Scoping Suggestions for the Risk of Accidents Associated with Vessel Traffic

Alexander Gillespie

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1. The base problem and the need for a cumulative view

Each year, around 11,000 large vessels and oil barges transit to and from the San Juan Islands Figure 1). This figure includes over 1,322 oil tankers, each of which carries an average of 30 to 40 million gallons of crude oil. Around 4,300 of these large vessels are destined for United States' ports in Puget Sound. The other 6,250 make for Canadian ports. This level of shipping traffic already comes with a certain inherent level of risk. For example, between 1995 and 2005, there were 1,462 accidents and 1,159 incidents reported.[1]

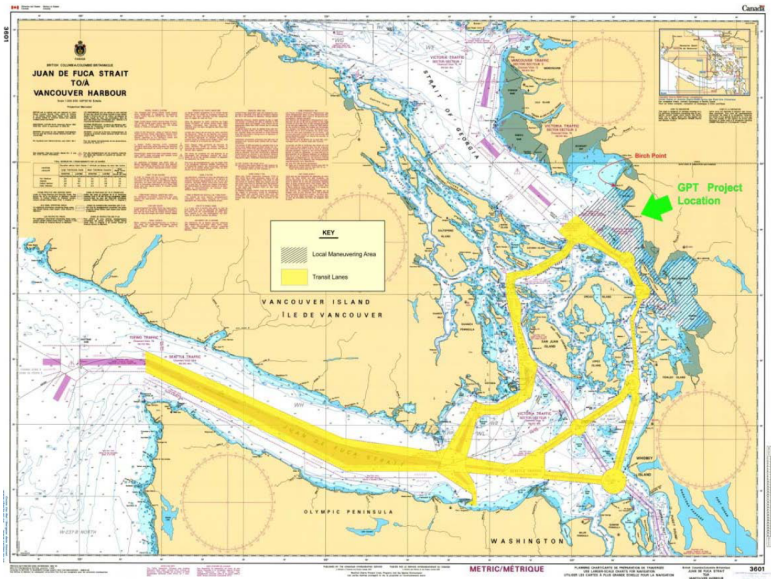

Figure 1. Main shipping routes of Northern or Greater Puget Sound[2]

The proposed Gateway Pacific Terminal (GPT) will add approximately 440 ship transits per year, equating to a 4% increase to the 2011 traffic once it becomes operational. After it becomes fully operational, the GPT is projected to generate an additional increase of about 950 transits per year, or an increase of 9%, within 15 years.[3] This increase will be over and above other future expansion in other shipping operations. Impacts from the specific increase in shipping from the development of the GPT needs to be understood and modeled. By using

[1] Hass, T. (2012). *The Vessel Traffic Risk Assessment for BP Cherry Point and Maritime Risk Management in Puget Sound*. (Puget Sound Partnership). 5. van Dorp, J. (2008). *Assessment of Oil Spill Risk due to Potential Increased Vessel Traffic at Cherry Point, Washington*. (Final Report - Submitted to BP : 8/31/2008).
[2] ibid
[3] Pacific International Terminals, Inc. (2011). *Project Information Document, Gateway Pacific Terminal*, Whatcom County, Washington. 304 p. Also, *Vessel Entries and Transits: 2011* WDOE Publication 12-08-003 April 2012

vessel traffic risk assessments, such as that conducted in 2008, and including updated projections of ship traffic for the GPT project, it will be possible to quantify the increased risk of accident from the extra transits.[4] It is important for the risk assessment to be updated to account for the additional transits projected for the GPT, to be in accordance with legal precedent.[5] However, the impact assessment must also evaluate the cumulative risks of all existing and projected (e.g., including vessels over 400 tons and/or carrying a dangerous cargo) transits through this area, as only this type of evaluation will reveal the true extent of the significant risk at hand. A cumulative assessment is required and essential as it will reveal risks that, while perhaps appearing to be minor on an individual level, once quantified in a cumulative assessment framework, may actually turn out to be highly relevant contributors to the risk profile when placed in the context of the overall risk to the greater Puget Sound area.[6]

In addition to the past, present and the currently proposed 8% increases in shipping traffic for the GPT development, the cumulative assessment should also scope the likely, further future additional expansions of vessel traffic in this area (even if they are not yet formal or approved proposals). This requirement is especially important when dealing with inter-related projects that will all utilize the same limited resource, in this case, shipping routes. That is, a forward projected assessment should also include data in the cumulative equation on traffic increases that can reasonably be foreseen including general increases in vessel traffic from other sources and also vessel traffic projections for other proposed major developments (including in Canada) that will need to use the same shipping route. This will greatly assist the authorities in providing the necessary information to achieve meaningful regional planning at a reasonable cost, in which uncertainties can be evaluated and effective, appropriate, and sustainable (in economic, social and environmental) choices can be made.[7]

[4] Montewka, J. (2012). 'Determination of Collision Criteria and Causation Factors Appropriate to a Model for Estimating the Probability of Maritime Accidents'. *Ocean Engineering* 40: 50–61.

[5] See Ocean Advocates v. United States Army Corps of Engineers**.** 402 F.3d 846 (9th Cir. 2005). Also, Anon (2004), 'Corps Fail to Take 'Hard Look' Required by NEPA Before Issuing FONSI and Permitting Extension of Oil Refinery Dock'. *Planning and Environmental Law* 56(5): 17.

[6] Kern v. United States Bureau of Land Mgmt., 284 F.3d 1062, 1075 (9th Cir. 2002) (quoting Churchill County v. Norton, 276 F.3d 1060, 1072 (9th Cir. 2001).

[7] Zhao, M. (2012). 'Barriers and Opportunities for Effective Cumulative Impact Assessment Within State-Level Environmental Review Frameworks in the United States'. *Journal of Environmental Planning and Management.* 55(7): 961-978. Senner, R. (2011). 'Appraising the Sustainability of Project Alternatives: An Increasing Role for Cumulative Impact Assessment'. *Environmental Impact Assessment Review.* 31: 502-505. Hegmann, G. (2011). 'Alchemy to Reason: Effective Use of Cumulative Effects Assessment in Resource Management'. 31 *Environmental Impact Assessment Review*. 31: 484-490. Gunn, J. (2011). 'Conceptual and Methodological Challenges to Cumulative Effects Assessment'. *Environmental Impact Assessment Review.* 31: 154-160. Therivel, R. (2007). 'Cumulative Effects Assessment: Does Scale Matter ?' *Environmental Impact Assessment Review*. 27: 365-385. Burris, R. (1997). 'Facilitating Cumulative Impact Assessment in the EIA Process'. *International Journal of Environmental Studies*. 53: 1-2, 11-29. Thatcher, T. (1990). 'Understanding Interdependence in the Natural Environment: Some Thoughts on Cumulative Impact Assessment Under the National

It is essential to evaluate the cumulative impacts on vessel safety from the various port expansion projects through the Salish Sea including at minimum the twinning of the Trans Mountain pipeline and associated tanker traffic, expansion of the Delta Port container terminal as well as the Westshore Coal Terminal. However, it is also critical for the Corps to recognize the fact that if all five of the proposed coal terminals are built in the Pacific Northwest it would result in approximately an additional 2000 bulk carriers transiting through Unimak Pass in Alaska. This would approximately double the volume of traffic that currently ply through these biologically rich and vulnerable waters.

