 1	PS_A_9	48° 10' 57	2.9	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 5	PS_A_10	48° 06' 35	6.8	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 3	PS_A_11	48° 01' 08	5.6	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 0	PS_A_12	47° 57' 41	4.0	Island	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 4	PS_A_13	47° 56' 38	1.8	Island	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 3	PS_A_14	47° 55' 17	2.3	Kitsap	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 1	PS_A_15	47° 45' 54	9.7	Kitsap	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 5	PS_A_16	47° 39' 42	6.3	Kitsap	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39' 4	PS_A_17	47° 34' 32	5.2	Kitsap	0	18	16	13	SS	
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34' 3	PS_A_18	47° 31' 51	2.8	Kitsap	0	17	16	13	SS	
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31' 5	PS_A_19	47° 26' 44	5.3	King	0	16	16	13	SS	
Sea_Tacoma	Arrival	X	N	L19	PS_A_19	47° 26' 4	PS_A_20	47° 23' 09	4.1	King	0	17	17	13	SS	
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23' 0	PS_A_21	47° 19' 39	5.3	King	0	14	13	12	SS	
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19' 3	PS_A_22	47° 19' 10	0.5	King	0	10	10	10	9	
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19' 1	PS_A_23	47° 18' 07	1.1	Pierce	0	10	10	10	8	

Total Distance 87.7 nm

Note: SS - Service Speed

Note: Red numbers - engines off

# Puget Sound Emissions Inventory

## OGV-Routing: TACOMA to EVERETT

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast    Fast    Medium    Slow    Very Slow**

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP1	End WP	Waypoint Dist.	County	Cruise	Speed by Link (knots)			
											Fast	Fast	Medium	Slow
											Bulkers		Reefer	Tankers
											Container	RO/RO	Log	Fishing
											Auto	Fishing	Fishing	Fishing
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47°	PS_D_3	47° 19	1.3 Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47°	PS_D_4	47° 19	0.9 Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47°	PS_D_5	47° 23	4.8 King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47°	PS_D_6	47° 26	4.4 King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47°	PS_D_7	47° 34	7.8 King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47°	PS_D_8	47° 35	1.4 King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47°	PS_D_9	47° 37	1.1 Kitsap	0	20	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47°	PS_D_10	47° 39	2.7 King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47°	PS_D_11	47° 41	2.3 King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47°	PS_D_12	47° 45	4.0 Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12a	PS_D_12	47°	ET_A_1	47° 46	0.8 King	0	SS	SS	SS	SS
Tacoma_Everett	Departure	T	N	L1	ET_A_1	47°	ET_A_2	47° 48	1.6 Snohomish	0	SS	SS	SS	SS
Tacoma_Everett	Departure	T	N	L2a	ET_A_2	47°	EV_A_5	47° 52	4.1 Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L5	EV_A_5	47°	EV_A_6	47° 54	2.4 Snohomish	0	19	SS	SS	SS
PS_Everett	Arrival	X	Y	L6	EV_A_6	47°	EV_A_7	47° 56	2.5 Snohomish	0	18	SS	SS	SS
PS_Everett	Arrival	X	Y	L7	EV_A_7	47°	EV_A_8	47° 57	1.1 Snohomish	0	14	14	12	SS
PS_Everett	Arrival	M	Y	L8	EV_A_8	47°	EV_A_9	47° 58	2.0 Snohomish	0	10	10	10	9
PS_Everett	Arrival	M	Y	L9	EV_A_9	47°	EV_A_10	47° 58	1.3 Snohomish	0	7	7	6	6

Total Distance 46.5 nm      Note: SS - Service Speed

**Puget Sound Emissions Inventory**

**OGV-Routing: EVERETT to TACOMA**

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Speed by Link (knots)			
												Auto	Fishing	Reefer	Tankers
												Container	RO/RO	Log	Fishing
Everett_PS	Departure	M	Y	L1	EV_D_1	47° 58' 40" N 122° 14' 15" W	EV_D_2	47° 58' 51" N 122° 16' 44" W	1.7	Snohomish	0	4	4	4	4
Everett_PS	Departure	M	Y	L2	EV_D_2	47° 58' 51" N 122° 16' 44" W	EV_D_3	47° 57' 44" N 122° 19' 42" W	2.3	Snohomish	0	10	10	10	9
Everett_PS	Departure	X	Y	L3	EV_D_3	47° 57' 44" N 122° 19' 42" W	EV_D_4	47° 54' 11" N 122° 21' 32" W	3.8	Island	0	16	14	SS	SS
Everett_PS	Departure	X	Y	L4	EV_D_4	47° 54' 11" N 122° 21' 32" W	EV_D_5	47° 52' 10" N 122° 23' 30" W	2.4	Island	0	20	17	SS	SS
Everett_PS	Departure	T	N	L5a	EV_D_5	47° 52' 10" N 122° 23' 30" W	ET_D_1	47° 51' 53" N 122° 23' 38" W	0.3	Island	0	SS	SS	SS	SS
Everett_Tacoma	Departure	T	N	L1	ET_D_1	47° 51' 53" N 122° 23' 38" W	ET_D_2	47° 46' 44" N 122° 26' 20" W	5.5	Snohomish	0	SS	SS	SS	SS
Everett_Tacoma	Departure	T	N	L2a	ET_D_2	47° 46' 44" N 122° 26' 20" W	PS_A_15	47° 45' 54" N 122° 26' 45" W	0.9	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 54" N 122° 26' 45" W	PS_A_16	47° 39' 42" N 122° 28' 24" W	6.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39' 42" N 122° 28' 24" W	PS_A_17	47° 34' 32" N 122° 27' 32" W	5.2	Kitsap	0	18	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34' 32" N 122° 27' 32" W	PS_A_18	47° 31' 51" N 122° 26' 34" W	2.8	Kitsap	0	17	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31' 51" N 122° 26' 34" W	PS_A_19	47° 26' 44" N 122° 24' 45" W	5.3	King	0	16	16	13	SS
Sea_Tacoma	Arrival	X	N	L19	PS_A_19	47° 26' 44" N 122° 24' 45" W	PS_A_20	47° 23' 09" N 122° 21' 56" W	4.1	King	0	17	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23' 09" N 122° 21' 56" W	PS_A_21	47° 19' 39" N 122° 27' 52" W	5.3	King	0	14	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19' 39" N 122° 27' 52" W	PS_A_22	47° 19' 10" N 122° 28' 05" W	0.5	King	0	10	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19' 10" N 122° 28' 05" W	PS_A_23	47° 18' 07" N 122° 27' 41" W	1.1	Pierce	0	10	10	10	8

Total Distance 47.3 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: SEA to TACOMA

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast    Fast    Medium    Slow    Very Slow**

**DRAFT**

Route	Arr/Dep	Mode	NPM	Link ID	Start WP	lg WP	La	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
												Cruise	Auto	Fishing	Fishing	Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28' 3	PS_A_2	48° 28'	10.7	Calallam	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28' 3	PS_A_3	48° 13'	35.9	Calallam	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13' 2	PS_A_4	48° 13'	15.4	Calallam	0	20	SS	SS	SS	
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13' 2	PS_A_5	48° 09'	6.9	Calallam	0	16	15	12	SS	
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09' 2	PS_A_6	48° 09'	0.6	Calallam	0	8	8	8	8	
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09' 5	PS_A_7	48° 11'	11.4	Calallam	0	18	16	12	SS	
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11' 5	PS_A_8	48° 11'	9.5	Calallam	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11' 1	PS_A_9	48° 10'	2.9	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 5	PS_A_10	48° 06'	6.8	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 3	PS_A_11	48° 01'	5.6	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 0	PS_A_12	47° 57'	4.0	Island	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 4	PS_A_13	47° 56'	1.8	Island	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 3	PS_A_14	47° 55'	2.3	Kitsap	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 1	PS_A_15	47° 45'	9.7	Kitsap	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 5	PS_A_16	47° 39'	6.3	Kitsap	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39' 4	PS_A_17	47° 34'	5.2	Kitsap	0	18	16	13	SS	
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34' 3	PS_A_18	47° 31'	2.8	Kitsap	0	17	16	13	SS	
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31' 5	PS_A_19	47° 26'	5.3	King	0	16	16	13	SS	
Sea_Tacoma	Arrival	X	N	L19	PS_A_19	47° 26' 4	PS_A_20	47° 23'	4.1	King	0	17	17	13	SS	
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23' 0	PS_A_21	47° 19'	5.3	King	0	14	13	12	SS	
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19' 3	PS_A_22	47° 19'	0.5	King	0	10	10	10	9	
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19' 1	PS_A_23	47° 18'	1.1	Pierce	0	10	10	10	8	

Total Distance 154.0 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

**OGV-Routing: TACOMA HARBOR**

Lat/Long in WGS84 Datum

**DRAFT**

Route	To_Port	To_Pier	Arr/Dep	nk	Start WP	og WP La	End WP	ading Waypoint Lat/L	Dist.	County	Speed by Link (knots)					
											Fast	Fast	Medium	Slow	Very Slow	
											Cruise	Auto	Fishing	Fishing	Fishing	
Sea_Tacoma	SEATTLE		Arrival		PS_A_23	47° 18' 0	Mode:	M		King						
Tacoma_Sea	SEATTLE		Departure		PS_D_2	47° 18' 0	NPE:	Y		King						
Sea_Tacoma	TACOMA	4-A	Arrival		PS_A_23	47° 18' 0	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	4-A	Arrival		TA_BW_1	47° 16' 5	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	4-A	Arrival		TA_BW_2	47° 16' 4	TA_B_4A	47° 16' 23'' N	122° 24	0.37	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-A	Departure		TA_B_4A	47° 16' 2	TA_BW_2	47° 16' 40'' N	122° 24	0.37	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-A	Departure		TA_BW_2	47° 16' 4	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	4-A	Departure		TA_BW_1	47° 16' 5	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	4-A&B	Arrival		PS_A_23	47° 18' 0	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	4-A&B	Arrival		TA_BW_1	47° 16' 5	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	4-A&B	Arrival		TA_BW_2	47° 16' 4	TA_B_4AB	47° 16' 25'' N	122° 24	0.29	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-A&B	Departure		TA_B_4AB	47° 16' 2	TA_BW_2	47° 16' 40'' N	122° 24	0.29	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-A&B	Departure		TA_BW_2	47° 16' 4	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	4-A&B	Departure		TA_BW_1	47° 16' 5	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	4-B	Arrival		PS_A_23	47° 18' 0	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	4-B	Arrival		TA_BW_1	47° 16' 5	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	4-B	Arrival		TA_BW_2	47° 16' 4	TA_B_4B	47° 16' 29'' N	122° 24	0.20	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-B	Departure		TA_B_4B	47° 16' 2	TA_BW_2	47° 16' 40'' N	122° 24	0.20	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-B	Departure		TA_BW_2	47° 16' 4	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	4-B	Departure		TA_BW_1	47° 16' 5	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	BLAIR-A	Arrival		PS_A_23	47° 18' 0	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	BLAIR-A	Arrival		TA_BW_1	47° 16' 5	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	BLAIR-A	Arrival		TA_BW_2	47° 16' 4	TA_BW_3	47° 15' 58'' N	122° 23	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	BLAIR-A	Arrival		TA_BW_3	47° 15' 5	TA_BW_4	47° 15' 42'' N	122° 23	0.40	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	BLAIR-A	Arrival		TA_BW_4	47° 15' 4	TA_B_BLA	47° 15' 34'' N	122° 23	0.16	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	BLAIR-A	Departure		TA_B_BLA	47° 15' 3	TA_BW_4	47° 15' 42'' N	122° 23	0.16	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	BLAIR-A	Departure		TA_BW_4	47° 15' 4	TA_BW_3	47° 15' 58'' N	122° 23	0.40	Pierce	0	3	3	3	3
Tacoma_Sea	TACOMA	BLAIR-A	Departure		TA_BW_3	47° 15' 5	TA_BW_2	47° 16' 40'' N	122° 24	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-A	Departure		TA_BW_2	47° 16' 4	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-A	Departure		TA_BW_1	47° 16' 5	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	BLAIR-B	Arrival		PS_A_23	47° 18' 0	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	BLAIR-B	Arrival		TA_BW_1	47° 16' 5	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	BLAIR-B	Arrival		TA_BW_2	47° 16' 4	TA_BW_3	47° 15' 58'' N	122° 23	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	BLAIR-B	Arrival		TA_BW_3	47° 15' 5	TA_BW_4	47° 15' 42'' N	122° 23	0.40	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	BLAIR-B	Arrival		TA_BW_4	47° 15' 4	TA_BW_5	47° 15' 30'' N	122° 22	0.28	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	BLAIR-B	Arrival		TA_BW_5	47° 15' 3	TA_B_BLB	47° 15' 20'' N	122° 22	0.18	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	BLAIR-B	Departure		TA_B_BLB	47° 15' 2	TA_BW_5	47° 15' 30'' N	122° 22	0.18	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	BLAIR-B	Departure		TA_BW_5	47° 15' 3	TA_BW_4	47° 15' 42'' N	122° 23	0.28	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	BLAIR-B	Departure		TA_BW_4	47° 15' 4	TA_BW_3	47° 15' 58'' N	122° 23	0.40	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-B	Departure		TA_BW_3	47° 15' 5	TA_BW_2	47° 16' 40'' N	122° 24	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-B	Departure		TA_BW_2	47° 16' 4	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-B	Departure		TA_BW_1	47° 16' 5	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	9	9	6	6

**Puget Sound Emissions Inventory**

**OGV-Routing: TACOMA HARBOR**

Lat/Long in WGS84 Datum

**DRAFT**

Route	To_Port	To_Pier	Arr/Dep	nk	Start WP	og WP La	End WP	ading Waypoint Lat/L	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Container	Reefer RO/RO	Tankers Log	Fishing	Fishing
Cruise	Auto	Fishing	Fishing	Fishing											
Sea_Tacoma	TACOMA	WA UNITED 1	Arrival	PS_A_23	47° 18' 0"	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	WA UNITED 1	Arrival	TA_BW_1	47° 16' 5"	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	WA UNITED 1	Arrival	TA_BW_2	47° 16' 4"	TA_BW_3	47° 15' 58'' N	122° 23	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	WA UNITED 1	Arrival	TA_BW_3	47° 15' 5"	TA_B_WU1	47° 15' 41'' N	122° 23	0.38	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WA UNITED 1	Departure	TA_B_WU1	47° 15' 4"	TA_BW_3	47° 15' 58'' N	122° 23	0.38	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WA UNITED 1	Departure	TA_BW_3	47° 15' 5"	TA_BW_2	47° 16' 40'' N	122° 24	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WA UNITED 1	Departure	TA_BW_2	47° 16' 4"	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WA UNITED 1	Departure	TA_BW_1	47° 16' 5"	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	WA UNITED 2	Arrival	PS_A_23	47° 18' 0"	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	WA UNITED 2	Arrival	TA_BW_1	47° 16' 5"	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	WA UNITED 2	Arrival	TA_BW_2	47° 16' 4"	TA_BW_3	47° 15' 58'' N	122° 23	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	WA UNITED 2	Arrival	TA_BW_3	47° 15' 5"	TA_B_WU2	47° 15' 49'' N	122° 23	0.19	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WA UNITED 2	Departure	TA_B_WU2	47° 15' 4"	TA_BW_3	47° 15' 58'' N	122° 23	0.19	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WA UNITED 2	Departure	TA_BW_3	47° 15' 5"	TA_BW_2	47° 16' 40'' N	122° 24	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WA UNITED 2	Departure	TA_BW_2	47° 16' 4"	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WA UNITED 2	Departure	TA_BW_1	47° 16' 5"	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	PCT-A	Arrival	PS_A_23	47° 18' 0"	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_1	47° 16' 5"	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_2	47° 16' 4"	TA_BW_3	47° 15' 58'' N	122° 23	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_3	47° 15' 5"	TA_BW_4	47° 15' 42'' N	122° 23	0.40	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_4	47° 15' 4"	TA_BW_5	47° 15' 30'' N	122° 22	0.28	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_5	47° 15' 3"	TA_B_PCTA	47° 15' 17'' N	122° 22	0.23	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_B_PCTA	47° 15' 1"	TA_BW_5	47° 15' 30'' N	122° 22	0.23	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_5	47° 15' 3"	TA_BW_4	47° 15' 42'' N	122° 23	0.28	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_4	47° 15' 4"	TA_BW_3	47° 15' 58'' N	122° 23	0.40	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_3	47° 15' 5"	TA_BW_2	47° 16' 40'' N	122° 24	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_2	47° 16' 4"	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_1	47° 16' 5"	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	PCT-B	Arrival	PS_A_23	47° 18' 0"	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	PCT-B	Arrival	TA_BW_1	47° 16' 5"	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	PCT-B	Arrival	TA_BW_2	47° 16' 4"	TA_BW_3	47° 15' 58'' N	122° 23	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	PCT-B	Arrival	TA_BW_3	47° 15' 5"	TA_BW_4	47° 15' 42'' N	122° 23	0.40	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	PCT-B	Arrival	TA_BW_4	47° 15' 4"	TA_BW_5	47° 15' 30'' N	122° 22	0.28	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	PCT-B	Arrival	TA_BW_5	47° 15' 3"	TA_B_PCTB	47° 15' 23'' N	122° 22	0.26	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	PCT-B	Departure	TA_B_PCTB	47° 15' 2"	TA_BW_5	47° 15' 30'' N	122° 22	0.26	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	PCT-B	Departure	TA_BW_5	47° 15' 3"	TA_BW_4	47° 15' 42'' N	122° 23	0.28	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	PCT-B	Departure	TA_BW_4	47° 15' 4"	TA_BW_3	47° 15' 58'' N	122° 23	0.40	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-B	Departure	TA_BW_3	47° 15' 5"	TA_BW_2	47° 16' 40'' N	122° 24	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-B	Departure	TA_BW_2	47° 16' 4"	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-B	Departure	TA_BW_1	47° 16' 5"	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival	PS_A_23	47° 18' 0"	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival	TA_BW_1	47° 16' 5"	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival	TA_BW_2	47° 16' 4"	TA_BW_3	47° 15' 58'' N	122° 23	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival	TA_BW_3	47° 15' 5"	TA_BW_4	47° 15' 42'' N	122° 23	0.40	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival	TA_BW_4	47° 15' 4"	TA_B_WYCF	47° 15' 43'' N	122° 23	0.04	Pierce	0	1	1	1	1

**Puget Sound Emissions Inventory**

OGV-Routing: TACOMA HARBOR

Lat/Long in WGS84 Datum

DRAFT

Route	To_Port	To_Pier	Arr/Dep	Link	Start WP	End WP	Waypoint Lat/L	Dist.	County	Speed by Link (knots)				
										Fast	Fast	Medium	Slow	Very Slow
										Cruise	Auto	Fishing	Fishing	Fishing
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_B_WYCF	TA_BW_4	TA_BW_4	47° 15' 42" N 122° 23'	0.04	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_BW_4	TA_BW_3	TA_BW_3	47° 15' 58" N 122° 23'	0.40	Pierce	0	3	3	3	3
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_BW_3	TA_BW_2	TA_BW_2	47° 16' 40" N 122° 24'	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_BW_2	TA_BW_1	TA_BW_1	47° 16' 50" N 122° 24'	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_BW_1	PS_D_2	PS_D_2	47° 18' 07" N 122° 27'	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	TOTE	Arrival	PS_A_23	TA_BW_1	TA_BW_1	47° 16' 50" N 122° 24'	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	TOTE	Arrival	TA_BW_1	TA_BW_2	TA_BW_2	47° 16' 40" N 122° 24'	0.25	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	TOTE	Arrival	TA_BW_2	TA_B_TO	TA_B_TO	47° 16' 24" N 122° 24'	0.45	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	TOTE	Departure	TA_B_TO	TA_BW_2	TA_BW_2	47° 16' 40" N 122° 24'	0.45	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	TOTE	Departure	TA_BW_2	TA_BW_1	TA_BW_1	47° 16' 50" N 122° 24'	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	TOTE	Departure	TA_BW_1	PS_D_2	PS_D_2	47° 18' 07" N 122° 27'	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	ANCHORAGE	Arrival	PS_A_23	TA_AN_1	TA_AN_1	47° 17' 25" N 122° 25'	1.54	Pierce	0	3	3	3	3
Tacoma_Sea	TACOMA	ANCHORAGE	Departure	TA_AN_1	PS_D_2	PS_D_2	47° 18' 07" N 122° 27'	1.54	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-A	Arrival	PS_A_23	PS_A_24	PS_A_24	47° 16' 53" N 122° 25'	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-A	Arrival	PS_A_24	TA_SI_1	TA_SI_1	47° 16' 20" N 122° 25'	0.74	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	7-A	Arrival	TA_SI_1	TA_B_7A	TA_B_7A	47° 16' 02" N 122° 24'	0.42	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-A	Departure	TA_B_7A	TA_SI_1	TA_SI_1	47° 16' 20" N 122° 25'	0.42	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-A	Departure	TA_SI_1	PS_A_24	PS_A_24	47° 16' 53" N 122° 25'	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	7-A	Departure	PS_A_24	PS_D_2	PS_D_2	47° 18' 07" N 122° 27'	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	7-B	Arrival	PS_A_23	PS_A_24	PS_A_24	47° 16' 53" N 122° 25'	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-B	Arrival	PS_A_24	TA_SI_1	TA_SI_1	47° 16' 20" N 122° 25'	0.74	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	7-B	Arrival	TA_SI_1	TA_B_7B	TA_B_7B	47° 16' 07" N 122° 24'	0.32	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-B	Departure	TA_B_7B	TA_SI_1	TA_SI_1	47° 16' 20" N 122° 25'	0.32	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-B	Departure	TA_SI_1	PS_A_24	PS_A_24	47° 16' 53" N 122° 25'	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	7-B	Departure	PS_A_24	PS_D_2	PS_D_2	47° 18' 07" N 122° 27'	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	7-C	Arrival	PS_A_23	PS_A_24	PS_A_24	47° 16' 53" N 122° 25'	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-C	Arrival	PS_A_24	TA_SI_1	TA_SI_1	47° 16' 20" N 122° 25'	0.74	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	7-C	Arrival	TA_SI_1	TA_B_7C	TA_B_7C	47° 16' 12" N 122° 25'	0.22	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-C	Departure	TA_B_7C	TA_SI_1	TA_SI_1	47° 16' 20" N 122° 25'	0.22	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-C	Departure	TA_SI_1	PS_A_24	PS_A_24	47° 16' 53" N 122° 25'	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	7-C	Departure	PS_A_24	PS_D_2	PS_D_2	47° 18' 07" N 122° 27'	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	7-D	Arrival	PS_A_23	PS_A_24	PS_A_24	47° 16' 53" N 122° 25'	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-D	Arrival	PS_A_24	TA_SI_1	TA_SI_1	47° 16' 20" N 122° 25'	0.74	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	7-D	Arrival	TA_SI_1	TA_B_7D	TA_B_7D	47° 16' 16" N 122° 25'	0.13	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-D	Departure	TA_B_7D	TA_SI_1	TA_SI_1	47° 16' 20" N 122° 25'	0.13	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-D	Departure	TA_SI_1	PS_A_24	PS_A_24	47° 16' 53" N 122° 25'	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	7-D	Departure	PS_A_24	PS_D_2	PS_D_2	47° 18' 07" N 122° 27'	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	MAERSK	Arrival	PS_A_23	PS_A_24	PS_A_24	47° 16' 53" N 122° 25'	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	MAERSK	Arrival	PS_A_24	TA_SI_1	TA_SI_1	47° 16' 20" N 122° 25'	0.74	Pierce	0	4	4	4	4

**Puget Sound Emissions Inventory**

**OGV-Routing: TACOMA HARBOR**

Lat/Long in WGS84 Datum

**DRAFT**

Route	To_Port	To_Pier	Arr/Dep	nk	Start WP	og WP La	End WP	ading Waypoint Lat/L	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Auto	Fishing	Fishing	Fishing
Tacoma_Sea	TACOMA	MAERSK	Departure	TA_B_MK	47° 16' 0"	TA_SL1	47° 16' 20" N	122° 25'	0.37	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	MAERSK	Departure	TA_SL1	47° 16' 2"	PS_A_24	47° 16' 53" N	122° 25'	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	MAERSK	Departure	PS_A_24	47° 16' 5"	PS_D_2	47° 18' 07" N	122° 27'	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	Sound Oil	Arrival	PS_A_23	47° 18' 0"	TA_HY_1	47° 17' 16" N	122° 24'	2.09	Pierce	0	0	6	6	6
Sea_Tacoma	TACOMA	Sound Oil	Arrival	TA_HY_1	47° 17' 1"	TA_HY_2	47° 17' 04" N	122° 24'	0.30	Pierce	0	0	4	4	4
Sea_Tacoma	TACOMA	Sound Oil	Arrival	TA_HY_2	47° 17' 0"	TA_HY_3	47° 16' 46" N	122° 24'	0.46	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	Sound Oil	Arrival	TA_HY_3	47° 16' 4"	TA_B_SO	47° 16' 33" N	122° 23'	0.65	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	Sound Oil	Departure	TA_B_SO	47° 16' 2"	TA_HY_3	47° 16' 46" N	122° 24'	0.65	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	Sound Oil	Departure	TA_HY_3	47° 16' 4"	TA_HY_2	47° 17' 04" N	122° 24'	0.46	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	Sound Oil	Departure	TA_HY_2	47° 17' 0"	TA_HY_1	47° 17' 16" N	122° 24'	0.30	Pierce	0	0	5	5	5
Tacoma_Sea	TACOMA	Sound Oil	Departure	TA_HY_1	47° 17' 1"	PS_D_2	47° 18' 07" N	122° 27'	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	PS_A_23	47° 18' 0"	TA_HY_1	47° 17' 16" N	122° 24'	2.09	Pierce	0	0	6	6	6
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_1	47° 17' 1"	TA_HY_2	47° 17' 04" N	122° 24'	0.30	Pierce	0	0	4	4	4
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_2	47° 17' 0"	TA_HY_3	47° 16' 46" N	122° 24'	0.46	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_3	47° 16' 4"	TA_HY_4	47° 16' 28" N	122° 22'	0.83	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_4	47° 16' 2"	TA_HY_5	47° 16' 10" N	122° 22'	0.44	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_5	47° 16' 1"	TA_HY_6	47° 15' 52" N	122° 21'	0.45	Pierce	0	0	2	2	2
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_6	47° 15' 5"	TA_B_WYL1	47° 15' 47" N	122° 21'	0.11	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_B_WYL1	47° 15' 4"	TA_HY_6	47° 15' 52" N	122° 21'	0.11	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_6	47° 15' 5"	TA_HY_5	47° 16' 10" N	122° 22'	0.45	Pierce	0	0	2	2	2
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_5	47° 16' 1"	TA_HY_4	47° 16' 28" N	122° 22'	0.44	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_4	47° 16' 2"	TA_HY_3	47° 16' 46" N	122° 24'	0.83	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_3	47° 16' 4"	TA_HY_2	47° 17' 04" N	122° 24'	0.46	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_2	47° 17' 0"	TA_HY_1	47° 17' 16" N	122° 24'	0.30	Pierce	0	0	5	5	5
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_1	47° 17' 1"	PS_D_2	47° 18' 07" N	122° 27'	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	PS_A_23	47° 18' 0"	TA_HY_1	47° 17' 16" N	122° 24'	2.09	Pierce	0	0	6	6	6
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_1	47° 17' 1"	TA_HY_2	47° 17' 04" N	122° 24'	0.30	Pierce	0	0	4	4	4
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_2	47° 17' 0"	TA_HY_3	47° 16' 46" N	122° 24'	0.46	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_3	47° 16' 4"	TA_HY_4	47° 16' 28" N	122° 22'	0.83	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_4	47° 16' 2"	TA_HY_5	47° 16' 10" N	122° 22'	0.44	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_5	47° 16' 1"	TA_HY_6	47° 15' 52" N	122° 21'	0.45	Pierce	0	0	2	2	2
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_6	47° 15' 5"	TA_B_WYL2	47° 15' 51" N	122° 21'	0.03	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_B_WYL2	47° 15' 5"	TA_HY_6	47° 15' 52" N	122° 21'	0.03	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_6	47° 15' 5"	TA_HY_5	47° 16' 10" N	122° 22'	0.45	Pierce	0	0	2	2	2
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_5	47° 16' 1"	TA_HY_4	47° 16' 28" N	122° 22'	0.44	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_4	47° 16' 2"	TA_HY_3	47° 16' 46" N	122° 24'	0.83	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_3	47° 16' 4"	TA_HY_2	47° 17' 04" N	122° 24'	0.46	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_2	47° 17' 0"	TA_HY_1	47° 17' 16" N	122° 24'	0.30	Pierce	0	0	5	5	5
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_1	47° 17' 1"	PS_D_2	47° 18' 07" N	122° 27'	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	PS_A_23	47° 18' 0"	TA_HY_1	47° 17' 16" N	122° 24'	2.09	Pierce	0	0	6	6	6
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_1	47° 17' 1"	TA_HY_2	47° 17' 04" N	122° 24'	0.30	Pierce	0	0	4	4	4
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_2	47° 17' 0"	TA_HY_3	47° 16' 46" N	122° 24'	0.46	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_3	47° 16' 4"	TA_HY_4	47° 16' 28" N	122° 22'	0.83	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_4	47° 16' 2"	TA_HY_5	47° 16' 10" N	122° 22'	0.44	Pierce	0	0	2	2	2
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_5	47° 16' 1"	TA_B_SHZ	47° 16' 02" N	122° 22'	0.23	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	SCHNITZER	Departure	TA_B_SHZ	47° 16' 0"	TA_HY_5	47° 16' 10" N	122° 22'	0.23	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	SCHNITZER	Departure	TA_HY_5	47° 16' 1"	TA_HY_4	47° 16' 28" N	122° 22'	0.44	Pierce	0	0	2	2	2
Tacoma_Sea	TACOMA	SCHNITZER	Departure	TA_HY_4	47° 16' 2"	TA_HY_3	47° 16' 46" N	122° 24'	0.83	Pierce	0	0	3	3	3



**Puget Sound Emissions Inventory**

OGV-Routing: TACOMA HARBOR

Lat/Long in WGS84 Datum

DRAFT

Route	To_Port	To_Pier	Arr/Dep	nk	Start WP	og WP La	End WP	ading Waypoint	Lat/L	Dist.	County	Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Cruise	Auto	Container	Reefer RO/RO	Bulkers Tankers Log Fishing
Tacoma_Sea	TACOMA	SCHNITZER	Departure		TA_HY_2	47° 17' 0"	TA_HY_1	47° 17' 16'' N	122° 24'	0.30	Pierce	0	0	4	4	4
Tacoma_Sea	TACOMA	SCHNITZER	Departure		TA_HY_1	47° 17' 1"	PS_D_2	47° 18' 07'' N	122° 27'	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	PIONEER	Arrival		PS_A_23	47° 18' 0"	TA_HY_1	47° 17' 16'' N	122° 24'	2.09	Pierce	0	0	5	5	5
Sea_Tacoma	TACOMA	PIONEER	Arrival		TA_HY_1	47° 17' 1"	TA_HY_2	47° 17' 04'' N	122° 24'	0.30	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	PIONEER	Arrival		TA_HY_2	47° 17' 0"	TA_B_PI	47° 16' 58'' N	122° 24'	0.13	Pierce	0	0	1	1	1

**Puget Sound Emissions Inventory**

**OGV-Routing: TACOMA HARBOR**

Lat/Long in WGS84 Datum

**DRAFT**

Route	To_Port	To_Pier	Arr/Dep	nk	Start WP	og WP La	End WP	ading Waypoint Lat/L	Dist.	County	Speed by Link (knots)					
											Fast	Fast	Medium	Slow	Very Slow	
											Cruise	Auto	Fishing	Fishing	Fishing	
Tacoma_Sea	TACOMA	PIONEER	Departure		TA_B_PI	47° 16' 5	TA_HY_2	47° 17' 04'' N	122° 24	0.13	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	PIONEER	Departure		TA_HY_2	47° 17' 0	TA_HY_1	47° 17' 16'' N	122° 24	0.30	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	PIONEER	Departure		TA_HY_1	47° 17' 1	PS_D_2	47° 18' 07'' N	122° 27	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	PNW	Arrival		PS_A_23	47° 18' 0	TA_HY_1	47° 17' 16'' N	122° 24	2.09	Pierce	0	0	6	6	6
Sea_Tacoma	TACOMA	PNW	Arrival		TA_HY_1	47° 17' 1	TA_HY_2	47° 17' 04'' N	122° 24	0.30	Pierce	0	0	4	4	4
Sea_Tacoma	TACOMA	PNW	Arrival		TA_HY_2	47° 17' 0	TACOMA	47° 16' 46'' N	122° 24	0.46	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	PNW	Arrival		TA_HY_3	47° 16' 4	TA_HY_4	47° 16' 28'' N	122° 22	0.83	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	PNW	Arrival		TA_HY_4	47° 16' 2	TA_HY_5	47° 16' 10'' N	122° 22	0.44	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	PNW	Arrival		TA_HY_5	47° 16' 1	TA_HY_6	47° 15' 52'' N	122° 21	0.45	Pierce	0	0	2	2	2
Sea_Tacoma	TACOMA	PNW	Arrival		TA_HY_6	47° 15' 5	TA_B_PNW	47° 15' 50'' N	122° 21	0.21	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	PNW	Departure		TA_B_PNW	47° 15' 5	TA_HY_6	47° 15' 52'' N	122° 21	0.21	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	PNW	Departure		TA_HY_6	47° 15' 5	TA_HY_5	47° 16' 10'' N	122° 22	0.45	Pierce	0	0	2	2	2
Tacoma_Sea	TACOMA	PNW	Departure		TA_HY_5	47° 16' 1	TA_HY_4	47° 16' 28'' N	122° 22	0.44	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	PNW	Departure		TA_HY_4	47° 16' 2	TA_HY_3	47° 16' 46'' N	122° 24	0.83	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	PNW	Departure		TA_HY_3	47° 16' 4	TA_HY_2	47° 17' 04'' N	122° 24	0.46	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	PNW	Departure		TA_HY_2	47° 17' 0	TA_HY_1	47° 17' 16'' N	122° 24	0.30	Pierce	0	0	5	5	5
Tacoma_Sea	TACOMA	PNW	Departure		TA_HY_1	47° 17' 1	PS_D_2	47° 18' 07'' N	122° 27	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	US OIL	Arrival		PS_A_23	47° 18' 0	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	0	0	5	0
Sea_Tacoma	TACOMA	US OIL	Arrival		TA_BW_1	47° 16' 5	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	US OIL	Arrival		TA_BW_2	47° 16' 4	TA_UO_1	47° 16' 11'' N	122° 23	0.72	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	US OIL	Arrival		TA_UO_1	47° 16' 1	TA_B_USO	47° 16' 00'' N	122° 23	0.20	Pierce	0	0	0	1	0
Sea_Tacoma	TACOMA	US OIL	Departure		TA_B_USO	47° 16' 0	TA_UO_1	47° 16' 11'' N	122° 23	0.20	Pierce	0	0	0	1	0
Sea_Tacoma	TACOMA	US OIL	Departure		TA_UO_1	47° 16' 1	TA_BW_2	47° 16' 40'' N	122° 24	0.72	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	US OIL	Departure		TA_BW_2	47° 16' 4	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	US OIL	Departure		TA_BW_1	47° 16' 5	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	0	0	6	0
Sea_Tacoma	TACOMA	TEMCO	Arrival		PS_A_23	47° 18' 0	TA_TC_1	47° 16' 07'' N	122° 26	2.12	Pierce	0	0	0	5	0
Sea_Tacoma	TACOMA	TEMCO	Arrival		TA_TC_1	47° 16' 0	TA_B_TEM	47° 15' 59'' N	122° 26	0.15	Pierce	0	0	0	2	0
Tacoma_Sea	TACOMA	TEMCO	Departure		TA_B_TEM	47° 15' 5	TA_TC_1	47° 16' 07'' N	122° 26	0.15	Pierce	0	0	0	2	0
Tacoma_Sea	TACOMA	TEMCO	Departure		TA_TC_1	47° 16' 0	PS_D_2	47° 18' 07'' N	122° 27	2.12	Pierce	0	0	0	6	0
Sea_Tacoma	TACOMA	SPERRY	Arrival		PS_A_23	47° 18' 0	TA_SP_1	47° 16' 36'' N	122° 27	1.54	Pierce	0	6	6	5	0
Sea_Tacoma	TACOMA	SPERRY	Arrival		TA_SP_1	47° 16' 3	TA_B_SPR	47° 16' 26'' N	122° 27	0.16	Pierce	0	2	2	2	0
Tacoma_Sea	TACOMA	SPERRY	Departure		TA_B_SPR	47° 16' 2	TA_SP_1	47° 16' 36'' N	122° 27	0.16	Pierce	0	2	2	2	0
Tacoma_Sea	TACOMA	SPERRY	Departure		TA_SP_1	47° 16' 3	PS_D_2	47° 18' 07'' N	122° 27	1.53	Pierce	0	9	9	6	0
Sea_Tacoma	TACOMA	3-SOUTH	Arrival		PS_A_23	47° 18' 0	TA_BW_1	47° 16' 50'' N	122° 24	2.24	Pierce	0	0	0	5	0
Sea_Tacoma	TACOMA	3-SOUTH	Arrival		TA_BW_1	47° 16' 5	TA_BW_2	47° 16' 40'' N	122° 24	0.25	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	3-SOUTH	Arrival		TA_BW_2	47° 16' 4	TA_UO_1	47° 16' 11'' N	122° 23	0.72	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	3-SOUTH	Arrival		TA_UO_1	47° 16' 1	TA_B_3S	47° 16' 07'' N	122° 23	0.13	Pierce	0	0	0	1	0
Sea_Tacoma	TACOMA	3-SOUTH	Departure		TA_B_3S	47° 16' 0	TA_UO_1	47° 16' 11'' N	122° 23	0.13	Pierce	0	0	0	1	0
Sea_Tacoma	TACOMA	3-SOUTH	Departure		TA_UO_1	47° 16' 1	TA_BW_2	47° 16' 40'' N	122° 24	0.72	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	3-SOUTH	Departure		TA_BW_2	47° 16' 4	TA_BW_1	47° 16' 50'' N	122° 24	0.25	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	3-SOUTH	Departure		TA_BW_1	47° 16' 5	PS_D_2	47° 18' 07'' N	122° 27	2.24	Pierce	0	0	0	6	0

Engines off in constricted channels:  
Hylebos, Blair, & Sitcum Waterways  
Ships pulled out by tug

# Puget Sound Emissions Inventory

## OGV-Routing: TACOMA to SEA

Lat/Long in WGS84 Datum

### DRAFT

										Speed by Link (knots)					
										Fast	Fast	Medium	Slow	Very Slow	
										Bulkers					
										Reefer Tankers					
										Container RO/RO Log					
Route	Arr/Dep	Mode	NPM	Link ID	Start WP	WP 1	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47° 1	PS_D_3	47° 15	1.3	Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 1	PS_D_4	47° 15	0.9	Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 1	PS_D_5	47° 22	4.8	King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47° 2	PS_D_6	47° 26	4.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 2	PS_D_7	47° 34	7.8	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 3	PS_D_8	47° 35	1.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 3	PS_D_9	47° 37	1.1	Kitsap	0	20	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 3	PS_D_10	47° 35	2.7	King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 3	PS_D_11	47° 41	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 4	PS_D_12	47° 45	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 4	PS_D_13	47° 46	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 4	PS_D_14	47° 48	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 4	PS_D_15	47° 52	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 5	PS_D_16	47° 55	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 5	PS_D_17	47° 57	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 5	PS_D_18	47° 58	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 5	PS_D_19	48° 02	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 0	PS_D_20	48° 04	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 0	PS_D_21	48° 06	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 0	PS_D_22	48° 07	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 0	PS_D_23	48° 11	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 1	PS_D_24	48° 11	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 1	PS_D_25	48° 11	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 1	PS_D_26	48° 12	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 1	PS_D_27	48° 16	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 1	PS_D_28	48° 11	0.8	Calallam	0	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 1	PS_D_29	48° 14	4.9	Calallam	0	15	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 1	PS_D_30	48° 15	3.1	Calallam	0	19	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 1	PS_D_31	48° 17	15.4	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 1	PS_D_32	48° 30	34.1	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 3	PS_D_33	48° 30	10.9	Calallam	0	SS	SS	SS	SS

Total Distance 154.8 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to TACOMA

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer Tankers				
												Container RO/RO Log				
Route	Arr/Dep	Mode	NPM	Link ID	Start WP	g WP	L <sub>i</sub> End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
NBndry_AI	Arrival	T	N	L1	AD_A_1	48° 40'	AD_A_2	48° 34' 5	5.2	San Juan	0	18	16	SS	SS	
NBndry_AI	Arrival	T	N	L2	AD_A_2	48° 34'	AD_A_3	48° 29' 2	5.9	San Juan	0	SS	SS	SS	SS	
NBndry_AI	Arrival	T	N	L3	AD_A_3	48° 29'	AD_A_4	48° 27' 2	2.4	San Juan	0	SS	SS	SS	SS	
NBndry_AI	Arrival	T	N	L4	AD_A_4	48° 27'	AD_A_5	48° 25' 0	3.6	San Juan	0	SS	SS	SS	SS	
NBndry_AI	Arrival	T	N	L5	AD_A_5	48° 25'	AD_A_6	48° 22' 3	3.3	San Juan	0	SS	SS	SS	SS	
NBndry_AI	Arrival	T	N	L6	AD_A_6	48° 22'	AD_A_7	48° 20' 0	2.9	San Juan	0	SS	SS	SS	SS	
NBndry_AI	Arrival	T	N	L7	AD_A_7	48° 20'	AD_A_8	48° 12' 4	8.8	San Juan	0	SS	SS	SS	SS	
NBndry_AI	Arrival	T	N	L8	AD_A_8	48° 12'	PS_D_25	48° 11' 5	0.9	Jefferson	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11'	PS_D_26	48° 12' 4	9.5	Calallam	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12'	PS_D_27	48° 10' 3	11.2	Calallam	0	16	12	SS	SS	
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10'	PS_A_6	48° 09' 5	0.8	Calallam	0	8	8	8	8	
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09'	PS_A_7	48° 11' 5	11.4	Calallam	0	18	16	12	SS	
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11'	PS_A_8	48° 11' 1	9.5	Calallam	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11'	PS_A_9	48° 10' 5	2.9	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10'	PS_A_10	48° 06' 3	6.8	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06'	PS_A_11	48° 01' 0	5.6	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01'	PS_A_12	47° 57' 4	4.0	Island	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57'	PS_A_13	47° 56' 3	1.8	Island	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56'	PS_A_14	47° 55' 1	2.3	Kitsap	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55'	PS_A_15	47° 45' 5	9.7	Kitsap	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45'	PS_A_16	47° 39' 4	6.3	Kitsap	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39'	PS_A_17	47° 34' 3	5.2	Kitsap	0	18	16	13	SS	
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34'	PS_A_18	47° 31' 5	2.8	Kitsap	0	17	16	13	SS	
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31'	PS_A_19	47° 26' 4	5.3	King	0	16	16	13	SS	
Sea_Tacoma	Arrival	X	N	L19	PS_A_19	47° 26'	PS_A_20	47° 23' 0	4.1	King	0	17	17	13	SS	
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23'	PS_A_21	47° 19' 3	5.3	King	0	14	13	12	SS	
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19'	PS_A_22	47° 19' 1	0.5	King	0	10	10	10	9	
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19'	PS_A_23	47° 18' 0	1.1	Pierce	0	10	10	10	8	

Total Distance 139.1 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**  
**OGV-Routing: TACOMA to VANCOUVER (NB2)**  
 Lat/Long in WGS84 Datum

Speed by Link (knots)  
 Fast Fast Medium Slow Very Slow

DRAFT Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP	End WP	Waypoint	Dist.	County	Cruise	Speed by Link (knots)			
												Fast	Fast	Medium	Slow
												Bulkers			
												Container	Reefer	Tankers	
												Auto	RO/RO	Log	
												Fishing	Fishing	Fishing	
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47°	PS_D_3	47° 19	1.3	Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47°	PS_D_4	47° 19	0.9	Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47°	PS_D_5	47° 23	4.8	King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47°	PS_D_6	47° 26	4.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47°	PS_D_7	47° 34	7.8	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47°	PS_D_8	47° 35	1.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47°	PS_D_9	47° 37	1.1	Kitsap	0	20	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47°	PS_D_10	47° 39	2.7	King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47°	PS_D_11	47° 41	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47°	PS_D_12	47° 45	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47°	PS_D_13	47° 46	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47°	PS_D_14	47° 48	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47°	PS_D_15	47° 52	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47°	PS_D_16	47° 55	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47°	PS_D_17	47° 57	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47°	PS_D_18	47° 58	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47°	PS_D_19	48° 02	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48°	PS_D_20	48° 04	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48°	PS_D_21	48° 06	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48°	PS_D_22	48° 07	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48°	PS_D_23	48° 11	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48°	PS_D_24	48° 11	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48°	PS_D_25	48° 11	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48°	PS_D_26	48° 12	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48°	PS_D_27	48° 10	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48°	PS_A_6	48° 09	0.8	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48°	PS_A_7	48° 11	11.4	Calallam	0	18	15	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48°	PS_A_8	48° 11	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8a	PS_A_8	48°	PS_D_24	48° 11	2.5	Jefferson	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L1a	PS_D_24	48°	AD_D_2	48° 13	2.1	San Juan	0	18	17	16	SS
AI_NB2	Departure	T	N	L2	AD_D_2	48°	AD_D_3	48° 19	8.1	San Juan	0	16	15	15	SS
AI_NB2	Departure	T	N	L3	AD_D_3	48°	AD_D_4	48° 24	5.1	San Juan	0	15	15	15	SS
AI_NB2	Departure	T	N	L4	AD_D_4	48°	AD_D_5	48° 29	7.3	San Juan	0	15	15	15	SS
AI_NB2	Departure	T	N	L5	AD_D_5	48°	AD_D_6	48° 34	5.8	San Juan	0	15	15	15	SS
AI_NB2	Departure	T	N	L6	AD_D_6	48°	AD_D_7	48° 40	5.4	San Juan	0	15	15	15	SS

Total Distance 143.6 nm

# Puget Sound Emissions Inventory

## OGV-Routing: SEA to Point Wells

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)					
											Fast	Fast	Medium	Slow	Very Slow	
											Container			Reefer	Bulkers	Tankers
											Auto	RO/RO	Fishing	Log	Fishing	
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	z WP	L WP	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28	PS_A_2	48° 28	10.7	Calallam	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28	PS_A_3	48° 13	35.9	Calallam	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13	PS_A_4	48° 13	15.4	Calallam	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13	PS_A_5	48° 09	6.9	Calallam	0	0	15	12	SS	
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09	PS_A_6	48° 09	0.6	Calallam	0	0	8	8	8	
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09	PS_A_7	48° 11	11.4	Calallam	0	0	16	12	SS	
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11	PS_A_8	48° 11	9.5	Calallam	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11	PS_A_9	48° 10	2.9	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10	PS_A_10	48° 06	6.8	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06	PS_A_11	48° 01	5.6	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01	PS_A_12	47° 57	4.0	Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57	PS_A_13	47° 56	1.8	Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56	PS_A_14	47° 55	2.3	Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	X	Y	L14a	PS_A_14	47° 55	PW_A_1	47° 49	6.2	Kitsap	0	0	12	9	SS	
PS_PointWells	Arrival	M	Y	L1	PW_A_1	47° 49	PW_A_2	47° 48	1.3	Kitsap	0	0	8	6	6	
PS_PointWells	Arrival	M	Y	L2	PW_A_2	47° 48	PW_B_1	47° 46	2.3	Snohomish	0	0	4	2	2	

Total Distance 123.6 nm

# Puget Sound Emissions Inventory

## OGV-Routing: POINT WELLS to SEA

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Reefer Tankers				
											Container RO/RO Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L <sub>z</sub>	End WP	aypoin	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
PointWells_PS	Departure	M	Y	L1a	PW_B_1	47° 46'	PS_D_14	47° 48'	2.1	Snohomish	0	0	9	6	5
Tacoma_Sea	Departure	X	Y	L14	PS_D_14	47° 48'	PS_D_15	47° 52'	4.6	Kitsap	0	0	12	8	SS
Tacoma_Sea	Departure	X	Y	L15	PS_D_15	47° 52'	PS_D_16	47° 55'	3.1	Island	0	0	14	10	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55'	PS_D_17	47° 57'	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57'	PS_D_18	47° 58'	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58'	PS_D_19	48° 02'	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02'	PS_D_20	48° 04'	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04'	PS_D_21	48° 06'	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06'	PS_D_22	48° 07'	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07'	PS_D_23	48° 11'	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11'	PS_D_24	48° 11'	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11'	PS_D_25	48° 11'	2.4	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11'	PS_D_26	48° 12'	9.5	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L26	PS_D_26	48° 12'	PS_D_27	48° 10'	11.2	Calallam	0	0	16	12	SS
Tacoma_Sea	Departure	T	N	L27	PS_D_27	48° 10'	PS_D_28	48° 11'	0.8	Calallam	0	0	8	8	8
Tacoma_Sea	Departure	T	N	L28	PS_D_28	48° 11'	PS_D_29	48° 14'	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14'	PS_D_30	48° 15'	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15'	PS_D_31	48° 17'	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17'	PS_D_32	48° 30'	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30'	PS_D_33	48° 30'	10.9	Calallam	0	0	SS	SS	SS

Total Distance 123.9 nm

# Puget Sound Emissions Inventory

## OGV-Routing: POINT WELLS to PORT ANGELES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Reefer Tankers				
											Log				
											Container	RO/RO	Fishing	Fishing	Fishing
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L	End WP	/aypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
PointWells_PS	Departure	M	Y	L1a	PW_B_1	47° 46'	PS_D_14	47° 48'	2.1	Snohomish	0	0	9	6	5
Tacoma_Sea	Departure	X	Y	L14	PS_D_14	47° 48'	PS_D_15	47° 52'	4.6	Kitsap	0	0	12	8	SS
Tacoma_Sea	Departure	X	Y	L15	PS_D_15	47° 52'	PS_D_16	47° 55'	3.1	Island	0	0	14	10	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55'	PS_D_17	47° 57'	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57'	PS_D_18	47° 58'	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58'	PS_D_19	48° 02'	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02'	PS_D_20	48° 04'	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04'	PS_D_21	48° 06'	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06'	PS_D_22	48° 07'	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07'	PS_D_23	48° 11'	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11'	PS_D_24	48° 11'	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11'	PS_D_25	48° 11'	2.4	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11'	PS_D_26	48° 12'	9.5	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	48° 12'	PS_D_27	48° 10'	11.2	Calallam	0	0	16	12	SS
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	48° 10'	PA_A_2	48° 09'	0.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09'	PA_A_3	48° 08'	1.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08'	PA_A_4	48° 08'	1.0	Calallam	0	0	6	6	6

Total Distance 58.0 nm



**Puget Sound Emissions Inventory**  
**OGV-Routing: PORT ANGELES to POINT WELLS**

Lat/Long in WGS84 Datum

DRAFT											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP I	End WP	Waypoint Dist.	County	Cruise	Auto	Container	Reefer RO/RO	Bulkers Tankers Log	Fishing
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08'	PA_D_2	48° 08'	1.2 Calallam	0	0	6	6	6	
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08'	PA_D_3	48° 09'	1.5 Calallam	0	0	8	8	8	
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09'	PS_A_6	48° 09'	0.5 Calallam	0	0	10	10	9	
Sea_Tacoma	Arrival	X	Y	L6	PS_A_6	48° 09'	PS_A_7	48° 11'	11.4 Calallam	0	0	16	12	SS	
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11'	PS_A_8	48° 11'	9.5 Calallam	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11'	PS_A_9	48° 10'	2.9 Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10'	PS_A_10	48° 06'	6.8 Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06'	PS_A_11	48° 01'	5.6 Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01'	PS_A_12	47° 57'	4.0 Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57'	PS_A_13	47° 56'	1.8 Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56'	PS_A_14	47° 55'	2.3 Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	X	Y	L14a	PS_A_14	47° 55'	PW_A_1	47° 49'	6.2 Kitsap	0	0	12	9	SS	
PS_PointWells	Arrival	M	Y	L1	PW_A_1	47° 49'	PW_A_2	47° 48'	1.3 Kitsap	0	0	8	6	6	
PS_PointWells	Arrival	M	Y	L2	PW_A_2	47° 48'	PW_B_1	47° 46'	2.3 Snohomis	0	0	4	2	2	
Total Distance										57.3 nm					

# Puget Sound Emissions Inventory

## OGV-Routing: POINT WELLS to MARCH POINT

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Reefer Tankers				
											Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L	End WP	aypoir	Dist.	County	Cruise	Container Auto	RO/RO Fishing	Fishing	Fishing
PointWells_PS	Departure	M	Y	L1a	PW_B_1	47° 46	PS_D_14	47° 48	2.1	Snohomish	0	0	9	6	5
Tacoma_Sea	Departure	X	Y	L14	PS_D_14	47° 48	PS_D_15	47° 50	4.6	Kitsap	0	0	12	8	SS
Tacoma_Sea	Departure	X	Y	L15	PS_D_15	47° 52	PS_D_16	47° 54	3.1	Island	0	0	14	10	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55	PS_D_17	47° 57	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57	PS_D_18	47° 59	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58	PS_D_19	48° 00	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02	PS_D_20	48° 04	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04	PS_D_21	48° 06	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06	PS_D_22	48° 08	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07	PS_D_23	48° 09	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11	PS_D_24	48° 13	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11	AA_A_1	48° 13	2.2	Island	0	0	SS	SS	SS
Admr_Anacorte	Arrival	T	N	L1	AA_A_1	48° 13	AA_A_2	48° 15	11.3	Island	0	0	18	SS	SS
Admr_Anacorte	Arrival	T	N	L2	AA_A_2	48° 24	AA_A_3	48° 26	0.7	Island	0	0	16	12	SS
Admr_Anacorte	Arrival	T	N	L3a	AA_A_3	48° 24	RS_A_6	48° 26	3.2	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28	RS_A_7	48° 30	2.0	Skagit	0	0	11	11	SS
RS_MarchPT	Arrival	T	Y	L1a	RS_A_7	48° 30	MP_A_2	48° 32	1.6	Skagit	0	0	11	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31	MP_A_3	48° 33	0.7	Skagit	0	0	11	11	SS
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	48° 31	MP_A_4	48° 33	3.1	Skagit	0	0	11	10	SS
RS_MarchPT	Arrival	M	Y	L3	MP_A_4	48° 31	MP_A_5	48° 33	1.1	Skagit	0	0	11	9	6

Total Distance 57.6 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: MARCH POINT to POINT WELLS

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Log Fishing	Fishing
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31'	MP_D_2	48° 31' 3	1.1	Skagit	0	0	10	8	6
MarchPT_RS	Departure	X	Y	L2	MP_D_2	48° 31'	MP_D_3	48° 31' 0	3.1	Skagit	0	0	13	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 31'	MP_D_4	48° 31' 0	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	T	N	L4a	MP_D_4	48° 31'	RS_A_7	48° 30' 0	1.6	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L1a	RS_A_7	48° 30'	RS_D_10	48° 29' 3	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29'	RS_D_11	48° 28' 5	0.7	Skagit	0	0	16	13	SS
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28'	AA_D_1	48° 26' 0	2.8	Skagit	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26'	AA_D_2	48° 24' 0	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24'	AA_D_3	48° 22' 2	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	T	N	L3	AA_D_3	48° 22'	AA_D_4	48° 13' 2	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13'	AA_D_5	48° 11' 3	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11'	PS_A_9	48° 10' 5	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10'	PS_A_10	48° 06' 3	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06'	PS_A_11	48° 01' 0	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01'	PS_A_12	47° 57' 4	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57'	PS_A_13	47° 56' 3	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56'	PS_A_14	47° 55' 1	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L14a	PS_A_14	47° 55'	PW_A_1	47° 49' 1	6.2	Kitsap	0	0	12	9	SS
PS_PointWells	Arrival	M	N	L1	PW_A_1	47° 49'	PW_A_2	47° 48' 2	1.3	Kitsap	0	0	8	6	6
PS_PointWells	Arrival	M	N	L2	PW_A_2	47° 48'	PW_B_1	47° 46' 5	2.3	Snohomis	0	0	4	2	2

Total Distance 56.8 nm

**Puget Sound Emissions Inventory**

OGV-Routing: SEA to OLYMPIA

Lat/Long in WGS84 Datum

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	End WP	L	End WP	apport	Dist.	County	Speed by Link (knots)				
												Cruise	Auto	Fishing	Bulkers	
															Reefer	Tankers
Container	RO/RO	Log	Fishing	Fishing												
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28	PS_A_2	48° 2	10.7	Calallam	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28	PS_A_3	48° 1	35.9	Calallam	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13	PS_A_4	48° 1	15.4	Calallam	0	20	SS	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13	PS_A_5	48° 0	6.9	Calallam	0	16	15	12	SS	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09	PS_A_6	48° 0	0.6	Calallam	0	8	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09	PS_A_7	48° 1	11.4	Clallam	0	18	16	12	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11	PS_A_8	48° 1	9.5	Calallam	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11	PS_A_9	48° 1	2.9	Jefferson	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10	PS_A_10	48° 0	6.8	Jefferson	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06	PS_A_11	48° 0	5.6	Jefferson	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01	PS_A_12	47° 5	4.0	Island	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57	PS_A_13	47° 5	1.8	Island	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56	PS_A_14	47° 5	2.3	Kitsap	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55	PS_A_15	47° 4	9.7	Kitsap	0	20	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45	PS_A_16	47° 3	6.3	Kitsap	0	18	17	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39	PS_A_17	47° 3	5.2	Kitsap	0	17	16	13	SS	SS
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34	VW_A_1	47° 3	1.5	Kitsap	0	14	13	13	SS	SS
Vash_Olympia	Arrival	T	N	L1	VW_A_1	47° 33	VW_A_2	47° 3	2.0	Kitsap	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L2	VW_A_2	47° 31	VW_A_3	47° 3	0.7	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L3	VW_A_3	47° 30	VW_A_4	47° 2	1.9	Kitsap	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L4	VW_A_4	47° 28	VW_A_5	47° 2	1.5	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L5	VW_A_5	47° 27	VW_A_6	47° 2	1.8	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L6	VW_A_6	47° 25	VW_A_7	47° 2	1.3	Kitsap	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L7	VW_A_7	47° 24	VW_A_8	47° 2	0.8	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L8	VW_A_8	47° 23	VW_A_9	47° 2	0.8	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L9	VW_A_9	47° 23	VW_A_10	47° 2	0.5	Pierce	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L10	VW_A_10	47° 22	VW_A_11	47° 2	1.6	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L11a	VW_A_11	47° 22	OL_A_4	47° 1	3.1	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L4	OL_A_4	47° 19	OL_A_5	47° 1	1.0	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L5	OL_A_5	47° 18	OL_A_6	47° 1	1.3	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L6	OL_A_6	47° 17	OL_A_7	47° 1	0.5	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L7	OL_A_7	47° 16	OL_A_8	47° 1	2.4	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L8	OL_A_8	47° 14	OL_A_9	47° 1	3.4	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L9	OL_A_9	47° 11	OL_A_10	47° 1	1.4	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L10	OL_A_10	47° 10	OL_A_11	47° 0	3.8	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L11	OL_A_11	47° 07	OL_A_12	47° 0	0.9	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L12	OL_A_12	47° 07	OL_A_13	47° 0	1.1	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L13	OL_A_13	47° 07	OL_A_14	47° 0	0.7	Thurston	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L14	OL_A_14	47° 07	OL_A_15	47° 0	1.3	Thurston	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L15	OL_A_15	47° 08	OL_A_16	47° 0	0.8	Thurston	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L16	OL_A_16	47° 09	OL_A_17	47° 1	1.1	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L17	OL_A_17	47° 10	OL_A_18	47° 1	0.9	Thurston	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L18	OL_A_18	47° 10	OL_A_19	47° 1	0.8	Thurston	0	13	13	13	9	9
PS_Olympia	Arrival	M	Y	L19	OL_A_19	47° 11	OL_A_20	47° 1	0.9	Thurston	0	9	9	9	9	9
PS_Olympia	Arrival	M	Y	L20	OL_A_20	47° 10	OL_A_21	47° 1	0.7	Thurston	0	9	9	9	9	9
PS_Olympia	Arrival	M	Y	L21	OL_A_21	47° 10	OL_A_22	47° 0	1.3	Mason	0	9	9	9	9	9
PS_Olympia	Arrival	M	Y	L22	OL_A_22	47° 09	OL_A_23	47° 0	0.5	Mason	0	9	9	9	9	9
PS_Olympia	Arrival	M	Y	L23	OL_A_23	47° 09	OL_A_24	47° 0	1.2	Thurston	0	8	8	8	8	8
PS_Olympia	Arrival	M	Y	L24	OL_A_24	47° 08	OL_A_25	47° 0	2.2	Thurston	0	7	7	7	7	7
PS_Olympia	Arrival	M	Y	L25	OL_A_25	47° 06	OL_A_26	47° 0	1.6	Thurston	0	6	6	6	6	6
PS_Olympia	Arrival	M	Y	L26	OL_A_26	47° 05	OL_A_27	47° 0	1.1	Thurston	0	4	4	4	4	4
PS_Olympia	Arrival	M	Y	L27	OL_A_27	47° 04	OL_A_28	47° 0	0.3	Thurston	0	4	4	4	4	4
PS_Olympia	Arrival	M	Y	L28	OL_A_28	47° 04	OL_A_29	47° 0	0.2	Thurston	0	4	4	4	4	4

Total Distance 183.9 nm

# Puget Sound Emissions Inventory

## OGV-Routing: OLYMPIA HARBOR

Lat/Long in WGS84 Datum

### DRAFT

Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	WP L	End WP	Appoin	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
PS_Olympia	OLYMPIA		Arrival	OL_A_29	47° 03		Mode:	M		Thurston					
Olympia_PS	OLYMPIA		Departure	OL_D_1	47° 03		NPE:	Y		Thurston					

NOTE: All ARRIVAL harbor transits branch from OL\_A\_29

NOTE: All DEPARTURE harbor transits goto OL\_D\_1

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Reefer Tankers				
											Container RO/RO Log				
Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	WP L	End WP	Appoin	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Olympia_PortDock1	OLYMPIA	PORT DOCK 1	Arrival	L1a	OL_A_29	47° 03	OL_B_1	47° 03	0.49	Thurston	0	2	2	2	2
Olympia_PortDock1	OLYMPIA	PORT DOCK 1	Departure	L1a	OL_B_1	47° 03	OL_D_1	47° 03	0.49	Thurston	0	2	2	2	2
Olympia_PortDock2	OLYMPIA	PORT DOCK 2	Arrival	L1a	OL_A_29	47° 03	OL_B_2	47° 03	0.60	Thurston	0	2	2	2	2
Olympia_PortDock2	OLYMPIA	PORT DOCK 2	Departure	L1a	OL_B_2	47° 03	OL_D_1	47° 03	0.60	Thurston	0	3	3	3	3
Olympia_PortDock3	OLYMPIA	PORT DOCK 3	Arrival	L1a	OL_A_29	47° 03	OL_B_3	47° 03	0.71	Thurston	0	2	2	2	2
Olympia_PortDock3	OLYMPIA	PORT DOCK 3	Departure	L1a	OL_B_3	47° 03	OL_D_1	47° 03	0.71	Thurston	0	3	3	3	3
Olympia_Anchorage	OLYMPIA	ANCHORAGE	Arrival	L1a	OL_A_29	47° 03	OL_B_4	47° 05	1.35	Thurston	0	3	3	3	3
Olympia_Anchorage	OLYMPIA	ANCHORAGE	Arrival	L2	OL_B_4	47° 05	OL_AN_1	47° 06	2.62	Thurston	0	3	3	3	2
Olympia_Anchorage	OLYMPIA	ANCHORAGE	Departure	L2	OL_AN_1	47° 06	OL_A_29	47° 03	2.62	Thurston	0	3	3	3	3
Olympia_Anchorage	OLYMPIA	ANCHORAGE	Departure	L1a	OL_A_29	47° 03	OL_B_4	47° 05	1.35	Thurston	0	3	3	3	2





Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to OLYMPIA

Lat/Long in WGS84 Datum

												Speed by Link (knots)					
												Fast	Fast	Medium	Slow	Very Slow	
												Bulkers					
												Reefer					
												Tankers					
												Log					
												Container RO/RO					
												Auto	Fishing	Fishing	Fishing	Fishing	
DRAFT	Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP L	End WP	Waypoint	Dist.	County	Cruise					
NBndry_AI	Arrival	T	N	L1	AD_A_1	48° 40'	AD_A_2	48° 34'	50'	5.2	San Juan	0	18	16	SS	SS	SS
NBndry_AI	Arrival	T	N	L2	AD_A_2	48° 34'	AD_A_3	48° 29'	20'	5.9	San Juan	0	SS	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L3	AD_A_3	48° 29'	AD_A_4	48° 27'	2'	2.4	San Juan	0	SS	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L4	AD_A_4	48° 27'	AD_A_5	48° 25'	0'	3.6	San Juan	0	SS	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L5	AD_A_5	48° 25'	AD_A_6	48° 22'	30'	3.3	San Juan	0	SS	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L6	AD_A_6	48° 22'	AD_A_7	48° 20'	00'	2.9	San Juan	0	SS	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L7	AD_A_7	48° 20'	AD_A_8	48° 12'	4'	8.8	San Juan	0	SS	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L8a	AD_A_8	48° 12'	PS_D_25	48° 11'	5'	0.9	Jefferson	0	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11'	PS_D_26	48° 12'	4'	9.5	Calallam	0	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12'	PS_D_27	48° 10'	3'	11.2	Calallam	0	16	12	SS	SS	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10'	PS_A_6	48° 09'	5'	0.8	Calallam	0	8	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09'	PS_A_7	48° 11'	50'	11.4	Calallam	0	18	16	12	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11'	PS_A_8	48° 11'	1'	9.5	Calallam	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11'	PS_A_9	48° 10'	5'	2.9	Jefferson	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10'	PS_A_10	48° 06'	3'	6.8	Jefferson	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06'	PS_A_11	48° 01'	0'	5.6	Jefferson	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01'	PS_A_12	47° 57'	4'	4.0	Island	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57'	PS_A_13	47° 56'	3'	1.8	Island	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56'	PS_A_14	47° 55'	1'	2.3	Kitsap	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55'	PS_A_15	47° 45'	5'	9.7	Kitsap	0	20	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45'	PS_A_16	47° 39'	4'	6.3	Kitsap	0	18	17	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39'	PS_A_17	47° 34'	3'	5.2	Kitsap	0	17	16	13	SS	SS
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34'	VW_A_1	47° 33'	0'	1.5	Kitsap	0	14	13	13	SS	SS
Vash_Olympia	Arrival	T	N	L1	VW_A_1	47° 33'	VW_A_2	47° 31'	1'	2.0	Kitsap	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L2	VW_A_2	47° 31'	VW_A_3	47° 30'	3'	0.7	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L3	VW_A_3	47° 30'	VW_A_4	47° 28'	5'	1.9	Kitsap	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L4	VW_A_4	47° 28'	VW_A_5	47° 27'	3'	1.5	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L5	VW_A_5	47° 27'	VW_A_6	47° 25'	4'	1.8	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L6	VW_A_6	47° 25'	VW_A_7	47° 24'	3'	1.3	Kitsap	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L7	VW_A_7	47° 24'	VW_A_8	47° 23'	4'	0.8	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L8	VW_A_8	47° 23'	VW_A_9	47° 23'	0'	0.8	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L9	VW_A_9	47° 23'	VW_A_10	47° 22'	2'	0.5	Pierce	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L10	VW_A_10	47° 22'	VW_A_11	47° 20'	5'	1.6	King	0	13	13	13	9	9
Vash_Olympia	Arrival	T	N	L11a	VW_A_11	47° 22'	OL_A_4	47° 19'	3'	3.1	Pierce	0	13	13	13	9	9
PS_Olympia	Arrival	T	N	L4	OL_A_4	47° 19'	OL_A_5	47° 18'	3'	1.0	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L5	OL_A_5	47° 18'	OL_A_6	47° 17'	2'	1.3	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L6	OL_A_6	47° 17'	OL_A_7	47° 16'	5'	0.5	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L7	OL_A_7	47° 16'	OL_A_8	47° 14'	5'	2.4	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L8	OL_A_8	47° 14'	OL_A_9	47° 11'	4'	3.4	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L9	OL_A_9	47° 11'	OL_A_10	47° 10'	5'	1.4	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L10	OL_A_10	47° 10'	OL_A_11	47° 07'	4'	3.8	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L11	OL_A_11	47° 07'	OL_A_12	47° 07'	0'	0.9	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L12	OL_A_12	47° 07'	OL_A_13	47° 07'	2'	1.1	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L13	OL_A_13	47° 07'	OL_A_14	47° 07'	3'	0.7	Thurston	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L14	OL_A_14	47° 07'	OL_A_15	47° 08'	3'	1.3	Thurston	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L15	OL_A_15	47° 08'	OL_A_16	47° 09'	1'	0.8	Thurston	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L16	OL_A_16	47° 09'	OL_A_17	47° 10'	1'	1.1	Pierce	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L17	OL_A_17	47° 10'	OL_A_18	47° 10'	5'	0.9	Thurston	0	13	13	13	SS	SS
PS_Olympia	Arrival	T	N	L18	OL_A_18	47° 10'	OL_A_19	47° 11'	2'	0.8	Thurston	0	13	13	13	SS	SS
PS_Olympia	Arrival	M	Y	L19	OL_A_19	47° 11'	OL_A_20	47° 10'	5'	0.9	Thurston	0	9	9	9	8	8
PS_Olympia	Arrival	M	Y	L20	OL_A_20	47° 10'	OL_A_21	47° 10'	2'	0.7	Thurston	0	9	9	9	8	8
PS_Olympia	Arrival	M	Y	L21	OL_A_21	47° 10'	OL_A_22	47° 09'	3'	1.3	Mason	0	9	9	9	8	8
PS_Olympia	Arrival	M	Y	L22	OL_A_22	47° 09'	OL_A_23	47° 09'	2'	0.5	Mason	0	9	9	9	8	8
PS_Olympia	Arrival	M	Y	L23	OL_A_23	47° 09'	OL_A_24	47° 08'	4'	1.2	Thurston	0	8	8	8	8	8
PS_Olympia	Arrival	M	Y	L24	OL_A_24	47° 08'	OL_A_25	47° 06'	3'	2.2	Thurston	0	7	7	7	7	7
PS_Olympia	Arrival	M	Y	L25	OL_A_25	47° 06'	OL_A_26	47° 05'	1'	1.6	Thurston	0	6	6	6	6	6
PS_Olympia	Arrival	M	Y	L26	OL_A_26	47° 05'	OL_A_27	47° 04'	2'	1.1	Thurston	0	4	4	4	4	4
PS_Olympia	Arrival	M	Y	L27	OL_A_27	47° 04'	OL_A_28	47° 04'	0'	0.3	Thurston	0	4	4	4	4	4
PS_Olympia	Arrival	M	Y	L28	OL_A_28	47° 04'	OL_A_29	47° 03'	5'	0.2	Thurston	0	4	4	4	4	4

Total Distance: 160.0 nm



**Puget Sound Emissions Inventory**

**OGV-Routing: OLYMPIA to SEATTLE**

Lat/Long in WGS84 Datum

**Speed by Link (knots)**  
**Fast Fast Medium Slow Very Slow**

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L <sub>z</sub>	End WP	Waypoint Dist.	County	Speed by Link (knots)				
										Cruise	Auto	Fishing	Fishing	Fishing
Olympia_PS	Departure	M	Y	L1	OL_D_1	47° 03'	OL_D_2	47° 04'	0.2 Thurston	0	4	4	4	4
Olympia_PS	Departure	M	Y	L2	OL_D_2	47° 04'	OL_D_3	47° 04'	0.3 Thurston	0	5	5	5	5
Olympia_PS	Departure	M	Y	L3	OL_D_3	47° 04'	OL_D_4	47° 05'	1.1 Thurston	0	5	5	5	5
Olympia_PS	Departure	M	Y	L4	OL_D_4	47° 05'	OL_D_5	47° 06'	1.57 Thurston	0	7	7	7	7
Olympia_PS	Departure	M	Y	L5	OL_D_5	47° 06'	OL_D_6	47° 08'	2.19 Thurston	0	7	7	7	7
Olympia_PS	Departure	M	Y	L6	OL_D_6	47° 08'	OL_D_7	47° 09'	1.18 Thurston	0	9	9	9	9
Olympia_PS	Departure	M	Y	L7	OL_D_7	47° 09'	OL_D_8	47° 09'	0.5 Mason	0	9	9	9	9
Olympia_PS	Departure	M	Y	L8	OL_D_8	47° 09'	OL_D_9	47° 10'	1.3 Mason	0	9	9	9	8
Olympia_PS	Departure	M	Y	L9	OL_D_9	47° 10'	OL_D_10	47° 10'	0.7 Thurston	0	9	9	9	8
Olympia_PS	Departure	M	Y	L10	OL_D_10	47° 10'	OL_D_11	47° 11'	0.9 Thurston	0	9	9	9	8
Olympia_PS	Departure	T	N	L11	OL_D_11	47° 11'	OL_D_12	47° 10'	0.8 Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L12	OL_D_12	47° 10'	OL_D_13	47° 10'	0.9 Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L13	OL_D_13	47° 10'	OL_D_14	47° 09'	1.1 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L14	OL_D_14	47° 09'	OL_D_15	47° 08'	0.8 Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L15	OL_D_15	47° 08'	OL_D_16	47° 07'	1.3 Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L16	OL_D_16	47° 07'	OL_D_17	47° 07'	0.7 Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L17	OL_D_17	47° 07'	OL_D_18	47° 07'	1.1 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L18	OL_D_18	47° 07'	OL_D_19	47° 07'	0.9 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L19	OL_D_19	47° 07'	OL_D_20	47° 10'	3.8 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L20	OL_D_20	47° 10'	OL_D_21	47° 11'	1.4 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L21	OL_D_21	47° 11'	OL_D_22	47° 14'	3.4 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L22	OL_D_22	47° 14'	OL_D_23	47° 16'	2.4 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L23	OL_D_23	47° 16'	OL_D_24	47° 17'	0.5 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L24	OL_D_24	47° 17'	OL_D_25	47° 18'	1.3 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L25	OL_D_25	47° 18'	OL_D_26	47° 19'	1.0 Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L26a	OL_D_26	47° 19'	VW_D_1	47° 20'	1.4 Pierce	0	13	13	13	9
Olympia_Vash	Departure	T	N	L1	VW_D_1	47° 20'	VW_D_2	47° 22'	1.6 King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L2	VW_D_2	47° 22'	VW_D_3	47° 23'	0.5 Pierce	0	13	13	13	9
Olympia_Vash	Departure	T	N	L3	VW_D_3	47° 23'	VW_D_4	47° 23'	0.8 King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L4	VW_D_4	47° 23'	VW_D_5	47° 24'	0.8 King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L5	VW_D_5	47° 24'	VW_D_6	47° 25'	1.3 Kitsap	0	13	13	13	9
Olympia_Vash	Departure	T	N	L6	VW_D_6	47° 25'	VW_D_7	47° 27'	1.8 King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L7	VW_D_7	47° 27'	VW_D_8	47° 28'	1.5 King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L8	VW_D_8	47° 28'	VW_D_9	47° 30'	1.9 Kitsap	0	13	13	13	9
Olympia_Vash	Departure	T	N	L9	VW_D_9	47° 30'	VW_D_10	47° 31'	0.7 King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L10	VW_D_10	47° 31'	VW_D_11	47° 33'	2.0 Kitsap	0	13	13	13	9
Tacoma_Sea	Departure	X	N	L11a	VW_D_11	47° 33'	PS_D_7	47° 34'	1.5 King	0	13	13	13	9
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26'	PS_D_7	47° 34'	7.8 King	0	20	17	SS	SS
Tacoma_Sea	Departure	T	Y	L7a	PS_D_7	47° 34'	EB_A_S1	47° 36'	2.2 King	0	20	17	SS	SS
Tacoma_Elliot	Arrival	X	Y	L1	EB_A_S1	47° 36'	EB_A_4	47° 36'	1.3 King	0	15	13	10	10

Total Distance 58.5 nm Note: SS - Service Speed

**Puget Sound Emissions Inventory**

OGV-Routing: OLYMPIA to EVERETT

Lat/Long in WGS84 Datum

Speed by Link (knots)  
Fast Fast Medium Slow Very Slow

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L	End WP	Waypoint Dist.	County	Cruise	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Container	Reefer	Bulkers		
											Auto	RO/RO	Tankers	Log	Fishing
											Fishing	Fishing	Fishing	Fishing	Fishing
Olympia_PS	Departure	M	Y	L1	OL_D_1	47° 03'	OL_D_2	47° 04'	0.2 Thurston	0	4	4	4	4	
Olympia_PS	Departure	M	Y	L2	OL_D_2	47° 04'	OL_D_3	47° 04'	0.3 Thurston	0	5	5	5	5	
Olympia_PS	Departure	M	Y	L3	OL_D_3	47° 04'	OL_D_4	47° 05'	1.1 Thurston	0	5	5	5	5	
Olympia_PS	Departure	M	Y	L4	OL_D_4	47° 05'	OL_D_5	47° 06'	1.57 Thurston	0	7	7	7	7	
Olympia_PS	Departure	M	Y	L5	OL_D_5	47° 06'	OL_D_6	47° 08'	2.19 Thurston	0	7	7	7	7	
Olympia_PS	Departure	M	Y	L6	OL_D_6	47° 08'	OL_D_7	47° 09'	1.18 Thurston	0	9	9	9	9	
Olympia_PS	Departure	M	Y	L7	OL_D_7	47° 09'	OL_D_8	47° 09'	0.5 Mason	0	9	9	9	9	
Olympia_PS	Departure	M	Y	L8	OL_D_8	47° 09'	OL_D_9	47° 10'	1.3 Mason	0	9	9	9	8	
Olympia_PS	Departure	M	Y	L9	OL_D_9	47° 10'	OL_D_10	47° 10'	0.7 Thurston	0	9	9	9	8	
Olympia_PS	Departure	M	Y	L10	OL_D_10	47° 10'	OL_D_11	47° 11'	0.9 Thurston	0	9	9	9	8	
Olympia_PS	Departure	T	N	L11	OL_D_11	47° 11'	OL_D_12	47° 10'	0.8 Thurston	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L12	OL_D_12	47° 10'	OL_D_13	47° 10'	0.9 Thurston	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L13	OL_D_13	47° 10'	OL_D_14	47° 09'	1.1 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L14	OL_D_14	47° 09'	OL_D_15	47° 08'	0.8 Thurston	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L15	OL_D_15	47° 08'	OL_D_16	47° 07'	1.3 Thurston	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L16	OL_D_16	47° 07'	OL_D_17	47° 07'	0.7 Thurston	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L17	OL_D_17	47° 07'	OL_D_18	47° 07'	1.1 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L18	OL_D_18	47° 07'	OL_D_19	47° 07'	0.9 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L19	OL_D_19	47° 07'	OL_D_20	47° 10'	3.8 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L20	OL_D_20	47° 10'	OL_D_21	47° 11'	1.4 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L21	OL_D_21	47° 11'	OL_D_22	47° 14'	3.4 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L22	OL_D_22	47° 14'	OL_D_23	47° 16'	2.4 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L23	OL_D_23	47° 16'	OL_D_24	47° 17'	0.5 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L24	OL_D_24	47° 17'	OL_D_25	47° 18'	1.3 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L25	OL_D_25	47° 18'	OL_D_26	47° 19'	1.0 Pierce	0	13	13	13	SS	
Olympia_PS	Departure	T	N	L25	OL_D_25	47° 18'	OL_D_26	47° 19'	1.0 Pierce	0	13	13	13	9	
Olympia_PS	Departure	T	N	L26a	OL_D_26	47° 19'	VW_D_1	47° 20'	1.4 Pierce	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L1	VW_D_1	47° 20'	VW_D_2	47° 22'	1.6 King	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L2	VW_D_2	47° 22'	VW_D_3	47° 23'	0.5 Pierce	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L3	VW_D_3	47° 23'	VW_D_4	47° 23'	0.8 King	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L4	VW_D_4	47° 23'	VW_D_5	47° 24'	0.8 King	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L5	VW_D_5	47° 24'	VW_D_6	47° 25'	1.3 Kitsap	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L6	VW_D_6	47° 25'	VW_D_7	47° 27'	1.8 King	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L7	VW_D_7	47° 27'	VW_D_8	47° 28'	1.5 King	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L8	VW_D_8	47° 28'	VW_D_9	47° 30'	1.9 Kitsap	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L9	VW_D_9	47° 30'	VW_D_10	47° 31'	0.7 King	0	13	13	13	9	
Olympia_Vasl	Departure	T	N	L10	VW_D_10	47° 31'	VW_D_11	47° 33'	2.0 Kitsap	0	13	13	13	9	
Tacoma_Sea	Departure	X	N	L11a	VW_D_11	47° 33'	PS_D_7	47° 34'	1.5 King	0	13	13	13	9	
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34'	PS_D_8	47° 35'	1.4 King	0	16	15	SS	SS	
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35'	PS_D_9	47° 37'	1.1 Kitsap	0	18	17	SS	SS	
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37'	PS_D_10	47° 39'	2.7 King	0	20	19	SS	SS	
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39'	PS_D_11	47° 41'	2.3 King	0	22	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41'	PS_D_12	47° 45'	4.0 Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L12a	PS_D_12	47° 45'	ET_A_1	47° 46'	0.8 King	0	SS	SS	SS	SS	
Tacoma_Ever	Departure	T	N	L1	ET_A_1	47° 46'	ET_A_2	47° 48'	1.6 Snohomish	0	SS	SS	SS	SS	
Tacoma_Ever	Departure	T	N	L2a	ET_A_2	47° 48'	EV_A_5	47° 52'	4.1 Snohomish	0	SS	SS	SS	SS	
PS_Everett	Arrival	T	N	L5	EV_A_5	47° 52'	EV_A_6	47° 54'	2.4 Snohomish	0	19	SS	SS	SS	
PS_Everett	Arrival	X	Y	L6	EV_A_6	47° 54'	EV_A_7	47° 56'	2.5 Snohomish	0	18	SS	SS	SS	
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56'	EV_A_8	47° 57'	1.1 Snohomish	0	14	14	12	SS	
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57'	EV_A_9	47° 58'	2.0 Snohomish	0	10	10	10	10	
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58'	EV_A_10	47° 58'	1.3 Snohomish	0	7	7	6	6	

Total Distance 75.5 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: SEA to PORT TOWNSEND/INDIAN ISLAND

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP 1	End WP	apport	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 2	PS_A_2	48° 2	10.7	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 2	PS_A_3	48° 1	35.9	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 1	PS_A_4	48° 1	15.4	Calallam	0	20	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 1	PS_A_5	48° 0'	6.9	Calallam	0	16	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 0'	PS_A_6	48° 0'	0.6	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 0'	PS_A_7	48° 1'	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 1'	PS_A_8	48° 1'	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 1'	PS_A_9	48° 1'	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L1a	PS_A_9	48° 1'	PT_A_1	48° 0'	3.6	Jefferson	0	16	14	10	SS
SJ_PortTownsend	Arrival	X	N	L2	PT_A_1	48° 0'	PT_A_2	48° 0'	1.7	Jefferson	0	10	8	6	6
Total Distance									98.6 nm						

# Puget Sound Emissions Inventory

## OGV-Routing: PORT TOWNSEND/INDIAN ISLAND HARBOR

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

### DRAFT

Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	WP L	End WP	ypoi	Dist.	County	Cruise	Container	RO/RO	Fishing	Fishing	Fishing
SJ_PortTownsend	PORT TOWNSEND		Arrival	L2	PT_A_2	48° 07	Mode:	M								
PortTownsend_SJ	PORT TOWNSEND		Departure	L1	PT_D_1	48° 07	NPE:	Y								

NOTE: All ARRIVAL harbor transits branch from PT\_A\_2

NOTE: All DEPARTURE harbor transits goto PT\_D\_1

PortTownsend_Anchor	PORT TOWNS ANCHORAGE		Arrival	L1a	PT_A_2	48° 07	PT_B_1	N 12	1.3	Jefferson	0	3	3	3	3	3
Anchorage_PortTown	PORT TOWNS ANCHORAGE		Departure	L1a	PT_B_1	N 123	PT_D_1	48°	1.3	Jefferson	0	3	3	3	3	3

IndianIsland_Ammo	INDIAN ISLAND AMMO		Arrival	L1a	PT_A_2	48° 07	II_A_1	N 12	2.28	Jefferson	0	4	4	4	4	4
IndianIsland_Ammo	INDIAN ISLAND AMMO		Arrival	L2	II_A_1	N 122	II_B_1	48°	0.52	Jefferson	0	2	2	2	2	2

Total Distance 5.4 nm

Ammo_IndianIsland	INDIAN ISLAND AMMO		Departure	L1	II_B_1	48° 04	II_D_1	N 12	0.52	Jefferson	0	2	2	2	2	2
Ammo_IndianIsland	INDIAN ISLAND AMMO		Departure	L2a	II_D_1	N 122	PT_D_1	48°	2.28	Jefferson	0	5	5	5	5	5

Total Distance 13.6 nm

### PORT TOWNSEND TO INDIAN ISLAND

PortTownsend_IndianI	PORT TOWNS ANCHORAGE		Arrival	L1	PT_A_2	48° 07	II_A_1	N 12	1.88	Jefferson	0	4	4	4	4	4
IndianIsland_Ammo	INDIAN ISLAND AMMO		Arrival	L2	II_A_1	N 122	II_B_1	48°	0.52	Jefferson	0	2	2	2	2	2

Total Distance 2.4 nm

### INDIAN ISLAND TO PORT TOWNSEND

IndianIsland_PortTow	INDIAN ISLAND AMMO		Departure	L1	II_B_1	48° 04	II_A_1	N 12	1.88	Jefferson	0	2	2	2	2	2
IndianIsland_PortTow	PORT TOWNS ANCHORAGE		Departure	L2	II_A_1	N 122	PT_A_2	48°	0.52	Jefferson	0	5	5	5	5	5

Total Distance 2.4 nm

# Puget Sound Emissions Inventory

OGV-Routing: PORT TOWNSEND/INDIAN ISLAND to SEA

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

## DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP 1	End WP	apypoir	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	
PortTownsend_SJ	Arrival	X	Y	L1	PT_D_1	48° 0	PT_D_2	48° 0	1.7	Jefferson	0	12	10	8	6
PortTownsend_SJ	Arrival	X	Y	L2	PT_D_2	48° 0	PT_D_3	48° 0	2.1	Jefferson	0	15	13	10	8
PortTownsend_SJ	Arrival	X	Y	L3	PT_D_3	48° 0	PT_D_4	48° 0	0.7	Island	0	17	15	SS	SS
PortTownsend_SJ	Arrival	X	Y	L4a	PT_D_4	48° 0	PS_D_23	48° 1	2.6	Island	0	20	18	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 1	PS_D_24	48° 1	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 1	PS_D_25	48° 1	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 1	PS_D_26	48° 1	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 1	PS_D_27	48° 1	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 1	PS_D_28	48° 1	0.8	Calallam	0	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 1	PS_D_29	48° 1	4.9	Calallam	0	15	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 1	PS_D_30	48° 1	3.1	Calallam	0	19	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 1	PS_D_31	48° 1	15.4	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 3	PS_D_32	48° 3	34.1	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 3	PS_D_33	48° 3	10.9	Calallam	0	SS	SS	SS	SS

Total Distance 100.6 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: PORT ANGELES to PORT TOWNSEND/INDIAN ISLAND