2. The reasonably foreseeable accident

Substantive shipping accidents, despite being of a low probability, carry with them the possibility of catastrophic consequences. Precedent tells us that these accidents are reasonably foreseeable. For example, since the *Exxon Valdez* accident in 1990, a succession of large spills have occurred including the *Nakhodka* spill of Japan in 1997, the *Prestige* spill off France in 1999, the *Erika* spill off Spain in 2003 and the *Hebei Spirit* spill off South Korea in 2007. Many spills occurring regularly around the world, and while other spills may be smaller, their impacts are far from negligible.[8]

Since the 1960s, the waters of the Salish sea (and especially the Juan de Fuca Strait and Puget Sound) have not only been exposed to the risk of oil pollution, they have also had to deal with actual oil spills and pollution. Since the 1980s, there have been six significant spills.[9] These larger spills have been in addition to dozens, if not hundreds (depending on how the counting is undertaken), of lesser spills. These lesser spills have still cost hundreds

Environmental Policy Act'. 20 *Environmental Law*. 611. Eckberg, D. (1986). 'Cumulative Impacts Under NEPA'. 16 *Environmental Law*. 673. http://www.aleutiansriskassessment.com/passing.htm

[8] For the most recent significant oil spill from a vessel, see Ministry for the Environment (2011). *Rena: Long-term Environmental Recovery Plan* (MFE, Wellington). 4-7. Note also,
Ramseur, J. (2010). Oil Spills in US Coastal Waters: Background and Governance. Congressional Research Service 7-5700.

[9] Ross, W. (1973). *Oil Pollution as an International Problem: A Study of Puget Sound and the Strait of Georgia*. (University of Victoria Press, Canada). Vagners, J. (1972). *Oil on Troubled Waters* (University of Washington Press, Seattle). The recent examples include the *Arco Anchorage* which, in 1985, spilled 239,000 gallons of crude oil off the Strait of Juan de Fuca. This incident was followed:, in 1988, by the barge *Nestucca* which spilled 231,000 gallons of crude oil in the outer coast near Grays Harbor; in 1991, the cargo ship *Tuo Hai* which collided with the fishing vessel *Tenyo Maru* spilling 400,000 gallons of heavy oil outside the entrance of the Strait of Juan de Fuca; in 1999, the explosion at Olympic Pipeline, killing 3 and spilling 277,000 gallons of gasoline into Whatcom Creek in Bellingham; in 2003, the Foss barge spill at Point Wells spilled approximately 4,700 gallons of heavy fuel during a transfer in Snohomish County; and, in 2004, the Conoco Phillips oil tanker *Polar Texas* spilled 7,200 gallons of ANS Crude oil while the ship attempted to introduce ballast water into its oil tanks. See Department of Ecology/Puget Sound Partnership (2011). *Improving Oil Spill Prevention and Response in Washington State: Lessons Learned From the BP Deepwater Horizon Oil Spill*. (DoE, Publication Number: 11-08-002). 7.

of thousands, if not millions of dollars, once the costs of the cleanup, restoration and fines are totaled.[10]

3. Indicators of significant risk

In order to be approved, the GPT development must reconcile a large number of relevant standards of regulatory, legislative and other legal and policy instruments from regional, state, federal and international agencies, all of which address issues of potential significant risk. A summary of some of the more relevant standards are provided below:

- The Antiquities Act
- The Endangered Species Act
- The National Historic Preservation Act
- The Migratory Bird Treaty Act
- The Bald and Golden Eagle Protection Act
- The Marine Mammal Protection Act
- Executive Order 13158: Marine Protected Areas
- The Coastal Zone Management Act
- The Fish And Wildlife Coordination Act
- The Exchange of Notes between Canada and the United States Constituting an Agreement on Vessel Traffic Management for the Juan de Fuca
- The British Columbia/Washington Environmental Cooperation Council Agreement and Memorandum of Understanding
- The Magnus-Stevens Fishery Conservation and Management Act-Essential Fish Habitat
- The Pacific Salmon Treaty
- The International Convention on the Regulation of Whaling and,
- The World Heritage Convention

[10] US Fed New Service (2007). 'Oil Cleanup Continues in Puget Sound'. 28 Feb. DiBenedetto, B. (2006). 'Polar Tankers to pay $540,000 fine for Puget Sound spill'. Journal of Commerce 16 Oct: 1. Note also, US Fed News Service. (2009). 'Tug Company Fined For Puget Sound Oil Spill'. 19 Nov. Ramasamy, E. (2006). 'ConocoPhillips to Pay $2.31 Million for Puget Sound Crude Spill'. *Platts Oilgram News*. October 18.

4. The significant risk of extinction and/or declining conservation status

(i). Birdlife

There are over 100 species of marine bird which rely on the Puget Sound as habitat. Some protected wetlands on the San Juan Islands are known to hold most, if not all, of these bird populations at key times.[11] Many of the species in the area are migratory and, at certain times of the year, populations can expand five-fold, to number in the tens of thousands. A number of these species, while not threatened at the species level, are known to be declining at the regional level (e.g., scoters, bugglehead, goldeneyes, long-tailed duck, common loon, and the western grebe).[12]

A number of species which frequent Puget Sound, which forms part of the Pacific Flyway, are listed as protected under the Migratory Bird Treaty Act (MBTA).[13] Therefore these species require special conservation attention (both for the birds themselves and their habitats) as part of international treaty obligations of the United States. Species requiring conservation attention include the great blue heron, (American)-black oystercatcher, peregrine falcons, trumpeter swans, northern harriers, rhinoceros auklet, the pigeon guillemots, the barred, and spotted owl, the brown pelican and the (American)-white pelican.

Some species listed under the MBTA have specific management plans, such as snow geese and Canadian geese, and therefore they also require special conservation attention. In addition, the marbled murrelet, although not subject to a specific management plan under the Pacific Flyway Council (the administrative body that forges cooperation among public wildlife agencies for the purpose of protecting and conserving migratory birds in western North America), is actually listed as being threatened with extinction under the Endangered Species Act (in both the United States and Canada) with the risk of oil spills being one of the catalysts for its listing. Finally, the bald eagle, also listed under the MBTA, must have its conservation needs considered. Given that the San Juan Islands may host the greatest concentration of bald eagles in the continental United States, the obligations to protect this

[11] Domico, T (2007). *Natural Areas of the San Juan Islands*. (Turtleback, Washington). 59-64, 81, 158. Johnson, C & J (2011). *Birds and Habitats of the Puget Sound Area* (Orange Spot, Seattle). Downing, J. (1983). *The Coast of Puget Sound,* (University of Washington Press, Seattle).

[12] Washington Department of Fish and Wildlife Program (2009). *Status and Trends of Marine Birds in Washington's Southern Puget Sound*. (WDFW, Seattle). 7-8. Washington Department of Fish and Wildlife (2006). *Nearshore Birds in Puget Sound* (Washington Department of Fish and Wildlife Technical Report 2006-05, Seattle).

[13] 16 U.S.C. 703. Note also the *North American Waterfowl Management Plan between Canada and the United States*.

species under both international and domestic law (i.e., the 1940 Bald and Golden Eagle Protection Act)[14] are clear and mandated. Under the 1940 legislation, although bald eagles are not actually endangered, due to their high cultural value, these eagles remain protected from acts including disturbance (as elaborated in the Act's associated Guidelines and conservation recommendations). An estimated 247 bald eagles were killed in Prince William Sound as a consequence of the Exxon Valdez spill in 1989.

(ii). Southern Resident killer whales

Puget Sound is frequented by a number of marine mammal species including, *inter alia*, harbor seals, river otters, Steller sea lions, common minke whales and Dall's porpoise. Although many of these are of conservation concern, one sub-species in particular, the resident pods of Killer whales around the San Juan Islands known as the Southern Resident killer whale community (SRKW), are of a very high concern. The SRKW represent the smallest of four resident sub-species of Killer Whale within the eastern North Pacific Ocean. The SRKW comprises three pods (termed J, K and L). The SRKW population has fluctuated considerably over the 30 years that it has been studied. All three southern resident pods were reduced in number between 1965 and 1975 because of captures for marine parks. In 1974, the group comprised 71 whales and it peaked at 97 animals in 1996, before falling to 86 as of the end of 2010.[15] Numbers may have fallen since then, as there were estimated to be fewer Killer Whale in the middle of 2012 than there were in the 2010 baseline year (N=83).[16]

[14] 16 U.S.C. 668-668c.
[15] National Marine Fisheries Service (2011). *Southern Resident Killer Whales: Five Year Review* (NMFS, Seattle).
[16] Puget Sound Partnership (2012). *The 2012 State of the Sound: A Biennial Report on the Recovery of Puget Sound*. (PSP, Seattle). 22, 24. NOAA (2008). *Recovery Plan for Southern Resident Killer Whales*. (NOAA, Washington). 2, 56-58.

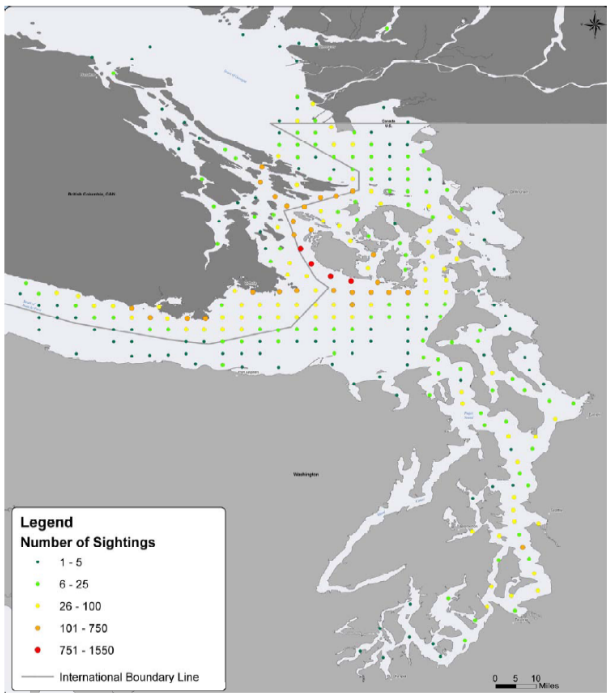

Figure 2. Distribution of Southern Resident killer whale sightings from 1990-2005.[17]

Due to being a distinct and significant population of very limited numbers, with a slow growth rate and low productivity,[18] after prolonged scientific and legal consideration,[19] the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration decided that SRKWs constituted a 'distinct population segment' that was endangered due to being 'threatened' with extinction, as per the 1973 Endangered Species Act (ESA).[20] This categorization was supplemental to their status as depleted (i.e., below its optimum sustainable population) under the Marine Mammal Protection Act (MMPA).[21] The national obligations upon authorities to conserve these species successfully are multiplied through both regional[22] and international conservation instruments, the latter through the International Convention for the Regulation of Whaling.[23]

The obligations imposed by all of these pieces of legislation mean that it is critical to protect the most important habitat on which a threatened/depleted species depends (Figure 2). This

[17] Source: NOAA (2008). Recovery Plan for Southern Resident Killer Whales. (NOAA, Washington). Figure 5. p. II-27. [*http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Status/upload/SRKW-Recov-Plan.pdf*]

[18] There is a limited number of reproductive-age Southern Resident males and several females of reproductive age are not having calves. This is a particular concern with the largest pod (L) with only three surviving females producing surviving female offspring in recent years.

[19] Center for Biological Diversity v. Lohn, 296 F. Supp. 2d. 1223 (W.D. Wash. 2003).

[20] Department of Commerce, NOAA, *Endangered Status for Southern Resident Killer Whales*. 50 CFR Part 224. Final Rule. As printed in the Federal Register /Vol. 70, No. 222 / Friday, November 18, 2005 /Rules and Regulations 69907.

[21] 68 FR 31980; May 29, 2003.

[22] The Canadians concur that the SRKW are endangered.

[23] See Gillespie, A. (2006). *Whaling Diplomacy*. (Edward Elgar, London). Chapter 6.

obligation is required under both the MMPA[24] and the ESA.[25] The designation of critical habitat[26] under the ESA is specifically focused upon the need to conserve habitat which is directly linked to the survival of the species. This designated habitat, which must not be destroyed or adversely modified, is well defined for the SRKW. Specifically, all pods use Haro Strait (i.e., west side of San Juan Island), particularly for transit. The southwest portion of San Juan Island is important for foraging and the southwest of Lopez Island is important for resting (as well as the south and west of Henry Island), although one pod (L) alone appears to frequent the area in the Strait of Juan de Fuca south of Vancouver Island.[27] In 2006, the NMFS designated critical habitat for SRKW to include all the waters of the inland sea other than military facilities (which overall compromises approximately 2,560 square miles of marine habitat).[28]. The Summer Core Area includes the waters in Haro Strait and the waters around the San Juan Islands This critical habitat is shown in Figure 3.

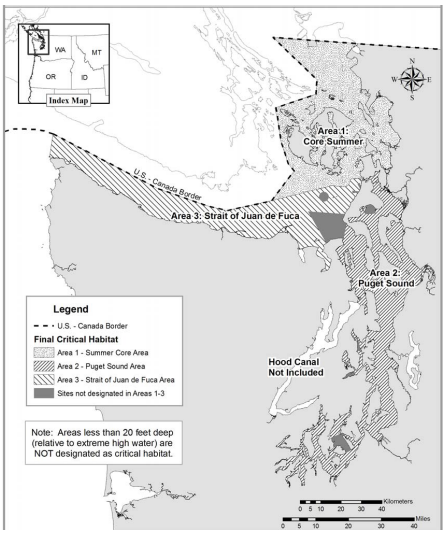

Figure 3. Designated critical habitat for Southern Resident killer whales under the Endangered Species Act[29]

[24] 'In particular, efforts should be made to protect essential habitats, including the rookeries, mating grounds, and areas of similar significance for each species of marine mammal from the adverse effect of man's actions'. See Section 2 (2). *Findings and Declaration of Policy* 16 U.S.C. 1361.

[25] *The 1973 Endangered Species Act*. Public Law 93–205, Approved Dec. 28, 1973, 87 Stat. 884; as Amended Through Public Law 107–136, Jan. 24, 2002. See section 4(2).

[26] The term ''critical habitat'' for a threatened or endangered species means the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of the ESA which are found as physical or biological features essential to the conservation of the species and which may require special management considerations or protection.

[27] National Marine Fisheries Service (2011). *Southern Resident Killer Whales: Five Year Review* (NMFS, Seattle). 5.

[28] NOAA (2008). *Recovery Plan for Southern Resident Killer Whales*. (NOAA, Washington). II-67, 76-78.

[29] Source: NOAA (2008). *Recovery Plan for Southern Resident Killer Whales*. (NOAA, Washington). Figure 7. p. II-38. [*http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Status/upload/SRKW-Recov-Plan.pdf*]

(iii). Chinook salmon

Although the risk and impact of an oil spill to the survival of the SRKW is clear, perhaps the foremost threat to their survival is a further reduction in the quantity or quality of their prey. Although the SRKW will consume other species, their preferred prey is Chinook salmon. As such, Chinook salmon is a critical food resource for SRKW (as well as for multiple other species). Mortality rates and rates of population increase for SRKW have shown statistical correlations with some indices of Chinook salmon abundance.[30]

The difficulty in ensuring the continuation of this critical food resource for the SRKW is that many (27) salmon populations are endangered. Puget Sound Chinook are currently estimated to be between 1 and 10% of their pre-exploitation numbers and they are already facing a clear risk of extinction as their overall abundance remains very low and many populations are in decline. For example, only one of 22 local to Puget Sound populations increased in the past five years and this small increase was in stark contrast to the overall trend in Puget Sound, of which the total number declined between 2006 and 2010.[31]

The Chinook salmon of Puget Sound (including the Straits of Juan De Fuca) is explicitly recognized as threatened with extinction and it is listed under the ESA.[32] The Chinook is also subject to further conservation considerations under Fish and Wildlife Coordination Act, the Magnus-Stevens Fishery Conservation and Management Act-Essential Fish Habitat,[33] and international conservation efforts under the 1985 Pacific Salmon Treaty.[34] When this treaty was updated in 2008, new fishing regimes came to encompass, *inter alia*, Chinook Salmon and included responsibilities which sought to preserve the biological diversity of the Chinook resource and contribute to the restoration of currently depressed stocks by improving their abundance, productivity, genetic diversity and spatial structure over time.[35]

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[30] National Marine Fisheries Services (2012). *The Effects of Salmon Fisheries on Southern Resident Killer Whales: Final Report of the Independent Science Panel.* (NOAA, Seattle). 3-4. National Marine Fisheries Service (2011). *Southern Resident Killer Whales: Five Year Review* (NMFS, Seattle). 6.