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer Tankers				
												Container RO/RO Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	lg WP La	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08' 00"	PA_D_2	48° 08' 18"	1.2	Calallam	0	6	6	6	6	
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08' 18"	PA_D_3	48° 09' 36"	1.5	Calallam	0	8	8	8	8	
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09' 36"	PS_A_6	48° 09' 58"	0.5	Calallam	0	8	8	8	8	
Sea_Tacoma	Arrival	X	Y	L6	PS_A_6	48° 09' 58"	PS_A_7	48° 11' 56"	11.4	Calallam	0	19	17	12	SS	
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11' 56"	PS_A_8	48° 11' 11"	9.5	Calallam	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11' 11"	PS_A_9	48° 10' 57"	2.9	Jefferson	0	SS	SS	SS	SS	
Sea_Tacoma	Arrival	X	Y	L1a	PS_A_9	48° 10' 57"	PT_A_1	48° 08' 40"	3.6	Jefferson	0	16	14	10	SS	
SJ_PortTownsend	Arrival	M	Y	L2	PT_A_1	48° 08' 40"	PT_A_2	48° 07' 00"	1.7	Jefferson	0	10	8	6	6	

Total Distance 32.2 nm

# Puget Sound Emissions Inventory

OGV-Routing: PORT TOWNSEND/INDIAN ISLAND to BREMERTON

Lat/Long in WGS84 Datum

Speed by Link (knots)  
 Fast Fast Medium Slow Very Slow

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP I	End WP	apoin	Dist.	County	Cruise	Speed by Link (knots)			
												Auto	Fishing	Reefer	Bulkers
												Container	RO/RO	Log	
PTII_Bremerton	Departure	X	Y	L1	PI_D_1	48° 0'	PI_D_2	48° 0'	0.7	Jefferson	0	12	10	8	6
PTII_Bremerton	Departure	X	Y	L2	PI_D_2	48° 0'	PI_D_3	48° 0'	0.6	Jefferson	0	14	12	9	7
PTII_Bremerton	Departure	X	Y	L3a	PI_D_3	48° 0'	PS_A_10	48° 0'	2.3	Jefferson	0	18	16	10	9
Sea_Tacoma	Arrival	X	Y	L10	PS_A_10	48° 0'	PS_A_11	48° 01'	5.6	Jefferson	0	20	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 0'	PS_A_12	47° 57'	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 5'	PS_A_13	47° 56'	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 5'	PS_A_14	47° 55'	2.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 5'	PS_A_15	47° 45'	9.7	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 4'	PS_A_16	47° 39'	6.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 3'	PS_A_17	47° 34'	5.2	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 3'	BR_A_1	47° 3'	2.1	Kitsap	0	SS	SS	SS	SS
PS_Bremerton	Arrival	X	Y	L1	BR_A_1	47° 3'	BR_A_2	47° 34'	0.6	Kitsap	0	20	18	SS	SS
PS_Bremerton	Arrival	X	Y	L2	BR_A_2	47° 3'	BR_A_3	47° 34'	0.7	Kitsap	0	18	16	11	SS
PS_Bremerton	Arrival	X	Y	L3	BR_A_3	47° 3'	BR_A_4	47° 35'	1.2	Kitsap	0	14	12	10	8
PS_Bremerton	Arrival	X	Y	L4	BR_A_4	47° 3'	BR_A_5	47° 35'	0.4	Kitsap	0	13	11	9	8
PS_Bremerton	Arrival	X	Y	L5	BR_A_5	47° 3'	BR_A_6	47° 35'	0.9	Kitsap	0	12	10	9	8
PS_Bremerton	Arrival	M	Y	L6	BR_A_6	47° 3'	BR_A_7	47° 35'	2.0	Kitsap	0	10	10	9	9
PS_Bremerton	Arrival	M	Y	L7	BR_A_7	47° 3'	BR_A_8	47° 35'	1.3	Kitsap	0	10	10	9	9
PS_Bremerton	Arrival	M	Y	L8	BR_A_8	47° 3'	BR_B_1	47° 35'	0.4	Kitsap	0	10	10	9	9

Total Distance 48 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

**OGV-Routing: BREMERTON to PORT TOWNSEND/INDIAN ISLAND**

Lat/Long in WGS84 Datum

**DRAFT**

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer Tankers				
												Container RO/RO Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
Bremerton_PS	Departure	M	Y	L1	BR_B_1	47° 33' 21" N 122° 38' 32" W	BR_D_1	47° 33' 09" N 122° 38' 06" W	0.4	Kitsap	0	10	10	9	9	
Bremerton_PS	Departure	M	Y	L2	BR_D_1	47° 33' 09" N 122° 38' 06" W	BR_D_2	47° 33' 45" N 122° 36' 22" W	1.3	Kitsap	0	10	10	9	9	
Bremerton_PS	Departure	M	Y	L3	BR_D_2	47° 33' 45" N 122° 36' 22" W	BR_D_3	47° 35' 10" N 122° 34' 23" W	2.0	Kitsap	0	10	10	9	9	
Bremerton_PS	Departure	X	Y	L4	BR_D_3	47° 35' 10" N 122° 34' 23" W	BR_D_4	47° 35' 39" N 122° 33' 16" W	0.9	Kitsap	0	12	10	9	8	
Bremerton_PS	Departure	X	Y	L5	BR_D_4	47° 35' 39" N 122° 33' 16" W	BR_D_5	47° 35' 34" N 122° 32' 46" W	0.4	Kitsap	0	13	11	9	8	
Bremerton_PS	Departure	X	Y	L6	BR_D_5	47° 35' 34" N 122° 32' 46" W	BR_D_6	47° 34' 24" N 122° 32' 12" W	1.2	Kitsap	0	14	12	10	8	
Bremerton_PS	Departure	X	Y	L7	BR_D_6	47° 34' 24" N 122° 32' 12" W	BR_D_7	47° 34' 04" N 122° 31' 22" W	0.7	Kitsap	0	18	16	11	SS	
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34' 04" N 122° 31' 22" W	BR_D_8	47° 33' 58" N 122° 30' 31" W	0.6	Kitsap	0	19	17	SS	SS	
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33' 58" N 122° 30' 31" W	PS_A_17	47° 34' 32" N 122° 27' 32" W	2.1	Kitsap	0	20	SS	SS	SS	
PSCross_Brem	Departure	T	N	L10a	PS_A_17	47° 34' 32" N 122° 27' 32" W	PS_D_8	47° 35' 55" N 122° 26' 45" W	1.5	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35' 55" N 122° 26' 45" W	PS_D_9	47° 37' 02" N 122° 26' 56" W	1.1	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37' 02" N 122° 26' 56" W	PS_D_10	47° 39' 42" N 122° 27' 25" W	2.7	King	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39' 42" N 122° 27' 25" W	PS_D_11	47° 41' 54" N 122° 26' 47" W	2.3	King	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41' 54" N 122° 26' 47" W	PS_D_12	47° 45' 52" N 122° 25' 49" W	4.0	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45' 52" N 122° 25' 49" W	PS_D_13	47° 46' 40" N 122° 26' 04" W	0.8	King	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46' 40" N 122° 26' 04" W	PS_D_14	47° 48' 06" N 122° 26' 29" W	1.5	Snohomish	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48' 06" N 122° 26' 29" W	PS_D_15	47° 52' 36" N 122° 28' 08" W	4.6	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52' 36" N 122° 28' 08" W	PS_D_16	47° 55' 34" N 122° 29' 11" W	3.1	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34" N 122° 29' 11" W	PS_D_17	47° 57' 01" N 122° 32' 03" W	2.4	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01" N 122° 32' 03" W	PS_D_18	47° 58' 07" N 122° 34' 19" W	1.9	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07" N 122° 34' 19" W	PS_D_19	48° 02' 01" N 122° 37' 40" W	4.5	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01" N 122° 37' 40" W	PS_D_20	48° 04' 48" N 122° 38' 31" W	2.8	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48" N 122° 38' 31" W	PS_D_21	48° 06' 58" N 122° 39' 13" W	2.2	Jefferson	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	X	Y	L21	PS_D_21	48° 06' 58" N 122° 39' 13" W	PS_D_22	48° 07' 51" N 122° 40' 43" W	1.3	Jefferson	0	20	18	SS	SS	
Tacoma_Sea	Departure	X	Y	L22a	PS_D_22	48° 07' 51" N 122° 40' 43" W	PI_A_1	48° 08' 08" N 122° 41' 34" W	0.6	Island	0	19	17	10	SS	
Bremerton_PTII	Arrival	X	Y	L1	PI_A_1	48° 08' 08" N 122° 41' 34" W	PI_A_2	48° 08' 03" N 122° 42' 10" W	0.4	Island	0	18	16	10	SS	
Bremerton_PTII	Arrival	X	Y	L2	PI_A_2	48° 08' 03" N 122° 42' 10" W	PI_A_3	48° 07' 48" N 122° 44' 03" W	1.3	Jefferson	0	14	12	8	8	
Bremerton_PTII	Arrival	X	Y	L3	PI_A_3	48° 07' 48" N 122° 44' 03" W	PI_A_4	48° 07' 00" N 122° 44' 13" W	0.8	Jefferson	0	12	10	8	8	

Total Distance 49.2 nm

Note: SS - Service Speed



# Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to PORT TOWNSEND/INDIAN ISLAND

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast    Fast    Medium    Slow    Very Slow**

**DRAFT**

Route	Arr/De	Mode	NPE	Link ID	Start WP	WP ↓	End WP	Waypoint Dist.	County	Speed by Link (knots)				
										Cruise	Auto	Fishing	Fishing	Fishing
ElliottB_PS	Departu	X	Y	L1	EB_D_1	47°	EB_D_2	47° 38'	2.6 King	0	12	9	8	6
ElliottB_PS	Departu	X	Y	L2a	EB_D_2	47°	PS_D_10	47° 39'	1.5 King	0	16	SS	SS	7
Tacoma_Sea	Departu	T	N	L10	PS_D_10	47°	PS_D_11	47° 41'	2.3 King	0	SS	SS	SS	SS
Tacoma_Sea	Departu	T	N	L11	PS_D_11	47°	PS_D_12	47° 45'	4.0 Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departu	T	N	L12	PS_D_12	47°	PS_D_13	47° 46'	0.8 King	0	SS	SS	SS	SS
Tacoma_Sea	Departu	T	N	L13	PS_D_13	47°	PS_D_14	47° 48'	1.5 Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departur	T	N	L14	PS_D_14	47°	PS_D_15	47° 52'	4.6 Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departur	T	N	L15	PS_D_15	47°	PS_D_16	47° 55'	3.1 Island	0	SS	SS	SS	SS
Tacoma_Sea	Departur	T	N	L16	PS_D_16	47°	PS_D_17	47° 57'	2.4 Island	0	SS	SS	SS	SS
Tacoma_Sea	Departur	T	N	L17	PS_D_17	47°	PS_D_18	47° 58'	1.9 Island	0	SS	SS	SS	SS
Tacoma_Sea	Departur	T	N	L18	PS_D_18	47°	PS_D_19	48° 02'	4.5 Island	0	SS	SS	SS	SS
Tacoma_Sea	Departur	T	N	L19	PS_D_19	48°	PS_D_20	48° 04'	2.8 Island	0	SS	SS	SS	SS
Tacoma_Sea	Departur	T	N	L20	PS_D_20	48°	PS_D_21	48° 06'	2.2 Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departur	T	N	L21	PS_D_21	48°	PS_D_22	48° 07'	1.3 Jefferson	0	20	18	SS	SS
Tacoma_Sea	Departur	X	Y	L22a	PS_D_22	48°	PI_A_1	48° 08'	0.6 Island	0	19	17	10	SS
Bremerton_PT	Arrival	X	Y	L1	PI_A_1	48°	PI_A_2	48° 08'	0.4 Island	0	18	16	10	SS
Bremerton_PT	Arrival	X	Y	L2	PI_A_2	48°	PI_A_3	48° 07'	1.3 Jefferson	0	14	12	8	8
Bremerton_PT	Arrival	X	Y	L3	PI_A_3	48°	PI_A_4	48° 07'	0.8 Jefferson	0	12	10	8	8

Total Distance 38.6 nm

# Puget Sound Emissions Inventory

## OGV-Routing: SEA to BREMERTON

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer Tankers				
												Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP	L WP	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28'	PS_A_2	48° 28' 38"	10.7	Calallam	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28'	PS_A_3	48° 13' 22"	35.9	Calallam	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L3	PS_A_3	48° 13'	PS_A_4	48° 13' 20"	15.4	Calallam	0	20	SS	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13'	PS_A_5	48° 09' 20"	6.9	Calallam	0	16	15	12	SS	SS
Sea_Tacoma	Arrival	X	N	L5	PS_A_5	48° 09'	PS_A_6	48° 09' 58"	0.6	Calallam	0	8	8	8	8	8
Sea_Tacoma	Arrival	T	N	L6	PS_A_6	48° 09'	PS_A_7	48° 11' 50"	11.4	Calallam	0	18	16	12	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11'	PS_A_8	48° 11' 11"	9.5	Calallam	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11'	PS_A_9	48° 10' 57"	2.9	Jefferson	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10'	PS_A_10	48° 06' 38"	6.8	Jefferson	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06'	PS_A_11	48° 01' 08"	5.6	Jefferson	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01'	PS_A_12	47° 57' 41"	4.0	Island	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57'	PS_A_13	47° 56' 38"	1.8	Island	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56'	PS_A_14	47° 55' 17"	2.3	Kitsap	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55'	PS_A_15	47° 45' 54"	9.7	Kitsap	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45'	PS_A_16	47° 39' 42"	6.3	Kitsap	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39'	PS_A_17	47° 34' 32"	5.2	Kitsap	0	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34'	BR_A_1	47° 33' 51"	2.1	Kitsap	0	SS	SS	SS	SS	SS
PS_Bremerton	Arrival	X	Y	L1	BR_A_1	47° 33'	BR_A_2	47° 34' 04"	0.6	Kitsap	0	20	18	SS	SS	SS
PS_Bremerton	Arrival	X	Y	L2	BR_A_2	47° 34'	BR_A_3	47° 34' 24"	0.7	Kitsap	0	18	16	11	SS	SS
PS_Bremerton	Arrival	X	Y	L3	BR_A_3	47° 34'	BR_A_4	47° 35' 34"	1.2	Kitsap	0	14	12	10	8	8
PS_Bremerton	Arrival	X	Y	L4	BR_A_4	47° 35'	BR_A_5	47° 35' 38"	0.4	Kitsap	0	13	11	9	8	8
PS_Bremerton	Arrival	X	Y	L5	BR_A_5	47° 35'	BR_A_6	47° 35' 10"	0.9	Kitsap	0	12	10	9	8	8
PS_Bremerton	Arrival	M	Y	L6	BR_A_6	47° 35'	BR_A_7	47° 33' 48"	2.0	Kitsap	0	10	10	9	9	9
PS_Bremerton	Arrival	M	Y	L7	BR_A_7	47° 33'	BR_A_8	47° 33' 08"	1.3	Kitsap	0	10	10	9	9	9
PS_Bremerton	Arrival	M	Y	L8	BR_A_8	47° 33'	BR_B_1	47° 33' 21"	0.4	Kitsap	0	10	10	9	9	9

Total Distance 144.4 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

OGV-Routing: BREMERTON to SEA

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast Fast Medium Slow Very Slow**

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP	Lat/Lon	End WP	Ending Waypoint	Lat/Lon	Dist.	County	Cruise	Speed by Link (knots)				
														Auto	Fishing	Bulkers Tankers	Reefer	Log
														Container	RO/RO	Fishing	Fishing	Fishing
Bremerton_PS	Departure	M	Y	L1	BR_B_1	47° 33' 21'' N	122° 38' 32'' W	BR_D_1	47° 33' 09'' N	122° 38' 06'' W	0.4	Kitsap	0	10	10	9	9	
Bremerton_PS	Departure	M	Y	L2	BR_D_1	47° 33' 09'' N	122° 38' 06'' W	BR_D_2	47° 33' 45'' N	122° 36' 22'' W	1.3	Kitsap	0	10	10	9	9	
Bremerton_PS	Departure	M	Y	L3	BR_D_2	47° 33' 45'' N	122° 36' 22'' W	BR_D_3	47° 35' 10'' N	122° 34' 23'' W	2.0	Kitsap	0	10	10	9	9	
Bremerton_PS	Departure	X	Y	L4	BR_D_3	47° 35' 10'' N	122° 34' 23'' W	BR_D_4	47° 35' 39'' N	122° 33' 16'' W	0.9	Kitsap	0	12	10	9	8	
Bremerton_PS	Departure	X	Y	L5	BR_D_4	47° 35' 39'' N	122° 33' 16'' W	BR_D_5	47° 35' 34'' N	122° 32' 46'' W	0.4	Kitsap	0	13	11	9	8	
Bremerton_PS	Departure	X	Y	L6	BR_D_5	47° 35' 34'' N	122° 32' 46'' W	BR_D_6	47° 34' 24'' N	122° 32' 12'' W	1.2	Kitsap	0	14	12	10	8	
Bremerton_PS	Departure	X	Y	L7	BR_D_6	47° 34' 24'' N	122° 32' 12'' W	BR_D_7	47° 34' 04'' N	122° 31' 22'' W	0.7	Kitsap	0	18	16	11	SS	
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34' 04'' N	122° 31' 22'' W	BR_D_8	47° 33' 58'' N	122° 30' 31'' W	0.6	Kitsap	0	19	17	SS	SS	
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33' 58'' N	122° 30' 31'' W	PS_A_17	47° 34' 32'' N	122° 27' 32'' W	2.1	Kitsap	0	20	SS	SS	SS	
PSCross_Brem	Departure	T	N	L10a	PS_A_17	47° 34' 32'' N	122° 27' 32'' W	PS_D_8	47° 35' 55'' N	122° 26' 45'' W	1.5	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35' 55'' N	122° 26' 45'' W	PS_D_9	47° 37' 02'' N	122° 26' 56'' W	1.1	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37' 02'' N	122° 26' 56'' W	PS_D_10	47° 39' 42'' N	122° 27' 25'' W	2.7	King	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39' 42'' N	122° 27' 25'' W	PS_D_11	47° 41' 54'' N	122° 26' 47'' W	2.3	King	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41' 54'' N	122° 26' 47'' W	PS_D_12	47° 45' 52'' N	122° 25' 49'' W	4.0	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45' 52'' N	122° 25' 49'' W	PS_D_13	47° 46' 40'' N	122° 26' 04'' W	0.8	King	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46' 40'' N	122° 26' 04'' W	PS_D_14	47° 48' 06'' N	122° 26' 29'' W	1.5	Snohomish	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48' 06'' N	122° 26' 29'' W	PS_D_15	47° 52' 36'' N	122° 28' 08'' W	4.6	Kitsap	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52' 36'' N	122° 28' 08'' W	PS_D_16	47° 55' 34'' N	122° 29' 11'' W	3.1	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34'' N	122° 29' 11'' W	PS_D_17	47° 57' 01'' N	122° 32' 03'' W	2.4	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01'' N	122° 32' 03'' W	PS_D_18	47° 58' 07'' N	122° 34' 19'' W	1.9	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07'' N	122° 34' 19'' W	PS_D_19	48° 02' 01'' N	122° 37' 40'' W	4.5	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01'' N	122° 37' 40'' W	PS_D_20	48° 04' 48'' N	122° 38' 31'' W	2.8	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48'' N	122° 38' 31'' W	PS_D_21	48° 06' 58'' N	122° 39' 13'' W	2.2	Jefferson	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 58'' N	122° 39' 13'' W	PS_D_22	48° 07' 51'' N	122° 40' 43'' W	1.3	Jefferson	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07' 51'' N	122° 40' 43'' W	PS_D_23	48° 11' 20'' N	122° 46' 47'' W	5.3	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 20'' N	122° 46' 47'' W	PS_D_24	48° 11' 44'' N	122° 48' 45'' W	1.4	Island	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11' 44'' N	122° 48' 45'' W	PS_D_25	48° 11' 57'' N	122° 52' 19'' W	2.4	Jefferson	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11' 57'' N	122° 52' 19'' W	PS_D_26	48° 12' 45'' N	123° 06' 35'' W	9.5	Calallam	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12' 45'' N	123° 06' 35'' W	PS_D_27	48° 10' 33'' N	123° 23' 03'' W	11.2	Calallam	0	17	16	12	SS	
Tacoma_Sea	Departure	X	N	L27	PS_D_27	48° 10' 33'' N	123° 23' 03'' W	PS_D_28	48° 11' 21'' N	123° 23' 02'' W	0.8	Calallam	0	8	8	8	8	
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11' 21'' N	123° 23' 02'' W	PS_D_29	48° 14' 13'' N	123° 28' 57'' W	4.9	Calallam	0	15	14	12	SS	
Tacoma_Sea	Departure	X	N	L29	PS_D_29	48° 14' 13'' N	123° 28' 57'' W	PS_D_30	48° 15' 21'' N	123° 33' 17'' W	3.1	Calallam	0	19	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15' 21'' N	123° 33' 17'' W	PS_D_31	48° 17' 36'' N	123° 56' 06'' W	15.4	Calallam	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17' 36'' N	123° 56' 06'' W	PS_D_32	48° 30' 38'' N	124° 43' 36'' W	34.1	Calallam	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30' 38'' N	124° 43' 36'' W	PS_D_33	48° 30' 43'' N	125° 00' 00'' W	10.9	Calallam	0	SS	SS	SS	SS	

Total Distance 145.0 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**  
**OGV-Routing: BREMERTON to SEATTLE**  
 Lat/Long in WGS84 Datum

Speed by Link (knots)  
 Fast Fast Medium Slow Very Slow

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Speed by Link (knots)			
												Fast	Fast	Medium	Slow
												Bulkers			
												Container	Reefer	Tankers	
												Auto	RO/RO	Log	Fishing
												Fishing	Fishing	Fishing	Fishing
Bremerton_PS	Departure	M	Y	L1	BR_B_1	47° 33' 21'' N 122° 38' 32'' W	BR_D_1	47° 33' 09'' N 122° 38' 06'' W	0.4	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	M	Y	L2	BR_D_1	47° 33' 09'' N 122° 38' 06'' W	BR_D_2	47° 33' 45'' N 122° 36' 22'' W	1.3	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	M	Y	L3	BR_D_2	47° 33' 45'' N 122° 36' 22'' W	BR_D_3	47° 35' 10'' N 122° 34' 23'' W	2.0	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	X	Y	L4	BR_D_3	47° 35' 10'' N 122° 34' 23'' W	BR_D_4	47° 35' 39'' N 122° 33' 16'' W	0.9	Kitsap	0	12	10	9	8
Bremerton_PS	Departure	X	Y	L5	BR_D_4	47° 35' 39'' N 122° 33' 16'' W	BR_D_5	47° 35' 34'' N 122° 32' 46'' W	0.4	Kitsap	0	13	11	9	8
Bremerton_PS	Departure	X	Y	L6	BR_D_5	47° 35' 34'' N 122° 32' 46'' W	BR_D_6	47° 34' 24'' N 122° 32' 12'' W	1.2	Kitsap	0	14	12	10	8
Bremerton_PS	Departure	T	N	L7	BR_D_6	47° 34' 24'' N 122° 32' 12'' W	BR_D_7	47° 34' 04'' N 122° 31' 22'' W	0.7	Kitsap	0	18	16	11	SS
Bremerton_PS	Departure	T	N	L8	BR_D_7	47° 34' 04'' N 122° 31' 22'' W	BR_D_8	47° 33' 58'' N 122° 30' 31'' W	0.6	Kitsap	0	19	17	SS	SS
Bremerton_PS	Departure	T	N	L9a	BR_D_8	47° 33' 58'' N 122° 30' 31'' W	PS_A_17	47° 34' 32'' N 122° 27' 32'' W	2.1	Kitsap	0	20	SS	SS	SS
PSCross_Brem	Departure	T	N	L10a	PS_A_17	47° 34' 32'' N 122° 27' 32'' W	PS_X_8	47° 34' 55'' N 122° 26' 58'' W	0.5	Kitsap	0	SS	SS	SS	SS
BremCross_ElliottBay	Arrival	X	Y	L8a	PS_X_8	47° 34' 55'' N 122° 26' 58'' W	EB_A_S1	47° 36' 28'' N 122° 25' 05'' W	2.0	Kitsap	0	17	SS	SS	SS
Tacoma_ElliottBay	Arrival	X	Y	L1	EB_A_S1	47° 36' 28'' N 122° 25' 05'' W	EB_A_4	47° 36' 52'' N 122° 23' 21'' W	1.3	King	0	15	13	10	10

Total Distance 13.2 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: SEA to MANCHESTER

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Reefer Tankers				
											Log				
											Fishing				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP I	End WP	'aypoin	Dist.	County	Cruise	Container Auto	RO/RO Fishing	Fishing	Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 2	PS_A_2	48° 28	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 2	PS_A_3	48° 13	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 1	PS_A_4	48° 13	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 1	PS_A_5	48° 09	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	X	N	L5	PS_A_5	48° 0	PS_A_6	48° 09	0.6	Calallam	0	0	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 0	PS_A_7	48° 11	11.4	Calallam	0	0	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 1	PS_A_8	48° 11	9.5	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 1	PS_A_9	48° 10	2.9	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 1	PS_A_10	48° 06	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 0	PS_A_11	48° 01	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 0	PS_A_12	47° 57	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 5	PS_A_13	47° 56	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 5	PS_A_14	47° 55	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 5	PS_A_15	47° 45	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 4	PS_A_16	47° 39	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 3	PS_A_17	47° 34	5.2	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	Y	L17a	PS_A_17	47° 3	BR_A_1	47° 33	2.1	Kitsap	0	0	16	10	SS
PS_Bremerton	Arrival	X	Y	L1a	BR_A_1	47° 3	MU_A_1	47° 33	1.0	Kitsap	0	0	12	9	8
Brem_Manchester	Arrival	X	Y	L2a	MU_A_1	47° 3	MU_B_1	47° 33	0.2	Kitsap	0	0	11	8	8

Total Distance 138.3 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: MANCHESTER to SEA

Lat/Long in WGS84 Datum

**DRAFT**

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Container		Reefer	Tankers	
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	ig WP	La	End WP	ypoi	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
Manchester_Brem	Departure	M	Y	L1	MU_D_1	47° 33' 4	MU_D_2	47°	0.2	Kitsap	0	0	11	8	8		
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	47° 33' 3	BR_D_7	47°	1.0	Kitsap	0	0	12	9	8		
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34' 0	BR_D_8	47°	0.6	Kitsap	0	0	13	9	8		
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33' 5	PS_A_17	47°	2.1	Kitsap	0	0	15	SS	SS		
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	47° 34' 3	PS_D_8	47°	1.5	Kitsap	0	0	17	SS	SS		
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35' 5	PS_D_9	47°	1.1	Kitsap	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37' 0	PS_D_10	47°	2.7	King	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39' 4	PS_D_11	47°	2.3	King	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41' 5	PS_D_12	47°	4.0	Kitsap	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45' 5	PS_D_13	47°	0.8	King	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46' 4	PS_D_14	47°	1.5	Snohomish	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48' 0	PS_D_15	47°	4.6	Kitsap	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52' 3	PS_D_16	47°	3.1	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 3	PS_D_17	47°	2.4	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 0	PS_D_18	47°	1.9	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 0	PS_D_19	48°	4.5	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 0	PS_D_20	48°	2.8	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 4	PS_D_21	48°	2.2	Jefferson	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 5	PS_D_22	48°	1.3	Jefferson	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07' 5	PS_D_23	48°	5.3	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 2	PS_D_24	48°	1.4	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11' 4	PS_D_25	48°	2.4	Jefferson	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11' 5	PS_D_26	48°	9.5	Calallam	0	0	SS	SS	SS		
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12' 4	PS_D_27	48°	11.2	Calallam	0	0	16	12	SS		
Tacoma_Sea	Departure	X	N	L27	PS_D_27	48° 10' 3	PS_D_28	48°	0.8	Calallam	0	0	8	8	8		
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11' 2	PS_D_29	48°	4.9	Calallam	0	0	14	12	SS		
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14' 1	PS_D_30	48°	3.1	Calallam	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15' 2	PS_D_31	48°	15.4	Calallam	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17' 3	PS_D_32	48°	34.1	Calallam	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30' 3	PS_D_33	48°	10.9	Calallam	0	0	SS	SS	SS		

Total Distance 139 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: MANCHESTER to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Auto	Fishing	Fishing	Fishing
Manchester_Brem	Departure	M	Y	L1	MU_D_1	47° 33' 42'' N 122° 32' 10'' W	MU_D_2	47° 33' 39'' N 122° 31' 51'' W	0.2	Kitsap	0	0	11	8	8
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	47° 33' 39'' N 122° 31' 51'' W	BR_D_7	47° 34' 04'' N 122° 31' 22'' W	1.0	Kitsap	0	0	12	9	8
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34' 04'' N 122° 31' 22'' W	BR_D_8	47° 33' 58'' N 122° 30' 31'' W	0.6	Kitsap	0	0	13	9	8
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33' 58'' N 122° 30' 31'' W	PS_A_17	47° 34' 32'' N 122° 27' 32'' W	2.1	Kitsap	0	0	15	SS	SS
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	47° 34' 32'' N 122° 27' 32'' W	PS_D_8	47° 35' 55'' N 122° 26' 45'' W	1.5	Kitsap	0	0	17	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35' 55'' N 122° 26' 45'' W	PS_D_9	47° 37' 02'' N 122° 26' 56'' W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37' 02'' N 122° 26' 56'' W	PS_D_10	47° 39' 42'' N 122° 27' 25'' W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39' 42'' N 122° 27' 25'' W	PS_D_11	47° 41' 54'' N 122° 26' 47'' W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41' 54'' N 122° 26' 47'' W	PS_D_12	47° 45' 52'' N 122° 25' 49'' W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45' 52'' N 122° 25' 49'' W	PS_D_13	47° 46' 40'' N 122° 26' 04'' W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46' 40'' N 122° 26' 04'' W	PS_D_14	47° 48' 06'' N 122° 26' 29'' W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48' 06'' N 122° 26' 29'' W	PS_D_15	47° 52' 36'' N 122° 28' 08'' W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52' 36'' N 122° 28' 08'' W	PS_D_16	47° 55' 34'' N 122° 29' 11'' W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34'' N 122° 29' 11'' W	PS_D_17	47° 57' 01'' N 122° 32' 03'' W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01'' N 122° 32' 03'' W	PS_D_18	47° 58' 07'' N 122° 34' 19'' W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07'' N 122° 34' 19'' W	PS_D_19	48° 02' 01'' N 122° 37' 40'' W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01'' N 122° 37' 40'' W	PS_D_20	48° 04' 48'' N 122° 38' 31'' W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48'' N 122° 38' 31'' W	PS_D_21	48° 06' 58'' N 122° 39' 13'' W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 58'' N 122° 39' 13'' W	PS_D_22	48° 07' 51'' N 122° 40' 43'' W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07' 51'' N 122° 40' 43'' W	PS_D_23	48° 11' 20'' N 122° 46' 47'' W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 20'' N 122° 46' 47'' W	PS_D_24	48° 11' 44'' N 122° 48' 45'' W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11' 44'' N 122° 48' 45'' W	AA_A_1	48° 13' 14'' N 122° 48' 23'' W	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	48° 13' 14'' N 122° 48' 23'' W	AA_A_2	48° 24' 06'' N 122° 43' 42'' W	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	N	L2	AA_A_2	48° 24' 06'' N 122° 43' 42'' W	AA_A_3	48° 24' 50'' N 122° 43' 44'' W	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	X	N	L3a	AA_A_3	48° 24' 50'' N 122° 43' 44'' W	RS_A_6	48° 28' 00'' N 122° 43' 53'' W	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28' 00'' N 122° 43' 53'' W	RS_A_7	48° 30' 01'' N 122° 44' 12'' W	2.0	Skagit	0	0	15	12	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 30' 01'' N 122° 44' 12'' W	RS_A_8	48° 31' 00'' N 122° 44' 21'' W	1.0	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31' 00'' N 122° 44' 21'' W	RS_A_9	48° 36' 04'' N 122° 45' 07'' W	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36' 04'' N 122° 45' 07'' W	RS_A_10	48° 37' 59'' N 122° 43' 52'' W	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37' 59'' N 122° 43' 52'' W	RS_A_11	48° 40' 15'' N 122° 42' 24'' W	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40' 15'' N 122° 42' 24'' W	RS_A_12	48° 40' 35'' N 122° 42' 10'' W	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40' 35'' N 122° 42' 10'' W	RS_A_13	48° 45' 17'' N 122° 45' 50'' W	5.3	Whatcom	0	0	15	11	SS

Total Distance 82.9 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

**OGV-Routing: CHERRY POINT/FERNDAL to MANCHESTER**

Lat/Long in WGS84 Datum

**DRAFT**

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer		Tankers		
												Container	RO/RO	Log		
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45' 16'' N 122° 47' 14'' W	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	5.3	San Juan	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	RS_D_4	48° 38' 22'' N 122° 43' 58'' W	2.2	San Juan	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38' 22'' N 122° 43' 58'' W	RS_D_5	48° 37' 43'' N 122° 44' 25'' W	0.7	Skagit	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37' 43'' N 122° 44' 25'' W	RS_D_6	48° 36' 06'' N 122° 45' 32'' W	1.8	Skagit	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36' 06'' N 122° 45' 32'' W	RS_D_7	48° 33' 58'' N 122° 45' 14'' W	2.2	Skagit	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33' 58'' N 122° 45' 14'' W	RS_D_8	48° 32' 48'' N 122° 45' 04'' W	1.2	San Juan	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32' 48'' N 122° 45' 04'' W	RS_D_9	48° 31' 41'' N 122° 44' 54'' W	1.1	Skagit	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31' 41'' N 122° 44' 54'' W	RS_D_10	48° 29' 33'' N 122° 44' 36'' W	2.1	San Juan	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29' 33'' N 122° 44' 36'' W	RS_D_11	48° 28' 53'' N 122° 44' 31'' W	0.7	Skagit	0	0	16	12	SS	
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28' 53'' N 122° 44' 31'' W	AA_D_1	48° 26' 04'' N 122° 44' 43'' W	2.8	Skagit	0	0	15	11	SS	
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26' 04'' N 122° 44' 43'' W	AA_D_2	48° 24' 08'' N 122° 44' 50'' W	1.9	San Juan	0	0	15	11	SS	
Anacortes_Admr	Departure	X	N	L2	AA_D_2	48° 24' 08'' N 122° 44' 50'' W	AA_D_3	48° 22' 25'' N 122° 45' 34'' W	1.8	San Juan	0	0	16	12	SS	
Anacortes_Admr	Departure	X	N	L3	AA_D_3	48° 22' 25'' N 122° 45' 34'' W	AA_D_4	48° 13' 29'' N 122° 49' 22'' W	9.3	Island	0	0	17	13	SS	
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13' 29'' N 122° 49' 22'' W	AA_D_5	48° 11' 32'' N 122° 48' 21'' W	2.1	Island	0	0	SS	SS	SS	
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11' 32'' N 122° 48' 21'' W	PS_A_9	48° 10' 57'' N 122° 48' 01'' W	0.6	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 57'' N 122° 48' 01'' W	PS_A_10	48° 06' 35'' N 122° 40' 10'' W	6.8	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 35'' N 122° 40' 10'' W	PS_A_11	48° 01' 08'' N 122° 38' 08'' W	5.6	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 08'' N 122° 38' 08'' W	PS_A_12	47° 57' 41'' N 122° 35' 10'' W	4.0	Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 41'' N 122° 35' 10'' W	PS_A_13	47° 56' 38'' N 122° 32' 57'' W	1.8	Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 38'' N 122° 32' 57'' W	PS_A_14	47° 55' 17'' N 122° 30' 06'' W	2.3	Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 17'' N 122° 30' 06'' W	PS_A_15	47° 45' 54'' N 122° 26' 45'' W	9.7	Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 54'' N 122° 26' 45'' W	PS_A_16	47° 39' 42'' N 122° 28' 24'' W	6.3	Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39' 42'' N 122° 28' 24'' W	PS_A_17	47° 34' 32'' N 122° 27' 32'' W	5.2	Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	X	Y	L17a	PS_A_17	47° 34' 32'' N 122° 27' 32'' W	BR_A_1	47° 33' 58'' N 122° 30' 31'' W	2.1	Kitsap	0	0	16	10	SS	
PS_Bremerton	Arrival	X	Y	L1a	BR_A_1	47° 33' 58'' N 122° 30' 31'' W	MU_A_1	47° 33' 39'' N 122° 31' 51'' W	1.0	Kitsap	0	0	12	9	8	
Brem_Manchester	Arrival	X	Y	L2a	MU_A_1	47° 33' 39'' N 122° 31' 51'' W	MU_B_1	47° 33' 42'' N 122° 32' 10'' W	0.2	Kitsap	0	0	11	8	8	

Total Distance 80.8 nm Note: SS - Service Speed



# Puget Sound Emissions Inventory

## OGV-Routing: MANCHESTER to SEATTLE

Lat/Long in WGS84 Datum

**DRAFT**

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Reefer Tankers				
													Log				
													Container RO/RO				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Long WP	Lat	End WP	Long WP	Lat	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Manchester_Brem	Departure	M	Y	L1	MU_D_1	47° 33'	W	MU_D_2	47° 33'	W	0.2	Kitsap	0	0	11	8	8
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	47° 33'	W	BR_D_7	47° 34'	W	1.0	Kitsap	0	0	12	9	8
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34'	W	BR_D_8	47° 33'	W	0.6	Kitsap	0	0	13	9	8
Bremerton_PS	Departure	T	N	L9a	BR_D_8	47° 33'	W	PS_A_17	47° 34'	W	2.1	Kitsap	0	0	15	SS	SS
PSCross_Brem	Departure	T	N	L10a	PS_A_17	47° 34'	W	PS_X_8	47° 34'	W	0.5	Kitsap	0	0	17	SS	SS
BremCross_ElliottBa	Arrival	X	Y	L8a	PS_X_8	47° 34'	W	EB_A_S1	47° 36'	W	2.0	Kitsap	0	0	17	SS	SS
Tacoma_ElliottBay	Arrival	X	Y	L1	EB_A_S1	47° 36'	W	EB_A_4	47° 36'	W	1.3	King	0	0	13	10	10
Total Distance											7.6	nm	Note: SS - Service Speed				

# Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to MANCHESTER

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP 1	End WP	ypoi	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Reefer	Bulkers
											Fast	Fast	Medium	Slow	Very Slow
											Container	RO/RO	Log	Tankers	Fishing
ElliotBay_Manchester	Departure	M	Y	L1	EB_D_1	47°	EB_D_B1	47°	1.7	King	0	0	8	6	7
ElliotBay_Manchester	Departure	M	Y	L2	EB_D_B1	47°	EB_D_B2	47°	1.5	King	0	0	8	8	8
ElliotBay_Manchester	Departure	M	Y	L3a	EB_D_B2	47°	PS_A_17	47°	0.7	Kitsap	0	0	9	9	9
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47°	BR_A_1	47°	2.1	Kitsap	0	0	16	10	SS
PS_Bremerton	Arrival	X	Y	L1a	BR_A_1	47°	MU_A_1	47°	1.0	Kitsap	0	0	12	9	8
Brem_Manchester	Arrival	X	Y	L2a	MU_A_1	47°	MU_B_1	47°	0.2	Kitsap	0	0	11	8	8

Total Distance

7.1 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to BLAKE ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L	End WP	appoin	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Very Slow
ElliotBay_Manchester	Departure	M	Y	L1	EB_D_1	47° 36	EB_D_B1	47° 30	1.7	King	0	0	8	6	7
ElliotBay_Manchester	Departure	M	Y	L2	EB_D_B1	47° 36	EB_D_B2	47° 35	1.5	King	0	0	8	8	8
ElliotBay_Manchester	Departure	M	Y	L3a	EB_D_B2	47° 35	PS_A_17	47° 34	0.7	Kitsap	0	0	9	9	9
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34	BR_A_1	47° 33	2.1	Kitsap	0	0	9	8	SS
PS_BlakeIsland	Arrival	M	Y	L1a	BR_A_1	47° 33	BI_AN_1	47° 33	0.7	Kitsap	0	0	4	4	4

Total Distance 6.6 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: MANCHESTER to PORT TOWNSEND/INDIAN ISLAND

Lat/Long in WGS84 Datum

DRAFT

													Speed by Link (knots)					
													Fast	Fast	Medium	Slow	Very Slow	
													Bulkers					
													Container		Reefer	Tankers		
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	ng WP	Lat	End WP	ig	Waypoint	La	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Manchester_Brem	Departure	M	Y	L1	MU_D_1	47° 33' 42"	MU_D_2	47° 33' 39"	N		0.2	Kitsap	0	0	11	8	8	
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	47° 33' 39"	BR_D_7	47° 34' 04"	N		1.0	Kitsap	0	0	12	9	8	
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34' 04"	BR_D_8	47° 33' 58"	N		0.6	Kitsap	0	0	13	9	8	
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33' 58"	PS_A_17	47° 34' 32"	N		2.1	Kitsap	0	0	15	SS	SS	
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	47° 34' 32"	PS_D_8	47° 35' 55"	N		1.5	Kitsap	0	0	17	SS	SS	
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35' 55"	PS_D_9	47° 37' 02"	N		1.1	Kitsap	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37' 02"	PS_D_10	47° 39' 42"	N		2.7	King	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39' 42"	PS_D_11	47° 41' 54"	N		2.3	King	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41' 54"	PS_D_12	47° 45' 52"	N		4.0	Kitsap	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45' 52"	PS_D_13	47° 46' 40"	N		0.8	King	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46' 40"	PS_D_14	47° 48' 06"	N		1.5	Snohomish	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48' 06"	PS_D_15	47° 52' 36"	N		4.6	Kitsap	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52' 36"	PS_D_16	47° 55' 34"	N		3.1	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34"	PS_D_17	47° 57' 01"	N		2.4	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01"	PS_D_18	47° 58' 07"	N		1.9	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07"	PS_D_19	48° 02' 01"	N		4.5	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01"	PS_D_20	48° 04' 48"	N		2.8	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48"	PS_D_21	48° 06' 58"	N		2.2	Jefferson	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 58"	PS_D_22	48° 07' 51"	N		1.3	Jefferson	0	0	18	SS	SS	
Tacoma_Sea	Departure	X	Y	L22a	PS_D_22	48° 07' 51"	PI_A_1	48° 08' 08"	N		0.6	Island	0	0	17	10	SS	
Bremerton_PTII	Arrival	X	Y	L1	PI_A_1	48° 08' 08"	PI_A_2	48° 08' 03"	N		0.4	Island	0	0	16	10	SS	
Bremerton_PTII	Arrival	X	Y	L2	PI_A_2	48° 08' 03"	PI_A_3	48° 07' 48"	N		1.3	Jefferson	0	0	12	8	8	
Bremerton_PTII	Arrival	M	Y	L3	PI_A_3	48° 07' 48"	PI_A_4	48° 07' 00"	N		0.8	Jefferson	0	0	10	8	8	

Total Distance 43.7 nm

# Puget Sound Emissions Inventory

OGV-Routing: MANCHESTER to MARCH POINT

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer Tankers				
												Container	RO/RO	Log	Fishing	Fishing
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing		
Manchester_Brem	Departure	M	Y	L1	MU_D_1	MU_D_2	47° 33' 35"	0.2	Kitsap	0	0	11	8	8		
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	BR_D_7	47° 34' 04"	1.0	Kitsap	0	0	12	9	8		
Bremerton_PS	Departure	X	Y	L8	BR_D_7	BR_D_8	47° 33' 58"	0.6	Kitsap	0	0	13	9	8		
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	PS_A_17	47° 34' 32"	2.1	Kitsap	0	0	15	SS	SS		
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	PS_D_8	47° 35' 55"	1.5	Kitsap	0	0	17	SS	SS		
Tacoma_Sea	Departure	T	N	L8	PS_D_8	PS_D_9	47° 37' 02"	1.1	Kitsap	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L9	PS_D_9	PS_D_10	47° 39' 42"	2.7	King	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L10	PS_D_10	PS_D_11	47° 41' 54"	2.3	King	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L11	PS_D_11	PS_D_12	47° 45' 52"	4.0	Kitsap	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L12	PS_D_12	PS_D_13	47° 46' 40"	0.8	King	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L13	PS_D_13	PS_D_14	47° 48' 06"	1.5	Snohomish	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L14	PS_D_14	PS_D_15	47° 52' 36"	4.6	Kitsap	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L15	PS_D_15	PS_D_16	47° 55' 34"	3.1	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L16	PS_D_16	PS_D_17	47° 57' 01"	2.4	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L17	PS_D_17	PS_D_18	47° 58' 07"	1.9	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L18	PS_D_18	PS_D_19	48° 02' 01"	4.5	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L19	PS_D_19	PS_D_20	48° 04' 48"	2.8	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L20	PS_D_20	PS_D_21	48° 06' 58"	2.2	Jefferson	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L21	PS_D_21	PS_D_22	48° 07' 51"	1.3	Jefferson	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L22	PS_D_22	PS_D_23	48° 11' 20"	5.3	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L23	PS_D_23	PS_D_24	48° 11' 44"	1.4	Island	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	AA_A_1	48° 13' 14"	2.2	Island	0	0	SS	SS	SS		
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	AA_A_2	48° 24' 06"	11.3	Island	0	0	18	SS	SS		
Admr_Anacortes	Arrival	T	N	L2	AA_A_2	AA_A_3	48° 24' 50"	0.7	Island	0	0	16	12	SS		
Admr_Anacortes	Arrival	T	N	L3a	AA_A_3	RS_A_6	48° 28' 00"	3.2	Skagit	0	0	15	11	SS		
PA_CherryPT	Arrival	X	Y	L6	RS_A_6	RS_A_7	48° 30' 01"	2.0	Skagit	0	0	15	11	SS		
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	MP_A_2	48° 31' 00"	1.6	Skagit	0	0	14	11	SS		
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	MP_A_3	48° 31' 04"	0.7	Skagit	0	0	14	11	SS		
RS_MarchPT	Arrival	M	Y	L3	MP_A_3	MP_A_4	48° 31' 34"	3.1	Skagit	0	0	11	8	SS		
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	MP_A_5	48° 31' 23"	1.1	Skagit	0	0	9	7	6		

Total Distance 73.2 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

**OGV-Routing: BLAKE ISLAND (ANCHORAGE) to PORT ANGELES**

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Speed by Link (knots)				
												Fast	Fast	Medium	Slow	
												Container	Reefer	Bulkers		
												Auto	RO/RO	Tankers	Log	Fishing
												Fishing	Fishing	Fishing	Fishing	Fishing
BlakeIsland_PS	Departure	M	Y	L1a	BI_AN_1	47° 33' 42" N 122° 32' 10" W	BR_D_8	47° 33' 58" N 122° 30' 31" W	0.7	Kitsap	0	0	6	3	3	
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33' 58" N 122° 30' 31" W	PS_A_17	47° 34' 32" N 122° 27' 32" W	2.1	Kitsap	0	0	15	9	SS	
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	47° 34' 32" N 122° 27' 32" W	PS_D_8	47° 35' 55" N 122° 26' 45" W	1.5	Kitsap	0	0	17	SS	SS	
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35' 55" N 122° 26' 45" W	PS_D_9	47° 37' 02" N 122° 26' 56" W	1.1	Kitsap	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37' 02" N 122° 26' 56" W	PS_D_10	47° 39' 42" N 122° 27' 25" W	2.7	King	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39' 42" N 122° 27' 25" W	PS_D_11	47° 41' 54" N 122° 26' 47" W	2.3	King	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41' 54" N 122° 26' 47" W	PS_D_12	47° 45' 52" N 122° 25' 49" W	4.0	Kitsap	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45' 52" N 122° 25' 49" W	PS_D_13	47° 46' 40" N 122° 26' 04" W	0.8	King	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46' 40" N 122° 26' 04" W	PS_D_14	47° 48' 06" N 122° 26' 29" W	1.5	Snohomish	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48' 06" N 122° 26' 29" W	PS_D_15	47° 52' 36" N 122° 28' 08" W	4.6	Kitsap	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52' 36" N 122° 28' 08" W	PS_D_16	47° 55' 34" N 122° 29' 11" W	3.1	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55' 34" N 122° 29' 11" W	PS_D_17	47° 57' 01" N 122° 32' 03" W	2.4	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57' 01" N 122° 32' 03" W	PS_D_18	47° 58' 07" N 122° 34' 19" W	1.9	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 07" N 122° 34' 19" W	PS_D_19	48° 02' 01" N 122° 37' 40" W	4.5	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02' 01" N 122° 37' 40" W	PS_D_20	48° 04' 48" N 122° 38' 31" W	2.8	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04' 48" N 122° 38' 31" W	PS_D_21	48° 06' 58" N 122° 39' 13" W	2.2	Jefferson	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06' 58" N 122° 39' 13" W	PS_D_22	48° 07' 51" N 122° 40' 43" W	1.3	Jefferson	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07' 51" N 122° 40' 43" W	PS_D_23	48° 11' 20" N 122° 46' 47" W	5.3	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 20" N 122° 46' 47" W	PS_D_24	48° 11' 44" N 122° 48' 45" W	1.4	Island	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11' 44" N 122° 48' 45" W	PS_D_25	48° 11' 57" N 122° 52' 19" W	2.4	Jefferson	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11' 57" N 122° 52' 19" W	PS_D_26	48° 12' 45" N 123° 06' 35" W	9.5	Calallam	0	0	SS	SS	SS	
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	48° 12' 45" N 123° 06' 35" W	PS_D_27	48° 10' 33" N 123° 23' 03" W	11.2	Calallam	0	0	16	12	SS	
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	48° 10' 33" N 123° 23' 03" W	PA_A_2	48° 09' 45" N 123° 23' 25" W	0.6	Calallam	0	0	8	8	8	
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09' 45" N 123° 23' 25" W	PA_A_3	48° 08' 21" N 123° 22' 25" W	1.6	Calallam	0	0	8	8	8	
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08' 21" N 123° 22' 25" W	PA_A_4	48° 08' 00" N 123° 23' 48" W	1.0	Calallam	0	0	6	6	6	

Total Distance 72.5 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: MANCHESTER to PORT ANGELES

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer Tankers				
												Container	RO/RO	Log	Fishing	Fishing
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	End WP	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing			
Manchester_Brem	Departure	M	Y	L1	MU_D_1	MU_D_2	0.2	Kitsap	0	0	11	8	8			
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	BR_D_7	1.0	Kitsap	0	0	12	9	8			
Bremerton_PS	Departure	X	Y	L8	BR_D_7	BR_D_8	0.6	Kitsap	0	0	13	9	8			
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	PS_A_17	2.1	Kitsap	0	0	15	SS	SS			
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	PS_D_8	1.5	Kitsap	0	0	17	SS	SS			
Tacoma_Sea	Departure	T	N	L8	PS_D_8	PS_D_9	1.1	Kitsap	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L9	PS_D_9	PS_D_10	2.7	King	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L10	PS_D_10	PS_D_11	2.3	King	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L11	PS_D_11	PS_D_12	4.0	Kitsap	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L12	PS_D_12	PS_D_13	0.8	King	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L13	PS_D_13	PS_D_14	1.5	Snohomish	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L14	PS_D_14	PS_D_15	4.6	Kitsap	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L15	PS_D_15	PS_D_16	3.1	Island	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L16	PS_D_16	PS_D_17	2.4	Island	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L17	PS_D_17	PS_D_18	1.9	Island	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L18	PS_D_18	PS_D_19	4.5	Island	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L19	PS_D_19	PS_D_20	2.8	Island	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L20	PS_D_20	PS_D_21	2.2	Jefferson	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L21	PS_D_21	PS_D_22	1.3	Jefferson	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L22	PS_D_22	PS_D_23	5.3	Island	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L23	PS_D_23	PS_D_24	1.4	Island	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L24	PS_D_24	PS_D_25	2.4	Jefferson	0	0	SS	SS	SS			
Tacoma_Sea	Departure	T	N	L25	PS_D_25	PS_D_26	9.5	Calallam	0	0	SS	SS	SS			
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	PS_D_27	11.2	Calallam	0	0	16	12	SS			
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	PA_A_2	0.6	Calallam	0	0	8	8	8			
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	PA_A_3	1.6	Calallam	0	0	8	8	8			
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	PA_A_4	1.0	Calallam	0	0	6	6	6			

Total Distance 73.5 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: SEA to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
													Reefer	Bulkers	
											Container	RO/RO	Log	Tankers	
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L	End WP	Waypoint I	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28'	PS_A_2	48° 28' 38'	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28'	PS_A_3	48° 13' 22'	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L3	PS_A_3	48° 13'	PS_A_4	48° 13' 20'	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	M	N	L4	PS_A_4	48° 13'	PS_A_5	48° 09' 20'	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	X	N	L5	PS_A_5	48° 09'	PS_A_6	48° 09' 58'	0.6	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48° 09'	RS_A_2	48° 16' 08'	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16'	RS_A_3	48° 19' 40'	6.6	San Juan	0	0	13	13	SS
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48° 19'	RS_A_4	48° 24' 06'	8.3	San Juan	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24'	RS_A_5	48° 26' 13'	2.7	San Juan	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26'	RS_A_6	48° 28' 00'	1.9	Skagit	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28'	RS_A_7	48° 30' 01'	2.0	Skagit	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 30'	RS_A_8	48° 31' 00'	1.0	San Juan	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31'	RS_A_9	48° 36' 04'	5.1	Skagit	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36'	RS_A_10	48° 37' 59'	2.1	Skagit	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37'	RS_A_11	48° 40' 15'	2.5	San Juan	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40'	RS_A_12	48° 40' 35'	0.4	Whatcom	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40'	RS_A_13	48° 45' 17'	5.3	Whatcom	0	0	11	11	SS

Total Distance 120.3 nm

Note: SS - Service Speed



## Puget Sound Emissions Inventory

### OGV-Routing: CHERRY POINT/FERNDALE HARBOR

Lat/Long in WGS84 Datum

Route	Arr/Dep	Link ID	Start WP	ng WP	Lat	End WP	Waypoint Dist.	County	Speed by Link (knots)					
									Cruise	Auto	Fishing	Fishing	Fishing	
PA_CherryPT	Arrival					RS_A_13	122° 45' 5"	Whatcom						
CherryPT_PT	Departure		RS_D_2			122° 47' 14" W		Whatcom						

NOTE: All ARRIVAL harbor transits branch from RS\_A\_13

NOTE: All DEPARTURE harbor transits goto RS\_D\_1

#### Ferndale Route to Ferndale\_Intalco

Ferndale_Intalco	Arrival	L1a	RS_A_13			122°	FI_B_1	122'	5.38	Whatcom	0	0	4	4	4
Ferndale_Intalco	Departure	L1a	FI_B_1			122°	RS_D_2	122'	5.76	Whatcom	0	0	6	6	6

#### Ferndale\_Intalco to SandyPoint Anchorage

Ferndale_Intalco_SandyPoint	Arrival	L1a	FI_B_1			122°	FA_AN_3	122'	2.59	Whatcom	0	0	4	4	4
SandyPoint_Ferndale_Intalco	Departure	L1a	FA_AN_3			122°	FI_B_1	122'	2.59	Whatcom	0	0	6	6	6

Ferndale_Phillips	Arrival	L1a	RS_A_13			122°	FP_B_2	122'	4.61	Whatcom	0	0	4	4	4
Ferndale_Phillips	Departure	L1a	FP_B_2			122°	RS_D_2	122'	5.04	Whatcom	0	0	6	6	6

#### Ferndale\_Phillips to SandyPoint Anchorage

Ferndale_Phillips_SandyPoint	Arrival	L1a	FP_B_2			122°	FA_AN_3	122'	2.19	Whatcom	0	0	4	4	4
SandyPoint_Ferndale_Phillips	Departure	L1a	FA_AN_3			122°	FP_B_2	122'	2.19	Whatcom	0	0	6	6	6

CherryPT_BP	Arrival	L1a	RS_A_13			122°	FC_A_1	122'	3.28	Whatcom	0	0	4	4	4
CherryPT_BP	Arrival	L2	FC_A_1			122°	FC_B_3	122'	3.23	Whatcom	0	0	6	6	6

Total Distance 6.51 nm

CherryPT_BP	Departure	L1	FC_B_3			122°	FC_D_2	122'	3.23	Whatcom	0	0	4	4	4
CherryPT_BP	Departure	L2a	FC_D_2			122°	RS_D_2	122'	3.39	Whatcom	0	0	6	6	6

Total Distance 6.62 nm

#### CherryPT\_BP to SandyPoint Anchorage

CherryPT_BP_SandyPoint	Departure	L1a	FC_B_3			122°	FA_AN_3	122'	3.14	Whatcom	0	0	4	4	4
SandyPoint_CherryPT_BP	Arrival	L1a	FA_AN_3			122°	FC_B_3	122'	3.14	Whatcom	0	0	6	6	6

#### PA\_CherryPT\_SandyPoint Anchorage

PA_CherryPT_SandyPoint	Arrival	L1a	RS_A_13			122°	FA_AN_3	122'	3.24	Whatcom	0	0	4	4	4
SandyPT_CherryPT_PA	Departure	L1a	FA_AN_3			122°	RS_D_2	122'	3.24	Whatcom	0	0	6	6	6

**Puget Sound Emissions Inventory**

**OGV-Routing: CHERRY POINT/ FERNDALE to SEA**

Lat/Long in WGS84 Datum

**DRAFT**

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
														Bulkers		
												Container	Reefer	Tankers		
												Auto	RO/RO	Log		
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45' 16" N 122° 47' 14" W	RS_D_3	48° 40' 34" N 122° 43' 28" W	5.3	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40' 34" N 122° 43' 28" W	RS_D_4	48° 38' 22" N 122° 43' 58" W	2.2	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38' 22" N 122° 43' 58" W	RS_D_5	48° 37' 43" N 122° 44' 25" W	0.7	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37' 43" N 122° 44' 25" W	RS_D_6	48° 36' 06" N 122° 45' 32" W	1.8	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36' 06" N 122° 45' 32" W	RS_D_7	48° 33' 58" N 122° 45' 14" W	2.2	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33' 58" N 122° 45' 14" W	RS_D_8	48° 32' 48" N 122° 45' 04" W	1.2	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32' 48" N 122° 45' 04" W	RS_D_9	48° 31' 41" N 122° 44' 54" W	1.1	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31' 41" N 122° 44' 54" W	RS_D_10	48° 29' 33" N 122° 44' 36" W	2.1	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29' 33" N 122° 44' 36" W	RS_D_11	48° 28' 53" N 122° 44' 31" W	0.7	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L10	RS_D_11	48° 28' 53" N 122° 44' 31" W	RS_D_12	48° 27' 12" N 122° 45' 18" W	1.8	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L11	RS_D_12	48° 27' 12" N 122° 45' 18" W	RS_D_13	48° 26' 10" N 122° 45' 48" W	1.1	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L12	RS_D_13	48° 26' 10" N 122° 45' 48" W	RS_D_14	48° 24' 37" N 122° 48' 09" W	2.2	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L13	RS_D_14	48° 24' 37" N 122° 48' 09" W	RS_D_15	48° 20' 13" N 122° 58' 21" W	8.1	San Juan	0	0	SS	SS	SS	
CherryPT_PA	Departure	X	N	L14a	RS_D_15	48° 20' 13" N 122° 58' 21" W	PS_D_27	48° 10' 33" N 123° 23' 03" W	19.0	Calallam	0	0	SS	SS	SS	
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10' 33" N 123° 23' 03" W	PS_D_28	48° 11' 21" N 123° 23' 02" W	0.8	Calallam	0	0	8	8	8	
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11' 21" N 123° 23' 02" W	PS_D_29	48° 14' 13" N 123° 28' 57" W	4.9	Calallam	0	0	14	12	SS	
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14' 13" N 123° 28' 57" W	PS_D_30	48° 15' 21" N 123° 33' 17" W	3.1	Calallam	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15' 21" N 123° 33' 17" W	PS_D_31	48° 17' 36" N 123° 56' 06" W	15.4	Calallam	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17' 36" N 123° 56' 06" W	PS_D_32	48° 30' 38" N 124° 43' 36" W	34.1	Calallam	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30' 38" N 124° 43' 36" W	PS_D_33	48° 30' 43" N 125° 00' 00" W	10.9	Calallam	0	0	SS	SS	SS	

Total Distance 118.6 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to VENDOVI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

## DRAFT

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Reefer		Tankers		
													Container	RO/RO	Log		
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing		
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45' 16'' N 122° 47' 14'' W	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	5.3	San Juan	0	0	15	13	SS		
CherryPT_PA	Departure	X	Y	L2a	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	SG_A_1	48° 39' 27'' N 122° 41' 37'' W	1.7	San Juan	0	0	13	9	SS		
GStght_Vendovi	Arrival	X	Y	L1	SG_A_1	48° 39' 27'' N 122° 41' 37'' W	SG_A_2	48° 38' 43'' N 122° 40' 24'' W	1.1	Whatcom	0	0	12	8	SS		
GStght_Vendovi	Arrival	M	Y	L2	SG_A_2	48° 38' 43'' N 122° 40' 24'' W	VI_AN_3	48° 37' 16'' N 122° 37' 59'' W	2.2	Skagit	0	0	6	4	SS		
Total Distance										10.2 nm							

# Puget Sound Emissions Inventory

OGV-Routing: VENDОВI ISLAND (ANCHORAGE) to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP I	End WP	g	Waypoint La	Dist.	County	Cruise	Auto	Speed by Link (knots)		
														Container	RO/RO	Log
Vendovi_GStght	Departure	M	Y	L1	VI_AN_3	48° 3	LI_D_2	48° 38' 43" N	1.9	Skagit	0	0	10	8	SS	
Vendovi_GStght	Departure	X	Y	L2a	LI_D_2	48° 3	RS_A_12	48° 40' 35" N	2.4	Whatcom	0	0	12	10	SS	
PA_CherryPT	Arrival	X	Y	L12a	RS_A_12	48° 4	RS_A_13	48° 45' 17" N	5.3	Whatcom	0	0	15	11	SS	

Total Distance 9.6 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: SEATTLE to VENDOVI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	End WP	Dist.	County	Speed by Link (knots)				
									Cruise	Auto	Fishing	Bulkers	Very Slow
									Fast	Fast	Medium	Slow	Very Slow
									Container	Reefer	RO/RO	Bulkers	Very Slow
									Auto	Fishing	Log	Fishing	Fishing
ElliottB_PS	Departure	X	Y	L1	EB_D_1	EB_D_2	2.6	King	0	0	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	PS_D_10	1.5	King	0	0	SS	SS	7
Tacoma_Sea	Departure	T	N	L10	PS_D_10	PS_D_11	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	PS_D_12	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	PS_D_13	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	PS_D_14	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	PS_D_15	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	PS_D_16	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	PS_D_17	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	PS_D_18	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	PS_D_19	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	PS_D_20	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	PS_D_21	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	PS_D_22	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	PS_D_23	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	PS_D_24	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	AA_A_1	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	Y	L1	AA_A_1	AA_A_2	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	Y	L2	AA_A_2	AA_A_3	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	X	Y	L3a	AA_A_3	RS_A_6	3.2	Skagit	0	0	15	11	SS
RS_Bellingham	Arrival	X	Y	L1a	RS_A_6	BH_A_2	2.2	Skagit	0	0	14	11	SS
RS_Bellingham	Arrival	X	Y	L2	BH_A_2	BH_A_3	3.7	Skagit	0	0	12	10	SS
RS_Bellingham	Arrival	M	Y	L3	BH_A_3	BH_A_4	2.9	Skagit	0	0	8	6	6
RS_Bellingham	Arrival	M	Y	L4	BH_A_4	VI_AN_3	1.5	Skagit	0	0	4	3	3

Total Distance 69.9 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

OGV-Routing: **CHERRY POINT/FERNDAL to SEATTLE**

Lat/Long in WGS84 Datum

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)					
											Cruise	Container	Reefer	Bulkers	Very Slow	
												Fast	Fast	Medium	Slow	
														RO/RO	Log	Fishing
													Auto	Fishing	Fishing	Fishing
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45' 16" N 122° 47' 14" W	RS_D_3	48° 40' 34" N 122° 43' 28" W	5.3	San Juan	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40' 34" N 122° 43' 28" W	RS_D_4	48° 38' 22" N 122° 43' 58" W	2.2	San Juan	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38' 22" N 122° 43' 58" W	RS_D_5	48° 37' 43" N 122° 44' 25" W	0.7	Skagit	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37' 43" N 122° 44' 25" W	RS_D_6	48° 36' 06" N 122° 45' 32" W	1.8	Skagit	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36' 06" N 122° 45' 32" W	RS_D_7	48° 33' 58" N 122° 45' 14" W	2.2	Skagit	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33' 58" N 122° 45' 14" W	RS_D_8	48° 32' 48" N 122° 45' 04" W	1.2	San Juan	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32' 48" N 122° 45' 04" W	RS_D_9	48° 31' 41" N 122° 44' 54" W	1.1	Skagit	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31' 41" N 122° 44' 54" W	RS_D_10	48° 29' 33" N 122° 44' 36" W	2.1	San Juan	0	0	15	11	SS	
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29' 33" N 122° 44' 36" W	RS_D_11	48° 28' 53" N 122° 44' 31" W	0.7	Skagit	0	0	16	12	SS	
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28' 53" N 122° 44' 31" W	AA_D_1	48° 26' 04" N 122° 44' 43" W	2.8	Skagit	0	0	15	11	SS	
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26' 04" N 122° 44' 43" W	AA_D_2	48° 24' 08" N 122° 44' 50" W	1.9	San Juan	0	0	15	11	SS	
Anacortes_Admr	Departure	X	N	L2	AA_D_2	48° 24' 08" N 122° 44' 50" W	AA_D_3	48° 22' 25" N 122° 45' 34" W	1.8	San Juan	0	0	16	12	SS	
Anacortes_Admr	Departure	X	N	L3	AA_D_3	48° 22' 25" N 122° 45' 34" W	AA_D_4	48° 13' 29" N 122° 49' 22" W	9.3	Island	0	0	17	13	SS	
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13' 29" N 122° 49' 22" W	AA_D_5	48° 11' 32" N 122° 48' 21" W	2.1	Island	0	0	SS	SS	SS	
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11' 32" N 122° 48' 21" W	PS_A_9	48° 10' 57" N 122° 48' 01" W	0.6	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 57" N 122° 48' 01" W	PS_A_10	48° 06' 35" N 122° 40' 10" W	6.8	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 35" N 122° 40' 10" W	PS_A_11	48° 01' 08" N 122° 38' 08" W	5.6	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 08" N 122° 38' 08" W	PS_A_12	47° 57' 41" N 122° 35' 10" W	4.0	Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 41" N 122° 35' 10" W	PS_A_13	47° 56' 38" N 122° 32' 57" W	1.8	Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 38" N 122° 32' 57" W	PS_A_14	47° 55' 17" N 122° 30' 06" W	2.3	Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 17" N 122° 30' 06" W	PS_A_15	47° 45' 54" N 122° 26' 45" W	9.7	Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 54" N 122° 26' 45" W	PS_A_16	47° 39' 42" N 122° 28' 24" W	6.3	Kitsap	0	0	13	SS	SS	
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39' 42" N 122° 28' 24" W	EB_A_2	47° 39' 21" N 122° 28' 02" W	0.4	Kitsap	0	0	13	9	8	
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39' 21" N 122° 28' 02" W	EB_A_3	47° 38' 16" N 122° 26' 36" W	1.5	King	0	0	12	8	7	
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38' 16" N 122° 26' 36" W	EB_A_4	47° 36' 52" N 122° 23' 21" W	2.6	King	0	0	11	6	6	

Total Distance 76.8 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
ElliottB_PS	Departure	X	Y	L1	EB_D_1	47°	EB_D_2	47° 38' 2"	2.6	King	0	0	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47°	PS_D_10	47° 39' 4"	1.5	King	0	0	SS	SS	7
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47°	PS_D_11	47° 41' 5"	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47°	PS_D_12	47° 45' 5"	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47°	PS_D_13	47° 46' 4"	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47°	PS_D_14	47° 48' 0"	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47°	PS_D_15	47° 52' 3"	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47°	PS_D_16	47° 55' 3"	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47°	PS_D_17	47° 57' 0"	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47°	PS_D_18	47° 58' 0"	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47°	PS_D_19	48° 02' 0"	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48°	PS_D_20	48° 04' 4"	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48°	PS_D_21	48° 06' 5"	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48°	PS_D_22	48° 07' 5"	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48°	PS_D_23	48° 11' 2"	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48°	PS_D_24	48° 11' 4"	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48°	AA_A_1	48° 13' 7"	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	48°	AA_A_2	48° 24' 0"	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	N	L2	AA_A_2	48°	AA_A_3	48° 24' 5"	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	X	N	L3a	AA_A_3	48°	RS_A_6	48° 28' 0"	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48°	RS_A_7	48° 30' 0"	2.0	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48°	RS_A_8	48° 31' 0"	1.0	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48°	RS_A_9	48° 36' 0"	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48°	RS_A_10	48° 37' 5"	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48°	RS_A_11	48° 40' 5"	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48°	RS_A_12	48° 40' 5"	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48°	RS_A_13	48° 45' 5"	5.3	Whatcom	0	0	15	11	SS

Total Distance 77.9 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to TACOMA

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Container	Reefer RO/RO	Bulkers Log	Tankers Fishing
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45' 16" N 122° 47' 14" W	RS_D_3	48° 40' 34" N 122° 43' 28" W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40' 34" N 122° 43' 28" W	RS_D_4	48° 38' 22" N 122° 43' 58" W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38' 22" N 122° 43' 58" W	RS_D_5	48° 37' 43" N 122° 44' 25" W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37' 43" N 122° 44' 25" W	RS_D_6	48° 36' 06" N 122° 45' 32" W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36' 06" N 122° 45' 32" W	RS_D_7	48° 33' 58" N 122° 45' 14" W	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33' 58" N 122° 45' 14" W	RS_D_8	48° 32' 48" N 122° 45' 04" W	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32' 48" N 122° 45' 04" W	RS_D_9	48° 31' 41" N 122° 44' 54" W	1.1	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31' 41" N 122° 44' 54" W	RS_D_10	48° 29' 33" N 122° 44' 36" W	2.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29' 33" N 122° 44' 36" W	RS_D_11	48° 28' 53" N 122° 44' 31" W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28' 53" N 122° 44' 31" W	AA_D_1	48° 26' 04" N 122° 44' 43" W	2.8	Skagit	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26' 04" N 122° 44' 43" W	AA_D_2	48° 24' 08" N 122° 44' 50" W	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24' 08" N 122° 44' 50" W	AA_D_3	48° 22' 25" N 122° 45' 34" W	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	X	N	L3	AA_D_3	48° 22' 25" N 122° 45' 34" W	AA_D_4	48° 13' 29" N 122° 49' 22" W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13' 29" N 122° 49' 22" W	AA_D_5	48° 11' 32" N 122° 48' 21" W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11' 32" N 122° 48' 21" W	PS_A_9	48° 10' 57" N 122° 48' 01" W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 57" N 122° 48' 01" W	PS_A_10	48° 06' 35" N 122° 40' 10" W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 35" N 122° 40' 10" W	PS_A_11	48° 01' 08" N 122° 38' 08" W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 08" N 122° 38' 08" W	PS_A_12	47° 57' 41" N 122° 35' 10" W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 41" N 122° 35' 10" W	PS_A_13	47° 56' 38" N 122° 32' 57" W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 38" N 122° 32' 57" W	PS_A_14	47° 55' 17" N 122° 30' 06" W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 17" N 122° 30' 06" W	PS_A_15	47° 45' 54" N 122° 26' 45" W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 54" N 122° 26' 45" W	PS_A_16	47° 39' 42" N 122° 28' 24" W	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39' 42" N 122° 28' 24" W	PS_A_17	47° 34' 32" N 122° 27' 32" W	5.2	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34' 32" N 122° 27' 32" W	PS_A_18	47° 31' 51" N 122° 26' 34" W	2.8	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	X	Y	L18	PS_A_18	47° 31' 51" N 122° 26' 34" W	PS_A_19	47° 26' 44" N 122° 24' 45" W	5.3	King	0	0	16	13	SS
Sea_Tacoma	Arrival	X	Y	L19	PS_A_19	47° 26' 44" N 122° 24' 45" W	PS_A_20	47° 23' 09" N 122° 21' 56" W	4.1	King	0	0	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23' 09" N 122° 21' 56" W	PS_A_21	47° 19' 39" N 122° 27' 52" W	5.3	King	0	0	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19' 39" N 122° 27' 52" W	PS_A_22	47° 19' 10" N 122° 28' 05" W	0.5	King	0	0	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19' 10" N 122° 28' 05" W	PS_A_23	47° 18' 07" N 122° 27' 41" W	1.1	Pierce	0	0	10	10	8

Total Distance 96.5 nm

Note: SS - Service Speed



# Puget Sound Emissions Inventory

OGV-Routing: TACOMA to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

## DRAFT

										Speed by Link (knots)					
										Fast	Fast	Medium	Slow	Very Slow	
										Bulkers					
										Reefer Tankers					
										Container RO/RO Log					
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP 1	End WP	Waypoint 1	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Tacoma_Sea	Departure	M	Y	L2	PS_D_2	47° 19' 20	PS_D_3	47° 19' 20	1.3	Pierce	0	0	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19' 54	PS_D_4	47° 19' 54	0.9	Pierce	0	0	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 23' 04	PS_D_5	47° 23' 04	4.8	King	0	0	14	SS	SS
Tacoma_Sea	Departure	X	Y	L5	PS_D_5	47° 26' 56	PS_D_6	47° 26' 56	4.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	X	Y	L6	PS_D_6	47° 34' 32	PS_D_7	47° 34' 32	7.8	King	0	0	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 35' 55	PS_D_8	47° 35' 55	1.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 37' 02	PS_D_9	47° 37' 02	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 39' 42	PS_D_10	47° 39' 42	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 41' 54	PS_D_11	47° 41' 54	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 45' 52	PS_D_12	47° 45' 52	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 46' 40	PS_D_13	47° 46' 40	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 48' 06	PS_D_14	47° 48' 06	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 52' 36	PS_D_15	47° 52' 36	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 55' 34	PS_D_16	47° 55' 34	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 57' 01	PS_D_17	47° 57' 01	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 58' 07	PS_D_18	47° 58' 07	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58' 01	PS_D_19	48° 02' 01	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 04' 48	PS_D_20	48° 04' 48	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 06' 58	PS_D_21	48° 06' 58	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 07' 51	PS_D_22	48° 07' 51	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 11' 20	PS_D_23	48° 11' 20	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11' 44	PS_D_24	48° 11' 44	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 13' 14	AA_A_1	48° 13' 14	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	48° 24' 06	AA_A_2	48° 24' 06	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	N	L2	AA_A_2	48° 24' 50	AA_A_3	48° 24' 50	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	T	N	L3a	AA_A_3	48° 28' 00	RS_A_6	48° 28' 00	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 30' 01	RS_A_7	48° 30' 01	2.0	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 31' 00	RS_A_8	48° 31' 00	1.0	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 36' 04	RS_A_9	48° 36' 04	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 37' 59	RS_A_10	48° 37' 59	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 40' 15	RS_A_11	48° 40' 15	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40' 35	RS_A_12	48° 40' 35	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 45' 17	RS_A_13	48° 45' 17	5.3	Whatcom	0	0	15	11	SS

Total Distance 98.2 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

**OGV-Routing: CHERRY POINT/FERNDALE to MARCH POINT**

Lat/Long in WGS84 Datum

Speed by Link (knots)

	Fast	Fast	Medium	Slow	Very Slow
--	------	------	--------	------	-----------

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Very Slow
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45' 16'' N 122° 47' 14'' W	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	RS_D_4	48° 38' 22'' N 122° 43' 58'' W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38' 22'' N 122° 43' 58'' W	RS_D_5	48° 37' 43'' N 122° 44' 25'' W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37' 43'' N 122° 44' 25'' W	RS_D_6	48° 36' 06'' N 122° 45' 32'' W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36' 06'' N 122° 45' 32'' W	RS_D_7	48° 33' 58'' N 122° 45' 14'' W	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33' 58'' N 122° 45' 14'' W	RS_D_8	48° 32' 48'' N 122° 45' 04'' W	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32' 48'' N 122° 45' 04'' W	RS_D_9	48° 31' 41'' N 122° 44' 54'' W	1.1	Skagit	0	0	15	13	SS
CherryPT_MP	Arrival	X	Y	L1a	RS_D_9	48° 31' 41'' N 122° 44' 54'' W	MP_A_2	48° 31' 00'' N 122° 42' 20'' W	1.8	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31' 00'' N 122° 42' 20'' W	MP_A_3	48° 31' 04'' N 122° 41' 17'' W	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	48° 31' 04'' N 122° 41' 17'' W	MP_A_4	48° 31' 34'' N 122° 36' 40'' W	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31' 34'' N 122° 36' 40'' W	MP_A_5	48° 31' 23'' N 122° 35' 00'' W	1.1	Skagit	0	0	9	7	6

Total Distance 21.3 nm

# Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to CHERRY POINT/ FERNDALE

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP	End WP	'aypoin	Dist.	County	Cruise	Speed by Link (knots)			
												Container	Reefer	Bulkers	Very Slow
											Auto	RO/RO	Log	Fishing	
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48°	MP_D_2	48° 31	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	M	Y	L2	MP_D_2	48°	MP_D_3	48° 31	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48°	MP_D_4	48° 31	0.7	Skagit	0	0	14	11	SS
March PT_CPFrn	Departure	T	N	L1a	MP_D_4	48°	RS_A_8	48° 31	1.3	Skagit	0	0	14	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48°	RS_A_9	48° 36	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48°	RS_A_10	48° 37	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48°	RS_A_11	48° 40	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48°	RS_A_12	48° 40	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48°	RS_A_13	48° 45	5.3	Whatcom	0	0	15	11	SS

Total Distance 21.6 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

OGV-Routing: **CHERRY POINT/FERNDALÉ to PORT ANGELES**

Lat/Long in WGS84 Datum

Speed by Link (knots)  
 Fast Fast Medium Slow Very Slow

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Container	Reefer	Bulkers		
												Auto	RO/RO	Tankers	Log	Fishing
												Fishing	Fishing	Fishing	Fishing	Fishing
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45' 16'' N 122° 47' 14'' W	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	5.3	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	RS_D_4	48° 38' 22'' N 122° 43' 58'' W	2.2	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38' 22'' N 122° 43' 58'' W	RS_D_5	48° 37' 43'' N 122° 44' 25'' W	0.7	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37' 43'' N 122° 44' 25'' W	RS_D_6	48° 36' 06'' N 122° 45' 32'' W	1.8	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36' 06'' N 122° 45' 32'' W	RS_D_7	48° 33' 58'' N 122° 45' 14'' W	2.2	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33' 58'' N 122° 45' 14'' W	RS_D_8	48° 32' 48'' N 122° 45' 04'' W	1.2	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32' 48'' N 122° 45' 04'' W	RS_D_9	48° 31' 41'' N 122° 44' 54'' W	1.1	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31' 41'' N 122° 44' 54'' W	RS_D_10	48° 29' 33'' N 122° 44' 36'' W	2.1	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	X	N	L9	RS_D_10	48° 29' 33'' N 122° 44' 36'' W	RS_D_11	48° 28' 53'' N 122° 44' 31'' W	0.7	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	X	N	L10	RS_D_11	48° 28' 53'' N 122° 44' 31'' W	RS_D_12	48° 27' 12'' N 122° 45' 18'' W	1.8	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	X	N	L11	RS_D_12	48° 27' 12'' N 122° 45' 18'' W	RS_D_13	48° 26' 10'' N 122° 45' 48'' W	1.1	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L12	RS_D_13	48° 26' 10'' N 122° 45' 48'' W	RS_D_14	48° 24' 37'' N 122° 48' 09'' W	2.2	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L13	RS_D_14	48° 24' 37'' N 122° 48' 09'' W	RS_D_15	48° 20' 13'' N 122° 58' 21'' W	8.1	San Juan	0	0	SS	SS	SS	
CherryPT_PA	Departure	X	Y	L14a	RS_D_15	48° 20' 13'' N 122° 58' 21'' W	PS_D_27	48° 10' 33'' N 123° 23' 03'' W	19.0	Calallam	0	0	SS	SS	SS	
CPFern_PA	Arrival	M	Y	L1a	PS_D_27	48° 10' 33'' N 123° 23' 03'' W	PA_A_2	48° 09' 45'' N 123° 23' 25'' W	0.8	Calallam	0	0	8	8	8	
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09' 45'' N 123° 23' 25'' W	PA_A_3	48° 08' 21'' N 123° 22' 25'' W	1.6	Calallam	0	0	8	8	8	
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08' 21'' N 123° 22' 25'' W	PA_A_4	48° 08' 00'' N 123° 23' 48'' W	1.0	Calallam	0	0	6	6	6	

Total Distance 52.8 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP	End WP	apport	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48°	PA_D_2	48° 0'	1.2	Calallam	0	0	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48°	PA_D_3	48° 0'	1.5	Calallam	0	0	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48°	PS_A_6	48° 0'	0.5	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	X	Y	L1a	PS_A_6	48°	RS_A_2	48° 1'	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48°	RS_A_3	48° 1'	6.6	San Juan	0	0	13	13	SS
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48°	RS_A_4	48° 2'	8.3	San Juan	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48°	RS_A_5	48° 2'	2.7	San Juan	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48°	RS_A_6	48° 2'	1.9	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48°	RS_A_7	48° 3'	2.0	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48°	RS_A_8	48° 3'	1.0	San Juan	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48°	RS_A_9	48° 3'	5.1	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48°	RS_A_10	48° 3'	2.1	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48°	RS_A_11	48° 4'	2.5	San Juan	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48°	RS_A_12	48° 4'	0.4	Whatcom	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48°	RS_A_13	48° 4'	5.3	Whatcom	0	0	13	11	SS

Total Distance 54.0 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

**OGV-Routing: CHERRY POINT/FERNDALE to VANCOUVER (NB3)**

Lat/Long in WGS84 Datum

Speed by Link (knots)				
Fast	Fast	Medium	Slow	Very Slow
				Bulkers
				Reefer Tankers
	Container	RO/RO		Log
		Fishing	Fishing	Fishing

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
CherryPT_PA	Departure	X	Y	L1a	RS_D_2	48° 45' 16'' N 122° 47' 14'' W	SG_D_1	48° 47' 27'' N 122° 51' 18'' W	3.45	San Juan	0	0	15	13	SS
BuoyYCA_NB3	Departure	T	N	L2	SG_D_1	48° 47' 27'' N 122° 51' 18'' W	SG_D_2	49° 00' 09'' N 123° 14' 09'' W	19.67	Whatcom	0	0	SS	SS	SS

Total Distance 23.12 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB3) to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

## DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	ing WP	Lat,	End WP	ing Waypoint	Lat/Dist.	County	Speed by Link (knots)				
												Cruise	Auto	Fishing	Fishing	Fishing
NB3_CherryPT	Arrival	T	N	L1	NB3_A_1	49° 00' 09''	NB3_A_2	48° 49' 10'' N	12:	17.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L2	NB3_A_2	48° 49' 10''	NB3_A_3	48° 45' 54'' N	12:	6.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	X	Y	L3a	NB3_A_3	48° 45' 54''	RS_D_2	48° 45' 16'' N	12:	2.0	San Juan	0	0	17	13	SS
CherryPT_Cross	Arrival	X	Y	L1a	RS_D_2	48° 45' 16''	RS_A_13	48° 45' 17'' N	12:	1.0	Whatcom	0	0	15	11	SS
Total Distance										26.4 nm	Note: SS - Service Speed					

# Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB3) to VENDОВI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	VP	End WP	rho	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
NB3_CherryPT	Arrival	T	N	L1	NB3_A_1	4	NB3_A_2	4	17.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L2	NB3_A_2	4	NB3_A_3	4	6.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	X	Y	L3a	NB3_A_3	4	RS_D_2	4	2.0	San Juan	0	0	17	13	SS
CherryPT_Cross	Arrival	X	Y	L1	RS_D_2	4	RS_D_3	4	5.3	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	X	Y	L2a	RS_D_3	4	SG_A_1	4	1.7	San Juan	0	0	13	9	SS
GStght_Vendovi	Arrival	X	Y	L1	SG_A_1	4	SG_A_2	4	1.1	Whatcom	0	0	12	8	SS
GStght_Vendovi	Arrival	M	Y	L2	SG_A_2	4	VI_AN_3	4	2.2	Skagit	0	0	6	4	SS

Total Distance 35.6 nm



# Puget Sound Emissions Inventory

## OGV-Routing: SEA to MARCH POINT

Lat/Long in WGS84 Datum

DRAFT

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Container		Reefer	Tankers	Other
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	ng WP	Lat	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28' 30	PS_A_2	48° 28' 3	10.7	Calallam	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28' 38	PS_A_3	48° 13' 2	35.9	Calallam	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13' 22	PS_A_4	48° 13' 2	15.4	Calallam	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13' 20	PS_A_5	48° 09' 2	6.9	Calallam	0	0	15	12	SS		
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09' 20	PS_A_6	48° 09' 5	0.6	Calallam	0	0	8	8	8		
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48° 09' 58	RS_A_2	48° 16' 0	13.1	Calallam	0	0	15	13.5	SS		
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16' 08	RS_A_3	48° 19' 4	6.6	San Juan	0	0	15	13	SS		
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48° 19' 40	RS_A_4	48° 24' 0	8.3	San Juan	0	0	15	11	SS		
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24' 06	RS_A_5	48° 26' 1	2.7	San Juan	0	0	15	11	SS		
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26' 13	RS_A_6	48° 28' 0	1.9	Skagit	0	0	15	11	SS		
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28' 00	RS_A_7	48° 30' 0	2.0	Skagit	0	0	15	11	SS		
RS_MarchPT	Arrival	T	N	L1a	RS_A_7	48° 30' 01	MP_A_2	48° 31' 0	1.6	Skagit	0	0	13	11	SS		
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31' 00	MP_A_3	48° 31' 0	0.7	Skagit	0	0	13	11	SS		
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	48° 31' 04	MP_A_4	48° 31' 3	3.1	Skagit	0	0	11	8	SS		
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31' 34	MP_A_5	48° 31' 2	1.1	Skagit	0	0	9	7	6		
Total Distance										110.5 nm							

# Puget Sound Emissions Inventory

## OGV-Routing: MARCH POINT HARBOR

Lat/Long in WGS84 Datum

Speed by Link (knots)				
Fast	Fast	Medium	Slow	Very Slow
				<b>Bulkers</b>
				<b>Reefer Tankers</b>
				<b>Container RO/RO Log</b>
				<b>Fishing Fishing Fishing</b>

### DRAFT

Route	Arr/Dep	Link ID	Start WP	1g WP La	End WP	g Waypoint La	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
RS_MarchPT	Arrival	L4	MP_A_5	48° 31' 2	Mode:	M		Skagit					
MarchPT_RS	Departure	L5	MP_D_5	48° 30' 3	NPE:	Y		Skagit					

NOTE: All ARRIVAL harbor transits branch from MP\_A\_5

NOTE: All DEPARTURE harbor transits goto MP\_D\_5

MP_Shell	Arrival	L1a	MP_A_5	48° 31' 2	MP_B_1	23'' N 122° 35	0.81	Skagit	0	0	3	3	3
MP_Shell	Departure	L1a	MP_B_1	'' N 122°	MP_D_5	48° 30' 33'' N	0.81	Skagit	0	0	4	4	4
MP_Tosoro	Arrival	L1a	MP_A_5	48° 31' 2	MP_B_2	32'' N 122° 34	1.02	Skagit	0	0	3	3	3
MP_Tosoro	Departure	L1a	MP_B_2	'' N 122°	MP_D_5	48° 30' 33'' N	1.02	Skagit	0	0	4	4	4
MP_Anchorage	Arrival	L1a	MP_A_5	48° 31' 2	MP_AN_1	26'' N 122° 33	0.69	Skagit	0	0	2	2	2
MP_Anchorage	Departure	L1a	MP_AN_1	'' N 122°	MP_D_5	48° 30' 33'' N	0.69	Skagit	0	0	3	3	3