[31] PugetSoundPartnership (2012). *The 2012 State of the Sound: A Biennial Report on the Recovery of Puget Sound*. (PSP, Seattle). 22, 24.

[32] See NOAA, *Endangered and Threatened Species; 5-Year Reviews for 17 Evolutionarily Significant Units and Distinct Population Segments of Pacific Salmon and Steelhead*. 50448 Federal Register / Vol. 76, No. 157 / Monday, August 15, 2011 / Proposed Rules.

[33] Public Law 94-265.

[34] *The Treaty Between the Government of Canada and the Government of the United States of America Concerning Pacific Salmon*. See in particular, article 3.

[35] See chapter 3 of Annex IV of the Treaty.

As a species listed under the ESA, like the SRKW, the Chinook salmon also has defined critical habitat that must be protected (Figure 4).[36] In this regard, the Puget Sound Salmon Recovery Plan[37] has placed a considerable emphasis upon the restoration of the most important habitats of the Chinook salmon in this region, including, amongst others, estuaries, floodplains, riparian areas and particularly important near shore (i.e., shoreline and marine) areas. Considerable success has already been made with this issue with approximately 2,350 acres of habitat restoration projects being completed from 2007 to 2011 in the 16 major river delta estuaries.[38] The restoration of the Elwha River that empties into Juan de Fuca Strait is the single largest salmon restoration project in the Nation. Although this habitat restoration work is to be commended, the risks of a substantial vessel accident upon all of these critical habitats remain significant and must be assessed.[39]

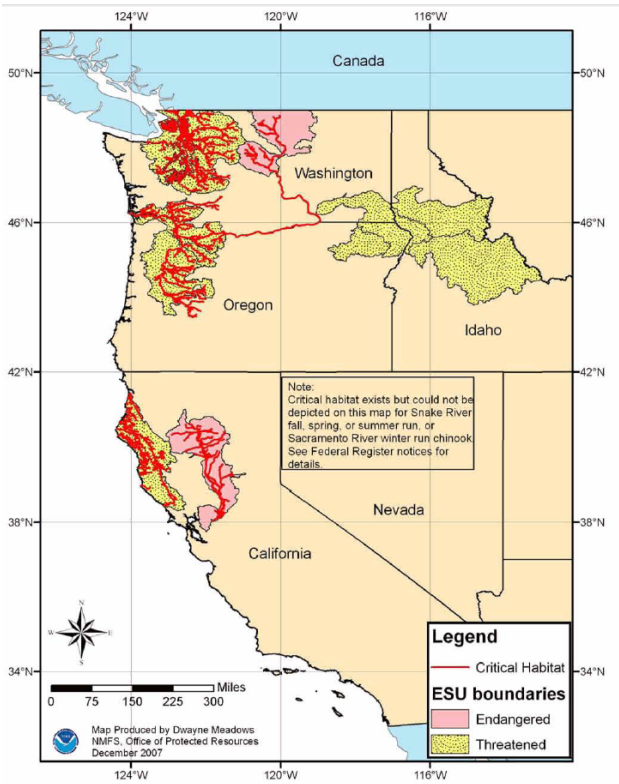

Figure 4. Designated critical habitat for Chinook salmon under the Endangered Species Act[40]

5. The significant risk of damaging listed protected areas

[36] *See http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/chinooksalmon.pdf*
[37] National Marine Fisheries Service (2007). *Puget Sound Salmon Recovery Plan* (NOAA, Washington).
[38] PugetSoundPartnership (2012). *The 2012 State of the Sound: A Biennial Report on the Recovery of Puget Sound*. (PSP, Seattle). 22, 24.
[39] Ibid.
[40] Source: NOAA (2007). *See http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/chinooksalmon.pdf*

(i). The areas at risk and associated obligations

Legal obligations already exist to conserve protected areas in this region. Beyond the federal governments Trust Obligations to the Treaty Tribes of the Salish Sea, the foremost obligation in this area exists at the international level through the World Heritage Convention,[41] which includes the Olympic National Park which can be reached from the southern side of the Strait of Juan de Fuca and along the Olympic Coast. This World Heritage area is internationally renowned for the diversity of its ecosystems. Glacier-clad peaks interspersed with extensive alpine meadows are surrounded by an extensive old growth forest, among which is the best example of intact and protected temperate rainforest in the Pacific Northwest. Eleven major river systems drain the Olympic Mountains offering some of the best habitat for anadromous fish species in the country. The park is rich in native and endemic animal and plant species, including critical populations of the endangered northern spotted owl, marbled murrelet and bull trout. The coastal strip of the Park is the longest Wilderness beach in the continental United States.[42]

In addition to its aesthetic value, this park has been recognized by the international community due to its varied topography, from seashore to glacier, which includes habitats of unmatched diversity on the Pacific coast. The coastal Olympic rainforest reaches its maximum pristine growth within the park confines and has a living standing biomass which may be unsurpassed anywhere else in the world. The park also includes more than 60 miles of wilderness coastline, the longest undeveloped coast in the contiguous United States. This coastline is characterized by rocky headlands, log-strewn beaches, and a wealth of intertidal life; rocky islets along the coast are remnants of a continuously receding, changing coastline and the arches, caves and buttresses are evidence of the continuous battering of the waves. Tide pools are filled with hundreds of species of invertebrate life and seals, sea lions, sea otters and several species of whale are often seen in the waves and around the offshore Islands.[43] Due to such overt importance, the Olympic Coast National Marine Sanctuary was promulgated under the National Marine Sanctuaries Act, and this was the basis for the International Maritime Organisation (IMO) to recognise, in 1991, this location as an Area to be Avoided. The core of this measure is a request for operators of vessels carrying

[41] See article 4 of the *World Heritage Convention*. Also, Gillespie, A. (2012). *Conservation, Biodiversity and International Law*. (Edward Elgar, London). Chapter 7.
[42] McNulty, T. (2009). *The Olympic National Park: A Natural History*. (University of Washington Press, Seattle). 249-250.
[43] Ibid. 151-215.

petroleum and/or hazardous materials to maintain a 25-mile buffer from the coast.[44] Despite the value of this measure, its application, in terms of geographical coverage, ends at the beginning of the Juan de Fuca strait.

At the national level, obligations also exist to conserve particular sites of significance within these high value areas, such as the San Juan Islands, and including the American and English camps. These two coastal sites are listed under the 1966 National Historic Preservation Act which requires that potential impacts on the listed sites must be considered and 'taken into account'.[45] In addition, Executive Order 13158 on Marine Protected Areas (MPA) requires federal agencies to identify actions that affect natural or cultural resources that are within a marine protected area. It further requires federal agencies, in taking such actions, to avoid harm to the natural and cultural resources protected by an MPA. Finally, the 1972 Coastal Zone Protection Act requires that federal actions that will have reasonably foreseeable effects on the land or water uses or natural resources of a state's coastal zone must be consistent with federally approved State Coastal Management Practices.[46]

Within this context, there is a complicated mix of 54 protected areas, which fall under multiple ownership and management regimes (including public, private and non-governmental ownership)[47] and all must have their conservation needs taken into account. Although none of these areas extend beyond the tidal zone, they are complemented by a myriad of MPAs. As it stands, Washington State is currently home to 127 MPAs managed by 11 federal, state and local agencies. These sites occur primarily in Puget Sound and associated coasts and cover approximately 644,000 acres and over 6 million feet of shoreline. The greater San Juan Islands area (San Juan archipelago) has responsibility for the most MPAs. Of note, in 2004, the San Juan County Board of Commissioners designated the entire marine waters of the county as a Marine Stewardship Area and, in 2007, the San Juan County Council enacted a local ordinance to prevent boaters from harassing SRKW that frequent County waters.[48] Cumulatively, between 1 to 5% of Puget Sound and coastal regions is covered by MPAs which have been recognized as possessing local, regional and global

[44] An ATBA is, 'a routeing measure comprising an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships, or certain classes of ships'. For the actual designation, see Department of Commerce/NOAA (2000). *Olympic Coast National Marine Sanctuary: Area to be Avoided*. (Marine Sanctuaries Conservation Series MSD-00-1).
[45] 16 U.S.C. 470. See sections 106 and 110.
[46] 16 U.S.C. 1451.
[47] Domico, T (2007). *Natural Areas of the San Juan Islands.* (Turtleback, Washington).
[48] No. 35-2007.

importance.[49] The waters surrounding the proposed Gateway Marine Terminal have been designated as a State Aquatic Reserve by the Department of Natural Resources for the primary purpose of recovering the genetically unique, spring spawning Cherry Point Herring stock. The stock has declined dramatically since the construction of the Delta Port Coal Dock in Point Robert and the Arco/BP refinery dock at Cherry Point.

(ii). The loss of integrity

All of the listed protected areas are at risk of losing their integrity (as in, the reasons for which their protected status was originally granted, such as being important habitats for species, special ecosystems, aesthetic beauty, etc), and thus their status, if a substantial vessel accident impacts upon them.[50]

(iii). The potential economic loss

The first estimates of the all-in cost to British Petroleum (BP) for the *Deepwater Horizon* spill in the Gulf of Mexico were below $5 billion (USD).[51] These original estimates, like all of those prior to the *Deepwater Horizon* spill, were based on the earlier cost-estimation methodologies used to quantify costs of the *Exxon Valdez* spill. These estimates were quickly eclipsed as the scale of the oil leaking out became apparent. By the end of 2012, the direct costs of the clean-up, compensation/damages for lost economic activity (collectively about $21 billion) and fines (based on the amount of oil spilt, by barrel, at around $17 billion) had taken the total closer to $38 billion.[52] However, these figures could climb even higher as while the cost of fines and compensation are relatively quantifiable and negotiable, the costs for restoration of the damaged environment (assuming this is possible and species are not made extinct) are proving much more difficult to conclude.

[49] Washington Department of Fish and Wildlife (2009) *Marine Protected Areas in Washington*. (WDFW, Washington). 2. Don, C. (2002). 'Could the San Juan Islands National Wildlife Refuge Serve to Protect Marine Areas ?' *Coastal Management*. 30: 421-426. Tuya, F. et al. (2000). 'An Assessment of the Effectiveness of Marine Protected Areas in the San Juan Islands'. *ICES Journal of Marine Science*. 57: 1218-12226.
[50] See Gillespie, A. (2008). *Protected Areas and International Law*. (Brill, The Netherlands). Chapter 8.
[51] Note, all figures are USD unless indicated otherwise.
[52] Goldenberg, S. (2012). 'BP adds $847m to Deepwater Horizon Costs'. *The Guardian*. July 31. A6. Goldenberg, S. (2012). 'Deepwater Horizon Aftermath: How Much is a Dolphin worth?'. *The Guardian*. April 12. A7. Anon (2010). 'The Oil Well and the Damage Done: BP Counts the Political and Financial cost of Deepwater Horizon'. *Economist.* June 17. 54-56.

The base difficulty in the *Deepwater Horizon* incident is that the long-term ecological impacts appear to be much larger than originally predicted as most of the damage is beyond what is visually apparent (i.e., oil soaked birds, mammals or fish). For example, although the 700 dolphin carcasses that washed up were most likely killed by the spill, the true death toll is unknown but is probably closer to many multiples of this with the majority dying at sea and never washing up ashore.[53] Similarly, with all of the associated ecosystems which are not immediately visible, such as those beneath the surface and especially on the ocean floor, the impacts are likely to considerably exceed predictions.[54]

A 2004 Report concluded that a major oil spill could cost Washington's economy $10.8 billion and impact 165,000 jobs.[55] This predicted figure is problematic both because of its age but also because it is likely to be an underestimate. Even relatively small oil spills – in high value areas – are proving increasingly difficult and expensive to clean up. For example, the most recent spill of note involved some 360 tons of bunker oil which escaped when the container ship *Rena* grounded off the east coast of New Zealand. This spill has already cost approximately $30 million in clean-up but the expectations are that it could cost as much as $110 million. Regrettably, the vast majority of this cost will fall upon the New Zealand taxpayer as the legal cap for the ship owners had been set at $29 million.[56]

The most obvious manifestation of direct economic risk from a large vessel accident is its impact upon tourism. Tourism is one of the economic powerhouses of the modern global economy. In 2011, the total for international tourist arrivals declined by 4.2% to 880 million due to the recession. These 880 million people spent some $852 billion on their travel. It is expected that this number will grow in the future to an estimated 1.6 billion international tourist arrivals by 2020. This growth in numbers is particularly noticeable with nature and eco-tourism and it is estimated that somewhere between 20-40% of all tourists are interested

[53] Williams et al (2011). Underestimating the Damage: interpreting cetacean carcass recoveries in the context of the Deepwater Horizon/BP incident. *Conservation Letters*. 4: 228–233.
[54] Whitehead, A. (2012). 'Genomic and Physiological Footprint of the Deepwater Horizon Oil Spill on Resident Marsh Fishes'. *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.1109545108. Helen K. White (2012). 'Impact of the Deepwater Horizon Oil Spill on a Deep-water Coral Community in the Gulf of Mexico'. PNAS 2012. doi:10.1073/pnas.1118029109.
[55] Department of Ecology/Puget Sound Partnership (2011). Improving Oil Spill Prevention and Response in Washington State: Lessons Learned From the BP Deepwater Horizon Oil Spill. (DoE, Publication Number: 11-08-002). 7, quoting an earlier 2004 study.
[56] Ministry for the Environment (2011). *Rena: Long-term Environmental Recovery Plan* (MFE, Wellington). 4-7.

in some form of wildlife watching.[57] This figure is broadly comparable with the United States as 82 million, or 39% of all Americans, participate in some kind of non-consumptive wildlife-related recreation, with an annual economic impact of $110 billion, or 1.1 % of the Gross Domestic Product.[58]

Areas which are already inscribed as protected and valued are generating large amounts of revenue. At the end of the 20th century, 63 million people were visiting 116 natural World Heritage sites annually. Fifteen sites recorded over one million visitors per year (eight of these being in the United States) with the Great Smokey Mountains having the highest number with 9,265,667 visitors. Even in areas which are not World Heritage, the revenue streams are impressive. For example, in the mid-1990s, nature tourism and visits to national parks in Costa Rica were estimated to generate over $600 million per annum. By 2001, this figure was over 1 billion dollars and had trebled to 3 billion by 2004. Australia's top eight national parks were estimated to be bringing in more than $2 billion per year with about a quarter of this sum coming from the Great Barrier Reef alone. In terms of the highest economic worth of an individual site, Yosemite in the United States generates approximately $1.3 billion per year.[59]

All of these figures have a direct applicability to the situation in Puget Sound. Protected areas can produce vast amounts of money. For example, the San Juan Islands have developed a particularly enviable position, commonly scoring in the top five places to visit on the planet. This popularity is reflected in visits to state parks on the Islands, which are in the range of 1.3 to 1.6 million people per year. In turn, this is believed to feed into an outdoor industry in the San Juan County worth $117 million per year, buttressed by 669 dependent jobs. This industry is understood to be a subset of the larger outdoor industry, with a value of $8.5 billion per year to the Washington State, buttressed by 115,000 dependent jobs.[60]

57 World Tourist Organisation (2012) *World Tourism Barometer* (NYC, WTO) 3-4; Convention on Migratory Species (2006) *Wildlife Watching and Tourism* (Bonn, CMS). 12-14; IUCN (2003) 'Protected Areas as Engines for Development.' *Parks* 13 (3), 1-71.