# Puget Sound Emissions Inventory

## OGV-Routing: MARCH POINT to SEA

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)					
											Fast	Fast	Medium	Slow	Very Slow	
											Bulkers					
											Reefer Tankers					
											Log					
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP	L WP	End WP	Waypoint	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulker Fishing	Very Slow Fishing
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31'	MP_D_2	48° 31'	1.1	Skagit	0	0	9	8	6	
MarchPT_RS	Departure	X	Y	L2	MP_D_2	48° 31'	MP_D_3	48° 31'	3.1	Skagit	0	0	12	10	SS	
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 31'	MP_D_4	48° 31'	0.7	Skagit	0	0	14	11	SS	
MarchPT_RS	Departure	T	N	L4a	MP_D_4	48° 31'	RS_A_7	48° 30'	1.6	Skagit	0	0	15	13	SS	
MarchPT_RS	Departure	T	N	L5a	RS_A_7	48° 30'	RS_D_10	48° 29'	0.8	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L10	RS_D_10	48° 29'	RS_D_11	48° 28'	0.7	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L11	RS_D_11	48° 28'	RS_D_12	48° 27'	1.8	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L12	RS_D_12	48° 27'	RS_D_13	48° 26'	1.1	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L13	RS_D_13	48° 26'	RS_D_14	48° 24'	2.2	San Juan	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L14	RS_D_14	48° 24'	RS_D_15	48° 20'	8.1	San Juan	0	0	SS	SS	SS	
CherryPT_PA	Departure	X	N	L15a	RS_D_15	48° 20'	PS_D_27	48° 10'	19.0	Calallam	0	0	SS	SS	SS	
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10'	PS_D_28	48° 11'	0.8	Calallam	0	0	8	8	8	
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11'	PS_D_29	48° 14'	4.9	Calallam	0	0	14	12	SS	
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14'	PS_D_30	48° 15'	3.1	Calallam	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15'	PS_D_31	48° 17'	15.4	Calallam	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17'	PS_D_32	48° 30'	34.1	Calallam	0	0	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30'	PS_D_33	48° 30'	10.9	Calallam	0	0	SS	SS	SS	

Total Distance 109.2 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to VANCOUVER (NB3)

Lat/Long in WGS84 Datum

## Speed by Link (knots)

Fast Fast Medium Slow Very Slow

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP 1	End WP	typo	Dist.	County	Cruise	Auto	Speed by Link (knots)		
													Container	Reefer RO/RO	Bulkers Tankers Log Fishing
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 3'	MP_D_2	48° 3'	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	X	Y	L2	MP_D_2	48° 3'	MP_D_3	48° 3'	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 3'	MP_D_4	48° 3'	0.7	Skagit	0	0	14	11	SS
March PT_CPFrn	Departure	T	N	L1a	MP_D_4	48° 3'	RS_A_8	48° 3'	1.3	Skagit	0	0	14	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 3'	RS_A_9	48° 3'	5.1	Skagit	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 3'	RS_A_10	48° 3'	2.1	Skagit	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 3'	RS_A_11	48° 4'	2.5	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 4'	RS_A_12	48° 4'	0.4	Whatcom	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 4'	RS_A_13	48° 4'	5.3	Whatcom	0	0	15	13	SS
BuoyYCA_NB3	Departure	T	N	L1a	RS_A_13	48° 4'	SG_D_1	48° 4'	4.2	Whatcom	0	0	17	13	SS
BuoyYCA_NB3	Departure	T	N	L2	SG_D_1	48° 4'	SG_D_2	49° 0'	19.7	Whatcom	0	0	SS	SS	SS

Total Distance 45.4 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB3) to MARCH POINT

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast      Fast      Medium      Slow      Very Slow**

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP	L End WP	Waypoint	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
NB3_CherryPT	Arrival	T	N	L1	NB3_A_1	49° 00'	NB3_A_2	48° 49'	17.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L2	NB3_A_2	48° 49'	NB3_A_3	48° 45'	6.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	X	N	L3a	NB3_A_3	48° 45'	RS_D_2	48° 45'	2.0	San Juan	0	0	17	13	SS
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45'	RS_D_3	48° 40'	5.3	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40'	RS_D_4	48° 38'	2.2	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38'	RS_D_5	48° 37'	0.7	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37'	RS_D_6	48° 36'	1.8	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36'	RS_D_7	48° 33'	2.2	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33'	RS_D_8	48° 32'	1.2	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32'	RS_D_9	48° 31'	1.1	Skagit	0	0	15	11	SS
CherryPT_MP	Arrival	T	N	L1a	RS_D_9	48° 31'	MP_A_2	48° 31'	1.8	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31'	MP_A_3	48° 31'	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	48° 31'	MP_A_4	48° 31'	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31'	MP_A_5	48° 31'	1.1	Skagit	0	0	9	7	6

Total Distance 46.6 nm

# Puget Sound Emissions Inventory

## OGV-Routing: MARCH POINT to VENDОВI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

**DRAFT**

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Container		Reefer	Tankers	
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP Lg	WP La	End WP	Waypoint L	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
MarchPT_Vendovi	Departure	M	Y	L1	MP_D_1	48° 31' 42'' N	122° 48' 33'' W	VI_D_1	48° 31' 33'' N	122° 48' 33'' W	1.0 Skagit	0	0	9	7	SS	
MarchPT_Vendovi	Departure	M	Y	L2	VI_D_1	48° 31' 33'' N	122° 48' 33'' W	VI_D_2	48° 34' 57'' N	122° 48' 33'' W	3.6 Skagit	0	0	10	8	SS	
MarchPT_Vendovi	Departure	M	Y	L3	VI_D_2	48° 34' 57'' N	122° 48' 33'' W	VI_AN_3	48° 37' 16'' N	122° 48' 33'' W	3.0 Skagit	0	0	6	5	4	
Total Distance										7.6 nm	Note: SS - Service Speed						

# Puget Sound Emissions Inventory

## OGV-Routing: VENDOVI ISLAND (ANCHORAGE) to MARCH POINT

Lat/Long in WGS84 Datum

### DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP <sub>lg</sub>	WP <sub>La</sub>	End WP <sub>;</sub>	Waypoint L	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
Vendovi_MarchPT	Arrival	M	Y	L1	VI_AN_3	48° 37' 11"	VI_A_2	48° 34' 57"	3.0	Skagit	0	0	6	5	4
Vendovi_MarchPT	Arrival	X	Y	L2	VI_A_2	48° 34' 11"	VI_A_1	48° 31' 33"	3.6	Skagit	0	0	12	9	SS
Vendovi_MarchPT	Arrival	M	Y	L3	VI_A_1	48° 31' 11"	MP_A_5	48° 31' 23"	1.0	Skagit	0	0	9	7	SS
Total Distance									7.6 nm	Note: SS - Service Speed					

# Puget Sound Emissions Inventory

OGV-Routing: VENDОВI ISLAND (ANCHORAGE) to ANACORTES

Lat/Long in WGS84 Datum

## DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	ing WP	Lat/	End WP	Waypoint L	Dist.	County	Speed by Link (knots)				
												Cruise	Auto	Fishing	Fishing	Fishing
Vendovi_MarchPT	Arrival	M	Y	L1	VI_AN_3	48° 37' 16''	VI_A_2	48° 34' 57''	1	3.0	Skagit	0	0	6	5	4
Vendovi_MarchPT	Arrival	X	Y	L2	VI_A_2	48° 34' 57''	VI_A_1	48° 31' 33''	1	3.6	Skagit	0	0	12	9	SS
Vendovi_MarchPT	Arrival	M	Y	L3	VI_A_1	48° 31' 33''	MP_D_1	48° 31' 23''	1	1.0	Skagit	0	0	9	7	SS
MarchPT_RS	Departure	X	Y	L1	MP_D_1	48° 31' 23''	MP_D_2	48° 31' 34''	1	1.1	Skagit	0	0	12	9	SS
Total Distance										8.7 nm	Note: SS - Service Speed					



**Puget Sound Emissions Inventory**  
**OGV-Routing: VENDOVI ISLAND to TACOMA**

Lat/Long in WGS84 Datum

**DRAFT**

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
																Bulkers	
																Tankers	
																Log	
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP La	End WP	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing			
Vendovi_RS	Departure	M	Y	L1a	VI_AN_3	48° 37' 1"	BH_D_4	1.5	Skagit	0	0	6	4	SS			
Bellingham_RS	Departure	X	Y	L3	BH_D_4	48° 36' 0"	BH_D_3	2.9	Skagit	0	0	12	10	SS			
Bellingham_RS	Departure	X	Y	L2	BH_D_3	48° 33' 1"	BH_D_2	3.7	Skagit	0	0	12	10	SS			
Bellingham_RS	Departure	X	Y	L1a	BH_D_2	48° 30' 0"	RS_A_6	2.2	Skagit	0	0	14	11	SS			
Bellingham_RS	Departure	X	Y	L0a	RS_A_6	48° 28' 0"	AA_D_2	1.9	San Juan	0	0	15	11	SS			
Anacortes_Admr	Departure	X	N	L2	AA_D_2	48° 24' 0"	AA_D_3	1.8	San Juan	0	0	16	12	SS			
Anacortes_Admr	Departure	X	N	L3	AA_D_3	48° 22' 2"	AA_D_4	9.3	Island	0	0	17	13	SS			
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13' 2"	AA_D_5	2.1	Island	0	0	SS	SS	SS			
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11' 3"	PS_A_9	0.6	Jefferson	0	0	SS	SS	SS			
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 5"	PS_A_10	6.8	Jefferson	0	0	SS	SS	SS			
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 3"	PS_A_11	5.6	Jefferson	0	0	SS	SS	SS			
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 0"	PS_A_12	4.0	Island	0	0	SS	SS	SS			
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 4"	PS_A_13	1.8	Island	0	0	SS	SS	SS			
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 3"	PS_A_14	2.3	Kitsap	0	0	SS	SS	SS			
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 1"	PS_A_15	9.7	Kitsap	0	0	SS	SS	SS			
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 5"	PS_A_16	6.3	Kitsap	0	0	SS	SS	SS			
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39' 4"	PS_A_17	5.2	Kitsap	0	18	16	13	SS			
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34' 3"	PS_A_18	2.8	Kitsap	0	17	16	13	SS			
Sea_Tacoma	Arrival	X	Y	L18	PS_A_18	47° 31' 5"	PS_A_19	5.3	King	0	16	16	13	SS			
Sea_Tacoma	Arrival	X	Y	L19	PS_A_19	47° 26' 4"	PS_A_20	4.1	King	0	17	17	13	SS			
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23' 0"	PS_A_21	5.3	King	0	14	13	12	SS			
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19' 3"	PS_A_22	0.5	King	0	10	10	10	9			
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19' 1"	PS_A_23	1.1	Pierce	0	10	10	10	8			

Total Distance 86.8 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to PORT ANGELES

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP I	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Reefer	Bulkers
											Container	RO/RO	Log	Fishing	
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31'	MP_D_2	48° 31'	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	X	Y	L2	MP_D_2	48° 31'	MP_D_3	48° 31'	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 31'	MP_D_4	48° 31'	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	X	Y	L4a	MP_D_4	48° 31'	RS_A_7	48° 30'	1.6	Skagit	0	0	15	13	SS
MarchPT_RS	Departure	X	Y	L5a	RS_A_7	48° 30'	RS_D_10	48° 29'	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	X	Y	L10	RS_D_10	48° 29'	RS_D_11	48° 28'	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L11	RS_D_12	48° 28'	RS_D_13	48° 26'	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_13	48° 26'	RS_D_14	48° 24'	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_14	48° 24'	RS_D_15	48° 20'	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	N	L14a	RS_D_15	48° 20'	PS_D_27	48° 10'	19.0	Calallam	0	0	SS	SS	13
CPFern_PA	Arrival	X	Y	L1a	PS_D_27	48° 10'	PA_A_2	48° 09'	0.8	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09'	PA_A_3	48° 08'	1.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08'	PA_A_4	48° 08'	1.0	Calallam	0	0	6	6	6

Total Distance 41.7 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: PORT ANGELES to MARCH POINT

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)					
												Fast	Fast	Medium	Slow	Very Slow	
															Bulkers		
															Reefer	Tankers	
												Container	RO/RO	Log			
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing			
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	PA_D_2	48° 08' 18"	1.2	Calallam	0	0	6	6	6			
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	PA_D_3	48° 09' 30"	1.5	Calallam	0	0	8	8	8			
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	PS_A_6	48° 09' 58"	0.5	Calallam	0	0	8	8	8			
PA_CherryPT	Arrival	X	Y	L1a	PS_A_6	RS_A_2	48° 16' 08"	13.1	Calallam	0	0	15	13.5	SS			
PA_CherryPT	Arrival	T	N	L2	RS_A_2	RS_A_3	48° 19' 40"	6.6	San Juan	0	0	15	13	SS			
PA_CherryPT	Arrival	T	N	L3	RS_A_3	RS_A_4	48° 24' 00"	8.3	San Juan	0	0	15	11	SS			
PA_CherryPT	Arrival	T	N	L4	RS_A_4	RS_A_5	48° 26' 13"	2.7	San Juan	0	0	15	11	SS			
PA_CherryPT	Arrival	T	N	L5	RS_A_5	RS_A_6	48° 28' 00"	1.9	Skagit	0	0	15	11	SS			
PA_CherryPT	Arrival	T	N	L6	RS_A_6	RS_A_7	48° 30' 01"	2.0	Skagit	0	0	15	11	SS			
RS_MarchPT	Arrival	T	N	L1a	RS_A_7	MP_A_2	48° 31' 00"	1.6	Skagit	0	0	14	11	SS			
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	MP_A_3	48° 31' 04"	0.7	Skagit	0	0	14	11	SS			
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	MP_A_4	48° 31' 34"	3.1	Skagit	0	0	11	8	SS			
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	MP_A_5	48° 31' 23"	1.1	Skagit	0	0	9	7	6			
								Total Distance	44.2 nm								

# Puget Sound Emissions Inventory

## OGV-Routing: MARCH POINT to SEATTLE

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer Tankers				
												Container	RO/RO	Log		
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing		
MarchPT_RS	Departure	M	Y	L1	MP_D_1	MP_D_2	48° 31' 00" N 122° 31' 00" W	1.1	Skagit	0	0	9	8	6		
MarchPT_RS	Departure	X	Y	L2	MP_D_2	MP_D_3	48° 31' 00" N 122° 31' 00" W	3.1	Skagit	0	0	12	10	SS		
MarchPT_RS	Departure	X	Y	L3	MP_D_3	MP_D_4	48° 31' 00" N 122° 31' 00" W	0.7	Skagit	0	0	14	11	SS		
MarchPT_RS	Departure	X	Y	L4a	MP_D_4	RS_A_7	48° 30' 00" N 122° 30' 00" W	1.6	Skagit	0	0	15	13	SS		
MarchPT_RS	Departure	X	Y	L5a	RS_A_7	RS_D_10	48° 29' 00" N 122° 29' 00" W	0.8	San Juan	0	0	15	13	SS		
CherryPT_PA	Departure	X	Y	L9	RS_D_10	RS_D_11	48° 28' 00" N 122° 28' 00" W	0.7	Skagit	0	0	15	13	SS		
CherryPT_PA	Departure	T	N	L10a	RS_D_14	AA_D_1	48° 26' 00" N 122° 26' 00" W	2.8	Skagit	0	0	15	13	SS		
Anacortes_Admr	Departure	T	N	L1	AA_D_1	AA_D_2	48° 26' 00" N 122° 24' 00" W	1.9	San Juan	0	0	15	13	SS		
Anacortes_Admr	Departure	T	N	L2	AA_D_2	AA_D_3	48° 22' 00" N 122° 22' 00" W	1.8	San Juan	0	0	16	13	SS		
Anacortes_Admr	Departure	T	N	L3	AA_D_3	AA_D_4	48° 13' 00" N 122° 13' 00" W	9.3	Island	0	0	17	13	SS		
Anacortes_Admr	Departure	T	N	L4	AA_D_4	AA_D_5	48° 11' 00" N 122° 11' 00" W	2.1	Island	0	0	SS	SS	SS		
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	PS_A_9	48° 10' 00" N 122° 10' 00" W	0.6	Jefferson	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	PS_A_10	48° 06' 00" N 122° 06' 00" W	6.8	Jefferson	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	PS_A_11	48° 01' 00" N 122° 01' 00" W	5.6	Jefferson	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	PS_A_12	47° 57' 00" N 122° 57' 00" W	4.0	Island	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	PS_A_13	47° 56' 00" N 122° 56' 00" W	1.8	Island	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	PS_A_14	47° 55' 00" N 122° 55' 00" W	2.3	Kitsap	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	PS_A_15	47° 45' 00" N 122° 45' 00" W	9.7	Kitsap	0	0	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	PS_A_16	47° 39' 00" N 122° 39' 00" W	6.3	Kitsap	0	0	13	SS	SS		
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	EB_A_2	47° 39' 00" N 122° 39' 00" W	0.4	Kitsap	0	0	13	9	8		
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	EB_A_3	47° 38' 00" N 122° 38' 00" W	1.5	King	0	0	12	8	7		
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	EB_A_4	47° 36' 00" N 122° 36' 00" W	2.6	King	0	0	11	6	6		

Total Distance 67.5 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: SEATTLE to MARCH POINT

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers Reefer Tankers				
											Container	RO/RO	Log		
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP I	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
ElliottB_PS	Departure	X	Y	L1	EB_D_1	47° 30'	EB_D_2	47° 38'	2.6	King	0	0	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38'	PS_D_10	47° 39'	1.5	King	0	0	SS	SS	7
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39'	PS_D_11	47° 41'	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41'	PS_D_12	47° 45'	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45'	PS_D_13	47° 46'	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46'	PS_D_14	47° 48'	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48'	PS_D_15	47° 52'	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52'	PS_D_16	47° 55'	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55'	PS_D_17	47° 57'	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57'	PS_D_18	47° 58'	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58'	PS_D_19	48° 02'	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02'	PS_D_20	48° 04'	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04'	PS_D_21	48° 06'	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06'	PS_D_22	48° 07'	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07'	PS_D_23	48° 11'	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11'	PS_D_24	48° 11'	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11'	AA_A_1	48° 13'	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	T	N	L1	AA_A_1	48° 13'	AA_A_2	48° 24'	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	N	L2	AA_A_2	48° 24'	AA_A_3	48° 24'	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	T	N	L3a	AA_A_3	48° 24'	RS_A_6	48° 28'	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28'	RS_A_7	48° 30'	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	T	N	L1a	RS_A_7	48° 30'	MP_A_2	48° 31'	1.6	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31'	MP_A_3	48° 31'	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	M	Y	L3	MP_A_3	48° 31'	MP_A_4	48° 31'	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31'	MP_A_5	48° 31'	1.1	Skagit	0	0	9	7	6

Total Distance 68.1 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: MARCH POINT to TACOMA

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
													Reefer	Bulkers	
											Container	RO/RO	Tankers		
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP I	End WP	appoin	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 3	MP_D_2	48° 31	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	M	Y	L2	MP_D_2	48° 3	MP_D_3	48° 31	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	M	Y	L3	MP_D_3	48° 3	MP_D_4	48° 31	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	M	Y	L4a	MP_D_4	48° 3	RS_A_7	48° 30	1.6	Skagit	0	0	15	13	SS
MarchPT_RS	Departure	M	Y	L5a	RS_A_7	48° 3	RS_D_10	48° 29	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	X	Y	L9	RS_D_10	48° 2	RS_D_11	48° 28	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 2	AA_D_1	48° 20	2.8	Skagit	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 2	AA_D_2	48° 24	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 2	AA_D_3	48° 22	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	T	N	L3	AA_D_3	48° 2	AA_D_4	48° 13	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 1	AA_D_5	48° 11	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 1	PS_A_9	48° 10	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 1	PS_A_10	48° 00	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 0	PS_A_11	48° 01	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 0	PS_A_12	47° 57	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 5	PS_A_13	47° 50	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 5	PS_A_14	47° 55	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 5	PS_A_15	47° 45	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 4	PS_A_16	47° 35	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 4	PS_A_16	47° 35	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 3	PS_A_17	47° 34	5.2	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 3	PS_A_18	47° 31	2.8	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 3	PS_A_19	47° 20	5.3	King	0	0	16	13	SS
Sea_Tacoma	Arrival	X	Y	L19	PS_A_19	47° 2	PS_A_20	47° 22	4.1	King	0	0	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 2	PS_A_21	47° 15	5.3	King	0	0	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 1	PS_A_22	47° 15	0.5	King	0	0	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 1	PS_A_23	47° 18	1.1	Pierce	0	0	10	10	8

Total Distance 93.5 nm

Note: SS - Service Speed

Note: Red numbers - engines off

# Puget Sound Emissions Inventory

## OGV-Routing: TACOMA to MARCH POINT

Lat/Long in WGS84 Datum

**DRAFT**

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Container		Reefer	Bulkers	
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP ]	End WP	Waypoint	Dist.	County	Cruise	Auto	RO/RO	Log	Fishing
											Fishing	Fishing	Fishing	Fishing	Fishing
Tacoma_Sea	Departure	M	Y	L2	PS_D_2	47°	PS_D_3	47° 19'	1.3	Pierce	0	0	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47°	PS_D_4	47° 19'	0.9	Pierce	0	0	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47°	PS_D_5	47° 23'	4.8	King	0	0	14	SS	SS
Tacoma_Sea	Departure	X	Y	L5	PS_D_5	47°	PS_D_6	47° 26'	4.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47°	PS_D_7	47° 34'	7.8	King	0	0	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47°	PS_D_8	47° 35'	1.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47°	PS_D_9	47° 37'	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47°	PS_D_10	47° 39'	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47°	PS_D_11	47° 41'	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47°	PS_D_12	47° 45'	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47°	PS_D_13	47° 46'	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47°	PS_D_14	47° 48'	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47°	PS_D_15	47° 52'	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47°	PS_D_16	47° 55'	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47°	PS_D_17	47° 57'	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47°	PS_D_18	47° 58'	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47°	PS_D_19	48° 02'	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48°	PS_D_20	48° 04'	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48°	PS_D_21	48° 06'	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48°	PS_D_22	48° 07'	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48°	PS_D_23	48° 11'	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48°	PS_D_24	48° 11'	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48°	AA_A_1	48° 13'	2.2	Island	0	0	SS	SS	SS
Admr_Anacorte	Arrival	X	Y	L1	AA_A_1	48°	AA_A_2	48° 24'	11.3	Island	0	0	18	SS	SS
Admr_Anacorte	Arrival	X	Y	L2	AA_A_2	48°	AA_A_3	48° 24'	0.7	Island	0	0	16	12	SS
Admr_Anacorte	Arrival	X	Y	L3a	AA_A_3	48°	RS_A_6	48° 28'	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	X	Y	L6	RS_A_6	48°	RS_A_7	48° 30'	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	48°	MP_A_2	48° 31'	1.6	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48°	MP_A_3	48° 31'	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	M	Y	L3	MP_A_3	48°	MP_A_4	48° 31'	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48°	MP_A_5	48° 31'	1.1	Skagit	0	0	9	7	6

Total Distance 88.4 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

## OGV-Routing: SEA to ANACORTES

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
														Reefer	Bulkers	
												Container	RO/RO	Tankers		
														Fishing	Fishing	Fishing
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP L	End WP	Waypoint L	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28	PS_A_2	48° 28' 38''	10.7	Calallam	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28	PS_A_3	48° 13' 22''	35.9	Calallam	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13	PS_A_4	48° 13' 20''	15.4	Calallam	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13	PS_A_5	48° 09' 20''	6.9	Calallam	0	0	15	12	SS	
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09	PS_A_6	48° 09' 58''	0.6	Calallam	0	0	8	8	8	
PA_CherryPT	Arrival	X	Y	L1a	PS_A_6	48° 09	RS_A_2	48° 16' 08''	13.1	Calallam	0	0	15	13.5	SS	
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16	RS_A_3	48° 19' 40''	6.6	San Juan	0	0	15	13	SS	
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48° 19	RS_A_4	48° 24' 06''	8.3	San Juan	0	0	15	11	SS	
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24	RS_A_5	48° 26' 13''	2.7	San Juan	0	0	15	11	SS	
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26	RS_A_6	48° 28' 00''	1.9	Skagit	0	0	15	11	SS	
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28	RS_A_7	48° 30' 01''	2.0	Skagit	0	0	15	11	SS	
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	48° 30	MP_A_2	48° 31' 00''	1.6	Skagit	0	0	13	11	SS	
RS_MarchPT	Arrival	M	Y	L2	MP_A_2	48° 31	MP_A_3	48° 31' 04''	0.7	Skagit	0	0	11	8	SS	
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31	AC_A_2	48° 31' 24''	2.6	Skagit	0	0	9	7	6	

Total Distance 108.9 nm



# Puget Sound Emissions Inventory

## OGV-Routing: ANACORTES HARBOR

Lat/Long in WGS84 Datum

### DRAFT

Route	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)					
									Cruise	Auto	Fishing	Fishing	Fishing	
RS_Anacortes	Arrival	L1	AC_A_2	48° 31' 24'' N 122° 37' 26'' W	Mode:	M		Skagit						
Anacortes_RS	Departure	L1	AC_D_2	48° 31' 24'' N 122° 37' 26'' W	NPE:	Y		Skagit						

NOTE: All ARRIVAL harbor transits branch from AC\_A\_2

NOTE: All DEPARTURE harbor transits goto AC\_D\_2

Anacortes_PortDock1	Arrival	L1a	AC_A_2	48° 31' 24'' N 122° 37' 26'' W	AC_B_1	48° 31' 20'' N 122° 36' 29'' W	0.63	Skagit	0	3	3	3	3
Anacortes_PortDock1	Departure	L1a	AC_B_1	48° 31' 20'' N 122° 36' 29'' W	AC_D_2	48° 31' 24'' N 122° 37' 26'' W	0.63	Skagit	0	3	3	3	3
Anacortes_PortDock2	Arrival	L1a	AC_A_2	48° 31' 24'' N 122° 37' 26'' W	AC_B_2	48° 31' 20'' N 122° 36' 42'' W	0.49	Skagit	0	3	3	3	3
Anacortes_PortDock2	Departure	L1a	AC_B_2	48° 31' 20'' N 122° 36' 42'' W	AC_D_2	48° 31' 24'' N 122° 37' 26'' W	0.49	Skagit	0	3	3	3	3
Anacortes_CurtisWharf	Arrival	L1a	AC_A_2	48° 31' 24'' N 122° 37' 26'' W	AC_B_3	48° 31' 19'' N 122° 36' 54'' W	0.36	Skagit	0	3	3	3	3
Anacortes_CurtisWharf	Departure	L1a	AC_B_3	48° 31' 19'' N 122° 36' 54'' W	AC_D_2	48° 31' 24'' N 122° 37' 26'' W	0.36	Skagit	0	3	3	3	3

**Puget Sound Emissions Inventory**

OGV-Routing: ANACORTES to SEA

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Very Slow
Anacortes_RS	Departure	M	Y	L1	AC_D_2	48° 31' 24" N 122° 37' 26" W	MP_D_3	48° 31' 04" N 122° 41' 17" W	2.6	Skagit	0	0	11	9	8
MarchPT_RS	Departure	X	Y	L2	MP_D_3	48° 31' 04" N 122° 41' 17" W	MP_D_4	48° 31' 00" N 122° 42' 20" W	0.7	Skagit	0	0	12	11	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_4	48° 31' 00" N 122° 42' 20" W	RS_A_7	48° 30' 01" N 122° 44' 12" W	1.6	Skagit	0	0	14	10	SS
MarchPT_RS	Departure	X	Y	L4a	RS_A_7	48° 30' 01" N 122° 44' 12" W	RS_D_10	48° 29' 33" N 122° 44' 36" W	0.8	San Juan	0	0	14	11	SS
CherryPT_PA	Departure	T	N	L10	RS_D_10	48° 29' 33" N 122° 44' 36" W	RS_D_11	48° 28' 53" N 122° 44' 31" W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L11	RS_D_11	48° 28' 53" N 122° 44' 31" W	RS_D_12	48° 27' 12" N 122° 45' 18" W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_12	48° 27' 12" N 122° 45' 18" W	RS_D_13	48° 26' 10" N 122° 45' 48" W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_13	48° 26' 10" N 122° 45' 48" W	RS_D_14	48° 24' 37" N 122° 48' 09" W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L14	RS_D_14	48° 24' 37" N 122° 48' 09" W	RS_D_15	48° 20' 13" N 122° 58' 21" W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	N	L15	RS_D_15	48° 20' 13" N 122° 58' 21" W	PS_D_27	48° 10' 33" N 123° 23' 03" W	19.0	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10' 33" N 123° 23' 03" W	PS_D_28	48° 11' 21" N 123° 23' 02" W	0.8	Calallam	8	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11' 21" N 123° 23' 02" W	PS_D_29	48° 14' 13" N 123° 28' 57" W	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14' 13" N 123° 28' 57" W	PS_D_30	48° 15' 21" N 123° 33' 17" W	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15' 21" N 123° 33' 17" W	PS_D_31	48° 17' 36" N 123° 56' 06" W	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17' 36" N 123° 56' 06" W	PS_D_32	48° 30' 38" N 124° 43' 36" W	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30' 38" N 124° 43' 36" W	PS_D_33	48° 30' 43" N 125° 00' 00" W	10.9	Calallam	0	0	SS	SS	SS

Total Distance 107.6 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB3) to ANACORTES

Lat/Long in WGS84 Datum

Speed by Link (knots)  

Fast	Fast	Medium	Slow	Very Slow
------	------	--------	------	-----------

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP	End WP	Waypoint	Dist.	County	Cruise	Auto	Speed by Link (knots)		
													Fast	Medium	Very Slow
													Bulkers		
													Container	Reefer	Tankers
													Fishing	RO/RO	Log
													Fishing	Fishing	Fishing
NB3_CherryPT	Arrival	T	N	L1	NB3_A_1	49°	NB3_A_2	48° 49'	17.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L2	NB3_A_2	48°	NB3_A_3	48° 45'	6.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L3a	NB3_A_3	48°	RS_D_2	48° 45'	2.0	San Juan	0	0	17	13	SS
CherryPT_PA	Departure	T	N	L1	RS_D_2	48°	RS_D_3	48° 40'	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48°	RS_D_4	48° 38'	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48°	RS_D_5	48° 37'	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48°	RS_D_6	48° 36'	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48°	RS_D_7	48° 33'	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48°	RS_D_8	48° 32'	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48°	RS_D_9	48° 31'	1.1	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48°	RS_D_9	48° 31'	1.1	Skagit	0	0	15	13	SS
CherryPT_MP	Arrival	X	Y	L1a	RS_D_9	48°	MP_A_2	48° 31'	1.8	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	M	Y	L2	MP_A_2	48°	MP_A_3	48° 31'	0.7	Skagit	0	0	11	8	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48°	AC_A_2	48° 31'	2.6	Skagit	0	0	9	7	6

Total Distance 46.1 nm

### Puget Sound Emissions Inventory

OGV-Routing: ANACORTES to MARCH POINT

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Reefer Tankers				
											Container RO/RO Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31' 34'' N 122° 36' 40'' W	MP_A_5	48° 31' 23'' N 122° 35' 00'' W	1.1	Skagit	0	0	11	9	SS
									Total Distance	1.1 nm	Note: SS - Service Speed				

**Puget Sound Emissions Inventory**

**OGV-Routing: MARCH POINT to ANACORTES**

Lat/Long in WGS84 Datum

**DRAFT**

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Reefer Tankers				
											Container RO/RO Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
MarchPT_RS	Departure	X	Y	L1	MP_D_1	48° 31' 23'' N 122° 35' 00'' W	MP_D_2	48° 31' 34'' N 122° 36' 40'' W	1.1	Skagit	0	0	12	9	SS
									Total Distance	1.1 nm	Note: SS - Service Speed				

**Puget Sound Emissions Inventory**  
**OGV-Routing: ANACORTES to PORT ANGELES**  
 Lat/Long in WGS84 Datum

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Bulkers	
														Reefer	Tankers
											Container	RO/RO	Log	Fishing	Fishing
Anacortes_RS	Departure	M	Y	L1a	AC_D_2	48° 31' 24'' N 122° 37' 26'' W	MP_D_3	48° 31' 04'' N 122° 41' 17'' W	2.6	Skagit	0	0	11	9	8
MarchPT_RS	Departure	X	Y	L2	MP_D_3	48° 31' 04'' N 122° 41' 17'' W	MP_D_4	48° 31' 00'' N 122° 42' 20'' W	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	T	N	L1	MP_D_4	48° 31' 00'' N 122° 42' 20'' W	RS_A_7	48° 30' 01'' N 122° 44' 12'' W	1.6	Skagit	0	0	15	13	SS
MarchPT_RS	Departure	T	N	L0a	RS_A_7	48° 30' 01'' N 122° 44' 12'' W	RS_D_10	48° 29' 33'' N 122° 44' 36'' W	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L10	RS_D_10	48° 29' 33'' N 122° 44' 36'' W	RS_D_11	48° 28' 53'' N 122° 44' 31'' W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L11	RS_D_12	48° 27' 12'' N 122° 45' 18'' W	RS_D_13	48° 26' 10'' N 122° 45' 48'' W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_13	48° 26' 10'' N 122° 45' 48'' W	RS_D_14	48° 24' 37'' N 122° 48' 09'' W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_14	48° 24' 37'' N 122° 48' 09'' W	RS_D_15	48° 20' 13'' N 122° 58' 21'' W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	T	N	L14a	RS_D_15	48° 20' 13'' N 122° 58' 21'' W	PS_D_27	48° 10' 33'' N 123° 23' 03'' W	19.0	Calallam	0	0	SS	SS	SS
CPFern_PA	Arrival	X	Y	L1a	PS_D_27	48° 10' 33'' N 123° 23' 03'' W	PA_A_2	48° 09' 45'' N 123° 23' 25'' W	0.8	Calallam	0	0	10	10	10
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09' 45'' N 123° 23' 25'' W	PA_A_3	48° 08' 21'' N 123° 22' 25'' W	1.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08' 21'' N 123° 22' 25'' W	PA_A_4	48° 08' 00'' N 123° 23' 48'' W	1.0	Calallam	0	0	6	6	6

Total Distance 40.1 nm Note: SS - Service Speed

**Puget Sound Emissions Inventory**

OGV-Routing: ANACORTES to SEATTLE

Lat/Long in WGS84 Datum

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Long	End WP	Ending Waypoint Lat/Long	Dist.	County	Speed by Link (knots)					
											Fast	Fast	Medium	Slow	Very Slow	
											Container	Reefer	Bulkers	Tankers		
											Cruise	Auto	RO/RO	Fishing	Log	Fishing
Anacortes_RS	Departure	M	Y	L1a	AC_D_2	48° 31' 24'' N 122° 37' 26'' W	MP_D_3	48° 31' 04'' N 122° 41' 17'' W	2.6	Skagit	0	0	10	7	7	
MarchPT_RS	Departure	M	Y	L5	MP_D_3	48° 31' 04'' N 122° 41' 17'' W	MP_D_4	48° 31' 00'' N 122° 42' 20'' W	0.7	Skagit	0	0	11	9	8	
MarchPT_RS	Departure	X	Y	L4	MP_D_4	48° 31' 00'' N 122° 42' 20'' W	RS_A_7	48° 30' 01'' N 122° 44' 12'' W	1.6	Skagit	0	0	13	10	SS	
MarchPT_RS	Departure	X	Y	L3a	RS_A_7	48° 30' 01'' N 122° 44' 12'' W	RS_D_15	48° 29' 33'' N 122° 44' 36'' W	0.8	San Juan	0	0	14	11	SS	
CherryPT_PA	Departure	X	Y	L10	RS_D_15	48° 29' 33'' N 122° 44' 36'' W	RS_D_14	48° 28' 53'' N 122° 44' 31'' W	0.7	Skagit	0	0	15	13	SS	
CherryPT_PA	Departure	T	N	L11a	RS_D_14	48° 28' 53'' N 122° 44' 31'' W	AA_D_1	48° 26' 04'' N 122° 44' 43'' W	2.8	Skagit	0	0	15	13	SS	
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26' 04'' N 122° 44' 43'' W	AA_D_2	48° 24' 08'' N 122° 44' 50'' W	1.9	San Juan	0	0	15	13	SS	
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24' 08'' N 122° 44' 50'' W	AA_D_3	48° 22' 25'' N 122° 45' 34'' W	1.8	San Juan	0	0	16	13	SS	
Anacortes_Admr	Departure	T	N	L3	AA_D_3	48° 22' 25'' N 122° 45' 34'' W	AA_D_4	48° 13' 29'' N 122° 49' 22'' W	9.3	Island	0	0	17	13	SS	
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13' 29'' N 122° 49' 22'' W	AA_D_5	48° 11' 32'' N 122° 48' 21'' W	2.1	Island	0	0	SS	SS	SS	
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11' 32'' N 122° 48' 21'' W	PS_A_9	48° 10' 57'' N 122° 48' 01'' W	0.6	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 57'' N 122° 48' 01'' W	PS_A_10	48° 06' 35'' N 122° 40' 10'' W	6.8	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 35'' N 122° 40' 10'' W	PS_A_11	48° 01' 08'' N 122° 38' 08'' W	5.6	Jefferson	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 08'' N 122° 38' 08'' W	PS_A_12	47° 57' 41'' N 122° 35' 10'' W	4.0	Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 41'' N 122° 35' 10'' W	PS_A_13	47° 56' 38'' N 122° 32' 57'' W	1.8	Island	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 38'' N 122° 32' 57'' W	PS_A_14	47° 55' 17'' N 122° 30' 06'' W	2.3	Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 17'' N 122° 30' 06'' W	PS_A_15	47° 45' 54'' N 122° 26' 45'' W	9.7	Kitsap	0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 54'' N 122° 26' 45'' W	PS_A_16	47° 39' 42'' N 122° 28' 24'' W	6.3	Kitsap	0	0	SS	SS	SS	
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39' 42'' N 122° 28' 24'' W	EB_A_2	47° 39' 21'' N 122° 28' 02'' W	0.4	Kitsap	0	0	13	9	8	
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39' 21'' N 122° 28' 02'' W	EB_A_3	47° 38' 16'' N 122° 26' 36'' W	1.5	King	0	0	12	8	7	
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38' 16'' N 122° 26' 36'' W	EB_A_4	47° 36' 52'' N 122° 23' 21'' W	2.6	King	0	0	11	6	6	

Total Distance 65.8 nm Note: SS - Service Speed

**Puget Sound Emissions Inventory**  
**OGV-Routing: SEATTLE to ANACORTES**

Lat/Long in WGS84 Datum

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Reefer	Bulkers
											Fast	Fast	Medium	Slow	Very Slow
											Container	RO/RO	Log		
												Fishing	Fishing	Fishing	
ElliottB_PS	Departure	X	Y	L1	EB_D_1	47° 38'	EB_D_2	47° 38'	2.6	King	0	0	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 39'	PS_D_10	47° 39'	1.5	King	0	0	SS	SS	7
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 41'	PS_D_11	47° 41'	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 45'	PS_D_12	47° 45'	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 46'	PS_D_13	47° 46'	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 48'	PS_D_14	47° 48'	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 52'	PS_D_15	47° 52'	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 55'	PS_D_16	47° 55'	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 57'	PS_D_17	47° 57'	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 58'	PS_D_18	47° 58'	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 02'	PS_D_19	48° 02'	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 04'	PS_D_20	48° 04'	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 06'	PS_D_21	48° 06'	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 07'	PS_D_22	48° 07'	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 11'	PS_D_23	48° 11'	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11'	PS_D_24	48° 11'	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 13'	AA_A_1	48° 13'	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	T	N	L1	AA_A_1	48° 24'	AA_A_2	48° 24'	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	Y	L2	AA_A_2	48° 24'	AA_A_3	48° 24'	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	X	Y	L3a	AA_A_3	48° 28'	RS_A_6	48° 28'	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	X	Y	L6	RS_A_6	48° 30'	RS_A_7	48° 30'	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	48° 31'	MP_A_2	48° 31'	1.6	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31'	MP_A_3	48° 31'	0.7	Skagit	0	0	13	10	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31'	AC_A_2	48° 31'	2.6	Skagit	0	0	11	9	SS

Total Distance 66.4 nm

Note: SS - Service Speed



# Puget Sound Emissions Inventory

## OGV-Routing: PORT ANGELES to ANACORTES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Bulkers				
											Reefer Tankers				
											Log				
											Fishing				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP L	End WP	'aypoin	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08	PA_D_2	48° 08	1.2	Calallam	0	0	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08	PA_D_3	48° 09	1.5	Calallam	0	0	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09	PS_A_6	48° 09	0.5	Calallam	0	0	10	10	10
PA_CherryPT	Arrival	T	N	L1a	PS_A_6	48° 09	RS_A_2	48° 16	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16	RS_A_3	48° 19	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48° 19	RS_A_4	48° 24	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24	RS_A_5	48° 26	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26	RS_A_6	48° 28	1.9	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28	RS_A_7	48° 30	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	48° 30	MP_A_2	48° 31	1.6	Skagit	0	0	13	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31	MP_A_3	48° 31	0.7	Skagit	0	0	13	11	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31	AC_A_2	48° 31	2.6	Skagit	0	0	10	8	8
Total Distance									42.5	nm					

# Puget Sound Emissions Inventory

OGV-Routing: ANACORTES to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

												Speed by Link (knots)					
												Fast	Fast	Medium	Slow	Very Slow	
												Bulkers					
												Reefer					
												Tankers					
												Log					
												Fishing					
												Container	RO/RO	Fishing	Fishing	Fishing	
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP	Lat/Lon	End WP	Ending Waypoint	Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
Anacortes_RS	Departure	M	Y	L1a	AC_D_2	48° 31' 24'' N	122° 37' 26'' W	MP_D_3	48° 31' 04'' N	122° 41' 17'' W	2.6	Skagit	0	0	11	9	8
MarchPT_RS	Departure	X	Y	L5	MP_D_3	48° 31' 04'' N	122° 41' 17'' W	MP_D_4	48° 31' 00'' N	122° 42' 20'' W	0.7	Skagit	0	0	12	9	8
Anacortes_CPFm	Departure	X	Y	L1a	MP_D_4	48° 31' 00'' N	122° 42' 20'' W	RS_A_8	48° 31' 00'' N	122° 44' 21'' W	1.3	Skagit	0	0	13	10	8
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31' 00'' N	122° 44' 21'' W	RS_A_9	48° 36' 04'' N	122° 45' 07'' W	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36' 04'' N	122° 45' 07'' W	RS_A_10	48° 37' 59'' N	122° 43' 52'' W	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37' 59'' N	122° 43' 52'' W	RS_A_11	48° 40' 15'' N	122° 42' 24'' W	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40' 15'' N	122° 42' 24'' W	RS_A_12	48° 40' 35'' N	122° 42' 10'' W	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40' 35'' N	122° 42' 10'' W	RS_A_13	48° 45' 17'' N	122° 45' 50'' W	5.3	Whatcom	0	0	15	11	SS
Total Distance												19.9 nm	Note: SS - Service Speed				

## Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALÉ to ANACORTES

Lat/Long in WGS84 Datum

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Reefer Tankers				
													Log				
													Container	Auto	RO/RO	Fishing	Fishing
DRAFT	Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	RO/RO	Fishing	Fishing	Fishing
	CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45' 16'' N 122° 47' 14'' W	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	5.3	San Juan	0	0	15	13	SS	
	CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40' 34'' N 122° 43' 28'' W	RS_D_4	48° 38' 22'' N 122° 43' 58'' W	2.2	San Juan	0	0	15	13	SS	
	CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38' 22'' N 122° 43' 58'' W	RS_D_5	48° 37' 43'' N 122° 44' 25'' W	0.7	Skagit	0	0	15	13	SS	
	CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37' 43'' N 122° 44' 25'' W	RS_D_6	48° 36' 06'' N 122° 45' 32'' W	1.8	Skagit	0	0	15	13	SS	
	CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36' 06'' N 122° 45' 32'' W	RS_D_7	48° 33' 58'' N 122° 45' 14'' W	2.2	Skagit	0	0	15	13	SS	
	CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33' 58'' N 122° 45' 14'' W	RS_D_8	48° 32' 48'' N 122° 45' 04'' W	1.2	San Juan	0	0	15	13	SS	
	CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32' 48'' N 122° 45' 04'' W	RS_D_9	48° 31' 41'' N 122° 44' 54'' W	1.1	Skagit	0	0	15	13	SS	
	CherryPT_MP	Arrival	X	Y	L1a	RS_D_9	48° 31' 41'' N 122° 44' 54'' W	MP_A_2	48° 31' 00'' N 122° 42' 20'' W	1.8	Skagit	0	0	14	11	SS	
	RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31' 00'' N 122° 42' 20'' W	MP_A_3	48° 31' 04'' N 122° 41' 17'' W	0.7	Skagit	0	0	14	11	SS	
	RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31' 04'' N 122° 41' 17'' W	AC_A_2	48° 31' 24'' N 122° 37' 26'' W	2.6	Skagit	0	0	10	8	8	

Total Distance 19.6 nm

# Puget Sound Emissions Inventory

## OGV-Routing: PORT ANGELES to ORCAS ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
													Reefer	Bulkers	
											Container	RO/RO	Log	Tankers	
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP I	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 0	PA_D_2	48° 08	1.2	Calallam	0	0	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 0	PA_D_3	48° 09	1.5	Calallam	0	0	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 0	PS_A_6	48° 09	0.5	Calallam	0	0	10	10	10
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48° 0	RS_A_2	48° 16	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 1	RS_A_3	48° 19	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L3	RS_A_3	48° 1	RS_A_4	48° 24	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 2	RS_A_5	48° 26	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 2	RS_A_6	48° 28	1.9	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 2	RS_A_7	48° 30	2.0	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 3	RS_A_8	48° 31	1.0	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 3	RS_A_9	48° 36	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 3	RS_A_10	48° 37	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 3	RS_A_11	48° 40	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 4	RS_A_12	48° 40	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	X	Y	L12	RS_A_12	48° 4	RS_A_13	48° 45	5.3	Whatcom	0	0	12	9	SS
OrcasIS_BuoyYC	Departure	M	Y	L1a	RS_A_13	48° 4	OC_A_1	48° 44	0.6	Whatcom	0	0	8	6	5
OrcasIS_BuoyYC	Departure	M	Y	L2	OC_A_1	48° 4	OC_AN_1	48° 43	2.4	San Juan	0	0	6	4	4

Total Distance 56.9 nm Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: ORCAS ISLAND to ANACORTES

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast    Fast    Medium    Slow    Very Slow**

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L	End WP	ypoin	Dist.	County	Cruise	Speed by Link (knots)			
												Auto	Fishing	Fishing	Fishing
OrcasIS_BuoyYCA	Departure	M	Y	L1a	OC_AN_1	48° 43	RS_D_2	48° 4	2.4	San Juan	0	0	8	6	6
CherryPT_PA	Departure	X	Y	L1	RS_D_2	48° 45	RS_D_3	48° 4	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40	RS_D_4	48° 3	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38	RS_D_5	48° 3	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37	RS_D_6	48° 3	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36	RS_D_7	48° 3	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33	RS_D_8	48° 3	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32	RS_D_9	48° 3	1.1	Skagit	0	0	15	13	SS
CherryPT_MP	Arrival	X	Y	L1a	RS_D_9	48° 31	MP_A_2	48° 3	1.8	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31	MP_A_3	48° 3	0.7	Skagit	0	0	14	11	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31	AC_A_2	48° 3	2.6	Skagit	0	0	10	8	8
Total Distance									22.0	nm					

# Puget Sound Emissions Inventory

## OGV-Routing: SEA to VENDOVI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

DRAFT

												Speed by Link (knots)					
												Fast	Fast	Medium	Slow	Very Slow	
															Bulkers		
														Reefer	Tankers		
												Container	RO/RO	Log			
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	z WP	L WP	End WP	ypoin	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28	PS_A_2	48° 2	10.7	Calallam		0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28	PS_A_3	48° 1	35.9	Calallam		0	0	SS	SS	SS	
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13	PS_A_4	48° 1	15.4	Calallam		0	0	SS	SS	SS	
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13	PS_A_5	48° 0	6.9	Calallam		0	0	15	12	SS	
Sea_Tacoma	Arrival	X	N	L5	PS_A_5	48° 09	PS_A_6	48° 0	0.6	Calallam		0	0	8	8	8	
PA_CherryPT	Arrival	T	N	L1a	PS_A_6	48° 09	RS_A_2	48° 1	13.1	Calallam		0	0	15	13.5	SS	
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16	RS_A_3	48° 1	6.6	San Juan		0	0	15	13	SS	
PA_CherryPT	Arrival	T	N	L3	RS_A_3	48° 19	RS_A_4	48° 2	8.3	San Juan		0	0	15	11	SS	
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24	RS_A_5	48° 2	2.7	San Juan		0	0	15	11	SS	
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26	RS_A_6	48° 2	1.9	Skagit		0	0	15	11	SS	
RS_Bellingham	Arrival	X	Y	L1a	RS_A_6	48° 28	BH_A_2	48° 3	2.2	Skagit		0	0	12	11	SS	
RS_Bellingham	Arrival	X	Y	L2	BH_A_2	48° 30	BH_A_3	48° 3	3.7	Skagit		0	0	10	10	SS	
RS_Bellingham	Arrival	M	Y	L3	BH_A_3	48° 33	BH_A_4	48° 3	2.9	Skagit		0	0	8	6	6	
RS_Bellingham	Arrival	M	Y	L4	BH_A_4	48° 36	VI_AN_3	48° 3	1.5	Skagit		0	0	4	3	3	

Total Distance 112.4 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: VENDOVI (ANCHORAGE) to SEA

Lat/Long in WGS84 Datum

DRAFT

													Speed by Link (knots)					
													Fast	Fast	Medium	Slow	Very Slow	
																Bulkers		
															Reefer	Tankers		
													Container	RO/RO	Log			
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	ig WP	La	End WP	/aypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing		
Vendovi_RS	Departure	M	Y	L1a	VI_AN_3	48° 37' 1	BH_D_4	48° 36'		1.5	Skagit	0	0	6	4	SS		
Bellingham_RS	Departure	M	Y	L3	BH_D_4	48° 36'	BH_D_3	48° 33'		2.9	Skagit	0	0	10	9	SS		
Bellingham_RS	Departure	X	Y	L2	BH_D_3	48° 33' 1	BH_D_2	48° 30'		3.7	Skagit	0	0	12	10	SS		
Bellingham_RS	Departure	X	Y	L1	BH_D_2	48° 30'	RS_A_6	48° 28'		2.2	Skagit	0	0	14	11	SS		
Bellingham_RS	Departure	T	N	L0a	RS_A_6	48° 28'	RS_D_12	48° 27'		1.3	Skagit	0	0	15	13	SS		
CherryPT_PA	Departure	T	N	L12	RS_D_12	48° 27' 1	RS_D_13	48° 26'		1.1	San Juan	0	0	15	13	SS		
CherryPT_PA	Departure	T	Y	L13	RS_D_13	48° 26' 1	RS_D_14	48° 24'		2.2	San Juan	0	0	15	13	SS		
CherryPT_PA	Departure	T	N	L14	RS_D_14	48° 24' 2	RS_D_15	48° 20'		8.1	San Juan	0	0	SS	SS	SS		
CherryPT_PA	Departure	X	N	L15a	RS_D_15	48° 20' 1	PS_D_27	48° 10'		19.0	Calallam	0	0	SS	SS	SS		
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10' 2	PS_D_28	48° 11'		0.8	Calallam	0	0	8	8	8		
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11' 2	PS_D_29	48° 14'		4.9	Calallam	0	0	14	12	SS		
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14' 1	PS_D_30	48° 15'		3.1	Calallam	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15' 2	PS_D_31	48° 17'		15.4	Calallam	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17' 2	PS_D_32	48° 30'		34.1	Calallam	0	0	SS	SS	SS		
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30' 2	PS_D_33	48° 30'		10.9	Calallam	0	0	SS	SS	SS		
Total Distance										111.1 nm	Note: SS - Service Speed							

# Puget Sound Emissions Inventory

## OGV-Routing: SEA to BELLINGHAM

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP ]	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48°	PS_A_2	48° 28' 0"	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48°	PS_A_3	48° 13' 0"	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48°	PS_A_4	48° 13' 0"	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48°	PS_A_5	48° 09' 0"	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48°	PS_A_6	48° 09' 0"	0.6	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48°	RS_A_2	48° 16' 0"	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48°	RS_A_3	48° 19' 0"	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L3	RS_A_3	48°	RS_A_4	48° 24' 0"	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48°	RS_A_5	48° 26' 0"	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48°	RS_A_6	48° 28' 0"	1.9	Skagit	0	0	15	11	SS
RS_Bellingham	Arrival	T	N	L1a	RS_A_6	48°	BH_A_2	48° 30' 0"	2.2	Skagit	0	0	15	11	SS
RS_Bellingham	Arrival	T	N	L2	BH_A_2	48°	BH_A_3	48° 33' 0"	3.7	Skagit	0	0	15	10	SS
RS_Bellingham	Arrival	T	N	L3	BH_A_3	48°	BH_A_4	48° 36' 0"	2.9	Skagit	0	0	15	10	SS
RS_Bellingham	Arrival	T	N	L4	BH_A_4	48°	BH_A_5	48° 38' 0"	4.1	Skagit	0	0	13	10	SS
RS_Bellingham	Arrival	X	Y	L5	BH_A_5	48°	BH_A_6	48° 38' 0"	0.4	Skagit	0	0	13	10	SS
RS_Bellingham	Arrival	M	Y	L6	BH_A_6	48°	BH_A_7	48° 42' 0"	4.2	Whatcom	0	0	10	8	6

Total Distance 119.5 nm Note: SS - Service Speed



# Puget Sound Emissions Inventory

## OGV-Routing: BELLINGHAM HARBOR

Lat/Long in WGS84 Datum

### DRAFT

Route	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Speed by Link (knots)					
										Fast	Fast	Medium	Slow	Very Slow	
											Bulkers		Reefer	Tankers	Log
											Container	RO/RO	Fishing	Fishing	Fishing
Route	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing		
RS_Bellingham	Arrival		BH_A_7	48° 42' 46'' N 122° 32' 43'' W	Mode:	M		Whatcom							
Bellingham_RS	Departure		BH_D_7	48° 42' 46'' N 122° 32' 43'' W	NPE:	Y		Whatcom							

NOTE: All ARRIVAL harbor transits branch from BH\_A\_7

NOTE: All DEPARTURE harbor transits goto BH\_D\_7

Bellingham_PortDock1	Arrival	L1a	BH_A_7	48° 42' 46'' N 122° 32' 43'' W	BP_B_1	48° 42' 46'' N 122° 32' 44'' W	2.88	Whatcom	0	3	3	3	3
Bellingham_PortDock1	Departure	L1a	BP_B_1	48° 42' 46'' N 122° 32' 44'' W	BH_D_7	48° 42' 46'' N 122° 32' 43'' W	2.88	Whatcom	0	5	5	5	5
Bellingham_PortDock2	Arrival	L1a	BH_A_7	48° 42' 46'' N 122° 32' 43'' W	BP_B_2	48° 42' 46'' N 122° 32' 43'' W	3.24	Whatcom	0	3.5	3.5	3.5	3.5
Bellingham_PortDock2	Departure	L1a	BP_B_2	48° 42' 46'' N 122° 32' 43'' W	BH_D_7	48° 42' 46'' N 122° 32' 43'' W	3.24	Whatcom	0	6	6	6	6
Bellingham_ColdStorage	Arrival	L1a	BH_A_7	48° 42' 46'' N 122° 32' 43'' W	BH_A_8	48° 44' 45'' N 122° 31' 16'' W	2.21	Whatcom	0	4	4	4	4
Bellingham_ColdStorage	Arrival	L2	BH_A_8	48° 44' 45'' N 122° 31' 16'' W	BH_B_3	48° 45' 32'' N 122° 30' 42'' W	0.86	Whatcom	0	3	3	3	3
Bellingham_ColdStorage	Departure	L2	BH_B_3	48° 45' 32'' N 122° 30' 42'' W	BH_A_8	48° 44' 45'' N 122° 31' 16'' W	0.86	Whatcom	0	3	3	3	3
Bellingham_ColdStorage	Departure	L1a	BH_A_8	48° 44' 45'' N 122° 31' 16'' W	BH_A_7	48° 42' 46'' N 122° 32' 43'' W	2.21	Whatcom	0	6	6	6	6
Bellingham_Anchorage	Arrival	L1a	BH_A_7	48° 42' 46'' N 122° 32' 43'' W	BP_B_4	48° 44' 18'' N 122° 32' 27'' W	1.53	Whatcom	0	3	3	3	3
Bellingham_Anchorage	Departure	L1a	BP_B_4	48° 44' 18'' N 122° 32' 27'' W	BH_D_7	48° 42' 46'' N 122° 32' 43'' W	1.53	Whatcom	0	4	4	4	4

**Puget Sound Emissions Inventory**

OGV-Routing: BELLINGHAM to SEA

Lat/Long in WGS84 Datum

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Long	End WP	Ending Waypoint Lat/Long	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Container	Reefer	Bulkers	Tankers
											RO/RO	Log	Fishing	Fishing	
Bellingham_RS	Departure	M	Y	L6	BH_D_7	48° 42' 46" N 122° 32' 43" W	BH_D_6	48° 38' 43" N 122° 34' 10" W	4.2	Whatcom	0	0	10	8	6
Bellingham_RS	Departure	X	Y	L5	BH_D_6	48° 38' 43" N 122° 34' 10" W	BH_D_5	48° 38' 22" N 122° 34' 18" W	0.4	Skagit	0	0	11	9	SS
Bellingham_RS	Departure	X	Y	L4	BH_D_5	48° 38' 22" N 122° 34' 18" W	BH_D_4	48° 36' 07" N 122° 39' 29" W	4.1	Skagit	0	0	14	12	SS
Bellingham_RS	Departure	T	N	L3	BH_D_4	48° 36' 07" N 122° 39' 29" W	BH_D_3	48° 33' 12" N 122° 39' 48" W	2.9	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L2	BH_D_3	48° 33' 12" N 122° 39' 48" W	BH_D_2	48° 30' 09" N 122° 43' 05" W	3.7	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L1a	BH_D_2	48° 30' 09" N 122° 43' 05" W	RS_A_6	48° 28' 00" N 122° 43' 53" W	2.2	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L0a	RS_A_6	48° 28' 00" N 122° 43' 53" W	RS_D_12	48° 27' 12" N 122° 45' 18" W	1.3	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_12	48° 27' 12" N 122° 45' 18" W	RS_D_13	48° 26' 10" N 122° 45' 48" W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_13	48° 26' 10" N 122° 45' 48" W	RS_D_14	48° 24' 37" N 122° 48' 09" W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L14	RS_D_14	48° 24' 37" N 122° 48' 09" W	RS_D_15	48° 20' 13" N 122° 58' 21" W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	N	L15a	RS_D_15	48° 20' 13" N 122° 58' 21" W	PS_D_27	48° 10' 33" N 123° 23' 03" W	19.0	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10' 33" N 123° 23' 03" W	PS_D_28	48° 11' 21" N 123° 23' 02" W	0.8	Calallam	0	0	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11' 21" N 123° 23' 02" W	PS_D_29	48° 14' 13" N 123° 28' 57" W	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14' 13" N 123° 28' 57" W	PS_D_30	48° 15' 21" N 123° 33' 17" W	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15' 21" N 123° 33' 17" W	PS_D_31	48° 17' 36" N 123° 56' 06" W	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17' 36" N 123° 56' 06" W	PS_D_32	48° 30' 38" N 124° 43' 36" W	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30' 38" N 124° 43' 36" W	PS_D_33	48° 30' 43" N 125° 00' 00" W	10.9	Calallam	0	0	SS	SS	SS

Total Distance 118.2 nm

Note: SS - Service Speed

**Puget Sound Emissions Inventory**

OGV-Routing: BELLINGHAM to VANCOUVER (NB3)

Lat/Long in WGS84 Datum

**DRAFT**

												Speed by Link (knots)				
												Fast	Fast	Medium	Slow	Very Slow
												Bulkers				
												Reefer Tankers				
												Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container	Auto	Fishing	Fishing	Fishing
Bellingham_RS	Departure	M	Y	L6	BH_D_7	48° 42' 46'' N 122° 32' 43'' W	BH_D_6	48° 38' 43'' N 122° 34' 10'' W	4.2	Whatcom	0	0	10	8	6	
Bellingham_RS	Departure	M	Y	L5	BH_D_6	48° 38' 43'' N 122° 34' 10'' W	BH_D_5	48° 38' 22'' N 122° 34' 18'' W	0.4	Skagit	0	0	11	9	SS	
Bellingham_RS	Departure	X	Y	L4a	BH_D_5	48° 38' 22'' N 122° 34' 18'' W	LI_D_1	48° 37' 15'' N 122° 38' 00'' W	2.7	Skagit	0	0	14	12	SS	
Vendovi_GStght	Departure	T	N	L1	LI_D_1	48° 37' 15'' N 122° 38' 00'' W	LI_D_2	48° 38' 43'' N 122° 39' 49'' W	1.9	Skagit	0	0	10	12	SS	
Vendovi_GStght	Departure	T	N	L2a	LI_D_2	48° 38' 43'' N 122° 39' 49'' W	RS_A_12	48° 40' 35'' N 122° 42' 10'' W	2.4	Whatcom	0	0	12	12	SS	
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40' 35'' N 122° 42' 10'' W	RS_A_13	48° 45' 17'' N 122° 45' 50'' W	5.3	Whatcom	0	0	15	12	SS	
BuoyYCA_NB3	Departure	T	N	L1a	RS_A_13	48° 45' 17'' N 122° 45' 50'' W	SG_D_1	48° 47' 27'' N 122° 51' 18'' W	4.2	Whatcom	0	0	17	13	SS	
BuoyYCA_NB3	Departure	T	N	L2	SG_D_1	48° 47' 27'' N 122° 51' 18'' W	SG_D_2	49° 00' 09'' N 123° 14' 09'' W	19.7	Whatcom	0	0	SS	SS	SS	
Total Distance									40.7 nm	Note: SS - Service Speed						

**Puget Sound Emissions Inventory**  
**OGV-Routing: BELLINGHAM to TACOMA**  
 Lat/Long in WGS84 Datum

Speed by Link (knots)  
 Fast Fast Medium Slow Very Slow

**DRAFT**

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Auto	Speed by Link (knots)		
													Fast	Fast	Medium
													Bulkers	Reefer	Tankers
													Container	RO/RO	Log
													Fishing	Fishing	Fishing
Bellingham_RS	Departure	M	Y	L6	BH_D_7	48° 42' 46" N 122° 32' 43" W	BH_D_6	48° 38' 43" N 122° 34' 10" W	4.2	Whatcom	0	0	10	8	6
Bellingham_RS	Departure	X	Y	L5	BH_D_6	48° 38' 43" N 122° 34' 10" W	BH_D_5	48° 38' 22" N 122° 34' 18" W	0.4	Skagit	0	0	11	9	SS
Bellingham_RS	Departure	X	Y	L4	BH_D_5	48° 38' 22" N 122° 34' 18" W	BH_D_4	48° 36' 07" N 122° 39' 29" W	4.1	Skagit	0	0	14	12	SS
Bellingham_RS	Departure	T	N	L3	BH_D_4	48° 36' 07" N 122° 39' 29" W	BH_D_3	48° 33' 12" N 122° 39' 48" W	2.9	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L2	BH_D_3	48° 33' 12" N 122° 39' 48" W	BH_D_2	48° 30' 09" N 122° 43' 05" W	3.7	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L1	BH_D_2	48° 30' 09" N 122° 43' 05" W	RS_A_6	48° 28' 00" N 122° 43' 53" W	2.2	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L0a	RS_A_6	48° 28' 00" N 122° 43' 53" W	AA_D_2	48° 24' 08" N 122° 44' 50" W	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24' 08" N 122° 44' 50" W	AA_D_3	48° 22' 25" N 122° 45' 34" W	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	T	N	L3	AA_D_3	48° 22' 25" N 122° 45' 34" W	AA_D_4	48° 13' 29" N 122° 49' 22" W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13' 29" N 122° 49' 22" W	AA_D_5	48° 11' 32" N 122° 48' 21" W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11' 32" N 122° 48' 21" W	PS_A_9	48° 10' 57" N 122° 48' 01" W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10' 57" N 122° 48' 01" W	PS_A_10	48° 06' 35" N 122° 40' 10" W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06' 35" N 122° 40' 10" W	PS_A_11	48° 01' 08" N 122° 38' 08" W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01' 08" N 122° 38' 08" W	PS_A_12	47° 57' 41" N 122° 35' 10" W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57' 41" N 122° 35' 10" W	PS_A_13	47° 56' 38" N 122° 32' 57" W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56' 38" N 122° 32' 57" W	PS_A_14	47° 55' 17" N 122° 30' 06" W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55' 17" N 122° 30' 06" W	PS_A_15	47° 45' 54" N 122° 26' 45" W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45' 54" N 122° 26' 45" W	PS_A_16	47° 39' 42" N 122° 28' 24" W	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39' 42" N 122° 28' 24" W	PS_A_17	47° 34' 32" N 122° 27' 32" W	5.2	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34' 32" N 122° 27' 32" W	PS_A_18	47° 31' 51" N 122° 26' 34" W	2.8	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31' 51" N 122° 26' 34" W	PS_A_19	47° 26' 44" N 122° 24' 45" W	5.3	King	0	0	16	13	SS
Sea_Tacoma	Arrival	X	Y	L19	PS_A_19	47° 26' 44" N 122° 24' 45" W	PS_A_20	47° 23' 09" N 122° 21' 56" W	4.1	King	0	0	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23' 09" N 122° 21' 56" W	PS_A_21	47° 19' 39" N 122° 27' 52" W	5.3	King	0	0	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19' 39" N 122° 27' 52" W	PS_A_22	47° 19' 10" N 122° 28' 05" W	0.5	King	0	0	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19' 10" N 122° 28' 05" W	PS_A_23	47° 18' 07" N 122° 27' 41" W	1.1	Pierce	0	0	10	10	8

Total Distance 93.9 nm  
 Note: SS - Service Speed  
 Note: Red numbers - engines off

# Puget Sound Emissions Inventory

OGV-Routing: TACOMA to BELLINGHAM

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	WP 1	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Container	Reefer	Bulkers		
											Auto	RO/RO	Tankers		
												Fishing	Log	Fishing	
											Cruise		Fishing	Fishing	
Tacoma_Sea	Departure	M	Y	L2	PS_D_2	47° 1	PS_D_3	47° 19'	1.3	Pierce	0	0	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 1	PS_D_4	47° 19'	0.9	Pierce	0	0	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 1	PS_D_5	47° 23'	4.8	King	0	0	14	SS	SS
Tacoma_Sea	Departure	X	Y	L5	PS_D_5	47° 2	PS_D_6	47° 26'	4.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 2	PS_D_7	47° 34'	7.8	King	0	0	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 3	PS_D_8	47° 35'	1.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 3	PS_D_9	47° 37'	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 3	PS_D_10	47° 39'	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 3	PS_D_11	47° 41'	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 4	PS_D_12	47° 45'	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 4	PS_D_13	47° 46'	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 4	PS_D_14	47° 48'	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 4	PS_D_15	47° 52'	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 5	PS_D_16	47° 55'	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 5	PS_D_17	47° 57'	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 5	PS_D_18	47° 58'	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 5	PS_D_19	48° 02'	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 0	PS_D_20	48° 04'	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 0	PS_D_21	48° 06'	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 0	PS_D_22	48° 07'	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 0	PS_D_23	48° 11'	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 1	PS_D_24	48° 11'	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 1	AA_A_1	48° 13'	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	48° 1	AA_A_2	48° 24'	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	T	N	L2	AA_A_2	48° 2	AA_A_3	48° 24'	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	T	N	L3a	AA_A_3	48° 2	RS_A_6	48° 28'	3.2	Skagit	0	0	15	11	SS
RS_Bellingham	Arrival	T	N	L1a	RS_A_6	48° 2	BH_A_2	48° 30'	2.2	Skagit	0	0	14	11	SS
RS_Bellingham	Arrival	T	N	L2	BH_A_2	48° 3	BH_A_3	48° 33'	3.7	Skagit	0	0	14	10	SS
RS_Bellingham	Arrival	T	N	L3	BH_A_3	48° 3	BH_A_4	48° 36'	2.9	Skagit	0	0	14	10	SS
RS_Bellingham	Arrival	T	N	L4	BH_A_4	48° 3	BH_A_5	48° 38'	4.1	Skagit	0	0	14	10	SS
RS_Bellingham	Arrival	X	Y	L5	BH_A_5	48° 3	BH_A_6	48° 38'	0.4	Skagit	0	0	12	10	SS
RS_Bellingham	Arrival	M	Y	L6	BH_A_6	48° 3	BH_A_7	48° 42'	4.2	Whatcom	0	0	10	8	6

Total Distance 97.4 nm

Note: SS - Service Speed

# Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to VANCOUVER (NB2)

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP L	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
											Cruise	Auto	Fishing	Fishing	Fishing
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08'	PA_D_2	48° 08' 18	1.2	Calallam	0	6	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08'	PA_D_3	48° 09' 36	1.5	Calallam	0	8	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09'	PS_A_6	48° 09' 58	0.5	Calallam	0	8	8	8	8
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48° 09'	RS_A_2	48° 16' 08	13.1	Calallam	0	20	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16'	RS_A_3	48° 19' 40	6.6	San Juan	0	21	15	13	SS
PA_CherryPT	Arrival	T	N	L3	RS_A_3	48° 19'	AD_D_3	48° 19' 51	8.3	San Juan	0	20	15	13	SS
AI_NB2	Departure	T	N	L3	AD_D_3	48° 19'	AD_D_4	48° 24' 17	5.1	San Juan	0	22	SS	SS	SS
AI_NB2	Departure	T	N	L4	AD_D_4	48° 24'	AD_D_5	48° 29' 18	7.3	San Juan	0	22	SS	SS	SS
AI_NB2	Departure	T	N	L5	AD_D_5	48° 29'	AD_D_6	48° 34' 47	5.8	San Juan	0	22	SS	SS	SS
AI_NB2	Departure	X	N	L6	AD_D_6	48° 34'	AD_D_7	48° 40' 00	5.4	San Juan	0	18	16	11	SS

Total Distance 54.7 nm

# Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to PORT ANGELES

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	End WP	Waypoint	Dist.	County	Speed by Link (knots)				
										Fast	Fast	Medium	Slow	Very Slow
										Cruise	Container	Reefer	Bulkers	
											Auto	RO/RO	Tankers	
												Fishing	Log	Fishing
NB2_AI	Arrival	T	N	L1	AD_A_1	AD_A_2	48° 40' 48° 34'	5.2	San Juan	0	18	16	SS	SS
NB2_AI	Arrival	T	N	L2	AD_A_2	AD_A_3	48° 34' 48° 29'	5.9	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	T	N	L3	AD_A_3	AD_A_4	48° 29' 48° 27'	2.4	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	T	N	L4	AD_A_4	AD_A_5	48° 27' 48° 25'	3.6	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	T	N	L5	AD_A_5	AD_A_6	48° 25' 48° 22'	3.3	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	T	N	L6	AD_A_6	AD_A_7	48° 22' 48° 20'	2.9	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	X	N	L7a	AD_A_7	PS_D_27	48° 20' 48° 10'	19.0	Calallam	0	16	14	13	11
CPFern_PA	Arrival	X	Y	L1a	PS_D_27	PA_A_2	48° 10' 48° 09'	0.8	Calallam	0	8	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	PA_A_3	48° 09' 48° 08'	1.6	Calallam	0	8	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	PA_A_4	48° 08' 48° 08'	1.0	Calallam	0	6	6	6	6
Total Distance								45.7 nm	Note: SS - Service Speed					

# Puget Sound Emissions Inventory

## OGV-Routing: SEA to PORT ANGELES

Lat/Long in WGS84 Datum

DRAFT

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Reefer				
													Tankers				
													Log				
													Fishing				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	1g WP La	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing		
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28' 3	PS_A_2	48° 28' 3	10.7	Calallam	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28' 3	PS_A_3	48° 13' 2	35.9	Calallam	0	SS	SS	SS	SS		
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13' 2	PS_A_4	48° 13' 2	15.4	Calallam	0	20	SS	SS	SS		
Sea_Tacoma	Arrival	X	Y	L4	PS_A_4	48° 13' 2	PS_A_5	48° 09' 2	6.9	Calallam	0	16	15	12	SS		
Sea_PortAngeles	Arrival	M	Y	L1a	PS_A_5	48° 09' 2	PA_A_2	48° 09' 4	0.4	Calallam	0	8	8	8	8		
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09' 4	PA_A_3	48° 08' 2	1.6	Calallam	0	8	8	8	8		
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08' 2	PA_A_4	48° 08' 0	1.0	Calallam	0	6	6	6	6		
Total Distance									71.8 nm	Note: SS - Service Speed							



**Puget Sound Emissions Inventory**  
**OGV-Routing: PORT ANGELES HARBOR**

Lat/Long in WGS84 Datum

Speed by Link (knots)  
**Fast    Fast    Medium    Slow    Very Slow**

**DRAFT**

Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	WP	End WP	ypoi	Dist.	County	Cruise	Container Auto	Reefer Fishing	RO/RO Log	Tankers	Fishing
Sea_PortAngeles	PORT ANGELES		Arrival		PA_A_4	48° (	Mode: M			Calallam						
PortAngeles_Sea	PORT ANGELES		Departure		PA_D_1	48° (	NPE: Y			Calallam						

NOTE: All ARRIVAL harbor transits branch from PA\_A\_4

NOTE: All DEPARTURE harbor transits goto PA\_D\_1

PortAngeles_1-North	PORT ANGELES	1-NORTH	Arrival	L1a	PA_A_4	48° (	PA_B_1	√ 12	2.55	Calallam	3	3	3	3	3	3
1-North_PortAngeles	PORT ANGELES	1-NORTH	Departure	L1a	PA_B_1	N 12	PA_D_1	48°	2.55	Calallam	4	4	4	4	4	4

PortAngeles_Tesoro	PORT ANGELES	TESORO	Arrival	L1a	PA_A_4	48° (	PA_B_2	√ 12	2.41	Calallam	3	3	3	3	3	3
Tesoro_PortAngeles	PORT ANGELES	TESORO	Departure	L1a	PA_B_2	N 12	PA_D_1	48°	2.41	Calallam	4	4	4	4	4	4

PortAngeles_Tesoro	PORT ANGELES	CITY DOCK	Arrival	L1a	PA_A_4	48° (	PA_B_3	√ 12	1.93	Calallam	3	3	3	3	3	3
Tesoro_PortAngeles	PORT ANGELES	CITY DOCK	Departure	L1a	PA_B_3	N 12	PA_D_1	48°	1.93	Calallam	4	4	4	4	4	4

PortAngeles_Tesoro	PORT ANGELES	T PIER	Arrival	L1a	PA_A_4	48° (	PA_B_4	√ 12	1.83	Calallam	3	3	3	3	3	3
Tesoro_PortAngeles	PORT ANGELES	T PIER	Departure	L1a	PA_B_4	N 12	PA_D_1	48°	1.83	Calallam	4	4	4	4	4	4

Sea_PortAngeles	PORT ANGELES		Arrival		PA_A_3	48° (	Mode: M			Calallam						
PortAngeles_Sea	PORT ANGELES		Departure		PA_D_2	48° (	NPE: Y			Calallam						

NOTE: All ANCHORAGE ARRIVAL harbor transits branch from PA\_A\_3

NOTE: All ANCHORAGE DEPARTURE harbor transits goto PA\_D\_2

PortAngeles_Tesoro	PORT ANGELES	ANCHOR	Arrival	L1a	PA_A_4	48° (	PA_B_5	√ 12	0.79	Calallam	2	2	2	2	2	2
Tesoro_PortAngeles	PORT ANGELES	ANCHOR	Departure	L1a	PA_B_5	N 12	PA_D_1	48°	0.53	Calallam	4	4	4	4	4	4

# Puget Sound Emissions Inventory

## OGV-Routing: PORT ANGELES to SEA

Lat/Long in WGS84 Datum

DRAFT

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
													Bulkers				
													Reefer				
													Container RO/RO				
													Log				
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	g WP	L WP	End WP	Waypoint	Dist.	County	Cruise	Auto	Fishing	Fishing	Fishing	
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08'	PA_D_2	48° 08'	1	1.2	Calallam	0	6	6	6	6	
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08'	PA_D_3	48° 09'	3	1.5	Calallam	0	8	8	8	8	
PortAngeles_Sea	Departure	M	Y	L3	PA_D_3	48° 09'	PA_D_4	48° 11'	2	1.8	Calallam	0	8	8	8	8	
Tacoma_Sea	Departure	X	Y	L28	PS_D_28	48° 11'	PS_D_29	48° 14'	1	4.9	Calallam	0	15	14	12	SS	
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14'	PS_D_30	48° 15'	2	3.1	Calallam	0	19	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15'	PS_D_31	48° 17'	3	15.4	Calallam	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17'	PS_D_32	48° 30'	3	34.1	Calallam	0	SS	SS	SS	SS	
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30'	PS_D_33	48° 30'	4	10.9	Calallam	0	SS	SS	SS	SS	
Total Distance										72.8 nm	Note: SS - Service Speed						

**APPENDIX B - SUPPORTING DATA**

**HARBOR VESSEL DATA**



**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine					Annual			
				ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
650273	Andrew Foss	Assist & Escort	Foss	1	Propulsion	GM EMD	16-645-E6	1981	ULSD	2000	2818	0.31
650273	Andrew Foss	Assist & Escort	Foss	2	Propulsion	GM EMD	16-645-E6	1981	ULSD	2000	2818	0.31
650273	Andrew Foss	Assist & Escort	Foss	3	auxiliary	GM Detroit	671	1982	ULSD	100	2964	0.43
650273	Andrew Foss	Assist & Escort	Foss	4	auxiliary	GM Detroit	671	1982	ULSD	100	4281	0.43
573848	Barbara Foss	Assist & Escort	Foss	1	Propulsion	GM EMD	12-645-E6	1975	ULSD	2150	6914	0.31
573848	Barbara Foss	Assist & Escort	Foss	2	Propulsion	GM EMD	12-645-E6	1975	ULSD	2150	6948	0.31
573848	Barbara Foss	Assist & Escort	Foss	3	auxiliary	GM Detroit	671	2003	ULSD	192	4082	0.43
573848	Barbara Foss	Assist & Escort	Foss	4	auxiliary	GM Detroit	671	2003	ULSD	192	4190	0.43
573848	Barbara Foss	Assist & Escort	Foss	5	auxiliary	GM Detroit	671	ULSD	192	148	0.43	
1063755	Chief	Assist & Escort	Crowley	1	Propulsion	CAT	3516	1998	ULSD	2400	2600	0.31
1063755	Chief	Assist & Escort	Crowley	2	Propulsion	CAT	3516	1998	ULSD	2400	2600	0.31
1063755	Chief	Assist & Escort	Crowley	3	auxiliary	CAT	3304	1998	ULSD	140	3000	0.43
1063755	Chief	Assist & Escort	Crowley	4	auxiliary	CAT	3304	1998	ULSD	140	3000	0.43
1139986	Corbin Foss	Assist & Escort	Foss	1	Propulsion	Fairbanks M Alco	16-251	1981	ULSD	4100	2730	0.31
1139986	Corbin Foss	Assist & Escort	Foss	2	Propulsion	Fairbanks M Alco	16-251	1981	ULSD	4100	3067	0.31
1139986	Corbin Foss	Assist & Escort	Foss	3	auxiliary	Cummins	6cta 8.3 -dci	1982	ULSD	228	4475	0.43
1139986	Corbin Foss	Assist & Escort	Foss	4	auxiliary	Cummins	6cta 8.3 -dci	1982	ULSD	228	4193	0.43
1139986	Corbin Foss	Assist & Escort	Foss	5	auxiliary	Cummins	N-14-M	ULSD	480	144	0.43	
1139986	Corbin Foss	Assist & Escort	Foss	6	auxiliary	John Deere	6068	ULSD	190	83	0.43	
1228451	Delta Lindsey	Assist & Escort	Foss	1	Propulsion	Caterpillar	3516B	2010	ULSD	2575	2481	0.31
1228451	Delta Lindsey	Assist & Escort	Foss	2	Propulsion	Caterpillar	3516B	2010	ULSD	2575	2480	0.31
1228451	Delta Lindsey	Assist & Escort	Foss	3	auxiliary	Caterpillar	C6.6	2010	ULSD	201	1623	0.43
1228451	Delta Lindsey	Assist & Escort	Foss	4	auxiliary	Caterpillar	C6.6	2010	ULSD	201	1623	0.43
1228451	Delta Lindsey	Assist & Escort	Foss	5	auxiliary	Caterpillar	C4.4	2010	ULSD	74	4757	0.43
997792	Garth Foss	Assist & Escort	Foss	1	Propulsion	GM EMD	ME16-710-C	1993	ULSD	4000	3589	0.31
997792	Garth Foss	Assist & Escort	Foss	2	Propulsion	GM EMD	ME16-710-C	1993	ULSD	4000	3589	0.31
997792	Garth Foss	Assist & Escort	Foss	3	auxiliary	GM Detroit	6V-92TA	2004	ULSD	241	5870	0.43
997792	Garth Foss	Assist & Escort	Foss	4	auxiliary	GM Detroit	6V-92TA	2005	ULSD	241	3455	0.43
1063763	Guide	Assist & Escort	Crowley	1	Propulsion	CAT	3516	1998	ULSD	2400	2600	0.31
1063763	Guide	Assist & Escort	Crowley	2	Propulsion	CAT	3516	1998	ULSD	2400	2600	0.31
1063763	Guide	Assist & Escort	Crowley	3	auxiliary	CAT	3304	1998	ULSD	140	3000	0.43
1063763	Guide	Assist & Escort	Crowley	4	auxiliary	CAT	3304	1998	ULSD	140	3000	0.43
650272	Henry Foss	Assist & Escort	Foss	1	Propulsion	GM EMD	12-645-E6	1982	ULSD	1500	3156	0.31
650272	Henry Foss	Assist & Escort	Foss	2	Propulsion	GM EMD	12-645-E6	1982	ULSD	1500	3156	0.31
650272	Henry Foss	Assist & Escort	Foss	3	Propulsion	Cummins	KTA-50-M2	2004	ULSD	1700	2853	0.31
650272	Henry Foss	Assist & Escort	Foss	4	auxiliary	GM Detroit	671	2000	ULSD	192	1666	0.43
650272	Henry Foss	Assist & Escort	Foss	5	auxiliary	GM Detroit	671	2000	ULSD	192	4307	0.43
997794	Lindsey Foss	Assist & Escort	Foss	1	Propulsion	GM EMD	16-710-G7A	1993	ULSD	4000	2849	0.31
997794	Lindsey Foss	Assist & Escort	Foss	2	Propulsion	GM EMD	16-710-G7A	1993	ULSD	4000	2846	0.31
997794	Lindsey Foss	Assist & Escort	Foss	3	auxiliary	GM Detroit	6V-92TA	2001	ULSD	550	3920	0.43
997794	Lindsey Foss	Assist & Escort	Foss	4	auxiliary	GM Detroit	6V-92TA	2002	ULSD	550	3990	0.43
9430507	Pacific Star	Assist & Escort	Foss	1	Propulsion	MTU	T1627M12/	2006	ULSD	2575	3406	0.31
9430507	Pacific Star	Assist & Escort	Foss	2	Propulsion	MTU	T1627M12/	2006	ULSD	2575	3404	0.31
9430507	Pacific Star	Assist & Escort	Foss	3	auxiliary	Northern Lig	M99C2 ? 991	2007	ULSD	201	4243	0.43
9430507	Pacific Star	Assist & Escort	Foss	4	auxiliary	Northern Lig	M99C2 ? 991	2007	ULSD	201	3620	0.43
1045212	Protector	Assist & Escort	Crowley	1	Propulsion	CAT	3606	1996	ULSD	2550	2600	0.31
1045212	Protector	Assist & Escort	Crowley	2	Propulsion	CAT	3606	1996	ULSD	2550	2600	0.31
1045212	Protector	Assist & Escort	Crowley	3	auxiliary	CAT	3304	1996	ULSD	140	3000	0.43
1045212	Protector	Assist & Escort	Crowley	4	auxiliary	CAT	3304	1996	ULSD	140	3000	0.43
1129936	Response	Assist & Escort	Crowley	1	Propulsion	CAT	3308	2002	ULSD	3600	2600	0.31
1129936	Response	Assist & Escort	Crowley	2	Propulsion	CAT	3308	2002	ULSD	3600	2600	0.31
1129936	Response	Assist & Escort	Crowley	3	auxiliary	CAT	3306	2002	ULSD	250	3000	0.43
1129936	Response	Assist & Escort	Crowley	4	auxiliary	CAT	3306	2002	ULSD	250	3000	0.43
1021169	Tioga	Assist & Escort	Crowley	1	Propulsion	CAT	3516	2002	ULSD	2400	2600	0.31
1021169	Tioga	Assist & Escort	Crowley	2	Propulsion	CAT	3516	2002	ULSD	2400	2600	0.31
1021169	Tioga	Assist & Escort	Crowley	3	auxiliary	CAT	3304	2002	ULSD	140	3000	0.43
1021169	Tioga	Assist & Escort	Crowley	4	auxiliary	CAT	3304	2002	ULSD	140	3000	0.43
1199816	Valor	Assist & Escort	Crowley	1	Propulsion	CAT	3516C	2002	ULSD	2400	2600	0.31
1199816	Valor	Assist & Escort	Crowley	2	Propulsion	CAT	3516C	2002	ULSD	2400	2600	0.31
1199816	Valor	Assist & Escort	Crowley	3	auxiliary	CAT	C4.4	2002	ULSD	75	3000	0.43
1199816	Valor	Assist & Escort	Crowley	4	auxiliary	CAT	C4.4	2002	ULSD	75	3000	0.43
649840	Wedell Foss	Assist & Escort	Foss	1	Propulsion	GM EMD	12-645-E6	1981	ULSD	1500	3529	0.31
649840	Wedell Foss	Assist & Escort	Foss	2	Propulsion	GM EMD	12-645-E6	1981	ULSD	1500	3529	0.31
649840	Wedell Foss	Assist & Escort	Foss	3	Propulsion	Cummins	KTA-50-M2	2005	ULSD	1700	2966	0.31
649840	Wedell Foss	Assist & Escort	Foss	4	auxiliary	GM Detroit	671	1982	ULSD	192	4823	0.43
649840	Wedell Foss	Assist & Escort	Foss	5	auxiliary	GM Detroit	671	1982	ULSD	192	1697	0.43
7613698	ADVENTURE	Commercial Fishing		1	Propulsion				ULSD	350	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual					
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load	
7613698	ADVENTURE	Commercial Fishing		2	Propulsion					ULSD	350	48	0.3
7613698	ADVENTURE	Commercial Fishing		3	auxiliary					ULSD	100	48	0.3
271628	AFOGNAK	Commercial Fishing		1	Propulsion					ULSD	290	48	0.3
271628	AFOGNAK	Commercial Fishing		2	Propulsion					ULSD	290	48	0.3
271628	AFOGNAK	Commercial Fishing		3	auxiliary					ULSD	100	48	0.3
599164	AJ	Commercial Fishing		1	Propulsion			1978	ULSD	760	48	0.3	
599164	AJ	Commercial Fishing		2	Propulsion			1978	ULSD	760	48	0.3	
599164	AJ	Commercial Fishing		3	auxiliary			1978	ULSD	330	48	0.3	
641608	AKEMI	Commercial Fishing		1	Propulsion					ULSD	550	48	0.3
641608	AKEMI	Commercial Fishing		2	Propulsion					ULSD	550	48	0.3
641608	AKEMI	Commercial Fishing		3	auxiliary					ULSD	330	48	0.3
7337165	ALASKA BEAUTY	Commercial Fishing		1	Propulsion					ULSD	400	48	0.3
7337165	ALASKA BEAUTY	Commercial Fishing		2	Propulsion					ULSD	400	48	0.3
7337165	ALASKA BEAUTY	Commercial Fishing		3	auxiliary					ULSD	100	48	0.3
996921	ALASKA KNIGHT	Commercial Fishing		1	Propulsion					ULSD	2300	48	0.3
996921	ALASKA KNIGHT	Commercial Fishing		2	Propulsion					ULSD	2300	48	0.3
996921	ALASKA KNIGHT	Commercial Fishing		3	auxiliary					ULSD	900	48	0.3
586179	ALASKA MIST	Commercial Fishing	GULF MIST	1	Propulsion			1944	ULSD	750	48	0.3	
586179	ALASKA MIST	Commercial Fishing	GULF MIST	2	Propulsion			1944	ULSD	750	48	0.3	
586179	ALASKA MIST	Commercial Fishing	GULF MIST	3	auxiliary			1944	ULSD	330	48	0.3	
637856	ALASKA OCEAN	Commercial Fishing	AK OCEAN	1	Propulsion			1981	ULSD	3125	48	0.3	
637856	ALASKA OCEAN	Commercial Fishing	AK OCEAN	2	Propulsion			1981	ULSD	3125	48	0.3	
637856	ALASKA OCEAN	Commercial Fishing	AK OCEAN	3	auxiliary			1981	ULSD	900	48	0.3	
8133059	ALASKA PACKER	Commercial Fishing	TRIDENT S	1	Propulsion			1949	ULSD	900	48	0.3	
8133059	ALASKA PACKER	Commercial Fishing	TRIDENT S	2	Propulsion			1949	ULSD	900	48	0.3	
8133059	ALASKA PACKER	Commercial Fishing	TRIDENT S	3	auxiliary					ULSD	330	48	0.3
5232907	ALASKA QUEEN II	Commercial Fishing		1	Propulsion					ULSD	450	48	0.3
5232907	ALASKA QUEEN II	Commercial Fishing		2	Propulsion					ULSD	450	48	0.3
5232907	ALASKA QUEEN II	Commercial Fishing		3	auxiliary					ULSD	100	48	0.3
510811	ALASKAN	Commercial Fishing		1	Propulsion			1967	ULSD	350	48	0.3	
510811	ALASKAN	Commercial Fishing		2	Propulsion			1967	ULSD	350	48	0.3	
510811	ALASKAN	Commercial Fishing		3	auxiliary			1967	ULSD	100	48	0.3	
7719193	ALASKAN BEAUTY	Commercial Fishing		1	Propulsion			1978	ULSD	425	48	0.3	
7719193	ALASKAN BEAUTY	Commercial Fishing		2	Propulsion			1978	ULSD	425	48	0.3	
7719193	ALASKAN BEAUTY	Commercial Fishing		3	auxiliary			1978	ULSD	100	48	0.3	
599383	ALASKAN COMMA	Commercial Fishing		1	Propulsion			1978	ULSD	3000	48	0.3	
599383	ALASKAN COMMA	Commercial Fishing		2	Propulsion			1978	ULSD	3000	48	0.3	
599383	ALASKAN COMMA	Commercial Fishing		3	auxiliary			1978	ULSD	900	48	0.3	
595760	ALASKAN ENTERI	Commercial Fishing		1	Propulsion			1978	ULSD	900	48	0.3	
595760	ALASKAN ENTERI	Commercial Fishing		2	Propulsion			1978	ULSD	900	48	0.3	
595760	ALASKAN ENTERI	Commercial Fishing		3	auxiliary			1978	ULSD	330	48	0.3	
8845767	ALASKAN LEADEF	Commercial Fishing		1	Propulsion			1991	ULSD	800	48	0.3	
8845767	ALASKAN LEADEF	Commercial Fishing		2	Propulsion			1991	ULSD	800	48	0.3	
8845767	ALASKAN LEADEF	Commercial Fishing		3	auxiliary			1991	ULSD	330	48	0.3	
8411932	ALDEBARAN	Commercial Fishing		1	Propulsion					ULSD	750	48	0.3
8411932	ALDEBARAN	Commercial Fishing		2	Propulsion					ULSD	750	48	0.3
8411932	ALDEBARAN	Commercial Fishing		3	auxiliary					ULSD	330	48	0.3
39072	ALESSA LEI	Commercial Fishing		1	Propulsion					ULSD	750	48	0.3
39072	ALESSA LEI	Commercial Fishing		2	Propulsion					ULSD	750	48	0.3
39072	ALESSA LEI	Commercial Fishing		3	auxiliary					ULSD	330	48	0.3
8851649	ALEUTIAN BALLA	Commercial Fishing		1	Propulsion			1983	ULSD	400	48	0.3	
8851649	ALEUTIAN BALLA	Commercial Fishing		2	Propulsion			1983	ULSD	400	48	0.3	
8851649	ALEUTIAN BALLA	Commercial Fishing		3	auxiliary			1983	ULSD	100	48	0.3	
7230989	ALEUTIAN BEAUT	Commercial Fishing		1	Propulsion			1971	ULSD	350	48	0.3	
7230989	ALEUTIAN BEAUT	Commercial Fishing		2	Propulsion			1971	ULSD	350	48	0.3	
7230989	ALEUTIAN BEAUT	Commercial Fishing		3	auxiliary			1971	ULSD	100	48	0.3	
7912109	ALEUTIAN CHALL	Commercial Fishing		1	Propulsion			1978	ULSD	850	48	0.3	
7912109	ALEUTIAN CHALL	Commercial Fishing		2	Propulsion			1978	ULSD	850	48	0.3	
7912109	ALEUTIAN CHALL	Commercial Fishing		3	auxiliary			1978	ULSD	330	48	0.3	
642161	ALEUTIAN FALCO	Commercial Fishing	NORQUES'	1	Propulsion			1981	ULSD	1500	48	0.3	
642161	ALEUTIAN FALCO	Commercial Fishing	NORQUES'	2	Propulsion			1981	ULSD	1500	48	0.3	
642161	ALEUTIAN FALCO	Commercial Fishing	NORQUES'	3	auxiliary			1981	ULSD	900	48	0.3	
7915864	ALEUTIAN MARIN	Commercial Fishing		1	Propulsion			1979	ULSD	600	48	0.3	
7915864	ALEUTIAN MARIN	Commercial Fishing		2	Propulsion			1979	ULSD	600	48	0.3	
7915864	ALEUTIAN MARIN	Commercial Fishing		3	auxiliary			1979	ULSD	330	48	0.3	
522870	ALEUTIAN SPRAY	Commercial Fishing	ALEUTIAN	1	Propulsion			1969	ULSD	290	48	0.3	
522870	ALEUTIAN SPRAY	Commercial Fishing	ALEUTIAN	2	Propulsion			1969	ULSD	290	48	0.3	