[58] Dolesh, R. (2011). 'Assessing the Value of Feathered Workers: Birds Perform a Multitude of Services that Contribute to Our Well-Being'. *Birder's World* 25(4): 12-20.

59 Maldonado, P (2008) 'Rumble in the Jungle' *Economist* (April 12) 50-51; Toepfer, K (2004) 'Protected Areas.' *Our Planet* 14(2): 1; IUCN (2002) *Sustainable Tourism in Protected Areas: Guidelines for Planning and Management* (Gland, IUCN) 24-25.

[60] For the popularity see, for example, the New York Times, The 41 Places to Go in 2011; National Geographic Traveller, The Best Trips for Summer 2011; Lonely Planet: US Islands That Won't Break the Bank. For the figures, see Dean Runyan Associates (2009). *The Economic Impacts to Visitors of Washington State Parks*.

Many of these jobs are based directly, or indirectly, around high-value eco-tourism such as whale-watching or bird-watching. Birding, the most accessible form of wildlife watching, continues to be the fastest growing outdoor recreational activity in the United States.[61] In addition to the indirect values that these birds bring, from controlling pests to performing key roles in ecosystems, they often have a direct economic value related to tourism.[62] On average, a day tripper focused on bird-watching will spend somewhere between $32 and $142 per day in a local community. However, this figure may be higher depending on the type of bird, its conservation status and the time of year.[63] Similar economic values come from whale-watching, which is now a rapidly growing industry active in over in 65 countries which is attracting more than 9 million participants per year and which brings in $2.1 billion per year.[64]

6. Alternatives

The most obvious alternative available in attempting to reduce the impact of increased shipping traffic and the risk of oil spill is the selection of routes which do not threaten either endangered species and/or protected areas. In this regard, alternate shipping routes which avoid designated critical, sensitive and protected areas should be investigated.

7. Mitigation

Mitigation actions should, ideally, render potentially significant impacts insignificant. This is not possible in this situation. What is possible, however, is reducing the magnitude of the

[61] Baicich, R (2003). Parks and Birders: A Natural Pair. *Parks & Recreation* 38. 2 (Feb 2003): 48-56.
[62] Dolesh, R. (2011). 'Assessing the Value of Feathered Workers: Birds Perform a Multitude of Services that Contribute to Our Well-Being'. Birder's World 25(4): 12-20.
[63] Edwards, P. (2011). 'The Economic Value of Viewing Migratory Shorebirds on the Delaware Bay: An Application of the Single Site Travel Cost Model Using On-Site Data'. Human Dimensions of Wildlife, 16:435–444. Lee, C. K. et al.. (2009). Assessing the Economic Value of a Public Birdwatching Interpretive Service Using a Contingent Valuation Method. International Journal of Tourism Research, 11, 583–593. Glowinski, S. L. (2008). 'Bird-Watching, Ecotourism, and Economic Development: A Review of the Evidence'. Applied Research in Economic Development, 5(3), 65–77. Eubanks, T. L., Stoll, J. R., & Ditton, B. (2004). Understanding the Diversity of Eight Birder Sub-Populations: Sociodemographic Characteristics, Motivations, Expenditures and Net Benefits. Journal of Ecotourism. 3: 151–172. MacMillan, D., (2004). Costs and Benefits of Wild Goose Conservation in Scotland. Biological Conservation, 119: 475–485.
[64] Pain, S (2009) 'You'll Miss Me When I'm Gone'. *New Scientist* (July 25) 34, 36-37. Anon (2009) 'Preservation Pays' *New Scientist* (July 4) 4; Hoyt, E (2008) *The State of Whalewatching in Latin America* (Washington, IFAW) 3; IFAW (2005) *The Growth of the New Zealand Whale Watching Industry* (Melbourne, IFAW) 4-5. Newsome, D (2007) *Wildlife Tourism* (Boston, Thomson) 122-127. Anon (2008) 'A Trophy for Conservation' *SPECIES* 49: 35; Barnett, R (2005) *Sport Hunting in the Southern African Development Community Region* (Cambridge, TRAFFIC) 3.

scale, and likelihood, of the significant risks.[65] This reduction of risk, but not its elimination, may be found in three areas: advanced preparedness, enhanced vessel controls, and an increased protection status for the most valuable regions.

(i). Preparedness

In the same year that the National Commission on the *Deepwater Horizon* disaster report came out in 2011, a joint review by the Department of Ecology and the Puget Sound Partnership was undertaken in response to recommendations from the National Commission, namely Improving Oil Spill Prevention and Response in Washington State.[66] The Joint Review made many sensible and robust recommendations which should form the first level of mitigation against the significant risks posed by shipping in the proposed GPT area and in the greater Puget Sound region. In particular, they identified a need to increase research and development to improve spill response, strengthen state and local involvement, develop new regulations to govern the use of dispersants and to improve oil spill response planning. All of these recommendations should be applied to the Puget Sound area and also to the consideration of the GPT proposal.[67]

(ii). Reducing the Risk of Accidents

Extension of pilotage limits

In the case of high densities of shipping traffic and associated risk around the San Juan Islands, one of the highest sources of risk has not been addressed by either the traffic separation and routing scheme[68] nor the broad precautionary measures that are required for oil tankers. As it stands, within the existing traffic control regime in this area, both the federal and state regulations require the master of oil tankers to accept both pilots and tugs. Such measures, complemented by additional requirements such as all oil tankers being double hulled, have, to date, been successful in mitigating disasters in this region of the world as less than 1 gallon of oil is spilled for every 100 million gallons transferred. The primary problem

[65] See Eccleston, C. (2012). *Preparing NEPA Environmental Assessments*. (Taylor and Francis, NYC). 47.
[66] Department of Ecology/Puget Sound Partnership (2011). *Improving Oil Spill Prevention and Response in Washington State: Lessons Learned From the BP Deepwater Horizon Oil Spill.* (DoE, Publication Number: 11-08-002).
[67] The original recommendations of the National Commission can be found in chapter 9, pages 265-269.
[68] See Traffic Separation Schemes: In the Strait of Juan de Fuca and Its Approaches; in Puget Sound and Its Approaches; and in Haro Strait, Boundary Pass, and the Strait of Georgia. Reprinted in The Federal Register (Nov 19, 2010).

here, with regards to oil tankers, is that the first 70 miles of the Strait of Juan de Fuca is *not* covered by pilots, with the starting point for pilotage only beginning at Victoria/Port Angeles, and tugboats are only mandatory for oil tankers which are laden. In addition, laden Articulated Tug/barges are not required to have tug escorts at all. Accordingly, in terms of a reduced risk, it is important to study the utility of an extension in the range of the compulsory use of pilots and tugs for both oil tankers, as well as all vessels over 400 tons and/or carrying dangerous cargo.

Revision of criteria for requiring pilotage and tug

The first standard that should be investigated to help mitigate potential risks in this area is the applicability of the requirement for a pilot and tug to all large vessels with the highest risk profile, such as those over 400 tons and/or carrying dangerous cargo. This is necessary because there is a much greater risk of accidents in this region, potentially even more so, given the projected increase in overall shipping traffic from the proposed GPT. Therefore, similar mitigation measures should be required for all large vessels and not just oil tankers. This requirement is especially important because the most common type of vessel currently involved in incidents or accidents are cargo vessels, followed by ferries, fishing vessels, and barges. The benefit for requiring the sectors with the highest risk profiles to be accompanied by tugs and guided by local pilots is potentially large given that the types of vessels most likely to be utilized in the freight of coal will be Panamax and Capesize. These vessels are up to 950 feet long and 106 feet wide. The same requirements should be implemented for barges over a certain size, especially those carrying oil. This requirement was recognized by the National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling, which noted that these vessels may represent a distinct and previously invisible risk.[69]

Furthermore, while oil tankers are presently the only vessels that require pilots and tugs, it is possible that other vessels not under pilotage and escort could be responsible for a collision with a laden oil tanker, even when the oil tanker was conforming to best practice. The impacts from such an event would likely be equivalent to an incident which was the fault of the oil tanker. Due to this reasonably foreseeable scenario, it is essential to study the possible mitigation benefits of the compulsory use of pilots and tugs for all large vessels and/or those carrying potentially dangerous cargo through the entire waterway.

[69] Commission Report (Chapter 9, page 251).

Reassessment of the definition of high risk and/or potentially dangerous cargo

With regard to the point above regarding potentially dangerous cargos, and with a view to exploring further risk mitigation, it would be useful to reassess the issue of whether other forms of cargo, including materials such as tarsands/bitumen and coal, should be classified as high risk and/or potentially dangerous and, therefore, requiring additional mitigation measures to ensure their safe transit. The definition of high risk and/or potentially dangerous should also be refined to include those cargoes that may result in significant, negative environmental, social and/or economic impact on this region. This should include both quantitative and qualitative assessment of the expected impacts from the sinking or grounding in the Puget Sound area of a fully loaded coal transport vessels of both Panamax and Capemax class.

Speed reductions

Another standard that should be investigated to help mitigate potential risks in this area is reducing the speed of all large vessels traversing this area. As it stands, the only restrictions on speed in this highly valuable and sensitive area pertain to restrictions that oil tankers should not outrun their escorts. There are no restrictions on other vessels and many of those most at risk, such as larger freighters, currently exceed 20 knots while traveling in the Salish Sea and related regions, which makes them both noisy and difficult to stop. Any enforced reduction in speed for all large vessels and/or those carrying dangerous cargos would be consistent with the broad international rules in this area, as stated in the 1972 Convention on the International Regulations for Preventing Collisions at Sea, that, 'Every vessel shall at all times proceed at a safe speed...'[70]. With this mitigation option in mind, there is merit in examining the utility of mandating a reduced speed for all large vessels and/or those carrying high risk and/or dangerous cargo.

(iii). Enhanced Protection Status

Whilst the preferred option would be that there is no risk posed by vessel traffic in the waters which are particularly vulnerable, the existing levels of traffic alone means that it is not possible to 'turn back the clock'. Accordingly, the best that can be achieved in this area is to

[70] Rule 6.

introduce further mitigations to reduce the risk of traffic accidents. The foremost tool to do this is rethinking the way, type and method of implementing effective protected areas around threatened or sensitive areas. This tool would not only assist goals of conservation and vessel shipping coordination in this area,[71] but it would also be consistent with regional initiatives to enhance conservation protection in the Salish sea (and especially the Juan de Fuca Strait and Puget Sound) Puget Sound area. Most importantly, it would help impose restrictions on the vessels traversing the area to Canadian (not American) destinations, as they would be obliged to work in accordance with regulations of an international basis.

The current possibilities in this area include the creation of a National Monument via the 1906 Antiquities Act through a public proclamation to protect sites of historic and scientific importance found on federally owned land. Recent notable precedents in this area are the Presidential Declaration for the Papahānaumokuākea National Marine Monument in the Northwestern Hawaiian Islands (2006) and the Pacific Islands National Marine Monuments (2009) which includes Rose Atoll Monument, Marianas Trench Monument, and the Pacific Remote Islands Monument.

The critical aspect of such a designation is that it could effectively be the stepping stone to reconciling an increase in vessel traffic and adequately protecting the endangered species and protected areas within it the region. That protection can be found in the designation of Puget Sound as a Particularly Sensitive Sea Area (PSSA). A PSSA is defined as, 'an area that needs special protection through action by the International Maritime Organization because of significance for recognized ecological, socioeconomic or scientific reasons and because it may be vulnerable to being damaged by international shipping activities'.[72] The PSSA is ultimately a balance between the protection of high value environments (of a coastal State) and the freedom of the high seas (as jealously guarded by flag States and the shipping communities). It is also an instrument which pulls together and synchronizes very complex, and often conflicting, domestic and international, legal and policy goals. The advantages of

[71] Washington Department of Fish and Wildlife (2009) *Marine Protected Areas in Washington*. (WDFW, Washington). 3-4.
[72] Broder, S. (2011). 'Particularly Sensitive Sea Areas-Protecting the Marine Environment in the Territorial Seas and Exclusive Economic Zones'. *Denver Journal of International Law and Policy*. 40(1): 472-300. Chalain, H. (2007). 'Fifteen Years of Particularly Sensitive Sea Areas: A Concept in Development'. *Ocean and Coastal Law Journal*. 13(1): 47-65. Ottesen, P. (1994). 'Shipping Threats and Protection of the Great Barrier Reef Marine Park: The Role of the Particularly Sensitive Sea Area'. *The International Journal of Marine and Coastal Law*. 9(4): 507-543. Gerard, P. (1994). 'Particularly Sensitive Sea Areas-A Documentary History'. *The International Journal of Marine and Coastal Law*. 9(4): 469-482. Gjerde, K. (1993). 'Protection of Particularly Sensitive Sea Areas under International Marine Environmental Law'. *Marine Pollution Bulletin,* 26(1): 9-13.

this instrument are many, as can be evidenced by the fact that a number of countries are presently actively exploring the creation of PSSAs to protect key areas and appropriately manage shipping traffic.[73]

To date, PSSAs have been designated in 14 areas. The first such designation was in 1990 in Australia's Great Barrier Reef and it was later extended to include the Torres Strait in 2005. The designation required compulsory pilotage and it was backed by criminal penalties (which are not permitted under other international conventions). It now extends 1,430 miles along the east coast of Queensland and covers an area of 215,000 square miles, passing through both Australia's territorial sea and its EEZ.[74] Subsequent PSSAs include Sabana-Camagüey Archipelago (Cuba, 1997),[75] Malpelo Island (Colombia, 2002), the Wadden Sea (Denmark, Germany, Netherlands, 2002), Paracas National Reserve (Peru, 2003), Western European Waters (2004) following the sinking of the *Prestige*, a single-hulled tanker which released over 20 million US gallons of oil into the sea,[76] Canary Islands (Spain, 2005), the Galapagos Archipelago (Ecuador, 2005), the Baltic Sea area (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden, 2005),[77] and the Strait of Bonifacio (France and Italy, 2011). These have been joined by Saba Bank (Caribbean Island of Saba, 2011), and The Netherlands (2012).

The United States has also already adopted and implemented two PSSAs. These are the waters around the Florida Keys (2002) and the Papahānaumokuākea Marine National Monument (2007). In the latter instance, the designation put into effect internationally recognized measures designed to protect marine resources of ecological or cultural significance from damage by ships, while helping keep mariners safe. In addition to enhanced

[73] Hazmi, M. (2012). 'Protecting vital sea lines of communication: A study of the proposed designation of the Straits of Malacca and Singapore as a Particularly Sensitive Sea Area'. *Ocean & Coastal Management* 57: 79-94.
[74] See the IMO, MEPC, Identification of the Great Barrier Reef Region as a Particularly Sensitive Area, Annex, IMO Marine Env't Prot. Comm. Res. 44 (30) (Nov. 16, 1990). Also, Australia Government, Australian Maritime Safety Authority [AMSA], The Torres Strait Particularly Sensitive Sea Area, available at http://www.amsa.gov.au/Marine_Environment_Protection/Torres_Strait (last visited December 22, 2012).
[75] Kristina, M. (1999). 'Cuba's Particularly Sensitive Sea Area in the Sabana-Camaguey Archipelago'. *International Journal of Marine and Coastal Law*. 14(3): 415-435.
[76] Detjen, M (2006). 'The Western European PSSA—Testing a Unique International Concept to Protect Imperilled Marine Ecosystems'. *Marine Policy* 30: 442–453.
[77] Uggla, Y. (2007). 'Environmental Protection and the Freedom of the High Seas: The Baltic Sea as a PSSA from a Swedish perspective'. *Marine Policy* 31: 251–257.