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Engine Fuel	Engine HP	Annual	
				ID User	Type						Hours	Load
522870	ALEUTIAN SPRAY	Commercial Fishing	ALEUTIAN		3 auxiliary			1969	ULSD	100	48	0.3
8010087	ALLIANCE	Commercial Fishing			1 Propulsion			1980	ULSD	500	48	0.3
8010087	ALLIANCE	Commercial Fishing			2 Propulsion			1980	ULSD	500	48	0.3
8010087	ALLIANCE	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
560237	ALYESKA	Commercial Fishing	WA'ATCH I		1 Propulsion			1974	ULSD	900	48	0.3
560237	ALYESKA	Commercial Fishing	WA'ATCH I		2 Propulsion			1974	ULSD	900	48	0.3
560237	ALYESKA	Commercial Fishing	WA'ATCH I		3 auxiliary			1974	ULSD	330	48	0.3
511315	AMATULI	Commercial Fishing	WIDING		1 Propulsion			1967	ULSD	365	48	0.3
511315	AMATULI	Commercial Fishing	WIDING		2 Propulsion			1967	ULSD	364	48	0.3
511315	AMATULI	Commercial Fishing	WIDING		3 auxiliary			1967	ULSD	100	48	0.3
633219	American Challenger	Commercial Fishing	AMERICAN		1 Propulsion			1981	ULSD	450	144	0.3
633219	American Challenger	Commercial Fishing	AMERICAN		2 Propulsion			1981	ULSD	450	144	0.3
633219	American Challenger	Commercial Fishing	AMERICAN		3 auxiliary			1981	ULSD	100	144	0.3
7390428	American Dynasty	Commercial Fishing	American Se		1 Propulsion	Bergen Dies	BRM 8	1990	ULSD	4400	48	0.3
7390428	American Dynasty	Commercial Fishing	American Se		2 Propulsion	Bergen Dies	BRM 8	1990	ULSD	4400	48	0.3
7513006	AMERICAN LADY	Commercial Fishing			1 Propulsion			1973	ULSD	425	48	0.3
7513006	AMERICAN LADY	Commercial Fishing			2 Propulsion			1973	ULSD	425	48	0.3
7513006	AMERICAN LADY	Commercial Fishing			3 auxiliary			1973	ULSD	100	48	0.3
7902001	American No. 1	Commercial Fishing	North Paciif		1 Propulsion			1979	ULSD	1125	48	0.3
7902001	American No. 1	Commercial Fishing	North Paciif		2 Propulsion			1979	ULSD	1125	48	0.3
7902001	American No. 1	Commercial Fishing	North Paciif		3 auxiliary			1979	ULSD	900	48	0.3
8851615	AMERICAN PATRI	Commercial Fishing			1 Propulsion				ULSD	750	48	0.3
8851615	AMERICAN PATRI	Commercial Fishing			2 Propulsion				ULSD	750	48	0.3
8851615	AMERICAN PATRI	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
7738412	American Triumph	Commercial Fishing	American Se		1 Propulsion	Wartsila	8R32	1989	ULSD	4400	48	0.3
7738412	American Triumph	Commercial Fishing	American Se		2 Propulsion	Wartsila	8R32	1989	ULSD	4400	48	0.3
6617075	AMY USEN	Commercial Fishing			1 Propulsion				ULSD	750	48	0.3
6617075	AMY USEN	Commercial Fishing			2 Propulsion				ULSD	750	48	0.3
6617075	AMY USEN	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
249544	ANGIE	Commercial Fishing			1 Propulsion				ULSD	150	48	0.3
249544	ANGIE	Commercial Fishing			2 Propulsion				ULSD	150	48	0.3
249544	ANGIE	Commercial Fishing			3 auxiliary				ULSD	100	48	0.3
7611391	ANITA J	Commercial Fishing			1 Propulsion				ULSD	250	48	0.3
7611391	ANITA J	Commercial Fishing			2 Propulsion				ULSD	250	48	0.3
7611391	ANITA J	Commercial Fishing			3 auxiliary				ULSD	100	48	0.3
524384	ANNA MARIE	Commercial Fishing			1 Propulsion			1970	ULSD	425	48	0.3
524384	ANNA MARIE	Commercial Fishing			2 Propulsion			1970	ULSD	425	48	0.3
524384	ANNA MARIE	Commercial Fishing			3 auxiliary			1970	ULSD	100	48	0.3
9204556	ANNELIES ILENA	Commercial Fishing			1 Propulsion				ULSD	750	48	0.3
9204556	ANNELIES ILENA	Commercial Fishing			2 Propulsion				ULSD	750	48	0.3
9204556	ANNELIES ILENA	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
609117	ANNIHILATOR	Commercial Fishing			1 Propulsion				ULSD	750	48	0.3
609117	ANNIHILATOR	Commercial Fishing			2 Propulsion				ULSD	750	48	0.3
609117	ANNIHILATOR	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
536823	AQUILA	Commercial Fishing	TAMARAK		1 Propulsion			1972	ULSD	1200	48	0.3
536823	AQUILA	Commercial Fishing	TAMARAK		2 Propulsion			1972	ULSD	1200	48	0.3
536823	AQUILA	Commercial Fishing	TAMARAK		3 auxiliary			1972	ULSD	900	48	0.3
550931	ARCTIC 5	Commercial Fishing	TRIDENT 5		1 Propulsion			1973	ULSD	2800	48	0.3
550931	ARCTIC 5	Commercial Fishing	TRIDENT 5		2 Propulsion			1973	ULSD	2800	48	0.3
550931	ARCTIC 5	Commercial Fishing	TRIDENT 5		3 auxiliary			1973	ULSD	900	48	0.3
8117885	ARCTIC DAWN	Commercial Fishing			1 Propulsion				ULSD	600	48	0.3
8117885	ARCTIC DAWN	Commercial Fishing			2 Propulsion				ULSD	600	48	0.3
8117885	ARCTIC DAWN	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
248169	ARCTIC ENTERPRI	Commercial Fishing	TRIDENT 5		1 Propulsion			1945	ULSD	850	48	0.3
248169	ARCTIC ENTERPRI	Commercial Fishing	TRIDENT 5		2 Propulsion			1945	ULSD	850	48	0.3
248169	ARCTIC ENTERPRI	Commercial Fishing	TRIDENT 5		3 auxiliary			1945	ULSD	330	48	0.3
9031325	ARCTIC FURY	Commercial Fishing			1 Propulsion				ULSD	3030	72	0.3
9031325	ARCTIC FURY	Commercial Fishing			2 Propulsion				ULSD	3030	72	0.3
9031325	ARCTIC FURY	Commercial Fishing			3 auxiliary				ULSD	900	72	0.3
592242	ARCTIC HUNTER	Commercial Fishing			1 Propulsion				ULSD	550	72	0.3
592242	ARCTIC HUNTER	Commercial Fishing			2 Propulsion				ULSD	550	48	0.3
592242	ARCTIC HUNTER	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
8802390	ARCTIC OCEAN	Commercial Fishing			1 Propulsion				ULSD	750	48	0.3
8802390	ARCTIC OCEAN	Commercial Fishing			2 Propulsion				ULSD	750	48	0.3
8802390	ARCTIC OCEAN	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
596137	ARCTIC SEA	Commercial Fishing	KRISTIAN		1 Propulsion			1978	ULSD	705	48	0.3
596137	ARCTIC SEA	Commercial Fishing	KRISTIAN		2 Propulsion			1978	ULSD	705	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual				
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
596137	ARCTIC SEA	Commercial Fishing	KRISTIAN	3	auxiliary			1978	ULSD	330	48	0.3
903511	ARCTIC STORM	Commercial Fishing	ARCTIC ST	1	Propulsion			1941	ULSD	2500	72	0.3
903511	ARCTIC STORM	Commercial Fishing	ARCTIC ST	2	Propulsion			1941	ULSD	2500	72	0.3
903511	ARCTIC STORM	Commercial Fishing	ARCTIC ST	3	auxiliary			1941	ULSD	900	72	0.3
655328	ARCTURUS	Commercial Fishing	TRIDENT S	1	Propulsion			1983	ULSD	770	48	0.3
655328	ARCTURUS	Commercial Fishing	TRIDENT S	2	Propulsion			1983	ULSD	770	48	0.3
655328	ARCTURUS	Commercial Fishing	TRIDENT S	3	auxiliary			1983	ULSD	330	48	0.3
550139	ARICA	Commercial Fishing	ARICA FISI	1	Propulsion			1973	ULSD	1500	48	0.3
550139	ARICA	Commercial Fishing	ARICA FISI	2	Propulsion			1973	ULSD	1500	48	0.3
550139	ARICA	Commercial Fishing	ARICA FISI	3	auxiliary			1973	ULSD	900	48	0.3
258139	ARLINE	Commercial Fishing		1	Propulsion			1989	ULSD	800	48	0.3
258139	ARLINE	Commercial Fishing		2	auxiliary			1989	ULSD	330	48	0.3
635397	AUGUSTINE	Commercial Fishing	AUGUSTIN	1	Propulsion			1981	ULSD	500	48	0.3
635397	AUGUSTINE	Commercial Fishing	AUGUSTIN	2	Propulsion			1981	ULSD	500	48	0.3
635397	AUGUSTINE	Commercial Fishing	AUGUSTIN	3	auxiliary			1981	ULSD	330	48	0.3
259779	AUTUMN DAWN	Commercial Fishing	AUTUMN I	1	Propulsion			1949	ULSD	300	48	0.3
259779	AUTUMN DAWN	Commercial Fishing	AUTUMN I	2	Propulsion			1949	ULSD	300	48	0.3
259779	AUTUMN DAWN	Commercial Fishing	AUTUMN I	3	auxiliary			1949	ULSD	100	48	0.3
7049158	BALLYHOO	Commercial Fishing		1	Propulsion			ULSD	625	48	0.3	
7049158	BALLYHOO	Commercial Fishing		2	auxiliary			ULSD	100	48	0.3	
598508	BARANOF	Commercial Fishing	ROMANZC	1	Propulsion			1978	ULSD	550	48	0.3
598508	BARANOF	Commercial Fishing	ROMANZC	2	Propulsion			1978	ULSD	550	48	0.3
598508	BARANOF	Commercial Fishing	ROMANZC	3	auxiliary			1978	ULSD	330	48	0.3
648690	BARBARA J	Commercial Fishing		1	Propulsion			1982	ULSD	400	48	0.3
648690	BARBARA J	Commercial Fishing		2	Propulsion			1982	ULSD	400	48	0.3
648690	BARBARA J	Commercial Fishing		3	auxiliary			1982	ULSD	100	48	0.3
7051668	BARWELL	Commercial Fishing		1	Propulsion			ULSD	700	48	0.3	
7051668	BARWELL	Commercial Fishing		2	Propulsion			ULSD	700	48	0.3	
7051668	BARWELL	Commercial Fishing		3	auxiliary			ULSD	330	48	0.3	
33800	BELINA	Commercial Fishing		1	Propulsion			ULSD	750	48	0.3	
33800	BELINA	Commercial Fishing		2	Propulsion			ULSD	750	48	0.3	
33800	BELINA	Commercial Fishing		3	auxiliary			ULSD	330	48	0.3	
631084	BELLA K	Commercial Fishing	HIGHLANI	1	Propulsion			1980	ULSD	600	48	0.3
631084	BELLA K	Commercial Fishing	HIGHLANI	2	Propulsion			1980	ULSD	600	48	0.3
631084	BELLA K	Commercial Fishing	HIGHLANI	3	auxiliary			1980	ULSD	330	48	0.3
973006	BERING PROWLEF	Commercial Fishing		1	Propulsion			1991	ULSD	675	48	0.3
973006	BERING PROWLEF	Commercial Fishing		2	auxiliary			ULSD	330	48	0.3	
8037578	BERING ROSE	Commercial Fishing		1	Propulsion			ULSD	1125	48	0.3	
8037578	BERING ROSE	Commercial Fishing		2	Propulsion			ULSD	1125	48	0.3	
8037578	BERING ROSE	Commercial Fishing		3	auxiliary			ULSD	900	48	0.3	
554126	BERING SEA	Commercial Fishing	POULSEN	1	Propulsion			1973	ULSD	425	48	0.3
554126	BERING SEA	Commercial Fishing	POULSEN	2	Propulsion			1973	ULSD	425	48	0.3
554126	BERING SEA	Commercial Fishing	POULSEN	3	auxiliary			1973	ULSD	100	48	0.3
593310	BERING STAR	Commercial Fishing	BERING SI	1	Propulsion			1978	ULSD	425	48	0.3
593310	BERING STAR	Commercial Fishing	BERING SI	2	Propulsion			1978	ULSD	425	48	0.3
593310	BERING STAR	Commercial Fishing	BERING SI	3	auxiliary			1978	ULSD	100	48	0.3
224779	BERYL E	Commercial Fishing	HOPPEN	1	Propulsion			1925	ULSD	200	48	0.3
224779	BERYL E	Commercial Fishing	HOPPEN	2	Propulsion			1925	ULSD	200	48	0.3
224779	BERYL E	Commercial Fishing	HOPPEN	3	auxiliary			1925	ULSD	100	48	0.3
550190	BILLIKIN	Commercial Fishing	TRIDENT S	1	Propulsion			1973	ULSD	565	48	0.3
550190	BILLIKIN	Commercial Fishing	TRIDENT S	2	Propulsion			1973	ULSD	565	48	0.3
550190	BILLIKIN	Commercial Fishing	TRIDENT S	3	auxiliary			1973	ULSD	330	48	0.3
624429	BLUE ATTU	Commercial Fishing	BLUE ATTI	1	Propulsion			1980	ULSD	520	48	0.3
624429	BLUE ATTU	Commercial Fishing	BLUE ATTI	2	Propulsion			1980	ULSD	520	48	0.3
624429	BLUE ATTU	Commercial Fishing	BLUE ATTI	3	auxiliary			1980	ULSD	330	48	0.3
546234	BLUE FIN	Commercial Fishing		1	Propulsion			ULSD	500	48	0.3	
546234	BLUE FIN	Commercial Fishing		2	Propulsion			ULSD	500	48	0.3	
546234	BLUE FIN	Commercial Fishing		3	auxiliary			ULSD	330	48	0.3	
569927	BLUE PACIFIC	Commercial Fishing	SELDOVIA	1	Propulsion			1944	ULSD	624	48	0.3
569927	BLUE PACIFIC	Commercial Fishing	SELDOVIA	2	Propulsion			1944	ULSD	624	48	0.3
569927	BLUE PACIFIC	Commercial Fishing	SELDOVIA	3	auxiliary			1944	ULSD	330	48	0.3
5410418	BLUE WATERS	Commercial Fishing		1	Propulsion			1980	ULSD	235	48	0.3
7902207	BOLD PERFORMA	Commercial Fishing		1	Propulsion			ULSD	750	48	0.3	
7902207	BOLD PERFORMA	Commercial Fishing		2	Propulsion			ULSD	750	48	0.3	
7902207	BOLD PERFORMA	Commercial Fishing		3	auxiliary			ULSD	330	48	0.3	
648108	BOTANY BAY	Commercial Fishing		1	Propulsion			1982	ULSD	350	48	0.3
648108	BOTANY BAY	Commercial Fishing		2	Propulsion			1982	ULSD	350	48	0.3



**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual					
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load	
648108	BOTANY BAY	Commercial Fishing			3 auxiliary				1982	ULSD	100	48	0.3
593404	BOUNTIFUL	Commercial Fishing	TRIDENT S		1 Propulsion				1978	ULSD	850	48	0.3
593404	BOUNTIFUL	Commercial Fishing	TRIDENT S		2 Propulsion				1978	ULSD	850	48	0.3
593404	BOUNTIFUL	Commercial Fishing	TRIDENT S		3 auxiliary				1978	ULSD	330	48	0.3
611519	BRENNA A	Commercial Fishing			1 Propulsion				ULSD	250	48	0.3	
611519	BRENNA A	Commercial Fishing			2 Propulsion				ULSD	250	48	0.3	
611519	BRENNA A	Commercial Fishing			3 auxiliary				ULSD	100	48	0.3	
8030647	BRISTOL EXPLOR	Commercial Fishing			1 Propulsion				1982	ULSD	1000	48	0.3
8030647	BRISTOL EXPLOR	Commercial Fishing			2 Propulsion				1982	ULSD	1000	48	0.3
8030647	BRISTOL EXPLOR	Commercial Fishing			3 auxiliary				1982	ULSD	330	48	0.3
1060513	BRISTOL LEADER	Commercial Fishing			1 Propulsion				1998	ULSD	1000	48	0.3
1060513	BRISTOL LEADER	Commercial Fishing			2 Propulsion				1998	ULSD	1000	48	0.3
1060513	BRISTOL LEADER	Commercial Fishing			3 auxiliary				ULSD	900	48	0.3	
600856	BRITTANY	Commercial Fishing	RENFRO		1 Propulsion				1979	ULSD	365	48	0.3
600856	BRITTANY	Commercial Fishing	RENFRO		2 Propulsion				1979	ULSD	365	48	0.3
600856	BRITTANY	Commercial Fishing	RENFRO		3 auxiliary				1979	ULSD	100	48	0.3
23277	CALEDONIAN	Commercial Fishing			1 Propulsion				1974	ULSD	425	48	0.3
23277	CALEDONIAN	Commercial Fishing			2 Propulsion				1974	ULSD	425	48	0.3
7739193	CALIFORNIA HOR	Commercial Fishing			1 Propulsion				1978	ULSD	350	48	0.3
7739193	CALIFORNIA HOR	Commercial Fishing			2 Propulsion				1978	ULSD	350	48	0.3
7739193	CALIFORNIA HOR	Commercial Fishing			3 auxiliary				1978	ULSD	100	48	0.3
6506953	CANADIAN NO 1	Commercial Fishing			1 Propulsion				ULSD	750	48	0.3	
6506953	CANADIAN NO 1	Commercial Fishing			2 Propulsion				ULSD	750	48	0.3	
6506953	CANADIAN NO 1	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3	
7939523	CAPE CALM	Commercial Fishing			1 Propulsion				1978	ULSD	460	48	0.3
7939523	CAPE CALM	Commercial Fishing			2 auxiliary				1978	ULSD	100	48	0.3
8856613	CAPE CREIG	Commercial Fishing			1 Propulsion				ULSD	450	48	0.3	
8856613	CAPE CREIG	Commercial Fishing			2 Propulsion				ULSD	450	48	0.3	
8856613	CAPE CREIG	Commercial Fishing			3 auxiliary				ULSD	100	48	0.3	
578178	CAPE DENBIGH	Commercial Fishing	NORQUES'		1 Propulsion				1944	ULSD	750	48	0.3
578178	CAPE DENBIGH	Commercial Fishing	NORQUES'		2 Propulsion				1944	ULSD	750	48	0.3
578178	CAPE DENBIGH	Commercial Fishing	NORQUES'		3 auxiliary				1944	ULSD	330	48	0.3
653806	CAPE HORN	Commercial Fishing	CAPE HOR		1 Propulsion				1982	ULSD	900	48	0.3
653806	CAPE HORN	Commercial Fishing	CAPE HOR		2 Propulsion				1982	ULSD	900	48	0.3
653806	CAPE HORN	Commercial Fishing	CAPE HOR		3 auxiliary				1982	ULSD	330	48	0.3
677905	CAPE ST JOHN	Commercial Fishing	TRIDENT S		1 Propulsion				1985	ULSD	460	48	0.3
677905	CAPE ST JOHN	Commercial Fishing			2 auxiliary				1985	ULSD	100	48	0.3
557441	CASCADE MARINE	Commercial Fishing	CASCADE I		1 Propulsion				1974	ULSD	450	48	0.3
557441	CASCADE MARINE	Commercial Fishing	CASCADE I		2 Propulsion				1974	ULSD	450	48	0.3
557441	CASCADE MARINE	Commercial Fishing	CASCADE I		3 auxiliary				1974	ULSD	100	48	0.3
619109	CHAMAI	Commercial Fishing			1 Propulsion				1979	ULSD	700	48	0.3
619109	CHAMAI	Commercial Fishing			2 auxiliary				1979	ULSD	330	48	0.3
632162	CHANDALAR	Commercial Fishing			1 Propulsion				1980	ULSD	175	48	0.3
632162	CHANDALAR	Commercial Fishing			2 Propulsion				1980	ULSD	175	48	0.3
632162	CHANDALAR	Commercial Fishing			3 auxiliary				1980	ULSD	100	48	0.3
623734	CHASINA	Commercial Fishing			1 Propulsion				1980	ULSD	150	48	0.3
623734	CHASINA	Commercial Fishing			2 Propulsion				1980	ULSD	150	48	0.3
623734	CHASINA	Commercial Fishing			3 auxiliary				1980	ULSD	100	48	0.3
9031181	CHELSEA K	Commercial Fishing			1 Propulsion				1992	ULSD	750	48	0.3
9031181	CHELSEA K	Commercial Fishing			2 Propulsion				1992	ULSD	750	48	0.3
9031181	CHELSEA K	Commercial Fishing			3 auxiliary				1992	ULSD	330	48	0.3
251424	CHICHAGOF	Commercial Fishing			1 Propulsion				ULSD	750	48	0.3	
251424	CHICHAGOF	Commercial Fishing			2 Propulsion				ULSD	750	48	0.3	
251424	CHICHAGOF	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3	
633593	CLIPPER ENDEAV	Commercial Fishing			1 Propulsion				1981	ULSD	600	48	0.3
633593	CLIPPER ENDEAV	Commercial Fishing			2 Propulsion				1981	ULSD	600	48	0.3
633593	CLIPPER ENDEAV	Commercial Fishing			3 auxiliary				1981	ULSD	330	48	0.3
1038382	Coastal Merchant	Commercial Fishing	COASTAL I		1 Propulsion				1966	ULSD	700	48	0.3
1038382	Coastal Merchant	Commercial Fishing	COASTAL I		2 Propulsion				1966	ULSD	700	48	0.3
1038382	Coastal Merchant	Commercial Fishing	COASTAL I		3 auxiliary				1966	ULSD	330	48	0.3
622773	COHO	Commercial Fishing			1 Propulsion				1980	ULSD	320	48	0.3
622773	COHO	Commercial Fishing			2 Propulsion				1980	ULSD	320	48	0.3
622773	COHO	Commercial Fishing			3 auxiliary				1980	ULSD	100	48	0.3
615729	COLUMBIA	Commercial Fishing			1 Propulsion				1988	ULSD	325	48	0.3
615729	COLUMBIA	Commercial Fishing			2 Propulsion				1988	ULSD	325	48	0.3
615729	COLUMBIA	Commercial Fishing			3 auxiliary				1988	ULSD	100	48	0.3
312068	COMEALONG	Commercial Fishing			1 Propulsion				ULSD	600	48	0.3	

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine					Annual			
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
312068	COMEALONG	Commercial Fishing		2	Propulsion				ULSD	600	48	0.3
312068	COMEALONG	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
914214	COMMODORE	Commercial Fishing EVENING		1	Propulsion			1987	ULSD	855	48	0.3
914214	COMMODORE	Commercial Fishing EVENING		2	Propulsion			1987	ULSD	855	48	0.3
914214	COMMODORE	Commercial Fishing EVENING		3	auxiliary			1987	ULSD	330	48	0.3
532762	CONFIDENCE	Commercial Fishing		1	Propulsion				ULSD	350	48	0.3
532762	CONFIDENCE	Commercial Fishing		2	Propulsion				ULSD	350	48	0.3
532762	CONFIDENCE	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
604998	CONSTELLATION	Commercial Fishing RSD FISHE		1	Propulsion			1979	ULSD	550	48	0.3
604998	CONSTELLATION	Commercial Fishing RSD FISHE		2	Propulsion			1979	ULSD	550	48	0.3
604998	CONSTELLATION	Commercial Fishing RSD FISHE		3	auxiliary			1979	ULSD	330	48	0.3
1128928	CONTROLLER BAY	Commercial Fishing		1	Propulsion			2002	ULSD	425	48	0.3
1128928	CONTROLLER BAY	Commercial Fishing		2	Propulsion			2002	ULSD	425	48	0.3
1128928	CONTROLLER BAY	Commercial Fishing		3	auxiliary			2002	ULSD	100	48	0.3
8036433	COPPER STAR	Commercial Fishing		1	Propulsion				ULSD	400	48	0.3
8036433	COPPER STAR	Commercial Fishing		2	Propulsion				ULSD	400	48	0.3
8036433	COPPER STAR	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
7947398	COURAGEOUS	Commercial Fishing		1	Propulsion				ULSD	700	48	0.3
7947398	COURAGEOUS	Commercial Fishing		2	Propulsion				ULSD	700	48	0.3
7947398	COURAGEOUS	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
284723	CRANE	Commercial Fishing		1	Propulsion				ULSD	150	48	0.3
284723	CRANE	Commercial Fishing		2	Propulsion				ULSD	150	48	0.3
284723	CRANE	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
1038177	DALENA	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
1038177	DALENA	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
1038177	DALENA	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
270361	DANCER	Commercial Fishing		1	Propulsion				ULSD	220	48	0.3
270361	DANCER	Commercial Fishing		2	Propulsion				ULSD	220	48	0.3
270361	DANCER	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
7223845	DEBBIE SUE	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
7223845	DEBBIE SUE	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
7223845	DEBBIE SUE	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
643920	DEBRA D	Commercial Fishing WARREN		1	Propulsion			1981	ULSD	350	48	0.3
643920	DEBRA D	Commercial Fishing WARREN		2	Propulsion			1981	ULSD	350	48	0.3
643920	DEBRA D	Commercial Fishing WARREN		3	auxiliary			1981	ULSD	100	48	0.3
640956	DECEPTION	Commercial Fishing KALEK		1	Propulsion			1988	ULSD	200	48	0.3
640956	DECEPTION	Commercial Fishing KALEK		2	auxiliary			1988	ULSD	100	48	0.3
980422	DECISION	Commercial Fishing		1	Propulsion			1991	ULSD	270	48	0.3
980422	DECISION	Commercial Fishing		2	Propulsion			1991	ULSD	270	48	0.3
980422	DECISION	Commercial Fishing		3	auxiliary			1991	ULSD	100	48	0.3
254366	DECO BAY	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
254366	DECO BAY	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
254366	DECO BAY	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
640128	DEEP PACIFIC	Commercial Fishing DEEP PACI		1	Propulsion			1981	ULSD	600	48	0.3
640128	DEEP PACIFIC	Commercial Fishing DEEP PACI		2	Propulsion			1981	ULSD	600	48	0.3
640128	DEEP PACIFIC	Commercial Fishing DEEP PACI		3	auxiliary			1981	ULSD	330	48	0.3
6506226	DEEP SEA	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
6506226	DEEP SEA	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
6506226	DEEP SEA	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
554030	DEFENDER	Commercial Fishing FV DEFEN		1	Propulsion			1974	ULSD	3300	48	0.3
554030	DEFENDER	Commercial Fishing FV DEFEN		2	Propulsion			1974	ULSD	3300	48	0.3
554030	DEFENDER	Commercial Fishing FV DEFEN		3	auxiliary			1974	ULSD	900	48	0.3
7926514	DEFIANT	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
7926514	DEFIANT	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
7926514	DEFIANT	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
571879	DESTINATION	Commercial Fishing DESTINAT		1	Propulsion				ULSD	1500	48	0.3
571879	DESTINATION	Commercial Fishing DESTINAT		2	Propulsion				ULSD	1500	48	0.3
571879	DESTINATION	Commercial Fishing DESTINAT		3	auxiliary				ULSD	900	48	0.3
603126	DILIGENCE	Commercial Fishing OSTROM F		1	Propulsion			1979	ULSD	460	48	0.3
603126	DILIGENCE	Commercial Fishing OSTROM F		2	Propulsion			1979	ULSD	460	48	0.3
500072	DISCOVERY STAR	Commercial Fishing ICICLE SE/		1	Propulsion			1965	ULSD	150	48	0.3
500072	DISCOVERY STAR	Commercial Fishing ICICLE SE/		2	Propulsion			1965	ULSD	150	48	0.3
500072	DISCOVERY STAR	Commercial Fishing ICICLE SE/		3	auxiliary			1965	ULSD	100	48	0.3
617019	DOLPHIN	Commercial Fishing TRIDENT S		1	Propulsion			1944	ULSD	563	48	0.3
617019	DOLPHIN	Commercial Fishing TRIDENT S		2	Propulsion			1944	ULSD	563	48	0.3
617019	DOLPHIN	Commercial Fishing TRIDENT S		3	auxiliary			1944	ULSD	330	48	0.3
602309	DOMINATOR	Commercial Fishing TRIDENT S		1	Propulsion			1978	ULSD	1000	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual				
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
602309	DOMINATOR	Commercial Fishing	TRIDENT S	2	Propulsion			1978	ULSD	1000	48	0.3
602309	DOMINATOR	Commercial Fishing	TRIDENT S	3	auxiliary			1978	ULSD	900	48	0.3
249559	DOROTHEA	Commercial Fishing	RUTLEDGI	1	Propulsion			1945	ULSD	110	48	0.3
249559	DOROTHEA	Commercial Fishing	RUTLEDGI	2	Propulsion			1945	ULSD	110	48	0.3
249559	DOROTHEA	Commercial Fishing	RUTLEDGI	3	auxiliary			1945	ULSD	100	48	0.3
982375	EASTERN HUNTEI	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
982375	EASTERN HUNTEI	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
982375	EASTERN HUNTEI	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
6920240	EASTWARD HO	Commercial Fishing		1	Propulsion				ULSD	325	48	0.3
6920240	EASTWARD HO	Commercial Fishing		2	Propulsion				ULSD	325	48	0.3
6920240	EASTWARD HO	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
629675	ECHO	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
629675	ECHO	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
629675	ECHO	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
261269	EIGIL B	Commercial Fishing	EIGIL B IN	1	Propulsion			1951	ULSD	350	48	0.3
261269	EIGIL B	Commercial Fishing	EIGIL B IN	2	Propulsion			1951	ULSD	350	48	0.3
261269	EIGIL B	Commercial Fishing	EIGIL B IN	3	auxiliary			1951	ULSD	100	48	0.3
657383	ENTERPRISE	Commercial Fishing		1	Propulsion			1983	ULSD	240	48	0.3
657383	ENTERPRISE	Commercial Fishing		2	Propulsion			1983	ULSD	240	48	0.3
657383	ENTERPRISE	Commercial Fishing		3	auxiliary			1983	ULSD	100	48	0.3
227368	ENTERPRISE 5	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
227368	ENTERPRISE 5	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
227368	ENTERPRISE 5	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
8851699	ENTRANCE POINT	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
8851699	ENTRANCE POINT	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
8851699	ENTRANCE POINT	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
603607	EPIC EXPLORER	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
603607	EPIC EXPLORER	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
603607	EPIC EXPLORER	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
972239	EQUINOX	Commercial Fishing		1	Propulsion			1991	ULSD	200	48	0.3
972239	EQUINOX	Commercial Fishing		2	Propulsion			1991	ULSD	200	48	0.3
972239	EQUINOX	Commercial Fishing		3	auxiliary			1991	ULSD	100	48	0.3
598365	ERLA N	Commercial Fishing		1	Propulsion			1978	ULSD	550	48	0.3
598365	ERLA N	Commercial Fishing		2	Propulsion			1978	ULSD	550	48	0.3
598365	ERLA N	Commercial Fishing		3	auxiliary			1978	ULSD	330	48	0.3
248539	EVENING STAR	Commercial Fishing		1	Propulsion				ULSD	170	48	0.3
248539	EVENING STAR	Commercial Fishing		2	Propulsion				ULSD	170	48	0.3
248539	EVENING STAR	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
967502	EXCELLENCE	Commercial Fishing	ALASKA J/	1	Propulsion				ULSD	2850	48	0.3
967502	EXCELLENCE	Commercial Fishing	ALASKA J/	2	Propulsion				ULSD	2850	48	0.3
967502	EXCELLENCE	Commercial Fishing	ALASKA J/	3	auxiliary				ULSD	900	48	0.3
7932109	EXODUS	Commercial Fishing		1	Propulsion			1984	ULSD	500	48	0.3
7932109	EXODUS	Commercial Fishing		2	Propulsion			1984	ULSD	500	48	0.3
7932109	EXODUS	Commercial Fishing		3	auxiliary			1984	ULSD	330	48	0.3
211065	EXPRESS	Commercial Fishing		1	Propulsion			1988	ULSD	220	48	0.3
211065	EXPRESS	Commercial Fishing		2	Propulsion			1988	ULSD	220	48	0.3
211065	EXPRESS	Commercial Fishing		3	auxiliary			1988	ULSD	100	48	0.3
7950228	FAIRWIND	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
7950228	FAIRWIND	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
7950228	FAIRWIND	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
369192	FEELIN FREE	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
369192	FEELIN FREE	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
369192	FEELIN FREE	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
925863	FORUM STAR	Commercial Fishing	FORUM ST	1	Propulsion			1988	ULSD	738	48	0.3
925863	FORUM STAR	Commercial Fishing	FORUM ST	2	Propulsion			1988	ULSD	738	48	0.3
925863	FORUM STAR	Commercial Fishing	FORUM ST	3	auxiliary			1988	ULSD	330	48	0.3
20881	FREE ENTERPRISE	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
20881	FREE ENTERPRISE	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
20881	FREE ENTERPRISE	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
975015	FRONTIER EXPLO	Commercial Fishing	ALASKA FI	1	Propulsion			1991	ULSD	550	48	0.3
975015	FRONTIER EXPLO	Commercial Fishing	ALASKA FI	2	Propulsion			1991	ULSD	550	48	0.3
975015	FRONTIER EXPLO	Commercial Fishing	ALASKA FI	3	auxiliary			1991	ULSD	330	48	0.3
951441	FRONTIER SPIRIT	Commercial Fishing	ALASKA FI	1	Propulsion			1989	ULSD	550	48	0.3
951441	FRONTIER SPIRIT	Commercial Fishing	ALASKA FI	2	Propulsion			1989	ULSD	550	48	0.3
951441	FRONTIER SPIRIT	Commercial Fishing	ALASKA FI	3	auxiliary			1989	ULSD	330	48	0.3
7628473	FROSTI	Commercial Fishing		1	Propulsion				ULSD	500	48	0.3
7628473	FROSTI	Commercial Fishing		2	Propulsion				ULSD	500	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual	
				ID User	Type						Hours	Load
7628473	FROSTI	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
617540	GANDIL	Commercial Fishing	PETTINGII		1 Propulsion			1980	ULSD	320	48	0.3
617540	GANDIL	Commercial Fishing	PETTINGII		2 Propulsion			1980	ULSD	320	48	0.3
617540	GANDIL	Commercial Fishing	PETTINGII		3 auxiliary			1980	ULSD	100	48	0.3
630401	GENE S	Commercial Fishing	FV GENE S		1 Propulsion			1981	ULSD	750	48	0.3
630401	GENE S	Commercial Fishing	FV GENE S		2 Propulsion			1981	ULSD	750	48	0.3
600325	Glacier Bay	Commercial Fishing	GLACIER I		1 Propulsion			1978	ULSD	1125	48	0.3
600325	Glacier Bay	Commercial Fishing	GLACIER I		2 Propulsion			1978	ULSD	1125	48	0.3
600325	Glacier Bay	Commercial Fishing	GLACIER I		3 auxiliary			1978	ULSD	900	48	0.3
7938115	GLADIATOR	Commercial Fishing			1 Propulsion			1978	ULSD	850	48	0.3
7938115	GLADIATOR	Commercial Fishing			2 Propulsion			1978	ULSD	850	48	0.3
7938115	GLADIATOR	Commercial Fishing			3 auxiliary			1978	ULSD	330	48	0.3
651041	GOLDEN ALASKA	Commercial Fishing	GAS LLC		1 Propulsion			1972	ULSD	2400	48	0.3
651041	GOLDEN ALASKA	Commercial Fishing	GAS LLC		2 Propulsion			1972	ULSD	2400	48	0.3
651041	GOLDEN ALASKA	Commercial Fishing	GAS LLC		3 auxiliary			1972	ULSD	900	48	0.3
604315	GOLDEN DAWN	Commercial Fishing	TRIDENT S		1 Propulsion			1979	ULSD	1000	48	0.3
604315	GOLDEN DAWN	Commercial Fishing	TRIDENT S		2 Propulsion			1979	ULSD	1000	48	0.3
604315	GOLDEN DAWN	Commercial Fishing	TRIDENT S		3 auxiliary			1979	ULSD	900	48	0.3
7932393	GOLDEN FLEECE	Commercial Fishing			1 Propulsion			1979	ULSD	550	48	0.3
7932393	GOLDEN FLEECE	Commercial Fishing			2 Propulsion			1979	ULSD	550	48	0.3
7932393	GOLDEN FLEECE	Commercial Fishing			3 auxiliary			1979	ULSD	330	48	0.3
477300	GOOD PARTNER	Commercial Fishing			1 Propulsion				ULSD	750	48	0.3
477300	GOOD PARTNER	Commercial Fishing			2 Propulsion				ULSD	750	48	0.3
477300	GOOD PARTNER	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
225264	GRANT	Commercial Fishing			1 Propulsion				ULSD	150	48	0.3
225264	GRANT	Commercial Fishing			2 Propulsion				ULSD	150	48	0.3
225264	GRANT	Commercial Fishing			3 auxiliary				ULSD	100	48	0.3
7947506	GREAT PACIFIC	Commercial Fishing			1 Propulsion			1979	ULSD	750	48	0.3
7947506	GREAT PACIFIC	Commercial Fishing			2 Propulsion			1979	ULSD	750	48	0.3
7947506	GREAT PACIFIC	Commercial Fishing			3 auxiliary			1979	ULSD	330	48	0.3
608438	GULF WINDS	Commercial Fishing	GULF WIN		1 Propulsion			1979	ULSD	250	48	0.3
608438	GULF WINDS	Commercial Fishing	GULF WIN		2 Propulsion			1979	ULSD	250	48	0.3
608438	GULF WINDS	Commercial Fishing	GULF WIN		3 auxiliary			1979	ULSD	100	48	0.3
615796	HALF MOON BAY	Commercial Fishing	EVENING		1 Propulsion			1979	ULSD	425	48	0.3
615796	HALF MOON BAY	Commercial Fishing	EVENING		2 Propulsion			1979	ULSD	425	48	0.3
615796	HALF MOON BAY	Commercial Fishing	EVENING		3 auxiliary			1979	ULSD	100	48	0.3
970937	HANDLER	Commercial Fishing	HANDLER		1 Propulsion			1991	ULSD	625	48	0.3
970937	HANDLER	Commercial Fishing	HANDLER		2 Propulsion			1991	ULSD	625	48	0.3
970937	HANDLER	Commercial Fishing	HANDLER		3 auxiliary			1991	ULSD	330	48	0.3
7644269	HARVESTOR	Commercial Fishing			1 Propulsion				ULSD	750	48	0.3
7644269	HARVESTOR	Commercial Fishing			2 Propulsion				ULSD	750	48	0.3
7644269	HARVESTOR	Commercial Fishing			3 auxiliary				ULSD	330	48	0.3
594154	HICKORY WIND	Commercial Fishing	HICKORY W		1 Propulsion			1978	ULSD	475	48	0.3
594154	HICKORY WIND	Commercial Fishing	HICKORY W		2 Propulsion			1978	ULSD	475	48	0.3
594154	HICKORY WIND	Commercial Fishing	HICKORY W		3 auxiliary			1978	ULSD	100	48	0.3
608177	HUNTRESS	Commercial Fishing			1 Propulsion			2000	ULSD	250	48	0.3
608177	HUNTRESS	Commercial Fishing			2 Propulsion			2000	ULSD	250	48	0.3
608177	HUNTRESS	Commercial Fishing			3 auxiliary			2000	ULSD	100	48	0.3
586918	HUSKY	Commercial Fishing	HUSKY CO		1 Propulsion			1942	ULSD	600	48	0.3
586918	HUSKY	Commercial Fishing	HUSKY CO		2 Propulsion			1942	ULSD	600	48	0.3
586918	HUSKY	Commercial Fishing	HUSKY CO		3 auxiliary			1942	ULSD	330	48	0.3
272744	ICY BAY	Commercial Fishing	ICY BAY IN		1 Propulsion			1956	ULSD	700	48	0.3
272744	ICY BAY	Commercial Fishing	ICY BAY IN		2 Propulsion			1956	ULSD	700	48	0.3
272744	ICY BAY	Commercial Fishing	ICY BAY IN		3 auxiliary			1956	ULSD	330	48	0.3
6701852	IKAIKA KAI ONE	Commercial Fishing			1 Propulsion				ULSD	2900	96	0.3
6701852	IKAIKA KAI ONE	Commercial Fishing			2 Propulsion				ULSD	2900	96	0.3
6701852	IKAIKA KAI ONE	Commercial Fishing			3 auxiliary				ULSD	900	96	0.3
237743	INDEPENDENCE	Commercial Fishing	TRIDENT S		1 Propulsion			1938	ULSD	1100	48	0.3
237743	INDEPENDENCE	Commercial Fishing	TRIDENT S		2 Propulsion			1938	ULSD	1100	48	0.3
237743	INDEPENDENCE	Commercial Fishing	TRIDENT S		3 auxiliary			1938	ULSD	900	48	0.3
9037771	INTREPID EXPLOI	Commercial Fishing			1 Propulsion			1992	ULSD	850	48	0.3
9037771	INTREPID EXPLOI	Commercial Fishing			2 Propulsion			1992	ULSD	850	48	0.3
9037771	INTREPID EXPLOI	Commercial Fishing			3 auxiliary			1992	ULSD	330	48	0.3
610290	ISLAND ENTERPR	Commercial Fishing	TRIDENT S		1 Propulsion			1979	ULSD	2400	48	0.3
610290	ISLAND ENTERPR	Commercial Fishing	TRIDENT S		2 Propulsion			1979	ULSD	2400	48	0.3
610290	ISLAND ENTERPR	Commercial Fishing	TRIDENT S		3 auxiliary			1979	ULSD	900	48	0.3
973478	ISLAND MIST	Commercial Fishing	EVANS		1 Propulsion			1991	ULSD	625	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual				
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
973478	ISLAND MIST	Commercial Fishing	EVANS	2	Propulsion			1991	ULSD	625	48	0.3
973478	ISLAND MIST	Commercial Fishing	EVANS	3	auxiliary			1991	ULSD	330	48	0.3
8950639	ISLAND SUN	Commercial Fishing		1	Propulsion				ULSD	548	48	0.3
8950639	ISLAND SUN	Commercial Fishing		2	Propulsion				ULSD	548	48	0.3
8950639	ISLAND SUN	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
8807296	JAMIE MARIE	Commercial Fishing		1	Propulsion			1988	ULSD	425	48	0.3
8807296	JAMIE MARIE	Commercial Fishing		2	Propulsion			1988	ULSD	425	48	0.3
8807296	JAMIE MARIE	Commercial Fishing		3	auxiliary			1988	ULSD	100	48	0.3
8939001	JANICE	Commercial Fishing		1	Propulsion			1958	ULSD	125	48	0.3
8939001	JANICE	Commercial Fishing		2	Propulsion			1958	ULSD	125	48	0.3
8939001	JANICE	Commercial Fishing		3	auxiliary			1958	ULSD	100	48	0.3
18085	JEANNA MARIE	Commercial Fishing	FENNIMOJ	1	Propulsion			1972	ULSD	110	48	0.3
18085	JEANNA MARIE	Commercial Fishing	FENNIMOJ	2	auxiliary			1972	ULSD	100	48	0.3
597611	JENNIFER A	Commercial Fishing	ST GEORG	1	Propulsion			1979	ULSD	400	48	0.3
597611	JENNIFER A	Commercial Fishing	ST GEORG	2	Propulsion			1979	ULSD	400	48	0.3
597611	JENNIFER A	Commercial Fishing	ST GEORG	3	auxiliary			1979	ULSD	100	48	0.3
41316	KAIA	Commercial Fishing		1	Propulsion			1989	ULSD	200	48	0.3
41316	KAIA	Commercial Fishing		2	Propulsion			1989	ULSD	200	48	0.3
41316	KAIA	Commercial Fishing		3	auxiliary			1989	ULSD	100	48	0.3
8854495	KAMI M	Commercial Fishing		1	Propulsion				ULSD	250	48	0.3
8854495	KAMI M	Commercial Fishing		2	Propulsion				ULSD	250	48	0.3
8854495	KAMI M	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
629244	KAMILAR	Commercial Fishing		1	Propulsion			1980	ULSD	250	48	0.3
629244	KAMILAR	Commercial Fishing		2	Propulsion			1980	ULSD	250	48	0.3
629244	KAMILAR	Commercial Fishing		3	auxiliary			1980	ULSD	100	48	0.3
7902219	KARENORA	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
7902219	KARENORA	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
7902219	KARENORA	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
592291	KARIN LYNN	Commercial Fishing	KARIN LY	1	Propulsion			1978	ULSD	225	48	0.3
592291	KARIN LYNN	Commercial Fishing	KARIN LY	2	Propulsion			1978	ULSD	225	48	0.3
592291	KARIN LYNN	Commercial Fishing	KARIN LY	3	auxiliary			1978	ULSD	100	48	0.3
228446	KARLUK	Commercial Fishing	WRIGHT	1	Propulsion			1929	ULSD	300	48	0.3
228446	KARLUK	Commercial Fishing	WRIGHT	2	Propulsion			1929	ULSD	300	48	0.3
548612	KATHLEEN	Commercial Fishing		1	Propulsion				ULSD	200	48	0.3
548612	KATHLEEN	Commercial Fishing		2	auxiliary				ULSD	100	48	0.3
6931055	Katie Ann	Commercial Fishing	American Se	1	Propulsion	Bergen Dies	KVM 18	1983	ULSD	4200	48	0.3
1157826	KELLY MAE	Commercial Fishing		1	Propulsion				ULSD	300	48	0.3
1157826	KELLY MAE	Commercial Fishing		2	Propulsion				ULSD	300	48	0.3
1157826	KELLY MAE	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
612616	KJEVOLJA	Commercial Fishing	JUBILEE FJ	1	Propulsion			1979	ULSD	500	48	0.3
612616	KJEVOLJA	Commercial Fishing	JUBILEE FJ	2	Propulsion			1979	ULSD	500	48	0.3
612616	KJEVOLJA	Commercial Fishing	JUBILEE FJ	3	auxiliary			1979	ULSD	330	48	0.3
8023682	KNIGHT DRAGON	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
8023682	KNIGHT DRAGON	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
8023682	KNIGHT DRAGON	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
579450	KODIAK ENTERPF	Commercial Fishing	TRIDENT S	1	Propulsion			1977	ULSD	3000	48	0.3
579450	KODIAK ENTERPF	Commercial Fishing	TRIDENT S	2	Propulsion			1977	ULSD	3000	48	0.3
579450	KODIAK ENTERPF	Commercial Fishing	TRIDENT S	3	auxiliary			1977	ULSD	900	48	0.3
178828	KORNAT 1	Commercial Fishing		1	Propulsion				ULSD	280	48	0.3
178828	KORNAT 1	Commercial Fishing		2	Propulsion				ULSD	280	48	0.3
178828	KORNAT 1	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
66355442	KYNOC	Commercial Fishing		1	Propulsion				ULSD	280	48	0.3
66355442	KYNOC	Commercial Fishing		2	Propulsion				ULSD	280	48	0.3
66355442	KYNOC	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
600600	LADY HELEN	Commercial Fishing		1	Propulsion				ULSD	230	48	0.3
600600	LADY HELEN	Commercial Fishing		2	Propulsion				ULSD	230	48	0.3
600600	LADY HELEN	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
7336850	LADY KATE	Commercial Fishing		1	Propulsion			1973	ULSD	225	48	0.3
7336850	LADY KATE	Commercial Fishing		2	Propulsion			1973	ULSD	225	48	0.3
7336850	LADY KATE	Commercial Fishing		3	auxiliary			1973	ULSD	100	48	0.3
600072	LADY KODIAK	Commercial Fishing		1	Propulsion			1978	ULSD	365	48	0.3
600072	LADY KODIAK	Commercial Fishing		2	Propulsion			1978	ULSD	365	48	0.3
600072	LADY KODIAK	Commercial Fishing		3	auxiliary			1978	ULSD	100	48	0.3
819946	LADY VALERIE	Commercial Fishing		1	Propulsion				ULSD	230	48	0.3
819946	LADY VALERIE	Commercial Fishing		2	Propulsion				ULSD	230	48	0.3
819946	LADY VALERIE	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
667407	LAST FRONTIER	Commercial Fishing		1	Propulsion			1984	ULSD	400	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual				
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
667407	LAST FRONTIER	Commercial Fishing		2	Propulsion			1984	ULSD	400	48	0.3
667407	LAST FRONTIER	Commercial Fishing		3	auxiliary			1984	ULSD	100	48	0.3
127489	LAUREN L KAPP	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
127489	LAUREN L KAPP	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
127489	LAUREN L KAPP	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
697907	LEGACY	Commercial Fishing	MARTIN	1	Propulsion			1985	ULSD	435	48	0.3
697907	LEGACY	Commercial Fishing	MARTIN	2	Propulsion			1985	ULSD	435	48	0.3
697907	LEGACY	Commercial Fishing	MARTIN	3	auxiliary			1985	ULSD	100	48	0.3
976538	LILLI ANN	Commercial Fishing	LILLI ANN	1	Propulsion			1991	ULSD	585	48	0.3
976538	LILLI ANN	Commercial Fishing	LILLI ANN	2	Propulsion			1991	ULSD	585	48	0.3
976538	LILLI ANN	Commercial Fishing	LILLI ANN	3	auxiliary			1991	ULSD	330	48	0.3
1038717	LISA MARIE	Commercial Fishing		1	Propulsion			1996	ULSD	425	48	0.3
1038717	LISA MARIE	Commercial Fishing		2	Propulsion			1996	ULSD	425	48	0.3
1038717	LISA MARIE	Commercial Fishing		3	auxiliary			1996	ULSD	100	48	0.3
101579	LOWRIDER	Commercial Fishing		1	Propulsion				ULSD	350	48	0.3
101579	LOWRIDER	Commercial Fishing		2	Propulsion				ULSD	350	48	0.3
101579	LOWRIDER	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
594399	MADISON HUNTE	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
594399	MADISON HUNTE	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
594399	MADISON HUNTE	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
8855358	MAJESTY	Commercial Fishing		1	Propulsion				ULSD	590	48	0.3
8855358	MAJESTY	Commercial Fishing		2	Propulsion				ULSD	590	48	0.3
8855358	MAJESTY	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
975597	MARAUDER	Commercial Fishing	PURATICH	1	Propulsion			1991	ULSD	270	48	0.3
975597	MARAUDER	Commercial Fishing	PURATICH	2	Propulsion			1991	ULSD	270	48	0.3
975597	MARAUDER	Commercial Fishing	PURATICH	3	auxiliary			1991	ULSD	100	48	0.3
615563	MARGARET LYN	Commercial Fishing	GREAT WE	1	Propulsion			1979	ULSD	750	48	0.3
615563	MARGARET LYN	Commercial Fishing	GREAT WE	2	Propulsion			1979	ULSD	750	48	0.3
615563	MARGARET LYN	Commercial Fishing	GREAT WE	3	auxiliary			1979	ULSD	330	48	0.3
1040505	MARINA	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
1040505	MARINA	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
1040505	MARINA	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
800021	MARY ISLE	Commercial Fishing		1	Propulsion				ULSD	350	48	0.3
800021	MARY ISLE	Commercial Fishing		2	Propulsion				ULSD	350	48	0.3
800021	MARY ISLE	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
647314	MAVERICK	Commercial Fishing	F/V MAVE	1	Propulsion			1983	ULSD	285	48	0.3
647314	MAVERICK	Commercial Fishing	F/V MAVE	2	Propulsion			1983	ULSD	285	48	0.3
647314	MAVERICK	Commercial Fishing	F/V MAVE	3	auxiliary			1983	ULSD	100	48	0.3
622875	MIKETTE	Commercial Fishing		1	Propulsion				ULSD	640	48	0.3
622875	MIKETTE	Commercial Fishing		2	Propulsion				ULSD	640	48	0.3
622875	MIKETTE	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
6404789	MILLBANKE SOUN	Commercial Fishing		1	Propulsion				ULSD	250	48	0.3
6404789	MILLBANKE SOUN	Commercial Fishing		2	Propulsion				ULSD	250	48	0.3
6404789	MILLBANKE SOUN	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
522643	MISS LEONA	Commercial Fishing	MISS LEON	1	Propulsion			1969	ULSD	425	48	0.3
522643	MISS LEONA	Commercial Fishing	MISS LEON	2	Propulsion			1969	ULSD	425	48	0.3
522643	MISS LEONA	Commercial Fishing	MISS LEON	3	auxiliary			1969	ULSD	100	48	0.3
668040	MISTY BLUE	Commercial Fishing	MISTY BLU	1	Propulsion			1984	ULSD	165	48	0.3
668040	MISTY BLUE	Commercial Fishing	MISTY BLU	2	Propulsion			1984	ULSD	165	48	0.3
668040	MISTY BLUE	Commercial Fishing	MISTY BLU	3	auxiliary			1984	ULSD	100	48	0.3
926647	MISTY DAWN	Commercial Fishing	KATAHDI	1	Propulsion			1988	ULSD	600	48	0.3
926647	MISTY DAWN	Commercial Fishing	KATAHDI	2	Propulsion			1988	ULSD	600	48	0.3
926647	MISTY DAWN	Commercial Fishing	KATAHDI	3	auxiliary			1988	ULSD	330	48	0.3
611524	MUIR MILACH	Commercial Fishing	MUIR MIL	1	Propulsion			1979	ULSD	400	48	0.3
611524	MUIR MILACH	Commercial Fishing	MUIR MIL	2	Propulsion			1979	ULSD	400	48	0.3
611524	MUIR MILACH	Commercial Fishing	MUIR MIL	3	auxiliary			1979	ULSD	100	48	0.3
250971	MUSKRAT	Commercial Fishing	BLUE SKIE	1	Propulsion			1942	ULSD	250	48	0.3
250971	MUSKRAT	Commercial Fishing	BLUE SKIE	2	Propulsion			1942	ULSD	250	48	0.3
250971	MUSKRAT	Commercial Fishing	BLUE SKIE	3	auxiliary			1942	ULSD	100	48	0.3
552893	MYSTERY BAY	Commercial Fishing	ARCTIC VE	1	Propulsion			1973	ULSD	850	48	0.3
552893	MYSTERY BAY	Commercial Fishing	ARCTIC VE	2	Propulsion			1973	ULSD	850	48	0.3
552893	MYSTERY BAY	Commercial Fishing	ARCTIC VE	3	auxiliary			1973	ULSD	330	48	0.3
572337	NEMESIS	Commercial Fishing	WELCH	1	Propulsion				ULSD	190	48	0.3
572337	NEMESIS	Commercial Fishing	WELCH	2	auxiliary				ULSD	100	48	0.3
7201756	NEW LIFE	Commercial Fishing		1	Propulsion			1966	ULSD	450	48	0.3
7201756	NEW LIFE	Commercial Fishing		2	Propulsion			1966	ULSD	450	48	0.3
7201756	NEW LIFE	Commercial Fishing		3	auxiliary			1966	ULSD	100	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual				
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
565816	NEW VENTURE	Commercial Fishing		1	Propulsion			1974	ULSD	150	48	0.3
565816	NEW VENTURE	Commercial Fishing		2	Propulsion			1974	ULSD	150	48	0.3
565816	NEW VENTURE	Commercial Fishing		3	auxiliary			1974	ULSD	100	48	0.3
739513	NOR QUEST	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
739513	NOR QUEST	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
739513	NOR QUEST	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
8825896	NORDIC PEARL	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
8825896	NORDIC PEARL	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
8825896	NORDIC PEARL	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
542651	NORDIC STAR	Commercial Fishing		1	Propulsion			1977	ULSD	500	48	0.3
542651	NORDIC STAR	Commercial Fishing		2	Propulsion			1977	ULSD	500	48	0.3
542651	NORDIC STAR	Commercial Fishing		3	auxiliary			1977	ULSD	330	48	0.3
601068	NORSEMAN II	Commercial Fishing	NORSEMAN	1	Propulsion			1979	ULSD	425	48	0.3
601068	NORSEMAN II	Commercial Fishing	NORSEMAN	2	Propulsion			1979	ULSD	425	48	0.3
601068	NORSEMAN II	Commercial Fishing	NORSEMAN	3	auxiliary			1979	ULSD	100	48	0.3
566067	NORTH AMERICA	Commercial Fishing	NORTH AM	1	Propulsion			1975	ULSD	600	48	0.3
566067	NORTH AMERICA	Commercial Fishing	NORTH AM	2	Propulsion			1975	ULSD	600	48	0.3
566067	NORTH AMERICA	Commercial Fishing	NORTH AM	3	auxiliary			1975	ULSD	330	48	0.3
950038	NORTH CAPE	Commercial Fishing	NORTH CA	1	Propulsion			1989	ULSD	460	48	0.3
950038	NORTH CAPE	Commercial Fishing	NORTH CA	2	Propulsion			1989	ULSD	460	48	0.3
950038	NORTH CAPE	Commercial Fishing	NORTH CA	3	auxiliary			1989	ULSD	100	48	0.3
606565	NORTH SEA	Commercial Fishing	KRISTIAN	1	Propulsion			1979	ULSD	705	48	0.3
606565	NORTH SEA	Commercial Fishing	KRISTIAN	2	Propulsion			1979	ULSD	705	48	0.3
606565	NORTH SEA	Commercial Fishing	KRISTIAN	3	auxiliary			1979	ULSD	330	48	0.3
615387	NORTHERN BELL	Commercial Fishing	TRITON IN	1	Propulsion			1979	ULSD	375	48	0.3
615387	NORTHERN BELL	Commercial Fishing	TRITON IN	2	Propulsion			1979	ULSD	375	48	0.3
615387	NORTHERN BELL	Commercial Fishing	TRITON IN	3	auxiliary			1979	ULSD	100	48	0.3
553713	NORTHERN CLOU	Commercial Fishing		1	Propulsion			1974	ULSD	425	48	0.3
553713	NORTHERN CLOU	Commercial Fishing		2	Propulsion			1974	ULSD	425	48	0.3
553713	NORTHERN CLOU	Commercial Fishing		3	auxiliary			1974	ULSD	100	48	0.3
506694	Northern Eagle	Commercial Fishing	American Se	1	Propulsion	Bergen Dies	BRM 8	1988	ULSD	3600	48	0.3
506694	Northern Eagle	Commercial Fishing	American Se	2	Propulsion	Bergen Dies	BRM 8	1988	ULSD	3600	48	0.3
663457	NORTHERN GLAC	Commercial Fishing	GLACIER I	1	Propulsion			1983	ULSD	1500	48	0.3
663457	NORTHERN GLAC	Commercial Fishing	GLACIER I	2	Propulsion			1983	ULSD	1500	48	0.3
663457	NORTHERN GLAC	Commercial Fishing	GLACIER I	3	auxiliary			1983	ULSD	900	48	0.3
521069	Northern Jaeger	Commercial Fishing	American Se	1	Propulsion	MAK	453 C	1989	ULSD	3680	48	0.3
521069	Northern Jaeger	Commercial Fishing	American Se	2	Propulsion	MAK	453 C	1989	ULSD	3680	48	0.3
511698	NORTHERN ODIN	Commercial Fishing		1	Propulsion				ULSD	300	48	0.3
511698	NORTHERN ODIN	Commercial Fishing		2	Propulsion				ULSD	300	48	0.3
511698	NORTHERN ODIN	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
637744	NORTHERN PATRI	Commercial Fishing	TRIDENT S	1	Propulsion			1981	ULSD	1000	48	0.3
637744	NORTHERN PATRI	Commercial Fishing	TRIDENT S	2	Propulsion			1981	ULSD	1000	48	0.3
637744	NORTHERN PATRI	Commercial Fishing	TRIDENT S	3	auxiliary			1981	ULSD	900	48	0.3
248959	NORTHERN VICT	Commercial Fishing	EVENING	1	Propulsion			1945	ULSD	1250	48	0.3
248959	NORTHERN VICT	Commercial Fishing	EVENING	2	Propulsion			1945	ULSD	1250	48	0.3
248959	NORTHERN VICT	Commercial Fishing	EVENING	3	auxiliary			1945	ULSD	900	48	0.3
7926538	NORTHWEST EXP	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
7926538	NORTHWEST EXP	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
7926538	NORTHWEST EXP	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
587816	NORTHWESTERN	Commercial Fishing	HANSEN E	1	Propulsion			1977	ULSD	640	48	0.3
587816	NORTHWESTERN	Commercial Fishing	HANSEN E	2	Propulsion			1977	ULSD	640	48	0.3
587816	NORTHWESTERN	Commercial Fishing	HANSEN E	3	auxiliary			1977	ULSD	330	48	0.3
602386	NORTHWIND	Commercial Fishing	NORDIC F	1	Propulsion			1979	ULSD	338	48	0.3
602386	NORTHWIND	Commercial Fishing	NORDIC F	2	Propulsion			1979	ULSD	338	48	0.3
602386	NORTHWIND	Commercial Fishing	NORDIC F	3	auxiliary			1979	ULSD	100	48	0.3
936017	NORTON SOUND	Commercial Fishing		1	Propulsion				ULSD	600	48	0.3
936017	NORTON SOUND	Commercial Fishing		2	Propulsion				ULSD	600	48	0.3
936017	NORTON SOUND	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
7202061	NOTORIOUS	Commercial Fishing		1	Propulsion				ULSD	550	48	0.3
7202061	NOTORIOUS	Commercial Fishing		2	Propulsion				ULSD	550	48	0.3
7202061	NOTORIOUS	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
587551	NUSHAGAK SPIR	Commercial Fishing	BELTZ	1	Propulsion			1977	ULSD	300	48	0.3
587551	NUSHAGAK SPIR	Commercial Fishing	BELTZ	2	Propulsion			1977	ULSD	300	48	0.3
587551	NUSHAGAK SPIR	Commercial Fishing	BELTZ	3	auxiliary			1977	ULSD	100	48	0.3
623210	OCEAN ALASKA	Commercial Fishing	OCEAN AL	1	Propulsion			1980	ULSD	475	48	0.3
623210	OCEAN ALASKA	Commercial Fishing	OCEAN AL	2	Propulsion			1980	ULSD	475	48	0.3
623210	OCEAN ALASKA	Commercial Fishing	OCEAN AL	3	auxiliary			1980	ULSD	100	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine			Engine Year	Engine Fuel	Engine HP	Annual		
				Engine ID User	Engine Type	Engine MFR				Hours	Load	
1021269	OCEAN CAPE	Commercial Fishing	NEAL	1	Propulsion		1995	ULSD	125	48	0.3	
1021269	OCEAN CAPE	Commercial Fishing	NEAL	2	Propulsion		1995	ULSD	125	48	0.3	
1021269	OCEAN CAPE	Commercial Fishing	NEAL	3	auxiliary		1995	ULSD	100	48	0.3	
678236	OCEAN FRESH	Commercial Fishing		1	Propulsion		1984	ULSD	900	48	0.3	
678236	OCEAN FRESH	Commercial Fishing		2	Propulsion		1984	ULSD	900	48	0.3	
678236	OCEAN FRESH	Commercial Fishing		3	auxiliary		1984	ULSD	330	48	0.3	
586441	OCEAN FURY	Commercial Fishing	FURY GRO	1	Propulsion		1977	ULSD	165	48	0.3	
586441	OCEAN FURY	Commercial Fishing	FURY GRO	2	Propulsion		1977	ULSD	425	48	0.3	
586441	OCEAN FURY	Commercial Fishing	FURY GRO	3	auxiliary		1977	ULSD	100	48	0.3	
7513331	OCEAN HARVESTI	Commercial Fishing		1	Propulsion			ULSD	200	48	0.3	
7513331	OCEAN HARVESTI	Commercial Fishing		2	Propulsion			ULSD	200	48	0.3	
7513331	OCEAN HARVESTI	Commercial Fishing		3	auxiliary			ULSD	100	48	0.3	
8306292	OCEAN HOPE 3	Commercial Fishing		1	Propulsion		1982	ULSD	425	48	0.3	
8306292	OCEAN HOPE 3	Commercial Fishing		2	Propulsion		1982	ULSD	425	48	0.3	
8306292	OCEAN HOPE 3	Commercial Fishing		3	auxiliary		1982	ULSD	100	48	0.3	
622324	OCEAN HUNTER	Commercial Fishing	OCEAN FI	1	Propulsion		1980	ULSD	425	48	0.3	
622324	OCEAN HUNTER	Commercial Fishing	OCEAN FI	2	Propulsion		1980	ULSD	425	48	0.3	
622324	OCEAN HUNTER	Commercial Fishing	OCEAN FI	3	auxiliary		1980	ULSD	100	48	0.3	
2591	OCEAN KING	Commercial Fishing		1	Propulsion			ULSD	750	48	0.3	
2591	OCEAN KING	Commercial Fishing		2	Propulsion			ULSD	750	48	0.3	
2591	OCEAN KING	Commercial Fishing		3	auxiliary			ULSD	330	48	0.3	
7613624	OCEAN LEADER	Commercial Fishing		1	Propulsion		1974	ULSD	850	48	0.3	
7613624	OCEAN LEADER	Commercial Fishing		2	Propulsion		1974	ULSD	850	48	0.3	
7613624	OCEAN LEADER	Commercial Fishing		3	auxiliary		1974	ULSD	330	48	0.3	
592441	OCEAN MAID	Commercial Fishing		1	Propulsion		1978	ULSD	1000	48	0.3	
592441	OCEAN MAID	Commercial Fishing		2	Propulsion		1978	ULSD	1000	48	0.3	
592441	OCEAN MAID	Commercial Fishing		3	auxiliary		1978	ULSD	900	48	0.3	
7803152	OCEAN MARAUDE	Commercial Fishing		1	Propulsion			ULSD	250	48	0.3	
7803152	OCEAN MARAUDE	Commercial Fishing		2	Propulsion			ULSD	250	48	0.3	
7803152	OCEAN MARAUDE	Commercial Fishing		3	auxiliary			ULSD	100	48	0.3	
677399	OCEAN PEACE	Commercial Fishing	OCEAN PE	1	Propulsion		1984	ULSD	1125	48	0.3	
677399	OCEAN PEACE	Commercial Fishing	OCEAN PE	2	Propulsion		1984	ULSD	1125	48	0.3	
677399	OCEAN PEACE	Commercial Fishing	OCEAN PE	3	auxiliary		1984	ULSD	900	48	0.3	
966130	OCEAN PEARL	Commercial Fishing	EBERLE	1	Propulsion		1991	ULSD	410	48	0.3	
966130	OCEAN PEARL	Commercial Fishing	EBERLE	2	Propulsion		1991	ULSD	410	48	0.3	
966130	OCEAN PEARL	Commercial Fishing	EBERLE	3	auxiliary		1991	ULSD	100	48	0.3	
296779	OCEAN PHOENIX	Commercial Fishing	PHOENIX	1	Propulsion		1964	ULSD	750	48	0.3	
296779	OCEAN PHOENIX	Commercial Fishing	PHOENIX	2	Propulsion		1964	ULSD	750	48	0.3	
296779	OCEAN PHOENIX	Commercial Fishing	PHOENIX	3	auxiliary		1964	ULSD	330	48	0.3	
632751	OCEAN PROWLER	Commercial Fishing	OCEAN PR	1	Propulsion		1944	ULSD	750	48	0.3	
632751	OCEAN PROWLER	Commercial Fishing	OCEAN PR	2	Propulsion		1944	ULSD	750	48	0.3	
632751	OCEAN PROWLER	Commercial Fishing	OCEAN PR	3	auxiliary		1944	ULSD	330	48	0.3	
7521089	Ocean Ranger	Commercial Fishing		1	Propulsion			ULSD	750	48	0.3	
7521089	Ocean Ranger	Commercial Fishing		2	Propulsion			ULSD	750	48	0.3	
7521089	Ocean Ranger	Commercial Fishing		3	auxiliary			ULSD	330	48	0.3	
7303968	Ocean Rover	Commercial Fishing	American Se	1	Propulsion	Wartsila	Vasa 12V32	1990	ULSD	6200	48	0.3
602279	OCEAN ROYAL	Commercial Fishing		1	Propulsion			1986	ULSD	220	48	0.3
602279	OCEAN ROYAL	Commercial Fishing		2	Propulsion			1986	ULSD	220	48	0.3
602279	OCEAN ROYAL	Commercial Fishing		3	auxiliary			1986	ULSD	100	48	0.3
251138	OREGON	Commercial Fishing	OREGON I	1	Propulsion			1946	ULSD	300	48	0.3
251138	OREGON	Commercial Fishing	OREGON I	2	Propulsion			1946	ULSD	300	48	0.3
251138	OREGON	Commercial Fishing	OREGON I	3	auxiliary			1946	ULSD	100	48	0.3
9158173	OSPREY 1	Commercial Fishing		1	Propulsion			ULSD	750	48	0.3	
9158173	OSPREY 1	Commercial Fishing		2	Propulsion			ULSD	750	48	0.3	
9158173	OSPREY 1	Commercial Fishing		3	auxiliary			ULSD	330	48	0.3	
518937	PACIFIC CHALLEN	Commercial Fishing	PETERSON	1	Propulsion			1969	ULSD	1000	48	0.3
518937	PACIFIC CHALLEN	Commercial Fishing	PETERSON	2	Propulsion			1969	ULSD	1000	48	0.3
518937	PACIFIC CHALLEN	Commercial Fishing	PETERSON	3	auxiliary			1969	ULSD	900	48	0.3
678237	PACIFIC EXPLORE	Commercial Fishing	B & N FISH	1	Propulsion			1984	ULSD	900	48	0.3
678237	PACIFIC EXPLORE	Commercial Fishing	B & N FISH	2	Propulsion			1984	ULSD	900	48	0.3
678237	PACIFIC EXPLORE	Commercial Fishing	B & N FISH	3	auxiliary			1984	ULSD	330	48	0.3
561934	PACIFIC FURY	Commercial Fishing	FURY GRO	1	Propulsion			1974	ULSD	750	48	0.3
561934	PACIFIC FURY	Commercial Fishing	FURY GRO	2	Propulsion			1974	ULSD	750	48	0.3
561934	PACIFIC FURY	Commercial Fishing	FURY GRO	3	auxiliary			1974	ULSD	330	48	0.3
933627	PACIFIC GLACIER	Commercial Fishing	GLACIER I	1	Propulsion			1988	ULSD	3300	96	0.3
933627	PACIFIC GLACIER	Commercial Fishing	GLACIER I	2	Propulsion			1988	ULSD	3300	96	0.3
933627	PACIFIC GLACIER	Commercial Fishing	GLACIER I	3	auxiliary			1988	ULSD	900	96	0.3



**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual				
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
5268231	PACIFIC HARVEST	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
5268231	PACIFIC HARVEST	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
5268231	PACIFIC HARVEST	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
92105	PACIFIC LAD 1	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
92105	PACIFIC LAD 1	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
92105	PACIFIC LAD 1	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
598959	PACIFIC MAIDEN	Commercial Fishing		1	Propulsion			1978	ULSD	350	48	0.3
598959	PACIFIC MAIDEN	Commercial Fishing		2	Propulsion			1978	ULSD	350	48	0.3
598959	PACIFIC MAIDEN	Commercial Fishing		3	auxiliary			1978	ULSD	100	48	0.3
560501	PACIFIC MARINER	Commercial Fishing PAC MARI		1	Propulsion			1974	ULSD	425	48	0.3
560501	PACIFIC MARINER	Commercial Fishing PAC MARI		2	Propulsion			1974	ULSD	425	48	0.3
560501	PACIFIC MARINER	Commercial Fishing PAC MARI		3	auxiliary			1974	ULSD	100	48	0.3
5268308	PACIFIC OCEAN	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
5268308	PACIFIC OCEAN	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
5268308	PACIFIC OCEAN	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
697280	PACIFIC PRINCE	Commercial Fishing PACIFIC PI		1	Propulsion			1986	ULSD	1000	48	0.3
697280	PACIFIC PRINCE	Commercial Fishing PACIFIC PI		2	Propulsion			1986	ULSD	1000	48	0.3
697280	PACIFIC PRINCE	Commercial Fishing PACIFIC PI		3	auxiliary			1986	ULSD	900	48	0.3
679774	PACIFIC QUEEN	Commercial Fishing		1	Propulsion				ULSD	550	48	0.3
679774	PACIFIC QUEEN	Commercial Fishing		2	auxiliary				ULSD	330	48	0.3
8124230	PACIFIC SOUNDEF	Commercial Fishing		1	Propulsion			1977	ULSD	150	48	0.3
8124230	PACIFIC SOUNDEF	Commercial Fishing		2	auxiliary			1977	ULSD	100	48	0.3
7742358	PACIFIC STAR	Commercial Fishing		1	Propulsion			1974	ULSD	1500	48	0.3
7742358	PACIFIC STAR	Commercial Fishing		2	Propulsion			1974	ULSD	1500	48	0.3
7742358	PACIFIC STAR	Commercial Fishing		3	auxiliary			1974	ULSD	330	48	0.3
555058	PACIFIC VIKING	Commercial Fishing TRIDENT S		1	Propulsion	CAT	3512	1988	ULSD	1300	48	0.3
555058	PACIFIC VIKING	Commercial Fishing TRIDENT S		2	auxiliary	CAT	3406	1992	ULSD	450	48	0.3
555058	PACIFIC VIKING	Commercial Fishing TRIDENT S		3	auxiliary	CAT	3406	1992	ULSD	450	48	0.3
536161	PAPADO 2	Commercial Fishing		1	Propulsion				ULSD	1125	48	0.3
536161	PAPADO 2	Commercial Fishing		2	auxiliary				ULSD	900	48	0.3
7437630	PARAGON	Commercial Fishing		1	Propulsion				ULSD	1150	48	0.3
7437630	PARAGON	Commercial Fishing		2	auxiliary				ULSD	900	48	0.3
597612	PATRICIA LEE	Commercial Fishing		1	Propulsion			1978	ULSD	800	48	0.3
597612	PATRICIA LEE	Commercial Fishing		2	Propulsion			1978	ULSD	800	48	0.3
597612	PATRICIA LEE	Commercial Fishing		3	auxiliary			1978	ULSD	330	48	0.3
597532	PAVLOF	Commercial Fishing PAVLOF FI		1	Propulsion			1979	ULSD	660	48	0.3
597532	PAVLOF	Commercial Fishing PAVLOF FI		2	Propulsion			1979	ULSD	660	48	0.3
597532	PAVLOF	Commercial Fishing PAVLOF FI		3	auxiliary			1979	ULSD	100	48	0.3
6708484	PEGGY JO	Commercial Fishing		1	Propulsion			1966	ULSD	550	48	0.3
6708484	PEGGY JO	Commercial Fishing		2	Propulsion			1966	ULSD	550	48	0.3
6708484	PEGGY JO	Commercial Fishing		3	auxiliary			1966	ULSD	330	48	0.3
982610	PERSEVERANCE	Commercial Fishing		1	Propulsion			1978	ULSD	350	48	0.3
982610	PERSEVERANCE	Commercial Fishing		2	Propulsion			1978	ULSD	350	48	0.3
982610	PERSEVERANCE	Commercial Fishing		3	auxiliary			1978	ULSD	100	48	0.3
1075512	PINNACLE	Commercial Fishing FV PINNAC		1	Propulsion			1998	ULSD	1000	48	0.3
1075512	PINNACLE	Commercial Fishing FV PINNAC		2	Propulsion			1998	ULSD	1000	48	0.3
1075512	PINNACLE	Commercial Fishing FV PINNAC		3	auxiliary			1998	ULSD	900	48	0.3
609940	POLAR LADY	Commercial Fishing MGF FISHI		1	Propulsion			1979	ULSD	325	48	0.3
609940	POLAR LADY	Commercial Fishing MGF FISHI		2	Propulsion			1979	ULSD	325	48	0.3
523613	POLAR PRINCE	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
523613	POLAR PRINCE	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
609940	POLAR PRINCE	Commercial Fishing MGF FISHI		3	auxiliary			1979	ULSD	100	48	0.3
523613	POLAR QUEEN	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
589317	POLAR SEA	Commercial Fishing WARNESS		1	Propulsion			1978	ULSD	425	48	0.3
589317	POLAR SEA	Commercial Fishing WARNESS		2	Propulsion			1978	ULSD	425	48	0.3
589317	POLAR SEA	Commercial Fishing WARNESS		3	auxiliary			1978	ULSD	100	48	0.3
210960	POLARIS	Commercial Fishing		1	Propulsion				ULSD	175	48	0.3
210960	POLARIS	Commercial Fishing		2	Propulsion				ULSD	175	48	0.3
210960	POLARIS	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
293151	PRIBILOF	Commercial Fishing NORQUES'		1	Propulsion			1954	ULSD	750	48	0.3
293151	PRIBILOF	Commercial Fishing NORQUES'		2	Propulsion			1954	ULSD	750	48	0.3
293151	PRIBILOF	Commercial Fishing NORQUES'		3	auxiliary			1954	ULSD	330	48	0.3
8016524	PROWLER	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
8016524	PROWLER	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
8016524	PROWLER	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
394194	QUEENS REACH	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
394194	QUEENS REACH	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual						
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load		
394194	QUEENS REACH	Commercial Fishing		3	auxiliary					ULSD	330	48	0.3	
604314	QUEST	Commercial Fishing		1	Propulsion			1979	ULSD	1000	48	0.3		
604314	QUEST	Commercial Fishing		2	Propulsion			1979	ULSD	1000	48	0.3		
604314	QUEST	Commercial Fishing		3	auxiliary			1979	ULSD	330	48	0.3		
538431	RAINIER	Commercial Fishing	RAINER IN	1	Propulsion			1972	ULSD	425	48	0.3		
538431	RAINIER	Commercial Fishing	RAINER IN	2	Propulsion			1972	ULSD	425	48	0.3		
538431	RAINIER	Commercial Fishing	RAINER IN	3	auxiliary			1972	ULSD	100	48	0.3		
8856259	RAMBLIN ROSE	Commercial Fishing		1	Propulsion			1990	ULSD	350	48	0.3		
8856259	RAMBLIN ROSE	Commercial Fishing		2	Propulsion			1990	ULSD	350	48	0.3		
8856259	RAMBLIN ROSE	Commercial Fishing		3	auxiliary			1990	ULSD	100	48	0.3		
629499	RAVEN	Commercial Fishing		1	Propulsion			1987	ULSD	175	48	0.3		
629499	RAVEN	Commercial Fishing		2	Propulsion			1987	ULSD	175	48	0.3		
629499	RAVEN	Commercial Fishing		3	auxiliary			1987	ULSD	100	48	0.3		
697637	REBECCA IRENE	Commercial Fishing	REBECCA I	1	Propulsion			1986	ULSD	900	48	0.3		
697637	REBECCA IRENE	Commercial Fishing	REBECCA I	2	Propulsion			1986	ULSD	900	48	0.3		
697637	REBECCA IRENE	Commercial Fishing	REBECCA I	3	auxiliary			1986	ULSD	330	48	0.3		
319724	RED SKY 1	Commercial Fishing		1	Propulsion				ULSD	150	48	0.3		
319724	RED SKY 1	Commercial Fishing		2	Propulsion				ULSD	150	48	0.3		
319724	RED SKY 1	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3		
516256	RELIANCE	Commercial Fishing	RELIANCE	1	Propulsion			1968	ULSD	725	48	0.3		
516256	RELIANCE	Commercial Fishing	RELIANCE	2	Propulsion			1968	ULSD	725	48	0.3		
516256	RELIANCE	Commercial Fishing	RELIANCE	3	auxiliary			1968	ULSD	330	48	0.3		
4162	REPUBLIC	Commercial Fishing		1	Propulsion				ULSD	200	48	0.3		
4162	REPUBLIC	Commercial Fishing		2	Propulsion				ULSD	200	48	0.3		
4162	REPUBLIC	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3		
223688	RESOLUTE	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3		
223688	RESOLUTE	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3		
223688	RESOLUTE	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3		
7710745	RM THORSTENSON	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3		
7710745	RM THORSTENSON	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3		
7710745	RM THORSTENSON	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3		
246619	ROBERT S	Commercial Fishing	PORT HILL	1	Propulsion			1944	ULSD	143	48	0.3		
246619	ROBERT S	Commercial Fishing	PORT HILL	2	Propulsion			1944	ULSD	143	48	0.3		
246619	ROBERT S	Commercial Fishing	PORT HILL	3	auxiliary			1944	ULSD	100	48	0.3		
591632	ROBERTA M	Commercial Fishing	ROBERTA M	1	Propulsion			1978	ULSD	380	48	0.3		
591632	ROBERTA M	Commercial Fishing	ROBERTA M	2	Propulsion			1978	ULSD	380	48	0.3		
591632	ROBERTA M	Commercial Fishing	ROBERTA M	3	auxiliary			1978	ULSD	100	48	0.3		
944290	ROGUE	Commercial Fishing	LIGHTSHII	1	Propulsion			1988	ULSD	350	48	0.3		
944290	ROGUE	Commercial Fishing	LIGHTSHII	2	Propulsion			1988	ULSD	350	48	0.3		
944290	ROGUE	Commercial Fishing	LIGHTSHII	3	auxiliary			1988	ULSD	100	48	0.3		
555403	ROLLO	Commercial Fishing	NYHAMME	1	Propulsion			1974	ULSD	450	48	0.3		
555403	ROLLO	Commercial Fishing	NYHAMME	2	Propulsion			1974	ULSD	450	48	0.3		
555403	ROLLO	Commercial Fishing	NYHAMME	3	auxiliary			1974	ULSD	100	48	0.3		
624371	ROYAL AMERICAN	Commercial Fishing	ROYAL AM	1	Propulsion			1980	ULSD	630	48	0.3		
624371	ROYAL AMERICAN	Commercial Fishing	ROYAL AM	2	Propulsion			1980	ULSD	630	48	0.3		
624371	ROYAL AMERICAN	Commercial Fishing	ROYAL AM	3	auxiliary			1980	ULSD	330	48	0.3		
559271	ROYAL ATLANTIC	Commercial Fishing	ROYAL AT	1	Propulsion			1974	ULSD	425	48	0.3		
559271	ROYAL ATLANTIC	Commercial Fishing	ROYAL AT	2	Propulsion			1974	ULSD	425	48	0.3		
6810184	ROYAL CANADIAN	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3		
6810184	ROYAL CANADIAN	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3		
6810184	ROYAL CANADIAN	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3		
521927	ROYAL PACIFIC	Commercial Fishing	FORDE	1	Propulsion			1969	ULSD	360	48	0.3		
521927	ROYAL PACIFIC	Commercial Fishing	FORDE	2	Propulsion			1969	ULSD	360	48	0.3		
521927	ROYAL PACIFIC	Commercial Fishing	FORDE	3	auxiliary			1969	ULSD	100	48	0.3		
542375	ROYAL VIKING	Commercial Fishing	TRIDENT S	1	Propulsion		D398	1972	ULSD	1000	48	0.3		
542375	ROYAL VIKING	Commercial Fishing	TRIDENT S	2	auxiliary	CAT		3406	1972	ULSD	450	48	0.3	
542375	ROYAL VIKING	Commercial Fishing	TRIDENT S	3	auxiliary	CAT		3406	1972	ULSD	450	48	0.3	
648763	SABRINA	Commercial Fishing		1	Propulsion			1981	ULSD	200	48	0.3		
648763	SABRINA	Commercial Fishing		2	Propulsion			1981	ULSD	200	48	0.3		
648763	SABRINA	Commercial Fishing		3	auxiliary			1981	ULSD	100	48	0.3		
313111	SALMON TRANSPC	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3		
313111	SALMON TRANSPC	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3		
313111	SALMON TRANSPC	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3		
5280667	SAOOK BAY	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3		
5280667	SAOOK BAY	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3		
5280667	SAOOK BAY	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3		
239651	SATURN	Commercial Fishing		1	Propulsion				ULSD	200	48	0.3		

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine					Annual			
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
239651	SATURN	Commercial Fishing		2	Propulsion				ULSD	200	48	0.3
239651	SATURN	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
625096	SAVANNAH RAY	Commercial Fishing		1	Propulsion				ULSD	425	48	0.3
625096	SAVANNAH RAY	Commercial Fishing		2	Propulsion				ULSD	425	48	0.3
625096	SAVANNAH RAY	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
7933529	SCANDIES ROSE	Commercial Fishing		1	Propulsion			1978	ULSD	240	48	0.3
7933529	SCANDIES ROSE	Commercial Fishing		2	auxiliary			1978	ULSD	100	48	0.3
39296	SEA BIRD	Commercial Fishing		1	Propulsion			1983	ULSD	600	48	0.3
39296	SEA BIRD	Commercial Fishing		2	auxiliary			1983	ULSD	330	48	0.3
249301	SEA LION	Commercial Fishing	TRIDENT S	1	Propulsion			1946	ULSD	325	48	0.3
249301	SEA LION	Commercial Fishing	TRIDENT S	2	Propulsion			1946	ULSD	325	48	0.3
249301	SEA LION	Commercial Fishing	TRIDENT S	3	auxiliary			1946	ULSD	100	48	0.3
7048271	SEA STAR	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
7048271	SEA STAR	Commercial Fishing		2	auxiliary				ULSD	330	48	0.3
628959	SEA STORM	Commercial Fishing	SEA STORM	1	Propulsion			1980	ULSD	875	48	0.3
628959	SEA STORM	Commercial Fishing	SEA STORM	2	Propulsion			1980	ULSD	875	48	0.3
628959	SEA STORM	Commercial Fishing	SEA STORM	3	auxiliary			1980	ULSD	330	48	0.3
573519	SEA TRADER	Commercial Fishing		1	Propulsion				ULSD	675	48	0.3
573519	SEA TRADER	Commercial Fishing		2	auxiliary				ULSD	330	48	0.3
563829	SEA WARRIOR	Commercial Fishing	THREE RIV	1	Propulsion			1975	ULSD	470	48	0.3
563829	SEA WARRIOR	Commercial Fishing	THREE RIV	2	Propulsion			1975	ULSD	470	48	0.3
563829	SEA WARRIOR	Commercial Fishing	THREE RIV	3	auxiliary			1975	ULSD	100	48	0.3
609823	SEA WOLF	Commercial Fishing	KENDRICK	1	Propulsion			1979	ULSD	855	48	0.3
609823	SEA WOLF	Commercial Fishing	KENDRICK	2	Propulsion			1979	ULSD	855	48	0.3
609823	SEA WOLF	Commercial Fishing	KENDRICK	3	auxiliary			1979	ULSD	330	48	0.3
7433907	SEAFISHER	Commercial Fishing		1	Propulsion				ULSD	375	48	0.3
7433907	SEAFISHER	Commercial Fishing		2	Propulsion				ULSD	375	48	0.3
7433907	SEAFISHER	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
517242	SEAFREEZE ALASI	Commercial Fishing	SEAFREEZ	1	Propulsion			1968	ULSD	1500	48	0.3
517242	SEAFREEZE ALASI	Commercial Fishing	SEAFREEZ	2	Propulsion			1968	ULSD	1500	48	0.3
517242	SEAFREEZE ALASI	Commercial Fishing	SEAFREEZ	3	auxiliary			1968	ULSD	900	48	0.3
904767	SEATTLE ENTERP.	Commercial Fishing	TRIDENT S	1	Propulsion			1973	ULSD	1950	48	0.3
904767	SEATTLE ENTERP.	Commercial Fishing	TRIDENT S	2	Propulsion			1973	ULSD	1950	48	0.3
904767	SEATTLE ENTERP.	Commercial Fishing	TRIDENT S	3	auxiliary			1973	ULSD	900	48	0.3
250279	SELDOVIA	Commercial Fishing		1	Propulsion				ULSD	250	48	0.3
250279	SELDOVIA	Commercial Fishing		2	Propulsion				ULSD	250	48	0.3
250279	SELDOVIA	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
6422602	SENA II	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
6422602	SENA II	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
6422602	SENA II	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
7940247	SEVEN DAUGHTER	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
7940247	SEVEN DAUGHTER	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
7940247	SEVEN DAUGHTER	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
914477	SEYMOUR	Commercial Fishing		1	Propulsion			1987	ULSD	160	48	0.3
914477	SEYMOUR	Commercial Fishing		2	Propulsion			1987	ULSD	160	48	0.3
914477	SEYMOUR	Commercial Fishing		3	auxiliary			1987	ULSD	100	48	0.3
6621648	SHARLENE K	Commercial Fishing		1	Propulsion				ULSD	340	48	0.3
6621648	SHARLENE K	Commercial Fishing		2	Propulsion				ULSD	340	48	0.3
6621648	SHARLENE K	Commercial Fishing		3	auxiliary				ULSD	100	48	0.3
7308774	SHELLFISH	Commercial Fishing		1	Propulsion			1967	ULSD	325	48	0.3
7308774	SHELLFISH	Commercial Fishing		2	Propulsion			1967	ULSD	325	48	0.3
7308774	SHELLFISH	Commercial Fishing		3	auxiliary			1967	ULSD	100	48	0.3
9054377	SIBERIAN SEA	Commercial Fishing		1	Propulsion			1991	ULSD	650	48	0.3
9054377	SIBERIAN SEA	Commercial Fishing		2	Propulsion			1991	ULSD	650	48	0.3
9054377	SIBERIAN SEA	Commercial Fishing		3	auxiliary			1991	ULSD	330	48	0.3
547726	SILVER DOLPHIN	Commercial Fishing	BREKKAA	1	Propulsion			1973	ULSD	425	48	0.3
547726	SILVER DOLPHIN	Commercial Fishing	BREKKAA	2	Propulsion			1973	ULSD	425	48	0.3
547726	SILVER DOLPHIN	Commercial Fishing	BREKKAA	3	auxiliary			1973	ULSD	100	48	0.3
8836273	SNOPAC INNOVA1	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
8836273	SNOPAC INNOVA1	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
8836273	SNOPAC INNOVA1	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
391861	SNOW DRIFT	Commercial Fishing	NO 162 SE/	1	Propulsion				ULSD	750	48	0.3
391861	SNOW DRIFT	Commercial Fishing	NO 162 SE/	2	Propulsion				ULSD	750	48	0.3
391861	SNOW DRIFT	Commercial Fishing	NO 162 SE/	3	auxiliary				ULSD	330	48	0.3
383423	SNOW QUEEN	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
383423	SNOW QUEEN	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
383423	SNOW QUEEN	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Annual				
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
29310	SOUTHERN RIDGE	Commercial Fishing		1	Propulsion			1975	ULSD	750	48	0.3
29310	SOUTHERN RIDGE	Commercial Fishing		2	Propulsion			1975	ULSD	750	48	0.3
29310	SOUTHERN RIDGE	Commercial Fishing		3	auxiliary			1975	ULSD	330	48	0.3
625927	SOUTHERN WIND	Commercial Fishing	NORQUES'	1	Propulsion			1981	ULSD	800	48	0.3
625927	SOUTHERN WIND	Commercial Fishing	NORQUES'	2	Propulsion			1981	ULSD	800	48	0.3
625927	SOUTHERN WIND	Commercial Fishing	NORQUES'	3	auxiliary			1981	ULSD	330	48	0.3
518545	ST JUDE	Commercial Fishing	CURRY	1	Propulsion			1969	ULSD	450	48	0.3
518545	ST JUDE	Commercial Fishing	CURRY	2	Propulsion			1969	ULSD	450	48	0.3
518545	ST JUDE	Commercial Fishing	CURRY	3	auxiliary			1969	ULSD	100	48	0.3
393998	STAR	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
393998	STAR	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
393998	STAR	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
561651	STAR FISH	Commercial Fishing	STARFISH'	1	Propulsion			1974	ULSD	510	48	0.3
561651	STAR FISH	Commercial Fishing	STARFISH'	2	Propulsion			1974	ULSD	510	48	0.3
561651	STAR FISH	Commercial Fishing	STARFISH'	3	auxiliary			1974	ULSD	330	48	0.3
8807284	STARBOUND	Commercial Fishing		1	Propulsion			1989	ULSD	2500	48	0.3
8807284	STARBOUND	Commercial Fishing		2	Propulsion			1989	ULSD	2500	48	0.3
8807284	STARBOUND	Commercial Fishing		3	auxiliary			1989	ULSD	330	48	0.3
7819228	STARLITE	Commercial Fishing		1	Propulsion			1978	ULSD	550	48	0.3
7819228	STARLITE	Commercial Fishing		2	Propulsion			1978	ULSD	550	48	0.3
7819228	STARLITE	Commercial Fishing		3	auxiliary			1978	ULSD	330	48	0.3
638851	SULTAN	Commercial Fishing	SULTAN FI	1	Propulsion			1981	ULSD	600	48	0.3
638851	SULTAN	Commercial Fishing	SULTAN FI	2	Propulsion			1981	ULSD	600	48	0.3
638851	SULTAN	Commercial Fishing	SULTAN FI	3	auxiliary			1981	ULSD	330	48	0.3
CZ4548	SUN MAIDEN	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
CZ4548	SUN MAIDEN	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
CZ4548	SUN MAIDEN	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
2574403	SUNNYVALE	Commercial Fishing		1	Propulsion				ULSD	400	48	0.3
2574403	SUNNYVALE	Commercial Fishing		2	Propulsion				ULSD	400	48	0.3
2574403	SUNNYVALE	Commercial Fishing		3	auxiliary				ULSD		48	0.3
251957	SUNWARD	Commercial Fishing		1	Propulsion				ULSD	110	48	0.3
251957	SUNWARD	Commercial Fishing		2	Propulsion				ULSD	110	48	0.3
251957	SUNWARD	Commercial Fishing		3	auxiliary				ULSD		48	0.3
6928553	TAMANGO	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
6928553	TAMANGO	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
6928553	TAMANGO	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
249682	TEBENKOF	Commercial Fishing		1	Propulsion				ULSD	636	48	0.3
249682	TEBENKOF	Commercial Fishing		2	Propulsion				ULSD	636	48	0.3
249682	TEBENKOF	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
611985	TEMPEST	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
611985	TEMPEST	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
611985	TEMPEST	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
620538	TEMPO SEA	Commercial Fishing		1	Propulsion				ULSD	270	48	0.3
620538	TEMPO SEA	Commercial Fishing		2	auxiliary				ULSD	100	48	0.3
654362	TENACIOUS	Commercial Fishing	TENACIOUS	1	Propulsion			1983	ULSD	270	48	0.3
654362	TENACIOUS	Commercial Fishing	TENACIOUS	2	auxiliary			1983	ULSD	100	48	0.3
8852356	TIME BANDIT	Commercial Fishing		1	Propulsion			1991	ULSD	425	48	0.3
8852356	TIME BANDIT	Commercial Fishing		2	Propulsion			1991	ULSD	425	48	0.3
8852356	TIME BANDIT	Commercial Fishing		3	auxiliary			1991	ULSD	330	48	0.3
967015	TINA B	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
967015	TINA B	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
967015	TINA B	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
596514	TRAILBLAZER	Commercial Fishing		1	Propulsion			1978	ULSD	750	48	0.3
596514	TRAILBLAZER	Commercial Fishing		2	Propulsion			1978	ULSD	750	48	0.3
596514	TRAILBLAZER	Commercial Fishing		3	auxiliary			1978	ULSD	330	48	0.3
929356	TRAVELER	Commercial Fishing		1	Propulsion			1989	ULSD	650	48	0.3
929356	TRAVELER	Commercial Fishing		2	Propulsion			1989	ULSD	650	48	0.3
929356	TRAVELER	Commercial Fishing		3	auxiliary			1989	ULSD	330	48	0.3
513354	TUXEDNI	Commercial Fishing	FV TUXED	1	Propulsion			1968	ULSD	245	48	0.3
513354	TUXEDNI	Commercial Fishing	FV TUXED	2	Propulsion			1968	ULSD	245	48	0.3
513354	TUXEDNI	Commercial Fishing	FV TUXED	3	auxiliary			1968	ULSD	100	48	0.3
604439	U S INTREPID	Commercial Fishing	U S FISHIN	1	Propulsion			1979	ULSD	1600	48	0.3
604439	U S INTREPID	Commercial Fishing	U S FISHIN	2	Propulsion			1979	ULSD	1600	48	0.3
604439	U S INTREPID	Commercial Fishing	U S FISHIN	3	auxiliary			1979	ULSD	900	48	0.3
637693	UNIMAK	Commercial Fishing	UNIMAK F	1	Propulsion			1981	ULSD	1500	48	0.3
637693	UNIMAK	Commercial Fishing	UNIMAK F	3	auxiliary			1981	ULSD	900	48	0.3
611520	US LIBERATOR	Commercial Fishing	LIBERATO	1	Propulsion			1979	ULSD	850	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine					Annual			
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load
611520	US LIBERATOR	Commercial Fishing	LIBERATO	2	Propulsion			1979	ULSD	850	48	0.3
611520	US LIBERATOR	Commercial Fishing	LIBERATO	3	auxiliary			1979	ULSD	330	48	0.3
611225	VAERDAL	Commercial Fishing	JUBILEE F	1	Propulsion			1979	ULSD	725	48	0.3
611225	VAERDAL	Commercial Fishing	JUBILEE F	2	Propulsion			1979	ULSD	725	48	0.3
611225	VAERDAL	Commercial Fishing	JUBILEE F	3	auxiliary			1979	ULSD	330	48	0.3
522574	VALIANT	Commercial Fishing	BOWL DEN	1	Propulsion			1969	ULSD	480	48	0.3
522574	VALIANT	Commercial Fishing	BOWL DEN	2	Propulsion			1969	ULSD	480	48	0.3
522574	VALIANT	Commercial Fishing	BOWL DEN	3	auxiliary			1969	ULSD	100	48	0.3
384011	VAMPY 1	Commercial Fishing		1	Propulsion			1978	ULSD	750	48	0.3
384011	VAMPY 1	Commercial Fishing		2	Propulsion			1978	ULSD	750	48	0.3
384011	VAMPY 1	Commercial Fishing		3	auxiliary			1978	ULSD	330	48	0.3
210906	VANSEE	Commercial Fishing	ODEGAAR	1	Propulsion			1913	ULSD	250	48	0.3
210906	VANSEE	Commercial Fishing	ODEGAAR	2	auxiliary			1913	ULSD	100	48	0.3
611642	VESTERAALEN	Commercial Fishing	VESTERAA	1	Propulsion			1978	ULSD	600	48	0.3
611642	VESTERAALEN	Commercial Fishing	VESTERAA	2	Propulsion			1978	ULSD	600	48	0.3
611642	VESTERAALEN	Commercial Fishing	VESTERAA	3	auxiliary			1978	ULSD	330	48	0.3
565017	VIKING	Commercial Fishing	VIKING LF	1	Propulsion			1974	ULSD	884	48	0.3
565017	VIKING	Commercial Fishing	VIKING LF	2	Propulsion			1974	ULSD	884	48	0.3
565017	VIKING	Commercial Fishing	VIKING LF	3	auxiliary			1974	ULSD	330	48	0.3
7803114	VIKING CAVALIEF	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
7803114	VIKING CAVALIEF	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
7803114	VIKING CAVALIEF	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
8802404	VIKING ENTERPIS	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
8802404	VIKING ENTERPIS	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
8802404	VIKING ENTERPIS	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
605228	VIKING EXPLORE	Commercial Fishing	ROYAL VII	1	Propulsion			1979	ULSD	600	48	0.3
605228	VIKING EXPLORE	Commercial Fishing	ROYAL VII	2	Propulsion			1979	ULSD	600	48	0.3
605228	VIKING EXPLORE	Commercial Fishing	ROYAL VII	3	auxiliary			1979	ULSD	330	48	0.3
817566	VIKING MOON	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
817566	VIKING MOON	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
817566	VIKING MOON	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
8989147	VIKING PRIDE	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
8989147	VIKING PRIDE	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
8989147	VIKING PRIDE	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
508212	VIKING QUEEN	Commercial Fishing	ICICLE SE/	1	Propulsion			1967	ULSD	350	48	0.3
508212	VIKING QUEEN	Commercial Fishing	ICICLE SE/	2	Propulsion			1967	ULSD	350	48	0.3
508212	VIKING QUEEN	Commercial Fishing	ICICLE SE/	3	auxiliary			1967	ULSD	100	48	0.3
593623	VIKING STAR	Commercial Fishing	OLSEN	1	Propulsion			1978	ULSD	183	48	0.3
593623	VIKING STAR	Commercial Fishing	OLSEN	2	Propulsion			1978	ULSD	183	48	0.3
593623	VIKING STAR	Commercial Fishing	OLSEN	3	auxiliary			1978	ULSD	100	48	0.3
7919858	VIKING STORM	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
7919858	VIKING STORM	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
7919858	VIKING STORM	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
640544	WASSILIE B	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
640544	WASSILIE B	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
640544	WASSILIE B	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
1043151	WENDY SEA	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
1043151	WENDY SEA	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
1043151	WENDY SEA	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
368913	WESTERLY	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
368913	WESTERLY	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
368913	WESTERLY	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
524423	WESTERN DAWN	Commercial Fishing	OLSEN	1	Propulsion			1970	ULSD	640	48	0.3
524423	WESTERN DAWN	Commercial Fishing	OLSEN	2	Propulsion			1970	ULSD	640	48	0.3
524423	WESTERN DAWN	Commercial Fishing	OLSEN	3	auxiliary			1970	ULSD	330	48	0.3
3066273	WESTERN INVEST	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
3066273	WESTERN INVEST	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
3066273	WESTERN INVEST	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
322411	WESTERN KING	Commercial Fishing		1	Propulsion				ULSD	750	48	0.3
322411	WESTERN KING	Commercial Fishing		2	Propulsion				ULSD	750	48	0.3
322411	WESTERN KING	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
585926	WESTERN MARINI	Commercial Fishing	WESTERN	1	Propulsion			1977	ULSD	425	48	0.3
585926	WESTERN MARINI	Commercial Fishing	WESTERN	2	Propulsion			1977	ULSD	425	48	0.3
585926	WESTERN MARINI	Commercial Fishing	WESTERN	3	auxiliary			1977	ULSD	100	48	0.3
223931	WESTWARD	Commercial Fishing	PACIFIC C/	1	Propulsion			1924	ULSD	150	48	0.3
223931	WESTWARD	Commercial Fishing	PACIFIC C/	2	Propulsion			1924	ULSD	150	48	0.3
223931	WESTWARD	Commercial Fishing	PACIFIC C/	3	auxiliary			1924	ULSD	100	48	0.3

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Engine Fuel	Engine HP	Annual	
				ID User	Engine Type						Hours	Load
615165	WESTWARD 1	Commercial Fishing	WESTWAR	1	Propulsion			1979	ULSD	750	48	0.3
615165	WESTWARD 1	Commercial Fishing	WESTWAR	2	Propulsion			1979	ULSD	750	48	0.3
615165	WESTWARD 1	Commercial Fishing	WESTWAR	3	auxiliary			1979	ULSD	330	48	0.3
7743467	WESTWARD WIND	Commercial Fishing	HIGHLANI	1	Propulsion			1978	ULSD	650	48	0.3
7743467	WESTWARD WIND	Commercial Fishing	HIGHLANI	2	Propulsion			1978	ULSD	650	48	0.3
7743467	WESTWARD WIND	Commercial Fishing	HIGHLANI	3	auxiliary			1978	ULSD	330	48	0.3
7316408	WHALE	Commercial Fishing		1	Propulsion				ULSD	480	48	0.3
7316408	WHALE	Commercial Fishing		2	Propulsion				ULSD	480	48	0.3
7316408	WHALE	Commercial Fishing		3	auxiliary				ULSD		48	0.3
583100	WIDE BAY	Commercial Fishing	TRIDENT S	1	Propulsion			1977	ULSD	230	48	0.3
583100	WIDE BAY	Commercial Fishing	TRIDENT S	2	Propulsion			1977	ULSD	230	48	0.3
583100	WIDE BAY	Commercial Fishing	TRIDENT S	3	auxiliary			1977	ULSD	100	48	0.3
1077274	WILD SALMON	Commercial Fishing		1	Propulsion				ULSD	600	48	0.3
1077274	WILD SALMON	Commercial Fishing		2	Propulsion				ULSD	600	48	0.3
1077274	WILD SALMON	Commercial Fishing		3	auxiliary				ULSD	330	48	0.3
594470	WIZARD	Commercial Fishing	WIZARD F	1	Propulsion			1978	ULSD	600	48	0.3
594470	WIZARD	Commercial Fishing	WIZARD F	2	Propulsion			1978	ULSD	600	48	0.3
594470	WIZARD	Commercial Fishing	WIZARD F	3	auxiliary			1978	ULSD	330	48	0.3
524422	YANKEE CLIPPER	Commercial Fishing	CAIN	1	Propulsion			1969	ULSD	360	48	0.3
524422	YANKEE CLIPPER	Commercial Fishing	CAIN	2	Propulsion			1969	ULSD	360	48	0.3
524422	YANKEE CLIPPER	Commercial Fishing	CAIN	3	auxiliary			1969	ULSD	100	48	0.3
628313	ZENITH	Commercial Fishing	ZENITH FI	1	Propulsion			1980	ULSD	425	48	0.3
628313	ZENITH	Commercial Fishing	ZENITH FI	2	Propulsion			1980	ULSD	425	48	0.3
628313	ZENITH	Commercial Fishing	ZENITH FI	3	auxiliary			1980	ULSD	100	48	0.3
9183556	ZODIAK	Commercial Fishing		1	Propulsion				ULSD	718	48	0.3
9183556	ZODIAK	Commercial Fishing		2	Propulsion				ULSD	718	48	0.3
9183556	ZODIAK	Commercial Fishing		3	auxiliary				ULSD		48	0.3
1219885	ZORRO	Commercial Fishing		1	Propulsion			1979	ULSD	215	48	0.3
1219885	ZORRO	Commercial Fishing		2	Propulsion			1979	ULSD	215	48	0.3
1219885	ZORRO	Commercial Fishing		3	auxiliary			1979	ULSD		48	0.3
D231868	AQUA EXPRESS	Excursion	AQUA EXP	1	Propulsion			1992	ULSD	2990	2500	0.42
600818	BEAVER	Excursion	ARGOSY L	1	Propulsion	Catepillar	3208T	1993	ULSD	325	500	0.42
234281	CARMELITA	Excursion	EVANS MA	1	Propulsion			1992	ULSD	330	800	0.42
944434	CELEBRATIONS	Excursion	ARGOSY L	1	Propulsion	Cummins	6BT5.9	1999	ULSD	210	1283	0.42
944434	CELEBRATIONS	Excursion	ARGOSY L	2	Propulsion	Cummins	6BT5.9	1999	ULSD	210	879	0.42
944434	CELEBRATIONS	Excursion	ARGOSY L	3	auxiliary	Yanmar	4JH26-TNE	2000	ULSD	40	879	0.43
PSECL	CHAMPAGNE LAD	Excursion	ARGOSY L	1	Propulsion	John Deere	6068TFM	1998	ULSD	210	1385	0.42
PSECL	CHAMPAGNE LAD	Excursion	ARGOSY L	2	Propulsion	John Deere	6068TFM	1998	ULSD	210	996	0.42
PSECL	CHAMPAGNE LAD	Excursion	ARGOSY L	3	auxiliary	Toyota	M984K	1998	ULSD	40	996	0.43
253102	CHARLES N. CURT	Excursion	MT RAINIE	1	Propulsion	Detroit		1992	ULSD	320	300	0.42
253102	CHARLES N. CURT	Excursion	MT RAINIE	2	Propulsion	Detroit		1992	ULSD	320	300	0.42
253102	CHARLES N. CURT	Excursion	MT RAINIE	3	auxiliary			1985	ULSD	40	300	0.43
956275	CHARLIE WELLS	Excursion	HERRON M	1	Propulsion			1992	ULSD	180	3000	0.42
956275	CHARLIE WELLS	Excursion	HERRON M	2	Propulsion			1992	ULSD	180	3000	0.42
1109391	Destiny	Excursion	WATERWA	1	Propulsion			1992	ULSD	750	208	0.42
1109391	Destiny	Excursion	WATERWA	2	Propulsion			1992	ULSD	750	208	0.42
1109391	Destiny	Excursion	WATERWA	3	auxiliary			1985	ULSD	56	60	0.43
520222	EMERALD STAR	Excursion	WATERWA	1	Propulsion			1992	ULSD	155	824	0.42
520222	EMERALD STAR	Excursion	WATERWA	2	Propulsion			1992	ULSD	155	824	0.42
520222	EMERALD STAR	Excursion	WATERWA	3	auxiliary			1985	ULSD	13	60	0.43
921107	FAIRHAVEN	Excursion	PACIFIC CI	1	Propulsion			1992	ULSD	120	2000	0.42
685462	FREMONT AVENU	Excursion	SEATTLE F	1	Propulsion			1985	ULSD	133	400	0.42
571306	GOODTIME II	Excursion	ARGOSY L	1	Propulsion	Catepillar	D343	1976	ULSD	365	766	0.42
571306	GOODTIME II	Excursion	ARGOSY L	2	Propulsion	Catepillar	D343	1976	ULSD	365	2083	0.42
571306	GOODTIME II	Excursion	ARGOSY L	3	auxiliary	Shibaura	3H3XL2	2003	ULSD	27	912	0.43
571306	GOODTIME II	Excursion	ARGOSY L	4	auxiliary	Shibaura	3H3XL2	2003	ULSD	22	912	0.43
594261	GOODTIME III	Excursion	ARGOSY L	1	Propulsion	Catepillar	3408	1978	ULSD	365	1371	0.42
594261	GOODTIME III	Excursion	ARGOSY L	2	Propulsion	Catepillar	3408	1978	ULSD	365	1207	0.42
594261	GOODTIME III	Excursion	ARGOSY L	3	auxiliary	Kubota	F2803-BGE	2002	ULSD	36	1020	0.43
594261	GOODTIME III	Excursion	ARGOSY L	4	auxiliary	Isusu	BV-4LE1T	2011	ULSD	36	1020	0.43
1064771	HUMPBAC	Excursion	R W MILLE	1	Propulsion			1992	ULSD	210	1200	0.42
PSEIN	INSPIRATION	Excursion	LAKE UNIO	1	Propulsion			1992	Gasoline	450	10	0.42
559548	ISLAND CAPER	Excursion	ISLAND M.	1	Propulsion			1992	ULSD	725	500	0.42
559548	ISLAND CAPER	Excursion	ISLAND M.	2	Propulsion			1992	ULSD	725	500	0.42
559548	ISLAND CAPER	Excursion	ISLAND M.	3	Propulsion			1992	ULSD	725	500	0.42
IDB	ISLAND DIVER	Excursion	BANDITO	1	Propulsion			2009	ULSD	315	250	0.42
603440	ISLAND EXPLORE	Excursion	AGGERGA	1	Propulsion			1992	ULSD	800	1500	0.42

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Engine Fuel	Engine HP	Annual	
				ID User	Engine Type						Hours	Load
603440	ISLAND EXPLORE	Excursion	AGGERGA		2 Propulsion			1992 ULSD	800	1500	0.42	
603440	ISLAND EXPLORE	Excursion	AGGERGA		3 auxiliary			1985 ULSD	20	1500	0.43	
PSEIE	ISLAND EXPRESS	Excursion	ISLAND E		1 Propulsion			1992 ULSD	315	1000	0.42	
PSEIEI	ISLAND EXPRESS	Excursion	ISLAND E		2 Propulsion			1992 ULSD	315	1000	0.42	
PSEIEII	ISLAND EXPRESS I	Excursion	ISLAND E		1 Propulsion			1992 ULSD	315	1000	0.42	
PSEIEIII	ISLAND EXPRESS I	Excursion	ISLAND E		2 Propulsion			1992 ULSD	315	1000	0.42	
PSEIS	ISLAND SPIRIT	Excursion	NEW DIMI		1 Propulsion			1992 ULSD	2200	1000	0.42	
525654	JAMAL	Excursion	JAMAL CH.		1 Propulsion			1970 ULSD	325	100	0.42	
525654	JAMAL	Excursion	JAMAL CH.		2 auxiliary			1991 ULSD	40	100	0.43	
525654	JAMAL	Excursion	JAMAL CH.		3 auxiliary			1991 ULSD	54	100	0.43	
PSEK	KITTIWAKE	Excursion	SAN JUAN		1 Propulsion			1992 ULSD	250	1000	0.42	
594991	KOINONIA	Excursion	HEETER		1 Propulsion			2005 ULSD	425	400	0.42	
594991	KOINONIA	Excursion	HEETER		2 Propulsion			2005 ULSD	425	400	0.42	
543871	LADY MARY	Excursion	ARGOSY L		1 Propulsion	John Deere	6068SFM	2006 ULSD	236	1101	0.42	
543871	LADY MARY	Excursion	ARGOSY L		2 Propulsion	John Deere	6068SFM	2006 ULSD	236	1211	0.42	
543871	LADY MARY	Excursion	ARGOSY L		3 auxiliary	Cummins	4B-3.9	1994 ULSD	20	1068	0.43	
543871	LADY MARY	Excursion	ARGOSY L		4 auxiliary	John Deere	TD4276T	2000 ULSD	27	1068	0.43	
1033659	Maritime Instrcutor	Excursion	Seattle Marit		1 Propulsion	Caterpillar	V-3412	1994 ULSD	800	264	0.42	
1033659	Maritime Instrcutor	Excursion	Seattle Marit		2 Propulsion	Caterpillar	V-3412	1994 ULSD	800	264	0.42	
908725	MATCH MAKER	Excursion	CRISTAL C		1 Propulsion			1992 ULSD	320	1000	0.42	
908725	MATCH MAKER	Excursion	CRISTAL C		2 Propulsion			1992 ULSD	320	1000	0.42	
908725	MATCH MAKER	Excursion	CRISTAL C		3 auxiliary			1985 ULSD	24	1000	0.43	
593090	MY GIRL	Excursion	BROWNS P		1 Propulsion			1976 ULSD	350	480	0.42	
593090	MY GIRL	Excursion	BROWNS P		2 Propulsion			1976 ULSD	350	480	0.42	
593090	MY GIRL	Excursion	BROWNS P		3 auxiliary			1985 ULSD	34	240	0.43	
504847	Naknak	Excursion	BANDITO		1 Propulsion			1992 ULSD	215	300	0.42	
PSEOQ	OCEAN QUEST	Excursion	BANDITO		1 Propulsion			1992 ULSD	250	425	0.42	
698903	OLYMPAS	Excursion	THE UNDI		1 Propulsion			1992 ULSD	495	800	0.42	
1055060	OLYMPIC STAR	Excursion	WATERWA		1 Propulsion			1992 ULSD	230	740	0.42	
1055060	OLYMPIC STAR	Excursion	WATERWA		2 Propulsion			1992 ULSD	230	740	0.42	
1055060	OLYMPIC STAR	Excursion	WATERWA		3 auxiliary			1985 ULSD	27	60	0.43	
1000079	ORCA SONG	Excursion	ORCA SON		1 Propulsion			1992 ULSD	1650	800	0.42	
553780	ORCAS EXPRESS	Excursion	ORCAS ISL		1 Propulsion			2005 ULSD	150	1095	0.42	
553780	ORCAS EXPRESS	Excursion	ORCAS ISL		2 Propulsion			2005 ULSD	150	1095	0.42	
1051053	PARACLETE	Excursion	HEETER		1 Propulsion			2002 ULSD	318	2800	0.42	
1051053	PARACLETE	Excursion	HEETER		2 Propulsion			2002 ULSD	318	2800	0.42	
1033607	PAUL JOHANSEN	Excursion	PORT MAL		1 Propulsion			1992 ULSD	264	500	0.42	
1079075	PELAGIC	Excursion	PELAGIC C		1 Propulsion			2001 ULSD	480	600	0.42	
PSEPL	PLOVER	Excursion	DRAYTON		1 Propulsion			1992 ULSD	120	600	0.42	
PSEPO	Popeye	Excursion	SEBRING M		1 Propulsion			1992 ULSD	350	500	0.42	
976735	QUEENS LAUNCH	Excursion	ARGOSY L		1 Propulsion	Perkins	LD20663U	1992 ULSD	85	446	0.42	
RAV1	Raven	Excursion	ARGOSY L		1 Propulsion	Suzuki	DF250	2000 Gasoline	250	100	0.42	
1093282	ROYAL ARGOSY	Excursion	ARGOSY L		1 Propulsion	Komatsu	SAGP170-A-	2000 ULSD	700	916	0.42	
1093282	ROYAL ARGOSY	Excursion	ARGOSY L		2 Propulsion	Komatsu	SAGP170-A-	2000 ULSD	700	1775	0.42	
1093282	ROYAL ARGOSY	Excursion	ARGOSY L		3 auxiliary	Komatsu	SAGD140-1	2000 ULSD	40	295	0.43	
1093282	ROYAL ARGOSY	Excursion	ARGOSY L		4 auxiliary	Komatsu	SAGD140-1	2000 ULSD	54	1033	0.43	
1093282	ROYAL ARGOSY	Excursion	ARGOSY L		5 auxiliary	John Deere	4045T	2000 ULSD	47	1033	0.43	
601283	SALVAGER I	Excursion	BALLARD I		1 Propulsion			2002 ULSD	370	20	0.42	
601283	SALVAGER I	Excursion	BALLARD I		2 Propulsion			2002 ULSD	370	20	0.42	
514506	SAMPAN	Excursion	BANDITO		1 Propulsion			1992 ULSD	350	600	0.42	
PSESH	SEA HAWK	Excursion	SAN JUAN		1 Propulsion			1992 ULSD	160	1000	0.42	
PSES	Seeker	Excursion	ANCHOR E		1 Propulsion			1974 ULSD	300	285	0.42	
PSES	Seeker	Excursion	ANCHOR E		2 Propulsion			1974 ULSD	300	285	0.42	
PSES	Seeker	Excursion	ANCHOR E		3 auxiliary			1974 ULSD	27	285	0.43	
282387	SIGHTSEER	Excursion	ARGOSY L		1 Propulsion	Catepillar	D343	1978 ULSD	365	910	0.42	
282387	SIGHTSEER	Excursion	ARGOSY L		2 auxiliary	John Deere	4039D	1999 ULSD	47	426	0.43	
916587	SPIRIT OF SEATTL	Excursion	ARGOSY L		1 Propulsion	Catepillar	3408 B	1987 ULSD	445	1828	0.42	
916587	SPIRIT OF SEATTL	Excursion	ARGOSY L		2 Propulsion	Catepillar	3408 B	1987 ULSD	445	404	0.42	
916587	SPIRIT OF SEATTL	Excursion	ARGOSY L		3 auxiliary	John Deere	4276D	1987 ULSD	40	926	0.43	
916587	SPIRIT OF SEATTL	Excursion	ARGOSY L		4 auxiliary	John Deere	4239T	1987 ULSD	40	926	0.43	
578880	SQUITO	Excursion	Tom Avena		1 Propulsion			1976 ULSD	180	300	0.42	
578880	SQUITO	Excursion	Tom Avena		2 Propulsion			1976 ULSD	180	300	0.42	
579981	STELLAR SEA	Excursion	SALISH SE.		1 Propulsion			2003 ULSD	235	1000	0.42	
579981	STELLAR SEA	Excursion	SALISH SE.		2 Propulsion			2003 ULSD	235	1000	0.42	
1025644	SYLVAN SPIRIT	Excursion	HEETER		1 Propulsion			1996 ULSD	300	800	0.42	
1025644	SYLVAN SPIRIT	Excursion	HEETER		2 Propulsion			1996 ULSD	300	800	0.42	
PSETI	THE ISLANDER	Excursion	LAKE UNIO		1 Propulsion			1992 ULSD	180	500	0.42	

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual	
				ID User	Engine Type						Hours	Load
1081068	TYLER M	Excursion	SEBRING M		1 Propulsion			1992	ULSD	350	500	0.42
1060642	UNITY	Excursion	LAKE UNI		1 Propulsion			1992	Gasoline	450	10	0.42
633786	VICTORIA EXPRES	Excursion	VICTORIA		1 Propulsion			1986	ULSD	485	500	0.42
633786	VICTORIA EXPRES	Excursion	VICTORIA		2 Propulsion			1986	ULSD	485	500	0.42
633786	VICTORIA EXPRES	Excursion	VICTORIA		3 Propulsion			1986	ULSD	485	500	0.42
633786	VICTORIA EXPRES	Excursion	VICTORIA		4 auxiliary			1986	ULSD	150	500	0.43
605959	VICTORIA EXPRES	Excursion	VICTORIA		1 Propulsion			1986	ULSD	510	500	0.42
605959	VICTORIA EXPRES	Excursion	VICTORIA		2 Propulsion			1986	ULSD	510	500	0.42
605959	VICTORIA EXPRES	Excursion	VICTORIA		3 Propulsion			1986	ULSD	510	500	0.42
605959	VICTORIA EXPRES	Excursion	VICTORIA		4 Propulsion			1986	ULSD	510	500	0.42
605959	VICTORIA EXPRES	Excursion	VICTORIA		5 auxiliary			1986	ULSD	150	500	0.43
572980	VICTORIA STAR2	Excursion	PACIFIC CI		1 Propulsion			1992	ULSD	600	2000	0.42
572980	VICTORIA STAR2	Excursion	PACIFIC CI		2 Propulsion			1992	ULSD	600	2000	0.42
572980	VICTORIA STAR2	Excursion	PACIFIC CI		3 Propulsion			1992	ULSD	600	2000	0.42
572980	VICTORIA STAR2	Excursion	PACIFIC CI		4 auxiliary			1985	ULSD	40	2000	0.43
PSEVS	VIKING STAR	Excursion	VIKING CF		1 Propulsion			1992	ULSD	760	1500	0.42
222170	VIRGINIA V	Excursion	THE STEAL		1 Propulsion			1992	ULSD	400	500	0.42
222170	VIRGINIA V	Excursion	THE STEAL		2 auxiliary			1985	ULSD	27	500	0.43
222170	VIRGINIA V	Excursion	THE STEAL		3 auxiliary			1985	ULSD	40	500	0.43
539994	WESTERN PRINCE	Excursion	WESTERN		1 Propulsion			1992	ULSD	316	900	0.42
539994	WESTERN PRINCE	Excursion	WESTERN		2 Propulsion			1992	ULSD	316	900	0.42
PSFC	CALLAHAN	Ferry	WASHINGTON		1 Propulsion	Detroit	8V71	1994	ULSD	300	2600	0.34
PSFC	CALLAHAN	Ferry	WASHINGTON		2 Propulsion	Detroit	8V71	1994	ULSD	300	2600	0.34
PSFC	CALLAHAN	Ferry	WASHINGTON		3 auxiliary	Lugger		1985	ULSD	16	2600	0.43
214872	CARLISLE II	Ferry	KITSAP TR		1 Propulsion			1994	ULSD	330	4000	0.34
636551	Cathlamet	Ferry	Washington		1 Propulsion	GE	7FDM12EF	2003	ULSD	2500	6494	0.34
636551	Cathlamet	Ferry	Washington		2 Propulsion	GE	7FDM12EF	2003	ULSD	2500	6494	0.34
636551	Cathlamet	Ferry	Washington		3 auxiliary	Detroit	Series 60 DI	2003	ULSD	400	7015	0.43
636551	Cathlamet	Ferry	Washington		4 auxiliary	Detroit	Series 60 DI	2003	ULSD	400	5851	0.43
636551	Cathlamet	Ferry	Washington		5 auxiliary	Detroit	Series 60 DI	2003	ULSD	400	1089	0.43
636551	Cathlamet	Ferry	Washington		6 auxiliary	Detroit	6V71	2003	ULSD	168	24	0.43
636551	Cathlamet	Ferry	Washington		7 boiler	Seattle Boile:	SDW50M	2003	ULSD	60	1500	0.43
636551	Cathlamet	Ferry	Washington		8 boiler	Seattle Boile:	SDW50M	2003	ULSD	60	1500	0.43
999032	Chelan	Ferry	Washington		1 Propulsion	GE	7FDM12EF	2005	ULSD	2500	4867	0.34
999032	Chelan	Ferry	Washington		2 Propulsion	GE	7FDM12EF	2005	ULSD	2500	4867	0.34
999032	Chelan	Ferry	Washington		3 auxiliary	Detroit	Series 60 DI	2003	ULSD	400	3968	0.43
999032	Chelan	Ferry	Washington		4 auxiliary	Detroit	Series 60 DI	2003	ULSD	400	2012	0.43
999032	Chelan	Ferry	Washington		5 auxiliary	Detroit	Series 60 DI	2003	ULSD	400	2035	0.43
999032	Chelan	Ferry	Washington		6 auxiliary	Detroit	6V71	2003	ULSD	168	24	0.43
999032	Chelan	Ferry	Washington		7 boiler	Seattle Boile:	SDW50M	2003	ULSD	60	1000	0.43
999032	Chelan	Ferry	Washington		8 boiler	Seattle Boile:	SDW50M	2003	ULSD	60	1000	0.43
1228643	Chetzemoka	Ferry	Washington		1 Propulsion	EMD	12-710	2011	ULSD	3000	4561	0.34
1228643	Chetzemoka	Ferry	Washington		2 Propulsion	EMD	12-710	2011	ULSD	3000	4561	0.34
1228643	Chetzemoka	Ferry	Washington		3 auxiliary	Detroit	Series 60 DI	2011	ULSD			0.43
1228643	Chetzemoka	Ferry	Washington		4 auxiliary	Detroit	Series 60 DI	2011	ULSD			0.43
1228643	Chetzemoka	Ferry	Washington		5 boiler	Weil McLain	88	2011	ULSD	60		0.43
1228643	Chetzemoka	Ferry	Washington		6 boiler	Weil McLain	88	2011	ULSD	60		0.43
1023545	Christine Anderson	Ferry	COUNTY C		1 Propulsion			1996	ULSD	960	5150	0.34
1023545	Christine Anderson	Ferry	COUNTY C		2 Propulsion			1996	ULSD	960	5150	0.34
1023545	Christine Anderson	Ferry	COUNTY C		3 auxiliary			1985	ULSD	99	2760	0.43
1023545	Christine Anderson	Ferry	COUNTY C		4 auxiliary			1985	ULSD	99	2760	0.43
PSFCa	COHO	Ferry	BLACK BA		1 Propulsion	EMD	12V	1994	ULSD	2600	1350	0.34
PSFCa	COHO	Ferry	BLACK BA		2 Propulsion			1994	ULSD	2600	1350	0.34
PSFE	EAGLE	Ferry	HORLUCK		1 Propulsion			1994	ULSD	500	4000	0.34
537794	EL Bartlett	Ferry	Seattle Marit		1 Propulsion	Fairbanks M	38D 81/8	1969	ULSD	1500	384	0.34
537794	EL Bartlett	Ferry	Seattle Marit		2 Propulsion	Fairbanks M	38D 81/8	1969	ULSD	1500	384	0.34
537794	EL Bartlett	Ferry	Seattle Marit		3 auxiliary	Cummins	NT855G3M	1969	ULSD	200	384	0.43
537794	EL Bartlett	Ferry	Seattle Marit		4 auxiliary	Cummins	NT855G3M	1969	ULSD	200	384	0.43
1117163	Elsie M II	Ferry	HATT ISLAN		1 Propulsion	Detroit Dies	6v72	2010	ULSD	400	3000	0.34
512324	Elwha	Ferry	Washington		1 Propulsion	EMD	645F7B	1991	ULSD	2550	5958	0.34
512324	Elwha	Ferry	Washington		2 Propulsion	EMD	645F7B	1991	ULSD	2550	5958	0.34
512324	Elwha	Ferry	Washington		3 Propulsion	EMD	645F7B	1991	ULSD	2550	5958	0.34
512324	Elwha	Ferry	Washington		4 Propulsion	EMD	645F7B	1991	ULSD	2550	5958	0.34
512324	Elwha	Ferry	Washington		5 auxiliary	Cat	3412	1991	ULSD	451	185	0.43
512324	Elwha	Ferry	Washington		6 auxiliary	Cat	3406	1991	ULSD	451	24	0.43
512324	Elwha	Ferry	Washington		7 boiler	Weil McLain	94	1991	ULSD	60	2000	0.43
512324	Elwha	Ferry	Washington		8 boiler	Weil McLain	94	1991	ULSD	60	2000	0.43



**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual	
				ID User	Engine Type						Hours	Load
268732	Evergreen State	Ferry	Washington	1	Propulsion	Stork Werksj	9FHD 240	1988	ULSD	1250	4141	0.34
268732	Evergreen State	Ferry	Washington	2	Propulsion	Stork Werksj	9FHD 240	1988	ULSD	1250	4141	0.34
268732	Evergreen State	Ferry	Washington	3	auxiliary	Cummins	NTA 855	1988	ULSD	425	48	0.43
268732	Evergreen State	Ferry	Washington	4	auxiliary	Cummins	NTA 855	1988	ULSD	425	28	0.43
268732	Evergreen State	Ferry	Washington	5	boiler	Weil McLain	BL-1088-SF	1988	ULSD	60	24	0.43
PSFGS	Glacier Spirit	Ferry	Puget Sound	1	Propulsion			1994	ULSD	1300	800	0.34
601686	GUEMES ISLAND I	Ferry	Skagit Count	1	Propulsion	Cummins	KTA-19	2005	ULSD	540	6000	0.34
601686	GUEMES ISLAND I	Ferry	Skagit Count	2	Propulsion	Cummins	KTA-19	2005	ULSD	540	6000	0.34
601686	GUEMES ISLAND I	Ferry	Skagit Count	3	Propulsion	Cummins	KTA-19	2005	ULSD	540	0	0.34
601686	GUEMES ISLAND I	Ferry	Skagit Count	4	auxiliary	Cat		2009	ULSD	54	0	0.43
1034230	Hat Express	Ferry	HAT ISLAN	1	Propulsion	Detroit Dies	16v92	1996	ULSD	1100	1100	0.34
1034230	Hat Express	Ferry	HAT ISLAN	2	Propulsion	Detroit Dies	16v92	1996	ULSD	1100	1100	0.34
508159	Hiyu	Ferry	Washington	1	Propulsion	CAT	D 379	1967	ULSD	430	301	0.34
508159	Hiyu	Ferry	Washington	2	Propulsion	CAT	D379	1967	ULSD	430	301	0.34
508159	Hiyu	Ferry	Washington	3	auxiliary	Cummins	4BT 3.9G2	1967	ULSD	102	0	0.43
508159	Hiyu	Ferry	Washington	4	auxiliary	Cummins	4BT 3.9G2	1967	ULSD	102	0	0.43
508159	Hiyu	Ferry	Washington	5	auxiliary	Cummins	4BT 3.9	1967	ULSD	82	0	0.43
508159	Hiyu	Ferry	Washington	6	boiler	Way Wolf	2128 - 8C	1967	ULSD	60	0	0.43
508160	Hyak	Ferry	Washington	1	Propulsion	EMD	645F7B	2005	ULSD	2000	6264	0.34
508160	Hyak	Ferry	Washington	2	Propulsion	EMD	645F7B	2005	ULSD	2000	6264	0.34
508160	Hyak	Ferry	Washington	3	Propulsion	EMD	645F7B	2005	ULSD	2000	6264	0.34
508160	Hyak	Ferry	Washington	4	Propulsion	EMD	645F7B	2005	ULSD	2000	6264	0.34
508160	Hyak	Ferry	Washington	5	auxiliary	Detroit	Series 50 DI	1999	ULSD	134	4651	0.43
508160	Hyak	Ferry	Washington	6	auxiliary	Cat	3412	1999	ULSD	451	3620	0.43
508160	Hyak	Ferry	Washington	7	auxiliary	Cat	3412	1999	ULSD	451	2457	0.43
508160	Hyak	Ferry	Washington	8	auxiliary	Detroit	6V92	1999	ULSD	355	24	0.43
508160	Hyak	Ferry	Washington	9	boiler	Weil McLain		1999	ULSD	60	750	0.43
508160	Hyak	Ferry	Washington	10	boiler	Weil McLain		1999	ULSD	60	750	0.43
574608	ISLAND COMMUTI	Ferry	ISLAND CC	1	Propulsion			1994	ULSD	400	2000	0.34
574608	ISLAND COMMUTI	Ferry	ISLAND CC	2	Propulsion			1994	ULSD	400	2000	0.34
624022	Issaquah	Ferry	Washington	1	Propulsion	GE	7FDM12EF	2003	ULSD	2500	6836	0.34
624022	Issaquah	Ferry	Washington	2	Propulsion	GE	7FDM12EF	2003	ULSD	2500	6836	0.34
624022	Issaquah	Ferry	Washington	3	auxiliary	Detroit	Series 60 DI	2003	ULSD	400	6842	0.43
624022	Issaquah	Ferry	Washington	4	auxiliary	Detroit	Series 60 DI	2003	ULSD	400	3562	0.43
624022	Issaquah	Ferry	Washington	5	auxiliary	Detroit	Series 60 DI	2003	ULSD	400	3484	0.43
624022	Issaquah	Ferry	Washington	6	auxiliary	Detroit	Series 60 DI	2003	ULSD	168	24	0.43
624022	Issaquah	Ferry	Washington	7	boiler	Seattle Boile:	SDW50M	2003	ULSD	60	1700	0.43
624022	Issaquah	Ferry	Washington	8	boiler	Seattle Boile:	SDW50M	2003	ULSD	60	1700	0.43
508604	Kaleetan	Ferry	Washington	1	Propulsion	EMD	645 E5	1999	ULSD	2000	5471	0.34
508604	Kaleetan	Ferry	Washington	2	Propulsion	EMD	645 E5	1999	ULSD	2000	5471	0.34
508604	Kaleetan	Ferry	Washington	3	Propulsion	EMD	645 E5	1999	ULSD	2000	5471	0.34
508604	Kaleetan	Ferry	Washington	4	Propulsion	EMD	645 E5	1999	ULSD	2000	5471	0.34
508604	Kaleetan	Ferry	Washington	5	auxiliary	Detroit	Series 60 DI	2002	ULSD	400	5821	0.43
508604	Kaleetan	Ferry	Washington	6	auxiliary	Detroit	Series 60 DI	2002	ULSD	400	3045	0.43
508604	Kaleetan	Ferry	Washington	7	auxiliary	Detroit	Series 60 DI	2002	ULSD	400	3035	0.43
508604	Kaleetan	Ferry	Washington	8	auxiliary	Detroit	6V92	2002	ULSD	355	44	0.43
508604	Kaleetan	Ferry	Washington	9	boiler	Weil McLain	94	2002	ULSD	60	1500	0.43
508604	Kaleetan	Ferry	Washington	10	boiler	Weil McLain	94	2002	ULSD	60	1500	0.43
1229902	Kennewick	Ferry	Washington	1	Propulsion	EMD	710G7C-T2	2011	ULSD	3000	4060	0.34
1229902	Kennewick	Ferry	Washington	2	Propulsion	EMD	710G7C-T2	2011	ULSD	3000	4060	0.34
1229902	Kennewick	Ferry	Washington	3	auxiliary	Detroit	Series 60 DI	2011	ULSD			0.43
1229902	Kennewick	Ferry	Washington	4	auxiliary	Detroit	Series 60 DI	2011	ULSD			0.43
1229902	Kennewick	Ferry	Washington	5	boiler	Weil McLain	88	2011	ULSD	60		0.43
1229902	Kennewick	Ferry	Washington	6	boiler	Weil McLain	88	2011	ULSD	60		0.43
630023	Kitsap	Ferry	Washington	1	Propulsion	GE	7FDM12EF	2003	ULSD	2500	5882	0.34
630023	Kitsap	Ferry	Washington	2	Propulsion	GE	7FDM12EF	2003	ULSD	2500	5882	0.34
630023	Kitsap	Ferry	Washington	3	auxiliary	Detroit	Series 60 DI	2003	ULSD	400	6551	0.43
630023	Kitsap	Ferry	Washington	4	auxiliary	Detroit	Series 60 DI	2003	ULSD	400	1168	0.43
630023	Kitsap	Ferry	Washington	5	auxiliary	Detroit	Series 60 DI	2003	ULSD	400	5588	0.43
630023	Kitsap	Ferry	Washington	6	auxiliary	Detroit	Series 60 DI	2003	ULSD	168	24	0.43
630023	Kitsap	Ferry	Washington	7	boiler	Seattle Boile:	SDW50M	2003	ULSD	60	3000	0.43
630023	Kitsap	Ferry	Washington	8	boiler	Seattle Boile:	SDW50M	2003	ULSD	60	3000	0.43
627507	Kittitas	Ferry	Washington	1	Propulsion	GE	7FDM12EF	2003	ULSD	2500	4772	0.34
627507	Kittitas	Ferry	Washington	2	Propulsion	GE	7FDM12EF	2003	ULSD	2500	4772	0.34
627507	Kittitas	Ferry	Washington	3	auxiliary	Detroit	Series 60 DI	2003	ULSD	400	6587	0.43
627507	Kittitas	Ferry	Washington	4	auxiliary	Detroit	Series 60 DI	2003	ULSD	400	3391	0.43
627507	Kittitas	Ferry	Washington	5	auxiliary	Detroit	Series 60 DI	2003	ULSD	400	3142	0.43

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual	
				ID User	Engine Type						Hours	Load
627507	Kittitas	Ferry	Washington		6 auxiliary	Detroit	Series 6V71	2003	ULSD	168	36	0.43
627507	Kittitas	Ferry	Washington		7 boiler	Seattle Boile:	SDW50M	2003	ULSD	60	1500	0.43
627507	Kittitas	Ferry	Washington		8 boiler	Seattle Boile:	SDW50M	2003	ULSD	60	1500	0.43
277872	Klahowya	Ferry	Washington		1 Propulsion	EMD	645 7B	1995	ULSD	1250	5739	0.34
277872	Klahowya	Ferry	Washington		2 Propulsion	EMD	645 7B	1995	ULSD	1250	5739	0.34
277872	Klahowya	Ferry	Washington		3 auxiliary	Cummins	NTA 855	1995	ULSD	325	61	0.43
277872	Klahowya	Ferry	Washington		4 auxiliary	Cummins	NTA 855	1995	ULSD	325	31	0.43
277872	Klahowya	Ferry	Washington		5 boiler	Weil McLain		1995	ULSD	60	0	0.43
PSFML	MARY L	Ferry	HORLUCK		1 Propulsion			1994	ULSD	400	4000	0.34
678705	MCNEIL	Ferry	WASHING'		1 Propulsion	Detroit	8V71	1994	ULSD	300	2900	0.34
678705	MCNEIL	Ferry	WASHING'		2 Propulsion	Detroit	8V71	1994	ULSD	300	2900	0.34
678705	MCNEIL	Ferry	WASHING'		3 auxiliary	Lugger		1985	ULSD	16	2900	0.43
510289	NEIL HENLY	Ferry	MCNEIL IS		1 Propulsion	Cat	D343	1994	ULSD	335	2600	0.34
510289	NEIL HENLY	Ferry	MCNEIL IS		2 Propulsion	Cat	D343	1994	ULSD	335	2600	0.34
510289	NEIL HENLY	Ferry	MCNEIL IS		3 auxiliary	Kato		1985	ULSD	27	2600	0.43
510289	NEIL HENLY	Ferry	MCNEIL IS		4 auxiliary	Yanmar		1985	ULSD	30	2600	0.43
1061310	Puyallup	Ferry	Washington		1 Propulsion	EMD	710 G7B	1999	ULSD	3300	6717	0.34
1061310	Puyallup	Ferry	Washington		2 Propulsion	EMD	710 G7B	1999	ULSD	3300	6717	0.34
1061310	Puyallup	Ferry	Washington		3 Propulsion	EMD	710 G7B	1999	ULSD	3300	6717	0.34
1061310	Puyallup	Ferry	Washington		4 Propulsion	EMD	710 G7B	1999	ULSD	3300	6717	0.34
1061310	Puyallup	Ferry	Washington		5 auxiliary	Cat	3412	1999	ULSD	719	1691	0.43
1061310	Puyallup	Ferry	Washington		6 auxiliary	Cat	3412	1999	ULSD	831	202	0.43
1061310	Puyallup	Ferry	Washington		7 boiler	Weil McLain	888	1999	ULSD	60	600	0.43
1061310	Puyallup	Ferry	Washington		8 boiler	Weil McLain	888	1999	ULSD	60	600	0.43
PSFRH	Red Head	Ferry	Puget Sound		1 Propulsion			1994	ULSD	900	800	0.34
251646	Rhododendron	Ferry	Washington		3 auxiliary	Cummins	6CTA8.3-G	1990	ULSD	277	5088	0.43
251646	Rhododendron	Ferry	Washington		4 auxiliary	Cummins	6CTA8.3-G	1990	ULSD	277	847	0.43
251646	Rhododendron	Ferry	Washington		5 auxiliary	Cummins	6BT5.9	1990	ULSD	166	25	0.43
251646	Rhododendron	Ferry	Washington		6 boiler	Weil McLain	H1088WS	1990	ULSD	60	2500	0.43
251646	Rhododendron	Ferry	Washington		1 Propulsion	Wartsilla	624 TS	1990	ULSD	1086	6218	0.34
251646	Rhododendron	Ferry	Washington		2 Propulsion	Wartsilla	624 TS	1990	ULSD	1086	6218	0.34
1229903	Salish	Ferry	Washington		1 Propulsion	EMD	710G7C-T2	2007	ULSD	3000	2707	0.34
1229903	Salish	Ferry	Washington		2 Propulsion	EMD	710G7C-T2	2007	ULSD	3000	2707	0.34
1229903	Salish	Ferry	Washington		3 auxiliary	Detroit	Series 60 DI	2006	ULSD			0.43
1229903	Salish	Ferry	Washington		4 auxiliary	Detroit	Series 60 DI	2006	ULSD			0.43
1229903	Salish	Ferry	Washington		5 boiler	Weil McLain	88	2006	ULSD	60		0.43
1229903	Salish	Ferry	Washington		6 boiler	Weil McLain	88	2006	ULSD	60		0.43
662478	Sealth	Ferry	Washington		1 Propulsion	GE	7FDM12EF	2004	ULSD	2500	5438	0.34
662478	Sealth	Ferry	Washington		2 Propulsion	GE	7FDM12EF	2004	ULSD	2500	5438	0.34
662478	Sealth	Ferry	Washington		3 auxiliary	Detroit	Series 60 DI	2004	ULSD	400	5628	0.43
662478	Sealth	Ferry	Washington		4 auxiliary	Detroit	Series 60 DI	2004	ULSD	400	796	0.43
662478	Sealth	Ferry	Washington		5 auxiliary	Detroit	Series 60 DI	2004	ULSD	400	4821	0.43
662478	Sealth	Ferry	Washington		6 auxiliary	Detroit	Series 6V71	2004	ULSD	168	24	0.43
662478	Sealth	Ferry	Washington		7 boiler	Seattle Boile:	SDW50M	2004	ULSD	60	1200	0.43
662478	Sealth	Ferry	Washington		8 boiler	Seattle Boile:	SDW50M	2004	ULSD	60	1200	0.43
544785	Spokane	Ferry	Washington		1 Propulsion	EMD	645 F7B	1972	ULSD	2875	6311	0.34
544785	Spokane	Ferry	Washington		2 Propulsion	EMD	645 F7B	1972	ULSD	2875	6311	0.34
544785	Spokane	Ferry	Washington		3 Propulsion	EMD	645 F7B	1972	ULSD	2875	6311	0.34
544785	Spokane	Ferry	Washington		4 Propulsion	EMD	645 F7B	1972	ULSD	2875	6311	0.34
544785	Spokane	Ferry	Washington		5 auxiliary	Detroit	Series 60 DI	2002	ULSD	400	6393	0.43
544785	Spokane	Ferry	Washington		6 auxiliary	Cummins	KTA38	2002	ULSD	1210	3427	0.43
544785	Spokane	Ferry	Washington		7 auxiliary	Cummins	KTA38	2002	ULSD	1210	3087	0.43
544785	Spokane	Ferry	Washington		8 auxiliary	Detroit	Series 60 DI	2002	ULSD	400	24	0.43
544785	Spokane	Ferry	Washington		9 boiler	Weil McLain	PL-1194S/F	2002	ULSD	60	3000	0.43
544785	Spokane	Ferry	Washington		10 boiler	Weil McLain	PL-1194S/F	2002	ULSD	60	3000	0.43
PSFS	STEILICOOM	Ferry	WASHING'		1 Propulsion	Cummins	6 Cyl.	1983	ULSD	250	500	0.34
PSFS	STEILICOOM	Ferry	WASHING'		2 auxiliary			1985	ULSD	20	500	0.43
1052576	Tacoma	Ferry	Washington		1 Propulsion	EMD	710 G7B	1997	ULSD	3300	5345	0.34
1052576	Tacoma	Ferry	Washington		2 Propulsion	EMD	710 G7B	1997	ULSD	3300	5345	0.34
1052576	Tacoma	Ferry	Washington		3 Propulsion	EMD	710 G7B	1997	ULSD	3300	5345	0.34
1052576	Tacoma	Ferry	Washington		4 Propulsion	EMD	710 G7B	1997	ULSD	3300	5345	0.34
1052576	Tacoma	Ferry	Washington		5 auxiliary	Cat	3412	1997	ULSD	719	1314	0.43
1052576	Tacoma	Ferry	Washington		6 auxiliary	Cat	3412	1997	ULSD	831	46	0.43
1052576	Tacoma	Ferry	Washington		7 boiler	Weil McLain	888	1997	ULSD	60	300	0.43
1052576	Tacoma	Ferry	Washington		8 boiler	Weil McLain	888	1997	ULSD	60	300	0.43
278437	Tillikum	Ferry	Washington		1 Propulsion	EMD	645 7B	1959	ULSD	1250	5707	0.34
278437	Tillikum	Ferry	Washington		2 Propulsion	EMD	645 7B	1959	ULSD	1250	5707	0.34

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Engine Fuel	Engine HP	Annual	
				ID User	Engine Type						Hours	Load
278437	Tillikum	Ferry	Washington	3	auxiliary	Cummins	NTA 855	1959	ULSD	425	249	0.43
278437	Tillikum	Ferry	Washington	4	auxiliary	Cummins	NTA 855	1959	ULSD	325	33	0.43
278437	Tillikum	Ferry	Washington	5	boiler	Weil McLain	H1088WS	1959	ULSD	60	100	0.43
8520757	Victoria Clipper	Ferry	Victoria Clip	1	Propulsion	MTU	16V396T74I	1994	ULSD	2500	1000	0.34
8520757	Victoria Clipper	Ferry	Victoria Clip	2	Propulsion	MTU	16V396T74I	1994	ULSD	2500	1000	0.34
965831	Victoria Clipper III	Ferry	Victoria Clip	1	Propulsion	Detroit	16V149TI	1989	ULSD	1600	1200	0.34
965831	Victoria Clipper III	Ferry	Victoria Clip	2	Propulsion	Detroit	16V149TI	1989	ULSD	1600	1200	0.34
991479	Victoria Clipper IV	Ferry	Victoria Clip	1	Propulsion	MTU	16V396T74I	1993	ULSD	4400	2000	0.34
991479	Victoria Clipper IV	Ferry	Victoria Clip	2	Propulsion	MTU	16V396T74I	1993	ULSD	4000	2000	0.34
546382	Walla Walla	Ferry	Washington	1	Propulsion	EMD	645 F7B	2005	ULSD	2875	5988	0.34
546382	Walla Walla	Ferry	Washington	2	Propulsion	EMD	645 F7B	2005	ULSD	2875	5988	0.34
546382	Walla Walla	Ferry	Washington	3	Propulsion	EMD	645 F7B	2005	ULSD	2875	5988	0.34
546382	Walla Walla	Ferry	Washington	4	Propulsion	EMD	645 F7B	2005	ULSD	2875	5988	0.34
546382	Walla Walla	Ferry	Washington	5	auxiliary	Detroit	Series 60 DI	2002	ULSD	400	3103	0.43
546382	Walla Walla	Ferry	Washington	6	auxiliary	Cummins	KTA38	2002	ULSD	1210	529	0.43
546382	Walla Walla	Ferry	Washington	7	auxiliary	Cummins	KTA38	2002	ULSD	1210	2731	0.43
546382	Walla Walla	Ferry	Washington	8	auxiliary	Detroit	Series 60 DI	2002	ULSD	400	24	0.43
546382	Walla Walla	Ferry	Washington	9	boiler	Weil McLain	PL-1194S/F	2002	ULSD	60	1000	0.43
546382	Walla Walla	Ferry	Washington	10	boiler	Weil McLain	PL-1194S/F	2002	ULSD	60	1000	0.43
1061309	Wenatchee	Ferry	Washington	1	Propulsion	EMD	710 G7B	1998	ULSD	3300	6176	0.34
1061309	Wenatchee	Ferry	Washington	2	Propulsion	EMD	710 G7B	1998	ULSD	3300	6176	0.34
1061309	Wenatchee	Ferry	Washington	3	Propulsion	EMD	710 G7B	1998	ULSD	3300	6176	0.34
1061309	Wenatchee	Ferry	Washington	4	Propulsion	EMD	710 G7B	1998	ULSD	3300	6176	0.34
1061309	Wenatchee	Ferry	Washington	5	auxiliary	Cat	3412	1998	ULSD	719	1314	0.43
1061309	Wenatchee	Ferry	Washington	6	auxiliary	Cat	3412	1998	ULSD	831	131	0.43
1061309	Wenatchee	Ferry	Washington	7	boiler			1998	ULSD	60	300	0.43
1061309	Wenatchee	Ferry	Washington	8	boiler			1998	ULSD	60	300	0.43
288249	WHATCOM CHIEF	Ferry	WHATCOM	1	Propulsion	Cat		2004	ULSD	360	6000	0.34
288249	WHATCOM CHIEF	Ferry	WHATCOM	2	Propulsion	Cat		2004	ULSD	360	6000	0.34
288249	WHATCOM CHIEF	Ferry	WHATCOM	3	auxiliary			2004	ULSD	20	3250	0.43
288249	WHATCOM CHIEF	Ferry	WHATCOM	4	auxiliary			2004	ULSD	13	3250	0.43
511823	Yakima	Ferry	Washington	1	Propulsion	EMD	645 E5	2000	ULSD	2000	4788	0.34
511823	Yakima	Ferry	Washington	2	Propulsion	EMD	645 E5	2000	ULSD	2000	4788	0.34
511823	Yakima	Ferry	Washington	3	Propulsion	EMD	645 E5	2000	ULSD	2000	4788	0.34
511823	Yakima	Ferry	Washington	4	Propulsion	EMD	645 E5	2000	ULSD	2000	4788	0.34
511823	Yakima	Ferry	Washington	5	auxiliary	Detroit	Series 60 DI	2004	ULSD	400	3954	0.43
511823	Yakima	Ferry	Washington	6	auxiliary	Detroit	Series 60 DI	2004	ULSD	400	2272	0.43
511823	Yakima	Ferry	Washington	7	auxiliary	Detroit	Series 60 DI	2004	ULSD	400	3099	0.43
511823	Yakima	Ferry	Washington	8	auxiliary	Detroit	Series 6V71	2004	ULSD	355	23	0.43
511823	Yakima	Ferry	Washington	9	boiler	Weil McLain	94	2004	ULSD	60	1000	0.43
511823	Yakima	Ferry	Washington	10	boiler	Weil McLain	94	2004	ULSD	60	1000	0.43
WMEC 618	Active	Government	USCG	1	Propulsion	Alco	251CE	1988	ULSD	2500	40	0.51
WMEC 618	Active	Government	USCG	2	Propulsion	Alco	251CE	1988	ULSD	2500	40	0.51
PSGAD	Adelie	Government	USCG	1	Propulsion	MTU	8V396TE94	1988	ULSD	1500	2000	0.51
PSGAD	Adelie	Government	USCG	2	Propulsion	MTU	8V396TE94	1988	ULSD	1500	2000	0.51
231095	Alki	Government	Seattle Fire I	1	Propulsion			1940	ULSD	500	143	0.51
231095	Alki	Government	Seattle Fire I	2	Propulsion			1940	ULSD	500	143	0.51
231095	Alki	Government	Seattle Fire I	3	auxiliary			1940	ULSD	160	7	0.43
231095	Alki	Government	Seattle Fire I	4	auxiliary			1940	ULSD	160	7	0.43
231095	Alki	Government	Seattle Fire I	5	auxiliary			1940	ULSD	160	10	0.43
231095	Alki	Government	Seattle Fire I	6	auxiliary			1940	ULSD	160	15	0.43
231095	Alki	Government	Seattle Fire I	7	auxiliary			1940	ULSD	160	57	0.43
231095	Alki	Government	Seattle Fire I	8	auxiliary			1940	ULSD	160	57	0.43
231095	Alki	Government	Seattle Fire I	9	auxiliary			1940	ULSD	160	193	0.43
231095	Alki	Government	Seattle Fire I	10	auxiliary			1940	ULSD	160	8	0.43
231095	Alki	Government	Seattle Fire I	11	auxiliary			1940	ULSD	160	45	0.43
231095	Alki	Government	Seattle Fire I	12	auxiliary			1940	ULSD	160	45	0.43
231095	Alki	Government	Seattle Fire I	13	auxiliary			1940	ULSD	160	45	0.43
231095	Alki	Government	Seattle Fire I	14	auxiliary			1940	ULSD	160	45	0.43
231095	Alki	Government	Seattle Fire I	15	auxiliary			1940	ULSD	160	45	0.43
231095	Alki	Government	Seattle Fire I	16	auxiliary			1940	ULSD	160	45	0.43
WPB 87301	Barracuda	Government	USCG	1	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WPB 87301	Barracuda	Government	USCG	2	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WPB 87354	BlueShark	Government	USCG	1	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WPB 87354	BlueShark	Government	USCG	2	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
674678	Chief Seattle	Government	Seattle Fire I	1	Propulsion			1984	ULSD	1000	339	0.51
674678	Chief Seattle	Government	Seattle Fire I	2	Propulsion			1984	ULSD	1000	339	0.51

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Engine Fuel	Engine HP	Annual	
				ID User	Engine Type						Hours	Load
674678	Chief Seattle	Government	Seattle Fire I	3	Propulsion			1984	ULSD	1000	339	0.51
674678	Chief Seattle	Government	Seattle Fire I	4	auxiliary			1984	ULSD	140	255	0.43
674678	Chief Seattle	Government	Seattle Fire I	5	auxiliary			1984	ULSD	140	226	0.43
CG044937	Cuttyhunk	Government	USCG	1	Propulsion	Paxman	V16	1988	ULSD	2880	1200	0.51
CG044937	Cuttyhunk	Government	USCG	2	Propulsion	Paxman	V16	1988	ULSD	2880	1200	0.51
7333195	David Starr Jordan	Government	NOAA	1	Propulsion	White Superior		1984	ULSD	534	50	0.51
7333195	David Starr Jordan	Government	NOAA	2	Propulsion	White Superior		1966	ULSD	534	50	0.51
PSGDB	DAWN BREAKER	Government	STATE OF	1	Propulsion			2004	ULSD	175	200	0.51
PSGDB	DAWN BREAKER	Government	STATE OF	2	Propulsion			2004	ULSD	175	200	0.51
PSGDM1	DOC MEDIC 1	Government	WASHINGTON	1	Propulsion	Chevy		1988	Gasoline	300	150	0.51
PSGDP2	DOC PATROL 2	Government	WASHINGTON	1	Propulsion	Mercruiser		1988	Gasoline	300	250	0.51
PSGDP3	DOC PATROL 3	Government	WASHINGTON	1	Propulsion	Mercruiser		1988	Gasoline	300	250	0.51
PSGDP5	DOC PATROL 5	Government	WASHINGTON	1	Propulsion	Chevy		1988	Gasoline	300	250	0.51
F0418	Engine I	Government	Seattle Fire I	1	Propulsion			2006	ULSD	715	122	0.51
F0418	Engine I	Government	Seattle Fire I	2	Propulsion			2006	ULSD	715	123	0.51
F0418	Engine I	Government	Seattle Fire I	3	auxiliary			2006	ULSD	19	39	0.43
F0418	Engine I	Government	Seattle Fire I	4	auxiliary			2006	ULSD	19	39	0.43
WAGB 20	Healy	Government	USCG	1	Propulsion	Sulzer	Sulzer 12ZA	1988	ULSD	1500	1800	0.51
WAGB 20	Healy	Government	USCG	2	Propulsion	Sulzer	Sulzer 12ZA	1988	ULSD	1500	1800	0.51
CG060360	Henry Blake	Government	USCG	1	Propulsion	CAT		1988	ULSD	2880	1200	0.51
CG060360	Henry Blake	Government	USCG	2	Propulsion	CAT		1988	ULSD	2880	1200	0.51
CG830693	John H. Cobb	Government	NOAA	1	Propulsion	FM		1988	ULSD	325	50	0.51
PSGK	KIMBERLY	Government	WASHINGTON	1	Propulsion	GM	V12-71	1988	ULSD	400	2700	0.51
PSGK	KIMBERLY	Government	WASHINGTON	2	Propulsion	GM	V12-71	1988	ULSD	400	2700	0.51
PSGK	KIMBERLY	Government	WASHINGTON	3	auxiliary	GM	361S	1978	ULSD	43	2700	0.43
F0419	Leschi	Government	Seattle Fire I	1	Propulsion			2007	ULSD	1555	193	0.51
F0419	Leschi	Government	Seattle Fire I	2	Propulsion			2007	ULSD	1555	193	0.51
F0419	Leschi	Government	Seattle Fire I	3	auxiliary			2007	ULSD	1555	22	0.43
F0419	Leschi	Government	Seattle Fire I	4	auxiliary			2007	ULSD	1555	21	0.43
F0419	Leschi	Government	Seattle Fire I	5	auxiliary			2007	ULSD	174	115	0.43
F0419	Leschi	Government	Seattle Fire I	6	auxiliary			2007	ULSD	174	127	0.43
CG325332	McArthur II	Government	NOAA	1	Propulsion	GE		1985	ULSD	800	50	0.51
CG325332	McArthur II	Government	NOAA	2	Propulsion	GE		1985	ULSD	800	50	0.51
CG044855	Mellon	Government	USCG	1	Propulsion	F-M	38TD8	1988	ULSD	3500	40	0.51
CG044855	Mellon	Government	USCG	2	Propulsion	F-M	38TD8	1988	ULSD	3500	40	0.51
CG004637	Midgett	Government	USCG	1	Propulsion	F-M	38TD8	1988	ULSD	3500	40	0.51
CG004637	Midgett	Government	USCG	2	Propulsion	F-M	38TD8	1988	ULSD	3500	40	0.51
508932	Miller Freeman	Government	NOAA	1	Propulsion	GM		1988	ULSD	2200	50	0.51
PSGM	MILLEWA	Government	WASHINGTON	1	Propulsion	Detroit	V12	1988	ULSD	400	2200	0.51
PSGM	MILLEWA	Government	WASHINGTON	2	Propulsion	Detroit	V12	1988	ULSD	400	2200	0.51
PSGM	MILLEWA	Government	WASHINGTON	3	auxiliary	GM		1978	ULSD	40	2200	0.43
PSGM	MILLEWA	Government	WASHINGTON	4	auxiliary	GM		1978	ULSD	40	2200	0.43
PSGMR	Mount Rainier	Government	NOAA	1	Propulsion	EMD		1968	ULSD	1200	50	0.51
PSGMR	Mount Rainier	Government	NOAA	2	Propulsion	EMD		1968	ULSD	1200	50	0.51
CG608131	Osprey	Government	USCG	1	Propulsion	MTU	8V396TE94	1988	ULSD	1600	1800	0.51
CG608131	Osprey	Government	USCG	2	Propulsion	MTU	8V396TE94	1988	ULSD	1600	1800	0.51
SPP1	Patrol 1	Government	Seattle Police	1	Propulsion			1988	ULSD	375	1083	0.51
SPP1	Patrol 1	Government	Seattle Police	2	Propulsion			1988	ULSD	375	1083	0.51
SPP15	Patrol 15	Government	Seattle Police	1	Propulsion			1988	Gasoline	300	192	0.51
SPP16	Patrol 16	Government	Seattle Police	1	Propulsion			2009	Gasoline	80	50	0.51
SPP2	Patrol 2	Government	Seattle Police	1	Propulsion			2000	ULSD	587	100	0.51
SPP2	Patrol 2	Government	Seattle Police	2	Propulsion			2000	ULSD	587	100	0.51
SPP3	Patrol 3	Government	Seattle Police	1	Propulsion			2009	Gasoline	225	729	0.51
SPP3	Patrol 3	Government	Seattle Police	2	Propulsion			2009	Gasoline	225	729	0.51
SPP4	Patrol 4	Government	Seattle Police	1	Propulsion			1988	ULSD	660	1400	0.51
SPP4	Patrol 4	Government	Seattle Police	2	Propulsion			1988	ULSD	660	1400	0.51
SPP4	Patrol 4	Government	Seattle Police	3	auxiliary			1978	ULSD	425	1400	0.43
SPP5	Patrol 5	Government	Seattle Police	1	Propulsion			2009	Gasoline	250	192	0.51
SPP6	Patrol 6	Government	Seattle Police	1	Propulsion			2000	Gasoline	250	50	0.51
SPP6	Patrol 6	Government	Seattle Police	2	Propulsion			2000	Gasoline	250	50	0.51
SPP6	Patrol 6	Government	Seattle Police	3	Propulsion			2000	Gasoline	250	50	0.51
SPP7	Patrol 7	Government	Seattle Police	1	Propulsion			2000	Gasoline	140	636	0.51
SPP8	Patrol 8	Government	Seattle Police	1	Propulsion			2000	Gasoline	140	286	0.51
SPPX1	Patrol X1	Government	Seattle Police	1	Propulsion			1988	Gasoline	10	40	0.51
605216	PEGGY N	Government	WASHINGTON	1	Propulsion	Detroit	8V71	1988	ULSD	700	2500	0.51
605216	PEGGY N	Government	WASHINGTON	2	Propulsion	Detroit	8V71	1988	ULSD	700	2500	0.51
605216	PEGGY N	Government	WASHINGTON	3	Propulsion	Detroit	8V71	1988	ULSD	700	2500	0.51

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Engine Fuel	Engine HP	Annual	
				ID User	Engine Type						Hours	Load
605216	PEGGY N	Government	WASHINGTON	4	auxiliary	Detroit	271	1978	ULSD	40	2500	0.43
605216	PEGGY N	Government	WASHINGTON	5	auxiliary	Detroit	271	1978	ULSD	40	2500	0.43
WAGB 11	Polar Sea	Government	USCG	1	Propulsion	ALCO	F-M - ALCC	1988	ULSD	1500	1800	0.51
WAGB 11	Polar Sea	Government	USCG	2	Propulsion	ALCO	F-M - ALCC	1988	ULSD	1500	1800	0.51
WAGB 10	Polar Star	Government	USCG	1	Propulsion	ALCO	F-M - ALCC	1988	ULSD	1500	1800	0.51
WAGB 10	Polar Star	Government	USCG	2	Propulsion	ALCO	F-M - ALCC	1988	ULSD	1500	1800	0.51
WPB 87368	Sea Devil	Government	USCG	1	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WPB 87368	Sea Devil	Government	USCG	2	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WPB 87374	Sea Fox	Government	USCG	1	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WPB 87374	Sea Fox	Government	USCG	2	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
PSGSL	Sea Lion	Government	USCG	1	Propulsion	MTU	8V396TE94	1988	ULSD	1500	1800	0.51
PSGSL	Sea Lion	Government	USCG	2	Propulsion	MTU	8V396TE94	1988	ULSD	1500	1800	0.51
WPB 87358	Swordfish	Government	USCG	1	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WPB 87358	Swordfish	Government	USCG	2	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WPB 87366	Terrapin	Government	USCG	1	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WPB 87366	Terrapin	Government	USCG	2	Propulsion	MTU	MTU 8V396	1988	ULSD	1500	1800	0.51
WADNRE1	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE1	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE1	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE1	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE1	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE1	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE1	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE1	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE1	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE2	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE3	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE4	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE5	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE6	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE7	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE8	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
WADNRE9	WA DNR Enforceme	Government	STATE OF	1	Propulsion		4-Stroke	2001	Gasolin	250	200	0.51
PSGW	Wahoo	Government	USCG	1	Propulsion	MTU	8V396TE94	1988	ULSD	1500	1800	0.51
526883	Alison S	Harbor Tug	Island Tug &	1	Propulsion	John Deere	8L	1999	ULSD	300	1200	0.31
526883	Alison S	Harbor Tug	Island Tug &	2	Propulsion	John Deere	8L	1999	ULSD	300	1200	0.31
526883	Alison S	Harbor Tug	Island Tug &	3	Propulsion	John Deere	8L	1999	ULSD	300	1200	0.31
526883	Alison S	Harbor Tug	Island Tug &	4	auxiliary	GM	671	1999	ULSD	100	600	0.43
526883	Alison S	Harbor Tug	Island Tug &	5	auxiliary	GM	671	1999	ULSD	100	600	0.43
502662	Alyssa Ann	Harbor Tug	Harley Marir	1	Propulsion	EMD		1978	ULSD	1050	1968	0.31
502662	Alyssa Ann	Harbor Tug	Harley Marir	2	Propulsion	EMD		1978	ULSD	1050	1977	0.31
502662	Alyssa Ann	Harbor Tug	Harley Marir	3	auxiliary			1978	ULSD	95	4009	0.43
502662	Alyssa Ann	Harbor Tug	Harley Marir	4	auxiliary			1978	ULSD	95	4283	0.43
WDE6211	Bandit	Harbor Tug	Campbell M.	1	Propulsion				ULSD	470	200	0.31
WDF2810	Blarney	Harbor Tug	Campbell M.	1	Propulsion	Mitsubishi		1984	ULSD	2150	750	0.31
WDF2810	Blarney	Harbor Tug	Campbell M.	2	auxiliary	Caterpillar	3304		ULSD	80	350	0.43
WDF2810	Blarney	Harbor Tug	Campbell M.	3	auxiliary	Caterpillar	3304		ULSD	80	350	0.43
WDF2810	Blarney	Harbor Tug	Campbell M.	4	auxiliary	Caterpillar	3304		ULSD	201	50	0.43
PSHTB	Blueberry	Harbor Tug	Fremont Tu	1	Propulsion	GM	671	1977	ULSD	165	500	0.31
PSHTB	Blueberry	Harbor Tug	Fremont Tu	2	Propulsion	GM	671	1977	ULSD	165	500	0.31
292934	Brian S	Harbor Tug	Harley Marir	1	Propulsion	EMD	12-645-E2		ULSD		639	0.31
292934	Brian S	Harbor Tug	Harley Marir	2	Propulsion	EMD	12-645-E2		ULSD		644	0.31
292934	Brian S	Harbor Tug	Harley Marir	3	auxiliary	Detroit	Apr-71		ULSD		1131	0.43
292934	Brian S	Harbor Tug	Harley Marir	4	auxiliary	Detroit	Apr-71		ULSD		755	0.43
CG058217	Camano	Harbor Tug	Dunlap Tow	1	Propulsion	CAT	3306DITA	1984	ULSD	220	832	0.31
583332	Catherine Quigg	Harbor Tug	Harley Marir	1	Propulsion	Detroit	12-149	1977	ULSD	675	272	0.31
583332	Catherine Quigg	Harbor Tug	Harley Marir	2	Propulsion	Detroit	12-149	1977	ULSD	675	246	0.31
583332	Catherine Quigg	Harbor Tug	Harley Marir	3	auxiliary	Detroit	Apr-71	1977	ULSD	50	659	0.43
583332	Catherine Quigg	Harbor Tug	Harley Marir	4	auxiliary	Detroit	Jun-71	1977	ULSD	50	987	0.43
529534	Cedar King	Harbor Tug	Dunlap Tow	1	Propulsion	CAT	343	1976	ULSD	340	2150	0.31
7514236	CF Campbell	Harbor Tug	Harley Marir	1	Propulsion	Caterpillar	3516B	1975	ULSD	2200	3613	0.31
7514236	CF Campbell	Harbor Tug	Harley Marir	2	Propulsion	Caterpillar	3516B	1975	ULSD	2200	3586	0.31
7514236	CF Campbell	Harbor Tug	Harley Marir	3	auxiliary	GM	Jun-71	1975	ULSD	95	3729	0.43
7514236	CF Campbell	Harbor Tug	Harley Marir	4	auxiliary	GM	Jun-71	1975	ULSD	95	5041	0.43
263365	Dixie	Harbor Tug	Fremont Tu	1	Propulsion	Cummins		1951	ULSD	500	500	0.31
1187285	Driftwood	Harbor Tug	Campbell M.	1	Propulsion			1945	ULSD	450	150	0.31
1187285	Driftwood	Harbor Tug	Campbell M.	2	auxiliary			1945	ULSD	150	150	0.43