monitoring and reporting requirements, special zones known as 'Areas to be Avoided', appeared on international nautical charts to direct ships away from them.[78]

All such PSSAs have been approved and designated, after first being requested by a member government at the IMO, once it has been proven that they meet a number of criteria including ecological, social, cultural and/or economic criteria.[79] Despite being the highest level of protection in this area, the PSSA does not, of itself, include any explicit prescribed protective mechanisms. Rather, the application to the IMO for PSSA designation needs to be accompanied by specific proposed Associated Protective Measures (APM). All IMO member governments are obligated to ensure that ships flying their flag comply with the APMs for that area.[80] APMs are those approved or adopted by the IMO to prevent, reduce, or eliminate the threat or identified vulnerability. There can be special discharge standards within PSSAs and specific measures can be used to control the maritime activities in that area, such as compulsory pilotage programs, separated shipping, traffic lanes, areas to be avoided, reporting requirements, no anchoring zones, equipment requirements for ships, and installation of Vessel Traffic Services.[81] It is also possible to encompass any measure that is already available under an existing IMO instrument; or is to be adopted by the IMO; and/or any measure that does not yet exist which is described as the development and adoption of other measures aimed at protecting specific sea areas against environmental damage from ships, provided that they have an identified legal basis.

[78] Anonymous (2008). 'Marine National Monument Designated Sensitive Sea Area'. *Sea Technology* 49 (5): 60-61. Also, Anon (2008). 'Papahanaumokuakea Marine National Monument designated a "Particularly Sensitive Sea Area'. *Ocean News & Technology* 14 (3): 20-21.

[79] Ecological criteria covers unique or rare ecosystem, diversity of the ecosystem or vulnerability to degradation by natural events or human activities; social, cultural and economic criteria include those having significance of the area for recreation or tourism; and scientific and educational criteria, such as biological research or historical value are also important. See IMO Resolution A.982(24) Revised Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas (PSSAs).

[80] IMO, Assembly, Revised Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas, Resolution A. 982 (Dec. 1, 2005).

[81] Vessel Traffic Services (as overlapping with guidance from the International Maritime Organisation) provides active monitoring and navigational advice and assistance for vessels in particularly areas which are confined and busy waterways, thereby improving the safety and efficiency of navigation, safety of life at sea and the protection of the marine environment. Advanced traffic organization (such as priority position, allocation of space, routes to be followed, and speed limits to be observed); navigational assistance, and overlapping technologies such as radar and other direction finding, location and management tools, combined with appropriate personnel, and a strong and supportive flow of information (for example reports on the position, identity and intentions of other traffic; waterway conditions; weather; hazards; or any other factors that may influence the vessel's transit) essential for making informed on-board navigational decisions. VTS is governed by the 1974 Safety of Life at Sea (SOLAS) Convention, Chapter V, Regulation 12, together with the Guidelines for Vessel Traffic Services, IMO Resolution A.857(20), as adopted by the IMO, on November 27, 1997.

8. Recommended research programs

Based on the assessment of the various risks posed by increased shipping from the proposed GPT and the consideration of potential mitigation options that are identified in this report, 10 research programs are recommended to assist in developing an understanding and evaluation of the impacts of the GPT. Five research programs are required for decision-makers to reach a full and informed decision with regards to assessing the significant risk of a substantial vessel accident in this region to endangered species and protected areas and a further five studies are required to assess the possibilities and potential effectiveness of the different mitigation options in this area.

Research programs to support decision makers

i. Create a cumulative risk assessment for all vessels with a high risk profile over 00 tons and/or carrying a dangerous cargo transiting through the area. This study should establish what the baseline is, how the proposed expansion will impact upon the baseline and what additional reasonably foreseeable growth in this area would look like in terms of increased volume and increased risk.
ii. Create a clear and accurate map of all of the critical habitats of endangered species and all of the established protected areas in the greater Puget Sound region which are at risk from the impacts of a vessel accident bearing in mind that impacts of oil spills can be regional in scope.
iii. Show if it is possible for alternative routes for the vessels to be charted which either do not pose, or significantly reduce, risks to either endangered species, their critical habitat or established protected areas.
iv. Investigate how a substantial vessel accident could potentially impact upon one or more endangered species (and their associated critical habitat) including Southern Resident killer whales, Chinook and Chum Salmon and any birdlife of conservation concern.
v. Complete an economic analysis of the potential costs of a substantial vessel accident.

Although economic cost is not an explicit consideration within NEPA, issues such as employment and availability of services are clearly part of the ‘human

environment' that section 102 of the NEPA requires to be examined. In this regard, although there is an expectation that issues of cost will be considered through processes outside of NEPA, good practice within the application of the NEPA means that it should also be included. This ambiguity to include economic considerations within the NEPA assessment is not present within the SEPA. Within the SEPA, the requirement 'that presently unquantified environmental amenities and values will be given appropriate consideration in decision making along with economic … considerations' is explicit. This requirement is particularly so because it overlaps with the other requirement of the Legislature for an examination of impacts which have a 'relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity'.[82]

Accordingly, the fifth study, especially in light of the *Deepwater Horizon* accident, should seek to update the figures for predicted economic losses from oil spills for the greater Puget Sound region. The particular areas to draw out are the potential impacts upon the fishing industry, the tourism industry, especially the high value eco-tourism areas. The costs associated with cleanup operations, compensation and damages, fines and also long-term habitat and environmental restoration should also be assessed. Within this study, it would also be worthy to examine the question of the adequacy of the existing liability regime for vessel accidents within Washington State. As the *Deepwater Horizon* accident clearly showed, had it not been for the exceptionally deep pockets of BP, many of the costs would have fallen upon the taxpayer.[83]

[82] SEPA, Chapter 43.21C RCW.

[83] Davis, A. (2011). 'Pure Economic Loss Claims Under the Oil Pollution Act: Combining Policy and Congressional Intent'. *Columbia Journal of Law and Social Problems* 45 (1): 1-44. Rogers, C. (2011). 'Under Extraordinary Circumstance: NEPA Practice Post Deepwater Horizon'. *Natural Resources and Environment*. 26(2): 15-26. Gaskell, N. (2008). 'Marine Pollution Damage in Australia: Implementing the Bunker Oil Convention 2011 and the Supplementary Fund Protocol 2003'. *The University of Queensland Law Journal.* 27(2): 104-130. Ganten, R (2008). 'Developments in Oil Pollution Liability'. *Environmental Policy and Law* 38 (6): 312-315. Faure, M. (2008). 'Financial caps for oil pollution damage: A historical mistake?'. *Marine Policy* 32: 592–606. Faure, M. (2006). 'An Economic Analysis of Compensation for Oil Pollution Damage'. *Journal of Maritime Law and Commerce* 37(2): 179-217. National Commission, Chapter 9, pages 283 and 285.

Research programs to investigate mitigation options

vi. The utility of an extended range for the compulsory use of pilots and tugs for both empty and full oil tankers.

vii. The value of the mandatory use of pilots and tugs for all large vessels and/or those carrying potentially dangerous cargo.

viii. Assessment of whether cargo, including tarsands/bitumen and coal, should be classified as high risk and/or potentially dangerous and therefore requiring additional measures to ensure their safe transit. The definition of high risk and/or potentially dangerous should also be refined to include those cargoes that have the potential to result in significant environmental, social and/or economic impact on this region.

ix. Assessment of the benefits of reducing risk through mandating a reduced speed for all large vessels and/or those carrying high risk and/or dangerous cargo.

x. Investigate the possible benefits and costs of enhancing protected status of the region, especially in terms of the creation of an internationally mandated Particularly Sensitive Sea Area.