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual	
				ID User	Type						Hours	Load
588535	Eagle	Harbor Tug	Harley Marir	1	Propulsion	Caterpillar	3512B	1978	ULSD	1500	2282	0.31
588535	Eagle	Harbor Tug	Harley Marir	2	Propulsion	Caterpillar	3512B	1978	ULSD	1500	2282	0.31
588535	Eagle	Harbor Tug	Harley Marir	3	auxiliary	Detroit	Jun-71	1978	ULSD	95	3897	0.43
588535	Eagle	Harbor Tug	Harley Marir	4	auxiliary	Detroit	Jun-71	1978	ULSD	95	4107	0.43
521907	Ernest Campbell	Harbor Tug	Harley Marir	1	Propulsion	EMD	12-645-E2	1969	ULSD	1500	1378	0.31
521907	Ernest Campbell	Harbor Tug	Harley Marir	2	Propulsion	EMD	12-645-E2	1969	ULSD	1500	1367	0.31
521907	Ernest Campbell	Harbor Tug	Harley Marir	3	auxiliary	Detroit	Jun-71	1969	ULSD	95	1702	0.43
521907	Ernest Campbell	Harbor Tug	Harley Marir	4	auxiliary	Detroit	Jun-71	1969	ULSD	95	1285	0.43
PSHTF	Fidalge	Harbor Tug	Dunlap Tow	1	Propulsion	CAT	3406	1998	ULSD	365	4368	0.31
PSHTF	Fidalge	Harbor Tug	Dunlap Tow	2	Propulsion	Cat	3406	1998	ULSD	365	4368	0.31
636922	Flyer	Harbor Tug	Western Tov	1	Propulsion	Cummins	1150	1981	ULSD	400	1200	0.31
WN8626RF	General Lee	Harbor Tug	Fremont Tu	1	Propulsion	Detroit	671	1995	ULSD	165	500	0.31
WN8626RF	General Lee	Harbor Tug	Fremont Tu	2	Propulsion	Detroit	671	1995	ULSD	165	500	0.31
639797	Gladys M	Harbor Tug	Manson Cor	1	Propulsion	Caterpillar	3508 MARL	2004	ULSD	1000	3893	0.31
639797	Gladys M	Harbor Tug	Manson Cor	2	Propulsion	Caterpillar	3508 MARL	2004	ULSD	1000	3893	0.31
639797	Gladys M	Harbor Tug	Manson Cor	3	auxiliary	Toyota	M-33C.2	2004	ULSD	48	2592	0.43
639797	Gladys M	Harbor Tug	Manson Cor	4	auxiliary	Toyota	M-33C.2	2004	ULSD	48	2612	0.43
639797	Gladys M	Harbor Tug	Manson Cor	5	auxiliary	Caterpillar	3054 CIPU	2002	ULSD	120	243	0.43
512190	Grace	Harbor Tug	Fremont Tu	1	Propulsion	Caterpillar		1968	ULSD	365	500	0.31
507652	Grizzly	Harbor Tug	Harley Marir	1	Propulsion	Caterpillar	D398		ULSD		700	0.31
507652	Grizzly	Harbor Tug	Harley Marir	2	Propulsion	Caterpillar	D398		ULSD		700	0.31
507652	Grizzly	Harbor Tug	Harley Marir	3	auxiliary	John Deere	4045TF280		ULSD		183	0.43
507652	Grizzly	Harbor Tug	Harley Marir	4	auxiliary	John Deere	4045TF280		ULSD		186	0.43
564341	Harry M	Harbor Tug	Manson Cor	1	Propulsion	Caterpillar	3508 MAR	2001	ULSD	1000	2518	0.31
564341	Harry M	Harbor Tug	Manson Cor	2	Propulsion	Caterpillar	3508 MAR	2001	ULSD	1000	2479	0.31
564341	Harry M	Harbor Tug	Manson Cor	3	auxiliary	Detroit Dies	6-71 (1063-7	1975	ULSD	180	532	0.43
564341	Harry M	Harbor Tug	Manson Cor	4	auxiliary	Detroit Dies	6-71 (1063-7	1975	ULSD	180	7685	0.43
249861	Helen S	Harbor Tug	Island Tug &	1	Propulsion	CAT	D348	1945	ULSD	800	0	0.31
249861	Helen S	Harbor Tug	Island Tug &	2	auxiliary	GM	671	1945	ULSD	100	0	0.43
249861	Helen S	Harbor Tug	Island Tug &	3	auxiliary	GM	671	1945	ULSD	100	0	0.43
506094	Hornet	Harbor Tug	Western Tov	1	Propulsion	CAT	3406	2008	ULSD	365	1000	0.31
524599	Hunter D	Harbor Tug	Harley Marir	1	Propulsion	Caterpillar	3516A		ULSD		3823	0.31
524599	Hunter D	Harbor Tug	Harley Marir	2	Propulsion	Caterpillar	3516A		ULSD		3823	0.31
524599	Hunter D	Harbor Tug	Harley Marir	3	auxiliary	Detroit	Jun-71		ULSD		4213	0.43
524599	Hunter D	Harbor Tug	Harley Marir	4	auxiliary	Detroit	Jun-71		ULSD		4634	0.43
299737	Island Breeze	Harbor Tug	Island Tug &	1	Propulsion	Cummins		1999	ULSD	550	1200	0.31
299737	Island Breeze	Harbor Tug	Island Tug &	2	Propulsion	Cummins		1999	ULSD	550	1200	0.31
299737	Island Breeze	Harbor Tug	Island Tug &	3	auxiliary	GM	671	1999	ULSD	100	600	0.43
299737	Island Breeze	Harbor Tug	Island Tug &	4	auxiliary	GM	671	1999	ULSD	100	600	0.43
299614	Island Champion	Harbor Tug	Island Tug &	1	Propulsion	CAT	3606	1996	ULSD	2800	1200	0.31
299614	Island Champion	Harbor Tug	Island Tug &	2	auxiliary	GM	671	1996	ULSD	100	600	0.43
299614	Island Champion	Harbor Tug	Island Tug &	3	auxiliary	GM	671	1996	ULSD	100	600	0.43
290759	Island Chief	Harbor Tug	Island Tug &	1	Propulsion	CAT	398	1963	ULSD	900	1200	0.31
290759	Island Chief	Harbor Tug	Island Tug &	2	Propulsion	CAT	398	1963	ULSD	900	1200	0.31
290759	Island Chief	Harbor Tug	Island Tug &	3	auxiliary	GM	671	1963	ULSD	100	600	0.43
290759	Island Chief	Harbor Tug	Island Tug &	4	auxiliary	GM	671	1963	ULSD	100	600	0.43
648423	Island Eagle	Harbor Tug	Island Tug &	1	Propulsion	Detroit Dies	12V71	1982	ULSD	400	1200	0.31
648423	Island Eagle	Harbor Tug	Island Tug &	2	Propulsion	Detroit Dies	12V71	1982	ULSD	400	1200	0.31
648423	Island Eagle	Harbor Tug	Island Tug &	3	auxiliary	GM	671	1982	ULSD	100	600	0.43
648423	Island Eagle	Harbor Tug	Island Tug &	4	auxiliary	GM	671	1982	ULSD	100	600	0.43
501938	Island Mist	Harbor Tug	Island Tug &	1	Propulsion	Detroit Dies	12V71	1965	ULSD	400	1200	0.31
501938	Island Mist	Harbor Tug	Island Tug &	2	Propulsion	Detroit Dies	12V71	1965	ULSD	400	1200	0.31
501938	Island Mist	Harbor Tug	Island Tug &	3	Propulsion	Detroit Dies	12V71	1965	ULSD	400	1200	0.31
501938	Island Mist	Harbor Tug	Island Tug &	4	auxiliary	GM	671	1965	ULSD	100	600	0.43
501938	Island Mist	Harbor Tug	Island Tug &	5	auxiliary	GM	671	1965	ULSD	100	600	0.43
510653	Island Scout	Harbor Tug	Island Tug &	1	Propulsion	CAT	3512B	1999	ULSD	1500	1200	0.31
510653	Island Scout	Harbor Tug	Island Tug &	2	Propulsion	CAT	3512B	1999	ULSD	1500	1200	0.31
510653	Island Scout	Harbor Tug	Island Tug &	3	auxiliary	GM	671	1999	ULSD	100	600	0.43
510653	Island Scout	Harbor Tug	Island Tug &	4	auxiliary	GM	671	1999	ULSD	100	600	0.43
640554	Island Spirit	Harbor Tug	Island Tug &	1	Propulsion	CAT	3512B	1981	ULSD	1250	1200	0.31
640554	Island Spirit	Harbor Tug	Island Tug &	2	Propulsion	CAT	3512B	1981	ULSD	1250	1200	0.31
640554	Island Spirit	Harbor Tug	Island Tug &	3	auxiliary	GM	671	1981	ULSD	100	600	0.43
640554	Island Spirit	Harbor Tug	Island Tug &	4	auxiliary	GM	671	1981	ULSD	100	600	0.43
294666	Island Storm	Harbor Tug	Island Tug &	1	Propulsion	CAT	3412	1964	ULSD	600	1200	0.31
294666	Island Storm	Harbor Tug	Island Tug &	2	Propulsion	CAT	3412	1964	ULSD	600	1200	0.31
294666	Island Storm	Harbor Tug	Island Tug &	3	auxiliary	GM	671	1964	ULSD	100	600	0.43
294666	Island Storm	Harbor Tug	Island Tug &	4	auxiliary	GM	671	1964	ULSD	100	600	0.43

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual		
				ID User	Engine Type						Hours	Load	
537733	James T Quigg	Harbor Tug	Harley Marir	1	Propulsion	EMD	L12-645-E2		ULSD		2130	0.31	
537733	James T Quigg	Harbor Tug	Harley Marir	2	Propulsion	EMD	R12-645-E2		ULSD		2130	0.31	
537733	James T Quigg	Harbor Tug	Harley Marir	3	auxiliary	Detroit	Apr-71		ULSD		2954	0.43	
537733	James T Quigg	Harbor Tug	Harley Marir	4	auxiliary	Detroit	Jun-71		ULSD		5386	0.43	
PSHTJ	Jeep	Harbor Tug	Fremont Tuq	1	Propulsion	Ford		1999	ULSD	135	500	0.31	
527549	Lela Joy	Harbor Tug	Harley Marir	1	Propulsion	Cummins	QSKTA38-N		ULSD	1200	3521	0.31	
527549	Lela Joy	Harbor Tug	Harley Marir	2	Propulsion	Cummins	QSKTA38-N		ULSD	1200	3591	0.31	
527549	Lela Joy	Harbor Tug	Harley Marir	3	auxiliary	John Deere	4045TFM01		ULSD	95	4171	0.43	
527549	Lela Joy	Harbor Tug	Harley Marir	4	auxiliary	John Deere	4045TFM01		ULSD	95	4553	0.43	
507942	Lisa M	Harbor Tug	Manson Cor	1	Propulsion	Detroit Dies	8V71	1993	ULSD	318	434	0.31	
507942	Lisa M	Harbor Tug	Manson Cor	2	Propulsion	Detroit Dies	8V71	1993	ULSD	318	447	0.31	
507942	Lisa M	Harbor Tug	Manson Cor	3	Propulsion	Detroit Dies		471	1993	ULSD	140	0	0.31
571211	Olympic Scout	Harbor Tug	Harley Marir	1	Propulsion	Caterpillar	D-399		ULSD		2003	0.31	
571211	Olympic Scout	Harbor Tug	Harley Marir	2	Propulsion	Caterpillar	D-399		ULSD		2007	0.31	
571211	Olympic Scout	Harbor Tug	Harley Marir	3	auxiliary	John Deere	4045TFM75		ULSD		4230	0.43	
571211	Olympic Scout	Harbor Tug	Harley Marir	4	auxiliary	John Deere	4045TFM75		ULSD		4531	0.43	
522088	Pacific	Harbor Tug	Western Tov	1	Propulsion	CAT		3508	1999	ULSD	775	3000	0.31
522088	Pacific	Harbor Tug	Western Tov	2	Propulsion	CAT		3508	1999	ULSD	775	3000	0.31
522088	Pacific	Harbor Tug	Western Tov	3	auxiliary	CAT		2000	ULSD	120	1750	0.43	
522088	Pacific	Harbor Tug	Western Tov	4	auxiliary	CAT	C 4.4	2006	ULSD	80	1750	0.43	
5072905	Patricia S	Harbor Tug	Island Tug &	1	Propulsion	CAT		3512	1999	ULSD	1200	1200	0.31
5072905	Patricia S	Harbor Tug	Island Tug &	2	Propulsion	CAT		3512	1999	ULSD	1200	1200	0.31
5072905	Patricia S	Harbor Tug	Island Tug &	3	auxiliary	GM		671	1999	ULSD	100	600	0.43
5072905	Patricia S	Harbor Tug	Island Tug &	4	auxiliary	GM		671	1999	ULSD	100	600	0.43
1072688	Peter M	Harbor Tug	Manson Cor	1	Propulsion	Caterpillar	3516B		1997	ULSD	2000	1550	0.31
1072688	Peter M	Harbor Tug	Manson Cor	2	Propulsion	Caterpillar	3516B		1997	ULSD	2000	1551	0.31
1072688	Peter M	Harbor Tug	Manson Cor	3	Propulsion	Detroit Dies	Jun-71		ULSD	180	1226	0.31	
1072688	Peter M	Harbor Tug	Manson Cor	4	auxiliary	Detroit Dies	Jun-71		ULSD	180	1203	0.43	
1072688	Peter M	Harbor Tug	Manson Cor	5	auxiliary	Detroit Dies	Apr-71		ULSD	140	0	0.43	
572463	Port Gardner	Harbor Tug	Dunlap Tow	1	Propulsion	Detroit Dies	8v71		1972	ULSD	220	600	0.31
928453	Port Susan	Harbor Tug	Dunlap Tow	1	Propulsion	CAT	3408 DITA		1984	ULSD	365	2496	0.31
530828	Pull-and-Be-Damned	Harbor Tug	Dunlap Tow	1	Propulsion	CAT	3306DITA		1985	ULSD	220	1248	0.31
275287	Quilceda	Harbor Tug	Dunlap Tow	1	Propulsion	Detroit Dies	12v71		1976	ULSD	340	2080	0.31
275287	Quilceda	Harbor Tug	Dunlap Tow	2	Propulsion	Detroit Dies	12v71		1976	ULSD	340	2080	0.31
585319	Rosario	Harbor Tug	Dunlap Tow	1	Propulsion	Cummins	KTA38		2002	ULSD	850	2560	0.31
585319	Rosario	Harbor Tug	Dunlap Tow	2	Propulsion	Cummins	KTA38		2002	ULSD	850	2560	0.31
585319	Rosario	Harbor Tug	Dunlap Tow	3	auxiliary	Perkins		6354	1980	ULSD	95	1855	0.43
585319	Rosario	Harbor Tug	Dunlap Tow	4	auxiliary	Detroit Dies		371	1980	ULSD	52	705	0.43
247040	Ruby VIII	Harbor Tug	Campbell M:	1	Propulsion				ULSD	500	500	0.31	
247040	Ruby VIII	Harbor Tug	Campbell M:	2	auxiliary				ULSD	10	500	0.43	
578032	Samish	Harbor Tug	Dunlap Tow	1	Propulsion	CAT		3508	1977	ULSD	855	4000	0.31
578032	Samish	Harbor Tug	Dunlap Tow	2	Propulsion	CAT		3508	1977	ULSD	855	4000	0.31
578032	Samish	Harbor Tug	Dunlap Tow	3	auxiliary	CAT	3304NA		1977	ULSD	70	2500	0.43
578032	Samish	Harbor Tug	Dunlap Tow	4	auxiliary	Perkins	6-354		1976	ULSD	95	1500	0.43
1038778	Southport	Harbor Tug	Manson Cor	1	auxiliary	Caterpillar		3208	1995	ULSD	230	0	0.43
571411	Taurus	Harbor Tug	Dunlap Tow	1	auxiliary	Detroit Dies		671	1975	ULSD	105	115	0.43
571411	Taurus	Harbor Tug	Dunlap Tow	2	auxiliary	Detroit Dies		471	1975	ULSD	60	1289	0.43
571411	Taurus	Harbor Tug	Dunlap Tow	3	auxiliary	Detroit Dies		471	1975	ULSD	60	546	0.43
571411	Taurus	Harbor Tug	Dunlap Tow	4	Propulsion	CAT		399	1975	ULSD	1125	1392	0.31
571411	Taurus	Harbor Tug	Dunlap Tow	5	Propulsion	CAT		399	1975	ULSD	1125	1392	0.31
PSHTV	Vulcan	Harbor Tug	Dunlap Tow	1	Propulsion	CAT		3508	1977	ULSD	705	5000	0.31
PSHTV	Vulcan	Harbor Tug	Dunlap Tow	2	Propulsion	CAT		3508	1977	ULSD	705	5000	0.31
PSHTV	Vulcan	Harbor Tug	Dunlap Tow	3	auxiliary	CAT	3304NA		1998	ULSD	140	3500	0.43
PSHTV	Vulcan	Harbor Tug	Dunlap Tow	4	auxiliary	Perkins	6-354		1977	ULSD	95	1500	0.43
514329	Wasp	Harbor Tug	Western Tov	1	Propulsion	CAT		3408	1982	ULSD	800	2500	0.31
514329	Wasp	Harbor Tug	Western Tov	2	Propulsion	CAT		3408	1982	ULSD	800	2500	0.31
514329	Wasp	Harbor Tug	Western Tov	3	auxiliary	John Deere			2000	ULSD	55	2500	0.43
984759	West Point	Harbor Tug	Western Tov	1	Propulsion	CAT		3412	1992	ULSD	600	2000	0.31
984759	West Point	Harbor Tug	Western Tov	2	Propulsion	CAT		3412	1992	ULSD	600	2000	0.31
984759	West Point	Harbor Tug	Western Tov	3	auxiliary	CAT		3304	1992	ULSD	120	1000	0.43
918736	Westrac	Harbor Tug	Western Tov	1	Propulsion	CAT		3512	1987	ULSD	1200	4000	0.31
918736	Westrac	Harbor Tug	Western Tov	2	Propulsion	CAT		3512	1987	ULSD	1200	4000	0.31
918736	Westrac	Harbor Tug	Western Tov	3	auxiliary	CAT		3304	1987	ULSD	120	2000	0.43
918736	Westrac	Harbor Tug	Western Tov	4	auxiliary	Duetz			1987	ULSD	120	2000	0.43
1033438	Westrac II	Harbor Tug	Western Tov	1	Propulsion	CAT		3512	1995	ULSD	1200	4500	0.31
1033438	Westrac II	Harbor Tug	Western Tov	2	Propulsion	CAT		3512	1995	ULSD	1200	4500	0.31
1033438	Westrac II	Harbor Tug	Western Tov	3	auxiliary	CAT		3304	1995	ULSD	120	1250	0.43

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual	
				ID User	Engine Type						Hours	Load
1033438	Westrac II	Harbor Tug	Western Tov	4	auxiliary	CAT	3304	1995	ULSD	120	1250	0.43
681479	Alaska Mariner	Ocean Tug	Western Tov	1	Propulsion	CAT	3516	1985	ULSD	2000	130	0.68
681479	Alaska Mariner	Ocean Tug	Western Tov	2	Propulsion	CAT	3516	1985	ULSD	2000	130	0.68
681479	Alaska Mariner	Ocean Tug	Western Tov	3	auxiliary	CAT	3304	1985	ULSD	120	130	0.43
681479	Alaska Mariner	Ocean Tug	Western Tov	4	auxiliary	CAT	3304	1985	ULSD	120	130	0.43
1211332	Alaska Titan	Ocean Tug	Western Tov	1	Propulsion	CAT	C 175	2010	ULSD	2500	130	0.68
1211332	Alaska Titan	Ocean Tug	Western Tov	3	auxiliary	CAT	3306	2009	ULSD	180	130	0.43
1211332	Alaska Titan	Ocean Tug	Western Tov	4	auxiliary	CAT	3306	2009	ULSD	180	130	0.43
1211332	Alaska Titan	Ocean Tug	Western Tov	2	Propulsion	CAT	C 175	2010	ULSD	2500	130	0.68
1090636	Alert	Ocean Tug	Crowley	1	Propulsion	CAT	3612B	2000	ULSD	5000	24	0.68
1090636	Alert	Ocean Tug	Crowley	2	Propulsion	CAT	3612B	2000	ULSD	5000	24	0.68
1090636	Alert	Ocean Tug	Crowley	3	auxiliary	CAT		2000	ULSD	150	24	0.43
1090636	Alert	Ocean Tug	Crowley	4	auxiliary	CAT		2000	ULSD	150	24	0.43
527280	American Salvor	Ocean Tug	Crowley	1	Propulsion	CAT	D399	1980	ULSD	1200	24	0.68
527280	American Salvor	Ocean Tug	Crowley	2	Propulsion	CAT	D399	1980	ULSD	1200	24	0.68
527280	American Salvor	Ocean Tug	Crowley	3	auxiliary	CAT	3406	1980	ULSD	140	24	0.43
527280	American Salvor	Ocean Tug	Crowley	4	auxiliary	CAT	3406	1980	ULSD	140	24	0.43
1165321	Arctic Titan	Ocean Tug	Western Tov	1	Propulsion	CAT	C 175	2011	ULSD	2500	130	0.68
1165321	Arctic Titan	Ocean Tug	Western Tov	2	Propulsion	CAT	C 175	2011	ULSD	2500	130	0.68
1165321	Arctic Titan	Ocean Tug	Western Tov	3	auxiliary	CAT	C 9	2011	ULSD	240	130	0.43
1165321	Arctic Titan	Ocean Tug	Western Tov	4	auxiliary	CAT	C 9	2011	ULSD	240	130	0.43
1090637	Attentive	Ocean Tug	Crowley	1	Propulsion	CAT	3612B	2000	ULSD	5000	24	0.68
1090637	Attentive	Ocean Tug	Crowley	2	Propulsion	CAT	3612B	2000	ULSD	5000	24	0.68
1090637	Attentive	Ocean Tug	Crowley	3	auxiliary	CAT		2000	ULSD	150	24	0.43
1090637	Attentive	Ocean Tug	Crowley	4	auxiliary	CAT		2000	ULSD	150	24	0.43
1090638	Aware	Ocean Tug	Crowley	1	Propulsion	CAT	3612B	2000	ULSD	5000	24	0.68
1090638	Aware	Ocean Tug	Crowley	2	Propulsion	CAT	3612B	2000	ULSD	5000	24	0.68
1090638	Aware	Ocean Tug	Crowley	3	auxiliary	CAT		2000	ULSD	150	24	0.43
1090638	Aware	Ocean Tug	Crowley	4	auxiliary	CAT		2000	ULSD	150	24	0.43
579789	Drew Foss	Ocean Tug	Foss	1	Propulsion	EMD	12-645-E2	1976	ULSD	1500	3722	0.68
579789	Drew Foss	Ocean Tug	Foss	2	Propulsion	EMD	12-645-E2	1976	ULSD	1500	3722	0.68
579789	Drew Foss	Ocean Tug	Foss	3	auxiliary	Detroit Dies	6V-71	1977	ULSD	192	2867	0.43
579789	Drew Foss	Ocean Tug	Foss	4	auxiliary	Detroit Dies	6V-71	1977	ULSD	192	2524	0.43
579789	Drew Foss	Ocean Tug	Foss	5	auxiliary	Detroit Dies	Jun-71		ULSD	192	149	0.43
540227	Gene Dunlap	Ocean Tug	Dunlap Tow	1	Propulsion	CAT	3516	1994	ULSD	1710	472	0.68
540227	Gene Dunlap	Ocean Tug	Dunlap Tow	2	Propulsion	CAT	3516	1994	ULSD	1710	472	0.68
540227	Gene Dunlap	Ocean Tug	Dunlap Tow	3	auxiliary	Detroit Dies	671	1975	ULSD	80	253	0.43
540227	Gene Dunlap	Ocean Tug	Dunlap Tow	4	auxiliary	Detroit Dies	671	1975	ULSD	80	260	0.43
540227	Gene Dunlap	Ocean Tug	Dunlap Tow	5	auxiliary	Detroit Dies	671	1975	ULSD	105	23	0.43
566429	Gladiator	Ocean Tug	Crowley	1	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
566429	Gladiator	Ocean Tug	Crowley	2	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
566429	Gladiator	Ocean Tug	Crowley	3	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
566429	Gladiator	Ocean Tug	Crowley	4	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
525855	Guardian	Ocean Tug	Crowley	1	Propulsion	EMD	16-645-E5	1970	ULSD	2850	24	0.68
525855	Guardian	Ocean Tug	Crowley	2	Propulsion	EMD	16-645-E5	1970	ULSD	2850	24	0.68
525855	Guardian	Ocean Tug	Crowley	3	auxiliary	CAT	3304	1970	ULSD	140	24	0.43
525855	Guardian	Ocean Tug	Crowley	4	auxiliary	CAT	3304	1970	ULSD	140	24	0.43
572647	Guardzman	Ocean Tug	Crowley	1	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
572647	Guardzman	Ocean Tug	Crowley	2	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
572647	Guardzman	Ocean Tug	Crowley	3	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
572647	Guardzman	Ocean Tug	Crowley	4	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
1115109	Gulf Titan	Ocean Tug	Western Tov	1	Propulsion	CAT	3516B	2001	ULSD	2500	130	0.68
1115109	Gulf Titan	Ocean Tug	Western Tov	2	Propulsion	CAT	3516B	2001	ULSD	2500	130	0.68
1115109	Gulf Titan	Ocean Tug	Western Tov	3	auxiliary	CAT	3306	2001	ULSD	180	130	0.43
1115109	Gulf Titan	Ocean Tug	Western Tov	4	auxiliary	CAT	3306	2001	ULSD	180	130	0.43
559404	Invader	Ocean Tug	Crowley	1	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
559404	Invader	Ocean Tug	Crowley	2	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
559404	Invader	Ocean Tug	Crowley	3	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
559404	Invader	Ocean Tug	Crowley	4	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
584331	Iver Foss	Ocean Tug	Foss	1	Propulsion	Caterpillar	D-399	1977	ULSD	1200	1823	0.68
584331	Iver Foss	Ocean Tug	Foss	2	Propulsion	Caterpillar	D-399	1977	ULSD	1200	1823	0.68
584331	Iver Foss	Ocean Tug	Foss	3	auxiliary	Detroit Dies	Jun-71	1973	ULSD	192	2274	0.43
584331	Iver Foss	Ocean Tug	Foss	4	auxiliary	Detroit Dies	Jun-71	1982	ULSD	192	1692	0.43
584331	Iver Foss	Ocean Tug	Foss	5	auxiliary	Detroit Dies	Apr-71	1977	ULSD	126	89	0.43
1037412	James Dunlap	Ocean Tug	Dunlap Tow	1	Propulsion	EMD	16-645E2	1995	ULSD	1950	0	0.68
1037412	James Dunlap	Ocean Tug	Dunlap Tow	2	Propulsion	EMD	16-645E2	1995	ULSD	1950	0	0.68
1037412	James Dunlap	Ocean Tug	Dunlap Tow	3	auxiliary	CAT	3304B	1995	ULSD	140	0	0.43



**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual	
				ID User	Engine Type						Hours	Load
1037412	James Dunlap	Ocean Tug	Dunlap Tow	4	auxiliary	CAT	3304B	1995	ULSD	140	0	0.43
526844	Jeffrey Foss	Ocean Tug	Foss	1	Propulsion	EMD	12-645-E7	1970	ULSD	2150	667	0.68
526844	Jeffrey Foss	Ocean Tug	Foss	2	Propulsion	EMD	12-645-E7	1970	ULSD	2150	653	0.68
526844	Jeffrey Foss	Ocean Tug	Foss	3	auxiliary	John Deere	6068 TFM50	2000	ULSD	159	556	0.43
526844	Jeffrey Foss	Ocean Tug	Foss	4	auxiliary	John Deere	6068 TFM50	2000	ULSD	159	503	0.43
526844	Jeffrey Foss	Ocean Tug	Foss	5	auxiliary	Caterpillar	D330-C4		ULSD	159	7	0.43
575361	Justine Foss	Ocean Tug	Foss	1	Propulsion	EMD	12-645-E7	1981	ULSD	2150	3498	0.68
575361	Justine Foss	Ocean Tug	Foss	2	Propulsion	EMD	12-645-E7	1981	ULSD	2150	3503	0.68
575361	Justine Foss	Ocean Tug	Foss	3	auxiliary	Detroit Dies	6V-71	1982	ULSD	192	2993	0.43
575361	Justine Foss	Ocean Tug	Foss	4	auxiliary	Detroit Dies	6V-71	1982	ULSD	192	2819	0.43
575361	Justine Foss	Ocean Tug	Foss	5	auxiliary	Detroit Dies	6V-71		ULSD	192	107	0.43
1134122	Lauren Foss	Ocean Tug	Foss	1	Propulsion	Fairbanks M Alco	16-251	1981	ULSD	4100	266	0.68
1134122	Lauren Foss	Ocean Tug	Foss	2	Propulsion	Fairbanks M Alco	16-251	1981	ULSD	4100	258	0.68
1134122	Lauren Foss	Ocean Tug	Foss	3	auxiliary	Cummins	6CTA8.3-DI	1982	ULSD	228	851	0.43
1134122	Lauren Foss	Ocean Tug	Foss	4	auxiliary	Cummins	6CTA8.3-DI	1982	ULSD	228	572	0.43
1134122	Lauren Foss	Ocean Tug	Foss	5	auxiliary	Cummins	N-14	2002	ULSD	228	16	0.43
1134122	Lauren Foss	Ocean Tug	Foss	6	auxiliary	John Deere	4045TF250I	2001	ULSD	107	0	0.43
569517	Malolo	Ocean Tug	Dunlap Tow	1	Propulsion	Cat	3516	1986	ULSD	1710	1041	0.68
569517	Malolo	Ocean Tug	Dunlap Tow	2	Propulsion	CAT	3516	1986	ULSD	1710	1041	0.68
569517	Malolo	Ocean Tug	Dunlap Tow	3	auxiliary	CAT	3304NA	1995	ULSD	85	605	0.43
569517	Malolo	Ocean Tug	Dunlap Tow	4	auxiliary	CAT	3304NA	1995	ULSD	85	564	0.43
569517	Malolo	Ocean Tug	Dunlap Tow	5	auxiliary	Detroit Dies	671	1975	ULSD	105	84	0.43
506243	Manfred Nystrom	Ocean Tug	Dunlap Tow	1	Propulsion	EMD	16-645	1966	ULSD	1950	490	0.68
506243	Manfred Nystrom	Ocean Tug	Dunlap Tow	2	Propulsion	EMD	16-645	1966	ULSD	1950	490	0.68
506243	Manfred Nystrom	Ocean Tug	Dunlap Tow	3	auxiliary	Detroit Dies	671	1966	ULSD	80	250	0.43
506243	Manfred Nystrom	Ocean Tug	Dunlap Tow	4	auxiliary	Detroit Dies	671	1966	ULSD	80	250	0.43
526607	Mars	Ocean Tug	Crowley	1	Propulsion	EMD	16-645-E5	1970	ULSD	2850	24	0.68
526607	Mars	Ocean Tug	Crowley	2	Propulsion	EMD	16-645-E5	1970	ULSD	2850	24	0.68
526607	Mars	Ocean Tug	Crowley	3	auxiliary	CAT	3304	1970	ULSD	140	24	0.43
526607	Mars	Ocean Tug	Crowley	4	auxiliary	CAT	3304	1970	ULSD	140	24	0.43
566082	Mike O'Leary	Ocean Tug	Dunlap Tow	1	Propulsion	CAT	D399	1975	ULSD	1125	1331	0.68
566082	Mike O'Leary	Ocean Tug	Dunlap Tow	2	Propulsion	CAT	D399	1975	ULSD	1125	1331	0.68
566082	Mike O'Leary	Ocean Tug	Dunlap Tow	3	auxiliary	Detroit Dies	671	1975	ULSD	70	623	0.43
566082	Mike O'Leary	Ocean Tug	Dunlap Tow	4	auxiliary	Detroit Dies	671	1975	ULSD	70	919	0.43
566082	Mike O'Leary	Ocean Tug	Dunlap Tow	5	auxiliary	Detroit Dies	671	1975	ULSD	105	116	0.43
562688	Navigator	Ocean Tug	Crowley	1	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
562688	Navigator	Ocean Tug	Crowley	2	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
562688	Navigator	Ocean Tug	Crowley	3	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
562688	Navigator	Ocean Tug	Crowley	4	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
662872	Ocean Mariner	Ocean Tug	Western Tov	1	Propulsion	CAT	3516B	1984	ULSD	1600	130	0.68
662872	Ocean Mariner	Ocean Tug	Western Tov	2	Propulsion	CAT	3516B	1984	ULSD	1600	130	0.68
662872	Ocean Mariner	Ocean Tug	Western Tov	3	auxiliary	GM	4 71	1984	ULSD	75	130	0.43
662872	Ocean Mariner	Ocean Tug	Western Tov	4	auxiliary	GM	6 71	1984	ULSD	75	130	0.43
693814	Ocean Navigator	Ocean Tug	Western Tov	1	Propulsion	CAT	3516B	1986	ULSD	1550	130	0.68
693814	Ocean Navigator	Ocean Tug	Western Tov	2	Propulsion	CAT	3516B	1986	ULSD	1550	130	0.68
693814	Ocean Navigator	Ocean Tug	Western Tov	3	auxiliary	CAT	3306	1986	ULSD	120	130	0.43
693814	Ocean Navigator	Ocean Tug	Western Tov	4	auxiliary	CAT	3306	1986	ULSD	120	130	0.43
961922	Ocean Ranger	Ocean Tug	Western Tov	1	Propulsion	CAT	3516B	1990	ULSD	2100	130	0.68
961922	Ocean Ranger	Ocean Tug	Western Tov	2	Propulsion	CAT	3516B	1990	ULSD	2100	130	0.68
961922	Ocean Ranger	Ocean Tug	Western Tov	3	auxiliary	CAT	3306	1990	ULSD	120	130	0.43
961922	Ocean Ranger	Ocean Tug	Western Tov	4	auxiliary	CAT	3306	1990	ULSD	120	130	0.43
1160544	Ocean Titan	Ocean Tug	Western Tov	1	Propulsion	CAT	3516B	2010	ULSD	2500	130	0.68
1160544	Ocean Titan	Ocean Tug	Western Tov	2	Propulsion	CAT	3516B	2010	ULSD	2500	130	0.68
1160544	Ocean Titan	Ocean Tug	Western Tov	3	auxiliary	CAT	3306	2004	ULSD	190	130	0.43
1160544	Ocean Titan	Ocean Tug	Western Tov	4	auxiliary	CAT	3306	2004	ULSD	190	130	0.43
500126	Pacific Eagle	Ocean Tug	Sea Coast Tr	1	Propulsion	CAT	D 398	1980	ULSD	900	5326	0.68
500126	Pacific Eagle	Ocean Tug	Sea Coast Tr	2	Propulsion	CAT	D 398	1980	ULSD	900	5326	0.68
500126	Pacific Eagle	Ocean Tug	Sea Coast Tr	3	auxiliary	Detroit	Jun-71	1981	ULSD	180	7132	0.43
500126	Pacific Eagle	Ocean Tug	Sea Coast Tr	4	auxiliary	Detroit	Jun-71	1977	ULSD	180	1582	0.43
1092436	Pacific Titan	Ocean Tug	Western Tov	1	Propulsion	CAT	3516B	2000	ULSD	2250	130	0.68
1092436	Pacific Titan	Ocean Tug	Western Tov	2	Propulsion	CAT	3516B	2000	ULSD	2250	130	0.68
1092436	Pacific Titan	Ocean Tug	Western Tov	3	auxiliary	CAT	3306	2000	ULSD	180	130	0.43
1092436	Pacific Titan	Ocean Tug	Western Tov	4	auxiliary	CAT	3306	2000	ULSD	180	130	0.43
1117884	Phyllis Dunlap	Ocean Tug	Dunlap Tow	1	Propulsion	CAT	3606	2001	ULSD	5100	324	0.68
1117884	Phyllis Dunlap	Ocean Tug	Dunlap Tow	2	Propulsion	CAT	3606	2001	ULSD	5100	324	0.68
1117884	Phyllis Dunlap	Ocean Tug	Dunlap Tow	3	auxiliary	CAT	3304T	2001	ULSD	140	180	0.43
1117884	Phyllis Dunlap	Ocean Tug	Dunlap Tow	4	auxiliary	CAT	3304T	2001	ULSD	140	177	0.43

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine					Annual				
				Engine ID User	Engine Type	Engine MFR	Engine Model	Engine Year	Fuel	HP	Hours	Load	
1117884	Phyllis Dunlap	Ocean Tug	Dunlap Tow	5	auxiliary	CAT	3306DITA	2001	ULSD	185	6	0.43	
648865	Pt. Barrow	Ocean Tug	Crowley	1	Propulsion	CAT		3512	1982	ULSD	1000	24	0.68
648865	Pt. Barrow	Ocean Tug	Crowley	2	Propulsion	CAT		3512	1982	ULSD	1000	24	0.68
648865	Pt. Barrow	Ocean Tug	Crowley	3	auxiliary	CAT		3304	1982	ULSD	140	24	0.43
648865	Pt. Barrow	Ocean Tug	Crowley	4	auxiliary	CAT		3304	1982	ULSD	140	24	0.43
648866	Pt. Oliktok	Ocean Tug	Crowley	1	Propulsion	CAT		3512	1982	ULSD	1000	24	0.68
648866	Pt. Oliktok	Ocean Tug	Crowley	2	Propulsion	CAT		3512	1982	ULSD	1000	24	0.68
648866	Pt. Oliktok	Ocean Tug	Crowley	3	auxiliary	CAT		3304	1982	ULSD	140	24	0.43
648866	Pt. Oliktok	Ocean Tug	Crowley	4	auxiliary	CAT		3304	1982	ULSD	140	24	0.43
648710	Pt. Thompson	Ocean Tug	Crowley	1	Propulsion	CAT		3512	1982	ULSD	1000	24	0.68
648710	Pt. Thompson	Ocean Tug	Crowley	2	Propulsion	CAT		3512	1982	ULSD	1000	24	0.68
648710	Pt. Thompson	Ocean Tug	Crowley	3	auxiliary	CAT		3304	1982	ULSD	140	24	0.43
648710	Pt. Thompson	Ocean Tug	Crowley	4	auxiliary	CAT		3304	1982	ULSD	140	24	0.43
571909	Ranger	Ocean Tug	Crowley	1	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68	
571909	Ranger	Ocean Tug	Crowley	2	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68	
571909	Ranger	Ocean Tug	Crowley	3	auxiliary	CAT		3304	1976	ULSD	140	24	0.43
571909	Ranger	Ocean Tug	Crowley	4	auxiliary	CAT		3304	1976	ULSD	140	24	0.43
571854	Sandra Foss	Ocean Tug	Foss	1	Propulsion	EMD	8-645-E7	1974	ULSD	1450	2364	0.68	
571854	Sandra Foss	Ocean Tug	Foss	2	Propulsion	EMD	8-645-E7	1974	ULSD	1450	2364	0.68	
571854	Sandra Foss	Ocean Tug	Foss	3	auxiliary	Detroit Dies	Jun-71	2003	ULSD	192	2373	0.43	
571854	Sandra Foss	Ocean Tug	Foss	4	auxiliary	Detroit Dies	Jun-71	2004	ULSD	192	1839	0.43	
571854	Sandra Foss	Ocean Tug	Foss	5	auxiliary	Detroit Dies	Jun-71		ULSD	192	64	0.43	
516870	Sea Flyer	Ocean Tug	Crowley	1	Propulsion	EMD	16-645-E5	1968	ULSD	2850	24	0.68	
516870	Sea Flyer	Ocean Tug	Crowley	2	Propulsion	EMD	16-645-E5	1968	ULSD	2850	24	0.68	
516870	Sea Flyer	Ocean Tug	Crowley	3	auxiliary	CAT		3304	1968	ULSD	140	24	0.43
516870	Sea Flyer	Ocean Tug	Crowley	4	auxiliary	CAT		3304	1968	ULSD	140	24	0.43
555271	Sea Prince	Ocean Tug	Crowley	1	Propulsion	CAT		3606	1974	ULSD	2500	24	0.68
555271	Sea Prince	Ocean Tug	Crowley	2	Propulsion	CAT		3606	1974	ULSD	2500	24	0.68
555271	Sea Prince	Ocean Tug	Crowley	3	auxiliary	Detroit		671	1974	ULSD	150	24	0.43
555271	Sea Prince	Ocean Tug	Crowley	4	auxiliary	Detroit		671	1974	ULSD	150	24	0.43
569925	Sea Ranger	Ocean Tug	Crowley	1	Propulsion	CAT		3606	1975	ULSD	2500	24	0.68
569925	Sea Ranger	Ocean Tug	Crowley	2	Propulsion	CAT		3606	1975	ULSD	2500	24	0.68
569925	Sea Ranger	Ocean Tug	Crowley	3	auxiliary	Detroit		671	1975	ULSD	150	24	0.43
569925	Sea Ranger	Ocean Tug	Crowley	4	auxiliary	Detroit		671	1975	ULSD	150	24	0.43
568498	Sea Venture	Ocean Tug	Crowley	1	Propulsion	EMD	20-645-E5	1975	ULSD	3500	24	0.68	
568498	Sea Venture	Ocean Tug	Crowley	2	Propulsion	EMD	20-645-E5	1975	ULSD	3500	24	0.68	
568498	Sea Venture	Ocean Tug	Crowley	3	auxiliary	Detroit	8V71	1975	ULSD	150	24	0.43	
568498	Sea Venture	Ocean Tug	Crowley	4	auxiliary	Detroit	8V71	1975	ULSD	150	24	0.43	
561652	Sea Victory	Ocean Tug	Crowley	1	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68	
561652	Sea Victory	Ocean Tug	Crowley	2	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68	
561652	Sea Victory	Ocean Tug	Crowley	3	auxiliary	Detroit	8V71	1976	ULSD	150	24	0.43	
561652	Sea Victory	Ocean Tug	Crowley	4	auxiliary	Detroit	8V71	1976	ULSD	150	24	0.43	
568790	Sea Viking	Ocean Tug	Crowley	1	Propulsion	CAT		3606	1975	ULSD	2500	24	0.68
568790	Sea Viking	Ocean Tug	Crowley	2	Propulsion	CAT		3606	1975	ULSD	2500	24	0.68
568790	Sea Viking	Ocean Tug	Crowley	3	auxiliary	Detroit		671	1975	ULSD	150	24	0.43
568790	Sea Viking	Ocean Tug	Crowley	4	auxiliary	Detroit		671	1975	ULSD	150	24	0.43
526717	Seneca	Ocean Tug	Crowley	1	Propulsion	EMD	8-645-E5	1970	ULSD	1450	24	0.68	
526717	Seneca	Ocean Tug	Crowley	2	Propulsion	EMD	8-645-E5	1970	ULSD	1450	24	0.68	
526717	Seneca	Ocean Tug	Crowley	3	auxiliary	Detroit		671	1970	ULSD	150	24	0.43
526717	Seneca	Ocean Tug	Crowley	4	auxiliary	Detroit		671	1970	ULSD	150	24	0.43
1029298	Siku	Ocean Tug	Crowley	1	Propulsion	EMD	8-645-E5	1970	ULSD	1450	24	0.68	
1029298	Siku	Ocean Tug	Crowley	2	Propulsion	EMD	8-645-E5	1970	ULSD	1450	24	0.68	
1029298	Siku	Ocean Tug	Crowley	3	auxiliary	Detroit		671	1970	ULSD	150	24	0.43
1029298	Siku	Ocean Tug	Crowley	4	auxiliary	Detroit		671	1970	ULSD	150	24	0.43
527409	Sioux	Ocean Tug	Crowley	1	Propulsion	EMD	8-645-E5	1970	ULSD	1450	24	0.68	
527409	Sioux	Ocean Tug	Crowley	2	Propulsion	EMD	8-645-E5	1970	ULSD	1450	24	0.68	
527409	Sioux	Ocean Tug	Crowley	3	auxiliary	Detroit		671	1970	ULSD	150	24	0.43
527409	Sioux	Ocean Tug	Crowley	4	auxiliary	Detroit		671	1970	ULSD	150	24	0.43
PSOTS	Suattle	Ocean Tug	Dunlap Tow	1	Propulsion	EMD	16-645	1981	ULSD	3070	1423	0.68	
PSOTS	Suattle	Ocean Tug	Dunlap Tow	2	Propulsion	EMD	16-645	1981	ULSD	3070	1423	0.68	
PSOTS	Suattle	Ocean Tug	Dunlap Tow	3	auxiliary	Detroit Dies		671	1981	ULSD	130	485	0.43
PSOTS	Suattle	Ocean Tug	Dunlap Tow	4	auxiliary	Detroit Dies		671	1981	ULSD	130	1265	0.43
527071	Snecoosh	Ocean Tug	Dunlap Tow	1	Propulsion	CAT		343	1978	ULSD	365	2080	0.68
540290	Snohomish	Ocean Tug	Dunlap Tow	1	Propulsion	CAT		3516	1994	ULSD	1710	532	0.68
540290	Snohomish	Ocean Tug	Dunlap Tow	2	Propulsion	CAT		3516	1994	ULSD	1710	532	0.68
540290	Snohomish	Ocean Tug	Dunlap Tow	3	auxiliary	Detroit Dies		671	1975	ULSD	80	312	0.43
540290	Snohomish	Ocean Tug	Dunlap Tow	4	auxiliary	Detroit Dies		671	1975	ULSD	80	212	0.43

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual	
				ID User	Engine Type						Hours	Load
540290	Snohomish	Ocean Tug	Dunlap Tow	5	auxiliary	Detroit Dies	671	1975	ULSD	105	16	0.43
571855	Stacey Foss	Ocean Tug	Foss	1	Propulsion	EMD	8-645-E7	1974	ULSD	1450	2386	0.68
571855	Stacey Foss	Ocean Tug	Foss	2	Propulsion	EMD	8-645-E7	1974	ULSD	1450	2386	0.68
571855	Stacey Foss	Ocean Tug	Foss	3	auxiliary	Detroit Dies	Jun-71	1982	ULSD	192	2291	0.43
571855	Stacey Foss	Ocean Tug	Foss	4	auxiliary	Detroit Dies	Jun-71	1982	ULSD	192	2267	0.43
571855	Stacey Foss	Ocean Tug	Foss	5	auxiliary	Detroit Dies	Jun-71	1982	ULSD	192	73	0.43
256829	Swinomish	Ocean Tug	Dunlap Tow	1	Propulsion	CAT	D398	1974	ULSD	850	5000	0.68
256829	Swinomish	Ocean Tug	Dunlap Tow	2	Propulsion	CAT	D398	1974	ULSD	850	5000	0.68
256829	Swinomish	Ocean Tug	Dunlap Tow	3	auxiliary	CAT	3304B	1974	ULSD	120	2500	0.43
256829	Swinomish	Ocean Tug	Dunlap Tow	4	auxiliary	CAT	3304B	1974	ULSD	120	2500	0.43
CG639650	Sydney Foss	Ocean Tug	Foss	1	Propulsion	EMD	8-645-E7	1981	ULSD	1500	3043	0.68
CG639650	Sydney Foss	Ocean Tug	Foss	2	Propulsion	EMD	8-645-E7	1981	ULSD	1500	3045	0.68
CG639650	Sydney Foss	Ocean Tug	Foss	3	auxiliary	Detroit Dies	Jun-71	1982	ULSD	192	2764	0.43
CG639650	Sydney Foss	Ocean Tug	Foss	4	auxiliary	Detroit Dies	Jun-71	1982	ULSD	192	2682	0.43
CG639650	Sydney Foss	Ocean Tug	Foss	5	auxiliary	Detroit Dies	Jun-71	ULSD	192	56	0.43	
513840	Triumph	Ocean Tug	Western Tov	1	Propulsion	CAT	3508	2006	ULSD	1000	130	0.68
513840	Triumph	Ocean Tug	Western Tov	2	Propulsion	CAT	3508	2006	ULSD	1000	130	0.68
513840	Triumph	Ocean Tug	Western Tov	3	auxiliary	CAT	3304	2006	ULSD	120	130	0.43
513840	Triumph	Ocean Tug	Western Tov	4	auxiliary	CAT	3304	2006	ULSD	120	130	0.43
565291	Warrior	Ocean Tug	Crowley	1	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
565291	Warrior	Ocean Tug	Crowley	2	Propulsion	EMD	20-645-E5	1976	ULSD	3500	24	0.68
565291	Warrior	Ocean Tug	Crowley	3	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
565291	Warrior	Ocean Tug	Crowley	4	auxiliary	CAT	3304	1976	ULSD	140	24	0.43
656807	Western Mariner	Ocean Tug	Western Tov	1	Propulsion	CAT	3516	1995	ULSD	1500	130	0.68
656807	Western Mariner	Ocean Tug	Western Tov	2	Propulsion	CAT	3516	1995	ULSD	1500	130	0.68
656807	Western Mariner	Ocean Tug	Western Tov	3	auxiliary	CAT	3304	2006	ULSD	120	130	0.43
656807	Western Mariner	Ocean Tug	Western Tov	4	auxiliary	CAT	3304	2000	ULSD	120	130	0.43
973968	Western Navigator	Ocean Tug	Western Tov	1	Propulsion	CAT	3516B	1991	ULSD	1550	130	0.68
973968	Western Navigator	Ocean Tug	Western Tov	2	Propulsion	CAT	3516B	1991	ULSD	1550	130	0.68
973968	Western Navigator	Ocean Tug	Western Tov	3	auxiliary	CAT	3304	1991	ULSD	120	130	0.43
973968	Western Navigator	Ocean Tug	Western Tov	4	auxiliary	CAT	3304	1991	ULSD	120	130	0.43
516924	Western Ranger	Ocean Tug	Western Tov	1	Propulsion	CAT	3516B	1968	ULSD	1700	130	0.68
516924	Western Ranger	Ocean Tug	Western Tov	2	Propulsion	CAT	3516B	1968	ULSD	1700	130	0.68
516924	Western Ranger	Ocean Tug	Western Tov	3	auxiliary	CAT	3306	1968	ULSD	100	130	0.43
516924	Western Ranger	Ocean Tug	Western Tov	4	auxiliary	CAT	3306	1968	ULSD	100	130	0.43
1052805	Western Titan	Ocean Tug	Western Tov	1	Propulsion	CAT	3516B	1997	ULSD	2250	130	0.68
1052805	Western Titan	Ocean Tug	Western Tov	2	Propulsion	CAT	3516B	1997	ULSD	2250	130	0.68
1052805	Western Titan	Ocean Tug	Western Tov	3	auxiliary	CAT	3306	1997	ULSD	180	130	0.43
1052805	Western Titan	Ocean Tug	Western Tov	4	auxiliary	CAT	3306	1997	ULSD	180	130	0.43
1120139	Juan de Fuca	Pilot Boat	Puget Sound	1	Propulsion			2001	ULSD	1100	763	0.51
1120139	Juan de Fuca	Pilot Boat	Puget Sound	2	Propulsion			2001	ULSD	1100	763	0.51
1120139	Juan de Fuca	Pilot Boat	Puget Sound	3	auxiliary	Northern Lig	984	2001	ULSD	43	327	0.43
1120139	Juan de Fuca	Pilot Boat	Puget Sound	4	auxiliary	Northern Lig	984	2001	ULSD	43	327	0.43
1088139	Puget Sound	Pilot Boat	Puget Sound	1	Propulsion			1999	ULSD	1100	834	0.51
1088139	Puget Sound	Pilot Boat	Puget Sound	2	Propulsion			1999	ULSD	1100	834	0.51
1088139	Puget Sound	Pilot Boat	Puget Sound	3	auxiliary	Northern Lig	984	1999	ULSD	50	357	0.43
1088139	Puget Sound	Pilot Boat	Puget Sound	4	auxiliary	Northern Lig	984	1999	ULSD	50	357	0.43
1235165	Betsy Arntz	Tank Barge	Harley Marir	1	auxiliary	IHI Shibaur: N84-D-8601			ULSD	185	280	0.43
1235165	Betsy Arntz	Tank Barge	Harley Marir	2	auxiliary	Detroit	6064TK33		ULSD	185	116	0.43
1235165	Betsy Arntz	Tank Barge	Harley Marir	3	auxiliary	Detroit	6064TK33		ULSD	185	161	0.43
1109007	Dottie	Tank Barge	Harley Marir	1	auxiliary	Cummins	N-14-P	2001	ULSD	185	446	0.43
1109007	Dottie	Tank Barge	Harley Marir	2	auxiliary	Cummins	N-14-P	2001	ULSD	185	545	0.43
1109007	Dottie	Tank Barge	Harley Marir	3	auxiliary	Cummins	6BT5.9-G6	2001	ULSD	185	3586	0.43
1109007	Dottie	Tank Barge	Harley Marir	4	auxiliary	Cummins	6BT5.9-G6	2001	ULSD	185	1173	0.43
1208933	Dugan Pearsall	Tank Barge	Harley Marir	1	auxiliary	Detroit	Series 60		ULSD	185	905	0.43
1208933	Dugan Pearsall	Tank Barge	Harley Marir	2	auxiliary	Detroit	Series 60		ULSD	185	1183	0.43
1208933	Dugan Pearsall	Tank Barge	Harley Marir	3	auxiliary	John Deere	4045HF285		ULSD	185	2437	0.43
TB248	Foss 248-P2	Tank Barge	Foss	1	auxiliary	Detroit Dies	Feb-71	1987	ULSD	80	500	0.43
TB248	Foss 248-P2	Tank Barge	Foss	2	auxiliary	Detroit Dies	Jun-71		ULSD	192	500	0.43
TB248	Foss 248-P2	Tank Barge	Foss	3	auxiliary	Detroit Dies	Jun-71		ULSD	192	500	0.43
1026330	HMS 2000	Tank Barge	Harley Marir	1	auxiliary	Detroit	Jun-71	1987	ULSD	185	1015	0.43
1026330	HMS 2000	Tank Barge	Harley Marir	2	auxiliary	Detroit	Jun-71	1987	ULSD	185	985	0.43
1026330	HMS 2000	Tank Barge	Harley Marir	3	auxiliary	John Deere	4045	1987	ULSD	185	1200	0.43
1218201	Lily Blair	Tank Barge	Harley Marir	1	auxiliary	Detroit	6064HV33		ULSD	185	1535	0.43
1218021	Lily Blair	Tank Barge	Harley Marir	2	auxiliary	Detroit	6064HV33		ULSD	185	1454	0.43
1218021	Lily Blair	Tank Barge	Harley Marir	3	auxiliary	IHI Shibaura			ULSD	185	2486	0.43
1205217	Lovel Briere	Tank Barge	Harley Marir	1	auxiliary	Detroit	6064HV33		ULSD	185	1297	0.43

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine		Engine MFR	Engine Model	Engine Year	Fuel	HP	Annual	
				ID User	Engine Type						Hours	Load
1205217	Lovel Briere	Tank Barge	Harley Marir	2	auxiliary	Detroit	6064HV33		ULSD	185	1316	0.43
1205217	Lovel Briere	Tank Barge	Harley Marir	3	auxiliary	John Deere	6068TF275		ULSD	185	1264	0.43
1205217	Lovel Briere	Tank Barge	Harley Marir	4	auxiliary	John Deere	6068TF275		ULSD	185	2143	0.43
1219418	Nathan Schmidt	Tank Barge	Harley Marir	1	auxiliary	Detroit	6064HV33		ULSD	185	1124	0.43
1219418	Nathan Schmidt	Tank Barge	Harley Marir	2	auxiliary	Detroit	6064HV33		ULSD	185	1161	0.43
1219418	Nathan Schmidt	Tank Barge	Harley Marir	3	auxiliary	IHI Shibaura	N844-C-860		ULSD	185	1746	0.43
981972	Puget Sounder	Tank Barge	Sea Coast Tr	1	auxiliary	Detroit	Aug-71	1991	ULSD	240	661	0.43
981972	Puget Sounder	Tank Barge	Sea Coast Tr	3	auxiliary	Detroit	Aug-71	1991	ULSD	240	429	0.43
981972	Puget Sounder	Tank Barge	Sea Coast Tr	4	auxiliary	Detroit	Apr-71	1992	ULSD	180	2537	0.43
1101122	Shauna Kay	Tank Barge	Harley Marir	1	auxiliary	Cummins	N14-P	1987	ULSD	185	1199	0.43
1101122	Shauna Kay	Tank Barge	Harley Marir	2	auxiliary	Cummins	N14-P	1987	ULSD	185	179	0.43
1101122	Shauna Kay	Tank Barge	Harley Marir	3	auxiliary	Cummins	6BT5.9-G2	1987	ULSD	185	971	0.43
1101122	Shauna Kay	Tank Barge	Harley Marir	4	auxiliary	Cummins	6BT5.9-G6	1987	ULSD	185	2087	0.43
1190801	Stoddard Sea	Tank Barge	Harley Marir	1	auxiliary	John Deere	6068HF475C	1987	ULSD	185	746	0.43
1190801	Stoddard Sea	Tank Barge	Harley Marir	2	auxiliary	John Deere	6068HF475C	1987	ULSD	185	727	0.43
1190801	Stoddard Sea	Tank Barge	Harley Marir	3	auxiliary	John Deere	6068HF475C	1987	ULSD	185	18	0.43
1190801	Stoddard Sea	Tank Barge	Harley Marir	4	auxiliary	John Deere	6068TF275F	1987	ULSD	185	643	0.43
1190801	Stoddard Sea	Tank Barge	Harley Marir	5	auxiliary	John Deere	6068TF275F	1987	ULSD	185	641	0.43
628604	Washington	Tank Barge	Foss	1	auxiliary			1980	ULSD	185	500	0.43
CG001716	Andrew	Workboat	Manson Cor	1	Propulsion	Detroit Dies	S-60	2004	ULSD	400	106	0.38
CG001716	Andrew	Workboat	Manson Cor	2	Propulsion	Caterpillar	C18	2011	ULSD	600	0	0.38
CG001919	Bob Lofgren	Workboat	Manson Cor	1	Propulsion	Caterpillar	3512B	1996	ULSD	1910	0	0.38
CG001919	Bob Lofgren	Workboat	Manson Cor	2	Propulsion	E M D	16V567C	1955	ULSD	1500	0	0.38
CG001919	Bob Lofgren	Workboat	Manson Cor	3	Propulsion	E M D	16V567C	1955	ULSD	1500	0	0.38
CG001919	Bob Lofgren	Workboat	Manson Cor	4	Propulsion	E M D	16V567C	1955	ULSD	1500	0	0.38
527467	Cheyenne Arrow	Workboat	Arrow Laun	1	Propulsion	Detroit	8V71	1971	ULSD	370	1000	0.38
527467	Cheyenne Arrow	Workboat	Arrow Laun	2	Propulsion	Detroit	8V71	1971	ULSD	370	1000	0.38
274237	Crow Arrow	Workboat	Arrow Laun	1	Propulsion	Detroit	8V71	1971	ULSD	392	350	0.38
657491	Derrick 24	Workboat	Manson Cor	1	Propulsion	Detroit Dies	S-60	2004	ULSD	400	2814	0.38
657491	Derrick 24	Workboat	Manson Cor	2	Propulsion	Caterpillar	3406C	1997	ULSD	450	673	0.38
657491	Derrick 24	Workboat	Manson Cor	3	Propulsion	John Deere	4045TF150	2004	ULSD	130	721	0.38
657491	Derrick 24	Workboat	Manson Cor	4	auxiliary	Detroit Dies	Apr-71	1969	ULSD	140	32	0.32
657491	Derrick 24	Workboat	Manson Cor	5	auxiliary	Detroit Dies	Apr-71		ULSD	140	15	0.32
DB3	Derrick 3	Workboat	Manson Cor	1	Propulsion	John Deere	6090HF485	2008	ULSD	384	479	0.38
DB3	Derrick 3	Workboat	Manson Cor	2	Propulsion	Detroit Dies	8V71	1969	ULSD	318	462	0.38
DB3	Derrick 3	Workboat	Manson Cor	3	auxiliary	John Deere	4045HF475C	2005	ULSD	130	1403	0.32
DB6	Derrick 6	Workboat	Manson Cor	1	Propulsion	Detroit Dies	8V71 (7087-	1963	ULSD	318	160	0.38
DB6	Derrick 6	Workboat	Manson Cor	2	Propulsion	John Deere	6466TF00	1986	ULSD	154	1658	0.38
DB6	Derrick 6	Workboat	Manson Cor	3	auxiliary	Detroit Dies	6-71 (1063-7	1971	ULSD	180	442	0.32
DB6	Derrick 6	Workboat	Manson Cor	4	auxiliary	Detroit Dies	6-71 (1063-7	1975	ULSD	180	46	0.32
DB6	Derrick 6	Workboat	Manson Cor	5	auxiliary	Detroit Dies	4-71 (1043-7	1967	ULSD	140	401	0.32
DB8	Derrick 8	Workboat	Manson Cor	1	Propulsion	Detroit Dies	S-60	2003	ULSD	400	52	0.38
DB8	Derrick 8	Workboat	Manson Cor	2	Propulsion	Detroit Dies	12V71	1965	ULSD	365	567	0.38
CG059573	Lester M	Workboat	Manson Cor	1	Propulsion	Detroit Dies	6V71	1988	ULSD	180	1858	0.38
PB10	Police Boat (10)	Workboat	Port of Seatt	1	Propulsion			1987	Gasoline	100	500	0.38
D691320	Scandia	Workboat	Manson Cor	1	Propulsion	Detroit Dies	S-60	2003	ULSD	400	1294	0.38
D691320	Scandia	Workboat	Manson Cor	2	Propulsion	Caterpillar	3406	1985	ULSD	420	2115	0.38
D691320	Scandia	Workboat	Manson Cor	3	auxiliary	Caterpillar	3306	1977	ULSD	230	62	0.32
D691320	Scandia	Workboat	Manson Cor	4	auxiliary	Detroit Dies	Apr-71	1979	ULSD	140	154	0.32
D691320	Scandia	Workboat	Manson Cor	5	auxiliary	Detroit Dies	Apr-71	1979	ULSD	140	189	0.32
537094	Sioux Arrow	Workboat	Arrow Laun	1	Propulsion	Detroit	8V71	1971	ULSD	600	1000	0.38
537094	Sioux Arrow	Workboat	Arrow Laun	2	Propulsion	Detroit	8V71	1971	ULSD	600	1000	0.38
SB97	Small Boat (97)	Workboat	Port of Seatt	1	Propulsion			1979	Gasoline	50	500	0.38
1131954	Southman	Workboat	Manson Cor	1	Propulsion	Caterpillar	3408	1989	ULSD	402	2226	0.38
1131954	Southman	Workboat	Manson Cor	2	Propulsion	Detroit Dies	Jun-71		ULSD	180	25	0.38
1177801	Viking	Workboat	Manson Cor	1	Propulsion	Caterpillar	C15	2006	ULSD	619	338	0.38
1177801	Viking	Workboat	Manson Cor	2	Propulsion	Caterpillar	3512	1983	ULSD	1200	7360	0.38
1177801	Viking	Workboat	Manson Cor	3	auxiliary	Caterpillar	C9	2005	ULSD	275	1125	0.32
1177801	Viking	Workboat	Manson Cor	4	auxiliary	Detroit Dies	8V71	1976	ULSD	318	301	0.32
1177801	Viking	Workboat	Manson Cor	5	auxiliary	Detroit Dies	8V71	1976	ULSD	318	0	0.32
1177801	Viking	Workboat	Manson Cor	6	auxiliary	Caterpillar	3306	2000	ULSD	230	0	0.32
CG747195	Warrior	Workboat	Arrow Laun	1	Propulsion	Detroit	8V71	1971	ULSD	330	75	0.38
CG747195	Warrior	Workboat	Arrow Laun	2	Propulsion	Detroit	8V71	1971	ULSD	330	75	0.38
W1	Workboat #1	Workboat	Port of Seatt	1	Propulsion			1980	Gasoline	50	500	0.38
W2	Workboat #2	Workboat	Port of Seatt	1	Propulsion			1983	Gasoline	50	500	0.38
W3	Workboat #3	Workboat	Port of Seatt	1	Propulsion			1983	Gasoline	50	500	0.38
W100	Workboat (100)	Workboat	Port of Seatt	1	Propulsion			1983	Gasoline	50	500	0.38

**Puget Sound Emissions Inventory**  
**Commercial Harbor Vessel Data**

Vessel ID	Vessel Name	Type	Owner Name	Engine				Engine			Annual	
				ID User	Type	MFR	Model	Year	Fuel	HP	Hours	Load
W1251	Workboat (1251)	Workboat	Port of Seatt	1	Propulsion			2001	Gasoline	50	500	0.38
W1260	Workboat (1260)	Workboat	Port of Seatt	1	Propulsion	Honda		1985	Gasoline	45	500	0.38
ZB12	Zodiac Boat (12)	Workboat	Port of Seatt	1	Propulsion	Honda		1995	Gasoline	50	500	0.38



**APPENDIX B - SUPPORTING DATA**

**CARGO HANDLING EQUIPMENT DATA**





**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, DOC Installed (y or n), Year DOC Installed)		On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	DOC Installed				
PSA010	Anacortes	Forklift	8	Clark		Continental	4 cyl	1970	50	32	Propane	na	Propane	n	na	n	na	1
PSA010	Anacortes	Forklift	10	Clark	2.5 ton		4 cyl	1963	50	18	Propane	na	Propane	n	na	n	na	1
PSA010	Anacortes	Forklift	11F		9 ton	Ford	351	1977	200	71	Propane	na	Propane	n	na	n	na	1
PSA010	Anacortes	Forklift	12F	CAT	9 ton	CAT	3206	1982	200	5	Diesel	na	ULSD	n	na	n	na	1
PSA010	Anacortes	Forklift	9A	Komatsu	5 ton	Nissan	6 cyl	1995	100	48	Propane	na	Propane	n	na	n	na	1
PSA010	Anacortes	Skid Steer Loader	ST1	Bobcat		Kubota	4 cyl	1991	150	22	Diesel	na	ULSD	n	na	n	na	1
PSE020	Everett	Loader	515	Caterpillar	966	Caterpillar	3306	1973	177	100	Diesel	300	ULSD	n	na	n	na	1
PSE020	Everett	Loader	524	Wagner	L80	Cummins	335	1989	335	200	Diesel	1000	ULSD	n	na	n	na	1
PSE020	Everett	Loader	527	Dart	kw80	Cummins	335	1976	335	200	Diesel	1000	ULSD	n	na	n	na	1
PSE020	Everett	Loader	531	Caterpillar	966	Caterpillar	3306	1973	177	1,200	Diesel	4500	ULSD	n	na	n	na	1
PSE020	Everett	Loader	545	Caterpillar	980c	Caterpillar	3306	1986	177	100	Diesel	300	ULSD	n	na	n	na	1
PSE020	Everett	Loader	549	Caterpillar	988b	Caterpillar	3408	1987	400	1,500	Diesel	9000	ULSD	n	na	n	na	1
PSE020	Everett	Loader	570	Caterpillar	988b	Caterpillar	3408	1991	400	2,000	Diesel	12000	ULSD	n	na	n	na	1
PSE020	Everett	Loader	578	Caterpillar	988b	Caterpillar	3408	1985	400	500	Diesel	3000	ULSD	n	na	n	na	1
PSE020	Everett	Log shovel	580	Caterpillar	330ll	Caterpillar	3306	1994	177	1,000	Diesel	3000	ULSD	n	na	n	na	1
PSE020	Everett	Log shovel	593	Caterpillar	330b-1	Caterpillar	3306	2001	177	1,500	Diesel	4500	ULSD	n	na	n	na	1
PSE010	Everett	Backhoe	57	Ford	455C	KF21Ford	201 C.I.	3C1988	63	300	Diesel	300	ULSD	n	na	n	na	1
PSE010	Everett	Compressor	75	Ingersol-Ra	100	White	G1600X11	1978	50	250	Gasoline	150	Gasoline	n	na	n	na	1
PSE010	Everett	Crane	71	Grove	RT59S	Detroit	4-71 NA	1968	160	150	Diesel	200	ULSD	n	na	n	na	1
PSE010	Everett	Crane	C1	Gottwald	350	Cummins	12 cyl	2000	250	280	Diesel	na	ULSD	n	na	n	na	1
PSE010	Everett	Crane	CR1	Manitowoc	Crane	Cummins	N14	1992	330	150	Diesel	300	ULSD	n	na	n	na	1
PSE010	Everett	Forklift	7	Towmotor	V160	Caterpillar	3208 NA,	1974	175	250	Diesel	250	ULSD	n	na	n	na	1
PSE010	Everett	Forklift	9	Towmotor	V160	Caterpillar	3208, 8 ton	1974	175	250	Diesel	250	ULSD	n	na	n	na	1
PSE010	Everett	Forklift	12	Hyster	H130F	Perkins	4.236 NA,	1976	85	300	Diesel	300	ULSD	n	na	n	na	1
PSE010	Everett	Forklift	18	Hyster	H130F	Perkins	4.236 NA,	1976	85	300	Diesel	300	ULSD	n	na	n	na	1
PSE010	Everett	Forklift	21	Clark	4024			1953			Gasoline	na	Gasoline	n	na	n	na	1
PSE010	Everett	Forklift	22	Clark	4024			1953			Gasoline	na	Gasoline	n	na	n	na	1
PSE010	Everett	Forklift	26	Yale	GP3180	MOSG					Gasoline	na	Gasoline	n	na	n	na	1
PSE010	Everett	Forklift	27	Hyster	H120C	Continental	F245, 6 ton	1968	76	200	Gasoline	200	Gasoline	n	na	n	na	1
PSE010	Everett	Forklift	28	Hyster	H120C	Continental	F245, 6 ton	1969	76	200	Gasoline	200	Gasoline	n	na	n	na	1
PSE010	Everett	Forklift	45	Mitsubishi	FGC20	Mitsubishi	2.0 Litre	4C1982	93	300	Propane	300	Propane	n	na	n	na	1
PSE010	Everett	Forklift	46	Mitsubishi	FGC20	Mitsubishi	2.0 Litre	4C1982	93	300	Propane	300	Propane	n	na	n	na	1
PSE010	Everett	Forklift	47	Mitsubishi	FGC20	Mitsubishi	2.0 Litre	4C1982	93	300	Propane	300	Propane	n	na	n	na	1
PSE010	Everett	Forklift	48	Mitsubishi	FGC20	Mitsubishi	2.0 Litre	4C1982	93	300	Propane	300	Propane	n	na	n	na	1
PSE010	Everett	Forklift	49	Mitsubishi	FGC25	Mitsubishi	2.0 Litre	4C1982	93	300	Propane	300	Propane	n	na	n	na	1
PSE010	Everett	Forklift	60	Nissan	CYMO2L2:na		2 ton	1994	0	0	Electric	na	Electric	n	na	n	na	0
PSE010	Everett	Forklift	61	Nissan	CYMO2L2:na		2 ton	1994	0	0	Electric	na	Electric	n	na	n	na	0
PSE010	Everett	Forklift	62	Nissan	CYMO2L2:na		2 ton	1994	0	0	Electric	na	Electric	n	na	n	na	0
PSE010	Everett	Forklift	63	Nissan	CYMO2L2:na		2 ton	1994	0	0	Electric	na	Electric	n	na	n	na	0
PSE010	Everett	Forklift	64	Nissan	CYMO2L2:na		2 ton	1994	0	0	Electric	na	Electric	n	na	n	na	0
PSE010	Everett	Forklift	65	Nissan	CYMO2L2:na		2 ton	1994	0	0	Electric	na	Electric	n	na	n	na	0
PSE010	Everett	Forklift	4F	Towmotor	V160	Caterpillar	3208 NA,	1974	175	250	Gasoline	250	Gasoline	n	na	n	na	1
PSE010	Everett	Generator	85	Onan	85 KW	Cummins	6CT 8.3	2000	210	50	Diesel	50	ULSD	n	na	n	na	1
PSE010	Everett	Generator	G1	DMT	Generator	John Deere	4039	1992	71	150	Diesel	150	ULSD	n	na	n	na	1
PSE010	Everett	Generator	G2	Kohler	400 KW	Volvo Pent:	12.13 Litre	2006	602		Diesel	na	ULSD	n	na	n	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)	DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines	
PSE010	Everett	Light tower	76	Winco	LSC4	Kubota	D 850	1991	25	300	Diesel	150	ULSD	n	na	n	n	na	1	
PSE010	Everett	Loader	29	Bobcat	600LP	Wisconsin	VF4D	1968	25	100	Propane	75	Propane	n	na	n	n	na	1	
PSE010	Everett	Loader	35	Bobcat	600LP						Diesel	na	ULSD	n	na	n	n	na	1	
PSE010	Everett	Loader	11L	Caterpillar	930	Caterpillar	3304	1974	101	200	Diesel	200	ULSD	n	na	n	n	na	1	
PSE010	Everett	Loader	32L	Caterpillar	930	Caterpillar	41K1189	1970	101	200	Diesel	200	ULSD	n	na	n	n	na	1	
PSE010	Everett	Manlift	72	Genie	S-65-2WD	Ford	2.5 Litre 4C	1998	82	300	Gasoline	300	Gasoline	n	na	n	n	na	1	
PSE010	Everett	Sweeper	73	Power Boss	SW90HD	Kubota	V-1702B	1987	36	300	Diesel	150	ULSD	n	na	n	n	na	1	
PSE010	Everett	Truck	56	Ford	F800 Boom	Ford	MFMO 7.8	1992	210	350	Diesel	350	ULSD	n	na	n	n	na	1	
PSE010	Everett	Welder	77	Lincoln	F245	Continental	F 245	1968	76	250	Gasoline	200	Gasoline	n	na	n	n	na	1	
PSE030	Everett	Forklift	151	Clark	C500Y155E	353 Detroit	7 ton	1984	75	92	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Forklift	160	Clark	C500Y155C	353 Detroit	7 ton	1990	75	32	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Forklift	192	Taylor	TE300S	Detroit	15 ton	1984	150	100	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Forklift	193	Taylor	TE300S	Detroit	15 ton	1984	150	175	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Forklift	921	Clark	C500Y100	Perkins	5 ton	1984	75	92	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Forklift	157E	Clark	C500Y155C	353 Detroit	7 ton	1984	75	168	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Top Handler	T29	Caterpillar	V925	3208Cat		1993	200	25	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Yard Tractor	T41	Ottawa	YT50	3208Cat		1986	175	225	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Yard Tractor	T42	Ottawa	YT50	3208Cat		1986	175	225	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Yard Tractor	T44	Ottawa	YT50	3208Cat		1986	175	225	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Yard Tractor	T45	Ottawa	YT50	3208Cat		1986	175	350	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Yard Tractor	T46	Ottawa	YT50	3208Cat		1986	175	350	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Yard Tractor	T48	Ottawa	YT50	3208Cat		1986	175	225	Diesel	na	ULSD	n	na	n	n	na	1	
PSE030	Everett	Yard Tractor	T56	Ottawa	YT50	3208Cat		1993	175	225	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Forklift	F1	Hyster	3 ton	Perkins		1990	50	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Forklift	F2	Hyster	7 ton			1990	75	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Forklift	F3	Hyster	10 ton		Cat D320	1975	150	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Forklift	F4	Hyster	10 ton		Cat D320	1975	150	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Forklift	F5	Mitsubishi	15 ton			1995	150	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Forklift	F6	Taylor	15 ton	Cummins	155hp	1995	150	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Reach stacker	10001	Hyster		Cummins		1995	200	400	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Reach stacker	RS1	Taylor				1995	200	400	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Yard Tractor	11YT	Sisu				1995	175	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Yard Tractor	B-54	Ottawa	YT50	Caterpillar	3208	1995	175	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Yard Tractor	H-962	AGM		Caterpillar	3208	1984	175	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSE040	Everett	Yard Tractor	H-963	AGM		Caterpillar	3208	1984	175	200	Diesel	na	ULSD	n	na	n	n	na	1	
PSO010	Olympia	Forklift	5918	Komatsu	FD80T7	Komatsu	6 cyl	2001	104	54	Diesel	38	ULSD	n	na	n	n	na	1	
PSO010	Olympia	Forklift	5919	Komatsu	FD80T7	Komatsu	6 cyl	2001	104	56	Diesel	47	ULSD	n	na	n	n	na	1	
PSO010	Olympia	Forklift	5924	Kalmar	DCD1366	Volvo	6 cyl	2001	159	85	Diesel	106	ULSD	n	na	n	n	na	1	
PSO010	Olympia	Loader	6013	Komatsu	WA600-1L	Komatsu	6 cyl	1990	415	738	Diesel	7054	ULSD	n	na	n	n	na	1	
PSO010	Olympia	Loader	6014	Komatsu	WA600-1L	Komatsu	6 cyl	1990	415	512	Diesel	5074	ULSD	n	na	n	n	na	1	
PSO010	Olympia	Loader	6015	Komatsu	WA600-1L	Komatsu	6 cyl	1990	415	254	Diesel	2310	ULSD	<b>YES</b>		2007	n	n	na	1
PSO010	Olympia	Loader	6016	Komatsu	WA600-3L	Cummins	6 cyl	2000	415	56	Diesel	2267	ULSD	n	na	n	n	na	1	
PSO010	Olympia	Loader	6017	Komatsu	WA600-3L	Cummins	6 cyl	2000	415	60	Diesel	4101	ULSD	n	na	n	n	na	1	
PSO010	Olympia	Loader	6018	Komatsu	WA600-3L	Cummins	6 cyl	2000	415	116	Diesel	2436	ULSD	n	na	n	n	na	1	
PSO010	Olympia	Loader	6111L	Wagner	Lumberjack International	DT466		1985	220	0	Diesel	0	ULSD	n	na	n	n	na	1	

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Used		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
												(gallons)	(ULSD)						
PSO010	Olympia	Loader	6112L	Komatsu	Bucket Load	Komatsu	SA6D110	1989	197	245	Diesel	253	ULSD	n	na	n	n	na	1
PSO010	Olympia	Manlift	5819	Genie	S60	Ford	LRG-423	1997	87	71	Propane	na	Propane	n	na	n	n	na	1
PSO010	Olympia	Sweeper	5769	Elgin	Crosswind	Nissan	6 cyl	2010	230	531	Diesel	538	ULSD	n	na	Y	n	na	1
PSO010	Olympia	Sweeper	5770	Athey	Top Gun	International	DT466	1999	210	8	Diesel	0	ULSD	n	na	Y	n	na	1
PSO010	Olympia	Sweeper	5818	Powerboss	SW9XT	Nissan	2.5 LITER	2002	130	2	Propane	na	Propane	n	na	Y	n	na	1
PSS020	Seattle	Crane	CT1				5.9L	1992	130	60	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Crane	CT2				3.9L	1998	130	510	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Crane	CT3				5.9	1998	130	510	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Crane	CT4				3.9	1998	130	270	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Crane	CT5				5.9	1998	130	540	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Crane	CT6				5.9	1998	130	720	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Crane	CT7				5.9	1998	130	720	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Crane	CT8				5.9	1998	130	540	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT10						0	324	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Forklift	CT11						0	240	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Forklift	CT12						0	240	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Forklift	CT13						0	240	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Forklift	CT14				5 T	1991	85	60	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT15				5 T	1991	85	60	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT16				10-15 T	1995	150	20	Diesel	na	ULSD	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT17				5 T	1987	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT18				5 T	1987	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT19				5 T	1987	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT20				5 T	1987	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT21				4 T	1989	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT22				4 T	1993	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT23				4 T	1993	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT24				4 T	1993	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT25				4 T	1993	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT26				4 T	1993	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT27				4 T	1993	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT28				4 T	1996	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT29				4 T	2005	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT30				4 T	2005	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT31				4 T	2005	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT32				4 T	2005	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT33				4 T	2005	85	480	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT34				4 T	2005	85	610	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT35				4 T	2005	85	610	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT36				4 T	2005	85	610	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT37				4 T	2005	85	610	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT38				4 T	2005	85	610	Propane	na	Propane	n	na	n	n	na	1
PSS020	Seattle	Forklift	CT9						0	324	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT39						0	610	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT40						0	610	Electric	na	Electric	n	na	n	n	na	0

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)	DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
PSS020	Seattle	Pallet Jacks	CT41					0	610	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT42					0	610	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT43					0	610	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT44					0	610	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT45					0	610	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT46					0	610	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT47					0	610	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT48					0	610	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT49					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT50					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT51					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT52					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT53					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT54					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT55					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT56					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT57					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT58					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT59					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS020	Seattle	Pallet Jacks	CT60					0	480	Electric	na	Electric	n	na	n	n	na	0
PSS040	Seattle	Forklift	FS86				1995	100	1,000	Diesel	na	ULSD	n	na	n	n	na	1
PSS010	Seattle	Car Loader	LDR1253	Daewoo			2001	150	365	Diesel	na	ULSD	n	na	n	n	na	1
PSS010	Seattle	Car Loader	LDR308	Chalmers			1981	150	22	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Car Loader	LDR310	Chalmers			1981	150	30	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Car Loader	LDR317	Chalmers			1981	150	14	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Car Loader	LDR323	Mitsubishi			1988	150	25	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Car Loader	LDR329	Mitsubishi			1989	150	25	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Car Loader	LDR332	Clark			1989	150	121	Gasoline	na	Gasoline	n	na	n	n	na	1
PSS010	Seattle	Forklift	ELT151	Crown			1975	0	24	Electric	na	Electric	n	na	n	n	na	0
PSS010	Seattle	Forklift	ELT169	Clark			1978	0	25	Electric	na	Electric	n	na	n	n	na	0
PSS010	Seattle	Forklift	GLT201				1988	100	69	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT203				1988	100	200	Gasoline	na	Gasoline	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT205				1988	100	222	Gasoline	na	Gasoline	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT208				1989	100	46	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT216				1989	100	5	Gasoline	na	Gasoline	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT217				1990	100	48	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT218				1990	100	35	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT221				1990	100	100	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT222				1990	100	200	Gasoline	na	Gasoline	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT273				1976	100	340	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT275				1993	100	110	Gasoline	na	Gasoline	n	na	n	n	na	1
PSS010	Seattle	Forklift	GLT276				1994	100	120	Propane	na	Propane	n	na	n	n	na	1
PSS010	Seattle	Forklift	HLT 1	Komatsu	16500#		1992	200	130	Diesel	na	ULSD	n	na	n	n	na	1
PSS010	Seattle	Forklift	HLT 12	Clark	30000#		1975	200	259	Diesel	na	ULSD	n	na	n	n	na	1
PSS010	Seattle	Forklift	HLT 13	Clark			1975	200	70	Diesel	na	ULSD	n	na	n	n	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	DOC Installed (y or n)						
PSS010	Seattle	Forklift	HLT 14	Clark	33000#			1975	200	47	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Forklift	HLT 16	Clark	30000#			1974	200	34	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Forklift	HLT 17	Hyster	40000#			1961	200	37	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Forklift	HLT 18	Clark	30000#			1973	200	20	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Forklift	HLT 25	Towmotor				1969	200	146	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Forklift	HLT 33	Clark				1977	200	72	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Forklift	HLT 34	Clark	33000#			1977	200	53	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Generator	GEN152	Taylor				2001	210	44	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Generator	GEN155	Taylor				2001	364	102	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Generator	GEN157	Caterpillar				2003	287	28	Diesel	na	ULSD	n	na	n	n	na	1	
PSS010	Seattle	Generator	GEN160	Honda				2005	5	5	Gasoline	na	Gasoline	n	na	n	n	na	1	
PSS010	Seattle	Generator	GEN162						20	5	Gasoline	na	Gasoline	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLC3006			Caterpillar	3208	1995	125		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLC3007			Caterpillar	3208	1995	125		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLH1001			Perkins	2158-2100	2005	215		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLH1002			Perkins	2158-2100	2005	215		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLH1003			Perkins	4.5	2005	215		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLH1005			Perkins	4.5	2005	215		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLH3602			Perkins	PDX4021	1995	120		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLH3603			Perkins	PDX4021	1995	120		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLH6215			Cummins	8.3	1995	215		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLT1502			Cummins	QSB6.7	2008	200		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLT3005			Cummins	6BT5.9-C	1993	135		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLT8018			Cummins	QSM-11	2006	335		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLT8019			Cummins	QSM-11	2007	335		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLT8021			Cummins	QSM-11	2007	335		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLT9211			Cummins	QSM-11	2006	335		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Forklift	FLT9214			Cummins	QSM-11	2008	335		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Reach Stacker	RS-01			Cummins	M11	2002	330		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Reach Stacker	RS-02			Cummins	QSM-11	2008	350		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Yard Tractor	YH103			Caterpillar	3208	1974	235		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Yard Tractor	YH105			Cummins	ISC-225	1999	225		Diesel	na	ULSD	n	na	n	n	na	1	
PSS030	Seattle	Yard Tractor	YH106			Cummins	ISC-225	1999	225		Diesel	na	ULSD	n	na	n	n	na	1	
PSS050	Seattle	Container Crane	8	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Container Crane	9	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Container Crane	10	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Container Crane	11	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Container Crane	1677	MHI	50LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Container Crane	1678	MHI	50LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Container Crane	1679	MHI	50LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Container Crane	99980	IHI	40LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Container Crane	99981	IHI	40LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Container Crane	100000	IHI	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0	
PSS050	Seattle	Forklift	8911	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1	
PSS050	Seattle	Forklift	8912	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1	

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)	DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
PSS050	Seattle	Forklift	8914	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	8917	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	8918	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	8919	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	8920	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	8921	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	8922	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	16900	Hyster	155XL2	Perkins		2001	150		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	20900	Hyster	H200E	Perkins		2000	185		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	20920	Hyster	H190XL	Perkins		2000	185		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	30262	Taylor	TXE 300	Cummins	B 5.9	2006	200		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	30918	Taylor	T 300M	Cummins	B 5.9	2005	200		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	30919	Taylor	T 300S	Cummins	B 5.9	2006	200		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Forklift	POS 26	Clark	CY625	GMC		1982	150		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	RTG	4	ZPMC		Cummins	KTA 19 G3	1995	620		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	RTG	5	ZPMC		Cummins	KTA 19 G3	1995	620		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	RTG	30	ZPMC		Cat	3412E	2005	947		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	RTG	31	ZPMC		Cat	3412E	2005	947		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	RTG	32	ZPMC		Cat	3412E	2005	947		Diesel	na	ULSD	n	na	n	<b>Super Cap</b>	<b>2005</b>	1
PSS050	Seattle	RTG	33	ZPMC		Cat	3412E	2005	947		Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Side Handler	15902	Taylor	TECSP 157	Cummins	B 5.9	2001	200	1,364	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Side Handler	15903	Taylor	TECSP 157	Cummins	QSB 5.9	2005	205	1,826	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Side Handler	15904	Taylor	TECSP 157	Cummins	QSB 5.9	2005	205	882	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Side Handler	15905	Taylor	TECSP 157	Cummins	QSB 5.9	2005	205	1,496	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Side Handler	15906	Taylor	TECSP 157	Cummins	QSB 5.9	2006	205	1,727	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80920	Taylor	THDC 955	Cummins	QSM 11	2003	335	1,624	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80921	Taylor	THDC 955	Cummins	QSM 11	2004	335	1,431	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80922	Taylor	THDC 955	Cummins	QSM 11	2004	335	1,282	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80923	Taylor	THDC 955	Cummins	QSM 11	2004	335	1,638	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80925	Taylor	THDC 955	Cummins	QSM 11	2004	335	1,469	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80928	Taylor	THDC 955	Cummins	QSM 11	2005	335	1,603	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80929	Taylor	THDC 955	Cummins	QSM 11	2005	335	1,782	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80930	Taylor	THDC 955	Cummins	QSM 11	2005	335	1,922	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80931	Taylor	THDC 955	Cummins	QSM 11	2005	335	2,119	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80933	Taylor	THDC 955	Cummins	QSM 11	2005	335	2,111	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80934	Taylor	THDC 955	Cummins	QSM 11	2005	335	1,723	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80935	Taylor	THDC 955	Cummins	QSM 11	2005	335	1,596	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80936	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,078	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80937	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,367	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80938	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,038	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80939	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,035	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80940	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,001	Diesel	na	ULSD	n	na	n	n	na	1
PSS050	Seattle	Top Handler	80941	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,838	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2010	1
PSS050	Seattle	Top Handler	80942	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,893	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2010	1
PSS050	Seattle	Top Handler	80943	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,938	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2010	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	Engine HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	Emulsified Fuel						
PSS050	Seattle	Top Handler	80944	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,984	Diesel	na	ULSD	n	na	n	n	DPF	2010	1
PSS050	Seattle	Top Handler	80945	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,670	Diesel	na	ULSD	n	na	n	n	DPF	2010	1
PSS050	Seattle	Top Handler	80946	Taylor	THDC 955	Cummins	QSM 11	2006	335	3,190	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS050	Seattle	Top Handler	80947	Taylor	THDC 955	Cummins	QSM 11	2006	335	2,977	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS050	Seattle	Top Handler	80948	Taylor	THDC 955	Cummins	QSM 11	2007	335	2,985	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS050	Seattle	Top Handler	80949	Taylor	THDC 975	Cummins	QSM 11	2007	335	2,756	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS050	Seattle	Top Handler	80950	Taylor	THDC 975	Cummins	QSM 11	2007	335	2,190	Diesel	na	ULSD	YES	2010	n	n	na	na	1
PSS050	Seattle	Top Handler	80951	Taylor	THDC 975	Cummins	QSM 11	2007	335	2,181	Diesel	na	ULSD	YES	2010	n	n	na	na	1
PSS050	Seattle	Top Handler	80952	Taylor	THDC 975	Cummins	QSM 11	2007	335	2,325	Diesel	na	ULSD	YES	2010	n	n	na	na	1
PSS050	Seattle	Top Handler	80953	Taylor	THDC 975	Cummins	QSM 11	2007	335	1,806	Diesel	na	ULSD	YES	2010	n	n	na	na	1
PSS050	Seattle	Top Handler	80954	Taylor	THDC 975	Cummins	QSM 11	2007	335	2,084	Diesel	na	ULSD	YES	2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 800	Capacity	TJ 7000	Cummins	6BT	2005	173	1,657	Diesel	na	ULSD	YES	8/5/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 801	Capacity	TJ 7000	Cummins	6BT	2005	173	1,514	Diesel	na	ULSD	YES	8/24/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 802	Capacity	TJ 7000	Cummins	6BT	2005	173	1,825	Diesel	na	ULSD	YES	8/23/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 803	Capacity	TJ 7000	Cummins	6BT	2005	173	2,052	Diesel	na	ULSD	YES	8/5/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 804	Capacity	TJ 7000	Cummins	6BT	2005	173	2,192	Diesel	na	ULSD	YES	8/24/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 805	Capacity	TJ 7000	Cummins	6BT	2005	173	1,614	Diesel	na	ULSD	YES	8/25/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 806	Capacity	TJ 7000	Cummins	6BT	2005	173	2,218	Diesel	na	ULSD	YES	8/30/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 807	Capacity	TJ 7000	Cummins	6BT	2005	173	2,007	Diesel	na	ULSD	YES	9/1/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 808	Capacity	TJ 7000	Cummins	6BT	2005	173	2,162	Diesel	na	ULSD	YES	8/25/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 809	Capacity	TJ 7000	Cummins	6BT	2005	173	1,654	Diesel	na	ULSD	YES	8/26/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 810	Capacity	TJ 7000	Cummins	6BT	2005	173	1,818	Diesel	na	ULSD	YES	8/27/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 811	Capacity	TJ 7000	Cummins	6BT	2005	173	1,842	Diesel	na	ULSD	YES	9/1/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 812	Capacity	TJ 7000	Cummins	6BT	2005	173	2,100	Diesel	na	ULSD	YES	8/26/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 813	Capacity	TJ 7000	Cummins	6BT	2005	173	2,063	Diesel	na	ULSD	YES	5/19/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 814	Capacity	TJ 7000	Cummins	6BT	2005	173	2,308	Diesel	na	ULSD	YES	5/20/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 815	Capacity	TJ 7000	Cummins	6BT	2005	173	2,000	Diesel	na	ULSD	YES	5/20/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 818	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	2,687	Diesel	na	ULSD	YES	5/20/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 819	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	2,638	Diesel	na	ULSD	YES	5/21/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 820	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	2,717	Diesel	na	ULSD	YES	5/20/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 821	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	1,780	Diesel	na	ULSD	YES	7/27/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 822	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	2,543	Diesel	na	ULSD	YES	5/13/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 823	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	2,757	Diesel	na	ULSD	YES	5/20/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 824	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	3,161	Diesel	na	ULSD	YES	5/13/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 825	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	3,380	Diesel	na	ULSD	YES	5/13/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 826	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	2,806	Diesel	na	ULSD	YES	5/13/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 827	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	2,996	Diesel	na	ULSD	YES	5/22/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 828	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	3,019	Diesel	na	ULSD	YES	5/13/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 829	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	3,022	Diesel	na	ULSD	YES	5/13/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 830	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	3,300	Diesel	na	ULSD	YES	7/20/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 831	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	235	Diesel	na	ULSD	YES	7/21/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 832	Capacity	TJ 7000	Cummins	QSB 5.9	2007	173	3,574	Diesel	na	ULSD	YES	5/17/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 833	Capacity	TJ 7000	Cummins	QSB 5.9	2008	173	3,192	Diesel	na	ULSD	YES	5/13/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 834	Capacity	TJ 7000	Cummins	QSB 5.9	2008	173	3,714	Diesel	na	ULSD	YES	5/13/2010	n	n	na	na	1
PSS050	Seattle	Yard Tractor	H 835	Capacity	TJ 7000	Cummins	QSB 5.9	2008	173	3,614	Diesel	na	ULSD	YES	5/17/2010	n	n	na	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)	DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
PSS050	Seattle	Yard Tractor	H 836	Capacity	TJ 7000	Cummins	QSB 5.9	2008	173	3,791	Diesel	na	ULSD	YES	7/26/2010	n	n	na	1
PSS050	Seattle	Yard Tractor	H 837	Capacity	TJ 7000	Cummins	QSB 5.9	2008	173	3,998	Diesel	na	ULSD	YES	7/22/2010	n	n	na	1
PSS050	Seattle	Yard Tractor	H 838	Capacity	TJ 7000	Cummins	QSB 5.9	2008	173	3,396	Diesel	na	ULSD	YES	7/22/2010	n	n	na	1
PSS050	Seattle	Yard Tractor	H 839	Capacity	TJ 7000	Cummins	QSB 5.9	2008	173	3,527	Diesel	na	ULSD	YES	7/22/2010	n	n	na	1
PSS050	Seattle	Yard Tractor	H 929	Capacity	TJ 7000	Cummins	6BT	2005	173	1,329	Diesel	na	ULSD	YES	7/1/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 930	Capacity	TJ 7000	Cummins	6BT	2005	173	1,699	Diesel	na	ULSD	YES	12/17/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 931	Capacity	TJ 7000	Cummins	6BT	2005	173	1,832	Diesel	na	ULSD	YES	10/18/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 932	Capacity	TJ 7000	Cummins	6BT	2005	173	1,272	Diesel	na	ULSD	YES	7/14/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 933	Capacity	TJ 7000	Cummins	6BT	2005	173	1,791	Diesel	na	ULSD	YES	7/2/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 934	Capacity	TJ 7000	Cummins	6BT	2005	173	1,466	Diesel	na	ULSD	YES	12/18/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 935	Capacity	TJ 7000	Cummins	6BT	2005	173	860	Diesel	na	ULSD	YES	7/14/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 936	Capacity	TJ 7000	Cummins	6BT	2005	173	1,494	Diesel	na	ULSD	YES	7/1/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 937	Capacity	TJ 7000	Cummins	6BT	2005	173	1,577	Diesel	na	ULSD	YES	12/17/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 938	Capacity	TJ 7000	Cummins	6BT	2005	173	2,041	Diesel	na	ULSD	YES	7/14/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 939	Capacity	TJ 7000	Cummins	6BT	2005	173	1,139	Diesel	na	ULSD	YES	10/2/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 940	Capacity	TJ 7000	Cummins	6BT	2005	173	1,788	Diesel	na	ULSD	YES	10/1/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 941	Capacity	TJ 7000	Cummins	6BT	2005	173	1,181	Diesel	na	ULSD	YES	10/1/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 942	Capacity	TJ 7000	Cummins	6BT	2005	173	1,175	Diesel	na	ULSD	YES	7/2/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 943	Capacity	TJ 7000	Cummins	6BT	2005	173	1,659	Diesel	na	ULSD	YES	7/11/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 944	Capacity	TJ 7000	Cummins	6BT	2005	173	1,662	Diesel	na	ULSD	YES	12/12/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 945	Capacity	TJ 7000	Cummins	6BT	2005	173	1,752	Diesel	na	ULSD	YES	10/1/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 946	Capacity	TJ 7000	Cummins	6BT	2005	173	1,412	Diesel	na	ULSD	YES	7/15/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 947	Capacity	TJ 7000	Cummins	6BT	2005	173	1,872	Diesel	na	ULSD	YES	9/30/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 948	Capacity	TJ 7000	Cummins	6BT	2005	173	1,525	Diesel	na	ULSD	YES	4/5/2006	n	n	na	1
PSS050	Seattle	Yard Tractor	H 949	Capacity	TJ 7000	Cummins	6BT	2005	173	2,028	Diesel	na	ULSD	YES	10/1/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 951	Capacity	TJ 7000	Cummins	6BT	2005	173	0	Diesel	na	ULSD	YES	10/1/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 952	Capacity	TJ 7000	Cummins	6BT	2005	173	1,300	Diesel	na	ULSD	YES	12/5/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 954	Capacity	TJ 7000	Cummins	6BT	2005	173	1,548	Diesel	na	ULSD	YES	12/12/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 955	Capacity	TJ 7000	Cummins	6BT	2005	173	1,927	Diesel	na	ULSD	YES	12/5/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 956	Capacity	TJ 7000	Cummins	6BT	2005	173	1,345	Diesel	na	ULSD	YES	7/11/2005	n	n	na	1
PSS050	Seattle	Yard Tractor	H 957	Capacity	TJ 7000	Cummins	6BT	2005	173	2,019	Diesel	na	ULSD	YES	10/2/2005	n	n	na	1
PSS060	Seattle	Container Crane	5	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS060	Seattle	Container Crane	6	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS060	Seattle	Container Crane	7	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS060	Seattle	Container Crane	261	Paceco	40LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS060	Seattle	Container Crane	961	Paceco	40LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS060	Seattle	Container Crane	1260	Paceco	40LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS060	Seattle	Forklift	8913	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1
PSS060	Seattle	Forklift	8915	Mitsubishi	FD40K	Mitsubishi		2004	85		Diesel	na	ULSD	n	na	n	n	na	1
PSS060	Seattle	Forklift	36900	Hyster	H 360	Perkins		2005	190		Diesel	na	ULSD	n	na	n	n	na	1
PSS060	Seattle	Side Handler	15900	Taylor	TECSP 157	Cummins	B 5.9	2001	200	824	Diesel	na	ULSD	n	na	n	n	na	1
PSS060	Seattle	Side Handler	15901	Taylor	TECSP 157	Cummins	B 5.9	2001	200	1,095	Diesel	na	ULSD	n	na	n	n	na	1
PSS060	Seattle	Top Handler	80014	Taylor	TEC 950L	Cummins	M 11	1997	260	524	Diesel	na	ULSD	YES	2004	n	n	na	1
PSS060	Seattle	Top Handler	80232	Taylor	THDC 955	Cummins	QSM 11	2002	260	572	Diesel	na	ULSD	YES	2004	n	n	na	1
PSS060	Seattle	Top Handler	80253	Taylor	THDC 955	Cummins	QSM 11	2001	260	371	Diesel	na	ULSD	YES	2004	n	n	na	1



**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)	DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
PSS060	Seattle	Top Handler	80254	Taylor	THDC 955	Cummins	QSM 11	2001	260	495	Diesel	na	ULSD	YES	2004	n	n	na	1
PSS060	Seattle	Top Handler	80910	Taylor	TEC 950L	Cummins	L 10	1996	250	646	Diesel	na	ULSD	YES	2004	n	n	na	1
PSS060	Seattle	Top Handler	80911	Taylor	TEC 950L	Cummins	L 10	1996	250	860	Diesel	na	ULSD	YES	2004	n	n	na	1
PSS060	Seattle	Top Handler	80912	Taylor	TEC 950L	Cummins	L 10	1996	250	663	Diesel	na	ULSD	YES	2004	n	n	na	1
PSS060	Seattle	Top Handler	80924	Taylor	THDC 955	Cummins	QSM 11	2004	335	2,196	Diesel	na	ULSD	n	na	n	n	na	1
PSS060	Seattle	Top Handler	80926	Taylor	THDC 955	Cummins	QSM 11	2004	335	2,343	Diesel	na	ULSD	n	na	n	n	na	1
PSS060	Seattle	Top Handler	80927	Taylor	THDC 955	Cummins	QSM 11	2005	335	2,301	Diesel	na	ULSD	n	na	n	n	na	1
PSS060	Seattle	Top Handler	80957	Taylor	TEC 950L	Cummins	M 11	1997	260	744	Diesel	na	ULSD	YES	2008	n	n	na	1
PSS060	Seattle	Yard Tractor	H 900	Capacity	TJ 7000	Cummins	6BT	2002	174	780	Diesel	na	ULSD	YES	7/22/2005	n	n	na	1
PSS060	Seattle	Yard Tractor	H 901	Capacity	TJ 7000	Cummins	6BT	2002	174	760	Diesel	na	ULSD	YES	5/10/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 902	Capacity	TJ 7000	Cummins	6BT	2002	174	671	Diesel	na	ULSD	YES	5/10/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 903	Capacity	TJ 7000	Cummins	6BT	2002	174	719	Diesel	na	ULSD	YES	6/9/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 904	Capacity	TJ 7000	Cummins	6BT	2002	174	456	Diesel	na	ULSD	YES	5/11/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 905	Capacity	TJ 7000	Cummins	6BT	2002	174	794	Diesel	na	ULSD	YES	6/4/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 906	Capacity	TJ 7000	Cummins	6BT	2002	174	948	Diesel	na	ULSD	YES	6/22/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 907	Capacity	TJ 7000	Cummins	6BT	2002	174	869	Diesel	na	ULSD	YES	5/11/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 908	Capacity	TJ 7000	Cummins	6BT	2002	174	0	Diesel	na	ULSD	YES	6/15/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 909	Capacity	TJ 7000	Cummins	6BT	2002	174	459	Diesel	na	ULSD	YES	6/16/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 910	Capacity	TJ 7000	Cummins	6BT	2003	174	868	Diesel	na	ULSD	YES	5/21/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 911	Capacity	TJ 7000	Cummins	6BT	2003	174	560	Diesel	na	ULSD	YES	6/23/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 912	Capacity	TJ 7000	Cummins	6BT	2003	174	886	Diesel	na	ULSD	YES	5/12/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 913	Capacity	TJ 7000	Cummins	6BT	2003	174	742	Diesel	na	ULSD	YES	5/13/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 914	Capacity	TJ 7000	Cummins	6BT	2003	174	873	Diesel	na	ULSD	YES	6/22/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 915	Capacity	TJ 7000	Cummins	6BT	2003	174	712	Diesel	na	ULSD	YES	5/17/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 916	Capacity	TJ 7000	Cummins	6BT	2003	174	205	Diesel	na	ULSD	YES	6/4/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 917	Capacity	TJ 7000	Cummins	6BT	2003	174	1,065	Diesel	na	ULSD	YES	5/27/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 918	Capacity	TJ 7000	Cummins	6BT	2003	174	1,537	Diesel	na	ULSD	YES	6/16/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 920	Capacity	TJ 7000	Cummins	6BT	2004	173	1,137	Diesel	na	ULSD	YES	6/28/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 921	Capacity	TJ 7000	Cummins	6BT	2004	173	943	Diesel	na	ULSD	YES	6/7/2010	n	n	na	1
PSS060	Seattle	Yard Tractor	H 922	Capacity	TJ 7000	Cummins	6BT	2004	173	1,034	Diesel	na	ULSD	YES	10/8/2005	n	n	na	1
PSS060	Seattle	Yard Tractor	H 923	Capacity	TJ 7000	Cummins	6BT	2004	173	911	Diesel	na	ULSD	YES	12/18/2005	n	n	na	1
PSS060	Seattle	Yard Tractor	H 926	Capacity	TJ 7000	Cummins	6BT	2005	173	1,037	Diesel	na	ULSD	YES	7/1/2005	n	n	na	1
PSS060	Seattle	Yard Tractor	H 928	Capacity	TJ 7000	Cummins	6BT	2005	173	849	Diesel	na	ULSD	YES	6/30/2005	n	n	na	1
PSS070	Seattle	Container Crane	1354	Paceco	50LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS070	Seattle	Container Crane	1472	Paceco	50LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS070	Seattle	Container Crane	J101A-1	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS070	Seattle	Container Crane	J101A-2	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS070	Seattle	Container Crane	J101A-3	ZMPC	65LT			na	0	na	Electric	na	Electric	n	na	n	n	na	0
PSS070	Seattle	Forklift	1038	Hyster	H70C	Continental	227	1966	100	68	Propane	na	Propane	n	na	n	n	na	1
PSS070	Seattle	Forklift	1054	Hyster	H70C	Continental	227	1966	100	190	Propane	na	Propane	n	na	n	n	na	1
PSS070	Seattle	Forklift	1318	Toyota	FGC30	fgc35		1994	100	30	Propane	na	Propane	n	na	n	n	na	1
PSS070	Seattle	Forklift	1701	CAT	5 T	CAT	DP40K	2004	100	120	Diesel	na	ULSD	n	na	n	n	na	1
PSS070	Seattle	Forklift	1702	CAT	5 T	CAT	DP40K	2004	100	120	Diesel	na	ULSD	n	na	n	n	na	1
PSS070	Seattle	Forklift	1703	CAT	5 T	CAT	DP40K	2004	100	120	Diesel	na	ULSD	n	na	n	n	na	1
PSS070	Seattle	Forklift	1704	CAT	5 T	CAT	DP40K	2004	100	120	Diesel	na	ULSD	n	na	n	n	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	DOC Installed (y or n)						
PSS070	Seattle	Forklift	1705	CAT	5 T	CAT	DP40K	2004	100	120	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS070	Seattle	Forklift	2404	Taylor	TE360L	Cummins	5.9	1994	150	121	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS070	Seattle	Forklift	2795	Taylor	TH305L	Cummins	5.9	2005	165	2,063	Diesel	na	ULSD	YES		2008	n	n	na	1
PSS070	Seattle	Forklift	3733	Taylor	Y-52	Detroit	453	1970	175	120	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS070	Seattle	Side Handler	7212	Taylor		Cummins	5.9	1995	152	350	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS070	Seattle	Top Handler	6000	Taylor		Cummins	L-10	1995	250	1,675	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6002	Taylor		Cummins	L-10	1995	250	1,991	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6109	Taylor		Cummins	L-10	1995	250	1,715	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6110	Taylor		Cummins	L-10	1995	250	1,989	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6111	Taylor		Cummins	L-10	1995	250	1,839	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6112	Taylor		Cummins	L-10	1995	250	1,711	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6113	Taylor		Cummins	L-10	1995	250	1,700	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6114	Taylor		Cummins	L-10	1995	250	1,570	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6119	Taylor		Cummins	L-10	1995	250	2,772	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6121	Taylor		Cummins	L-10	1995	250	2,229	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6124	Taylor		Cummins	M-11	1997	250	1,999	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6126	Taylor		Cummins	M-11	1997	250	1,999	Diesel	na	ULSD	YES		2011	n	n	na	1
PSS070	Seattle	Top Handler	6130	Taylor		Cummins	M-11	1998	250	1,999	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6136	Taylor		Cummins	M-11	1997	250	2,479	Diesel	na	ULSD	YES		2011	n	n	na	1
PSS070	Seattle	Top Handler	6137	Taylor		Cummins	M-11	1998	250	3,220	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Top Handler	6176	Taylor	THDC-955	Cummins	QSM-11	2005	250	3,280	Diesel	na	ULSD	YES		2008	n	n	na	1
PSS070	Seattle	Top Handler	6177	Taylor	THDC-955	Cummins	QSM-11	2005	250	3,056	Diesel	na	ULSD	YES		2008	n	n	na	1
PSS070	Seattle	Top Handler	6178	Taylor	THDC-955	Cummins	QSM-11	2005	250	1,600	Diesel	na	ULSD	YES		2008	n	n	na	1
PSS070	Seattle	Yard Tractor	5310	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,692	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5311	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,692	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5312	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,270	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5313	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,876	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5314	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,865	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5315	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,879	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5316	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,634	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5317	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,749	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5318	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,730	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5319	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,774	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5320	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,784	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5321	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,816	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5323	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,799	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5324	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	2,128	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5325	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	2,102	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5369	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	2,011	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5370	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,991	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5371	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,991	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5372	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,991	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5373	Magnum	Sisu TT-12C	Cummins	5.9	2002	174	1,991	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5523	Magnum	Sisu TT-12C	Cummins	5.9	2005	174	1,991	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS070	Seattle	Yard Tractor	5524	Capacity	TJ7000	CAT	C-7	2005	240	2,095	Diesel	na	ULSD	n	na	YES	n	na	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	DOC Installed (y or n)						
PSS070	Seattle	Yard Tractor	5525	Capacity	TJ7000	CAT	C-7	2005	240	2,330	Diesel	na	ULSD	n	na		YES	n	na	1
PSS070	Seattle	Yard Tractor	5526	Capacity	TJ7000	CAT	C-7	2005	240	2,464	Diesel	na	ULSD	n	na		YES	n	na	1
PSS070	Seattle	Yard Tractor	5527	Capacity	TJ7000	CAT	C-7	2005	240	2,265	Diesel	na	ULSD	n	na		YES	n	na	1
PSS070	Seattle	Yard Tractor	5543	Capacity	TJ7000	CAT	C-7	2006	240	2,444	Diesel	na	ULSD	n	na		YES	n	na	1
PSS070	Seattle	Yard Tractor	5544	Capacity	TJ7000	CAT	C-7	2006	240	2,473	Diesel	na	ULSD	n	na		YES	n	na	1
PSS070	Seattle	Yard Tractor	5614	Capacity	TJ9000	Cummins	ISB07	2007	210	2,224	Diesel	na	ULSD	n	na		YES	n	na	1
PSS070	Seattle	Yard Tractor	5842	Magnum	Sisu TT-12C	Cummins	5.9	2000	174	1,600	Diesel	na	ULSD	n	na		n	n	na	1
PSS070	Seattle	Yard Tractor	5919	Magnum	Sisu TT-12C	Cummins	5.9	2005	174	1,991	Diesel	na	ULSD	YES		2007	n	n	na	1
PSS080	Seattle	Container Crane	1261	Paceco	50LT			na	0	na	Electric	na	Electric	n	na		n	n	na	0
PSS080	Seattle	Container Crane	1262	Paceco	50LT			na	0	na	Electric	na	Electric	n	na		n	n	na	0
PSS080	Seattle	Container Crane	1263	Paceco	50LT			na	0	na	Electric	na	Electric	n	na		n	n	na	0
PSS080	Seattle	Container Crane	1264	Paceco	50LT			na	0	na	Electric	na	Electric	n	na		n	n	na	0
PSS080	Seattle	Container Crane	1355	Paceco	50LT			na	0	na	Electric	na	Electric	n	na		n	n	na	0
PSS080	Seattle	Container Crane	1473	Paceco	50LT			na	0	na	Electric	na	Electric	n	na		n	n	na	0
PSS080	Seattle	Forklift	EMRF101	Taylor	47510 Lbs			1978	215	800	Diesel	na	ULSD	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF548	Mitsubishi	5000 Lbs			1982	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF565	Mitsubishi	5000 Lbs			1987	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF568	Taylor	30000 Lbs			1986	215	800	Diesel	na	ULSD	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF571	Mitsubishi	15000 Lbs			1986	125	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF573	Mitsubishi	15000 Lbs			1986	125	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF574	Clark	5000 Lbs			1990	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF575	Clark	5000 Lbs			1990	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF576	Clark	5000 Lbs			1990	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF577	Taylor	15000 Lbs			1988	125	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF578	Clark	10000 Lbs			1991	125	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF579	Clark	10000 Lbs			1991	125	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF581	Hyster	8000 Lbs			1992	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF583	Hyster	8000 Lbs			1992	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF584	Hyster	8000 Lbs			1992	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF586	Hyster	44000 Lbs			1992	215	800	Diesel	na	ULSD	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF587	Hyster	36000 Lbs			1992	215	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF588	Hyster	8000 Lbs			1993	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF589	Hyster	8000 Lbs			1993	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF616	Clark	5000 Lbs			1996	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF617	Clark	5000 Lbs			1996	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF618	Clark	5000 Lbs			1996	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF619	Clark	5000 Lbs			1996	85	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF621	Hyster	12000 Lbs			1996	125	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF622	Hyster	12000 Lbs			1996	125	800	Propane	na	Propane	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF623	Hyster	15500 Lbs			1997	125	800	Diesel	na	ULSD	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF624	Hyster	15500 Lbs			1997	125	800	Diesel	na	ULSD	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF625	Hyster	15500 Lbs			1997	125	800	Diesel	na	ULSD	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF626	Hyster	15500 Lbs			1997	125	800	Diesel	na	ULSD	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF627	Hyster	15500 Lbs			1997	125	800	Diesel	na	ULSD	n	na		n	n	na	1
PSS080	Seattle	Forklift	EMSF628	Hyster	15500 Lbs			1997	125	800	Diesel	na	ULSD	n	na		n	n	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip		Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
			ID	Manufacturer								ULSD	DOC						
PSS080	Seattle	Forklift	EMSF648	Mitsubishi	5000 Lbs		1998	0	0	Electric	na	Electric	n	na	n	n	na	na	0
PSS080	Seattle	Forklift	EMSF649	Mitsubishi	5000 Lbs		1998	0	0	Electric	na	Electric	n	na	n	n	na	na	0
PSS080	Seattle	Forklift	EMSF677	Mitsubishi	8000 Lbs		2005	85	800	Propane	na	Propane	n	na	n	n	na	na	1
PSS080	Seattle	Forklift	EMSF678	Nissan	4700 Lbs			85	800	Propane	na	Propane	n	na	n	n	na	na	1
PSS080	Seattle	Forklift	EMSF680	Nissan	5000 Lbs		2006	85	800	Propane	na	Propane	n	na	n	n	na	na	1
PSS080	Seattle	Forklift	EMSF681	Nissan	5000 Lbs		2006	85	800	Propane	na	Propane	n	na	n	n	na	na	1
PSS080	Seattle	Forklift	EMSF682	Nissan	5000 Lbs		2006	85	800	Propane	na	Propane	n	na	n	n	na	na	1
PSS080	Seattle	Forklift	EMSF683	Nissan	5000 Lbs		2006	85	800	Propane	na	Propane	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ047	MI-JACK	MJ450H4		1997	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ045	MI-JACK	MJ450H4		1997	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ050	MI-JACK	MJ450H4		1997	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ051	MI-JACK	MJ450H4		1997	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ284	Fantuzzi	FDC 500G5		2005	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ285	Fantuzzi	FDC 500G5		2005	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ288	Fantuzzi	FDC 500G5		2005	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ287	Fantuzzi	FDC 500G5		2005	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ295	Taylor	TXC-975		2007	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ300	Taylor	TXC-976		2008	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ301	Taylor	TXC-976		2008	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ302	Taylor	TXC-976		2008	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Top Handler	EMSZ303	Taylor	TXC-976		2008	330	4,300	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Yard Tractor	APST183	Capacity			2000	174	1,200	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Yard Tractor	APST184	Capacity			2000	174	1,200	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Yard Tractor	APST185	Capacity			2000	174	1,200	Diesel	na	ULSD	n	na	n	n	na	na	1
PSS080	Seattle	Yard Tractor	EMST302	Capacity	TJ5000		1996	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST303	Capacity	TJ5000		1996	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST305	Capacity	TJ5000		1996	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST323	Capacity			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST324	Capacity			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST327	Capacity			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST342	Capacity			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST351	Capacity			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST354	Capacity			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST372	Capacity			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST392	Capacity			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST396	Capacity			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST406	Ottawa			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST407	Ottawa			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST408	Ottawa			1997	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST462	Capacity	TJ7000		1999	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST463	Capacity	TJ7000		1999	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST464	Capacity	TJ7000		1999	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST465	Capacity	TJ7000		1999	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST466	Capacity	TJ7000		1999	174	1,200	Diesel	na	ULSD	YES		2006	n	n	na	1
PSS080	Seattle	Yard Tractor	EMST684	Capacity	TJ7000	Cat	C-7	2004	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1



**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip		Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
			ID	Manufacturer								ULSD	ULSD						
PSS080	Seattle	Yard Tractor	EMST825	Capacity	TJ7000	Cat	C-7	2007	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST830	Capacity	TJ7000	Cat	C-7	2007	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST895	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST900	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST901	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST902	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST903	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST904	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST905	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST906	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST907	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST908	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST909	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PSS080	Seattle	Yard Tractor	EMST910	Capacity	TJ7000	Cat	C-7	2008	210	1,200	Diesel	na	ULSD	n	na	Yes	n	na	1
PST050	Tacoma	Forklift	2247	Nissan	PHO2A25V	Nissan	4 CYL	1988	120	4	Propane	0	Propane	n	na	n	n	na	1
PST050	Tacoma	Forklift	2333	Caterpillar	DP40KL	Mitsubishi	6 CYL	2003	120	163	Diesel	408	ULSD	n	na	n	n	na	1
PST050	Tacoma	Forklift	2334	Caterpillar	DP40KL	Mitsubishi	6 CYL	2003	120	168	Diesel	420	ULSD	n	na	n	n	na	1
PST050	Tacoma	Forklift	2349	Caterpillar	DP40KL	Mitsubishi	6 CYL	2005	120	187	Diesel	468	ULSD	n	na	n	n	na	1
PST050	Tacoma	Forklift	2350	Caterpillar	DP40KL	Mitsubishi	6 CYL	2005	120	232	Diesel	580	ULSD	n	na	n	n	na	1
PST050	Tacoma	Forklift	7078	Kalmar	DCE160-6	Cummins	QSB5.9	2003	185	106	Diesel	270	ULSD	n	na	n	n	na	1
PST050	Tacoma	Forklift	7085	Taylor	T-200S	Cummins	QSB5.9	2006	185	121	Diesel	303	ULSD	n	na	n	n	na	1
PST050	Tacoma	Manlift	1097	Genie	S125	Cummins	4B3.9L	2005	185	99	Diesel	248	ULSD	n	na	n	n	na	1
PST050	Tacoma	Reach Stacker	6149	Sisu	RSD453151	Cummins	M11	1998	330	9	Diesel	23	ULSD	n	na	n	n	na	1
PST050	Tacoma	Reach Stacker	6298	Kalmar	DRS4531-S	Cummins	QSMII	2006	335	111	Diesel	278	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Reach Stacker	6299	Kalmar	DRS4531-S	Cummins	QSMII	2006	335	68	Diesel	170	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Reach Stacker	6324	Kalmar	DRS4531-S	Cummins	QSMII	2006	335	262	Diesel	655	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Sweeper	1056	Elgin	Crosswind J	Cummins	ISB	2000	205	162	Diesel	405	ULSD	n	na	YES	n	na	1
PST050	Tacoma	Top Handler	6232	Kalmar	Full Cont/F	Cummins	M11	2002	330	11	Diesel	28	ULSD	n	na	n	n	na	1
PST050	Tacoma	Yard Tractor	4580	Ottawa	Commando	Cummins	6BTA	2000	174	92	Diesel	230	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4582	Ottawa	Commando	Cummins	6BTA	2000	174	205	Diesel	513	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4585	Ottawa	Commando	Cummins	6BTA	2000	174	122	Diesel	305	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4586	Ottawa	Commando	Cummins	6BTA	2000	174	285	Diesel	713	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4687	Ottawa	Commando	Cummins	6BTA	2001	174	358	Diesel	895	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4688	Ottawa	Commando	Cummins	6BTA	2001	174	260	Diesel	650	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4689	Ottawa	Commando	Cummins	6BTA	2001	174	342	Diesel	855	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4690	Ottawa	Commando	Cummins	6BTA	2001	174	327	Diesel	818	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4751	Ottawa	Commando	Cummins	6CT	2003	215	700	Diesel	1,750	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4752	Ottawa	Commando	Cummins	6CT	2003	215	512	Diesel	1,280	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4753	Ottawa	Commando	Cummins	6CT	2003	215	625	Diesel	1,250	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4754	Ottawa	Commando	Cummins	6CT	2003	215	554	Diesel	1,385	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4755	Ottawa	Commando	Cummins	6CT	2003	215	688	Diesel	1,720	ULSD	YES	2011	n	n	na	1
PST050	Tacoma	Yard Tractor	4756	Ottawa	Commando	Cummins	6CT	2003	215	527	Diesel	1,318	ULSD	n	na	n	n	na	1
PST050	Tacoma	Yard Tractor	4895	Ottawa	Commando	Cummins	ISB	2005	245	860	Diesel	2,150	ULSD	YES	2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4896	Ottawa	Commando	Cummins	ISB	2005	245	0	Diesel	0	ULSD	YES	2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4897	Ottawa	Commando	Cummins	ISB	2005	245	940	Diesel	2,350	ULSD	YES	2011	YES	n	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	Emulsified Fuel						
PST050	Tacoma	Yard Tractor	4898	Ottawa	Commando	Cummins	ISB	2005	245	875	Diesel	2,188	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4899	Ottawa	Commando	Cummins	ISB	2005	245	1,175	Diesel	1,925	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4900	Ottawa	Commando	Cummins	ISB	2005	245	946	Diesel	2,365	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4901	Ottawa	Commando	Cummins	ISB	2005	245	913	Diesel	2,282	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4902	Ottawa	Commando	Cummins	ISB	2005	245	1,062	Diesel	2,655	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4903	Ottawa	Commando	Cummins	ISB	2005	245	893	Diesel	2,233	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4904	Ottawa	Commando	Cummins	ISB	2005	245	979	Diesel	2,715	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4905	Ottawa	Commando	Cummins	ISB	2005	245	345	Diesel	863	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4906	Ottawa	Commando	Cummins	ISB	2005	245	1,246	Diesel	3,115	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4921	Ottawa	Commando	Cummins	ISB	2005	245	1,002	Diesel	2,505	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4922	Ottawa	Commando	Cummins	ISB	2005	245	0	Diesel	0	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4923	Ottawa	Commando	Cummins	ISB	2005	245	905	Diesel	2,263	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4924	Ottawa	Commando	Cummins	ISB	2005	245	1,112	Diesel	2,780	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4925	Ottawa	Commando	Cummins	ISB	2005	245	670	Diesel	1,675	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4927	Ottawa	Commando	Cummins	ISB	2005	245	848	Diesel	2,120	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4928	Ottawa	Commando	Cummins	ISB	2005	245	1,217	Diesel	3,043	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4929	Ottawa	Commando	Cummins	ISB	2005	245	674	Diesel	1,685	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4930	Ottawa	Commando	Cummins	ISB	2005	245	1,029	Diesel	2,573	ULSD	YES		2011	YES	n	na	1
PST050	Tacoma	Yard Tractor	4931	Ottawa	Commando	Cummins	ISB	2005	245	1,005	Diesel	2,513	ULSD	YES		2011	YES	n	na	1
PST110	Tacoma	Forklift	R50	Caterpillar				1989			Propane	na	Propane	n	na	n	n	na	na	1
PST110	Tacoma	Loader	938	Komatsu	WA360			1987			Diesel	na	ULSD	n	na	n	n	na	na	1
PST110	Tacoma	Loader	941	Komatsu	WA360			1989			Diesel	na	ULSD	n	na	n	n	na	na	1
PST110	Tacoma	Loader	945	Komatsu	WA360			1986			Diesel	na	ULSD	n	na	n	n	na	na	1
PST110	Tacoma	Loader	948	Komatsu	WA360			1990			Diesel	na	ULSD	n	na	n	n	na	na	1
PST110	Tacoma	Truck	WT	Ford				1972	150		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Backhoe	#603	Case Backh	580E	Cummins	6 cyl	1991	65		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#118	Linkbelt	LS2800Q	Isuzu	6 cyl	2000	120		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#124	Doosan Log	225S	Doosan	6 cyl	2007	150		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#125	Linkbelt	240LXTL	Isuzu	6 cyl	2007	197		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#130	Doosan Log	DX300LLC	Doosan	6 cyl	2011	197		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#131	Linkbelt	240LXTL	Isuzu	6 cyl	2011	197		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#511	Wagner Sta	L90	Cummins	6 cyl		440		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#512	Wagner Sta	L90	Cummins	6 cyl		440		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#514	Cat Log Sta	988-B	Caterpillar	6 cyl		375		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#517	Cat Log Sta	988-B	Caterpillar	6 cyl		375		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#518	Wagner Sta	L80	Cummins	6 cyl		415		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#520	Wagner Sta	L80	Cummins	6 cyl		415		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#522	Cat Log Sta	988-B	Caterpillar	6 cyl	1987	375		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#608	Cat Wheel	I966-C	Caterpillar	6 cyl		170		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#610	Komatsu WWA	380	Cummins	6 cyl		192		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Loader	#611	Cat Skid Ste	216B CN	Caterpillar	4 cyl	2007	51		Diesel	na	ULSD	n	na	n	n	na	na	1
PST120	Tacoma	Truck	#853	Ford	L8000	Cummins	6 cyl	1995	210		Diesel	na	ULSD	n	na	n	n	na	na	1
PST055	Tacoma	Forklift	H8249	1976 CATEF	-30B	Cummins	CPH01A-1	1976	50	500	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST055	Tacoma	Forklift	H8394	1983 CLARC	C500 Y90	Cummins	C500-Y90	1983	100	360	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST055	Tacoma	Forklift	H8498	1987 NISSA/	PH-50			1987	50	443	Diesel	na	ULSD	YES	na	n	n	na	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip		Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
				Manufacturer	Model								Used	DOC						
PST055	Tacoma	Forklift	H8508	1987 NISSA	50-P			1987	50	132	Diesel	na	ULSD	YES	na	n	n	na	1	
PST055	Tacoma	Forklift	H8510	1988 CATE	V-150	CAT	V-150	1988	100	170	Diesel	na	ULSD	YES	na	n	n	na	1	
PST055	Tacoma	Forklift	H8511	1989 CATE	V-150	CAT	V-150	1989	100	73	Diesel	na	ULSD	YES	na	n	n	na	1	
PST055	Tacoma	Forklift	H8513	1988 CATE	V-80E	CAT	V-80E	1988	100	500	Diesel	na	ULSD	YES	na	n	n	na	1	
PST055	Tacoma	Forklift	H8515	1988 NISSA	CUM01L-1	Cummins		1988	55	333	Electric	na	Electric	n	na	n	n	na	0	
PST055	Tacoma	Forklift	H8516	1988 NISSA	CUM01L-1	Cummins		1988	55	1,199	Electric	na	Electric	n	na	n	n	na	0	
PST055	Tacoma	Forklift	H8518	1988 NISSA	CUM01L-1	Cummins		1988	55	285	Electric	na	Electric	n	na	n	n	na	0	
PST055	Tacoma	Forklift	H8520	1988 NISSA	PH02A-25V			1988	55	500	Propane	na	Propane	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8522	1988 NISSA	PH02A-25V			1988	55	602	Propane	na	Propane	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8539	1988 NISSA	PH02A-25V			1988	55	500	Propane	na	Propane	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8586	1990 NISSA	PH02A-25V			1990	55	524	Propane	na	Propane	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8590	1990 NISSA	CPH01A-18V			1990	55	832	Propane	na	Propane	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8591	1990 NISSA	CPH01A-18V			1990	55	863	Propane	na	Propane	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8593	1990 NISSA	CPH01A-18V			1990	55	981	Propane	na	Propane	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8829	MITSUBISI	FG25N-LP			2009	55	352	Propane	na	Propane	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8830	MITSUBISI	FG25N-LP			2009	55	391	Propane	na	Propane	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8831	MITSUBISHI				2009	55	542	Diesel	na	ULSD	n	na	n	n	na	1	
PST055	Tacoma	Forklift	H8832	MITSUBISHI				2009	55	121	Diesel	na	ULSD	n	na	n	n	na	1	
PST055	Tacoma	Top Handler	H9616	TAYLOR	TOPPICK	Cummins	M-11	2007	330	1,271	Diesel	na	ULSD	n	na	n	n	na	1	
PST055	Tacoma	Top Handler	H9704	Fantuzzi	CS 45KM	Cat		2000	330	407	Diesel	na	ULSD	n	na	n	n	na	1	
PST055	Tacoma	Yard Tractor	H5213	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5214	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5215	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5216	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5217	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5218	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174	1,500	Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5219	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5220	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5226	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5227	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5229	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST055	Tacoma	Yard Tractor	H5230	CAPACITY	TJ5000	Cummins	ISB 5.9L	2006	174		Diesel	na	ULSD	n	na	YES	n	na	1	
PST030	Tacoma	Forklift	FL11	Taylor	TY3005			1982		41	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Forklift	FL27	KALMAR	DCE120-12			2004		2,100	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Forklift	FL28	KALMAR	DCE120-12			2004		1,996	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Forklift	FL29	MITSUBISI	FO30N			2006	57	463	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Forklift	FL30	MITSUBISI	FO30N			2006	57	436	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	RTG	TT1	MITSUBI	PACECO			1988	300	44	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	RTG	TT2	MITSUBI	PACECO			1988	300	11	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	RTG	TT3	PACECO				1984	300	0	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	RTG	TT4	PACECO				1989	300	0	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	RTG	TT5	MITSUBI	PACECO			2005	300	78	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	RTG	TT6	MITSUBI	PACECO			2005	300	78	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Top Handler	TP23	TAYLOR	TEC950L			1996	300	1,264	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Top Handler	TP24	TAYLOR	TEC950L			1997	300	1,017	Diesel	na	ULSD	n	na	n	n	na	1	



**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	Emulsified Fuel						
PST030	Tacoma	Top Handler	TP25	TAYLOR	THDC955			2002	300	1,164	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Top Handler	TP26	TAYLOR	THDC955			2002	300	1,586	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Top Handler	TP27	KALMAR	DCD450			2004	300	1,717	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2011		1
PST030	Tacoma	Top Handler	TP28	KALMAR	DCD450			2004	300	105	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2011		1
PST030	Tacoma	Top Handler	TP29	TAYLOR	THDC955			2006	300	2,231	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2011		1
PST030	Tacoma	Top Handler	TP30	KALMAR	DCF410CSG			2006	300	2,243	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2011		1
PST030	Tacoma	Top Handler	TP31	KALMAR	DCF410CSG			2006	300	2,220	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2011		1
PST030	Tacoma	Top Handler	TP32	KALMAR	DCD450CSG			2004	300	1,500	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2011		1
PST030	Tacoma	Top Handler	TP33	KALMAR	DCF410CSG			2005	300	1,500	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2011		1
PST030	Tacoma	Yard Tractor	YT1	CAPACITYTJ7000				2004	174	385	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT10	CAPACITYTJ7000				2004	174	483	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT11	CAPACITYTJ7000				2004	174	535	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT12	CAPACITYTJ7000				2004	174	223	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT13	CAPACITYTJ7000				2004	174	227	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT14	CAPACITYTJ7000				2004	174	219	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT15	CAPACITYTJ7000				2004	174	589	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT16	OTTAWA	MODEL 50			2004	174	793	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT17	OTTAWA	MODEL 50			2004	174	569	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT18	OTTAWA	MODEL 50			2004	174	449	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT19	OTTAWA	MODEL 50			2004	174	839	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT2	CAPACITYTJ7000				2004	174	664	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT20	OTTAWA	MODEL 50			2004	174	1,328	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT21	OTTAWA	MODEL 50			2004	174	1,019	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT22	OTTAWA	MODEL 50			2004	174	821	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT23	OTTAWA	MODEL 50			2004	174	1,272	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT24	OTTAWA	MODEL 50			2004	174	1,073	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT25	OTTAWA	MODEL 50			2004	174	924	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT26	OTTAWA	MODEL 50			2004	174	1,034	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT3	CAPACITYTJ7000				2004	174	555	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT39	OTTAWA	MODEL 50			2004	173	1,226	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT4	CAPACITYTJ7000				2004	174	85	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT40	OTTAWA	MODEL 50			2004	173	1,290	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT41	OTTAWA	MODEL 50			2004	173	1,536	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT42	OTTAWA	MODEL 50			2004	173	1,358	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT43	OTTAWA	MODEL 50			2004	173	1,574	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT44	OTTAWA	MODEL 50			2005	173	1,081	Diesel	na	ULSD	n	na	n	<b>DPF</b>	2011		1
PST030	Tacoma	Yard Tractor	YT45	OTTAWA	MODEL 50			2005	173	1,479	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT46	OTTAWA	MODEL 50			2005	173	773	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT47	OTTAWA	MODEL 50			2005	173	1,274	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT48	OTTAWA	MODEL 50			2005	173	948	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT49	KALMAR	4x2			2006	173	2,017	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT5	CAPACITYTJ7000				2004	174	353	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT50	KALMAR	4x2			2006	173	850	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT51	KALMAR	4x2			2006	173	1,545	Diesel	na	ULSD	n	na	n	n	na		1
PST030	Tacoma	Yard Tractor	YT52	KALMAR	4x2			2006	173	1,769	Diesel	na	ULSD	n	na	n	n	na		1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	DOC Installed (y or n)						
PST030	Tacoma	Yard Tractor	YT53	KALMAR	4x2			2006	173	1,180	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Yard Tractor	YT54	KALMAR	4x2			2006	173	1,034	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Yard Tractor	YT55	KALMAR	4x2			2006	173	1,594	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Yard Tractor	YT56	KALMAR	4x2			2006	173	1,457	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Yard Tractor	YT57	KALMAR	4x2			2006	173	1,898	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Yard Tractor	YT58	KALMAR	4x2			2006	173	1,080	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Yard Tractor	YT6	CAPACITYTJ7000				2004	174	366	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Yard Tractor	YT7	CAPACITYTJ7000				2004	174	198	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Yard Tractor	YT8	CAPACITYTJ7000				2004	174	311	Diesel	na	ULSD	n	na	n	n	na	1	
PST030	Tacoma	Yard Tractor	YT9	CAPACITYTJ7000				2004	174	869	Diesel	na	ULSD	n	na	n	n	na	1	
PST130	Tacoma	Forklift	16	HYSTER	210XL	PERKINS	6165	1990	165	2,000	Diesel	na	ULSD	n	na	n	n	na	1	
PST130	Tacoma	Forklift	17	HYSTER	50XL	NISSAN	4CYL	1997	80	200	Propane	na	Propane	n	na	n	n	na	1	
PST130	Tacoma	Forklift	19	HYSTER	210XL	PERKINS	6165	1998	165	2,000	Diesel	na	ULSD	n	na	n	n	na	1	
PST130	Tacoma	Reach Stacker	45/40 LS	TEREX	45/40LS	Cummins	M11	2001	325	2,000	Diesel	12000	ULSD	n	na	n	n	DPF	na	1
PST130	Tacoma	Reach Stacker	HR45/25	TEREX	45/25	Cummins	M11	2001	325	2,000	Diesel	12000	ULSD	n	na	n	n	DPF	na	1
PST070	Tacoma	Forklift	1014	Hyster	H80XL	Cont		1992	70	176	Diesel	na	ULSD	n	na	n	n	na	1	
PST070	Tacoma	Forklift	1056	Hyster	H70C	Cont		1967	80	200	Diesel	na	ULSD	n	na	n	n	na	1	
PST070	Tacoma	Forklift	1061	Hyster	H70C	Cont		1969	80	53	Diesel	na	ULSD	n	na	n	n	na	1	
PST070	Tacoma	Forklift	2106	Hyster	H360	Perkins		1998	200	1,501	Diesel	na	ULSD	n	na	n	n	na	1	
PST070	Tacoma	Side Handler	7011	Hyster	H-400	CUMMINS		2000	210	185	Diesel	na	ULSD	YES	na	n	n	na	1	
PST070	Tacoma	Side Handler	7012	Hyster	H-400	CUMMINS		2000	210	294	Diesel	na	ULSD	YES	na	n	n	na	1	
PST070	Tacoma	Side Handler	7013	Hyster	H-400	CUMMINS		2000	210	642	Diesel	na	ULSD	YES	na	n	n	na	1	
PST070	Tacoma	Top Handler	6120	Taylor	TEC-950L	CUMMINS		1995	300	60	Diesel	na	ULSD	YES	na	n	n	na	1	
PST070	Tacoma	Yard Tractor	5293	Sisu	TT-120	CUMMINS		2001	174	272	Diesel	na	ULSD	YES	na	n	n	na	1	
PST070	Tacoma	Yard Tractor	5295	Sisu	TT-120	CUMMINS		2001	174	571	Diesel	na	ULSD	YES	na	n	n	na	1	
PST070	Tacoma	Yard Tractor	5296	Sisu	TT-120	CUMMINS		2001	174	857	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Forklift	49832	Mitsubishi	FG-25	Mitsubishi	4g-63	1989	45	24	Propane	na	Propane	n	na	n	n	na	1	
PST100	Tacoma	Manlift	48731	Snorkelift	A-42-50	Wisconsin	W-4-1770	1987	30	25	Gasoline	na	Gasoline	n	na	n	n	na	1	
PST100	Tacoma	Top Handler	79305	Taylor		Cummins	L-10C	1993	250	1,500	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Top Handler	89306	Taylor		Cummins	NTA-855	1993	335	480	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Top Handler	89408	Taylor		Cummins	L-10C	1994	250	480	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Yard Tractor	10352	Ottawa		Cummins	6BT5.9	2003	148	1,300	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Yard Tractor	10519	Ottawa		Cummins	QSB	2005	155	1,300	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Yard Tractor	10522	Ottawa		Cummins	QSB	2005	155	1,300	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Yard Tractor	10575	Ottawa		Cummins	QSB	2005	155	1,300	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Yard Tractor	10893	Ottawa		Cummins	QSB6.7	2008	160	1,300	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Yard Tractor	10895	Ottawa		Cummins	QSB6.7	2008	160	1,300	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Yard Tractor	108113	Ottawa		Cummins	QSB6.7	2008	160	1,300	Diesel	na	ULSD	YES	na	n	n	na	1	
PST100	Tacoma	Yard Tractor	108129	Ottawa		Cummins	QSB6.7	2008	160	1,300	Diesel	na	ULSD	YES	na	n	n	na	1	
PST020	Tacoma	Crane	CC-1	ZPMC	50-60LT	ELECTRICN/A		2005	0	0	Electric	0	Electric	n	na	n	n	na	0	
PST020	Tacoma	Crane	CC-2	ZPMC	50-60LT	ELECTRICN/A		2005	0	0	Electric	0	Electric	n	na	n	n	na	0	
PST020	Tacoma	Crane	CC-3	ZPMC	50-60LT	ELECTRICN/A		2005	0	0	Electric	0	Electric	n	na	n	n	na	0	
PST020	Tacoma	Crane	CC-4	ZPMC	50-60LT	ELECTRICN/A		2005	0	0	Electric	0	Electric	n	na	n	n	na	0	
PST020	Tacoma	Crane	CC-5	ZPMC	50-60LT	ELECTRICN/A		2005	0	0	Electric	0	Electric	n	na	n	n	na	0	
PST020	Tacoma	Crane	CC-6	ZPMC	50-60LT	ELECTRICN/A		2005	0	0	Electric	0	Electric	n	na	n	n	na	0	

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													Emulsified Fuel, (ULSD)	DOC Installed (y or n)						
PST020	Tacoma	Crane	CC-7	ZPMC	50-60LT	ELECTRIC	N/A	2005	0	0	Electric	0	Electric	n	na	n	n	na	na	0
PST020	Tacoma	Forklift	F-01	MITSUBISI	3EM7B	MITSUBISI	3200	2005	155	225	Propane	387	Propane	n	na	n	n	na	na	1
PST020	Tacoma	Forklift	F-02	MITSUBISI	3EM7B	MITSUBISI	3200	2005	155	243	Propane	418	Propane	n	na	n	n	na	na	1
PST020	Tacoma	Forklift	F-03	MITSUBISI	3EM7B	MITSUBISI	3200	2005	155	245	Propane	421	Propane	n	na	n	n	na	na	1
PST020	Tacoma	Forklift	F-04	MITSUBISI	3EM7B	MITSUBISI	3200	2005	155	269	Propane	463	Propane	n	na	n	n	na	na	1
PST020	Tacoma	Forklift	F-05	MITSUBISI	3EM7B	MITSUBISI	3200	2005	155	117	Propane	201	Propane	n	na	n	n	na	na	1
PST020	Tacoma	Forklift	F-06	MITSUBISI	3EM7B	MITSUBISI	3200	2005	155	89	Propane	153	Propane	n	na	n	n	na	na	1
PST020	Tacoma	Forklift	L-01	FANTUZZ	18 TON 7B	CUMMINS	6BT	2005	180	276	Diesel	726	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Forklift	L-02	FANTUZZ	18 TON 7B	CUMMINS	6BT	2005	180	83	Diesel	218	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Side Handler	S-01	FANTUZZ	FDC25K8	CUMMINS	6CT	2005	210	620	Diesel	1,736	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Side Handler	S-02	FANTUZZ	FDC25K8	CUMMINS	6CT	2005	210	496	Diesel	1,389	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Side Handler	S-03	FANTUZZ	FDC25K8	CUMMINS	6CT	2005	210	395	Diesel	1,106	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Side Handler	S-04	FANTUZZ	FDC25K8	CUMMINS	6CT	2005	210	607	Diesel	1,700	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Side Handler	S-05	FANTUZZ	FDC25K8	CUMMINS	6CT	2005	210	478	Diesel	1,338	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Side Handler	S-06	FANTUZZ	FDC25K9	CUMMINS	6CT	2006	210	983	Diesel	2,752	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Side Handler	S-07	FANTUZZ	FDC25K10	CUMMINS	6CT	2006	210	1,244	Diesel	3,483	ULSD	n	na	n	<b>DPF</b>	2011	na	1
PST020	Tacoma	Side Handler	S-08	FANTUZZ	FDC25K11	CUMMINS	6CT	2006	210	638	Diesel	1,786	ULSD	n	na	n	<b>DPF</b>	2011	na	1
PST020	Tacoma	Straddle Carrier	SC-01	NOELL	534ESW	CATERPIL	C-12	2004	455	1,807	Diesel	5,276	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-02	NOELL	534ESW	CATERPIL	C-12	2004	455	1,820	Diesel	5,314	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-03	NOELL	534ESW	CATERPIL	C-12	2004	455	1,980	Diesel	5,782	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-04	NOELL	534ESW	CATERPIL	C-12	2004	455	1,197	Diesel	3,495	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-05	NOELL	534ESW	CATERPIL	C-12	2004	455	2,244	Diesel	6,552	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-06	NOELL	534ESW	CATERPIL	C-12	2004	455	1,000	Diesel	2,920	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-07	NOELL	534ESW	CATERPIL	C-12	2004	455	1,704	Diesel	4,976	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-08	NOELL	534ESW	CATERPIL	C-12	2004	455	2,295	Diesel	6,701	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-09	NOELL	534ESW	CATERPIL	C-12	2004	455	1,210	Diesel	3,533	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-10	NOELL	534ESW	CATERPIL	C-12	2004	455	1,142	Diesel	3,335	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-11	NOELL	534ESW	CATERPIL	C-12	2004	455	2,333	Diesel	6,812	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-12	NOELL	534ESW	CATERPIL	C-12	2004	455	2,019	Diesel	5,895	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-13	NOELL	534ESW	CATERPIL	C-12	2004	455	3,086	Diesel	9,011	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-14	NOELL	534ESW	CATERPIL	C-12	2004	455	3,666	Diesel	10,705	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-15	NOELL	534ESW	CATERPIL	C-12	2004	455	3,210	Diesel	9,373	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-16	NOELL	534ESW	CATERPIL	C-12	2004	455	2,866	Diesel	8,369	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-17	NOELL	534ESW	CATERPIL	C-12	2004	455	1,282	Diesel	3,743	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-18	NOELL	534ESW	CATERPIL	C-12	2004	455	1,822	Diesel	5,320	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-19	NOELL	534ESW	CATERPIL	C-12	2004	455	703	Diesel	2,053	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-20	NOELL	534ESW	CATERPIL	C-12	2004	455	1,592	Diesel	4,649	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-21	NOELL	534ESW	CATERPIL	C-12	2004	455	660	Diesel	1,927	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-22	NOELL	534ESW	CATERPIL	C-12	2004	455	962	Diesel	2,809	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-23	NOELL	534ESW	CATERPIL	C-12	2004	455	1,470	Diesel	4,292	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-24	NOELL	534ESW	CATERPIL	C-12	2004	455	2,519	Diesel	7,355	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-25	NOELL	534ESW	CATERPIL	C-12	2004	455	2,001	Diesel	5,843	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-26	NOELL	534ESW	CATERPIL	C-12	2004	455	1,877	Diesel	5,481	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-27	NOELL	534ESW	CATERPIL	C-12	2004	455	1,805	Diesel	5,271	ULSD	n	na	n	n	na	na	1
PST020	Tacoma	Straddle Carrier	SC-28	NOELL	534ESW	CATERPIL	C-12	2004	455	3,084	Diesel	9,005	ULSD	n	na	n	n	na	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)	DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines	
PST020	Tacoma	Straddle Carrier	SC-29	NOELL	534ESW	CATERPIL	C-12	2004	455	3,122	Diesel	9,116	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-30	NOELL	534ESW	CATERPIL	C-12	2004	455	669	Diesel	1,953	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-31	NOELL	534ESW	CATERPIL	C-12	2004	455	1,835	Diesel	5,358	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-32	NOELL	534ESW	CATERPIL	C-12	2004	455	2,434	Diesel	7,107	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-34	NOELL	534ESW	CATERPIL	C-12	2004	455	2,028	Diesel	5,922	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-35	NOELL	534ESW	CATERPIL	C-12	2005	455	1,629	Diesel	4,757	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-36	NOELL	534ESW	CATERPIL	C-12	2005	455	1,654	Diesel	4,830	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-37	NOELL	534ESW	CATERPIL	C-12	2005	455	2,667	Diesel	7,788	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-38	NOELL	534ESW	CATERPIL	C-12	2005	455	2,262	Diesel	6,605	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-39	NOELL	534ESW	CATERPIL	C-12	2005	455	1,350	Diesel	3,942	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-40	NOELL	534ESW	CATERPIL	C-12	2005	455	2,440	Diesel	7,125	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-41	NOELL	534ESW	CATERPIL	C-12	2005	455	2,044	Diesel	5,968	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-42	NOELL	534ESW	CATERPIL	C-12	2005	455	2,195	Diesel	6,409	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-43	NOELL	534ESW	CATERPIL	C-12	2005	455	2,039	Diesel	5,954	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-44	NOELL	534ESW	CATERPIL	C-12	2005	455	2,237	Diesel	6,532	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-45	NOELL	534ESW	CATERPIL	C-12	2005	455	2,423	Diesel	7,075	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-46	NOELL	534ESW	CATERPIL	C-12	2005	455	1,719	Diesel	5,019	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-47	NOELL	534ESW	CATERPIL	C-12	2005	455	2,297	Diesel	6,707	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-48	NOELL	534ESW	CATERPIL	C-12	2005	455	2,379	Diesel	6,947	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-49	NOELL	534ESW	CATERPIL	C-12	2005	455	2,104	Diesel	6,144	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-50	NOELL	534ESW	CATERPIL	C-12	2005	455	1,947	Diesel	5,685	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Straddle Carrier	SC-51	NOELL	534ESW	CATERPIL	C-13	2005	455	2,256	Diesel	6,588	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Yard Tractor	H-01	CAPACITYY-50R		CUMMINS	6BT	2005	180	200	Diesel	262	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Yard Tractor	H-02	CAPACITYY-50R		CUMMINS	6BT	2005	180	929	Diesel	1,215	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Yard Tractor	H-03	CAPACITYY-50R		CUMMINS	6BT	2005	180	790	Diesel	1,033	ULSD	n	na	n	n	na	1	
PST020	Tacoma	Yard Tractor	H-04	CAPACITYY-50R		CUMMINS	6BT	2006	180	489	Diesel	640	ULSD	n	na	n	n	na	1	
PST010	Tacoma	Backhoe	4535	Case	580E		12",18",24"	1985	350	65	Diesel	69	ULSD	n	na	n	69	na	1	
PST010	Tacoma	Backhoe	5491	JohnDeere	310SE	LOADER		17940 LBS	1998	350	271	Diesel	455	ULSD	n	na	n	n	na	1
PST010	Tacoma	Compressor	4263	Saylor B	703-	COMPRESSOR			1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Compressor	4464	ING Rand	P185WJD		185CF		1982	10	17	Diesel	16	ULSD	n	na	n	n	na	1
PST010	Tacoma	Compressor	4528	ING Rand	P185WJD		185CF		1984	10	61	Diesel	85	ULSD	n	na	n	n	na	1
PST010	Tacoma	Compressor	4542	ING Rand	P100AWD				1985	10	4	Diesel	5	ULSD	n	na	n	n	na	1
PST010	Tacoma	Compressor	5407	Speedair	324206		165 PSI		1992	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Compressor	5461	ING Rand	T-30				1996	10		Gasoline	0	Gasoline	n	na	n	n	na	1
PST010	Tacoma	Compressor	5488	Speedair	5F219B				1998	10		Gasoline	0	Gasoline	n	na	n	n	na	1
PST010	Tacoma	Compressor	5511	Speedair	57219C		8 HP/8 GA		1999	10		Gasoline	0	Gasoline	n	na	n	n	na	1
PST010	Tacoma	Compressor	5543	ING Rand	2475F11GHED				2001	10		Gasoline	0	Gasoline	n	na	n	n	na	1
PST010	Tacoma	Compressor	10097	Thomas	T2820ST				2003	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Compressor	10339	ING Rand	P185WIR				2004	10		Diesel	0	ULSD	n	na	n	n	na	1
PST010	Tacoma	Compressor	10340	ING Rand	P185WIR				2004	10		Diesel	0	ULSD	n	na	n	n	na	1
PST010	Tacoma	Compressor	10574	EMGLO	R5B120				1977	10		Diesel	0	ULSD	n	na	n	n	na	1
PST010	Tacoma	Crane	2077	Sumitomo	RN26		55 TN		1986	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	2078	IHI	6021-989		50 TN		1979	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	2241	Washington	28KN		40 TN		1941	0	14	Electric	0	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	2301	Kone			66 TN		1989	0	0	Electric	na	Electric	n	na	n	n	na	0

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)	DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
PST010	Tacoma	Crane	2302	Kone			66 TN	1989	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	2403	Sumitomo	RN26		55 TN	1986	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	2405	Z.P.M.C.	Quayside CC		60 LT	1996	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	2406	Z.P.M.C.			50 LT	2001	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	2512	Klyde	3337		27.5 TN	1974	0	195	Electric	0	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4349	DEMAG			20 Ton Stra	1976	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4425	American			15 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4426	American			15 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4431	Edder			7.5 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4432	Edder			7.5 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4433	American			7.5 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4435	Niles			10 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4436	Robbins	1-ER-46		2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4438	Robbins	1-ER-46		2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4440	Robbins	1-ER-46		2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4441	Robbins	1-ER-46		2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4442	Robbins	1-ER-46		2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4443	Robbins			7.5 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4444	Robbins	1-ER-46		2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4445	Budget	309828-52		1 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4446	American			2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	4447	Monck	221-5426		2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5367	DEMAG	EZD520H20KN2		7.5 TN	1990	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5415	Abelhowe	J-904-140-12FS		2 TN	1993	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5434	Yale Hoi	TRTB-20-79D		10 TN	1995	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5435	Yale Hoi	TRTB-20-79D		5 TN	1995	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5443	Kone	XL400		7.5 TN	1995	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5504	American	4K CHAIN FALL		2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5505	Coffing	EC4		2 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5506	Coffing	CHAIN FALL		3 TN	1974	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5513	F.T. Crow			5 TN	1995	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5531	Davit Crane	5124M2		2000 lbs	2000	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	5537	Venturo	CT2004FB		800 LB	2000	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Crane	2404T	Sumitomo	RN26		55 TN	1986	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Forklift	1105	Hyster	S50C		5,000 cap	1971	60	0	Propane	0	Propane	n	na	n	n	na	1
PST010	Tacoma	Forklift	1107	Taylor	Y62WO		62,000 cap	2011	174	37	Diesel	108	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Forklift	1108	Taylor	Y45WO		45,000 cap	2011	174	27	Diesel	95	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Forklift	1117	Taylor	Y30WO		30,000 cap	2011	174	10	Diesel	5	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Forklift	1118	Taylor	Y52WO/471 eng		52,000 cap	2011	174	72	Diesel	107	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Forklift	1119	Taylor	Y52WO		52,000 cap	2011	174	106	Diesel	73	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Forklift	1168	Hyster	H60HP		6,000 cap	1977	60	33	Propane	40	Propane	n	na	n	n	na	1
PST010	Tacoma	Forklift	1174	Hyster	H60HP		6,000 cap	1977	60	0	Propane	0	Propane	n	na	n	n	na	1
PST010	Tacoma	Forklift	1175	Hyster	H60HP		6,000 cap	1977	60	36	Propane	18	Propane	n	na	n	n	na	1
PST010	Tacoma	Forklift	1176	Hyster	H60HP		6,000 cap	1977	60	0	Propane	0	Propane	n	na	n	n	na	1
PST010	Tacoma	Forklift	1178	Hyster	H60HP		6,000 cap	1977	60	49	Propane	49	Propane	n	na	n	n	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, DOC Installed (y or n), Year DOC Installed)		On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	DOC Installed				
PST010	Tacoma	Forklift	1180	Hyster	H60HP		6,000 cap	1977	60	0	Propane	0	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1183	Hyster	H150		15,000 cap	1977	200	0	Diesel	0	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1190	Hyster	H60HP		6,000 cap	1977	60	0	Propane	0	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1193	Taylor	Y52WOM		52,000 cap	1978	200	59	Diesel	54	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1194	CAT	V140		14,000 cap	1979	200	0	Diesel	0	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1195	CAT	V140		14,000 cap	1979	200	0	Diesel	0	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1204	CAT	V80D		8,000 cap	1979	200	34	Diesel	30	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1206	CAT	V80D		8,000 cap	1979	200	130	Diesel	17	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1207	CAT	V80D		8,000 cap	1979	200	48	Diesel	11	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1212	Taylor	TY620L		62,000 cap	1979	200	0	Diesel	0	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1215	CAT	V60B		6,000 cap	1980	60	0	Propane	0	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1216	CAT	V60B		6,000 cap	1980	60	0	Propane	0	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1217	CAT	V60B		6,000 cap	1980	60	0	Propane	0	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1221	CAT	V60B		6,000 cap	1980	60	0	Propane	0	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1224	CAT	V60B		6,000 cap	1980	60	0	Propane	0	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1226	CAT	V60B		6,000 cap	1980	60	0	Propane	0	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1227	CAT	V60B		6,000 cap	1980	60	24	Propane	49	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1230	CAT	V60B/cont eng		6,000 cap	1980	60	19	Propane	17	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1231	CAT	V60B		6,000 cap	1980	60	15	Propane	10	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1233	CAT	V150		15,000 cap	1981	200	1	Diesel	36	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1234	CAT	V150		15,000 cap	1981	200	19	Diesel	15	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1235	CAT	V150		15,000 cap	1981	200	18	Diesel	5	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1236	CAT	V150		15,000 cap	1981	200	0	Diesel	0	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1240	Valmet	4212		92,000 cap	2011	375	181	Diesel	332	ULSD	YES	na	n	na	1
PST010	Tacoma	Forklift	1241	TCM	FD70Z7		15,000 cap	1998	200	25	Diesel	21	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1242	Hyster	X80XLBCS		8,000 cap	1989	80	19	Propane	60	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1243	Hyster	X80XLBCS		8,000 cap	1989	80	30	Propane	53	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1244	Hyster	X80XLBCS/boxcar		8,000 cap	1989	80	76	Propane	141	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1245	Hyster	X80XLBCS		8,000 cap	1989	80	91	Propane	225	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1246	Hyster	X80XLBCS		8,000 cap	1989	80	83	Propane	135	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1247	Hyster	X80XLBCS		8,000 cap	1989	80	109	Propane	204	Propane	n	na	n	na	1
PST010	Tacoma	Forklift	1248	Hyster	H190XL		19,000 cap	1989	200	87	Diesel	85	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1249	Hyster	H190XL		19,000 cap	1989	200	32	Diesel	39	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1250	Hyster	H190XL		19,000 cap	1989	200	75	Diesel	84	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1251	Hyster	H190XL		19,000 cap	1989	200	83	Diesel	94	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1252	Hyster	H190XL		19,000 cap	1989	200	288	Diesel	456	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	1255	CAT	V925		95,000 cap	2001	200	101	Diesel	196	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	10055	CAT	V925		95,000 cap	2001	200	79	Diesel	154	ULSD	n	na	n	na	1
PST010	Tacoma	Forklift	10196	Wiggins	W360YXL		30,000 cap	2004	200	497	Diesel	1512	ULSD	YES	na	n	na	1
PST010	Tacoma	Generator	4101	Taylor	0275DSPS		250KW	1996			Diesel	0	ULSD	YES	na	n	na	1
PST010	Tacoma	Generator	4501	ONAN	600DYA15R14J		60 KW	1982	50	0	Diesel	0	ULSD	n	na	n	na	1
PST010	Tacoma	Generator	4506	Sears	580.32826		7.5 KW	1982	50	0	Gasoline	0	Gasoline	n	na	n	na	1
PST010	Tacoma	Generator	5486	Honda	EM3500SXXKI		3546972	1998	50	0	Gasoline	0	Gasoline	n	na	n	na	1
PST010	Tacoma	Generator	5549	Honda	EM3000C			2001	50	0	Gasoline	0	Gasoline	n	na	n	na	1
PST010	Tacoma	Generator	5552	Honda	3000			2002	50	0	Gasoline	0	Gasoline	n	na	n	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	DOC Installed (y or n)						
PST010	Tacoma	Generator	10261	Olympian	97A067A06459-S			1997		0	Diesel	0	ULSD	n	na	n	n	na	na	1
PST010	Tacoma	Generator	10460	ONAN	150DGFA-148		150 KW	1999	100	401	Gasoline	1133	Gasoline	YES	na	n	n	na	na	1
PST010	Tacoma	Generator	10843	Honda	EUC500			2007		1,264	Gasoline	165	Gasoline	n	na	n	n	na	na	1
PST010	Tacoma	Generator	10891	Honda	EU300cka			2008		0	Gasoline	0	Gasoline	n	na	n	n	na	na	1
PST010	Tacoma	Generator	11324	Luminite	C-00221			2011		0	Gasoline	0	Gasoline	n	na	n	n	na	na	1
PST010	Tacoma	Manlift	4583	Simon	MP60		500 LB	1984	60	52	Gasoline	79	Gasoline	n	na	n	n	na	na	1
PST010	Tacoma	Manlift	5418	Genie	Z601342WD		500 LB	1993	60	226	Gasoline	284	Gasoline	n	na	n	n	na	na	1
PST010	Tacoma	Manlift	5530	GMC	7C7H042ECH50		600 LB	2000	60	218	Propane	420	Propane	n	na	n	n	na	na	1
PST010	Tacoma	Manlift	10341	Genie	GS2632		500/250 LB	2005	0	0	Electric	0	Electric	n	na	n	n	na	na	0
PST010	Tacoma	Manlift	10620	JLG	3394RT		500LB	2006		54	Diesel	30	ULSD	n	na	n	n	na	na	1
PST010	Tacoma	Manlift	11308	JLG	135OSJ		500LB	2011		146	Diesel	223	ULSD	YES	na	n	n	na	na	1
PST010	Tacoma	Manlift	11335	Genie	S60		500LB	2004		52	Gasoline	30	Gasoline	n	na	n	n	na	na	1
PST010	Tacoma	Straddle Carrier	1541	Valmet	401093678T		88,200 lbs	1991	185	147	Diesel	649	ULSD	YES	na	n	n	na	na	2
PST010	Tacoma	Straddle Carrier	1542	Valmet	401093678T		88,200 lbs	1991	185	213	Diesel	931	ULSD	YES	na	n	n	na	na	2
PST010	Tacoma	Straddle Carrier	1543	Valmet	401093678T		88,200 lbs	1991	185	275	Diesel	1206	ULSD	YES	na	n	n	na	na	2
PST010	Tacoma	Straddle Carrier	1544	Valmet	401093678T		88,200 lbs	1991	185	267	Diesel	1257	ULSD	YES	na	n	n	na	na	2
PST010	Tacoma	Straddle Carrier	1545	Valmet	401093678T		88,200 lbs	1991	185	332	Diesel	1546	ULSD	YES	na	n	n	na	na	2
PST010	Tacoma	Straddle Carrier	1546	Valmet	401093678T		88,200 lbs	1991	185	276	Diesel	1282	ULSD	YES	na	n	n	na	na	2
PST010	Tacoma	Straddle Carrier	1547	Valmet	401093678T		88,200 lbs	1992	185	372	Diesel	1841	ULSD	YES	na	n	n	na	na	2
PST010	Tacoma	Straddle Carrier	1548	Valmet	401093678T		88,200 lbs	1992	185	522	Diesel	2634	ULSD	YES	na	n	n	na	na	2
PST010	Tacoma	Straddle Carrier	1553	Kalmar	CSC340		40 LT	2002	185	2,102	Diesel	12505	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1554	Kalmar	CSC340		40 LT	2002	185	2,239	Diesel	14881	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1555	Kalmar	CSC340		40 LT	2002	185	2,330	Diesel	17224	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1556	Kalmar	CSC340		40 LT	2002	185	0	Diesel	0	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1557	Kalmar	CSC340		40 LT	2002	185	1,192	Diesel	7703	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1558	Kalmar	CSC340		40 LT	2002	185	1,604	Diesel	10177	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1559	Kalmar	CSC340		40 LT	2002	185	1,567	Diesel	9968	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1560	Kalmar	CSC340		40 LT	2002	185	1,513	Diesel	10133	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1561	Kalmar	CSC340		40 LT	2004	185	1,777	Diesel	14691	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1562	Kalmar	CSC340		40 LT	2004	185	1,838	Diesel	17059	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1563	Kalmar	CSC340		40 LT	2004	185	2,023	Diesel	13725	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1564	Kalmar	CSC340		40 LT	2004	185	1,715	Diesel	12694	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1565	Kalmar	CSC340		40 LT	2004	185	1,749	Diesel	12002	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1566	Kalmar	CSC340		40 LT	2008	185	1,523	Diesel	14857	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1567	Kalmar	CSC340		40 LT	2008	185	1,528	Diesel	14651	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1568	Kalmar	CSC340		40 LT	2008	185	1,622	Diesel	14834	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1569	Kalmar	CSC340		40 LT	2008	185	1,347	Diesel	13680	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1570	Kalmar	CSC340		40 LT	2008	185	1,516	Diesel	14324	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1571	Kalmar	CSC340		40 LT	2008	185	1,472	Diesel	14625	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Straddle Carrier	1572	Kalmar	CSC340		40 LT	2008	185	1,505	Diesel	15262	ULSD	n	na	n	n	DPF	2010	2
PST010	Tacoma	Sweeper	4599	PWRBOSS	SW90HD			1989	50	8	Propane	10	Propane	n	na	n	n	na	na	1
PST010	Tacoma	Sweeper	5428	Elgin	SERIES P (PELICAN)	3 Cubic Yard		1994	175	82	Diesel	173	ULSD	YES	na	n	n	na	na	1
PST010	Tacoma	Sweeper	10259	TENNANT	Power Sweeper/Rider	20,000 lb		2004	50	219	Diesel	630	ULSD	YES	na	n	n	na	na	1
PST010	Tacoma	Truck	3284		Water Tank Truck			1984		47	Diesel	na	ULSD	n	na	n	n	na	na	1
PST010	Tacoma	Truck	3293		Dump Truck			1985		8	Diesel	na	ULSD	n	na	n	n	na	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)	DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
PST010	Tacoma	Truck	3373		Fuel Truck			1996		13	Diesel	na	ULSD	n	na	n	n	na	1
PST010	Tacoma	Truck	3408		Fuel Truck			1999		47	Gasoline	na	Gasoline	n	na	n	n	na	1
PST010	Tacoma	Truck	3420					2001	0	0	Electric	na	Electric	n	na	n	n	na	0
PST010	Tacoma	Truck	10040	Ford	F550 V/10 ENG		19500 GVW	2003	130	1,665	Gasoline	9480	Gasoline	n	na	n	n	na	1
PST010	Tacoma	Truck	10644		Dump Truck			1996		203	Diesel	na	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Truck	10696		Fuel Truck			2000		4	Diesel	na	ULSD	n	na	n	n	na	1
PST010	Tacoma	Truck	10864		Rollback			1999		70	Diesel	na	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Truck	10893		Vactor			1994		53	Diesel	na	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Yard Tractor	3303	Ottawa	YTD50TANDEM AX	30000		1987	110	16	Diesel	22	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Yard Tractor	3348	Capacity	TJ5500			1991	110	43	Diesel	43	ULSD	YES	na	n	n	na	1
PST010	Tacoma	Yard Tractor	10066	Ottawa	COMMANDO59	4629:170,000 pul		2003	110	65	Gasoline	131	Gasoline	YES	na	n	n	na	1
PST080	Tacoma	Forklift	1F					2002		660	Propane	na	Propane	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	139	Ottawa	Commando CAT		3208	1998	210	600	Diesel	1080	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	140	Ottawa	Commando CAT		3208	1998	210	300	Diesel	588	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	149	Ottawa	Commando CAT		3208	1994	210	400	Diesel	920	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	150	Ottawa	Commando CAT		3208	1994	210	400	Diesel	872	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	153	Ottawa	Commando CAT		3208	1995	210	420	Diesel	938	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	156	Ottawa	Commando CAT		3208	1996	210	316	Diesel	760	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	157	Ottawa	Commando CAT		3208	1996	210	336	Diesel	676	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	158	Ottawa	Commando CAT		3208	1996	210	336	Diesel	564	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	169	Ottawa	Commando CAT		3208	1997	210	444	Diesel	1052	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	170	Ottawa	Commando CAT		3208	1998	210	372	Diesel	984	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	171	Ottawa	Commando CAT		3208	1998	210	324	Diesel	848	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	172	Ottawa	Commando CAT		3208	1999	210	444	Diesel	1158	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	173	Ottawa	Commando CAT		3208	1999	210	396	Diesel	914	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	174	Ottawa	Commando CAT		3208	1999	210	160	Diesel	982	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	175	Ottawa	Commando CAT		3208	1999	210		Diesel	na	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	178	Ottawa	Commando CAT		3208	2000	210	660	Diesel	1186	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	179	Ottawa	Commando CAT		3208	1998	210	576	Diesel	986	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	301	Ottawa	Commando CUM		C8.3	1998	210	168	Diesel	642	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	305	Ottawa	Commando CUM		C8.3	1998	210	372	Diesel	1040	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	306	Ottawa	Commando CUM		C8.3	1998	210	328	Diesel	1190	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	307	Ottawa	Commando CUM		C8.3	1998	210	388	Diesel	920	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	309	Ottawa	Commando CUM		C8.3	1998	210	476	Diesel	980	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	311	Ottawa	Commando CUM		C8.3	1998	210	480	Diesel	924	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	312	Ottawa	Commando CUM		C8.3	1999	210	408	Diesel	964	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	315	Ottawa	Commando CUM		C8.3	1998	210	472	Diesel	916	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	318	Ottawa	Commando CUM		C8.3	1999	210	376	Diesel	1236	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	319	Ottawa	Commando CUM		C8.3	1999	210	640	Diesel	908	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	322	Ottawa	Commando CUM		C8.3	2000	210	444	Diesel	1044	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	324	Ottawa	Commando CUM		C8.3	2000	210	496	Diesel	1216	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	325	Ottawa	Commando CUM		QSB6.7	2008	210	1,032	Diesel	1748	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	326	Ottawa	Commando CUM		QSB6.7	2008	220	717	Diesel	2012	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	328	Ottawa	Commando CUM		QSB6.7	2009	220	453	Diesel	2044	ULSD	n	na	n	n	na	1
PST040	Tacoma	Yard Tractor	329	Ottawa	Commando CUM		QSB6.7	2009	220	785	Diesel	1940	ULSD	n	na	n	n	na	1



**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	(Emulsified Fuel)						
PST060	Tacoma	Forklift	721	Mitsubishi	F15C-5006	Mitsubishi	N/A	1999	130	54	Diesel	na	ULSD	n	na	n	n	na	na	1
PST060	Tacoma	Forklift	722	Hyster	D019D017	(Perkins)	N/A	1964	130	30	Diesel	na	ULSD	n	na	n	n	na	na	1
PST060	Tacoma	Reach Stacker	201	Kalmar	DRD450-8	(Volvo)	TWD1231V	1998	375	946	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Reach Stacker	202	Kalmar	DRD450-8	(Volvo)	TWD1231V	1998	375	615	Diesel	na	ULSD	n	na	n	n	na	na	1
PST060	Tacoma	Reach Stacker	203	Kalmar	DRD450-8	(Volvo)	TWD1231V	1998	375	679	Diesel	na	ULSD	n	na	n	n	na	na	1
PST060	Tacoma	Reach Stacker	204	Sisu	RSD4540-5	Cummins	M11	1999	330	1,149	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Reach Stacker	205	Kalmar	DRS4531-S	Cummins	M11	1999	330	1,321	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Reach Stacker	206	Kalmar	DRD450-8	Cummins	M11	2001	375	815	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Side Handler	301	Kalmar	DCD80-40	(Volvo)	TWD731M	1998	228	171	Diesel	na	ULSD	n	na	n	n	na	na	1
PST060	Tacoma	Top Handler	207	Hyster	1150HD-CI	Cummins	QSM11	2005	365	1,502	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Top Handler	208	Hyster	1150HD-CI	Cummins	QSM11	2010	365	474	Diesel	na	ULSD	n	na	n	n	na	na	1
PST060	Tacoma	Top Handler	209	Hyster	1150HD-CI	Cummins	QSM11	2007	365	1,787	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Yard Tractor	501	Ottawa	Commando	Cummins	6BT5.9	1998	174	452	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	502	Ottawa	Commando	Cummins	6BT5.9	1998	174	680	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	503	Ottawa	Commando	Cummins	6BT5.9	1998	174	457	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	504	Ottawa	Commando	Cummins	6BT5.9	1998	174	739	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	505	Ottawa	Commando	Cummins	6BT5.9	1998	174	777	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	506	Ottawa	Commando	Cummins	6BT5.9	1998	174	723	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	507	Ottawa	Commando	Cummins	6BT5.9	1998	174	770	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	508	Ottawa	Commando	Cummins	6BT5.9	1998	174	630	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	509	Ottawa	Commando	Cummins	6BT5.9	1998	174	497	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	510	Ottawa	Commando	Cummins	6BT5.9	1998	174	1,049	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	511	Ottawa	Commando	Cummins	6BT5.9	1998	174	754	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	512	Ottawa	Commando	Cummins	6BT5.9	1998	174	1,139	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	513	Ottawa	Commando	Cummins	6BT5.9	1998	174	925	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	514	Ottawa	Commando	Cummins	6BT5.9	1998	174	2,550	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	516	Ottawa	Commando	Cummins	6BT5.9	1998	174	466	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	517	Ottawa	Commando	Cummins	6BT5.9	1998	174	389	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	518	Ottawa	Commando	Cummins	6BT5.9	1998	174	1,961	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	519	Ottawa	Commando	Cummins	6BT5.9	1998	174	996	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	520	Ottawa	Commando	Cummins	6BT5.9	1998	174	979	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	521	Ottawa	Commando	Cummins	6BT5.9	1998	174	976	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	522	Ottawa	Commando	Cummins	6BT5.9	1998	174	646	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	523	Ottawa	Commando	Cummins	6BT5.9	1998	174	705	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	524	Ottawa	Commando	Cummins	6BT5.9	1998	174	991	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	525	Ottawa	Commando	Cummins	6BT5.9	1998	174	569	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	526	Ottawa	Commando	Cummins	6BT5.9	1998	174	946	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	527	Ottawa	Commando	Cummins	6BT5.9	1998	174	1,311	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	528	Ottawa	Commando	Cummins	6BT5.9	1998	174	1,138	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	529	Ottawa	Commando	Cummins	6BT5.9	1998	174	1,404	Diesel	na	ULSD	YES	na	n	n	na	na	1
PST060	Tacoma	Yard Tractor	531	Ottawa	Commando	Cummins	QSB5.9	2005	175	1,303	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Yard Tractor	532	Ottawa	Commando	Cummins	QSB5.9	2005	175	1,446	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Yard Tractor	533	Ottawa	Commando	Cummins	QSB5.9	2005	175	1,339	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Yard Tractor	534	Ottawa	Commando	Cummins	QSB5.9	2005	175	1,029	Diesel	na	ULSD	n	na	n	n	DPF	na	1
PST060	Tacoma	Yard Tractor	535	Ottawa	Commando	Cummins	QSB5.9	2006	175	1,876	Diesel	na	ULSD	n	na	n	n	DPF	na	1

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip Manufacturer	Equip Model	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
													ULSD	Emulsified Fuel						
PST060	Tacoma	Yard Tractor	536	Ottawa	Commando	Cummins	QSB5.9	2006	175	1,682	Diesel	na	ULSD	n	na	n	DPF	na	1	
PST060	Tacoma	Yard Tractor	537	Ottawa	Commando	Cummins	QSB5.9	2006	175	1,172	Diesel	na	ULSD	n	na	n	DPF	na	1	
PST060	Tacoma	Yard Tractor	538	Ottawa	Commando	Cummins	QSB5.9	2006	175	1,727	Diesel	na	ULSD	n	na	n	DPF	na	1	
PST060	Tacoma	Yard Tractor	539	Ottawa	Commando	Cummins	QSB5.9	2006	175	1,220	Diesel	na	ULSD	n	na	n	DPF	na	1	
PST060	Tacoma	Yard Tractor	540	Ottawa	Commando	Cummins	QSB5.9	2006	175	2,259	Diesel	na	ULSD	n	na	n	DPF	na	1	
PST060	Tacoma	Yard Tractor	541	Ottawa	Commando	Cummins	ISB02	2006	200	520	Diesel	na	ULSD	n	na	YES	n	na	1	
PST060	Tacoma	Yard Tractor	542	Ottawa	4X2 Off R	Cummins	ISB07	2008	200	1,288	Diesel	na	ULSD	n	na	YES	n	na	1	
PST060	Tacoma	Yard Tractor	543	Ottawa	4X2 Off R	Cummins	ISB07	2008	200	2,049	Diesel	na	ULSD	n	na	YES	n	na	1	
PST060	Tacoma	Yard Tractor	544	Ottawa	4X2 Off R	Cummins	ISB07	2008	200	1,712	Diesel	na	ULSD	n	na	YES	n	na	1	
PST060	Tacoma	Yard Tractor	545	Ottawa	4X2 Off R	Cummins	ISB07	2008	200	1,188	Diesel	na	ULSD	n	na	YES	n	na	1	
PST060	Tacoma	Yard Tractor	546	Ottawa	4X2 Off R	Cummins	ISB07	2008	200	1,729	Diesel	na	ULSD	n	na	YES	n	na	1	
PST060	Tacoma	Yard Tractor	547	Ottawa	4X2 Off R	Cummins	ISB07	2008	200	1,542	Diesel	na	ULSD	n	na	YES	n	na	1	
PST060	Tacoma	Yard Tractor	548	Ottawa	YT 50	Cummins	6CT8.3	1998	215	149	Diesel	na	ULSD	n	na	n	n	na	1	
PST060	Tacoma	Yard Tractor	549	Ottawa	YT 50	Cummins	6CT8.3	1998	215	392	Diesel	na	ULSD	n	na	n	n	na	1	
PST060	Tacoma	Yard Tractor	550	Ottawa	YT 50	Cummins	6CT8.3	1998	215	229	Diesel	na	ULSD	n	na	n	n	na	1	
PST060	Tacoma	Yard Tractor	551	Ottawa	YT 50	Cummins	6CT8.3	1998	215	263	Diesel	na	ULSD	n	na	n	n	na	1	
PST060	Tacoma	Yard Tractor	552	Ottawa	YT 50	Cummins	6CT8.3	1999	215	292	Diesel	na	ULSD	n	na	n	n	na	1	
PST060	Tacoma	Yard Tractor	553	Ottawa	YT 50	Cummins	6CT8.3	1999	215	350	Diesel	na	ULSD	n	na	n	n	na	1	
PST060	Tacoma	Yard Tractor	554	Ottawa	YT 50	Cummins	6CT8.3	1999	215	360	Diesel	na	ULSD	n	na	n	n	na	1	
PST060	Tacoma	Yard Tractor	555	Ottawa	YT 50	Cummins	6CT8.3	1999	215	427	Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Loader		Titan-Taylo	994			1997	355		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Loader		Titan-Taylo	994			1997	355		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Loader		Titan-Taylo	994			2003	355		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Loader		Titan-Taylo	994			2005	355		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Side Handler		Taylor	950			1993	250		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Side Handler		Taylor	950			1991	250		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Side Handler		Taylor	950			1993	250		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Side Handler		Taylor	950			1993	250		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Side Handler		Taylor	950			2000	250		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Yard Tractor		Ottawa				2008	155		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Yard Tractor		Ottawa				2008	155		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Yard Tractor		Ottawa				2008	155		Diesel	na	ULSD	n	na	n	n	na	1	
SIG Yard	BNSF	Yard Tractor		Ottawa				2004	155		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Loader	#118	Linkbelt	LS2800Q	Isuzu	6 cyl	2000	120		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Loader	#124	Doosan Log	225S	Doosan	6 cyl	2007	150		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Loader	#125	Linkbelt	240LXTL	Isuzu	6 cyl	2007	197		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Loader	#130	Doosan Log	DX300LLC	Doosan	6 cyl	2011	197		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Loader	#131	Linkbelt	240LXTL	Isuzu	6 cyl	2011	197		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Stacker	#511	Wagner Sta	L90	Cummins	6 cyl		440		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Stacker	#512	Wagner Sta	L90	Cummins	6 cyl		440		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Stacker	#514	Cat Log Sta	988-B	Caterpillar	6 cyl		375		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Stacker	#517	Cat Log Sta	988-B	Caterpillar	6 cyl		375		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Stacker	#518	Wagner Sta	L80	Cummins	6 cyl		415		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Stacker	#520	Wagner Sta	L80	Cummins	6 cyl		415		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Log Stacker	#522	Cat Log Sta	988-B	Caterpillar	6 cyl	1987	375		Diesel	na	ULSD	n	na	n	n	na	1	

**Puget Sound Emissions Inventory**  
**Cargo-handling Equipment Data**

Terminal ID	Port	Equip Type	Equip ID	Equip		Engine Make	Engine Model	Engine Year	HP	Annual Hours	Fuel Type	Total Fuel Consumed (gallons)	Alt. Fuel Used (Emulsified Fuel, ULSD)		DOC Installed (y or n)	Year DOC Installed	On-road Engine (y or n)	Other Emission Control	Date Implemented (Mo/Yr)	Number of Engines
				Manufacturer	Model								ULSD	DOC						
PSO020	Olympia	Backhoe	#603	Case Backhoe	580E	Cummins	6 cyl	1991	65		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Skid Steer Loader	#608	Cat Wheel Loader	1966-C	Caterpillar	6 cyl		170		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Skid Steer Loader	#610	Komatsu WWA	380	Cummins	6 cyl		192		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Skid Steer Loader	#611	Cat Skid Steer	216B CN	Caterpillar	4 cyl	2007	51		Diesel	na	ULSD	n	na	n	n	na	1	
PSO020	Olympia	Skid Steer Loader	#853	Ford	L8000	Cummins	6 cyl	1995	210		Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Stacker	15	Letourneau	SL3592	Cummins	6 cyl	2000	475	500	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Stacker	16	Letourneau	SL3592	Cummins	6 cyl	2000	475	1000	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Stacker	21	Letourneau	4592	Caterpillar	6 cyl	1994	425	500	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Stacker	22	Letourneau	4592	Caterpillar	6 cyl	1995	425	1800	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Stacker	23	Letourneau	4592	Caterpillar	6 cyl	1996	425	1500	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Stacker	24	Letourneau	SL3592	Detriot	6 cyl	2007	425	1800	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Stacker	25	Letourneau	SL3592	Detriot	6 cyl	2000	425	1500	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Stacker	19	Caterpillar	988H	Caterpillar	6 cyl	2007	500	1200	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Stacker	20	Caterpillar	988H	Caterpillar	6 cyl	2011	500	2000	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Handler	53	Komatsu	PC300-6	Cummins	6 cyl	2000	200	500	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Handler	54	Komatsu	PC300-6	Cummins	6 cyl	2001	200	800	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Handler	55	Komatsu	PC300-6	Cummins	6 cyl	2001	200	1500	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Handler	132	Komatsu	PC300-6	Cummins	6 cyl	2000	200	1800	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Handler	134	Komatsu	PC300-6	Cummins	6 cyl	2001	200	1800	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Log Handler	919	Komatsu	PC300-6	Cummins	6 cyl	2001	200	100	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Skid Steer Loader	13	Volvo	120	Volvo	4 cyl	1998	200	300	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Skid Steer Loader		Bobcat		Kubota	4 cyl	1994	100	75	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Forklift		Hyster		GM	4 cyl		120	250	Propane	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Crane		Drott		Perkins	4 cyl		100	20	Diesel	na	ULSD	n	na	n	n	na	1	
PSO030	Olympia	Truck		Kenworth		Cummins	6 cyl	1995	460	50	Diesel	na	ULSD	n	na	YES	n	na	1	
PSO030	Olympia	Truck		Kenworth		Cummins	6 cyl	1991	400	250	Diesel	na	ULSD	n	na	YES	n	na	1	



**APPENDIX B - SUPPORTING DATA**

**HEAVY-DUTY VEHICLE DATA**



## MEMORANDUM

April 20, 2012

**To:** Ron Stuart, Port of Tacoma

**From:** Kelly McGourty  
Program Manager

**Subject:** 2011 Puget Sound Emissions Inventory Update – On-Road Heavy-Duty Diesel Vehicle Emissions

This memo transmits the methodology and estimated on-road emissions from port-related heavy duty diesel vehicle traffic in the Puget Sound region for calendar year 2011. This documentation is provided as part of the 2011 Puget Sound Emissions Inventory Update.

### BACKGROUND AND METHODOLOGY

PSRC participated with the “HDV LDV Technical Work Group” for the 2011 Puget Sound Emissions Inventory Update since November 2011. Related to on-road emissions, the group discussed the appropriate models to be used, the methodology for estimating port-related vehicle miles traveled (VMT), and the pollutants to be analyzed.

The methodology is similar to that used for the 2005 emissions inventory, with two exceptions: 1) the estimation of port-related VMT and 2) the potential use of the Environmental Protection Agency’s new Motor Vehicle Emission Simulator (MOVES).

#### Vehicle Miles Traveled (VMT)

In 2005, PSRC utilized our current travel demand model at that time to estimate on-road heavy duty diesel VMT related to port traffic. This methodology is described in the August 25, 2006 memo, “Estimating Regional Heavy Truck VMT for 2000 associated with Port traffic.” A growth factor was used to forecast calendar year 2000 VMT to 2005 for the emissions inventory. Also, since certain port-related trips were considered to be underrepresented in the model, an additional adjustment was applied as described in the above referenced memo.

Since that time, PSRC has made improvements to our travel demand model, with specific improvements made based on information provided by the Ports on special generators. As such, for the 2011 update there was no need to make any additional adjustments to the model output. Since 2010 is an existing model analysis year, and since it was determined that there would be little to no differences in port-related VMT between 2010 and 2011, the decision was made to use the 2010 analysis year as a surrogate for the 2011 emissions inventory data. This decision was discussed with the Technical Workgroup.

### Emissions Models

Per discussions with the Technical Workgroup, PSRC and the Washington State Department of Ecology were to prepare emission factors using both the existing EPA software, MOBILE6.2, as well as the new MOVES model. The MOVES model is significantly different from MOBILE6.2, designed around a database and graphical user interface, and containing the most up to date estimation of vehicle emissions. The comparison of emissions between the two models varies depending on the pollutant, with MOVES estimating higher emissions for some pollutants but lower for others compared to MOBILE6.2. However, based on preliminary research, the trend between years by pollutant are similar between the two models. Given the complexity of MOVES, EPA has granted an additional one year extension before the new model must be used for transportation conformity analyses.

Both Ecology and PSRC are continuing to transition to MOVES, which is a very complicated and time consuming process. As such, we are not yet prepared to perform emissions estimations using MOVES at this time. For the 2011 emissions inventory, MOBILE6.2 was used to estimate on-road emissions from port-related traffic. In addition, emission factors were prepared and forwarded to Starcrest Consulting Group for their use in estimating on-port emissions. We are committed, however, to continue to work towards the use of MOVES. By the time of the next update to the emissions inventory, we expect to be fully transitioned to the MOVES model. In addition, we will continue to work towards accelerating this schedule to the extent possible; if we are able to do so in the next several months, we will provide estimated emissions for the 2011 emissions inventory using MOVES, to be included as an appendix to the main report.

### Modeling Parameters

Starcrest Consulting Group provided updated vehicle distribution data for the Ports of Seattle, Tacoma and Olympia, representing Class 8 heavy duty diesel vehicles. In consultation with Ecology, the variation between the data representing just the Ports of Seattle and Tacoma (within the Puget Sound region) and the data for all three ports was considered to be minimal and would not produce any significant differences in emissions output. Also, the majority of the truck trips were to and from the Seattle and Tacoma ports. Therefore, the all ports distribution was used for this analysis.



Using MOBILE6.2, the following pollutants were analyzed for Class 8 heavy duty vehicles:

- carbon monoxide (CO)
- nitrogen oxides (NOx)
- volatile organic compounds (VOC)
- carbon dioxide (CO<sub>2</sub>)
- sulfur dioxide (SO<sub>2</sub>)
- fine particulates (PM<sub>2.5</sub>) and coarse particulates (PM<sub>10</sub>)
  - ❖ brake wear particulate (Brake)
  - ❖ tire wear particulate (Tire)
  - ❖ diesel particulate matter
    - elemental carbon portion of diesel exhaust particulate (ECARBON)
    - organic carbon portion of diesel exhaust particulate (OCARBON)
    - sulfate portion of exhaust particulate (SO4)

Emission factors for CO, NOx and VOCs were created for speeds between 2.5 and 65 miles per hour. MOBILE6.2 produces emission factors for CO<sub>2</sub>, SO<sub>2</sub> and particulate matter that are the same regardless of speed. These emission factors were then applied to the output from PSRC's travel demand model for on-road port-related traffic. The results of the analysis are provided in the tables below.

**TABLE 1: ESTIMATED 2011 DAILY ON-ROAD PORT-RELATED TRUCK VMT**

<b>DAILY VMT</b>			
Location	Everett	Seattle	Tacoma
Distribution Centers	1,577.18	16,198.1	8,520.2
I-5 South	7,317.41	7,823.6	7,570.3
I-90	3,617.75	4,875.8	8,543.4
I-5 North	1,265.10	4,496.4	8,724.1
other externals	682.39	854.3	877.2
Rest of King County	12,955.98	97,218.8	88,182.5
Snohomish County	1,723.24	45,829.5	24,934.9
Rest of Pierce County	4,528.55	54,359.5	13,275.6
Kitsap County	1,330.16	22,909.6	13,116.9
Rail yards	0.00	0.00	0.00
Total VMT	34,997.76	254,565.50	173,745.10
<b>TOTAL Daily VMT</b>	<b>463,308.36</b>		

**Table 2: Estimated 2011 Daily On-Road Port-Related Diesel Truck Emissions**

**DAILY  
EMISSIONS**

<b>Pollutant</b>	<b>Everett</b>	<b>Seattle</b>	<b>Tacoma</b>	<b>2011 Emissions (grams/day)</b>	<b>2011 Emissions (tons/day)</b>
<b>CO</b>	81,473.60	727,107.64	424,715.31	1,233,296.55	1.36
<b>VOC</b>	18,509.87	158,686.24	95,801.08	272,997.19	0.30
<b>NO<sub>x</sub></b>	351,110.21	2,445,764.76	1,753,167.73	4,550,042.69	5.02
<b>CO<sub>2</sub></b>	56,073,131.09	407,862,759.51	278,372,977.22	742,308,867.82	818.26
<b>SO<sub>2</sub></b>	523.22	3,805.75	2,597.49	6,926.46	0.01
<b>TOTAL PM<sub>10</sub></b>	8,261.89	60,095.02	41,015.83	109,372.73	0.12
Brake	437.47	3,182.07	2,171.81	5,791.35	0.01
Tire	1,259.92	9,164.36	6,254.82	16,679.10	0.02
ECARBON	4,689.35	34,109.23	23,280.10	62,078.68	0.07
OCARBON	1,837.38	13,364.69	9,121.62	24,323.69	0.03
SO <sub>4</sub>	37.76	274.68	187.47	499.91	0.00
<b>TOTAL PM<sub>2.5</sub></b>	6,543.85	47,598.40	32,486.68	86,628.92	0.10
Brake	185.49	1,349.20	920.85	2,455.53	0.00
Tire	314.98	2,291.09	1,563.71	4,169.77	0.00
ECARBON	4,315.22	31,387.92	21,422.77	57,125.91	0.06
OCARBON	1,690.39	12,295.51	8,391.89	22,377.79	0.02
SO <sub>4</sub>	37.76	274.68	187.47	499.91	0.00

**Table 3: Estimated 2011 Annual On-Road Port-Related Diesel Truck Emissions**

**ANNUAL EMISSIONS**

<b>Pollutant</b>	<b>2011 Emissions (tons)</b>
<b>CO</b>	496.04
<b>VOC</b>	109.83
<b>NO<sub>x</sub></b>	1,830.66
<b>CO<sub>2</sub></b>	298,663.08
<b>SO<sub>2</sub></b>	2.79
<b>TOTAL PM<sub>10</sub></b>	44.00
<b>TOTAL PM<sub>2.5</sub></b>	34.82

Some key differences to note between the 2005 and 2011 analyses include the updated VMT estimation for port-related traffic, as well as the updated port-related vehicle distribution data provided by Starcrest Consulting Group. These have resulted in greater emissions estimated in 2011 for all pollutants with the exception of SO<sub>2</sub>.

Please contact Kelly McGourty at (206)971-3601 or [kmcgourty@psrc.org](mailto:kmcgourty@psrc.org) if you have any questions or would like additional information regarding this analysis.

cc: Sally Otterson, Ecology  
Joseph Ray, Starcrest Consulting Group



**Puget Sound Emissions Inventory**  
**On-Terminal HDV Data and Driving Emissions, tpy**

Terminal ID	Avg. Driving	Driving	Driving	Driving	NO <sub>x</sub>	VOC	CO	Driving Emissions, tpy							
	Speed (mph)	Per Trip (hours)	Per Trip (miles)	All Trips (miles)				SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	CO <sub>2</sub> E
PSS070	15	0.07	1.00	301,444	4.12	0.31	1.65	0.005	0.062	0.057	0.062	532	0.0016	0.0017	533
PSS050	15	0.12	1.75	1,126,416	15.38	1.17	6.15	0.019	0.233	0.214	0.233	1,989	0.0060	0.0063	1,991
PSS060	15	0.13	1.90	168,562	2.30	0.18	0.92	0.003	0.035	0.032	0.035	298	0.0009	0.0009	298
PSS080	15	0.07	1.00	320,268	4.37	0.33	1.75	0.005	0.066	0.061	0.066	566	0.0017	0.0018	566
PSS030	10	0.05	0.50	19,240	0.30	0.02	0.15	0.000	0.004	0.004	0.004	34	0.0001	0.0001	34
PSS020A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
PSS020B	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
PST070	15	0.02	0.28	25,704	0.35	0.03	0.14	0.000	0.005	0.005	0.005	45	0.0001	0.0001	45
PST030	10	0.10	0.95	51,937	0.81	0.07	0.39	0.001	0.011	0.010	0.011	92	0.0003	0.0003	92
PST050	15	0.07	1.00	144,300	1.97	0.15	0.79	0.002	0.030	0.027	0.030	255	0.0008	0.0008	255
PST020	15	0.04	0.66	137,280	1.87	0.14	0.75	0.002	0.028	0.026	0.028	243	0.0007	0.0008	243
PST040	15	0.05	0.68	63,158	0.86	0.07	0.35	0.001	0.013	0.012	0.013	112	0.0003	0.0004	112
PST060	15	0.10	1.53	194,266	2.65	0.20	1.06	0.003	0.040	0.037	0.040	343	0.0010	0.0011	343
PST100	25	0.04	1.04	78,000	0.90	0.06	0.25	0.001	0.016	0.015	0.016	138	0.0004	0.0004	138
PST010	8	0.03	0.25	1,795	0.03	0.00	0.02	0.000	0.000	0.000	0.000	3	0.0000	0.0000	3
PST090	15	0.03	0.50	2,031	0.03	0.00	0.01	0.000	0.000	0.000	0.000	4	0.0000	0.0000	4
PST120	5	0.06	0.30	4,500	0.08	0.01	0.05	0.000	0.001	0.001	0.001	8	0.0000	0.0000	8
PST110	10	0.02	0.24	2,430	0.04	0.00	0.02	0.000	0.001	0.000	0.001	4	0.0000	0.0000	4
PST130	5	0.08	0.40	15,840	0.29	0.03	0.17	0.000	0.003	0.003	0.003	28	0.0001	0.0001	28
PSA010	5	0.05	0.25	1,999	0.04	0.00	0.02	0.000	0.000	0.000	0.000	4	0.0000	0.0000	4
PSE010	8	0.13	1.00	4,025	0.07	0.01	0.03	0.000	0.001	0.001	0.001	7	0.0000	0.0000	7
PSO010	5	0.05	0.25	1,902	0.04	0.00	0.02	0.000	0.000	0.000	0.000	3	0.0000	0.0000	3
BNSF SIG	15	0.07	1.00	217,264	2.97	0.23	1.19	0.004	0.045	0.041	0.045	384	0.0011	0.0012	384
UP Argo	15	0.07	1.00	193,333	2.64	0.20	1.06	0.003	0.040	0.037	0.040	342	0.0010	0.0011	342

**Puget Sound Emissions Inventory**  
**HDV Composite Emission Factors, HDDV8A, HDDV8B, grams/mile (g/hr for idle)**

Speed	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
Idle										
(g/hr)	46.4647	4.2577	30.5090	0.0374	0.4690	0.4318	0.4690	4,005	0.0120	0.0128
2.5	18.5859	1.7031	12.2036	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
3	18.0035	1.6346	11.4568	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
4	17.2753	1.5487	10.5229	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
5	16.8378	1.4968	9.9626	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
6	15.9569	1.3895	8.9312	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
7	15.3278	1.3132	8.1952	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
8	14.8553	1.2555	7.6424	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
9	14.4879	1.2109	7.2131	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
10	14.1942	1.1752	6.8697	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
11	13.7011	1.1117	6.3477	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
12	13.2908	1.0585	5.9136	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
13	12.9428	1.0142	5.5452	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
14	12.6453	0.9765	5.2305	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
15	12.3866	0.9427	4.9567	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
16	12.0843	0.9004	4.6538	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
17	11.8178	0.8636	4.3864	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
18	11.5804	0.8299	4.1482	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
19	11.3677	0.8001	3.9351	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
20	11.1771	0.7739	3.7440	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
21	10.9963	0.7440	3.5569	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
22	10.8318	0.7170	3.3870	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
23	10.6812	0.6918	3.2319	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
24	10.5431	0.6697	3.0899	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
25	10.4167	0.6485	2.9587	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
26	10.3244	0.6273	2.8411	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
27	10.2397	0.6078	2.7321	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
28	10.1609	0.5896	2.6298	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
29	10.0870	0.5722	2.5354	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
30	10.0181	0.5558	2.4475	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
31	10.0005	0.5405	2.3732	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
32	9.9831	0.5259	2.3037	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
33	9.9676	0.5123	2.2382	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
34	9.9528	0.4997	2.1763	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051

**Puget Sound Emissions Inventory**  
**HDV Composite Emission Factors, HDDV8A, HDDV8B, grams/mile (g/hr for idle)**

Speed	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
35	9.9384	0.4873	2.1186	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
36	9.9889	0.4757	2.0741	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
37	10.0375	0.4652	2.0326	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
38	10.0832	0.4554	1.9930	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
39	10.1270	0.4458	1.9555	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
40	10.1677	0.4362	1.9197	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
41	10.2914	0.4284	1.8976	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
42	10.4091	0.4208	1.8772	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
43	10.5218	0.4138	1.8570	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
44	10.6286	0.4062	1.8379	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
45	10.7317	0.3995	1.8203	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
46	10.9407	0.3947	1.8165	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
47	11.1401	0.3889	1.8137	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
48	11.3325	0.3841	1.8109	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
49	11.5163	0.3793	1.8087	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
50	11.6925	0.3743	1.8059	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
51	12.0104	0.3705	1.8213	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
52	12.3156	0.3677	1.8349	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
53	12.6101	0.3639	1.8493	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
54	12.8932	0.3609	1.8628	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
55	13.1655	0.3581	1.8754	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
56	13.6310	0.3561	1.9102	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
57	14.0795	0.3551	1.9439	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
58	14.5131	0.3531	1.9767	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
59	14.9320	0.3521	2.0076	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
60	15.3366	0.3503	2.0384	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
61	16.0122	0.3503	2.0983	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
62	16.6655	0.3503	2.1560	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
63	17.2977	0.3503	2.2111	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
64	17.9112	0.3503	2.2660	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051
65	18.5052	0.3503	2.3181	0.0150	0.2361	0.1870	0.2361	1,602	0.0048	0.0051





**APPENDIX B - SUPPORTING DATA**

**FLEET VEHICLE DATA**



**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Anacortes	PSA010	A1	1970	Ford	F800	Gasoline	15	864	
Anacortes	PSA010	A2	1990	Chevrolet	3/4 ton	Gasoline	15	1274	
Anacortes	PSA010	A3	1994	Chevrolet	1/2 ton	Gasoline	15	733	
Anacortes	PSA010	A4	1995	Chevrolet	1 ton Van	Gasoline	15	177	
Anacortes	PSA010	A5	1995	Chevrolet	1 ton	Gasoline	15	3145	
Anacortes	PSA010	A6	2006	Ford	truck	Gasoline	15	2947	
Anacortes	PSA010	A7	1995	Taurus	V6	Gasoline	25	653	
Anacortes	PSA010	A8	1999	Jeep		Gasoline	15	2165	
Anacortes	PSA010	A9	2007	Taurus	V6	Gasoline	25	2237	
Anacortes	PSA010	A10	2008	Ford	F250	Gasoline	15	3800	
Anacortes	PSA010	A11	2011	Ford	F350	Gasoline	15	2675	
Anacortes	PSA010	A12	1995	Ford	F150	Gasoline	15	6664	
Everett	PSE010	1	1984	International	2 Ton Flatbed	Diesel	10	2500	250
Everett	PSE010	41	1989	Chevrolet	1 Ton	Gasoline	10	4000	400
Everett	PSE010	42	1989	Chevrolet	1 Ton	Gasoline	10	4000	400
Everett	PSE010	44	1991	Chevrolet	1 Ton	Gasoline	10	4000	400
Everett	PSE010	50	1983	Ford	F100	Gasoline	10	4000	400
Everett	PSE010	51	1983	Ford	F100	Gasoline	10	4000	400
Everett	PSE010	52	1983	Ford	F100	Gasoline	10	4000	400
Everett	PSE010	53	1996	Ford	F250	Gasoline	10	4000	400
Everett	PSE010	54	1992	Ford	Ranger	Gasoline	10	4000	400
Everett	PSE010	55	1992	Ford	F350 1 Ton	Gasoline	10	4000	400
Everett	PSE010	58	1994	Chevrolet	S10 SC	Gasoline	10	4000	400
Everett	PSE010	59	1995	Ford	Crown Victory	Gasoline	10	4000	400
Everett	PSE010	66	1996	Ford	F350	Gasoline	10	4000	400
Everett	PSE010	67	1997	Ford	F100	Gasoline	10	4000	400
Everett	PSE010	68	1997	Ford	F250 4WD	Gasoline	10	4000	400
Everett	PSE010	69	1997	Ford	F250	Gasoline	10	4000	400
Everett	PSE010	70	1998	Chevrolet	1 Ton	Gasoline	10	4000	400
Everett	PSE010	81	1999	Chevrolet	Sonoma	Gasoline	10	4000	400
Everett	PSE010	135	2008	Ford	Escape	Gasoline	10	4000	400
Everett	PSE010	136	2008	Ford	Escape	Gasoline	10	4000	400
Everett	PSE010	137	2008	Ford	Escape	Gasoline	10	4000	400
Everett	PSE010	124	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	125	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	126	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	127	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	128	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	129	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	130	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	131	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	132	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	133	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	134	2008	Ford	F350SD	Gasoline	10	4000	400
Everett	PSE010	82	1999	Ford	F150 Ect cab	Gasoline	10	5000	500
Everett	PSE010	84	2000	GMC	Seerra 1500	Gasoline	10	5000	500
Everett	PSE010	121	2008	Dodge	Sprinter	Gasoline	10	5000	500
Everett	PSE010	33	1981	Travel Lift	30 AMO	Gasoline	10	6000	600
Everett	PSE010	118	2008	Ford	Escape Hybrid	Gasoline	10	10000	1000
Everett	PSE010	119	2008	Ford	Escape Hybrid	Gasoline	10	10000	1000
Everett	PSE010	103	2007	Linde	C4535	Gasoline	10	11000	1100
Everett	PSE010	104	2007	Linde	C4535	Gasoline	10	11000	1100

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Everett	PSE010	138	2007	Ford	F350SD	Gasoline	10	11000	1100
Everett	PSE010	122	2007	Hyster	H400HD	Gasoline	10	12500	1250
Everett	PSE010	2	1991	Chevrolet	1/2 Ton	Gasoline	10		
Everett	PSE010	3	1991	Ford	Ranger	Gasoline	10		
Everett	PSE010	5	1991	Ford	F250	Gasoline	10		
Everett	PSE010	6	1978	GMC	1 Ton	Gasoline	10		
Everett	PSE010	8	1991	Ford	F250	Gasoline	10		
Everett	PSE010	10	1994	GMC	1 Ton	Gasoline	10		
Everett	PSE010	13	1986	Ford	Ranger	Gasoline	10		
Everett	PSE010	14	1992	Ford	Ranger SC	Gasoline	10		
Everett	PSE010	15	1986	Ford	Ranger	Gasoline	10		
Everett	PSE010	16	1992	Ford	Ranger SC	Gasoline	10		
Everett	PSE010	20	1989	Chevrolet	S10	Gasoline	10		
Everett	PSE010	23	1989	Ford	LTD	Gasoline	10		
Everett	PSE010	24	1989	Chevrolet	S10	Gasoline	10		
Everett	PSE010	25	1989	Chevrolet	S10	Gasoline	10		
Everett	PSE010	30	1981	Mercury	Marque	Gasoline	10		
Everett	PSE010	31	1994	GMC	3500 1 Ton	Gasoline	10		
Everett	PSE010	34	1991	Chevrolet	1 Ton	Gasoline	10		
Everett	PSE010	36	1991	Chevrolet	1 Ton	Gasoline	10		
Everett	PSE010	37	1991	Chevrolet	Astro	Gasoline	10		
Everett	PSE010	38	1988	Chevrolet	Celebrity Sedan	Gasoline	10		
Everett	PSE010	39	1983	Travel Lift	35BFM	Gasoline	10		
Everett	PSE010	40	1994	GMC	Safari XT	Gasoline	10		
Everett	PSE010	43	1981	GMC	1/2 Ton	Gasoline	10		
Olympia	PSO010	04953C	1998	Chevrolet	Astro	Gasoline	15		40
Olympia	PSO010	30143C	1995	Ford	Taurus	Gasoline	15	130	
Olympia	PSO010	43669C	1997	Chevrolet	Lumina	Gasoline	15		32
Olympia	PSO010	46343C	1993	Ford	Cube Van	Gasoline	15	370	
Olympia	PSO010	07785C	1969	GMC	Fuel Truck	Gasoline	15		9
Olympia	PSO010	C56359	1981	International	Dump/Water Truck	Gasoline	15		34
Olympia	PSO010	66034C	1996	International	Service Truck 4700	Gasoline	15	480	
Olympia	PSO010	13154C	1990	Chevrolet	3/4 Ton Pickup	Gasoline	15	216	
Olympia	PSO010	15857E	2005	Ford	Ext Cab Pickup F350	Gasoline	15	501	
Olympia	PSO010	43693C	1998	Chevrolet	Pickup 2500	Gasoline	15	38	
Olympia	PSO010	13155C	1990	Chevrolet	1/2 Ton Pickup	Gasoline	15	12	
Olympia	PSO010	46344C	1993	Ford	Cube Van	Gasoline	15	3	
Olympia	PSO010	19142C	1991	GMC	Sierra	Gasoline	15	52	
Olympia	PSO010	30141C	1986	Chevrolet	S-10	Gasoline	15	0	
Seattle	PSS050	T 902	2003	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 903	1991	Ford	F 700	Gasoline	15		
Seattle	PSS050	T 904	2000	Ford	Taurus	Gasoline	15		
Seattle	PSS050	T 905	1994	Ford	E 350	Gasoline	15		
Seattle	PSS050	T 906	1996	Ford	E 350	Gasoline	15		
Seattle	PSS050	T 907	2004	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 908	1997	Chev	1 Ton	Gasoline	15		
Seattle	PSS050	T 911	2001	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 913	2001	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 914	2007	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 915	1992	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 917	1988	Ford	F 450	Gasoline	15		
Seattle	PSS050	T 918	2007	Ford	F 150	Gasoline	15		

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Seattle	PSS050	T 920	2002	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 921	1998	International		Diesel	15		
Seattle	PSS050	T 922	1985	International		Diesel	15		
Seattle	PSS050	T 923	1985	Ford	F 750	Gasoline	15		
Seattle	PSS050	T 926	1999	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 927	1995	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 928	2004	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 929	2000	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 930	2006	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 932	1997	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 933	2001	Chev	CT3	Gasoline	15		
Seattle	PSS050	T 934	2001	Chev	CT3	Gasoline	15		
Seattle	PSS050	T 935	2007	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 936	2001	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 938	1998	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 939	1995	Dodge		Gasoline	15		
Seattle	PSS050	T 940	1997	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 941	1997	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 942	1997	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 943	1997	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 944	2006	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 945	2007	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 946	1997	Ford	F 350	Gasoline	15		
Seattle	PSS050	T 947	1996	Ford	F 350	Gasoline	15		
Seattle	PSS050	T 949	2004	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 950	1998	Ford	E 350	Gasoline	15		
Seattle	PSS050	T 951	2002	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 952	1994	Nissan		Gasoline	15		
Seattle	PSS050	T 953	2005	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 954	2005	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 955	2005	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 956	1989	Ford	LTN	Diesel	15		
Seattle	PSS050	T 957	1990	GMC	V-2	Diesel	15		
Seattle	PSS050	T 958	2000	Ford	F 250	Gasoline	15		
Seattle	PSS050	T 959	2000	Ford	F 250	Gasoline	15		
Seattle	PSS050	T 960	1999	Ford	F 250	Gasoline	15		
Seattle	PSS050	T 961	2001	Ford	F 250	Gasoline	15		
Seattle	PSS050	T 962	2006	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 963	2001	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 964	2002	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 965	2000	Chev	1500	Gasoline	15		
Seattle	PSS050	T 966	2000	Chev	1500	Gasoline	15		
Seattle	PSS050	T 967	1997	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 968	2006	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 969	1997	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 970	1997	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 971	1997	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 972	2002	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 973	2001	Ford	F 250	Gasoline	15		
Seattle	PSS050	T 974	2003	Ford	F 250	Gasoline	15		
Seattle	PSS050	T 975	2007	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 976	2001	Ford	F 150	Gasoline	15		

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal		YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
	ID	ID No.					Speed		
Seattle	PSS050	T 978	1998	Chev	2500	Gasoline	15		
Seattle	PSS050	T 979	1997	Chev	2500	Gasoline	15		
Seattle	PSS050	T 980	1996	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 981	2001	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 982	2001	Dodge		Gasoline	15		
Seattle	PSS050	T 983	2002	Dodge		Gasoline	15		
Seattle	PSS050	T 984	2001	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 985	2006	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 986	2007	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 987	1996	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 988	1996	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 989	1995	Nissan		Gasoline	15		
Seattle	PSS050	T 990	2001	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 995	2004	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 996	2005	Dodge	1500	Gasoline	15		
Seattle	PSS050	T 997	1999	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 998	2000	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 999	1999	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 800	1991	Chev	1500	Gasoline	15		
Seattle	PSS050	T 801	1989	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 802	1989	Chev	S 10	Gasoline	15		
Seattle	PSS050	T 804	1999	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 805	1999	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 806	1999	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 807	1999	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 809	1992	Chev	1500	Gasoline	15		
Seattle	PSS050	T 812	1989	Ford	E 350	Gasoline	15		
Seattle	PSS050	T 813	1991	Ford	E 350	Gasoline	15		
Seattle	PSS050	T 814		Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 815	1996	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 816	1999	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 820	2005	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 821	2005	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 822	2005	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 823	2005	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 824	1998	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 826	1998	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 827	1999	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 828	2000	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 829	2000	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 830	2000	Ford	Ranger	Gasoline	15		
Seattle	PSS050	T 833	1996	Ford	E 350	Gasoline	15		
Seattle	PSS050	T 834	2000	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 835	2004	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 836	2001	Ford	F 150	Gasoline	15		
Seattle	PSS050	T 1227	1992	Chev	1500	Gasoline	15		
Seattle	PSS050	T 1240		Dodge		Gasoline	15		
Seattle	PSS050	CM 0	2002	Ford	F 150	Gasoline	15		
Seattle	PSS050	CM 1	1989	Step Van		Gasoline	15		
Seattle	PSS050	CM 2		Step Van		Gasoline	15		
Seattle	PSS050	CM 3	1979	Step Van		Gasoline	15		
Seattle	PSS050	CM 4	2000	Isuzu	NPR	Diesel	15		

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal		YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
	ID	ID No.					Speed		
Seattle	PSS050	CM 5	1999	Step Van	WORK	Gasoline	15		
Seattle	PSS050	CM 6	1996	Step Van	WORK	Gasoline	15		
Seattle	PSS050	CM 20	1999	Step Van	Frtliner	Diesel	15		
Seattle	PSS050	CM 21	2002	Step Van	WORK	Gasoline	15		
Seattle	PSS050	CM 22	1999	Step Van	Frtliner	Diesel	15		
Seattle	PSS050	CM 23	1999	Step Van	Frtliner	Diesel	15		
Seattle	PSS050	CM 24	1999	Step Van	Frtliner	Diesel	15		
Seattle	PSS050	CM 25	1999	Step Van	Frtliner	Diesel	15		
Seattle	PSS050	CM 69	1986	GMC		Diesel	15		
Seattle	PSS060	T 992	2004	Chev	1500	Gasoline	15		
Seattle	PSS060	T 993	2006	Chev	1500	Gasoline	15		
Seattle	PSS060	T 994	2002	Chev	1500	Gasoline	15		
Seattle	PSS060	T 808	1994	Ford	Ranger	Gasoline	15		
Seattle	PSS060	T 811	1997	Ford	Ranger	Gasoline	15		
Seattle	PSS060	T 817	2004	Ford	Ranger	Gasoline	15		
Seattle	PSS060	T 825	1998	Ford	Ranger	Gasoline	15		
Seattle	PSS060	T 831	2001	Ford	Ranger	Gasoline	15		
Seattle	PSS060	T 832		Ford	F 150	Gasoline	15		
Seattle	PSS080	EMSU332	1998	Ford	F150	Gasoline	15		
Seattle	PSS080	EMSU337	1998	Ford	F150	Gasoline	15		
Seattle	PSS080	EMSU397	2000	Ford	F150	Gasoline	15		
Seattle	PSS080	EMSU398	2000	Ford	F150	Gasoline	15		
Seattle	PSS080	EMSU399	2000	Ford	F150	Gasoline	15		
Seattle	PSS080	EMSU476	2005	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU477	2005	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU478	2005	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU479	2005	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU480	2005	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU528	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU529	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU530	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU531	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU532	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU533	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU534	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU535	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU536	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU537	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU538	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU539	2006	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU581	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU582	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU583	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU584	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU585	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU587	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU588	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU589	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU590	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU591	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU592	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU593	2007	Dodge	RAM 1500	Gasoline	15		

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal		YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
	ID	ID No.					Speed (mph)	2011	2011
Seattle	PSS080	EMSU594	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU595	2007	Dodge	RAM 1500	Gasoline	15		
Seattle	PSS080	EMSU619	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU620	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU621	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU622	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU623	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU624	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU625	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU626	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU627	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU628	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU629	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU630	2007	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU693	2008	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU694	2008	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU695	2008	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU696	2008	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU697	2008	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU698	2008	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS080	EMSU699	2008	Chevrolet	Silverado	Gasoline	15		
Seattle	PSS010	51	1992	DODGE	CARAVAN	Gasoline	30	1047	
Seattle	PSS010	289	1990	CHEV	1-TON UTILITY TF	Gasoline	30	913	
Seattle	PSS010	359	1992	CHEV	3/4-TON PICKUP	Gasoline	30	2100	
Seattle	PSS010	527	1996	CONDOR	210' HIGH REACH	B20	30	180	
Seattle	PSS010	612	1992	FORD	EXPLORER	Gasoline	30	1858	
Seattle	PSS010	785	1991	CHEV	SUBURBAN 4X4	Gasoline	30	2131	
Seattle	PSS010	791	1991	DODGE	D250 3/4-TON PICU	Gasoline	30	787	
Seattle	PSS010	800	1992	FORD	TAURUS WAGON	Gasoline	30	886	
Seattle	PSS010	823	1993	IHI	FUEL TRUCK	B20	30	1243	
Seattle	PSS010	852	1993	GMC	SONOMA 1/2 Ton	Gasoline	30	1160	
Seattle	PSS010	853	1994	CHEV	1-TON H/D 3500 F	Gasoline	30	534	
Seattle	PSS010	857	1994	NISSAN	ALTIMA 4/DR SDN	Gasoline	30	1000	
Seattle	PSS010	861	1994	CHEV	1-TON H/D 3500 T	Gasoline	30	2552	
Seattle	PSS010	862	1994	CHEV	1-TON H/D 3500 T	Gasoline	30	2379	
Seattle	PSS010	864	1994	CHEV	1-TON H/D 3500 T	Gasoline	30	1348	
Seattle	PSS010	865	1994	CHEV	1-TON H/D 3500 T	Gasoline	30	2204	
Seattle	PSS010	871	1994	FORD	AEROSTAR VAN	Gasoline	30	731	
Seattle	PSS010	877	1994	JEEP	CHEROKEE 4/DR	Gasoline	30	82	
Seattle	PSS010	878	1994	JEEP	CHEROKEE 4/DR	Gasoline	30	837	
Seattle	PSS010	880	1994	GMC	SONOMA PICKUP	Gasoline	30	278	
Seattle	PSS010	882	1994	GMC	SONOMA PICKUP	Gasoline	30	1472	
Seattle	PSS010	891	1995	IHI	ROLLBACK DUAL	B20	30	2881	
Seattle	PSS010	895	1995	CHEV	S-10 CHEV PICKUP	Gasoline	30	769	
Seattle	PSS010	915	1995	FORD	RANGER PICKUP	Gasoline	30	35	
Seattle	PSS010	917	1995	CHEV	1-TON H/D 3500 T	Gasoline	30	1711	
Seattle	PSS010	922	1995	CHEV	1-TON H/D 3500 T	Gasoline	30	3747	
Seattle	PSS010	924	1996	FORD	RANGER 1/2 TON	Gasoline	30	3526	
Seattle	PSS010	933	1996	CHEV	1 TON UTILITY	Gasoline	30	2680	
Seattle	PSS010	935	1996	CHEV	1-TON H/D 3500 T	Gasoline	30	3218	
Seattle	PSS010	936	1996	CHEV	1-TON H/D 3500 T	Gasoline	30	2216	
Seattle	PSS010	938	1996	CHEV	1-TON H/D 3500 T	Gasoline	30	48	



**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Seattle	PSS010	945	1996	FORD	RANGER 1/2 TON	Gasoline	30	1489	
Seattle	PSS010	946	1996	FORD	RANGER 1/2 TON	Gasoline	30	402	
Seattle	PSS010	948	1996	FORD	RANGER 1/2 TON	Gasoline	30	1634	
Seattle	PSS010	949	1996	FORD	RANGER 1/2 TON	Gasoline	30	215	
Seattle	PSS010	955	1996	DODGE	CARGO VAN	Gasoline	30	2465	
Seattle	PSS010	971	1997	FORD	H/D E-250 CARGO	Gasoline	30	2811	
Seattle	PSS010	972	1997	FORD	H/D E-250 CARGO	Gasoline	30	4033	
Seattle	PSS010	994	1997	CHEV	BLAZER S-10 4X4	Gasoline	30	1821	
Seattle	PSS010	1005	1998	FORD	WINSTAR VAN	Gasoline	30	2237	
Seattle	PSS010	1006	1998	FORD	WINSTAR VAN	Gasoline	30	2990	
Seattle	PSS010	1007	1999	CHEV	1-TON H/D 3500 T	Gasoline	30	619	
Seattle	PSS010	1009	1999	CHEV	1-TON H/D 3500 T	Gasoline	30	2573	
Seattle	PSS010	1010	1999	CHEV	1-TON H/D 3500 F1B20		30	1249	
Seattle	PSS010	1011	1999	CHEV	1-TON H/D 3500 T B20		30	1323	
Seattle	PSS010	1012	1998	DODGE	2500-PICKUP 3/4 T	Gasoline	30	1693	
Seattle	PSS010	1013	1998	DODGE	2500-PICKUP 3/4 T	Gasoline	30	1559	
Seattle	PSS010	1014	1999	CHEV	1500-PICKUP TRUC	Gasoline	30	641	
Seattle	PSS010	1015	1998	CHEV	3500-CARGO VAN	Gasoline	30	517	
Seattle	PSS010	1016	1998	FORD	F-150 1/2 TON PICI	Gasoline	30	8272	
Seattle	PSS010	1017	1998	FORD	F-150 1/2 TON PICI	Gasoline	30	3441	
Seattle	PSS010	1018	1998	CHEV	1500 1/2 TON PICK	Gasoline	30	952	
Seattle	PSS010	1027	1998	DODGE	CARAVAN VAN	Gasoline	30	4100	
Seattle	PSS010	1060	1999	CHEV	BLAZER 4 X 4	Gasoline	30	4386	
Seattle	PSS010	1067	1999	JEEP	CHEROKEE 4 DR	Gasoline	30	1278	
Seattle	PSS010	1068	1999	CHEV	1500 1/5 TON PICK	Gasoline	30	1964	
Seattle	PSS010	1069	2000	FORD	F-250 3/4 TON PICI	Gasoline	30	2723	
Seattle	PSS010	1070	1999	CHEV	3500 FLAT BED TR	Gasoline	30	3523	
Seattle	PSS010	1071	1999	CHEV	3500 1 TON UTILIT	Gasoline	30	3983	
Seattle	PSS010	1072	1999	CHEV	CARGO VAN	Gasoline	30	2911	
Seattle	PSS010	1073	1999	GMC	CARGO VAN	Gasoline	30	5217	
Seattle	PSS010	1074	1999	GMC	3500 UTILITY TRU	Gasoline	30	486	
Seattle	PSS010	1075	1999	FORD	F-550 UTILITY TRU	Gasoline	30	3631	
Seattle	PSS010	1091	1999	JEEP	CHEROKEE 4 DR	Gasoline	30	481	
Seattle	PSS010	1092	1999	JEEP	CHEROKEE 4 DR	Gasoline	30	519	
Seattle	PSS010	1099	1999	FORD	WINDSTAR	Gasoline	30	252	
Seattle	PSS010	1107	1999	GMC-VOLVO	DUAL-TAMDEM T B20		30	3301	
Seattle	PSS010	1117	1996	FORD	3/4-TON CARGO V	Gasoline	30	1915	
Seattle	PSS010	1119	1999	CHEV	MAILIBU 4 DR SD	Gasoline	30	3111	
Seattle	PSS010	1122	2000	FORD	F-250 PICKUP SUPI	Gasoline	30	6353	
Seattle	PSS010	1131	1996	FORD	CARGO VAN E 25	Gasoline	30	1847	
Seattle	PSS010	1137	2000	FORD	TAURUS 4 DR STA' FLEX		30	1523	
Seattle	PSS010	1138	2000	DODGE	3/4 TON PICKUP T	Gasoline	30	820	
Seattle	PSS010	1139	2000	FORD	F-450 SUPER DUTY	Gasoline	30	1932	
Seattle	PSS010	1140	2000	FORD	F-450 SUPER DUTY	Gasoline	30	2197	
Seattle	PSS010	1141	2001	FORD	F-450 SUPER DUTY	Gasoline	30	2424	
Seattle	PSS010	1142	2000	FORD	F-450 SUPER DUTY	Gasoline	30	3442	
Seattle	PSS010	1143	2001	FORD	F-450 SUPER DUTY	Gasoline	30	4288	
Seattle	PSS010	1144	2000	CHEV	WORK HORSE, (R	Gasoline	30	193	
Seattle	PSS010	1145	2000	DODGE	3/4 TON PICKUP T	Gasoline	30	1766	
Seattle	PSS010	1146	2000	DODGE	3/4 TON PICKUP T	Gasoline	30	3401	
Seattle	PSS010	1147	2000	CHEV	1/2 TON PICKUP T	Gasoline	30	6445	
Seattle	PSS010	1151	2000	JEEP	CHEROKEE 4 DR	Gasoline	30	2210	

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Seattle	PSS010	1157	2000	CHEV	1/2 TON PICKUP	Gasoline	30	7635	
Seattle	PSS010	1158	2001	FORD	1/2 TON CC PICKU	Gasoline	30	1236	
Seattle	PSS010	1165	2000	CHEV	BLAZER 4 DR	Gasoline	30	1661	
Seattle	PSS010	1169	2000	FORD	F-550 FORD UTILI	DIESEL	30	282	
Seattle	PSS010	1182	2001	JOHNSON	JOHNSON 605 TRU	B20	30	3404	
Seattle	PSS010	1183	2001	FORD	TAURUS 4 DR STA	FLEX	30	4561	
Seattle	PSS010	1184	2001	FORD	TAURUS 4 DR STA	FLEX	30	5036	
Seattle	PSS010	1185	2001	FORD	TAURUS 4 DR STA	FLEX	30	7996	
Seattle	PSS010	1187	2001	FORD	TAURUS 4 DR STA	FLEX	30	4170	
Seattle	PSS010	1188	2001	FORD	TAURUS 4 DR STA	FLEX	30	4877	
Seattle	PSS010	1189	2001	FORD	TAURUS 4 DR STA	FLEX	30	5781	
Seattle	PSS010	1190	2001	FORD	TAURUS 4 DR STA	FLEX	30	3821	
Seattle	PSS010	1191	2001	FORD	F-550 FORD UTILI	DIESEL	30	3984	
Seattle	PSS010	1192	2001	FORD	F-450 FORD UTILI	Gasoline	30	2129	
Seattle	PSS010	1193	2001	FORD	F-450 FORD UTILI	Gasoline	30	1134	
Seattle	PSS010	1194	2001	FORD	F-450 FORD UTILI	B20	30	1451	
Seattle	PSS010	1195	2001	FORD	F-450 FORD UTILI	Gasoline	30	3826	
Seattle	PSS010	1196	2001	FORD	F-450 FORD UTILI	Gasoline	30	3693	
Seattle	PSS010	1197	2001	FORD	F-450 FORD UTILI	Gasoline	30	3505	
Seattle	PSS010	1198	2001	CHEV	PASSENGER VAN	Gasoline	30	220	
Seattle	PSS010	1199	2001	DODGE	2500-PICKUP TRUC	Gasoline	30	1233	
Seattle	PSS010	1200	2001	DODGE	2500-PICKUP TRUC	Gasoline	30	3049	
Seattle	PSS010	1244	2001	FORD	TAURUS 4 DR STA	FLEX	30	3192	
Seattle	PSS010	1245	2001	FORD	TAURUS 4 DR STA	FLEX	30	668	
Seattle	PSS010	1246	2001	FORD	TAURUS 4 DR STA	FLEX	30	2111	
Seattle	PSS010	1248	2001	CHEV	BLAZER 4X4 4 DO	FLEX	30	2930	
Seattle	PSS010	1249	2001	GMC	PICKUP 1500 WHI	FLEX	30	11251	
Seattle	PSS010	1250	2001	GMC	PICKUP 1500 PEW	FLEX	30	4015	
Seattle	PSS010	1262	2003	CHEV	BLAZER 4X4 4 DO	Gasoline	30	1670	
Seattle	PSS010	1263	2003	HONDA	CIVIC HYBRID 4 D	Hybrid	30	7711	
Seattle	PSS010	1265	2004	CHEV	SILVERADO EXT	(CNG	30	32	
Seattle	PSS010	1267	2006	CHEV	SILVERADO EXT	(CNG	30	1563	
Seattle	PSS010	1283	2006	FORD	F550 SD	Gasoline	30	2673	
Seattle	PSS010	1289	2006	FORD	ESCAPE, HYBRID	Hybrid	30	1536	
Seattle	PSS010	1290	2007	CHEV	SILVERADO FLAT	B20	30	4262	
Seattle	PSS010	1291	2007	CHEV	SILVERADO FLAT	B20	30	4074	
Seattle	PSS010	1293	2006	JEEP	GRAND CHEROKI	Gasoline	30	5400	
Seattle	PSS010	1295	2007	CHEV	SILVERADO FLAT	B20	30	8537	
Seattle	PSS010	1296	2006	DODGE	SPRINTER VAN 25	B20	30	1823	
Seattle	PSS010	1297	2006	DODGE	SPRINTER VAN 25	B20	30	3218	
Seattle	PSS010	1298	2007	TOYOTA	PRIUS HYBRID	Hybrid	30	2448	
Seattle	PSS010	1299	2007	TOYOTA	PRIUS HYBRID	Hybrid	30	4423	
Seattle	PSS010	1303	2006	FORD	CROWN VIC	Gasoline	30	22567	
Seattle	PSS010	1322	2004	CHEV	SILVERADO PICK	Gasoline	30	2988	
Seattle	PSS010	1323	2004	CHEV	SILVERADO PICK	Gasoline	30	1255	
Seattle	PSS010	1324	2004	CHEV	SILVERADO PICK	Gasoline	30	203	
Seattle	PSS010	1325	2004	CHEV	SILVERADO PICK	Gasoline	30	380	
Seattle	PSS010	1326	2004	CHEV	SILVERADO PICK	Gasoline	30	7473	
Seattle	PSS010	1327	2004	CHEV	SILVERADO PICK	Gasoline	30	1575	
Seattle	PSS010	1338	2007	HONDA	CIVIC HYBRID 4 D	Hybrid	30	7373	
Seattle	PSS010	1342	2007	HONDA	CIVIC HYBRID	Hybrid	30	7125	
Seattle	PSS010	1343	2007	HONDA	CIVIC HYBRID	Hybrid	30	7249	

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Seattle	PSS010	1344	2007	HONDA	CIVIC HYBRID	Hybrid	30	8172	
Seattle	PSS010	1345	2007	JEEP	GRAND CHEROKI	Gasoline	30	1206	
Seattle	PSS010	1346	2007	HONDA	CIVIC HYBRID	Hybrid	30	3213	
Seattle	PSS010	1347	2005	DODGE	SPRINTER SHUTTLE	B20	30	969	
Seattle	PSS010	1348	2007	DODGE	SPRINTER VAN 35	B20	30	75	
Seattle	PSS010	1349	2007	CHEV	1 TON FLATBED	B20	30	4541	
Seattle	PSS010	1350	2007	CHEV	1 TON FLATBED	B20	30	3058	
Seattle	PSS010	1352	2008	FORD	CROWN VIC	Gasoline	30	16320	
Seattle	PSS010	1357	2007	DODGE	SPRINTER VAN 25	B20	30	1330	
Seattle	PSS010	1358	2007	DODGE	SPRINTER VAN 25	B20	30	2876	
Seattle	PSS010	1359	2007	CHEV	1 TON FLATBED	B20	30	2829	
Seattle	PSS010	1360	2008	TOYOTA	PRIUS HYBRID PH	Hybrid	30	3451	
Seattle	PSS010	1370	2008	FORD	CROWN VIC	Gasoline	30	25868	
Seattle	PSS010	1371	2007	E-RIDE	ELECTRIC TRUCK	ELEC	30	711	
Seattle	PSS010	1372	2009	TOYOTA	PRIUS HYBRID	Hybrid	30	1716	
Seattle	PSS010	1373	2008	TOYOTA	PRIUS HYBRID	Hybrid	30	5027	
Seattle	PSS010	1374	2009	TOYOTA	PRIUS HYBRID	Hybrid	30	948	
Seattle	PSS010	1375	2009	TOYOTA	PRIUS HYBRID	Hybrid	30	1812	
Seattle	PSS010	1376	2009	TOYOTA	PRIUS HYBRID	Hybrid	30	1200	
Seattle	PSS010	1377	2009	TOYOTA	PRIUS HYBRID	Hybrid	30	1092	
Seattle	PSS010	1380	2008	DODGE	SPRINTER	Diesel	30	3122	
Seattle	PSS010	1381	2008	DODGE	SPRINTER	Diesel	30	667	
Seattle	PSS010	1387	2009	ELGIN	SWEEPER, NISSAN	B20	30	6888	
Seattle	PSS010	1388	2009	HONDA	CIVIC HYBRID	Hybrid	30	6966	
Seattle	PSS010	1390	2010	FORD	BUCKET TRUCK	B20	30	2661	
Seattle	PSS010	1391	2010	FORD	BUCKET TRUCK	B20	30	1067	
Seattle	PSS010	1392	2010	DODGE	GRAND CARAVAN	Gasoline	30	1500	
Seattle	PSS010	1395	2011	PETERBILT	DUMP TRUCK	B20	30	13074	
Seattle	PSS010	1396	2008	DODGE	SPRINTER VAN	B20	30	47	
Seattle	PSS010	1398	2007	PETERBILT	VACCON INDUSTRIAL	B20	30	1852	
Seattle	PSS010	1399	2012	FORD	ESCAPE HYBRID	Hybrid	30	3804	
Seattle	PSS010	1430	2011	MERCEDES	3500 SPRINTER	diesel	30	1067	
Seattle	PSS010	1434	2011	FORD	TRANSIT	Gasoline	30	2000	
Seattle	PSS010	1435	2011	FORD	TRANSIT	Gasoline	30	2000	
Seattle	PSS010	5016	1998	CHEV	BLAZER	Gasoline	30	2020	
Seattle	PSS010	5017	1999	CHEV	BLAZER	Gasoline	30	214	
Seattle	PSS010	5018	1997	FORD	EXPLORER	Gasoline	30	4686	
Seattle	PSS010	5020	1998	GMC	JIMMY	Gasoline	30	1424	
Seattle	PSS010	5022	1999	CHEV	S10 EXTENDED C.	Gasoline	30	3329	
Seattle	PSS010	5024	1999	CHEV	4DOOR BLAZER	Gasoline	30	145	
Seattle	PSS010	5025	2000	CHEV	4DOOR BLAZER	Gasoline	30	656	
Seattle	PSS010	5028	1999	CHEV	4DOOR BLAZER	Gasoline	30	1289	
Seattle	PSS010	5029	1999	CHEV	4DOOR BLAZER	Gasoline	30	1345	
Seattle	PSS010	5030	1999	CHEV	4DOOR BLAZER	Gasoline	30	4282	
Seattle	PSS010	5033	1999	FORD	TAURUS 4 DR. SE	Gasoline	30	440	
Seattle	PSS010	5034	1999	FORD	TAURUS 4 DR. SE	Gasoline	30	444	
Seattle	PSS010	5037	1999	FORD	TAURUS 4 DR. SE	Gasoline	30	539	
Seattle	PSS010	5039	1999	FORD	TAURUS 4 DR. SE	Gasoline	30	3376	
Seattle	PSS010	5040	1999	FORD	TAURUS 4 DR. SE	Gasoline	30	644	
Seattle	PSS010	5041	1999	FORD	TAURUS 4 DR. SE	Gasoline	30	343	
Seattle	PSS010	5042	1999	FORD	TAURUS 4 DR. SE	Gasoline	30	94	
Seattle	PSS010	5044	2000	FORD	RANGER 4X2 PICK	Gasoline	30	46	

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Seattle	PSS010	5045	2000	FORD	RANGER 4X2 PICK	Gasoline	30	1402	
Seattle	PSS010	5046	2000	FORD	RANGER 4X2 PICK	Gasoline	30	1640	
Seattle	PSS010	5047	2000	FORD	RANGER 4X2 PICK	Gasoline	30	1884	
Seattle	PSS010	5048	1999	CHEV	BLAZER 4X4 4 DO	Gasoline	30	2427	
Seattle	PSS010	5049	1999	CHEV	BLAZER 4X4 4 DO	Gasoline	30	2524	
Seattle	PSS010	5050	1999	CHEV	BLAZER 4X4 4 DO	Gasoline	30	1789	
Seattle	PSS010	5056	2001	CHEV	BLAZER 4X4 4 DO	Gasoline	30	1360	
Seattle	PSS010	5057	2000	FORD	RANGER 4X2 PICK	Gasoline	30	1663	
Seattle	PSS010	5058	2000	FORD	RANGER 4X2 PICK	Gasoline	30	2746	
Seattle	PSS010	5060	2000	CHEV	BLAZER 4X4 4 DO	Gasoline	30	3251	
Seattle	PSS010	5061	2000	CHEV	BLAZER 4X4 4 DO	Gasoline	30	1839	
Seattle	PSS010	5062	2000	CHEV	BLAZER 4X4 4 DO	Gasoline	30	2436	
Seattle	PSS010	5063	2000	CHEV	BLAZER 4X4 4 DO	Gasoline	30	1000	
Seattle	PSS010	5069	2000	FORD	RANGER 4X2 PICK	Gasoline	30	238	
Seattle	PSS010	5070	2000	CHEV	BLAZER 4X4 4 DO	Gasoline	30	535	
Seattle	PSS010	5071	2000	FORD	RANGER 4X2 PICK	Gasoline	30	1633	
Seattle	PSS010	5073	2000	FORD	RANGER 4X2 PICK	Gasoline	30	1975	
Seattle	PSS010	5076	2000	CHEV	BLAZER 4 X 4 4 DC	Gasoline	30	1474	
Seattle	PSS010	5078	2001	CHEV	BLAZER 4 X 4 4 DC	Gasoline	30	1829	
Seattle	PSS010	5079	2001	FORD	RANGER 4X2 PICK	Gasoline	30	128	
Seattle	PSS010	5080	2001	FORD	RANGER 4X2 PICK	Gasoline	30	1832	
Seattle	PSS010	5081	2002	CHEV	TRAILBLAZER 4X2	Gasoline	30	3272	
Seattle	PSS010	5087	1999	FORD	EXPLORER 4X4 4E	Gasoline	30	589	
Seattle	PSS010	5088	1999	FORD	EXPLORER 4X4 4E	Gasoline	30	2819	
Seattle	PSS010	5089	1998	FORD	EXPLORER 4X4 4E	Gasoline	30	83	
Seattle	PSS010	5090	2003	CHEV	TRAILBLAZER 4X2	Gasoline	30	2798	
Seattle	PSS010	5096	2010	FORD	Ford Edge 4DR SEL	Gasoline	30	8000	
Tacoma	PST055	59101	2002	Chevrolet	Astro	Gasoline	15	465	31
Tacoma	PST055	5947	2000	Chevrolet	C1500	Gasoline	15	1110	74
Tacoma	PST055	59238	2001	Chevrolet	S10	Gasoline	20	1500	75
Tacoma	PST055	5730	1990	Chevrolet	Kodiak	Gasoline	15	1425	95
Tacoma	PST055	59725	2006	Chevrolet	Silverado	Gasoline	20	2160	108
Tacoma	PST055	59438	2004	Chevrolet	C1500	Gasoline	15	2025	135
Tacoma	PST055	5911	2000	Chevrolet	C1500	Gasoline	20	3260	163
Tacoma	PST055	5859	2000	Chevrolet	Silverado	Gasoline	15	2670	178
Tacoma	PST055	59540	2005	Chevrolet	C1500	Gasoline	15	2715	181
Tacoma	PST055	59441	2004	Chevrolet	C1500	Gasoline	15	4200	280
Tacoma	PST055	59549	2005	Chevrolet	C1500	Gasoline	15	4320	288
Tacoma	PST055	59832	2005	Chevrolet	Express G350	Gasoline	15	4590	306
Tacoma	PST055	59842	2007	Ford	Express G350	Gasoline	15	5085	339
Tacoma	PST055	59841	2008	Ford	Express G350	Gasoline	15	7140	476
Tacoma	PST055	59444	2004	Chevrolet	C1500	Gasoline	15	9030	602
Tacoma	PST055	59544	2005	Chevrolet	C1500	Gasoline	15	9030	602
Tacoma	PST055	59443	2004	Chevrolet	C1500	Gasoline	15	10800	720
Tacoma	PST055	59543	2005	Chevrolet	C1500	Gasoline	15	10800	720
Tacoma	PST055	59445	2004	Chevrolet	C1500	Gasoline	15	11205	747
Tacoma	PST055	59545	2005	Chevrolet	C1500	Gasoline	15	11205	747
Tacoma	PST055	59546	2005	Chevrolet	C1500	Gasoline	15	13485	899
Tacoma	PST055	59547	2005	Chevrolet	C1500	Gasoline	15	13740	916
Tacoma	PST055	59442	2004	Chevrolet	C1500	Gasoline	15	14205	947
Tacoma	PST055	59542	2005	Chevrolet	C1500	Gasoline	15	14205	947
Tacoma	PST055	59548	2005	Chevrolet	C1500	Gasoline	15	15045	1003

# Puget Sound Emissions Inventory

## Terminal Fleet Vehicle Data

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Tacoma	PST055	59724	2007	Chevrolet	Silverado	Gasoline	15	20025	1335
Tacoma	PST055	59550	2005	Chevrolet	C3000	Gasoline	15	28470	1898
Tacoma	PST055	59541	2005	Chevrolet	C1500	Gasoline	15	30390	2026
Tacoma	PST055	59608	2006	Chevrolet	Cororado	Gasoline	25	1181	
Tacoma	PST080	1G	1998	GMC	Flatbed	Gasoline		4800	
Tacoma	PST080	2G	2009	Chevy	Silverado 1500	Gasoline		14100	
Tacoma	PST120	#912	2000	Kenworth	T800B	Diesel	25	1500	
Tacoma	PST120	#915	2005	Kenworth	T800B	Diesel	25	1250	
Tacoma	PST120	#918	2008	Kenworth	T800B	Diesel	25	1500	
Tacoma	PST055	H71064	2004	Ford	F150	Gasoline	15	500	
Tacoma	PST055	H6872	1983	GMC	TC20903	Gasoline	15	500	
Tacoma	PST055	H71114	2002	Chevrolet	G2500	Gasoline	15	500	
Tacoma	PST055	H7514	1990	Ford	350	Gasoline	15	500	
Tacoma	PST030	PC53	1999	FORD	Taurus	Gasoline	10	1100	
Tacoma	PST030	PC55	2003	MERCURY	Sable	Gasoline	10	1238	
Tacoma	PST030	PG54	1996	CHEVROLET	3500HD	Gasoline	10	860	
Tacoma	PST030	PB41	1999	FORD-DIAMOND	E-450	Gasoline	10	5366	
Tacoma	PST030	PB42	2005	FORD-DIAMOND	E-450	Gasoline	10	1404	
Tacoma	PST030	PB43	1999	FORD-ELDORADO	E-450	Gasoline	10	2294	
Tacoma	PST030	PSR56	1995	FORD	F-350XL	Gasoline	2	16	
Tacoma	PST030	PF67	1979	INTERNATIONAL		Gasoline	2	2	
Tacoma	PST030	PF68	2000	PETERBILT		Diesel	2	12	
Tacoma	PST030	PF69	2005	INTERNATIONAL	4300 / T466	Diesel	2	160	
Tacoma	PST030	P64	1991	ISUZUU	Pickup Truck	Gasoline	10	398	
Tacoma	PST030	P66	1991	ISUZU	Pickup Truck	Gasoline	10	472	
Tacoma	PST030	P68	1993	TOYOTA	Pickup Truck	Gasoline	10	417	
Tacoma	PST030	P-70	1993	TOYOTA	Pickup Truck	Gasoline	10	1100	
Tacoma	PST030	P-73	2001	DODGE	RAM 1500	Gasoline	10	1122	
Tacoma	PST030	P-74	2001	DODGE	RAM 1500	Gasoline	10	1001	
Tacoma	PST030	P-75	2001	DODGE	RAM 1500	Gasoline	10	2039	
Tacoma	PST030	P-76	2002	FORD	F-150	Gasoline	10	1766	
Tacoma	PST030	P-77	2002	FORD	F-150	Gasoline	10	2966	
Tacoma	PST030	P-78	2002	FORD	F-150	Gasoline	10	1452	
Tacoma	PST030	P-79	2003	FORD	F-150	Gasoline	10	2864	
Tacoma	PST030	P-80	2003	DODGE	RAM 1500	Gasoline	10	1042	
Tacoma	PST030	P-81	2003	DODGE	RAM 1500	Gasoline	10	3602	
Tacoma	PST030	P-82	2005	FORD	F-150	Gasoline	10	3265	
Tacoma	PST030	P-83	2005	FORD	F-150	Gasoline	10	1559	
Tacoma	PST030	P-84	2005	FORD	F-150	Gasoline	10	2573	
Tacoma	PST030	P-85	2005	FORD	F-150	Gasoline	10	2927	
Tacoma	PST030	P-86	2003	FORD	F-150	Gasoline	10	4734	
Tacoma	PST030	P-87	2002	FORD	F-150	Gasoline	10	670	
Tacoma	PST030	P-88	2004	FORD	F-150	Gasoline	10	3437	
Tacoma	PST030	P-89	2000	FORD	F-150	Gasoline	10	4434	
Tacoma	PST030	P-90	2008	FORD	F-150	Gasoline	10	1877	
Tacoma	PST130	1N	2008	FORD	F450	Diesel		30000	
Tacoma	PST130	2N	2010	FORD	E350	Gasoline		10000	
Tacoma	PST130	3N	1979	GRUMAN	G350	Gasoline		5000	
Tacoma	PST130	4N	2004	GMC	E350	Gasoline		5000	
Tacoma	PST130	5N	2003	FORD	F350	Gasoline		1000	
Tacoma	PST070	14094	1998	Ford Eldorado	SI Bus	Gasoline	15	1113	
Tacoma	PST070	15096	2000	Ford Ranger	Ranger	Gasoline	15	1118	

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Tacoma	PST070	15172	2000	Ford Ranger	Ranger	Gasoline	15	534	
Tacoma	PST070	15175	2000	Ford Ranger	Ranger	Gasoline	15	455	
Tacoma	PST070	15343	2004	Ford Ranger	Ranger	Gasoline	15	235	
Tacoma	PST070	15426	2007	GMC Sierra	Sierra	Gasoline	15	1016	
Tacoma	PST070	15479	2007	GMC Sierra	Sierra	Gasoline	15	935	
Tacoma	PST070	15525	2003	Ford -150	F-150	Gasoline	15	302	
Tacoma	PST070	15548	1989	Dodge	Dakota	Gasoline	15	75	
Tacoma	PST070	15550	1990	Dodge	Dakota	Gasoline	15	75	
Tacoma	PST070	15553	1989	Dodge	Dakota	Gasoline	15	452	
Tacoma	PST070	15561	2003	Forf F-150	F-150	Gasoline	15	510	
Tacoma	PST070	17024	1998	GMC	Savana	Gasoline	15	1108	
Tacoma	PST070	18011	1991	Ford F-350	F-350	Gasoline	15	107	
Tacoma	PST020	J01	2004	Ford	F350	Gasoline	15	836	
Tacoma	PST020	J02	2004	Toyota	Tacoma	Gasoline	10	243	
Tacoma	PST020	J11	2005	Ford	F250	Gasoline	5	175	
Tacoma	PST020	J12	2005	Ford	F250	Gasoline	5	2539	
Tacoma	PST020	J13	2005	Ford	F250	Gasoline	5	2400	
Tacoma	PST020	J51	2005	Ford	Ranger	Gasoline	15	2769	
Tacoma	PST020	J52	2005	Ford	Ranger	Gasoline	15	0	
Tacoma	PST020	J53	2005	Ford	Ranger	Gasoline	15	1607	
Tacoma	PST020	J54	2005	Ford	Ranger	Gasoline	15	1915	
Tacoma	PST020	J55	2005	Ford	Ranger	Gasoline	15	1122	
Tacoma	PST020	J56	2005	Ford	Ranger	Gasoline	15	868	
Tacoma	PST020	J57	2005	Ford	Ranger	Gasoline	15	1264	
Tacoma	PST020	J58	2005	Ford	Ranger	Gasoline	15	1249	
Tacoma	PST020	J59	2005	Ford	Ranger	Gasoline	15	4967	
Tacoma	PST020	J60	2005	Ford	Ranger	Gasoline	15	1355	
Tacoma	PST020	J61	2005	Ford	Ranger	Gasoline	15	2678	
Tacoma	PST020	J62	2005	Ford	Ranger	Gasoline	15	2241	
Tacoma	PST020	J63	2005	Ford	Ranger	Gasoline	15	3037	
Tacoma	PST020	J64	2005	Ford	Ranger	Gasoline	15	1121	
Tacoma	PST020	J65	2005	Ford	Ranger	Gasoline	15	929	
Tacoma	PST020	J66	2005	Ford	Ranger	Gasoline	15	1303	
Tacoma	PST020	J67	2005	Ford	Ranger	Gasoline	15	822	
Tacoma	PST020	J68	2005	Ford	Ranger	Gasoline	15	2529	
Tacoma	PST020	J69	2005	Ford	Ranger	Gasoline	15	1077	
Tacoma	PST020	J70	2003	Ford	Ranger	Gasoline	15	1463	
Tacoma	PST020	J71	2002	Ford	Ranger	Gasoline	15	125	
Tacoma	PST020	J72	2002	Chevrolet	S10	Gasoline	15	613	
Tacoma	PST020	J73	2003	Ford	Ranger	Gasoline	15	2784	
Tacoma	PST020	J74	2000	Chevrolet	S10	Gasoline	15	447	
Tacoma	PST020	U01	2004	Acroft	Ford E350 Cutaway	Gasoline	15	6865	
Tacoma	PST020	U02	2004	Acroft	Ford450 (perimeter st	Gasoline	15	3536	
Tacoma	PST020	O01	2005	Pacific Tank	5000 gal Fuel Truck	Diesel	5	538	
Tacoma	PST020	O02	2005	Pacific Tank	2500 gal Fuel Truck	Diesel	5	453	
Tacoma	PST100	1P	2003	Ford	1/2 Ton	Gasoline	15	6000	
Tacoma	PST100	2P	2000	Chevrolet	1/2 Ton	Gasoline	15	4800	
Tacoma	PST100	3P	2005	Toyota	1/2 Ton	Gasoline	15	840	
Tacoma	PST100	4P	2004	Toyota	1/2 Ton	Gasoline	15	5400	
Tacoma	PST100	5P	2005	Toyota	1/2 Ton	Gasoline	15	2400	
Tacoma	PST010	3237	1979	Chevrolet	C60	Gasoline	15	321	
Tacoma	PST010	3369	1995	Ford	F250XL	Gasoline	15	1768	

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Tacoma	PST010	3371	1995	Ford	F350XL FLATBED	Gasoline	15	2027	
Tacoma	PST010	3375	1996	Ford	F250HD	Gasoline	15	1872	
Tacoma	PST010	3380	1996	Ford	F250 TRANS(OVER	Gasoline	15	2534	
Tacoma	PST010	3382	1997	Ford	F250	Gasoline	15	7431	
Tacoma	PST010	3383	1997	Ford	F250	Gasoline	15	4760	
Tacoma	PST010	3387	1997	Chevrolet	CM11006 ASTRO	Gasoline	15	2019	
Tacoma	PST010	3405	1999	Dodge	RAM BR2L62 5.9L I	Gasoline	15	1299	
Tacoma	PST010	3411	2000	Ford	F56 SERVICEBDY	Gasoline	15	1339	
Tacoma	PST010	3430	1994	Chevrolet	1500C Cheyenne 199	Gasoline	15	2168	
Tacoma	PST010	3431	1994	Chevrolet	1500C CHEYENNE	Gasoline	15	1027	
Tacoma	PST010	3432	1995	Chevrolet	C3500 350 CID	Gasoline	15	477	
Tacoma	PST010	10169	1998	Chevrolet	USED, meter 68417	Gasoline	15	1830	
Tacoma	PST010	10333	2005	Ford	ESCAPE 4x2 U95	Gasoline	15	1259	
Tacoma	PST010	10436	1998	Dodge	Ram 1500 4WD	Gasoline	15	1291	
Tacoma	PST010	10627	1999	Ford	Ranger	Gasoline	15	618	
Tacoma	PST010	10643	2000	Ford	EXPLORER	Gasoline	15	2501	
Tacoma	PST010	10695	2007	Ford	F250XL	Gasoline	15	4724	
Tacoma	PST010	10936	2008	Miles	ZX40ST	Gasoline	15	10	
Tacoma	PST010	10926	2008	Ford	F350	Gasoline	15	2458	
Tacoma	PST010	11249	2010	Ford	XLT CARGO VAN	Gasoline	15	3163	
Tacoma	PST010	11250	2010	Ford	XLT CARGO VAN	Gasoline	15	1631	
Tacoma	PST010	3377	1996	Ford	F450 SUPERDUTY(C	Gasoline	15	783	
Tacoma	PST010	3388	1997	Ford	F350	Gasoline	15	7077	
Tacoma	PST010	3395	1998	Dodge	RAM PU BR2L62	Gasoline	15	3539	
Tacoma	PST010	3398	1998	Dodge	RAM PU	Gasoline	15	11373	
Tacoma	PST010	3399	1998	DODGE	RAM PU	Gasoline	15	2566	
Tacoma	PST010	3402	1998	Chevrolet	CP30842	Gasoline	15	6992	
Tacoma	PST010	3404	1999	Chevrolet	CG31503	Gasoline	15	3458	
Tacoma	PST010	3409	1999	Chevrolet	CC31403 C3500HI	Gasoline	15	9671	
Tacoma	PST010	3410	2000	Chevrolet	CC31403	Gasoline	15	9472	
Tacoma	PST010	3412	2000	Chevrolet	ASTROVAN	Gasoline	15	4034	
Tacoma	PST010	3414	2000	Chevrolet	G3500 EXPRESS V/	Gasoline	15	2669	
Tacoma	PST010	3421	2001	Dodge	RAM 2500 BR2L62	Gasoline	15	4284	
Tacoma	PST010	10168	1996	Chevrolet	G3500 P SERIES	Gasoline	15	4575	
Tacoma	PST010	10179	1992	Chevrolet	USED, meter 100,866	Gasoline	15	5835	
Tacoma	PST010	10245	1996	Chevrolet	P30 Multistop WALL	Gasoline	15	3594	
Tacoma	PST010	10437	2000	Jeep	Cherokee	Gasoline	15	2671	
Tacoma	PST010	10497	2001	Ford	F-150/7700 HD	Propane	15	2267	
Tacoma	PST010	10529	1992	GMC	3500 2WD	Gasoline	15	151	
Tacoma	PST010	10689	2004	Ford	E250 C/V	Gasoline	15	4987	
Tacoma	PST010	10749	2008	Ford	F350	Gasoline	15	6864	
Tacoma	PST010	10823	2008	Ford	F350	Gasoline	15	7387	
Tacoma	PST010	10925	2008	Ford	EXPLORER XL	Gasoline	15	2376	
Tacoma	PST010	10934	2008	Ford	F250	Gasoline	15	9120	
Tacoma	PST010	10937	2008	Ford	F350	Gasoline	15	9538	
Tacoma	PST010	10938	2008	Ford	F250XL	Gasoline	15	5296	
Tacoma	PST010	11248	2010	Ford	XLT CARGO VAN	Gasoline	15	6769	
Tacoma	PST010	10935	2008	Miles	ZX40S	Gasoline	15	88	
Tacoma	PST010	3396	1998	DODGE	RAM PU 2500	Gasoline	15	1954	
Tacoma	PST010	3424	2002	GMC	SONOMA TS10653	Gasoline	15	2224	
Tacoma	PST010	3400	1998	DODGE	D20	Gasoline	15	2198	
Tacoma	PST010	3352	1992	Isuzu	S14	Gasoline	15	229	

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Tacoma	PST010	3357	1993	Ford	RANGER139166	Gasoline	15	761	
Tacoma	PST010	3362	1994	Chevrolet	CC20903	Gasoline	15	427	
Tacoma	PST010	3385	1997	Chevrolet	DBL CAB C3500	Gasoline	15	1438	
Tacoma	PST010	3423	1994	Chevrolet	C2500 350 2WD	Gasoline	15	4343	
Tacoma	PST010	10103	1996	DODGE	DODGE 1500	Gasoline	15	1595	
Tacoma	PST010	3374	1996	Ford	F250HD	Gasoline	15	1043	
Tacoma	PST010	10516	2002	Mitsubishi	Sport XLS	Gasoline	15	2189	
Tacoma	PST010	10101	1998	Ford	Ranger 98 XCab	Gasoline	15	1401	
Tacoma	PST010	3317	1988	Isuzu	S14 2.6L	Gasoline	15	297	
Tacoma	PST010	3425	2002	GMC	SONOMA TS10653	Gasoline	15	515	
Tacoma	PST010	3356	1993	Ford	RANGER 136514	Gasoline	15	335	
Tacoma	PST010	3419	1994	Chevrolet	K1PU 1500S	Gasoline	15	1859	
Tacoma	PST010	3422	1994	Jeep	CHEROKEE	Gasoline	15	3441	
Tacoma	PST010	10657	1997	Chevrolet	K2500 4WD	Gasoline	15	2072	
Tacoma	PST010	10658	2002	Ford	RANGER EXT-CAI	Gasoline	15	7059	
Tacoma	PST010	10773	2001	Ford	Taurus	Gasoline	15	4132	
Tacoma	PST010	11259	2005	Ford	F250 2WD	Gasoline	15	6729	
Tacoma	PST010	11318	2006	Ford	F250 2WD	Gasoline	15	2964	
Tacoma	PST010	10555	2006	Ford	ESCAPE	Gasoline	15	3090	
Tacoma	PST010	10716	2006	Ford	ESCAPE	Gasoline	15	3124	
Tacoma	PST010	3397	1998	GMC	C15 FULL EXT CAI	Gasoline	15	1983	
Tacoma	PST010	3427	2002	Ford	EXPLORER	Gasoline	15	545	
Tacoma	PST010	3434	2003	Ford	Explorer SUV	Gasoline	15	715	
Tacoma	PST010	10093	2003	Ford	Explorer SUV	Gasoline	15	777	
Tacoma	PST010	10260	2005	Toyota	Prius	Gasoline	15	4310	
Tacoma	PST010	10394	2005	Ford	ESCAPE 4x2 U95	Gasoline	15	604	
Tacoma	PST010	10435	2005	Ford	Escape Hybrid 2WD	Gasoline	15	1614	
Tacoma	PST010	10662	2007	Ford	ESC4D	Gasoline	15	3625	
Tacoma	PST010	10807	2008	Ford	F-150 PICKUP SUP-	Gasoline	15	6284	
Tacoma	PST010	10808	2008	Ford	F-15 PICKUP SUP-C	Gasoline	15	4886	
Tacoma	PST010	10862	2000	Ford	EXPLORER XL	Gasoline	15	228	
Tacoma	PST010	3413	2000	Chevrolet	CL11006 VAN,ASTF	Gasoline	15	641	
Tacoma	PST010	10645	2006	Kia	SEDONA LX	Gasoline	15	3115	
Tacoma	PST010	10863	2002	Ford	Escape SP	Gasoline	15	2901	
Tacoma	PST010	10331	2005	Ford	103 Escape Hybrid	Gasoline	15	4282	
Tacoma	PST010	10674	2000	Chevrolet	C3500	Gasoline	15	1863	
Tacoma	PST010	3379	1996	Dodge	NEON HIGHLINE	Gasoline	15	303	
Tacoma	PST010	3381	1997	Ford	CLUB WAGON 15 I	Gasoline	15	955	
Tacoma	PST010	3426	2002	Kia	SEDONA	Gasoline	15	2730	
Tacoma	PST010	11021	2009	Ford	F150 4 X 4 CREW C	Gasoline	15	20552	
Tacoma	PST010	10094	2003	Ford	Explorer SUV	Gasoline	15	26816	
Tacoma	PST010	3433	2003	Ford	Explorer	Gasoline	15	27711	
Tacoma	PST010	10429	2005	Ford	Crown Victoria Intert	Gasoline	15	5808	
Tacoma	PST010	10752	2007	Ford	EXPLORER U73	Gasoline	15	12276	
Tacoma	PST010	10753	2007	Ford	EXPLORER U73	Gasoline	15	8678	
Tacoma	PST010	10337	2005	Ford	EXPLORER	Gasoline	15	7620	
Tacoma	PST010	3435	2003	Chevrolet	K15 EXT CAB PICK	Gasoline	15	4284	
Tacoma	PST040	21	2004	FORD	VAN	Diesel	5	600	
Tacoma	PST040	22	1985	FORD	LN8000	Diesel	5	600	
Tacoma	PST040	23	1995	FORD	TANKER	Diesel	5	600	
Tacoma	PST040	27	1985	GMC	P-30 VAN	Diesel	5	600	
Tacoma	PST040	28	1985	GMC	P-30 VAN	Diesel	5	600	



**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Tacoma	PST040	30	1985	GMC	P-30 VAN	Diesel	5	600	
Tacoma	PST040	35	1987	GMC	P-30 VAN	Diesel	5	600	
Tacoma	PST040	48	1984	FORD	VAN	Diesel	5	600	
Tacoma	PST040	49	2002	FORD	VAN	Diesel	5	600	
Tacoma	PST040	54	1978	GMC	P-30 VAN	Diesel	5	600	
Tacoma	PST040	55	1978	GMC	P-30 VAN	Diesel	5	600	
Tacoma	PST040	56	1978	GMC	P-30 VAN	Diesel	5	600	
Tacoma	PST040	68	1985	CHEV	P-30 VAN	Diesel	5	600	
Tacoma	PST040	69	1985	CHEV	P-30 VAN	Diesel	5	600	
Tacoma	PST040	70	1985	CHEV	P-30 VAN	Diesel	5	600	
Tacoma	PST040	74	1984	CHEV	P-30 VAN	Diesel	5	600	
Tacoma	PST040	75	1984	CHEV	P-30 VAN	Diesel	5	600	
Tacoma	PST040	77	1984	CHEV	P-30 VAN	Diesel	5	600	
Tacoma	PST040	SSA2	1994	DODGE	RAM	Gasoline	5	600	
Tacoma	PST040	SSA3	1991	CHEV	SPORT VAN	Gasoline	5	600	
Tacoma	PST040	SSA6	1977	GMC	VAN	Gasoline	5	600	
Tacoma	PST060	832	1999	Dodge	Terminal Passenger V	Gasoline	15	540	36
Tacoma	PST060	851	2006	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	1875	125
Tacoma	PST060	816	1999	Dodge	Pickup Truck 1/2 To	Gasoline	15	2340	156
Tacoma	PST060	860	2008	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	2490	166
Tacoma	PST060	846	2005	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	4290	286
Tacoma	PST060	858	2008	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	4410	294
Tacoma	PST060	830	1999	Chevrolet	Step Van 16 Foot	Diesel	15	5640	376
Tacoma	PST060	828	1999	Chevrolet	Step Van 14 Foot	Diesel	15	7905	527
Tacoma	PST060	825	1999	Mack	Fuel Truck	Diesel	15	9180	612
Tacoma	PST060	848	2005	Chevrolet	Pickup Truck 3/4 To	Gasoline	15	10080	672
Tacoma	PST060	824	1999	Dodge	Pickup Truck 1 Ton	Diesel	15	10200	680
Tacoma	PST060	831	1999	Chevrolet	Step Van 16 Foot	Diesel	15	10980	732
Tacoma	PST060	866	2001	Freightliner	Step Van 16 Foot	Diesel	15	11220	748
Tacoma	PST060	845	2005	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	12645	843
Tacoma	PST060	834	2004	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	12930	862
Tacoma	PST060	812	1999	Dodge	Pickup Truck 1/2 To	Gasoline	15	14070	938
Tacoma	PST060	801	1999	Dodge	Pickup Truck 1/2 To	Gasoline	15	14265	951
Tacoma	PST060	865	2001	Freightliner	Step Van 16 Foot	Diesel	15	14385	959
Tacoma	PST060	826	1999	Dodge	Pickup Truck - Dako	Gasoline	15	14760	984
Tacoma	PST060	840	2004	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	15120	1008
Tacoma	PST060	857	2006	Chevrolet	Pickup Truck 3/4 To	Gasoline	15	16125	1075
Tacoma	PST060	847	2005	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	16425	1095
Tacoma	PST060	850	2006	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	17010	1134
Tacoma	PST060	869	2006	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	18810	1254
Tacoma	PST060	856	2006	Chevrolet	Pickup Truck 3/4 To	Gasoline	15	19365	1291
Tacoma	PST060	844	2005	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	19605	1307
Tacoma	PST060	861	2008	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	20100	1340
Tacoma	PST060	839	2004	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	20670	1378
Tacoma	PST060	868	2006	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	20985	1399
Tacoma	PST060	855	2006	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	21375	1425
Tacoma	PST060	867	2001	Freightliner	Step Van 16 Foot	Diesel	15	22425	1495
Tacoma	PST060	849	2005	Chevrolet	Pickup Truck 3/4 To	Gasoline	15	22860	1524
Tacoma	PST060	843	2005	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	23145	1543
Tacoma	PST060	842	2005	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	23220	1548
Tacoma	PST060	841	2005	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	24645	1643
Tacoma	PST060	859	2008	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	25215	1681

**Puget Sound Emissions Inventory**  
**Terminal Fleet Vehicle Data**

Port	Terminal ID	ID No.	YEAR	MAKE	MODEL	ENGINE	Avg	Mileage	Hours
							Speed (mph)	2011	2011
Tacoma	PST060	829	1999	Chevrolet	Step Van 12 Foot	Gasoline	15	26460	1764
Tacoma	PST060	836	2004	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	26955	1797
Tacoma	PST060	853	2006	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	27540	1836
Tacoma	PST060	835	2004	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	29685	1979
Tacoma	PST060	833	1999	Chevrolet	Step Van 12 Foot	Gasoline	15	33570	2238
Tacoma	PST060	864	2008	Workhorse	Step Van 12 Foot	Gasoline	15	37290	2486
Tacoma	PST060	852	2006	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	38040	2536
Tacoma	PST060	854	2006	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	38610	2574
Tacoma	PST060	838	2004	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	39285	2619
Tacoma	PST060	827	1999	Chevrolet	Step Van 14 Foot	Diesel	15	40515	2701
Tacoma	PST060	862	2008	Chevrolet	Pickup Truck 1/2 To	Gasoline	15	40530	2702
Tacoma	PST060	863	2008	Workhorse	Step Van 12 Foot	Gasoline	15	40665	2711
Seattle	PSS020			Car	Passenger cars	Gasoline	15	11813	
Seattle	PSS020			Minivan		Gasoline	15	60	