POLLUTION CONTROL HEARINGS BOARD
FOR THE STATE OF WASHINGTON

AIRPORT COMMUNITIES COALITION and CITIZENS AGAINST SEA-TAC EXPANSION, Appellants, v. DEPARTMENT OF ECOLOGY and THE PORT OF SEATTLE, Respondents.	No. PCHB 01-160 PREFILED TESTIMONY OF JAMES C. KELLEY, PH.D. (with errata corrections)

ORIGINAL

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1. Professional Qualifications. I am a professional ecologist employed by Parametrix, Inc., an engineering and environmental consulting firm. My educational background includes a Doctoral of Science degree (1985) from the Fisheries and Wildlife Department at Michigan State University where my studies focused on aquatic ecology. I have a Master of Science degree from the Department of Botany and Plant Pathology (1980) at Michigan State University where my studies focused on plant ecology and plant taxonomy. My Bachelor of Science is from the Botany Department (1978) at the University of Vermont. I have completed postdoctoral research at the University of Minnesota-Duluth (1985-1987), where I studied wetland and riparian processes.

2. In 1997, I served on the Riverine Assessment Team and Depressional Assessment Team to help develop *Methods for Assessing Wetland Function Volume I Riverine and Depressional Wetlands in the Lowlands of Western Washington* (Ecology Publication #99-115). I have professional training and practical experience in the planning, design, implementation, and maintenance of constructed wetlands for water quality treatment, and have completed treatability studies that evaluate the ability of constructed wetland systems to remove excess metals from surface water. I have developed and implemented wetland restoration plans as part of sediment remediation (including dredging, capping, and natural recovery) actions. I have prepared over a dozen presentations and publications on wetland ecology and related topics, which are included with my resume attached as Exhibit A.

3. Familiarity with Project. I serve as the principal consulting ecologist for the Master Plan Update (MPU) projects at Seattle-Tacoma International Airport ("Airport"). In that capacity, I have directed and managed the wetland and natural resource studies for the MPU, which includes the Third Runway Project, the runway safety area extensions, the South Aviation Safety Area, and the development of on-site borrow areas. I and others working under my direction have been primarily responsible for the identification of impacts to wetlands and other aquatic resources, the assessment of wetland functions, and the design of compensatory mitigation for the MPU projects. The scientific analysis and conclusions on which this declaration is based are provided in the *Wetland Delineation*

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Report, the *Wetland Functional Assessment and Impact Analysis Report* (WFAIA), and the *Natural Resource Mitigation Plan* (NRMP).

4. Outline. In this testimony, I describe the work I have conducted in regard to the 401 Water Quality Certification issued by Ecology for the Port's MPU projects, including:

- Environmental conditions in the project area;
- The studies and analysis that I completed, including the wetland delineation, impact analysis, and mitigation planning.
- A summary of how the project was designed to avoid wetlands.
- An explanation of wetland mitigation issues related to aviation safety and why some mitigation if off-site.
- A discussion on the reliability of wetland mitigation, and
- An explanations of how the suite of mitigation activities replace the functional attributes of the filled wetlands.

5. Some MPU projects at the Airport result in the permanent filling of 18.37 acres of wetland. During construction, an additional 2.05 acres of wetland will be impacted and will be treated as permanent wetland impacts, even though they will be restored after construction. The project will also fill 0.92 acres of Prior Converted Cropland as explained in prior Section 404/401 Public Notices for the project (Exhibit B). A complete and comprehensive mitigation plan has been developed to replace the ecological functions these wetlands provide to the Miller, Walker, and Des Moines Creek basins.

6. Conditions Prior to the Port's MPU Project. I am thoroughly familiar with the baseline conditions of the area where the Port's construction is planned. I began examining property in the acquisition area (the medium density residential neighborhood located west of the Airport) in 1997. I have also examined historic aerial photographs and maps of the area. This evaluation is documented in the *Cumulative Impacts to Wetlands and Stream Reports* (Parametrix 2001) and in *Wetland Photographs and Maps* (Parametrix 2001). The development and land-use practices that I have observed in the area did not protect wetlands or stream buffers. Past logging and farming practices historically modified vegetation, drainage, and channel conditions in the Miller, Walker, and Des Moines Creek basins. More recent urban development has also modified stream, wetland, and upland habitats. Many wetland areas have been cleared of native vegetation and used as lawn, as plant nurseries, for crop production, or for

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pasture. In many locations Miller Creek has been modified by ditching, with rock riprap, by tire riprap, or with concrete bulkhead. Like most urban streams, residents cleared fallen trees from the channel and banks, a process that destroys fish and invertebrate habitat.

7. As a result, environmental conditions in the project area are significantly degraded. Increased impervious surfaces have resulted in increased erosion, increased sedimentation and habitat degradation. Runoff from residential, commercial, and agricultural areas located in wetlands and uplands has increased input of sediment, nutrients, and pollutants to the stream. Upland and wetland riparian areas adjacent to the stream have been altered from the original forest and/or shrub cover to impervious surfaces, agricultural fields, residential lawns, or ornamental landscaping. Native plant and animal habitats have been reduced in size and fragmented, resulting in a loss of species diversity.

8. These disturbances have significantly degraded many of the functions of the area wetlands. For example, the historic conversion of forested riparian wetlands to farmland, lawn and pasture (as has occurred in portions of Wetland 18, 37, near the Vacca Farm, and wetlands on the Tyee Valley Golf Course) reduced habitat value, nutrient and carbon cycling processes, and carbon export capabilities. Their riparian functions are also affected, as their ability to deliver woody debris and organic matter to creek ecosystems is severely diminished. In many locations, the land adjacent to Miller Creek, Walker Creek, and Des Moines Creek fails to meet the definition of a buffer provided in the Section 404 guidelines which state that "*mowed lawns are not considered vegetated buffers because they provide little or no aquatic habitat functions and values*"[1,2].

9. The channel morphology of Miller Creek has also been altered throughout the project area. Extensive areas of the channel have been armored with riprap or retaining walls, and dredged or straightened to protect property adjacent to the stream or to drain land for agricultural uses. Dredging or

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[1] see page 12899, Federal Register 65(47), March 9,2000. *Final Notice of Issuance and Modification of Nationwide Permits*, Army Corps of Engineers.

[2] See page 119 in *Final Regional Conditions, 401 Water Quality Certification Conditions, Coastal Zone Management Condition Consistency Responses, for Nationwide Permits for the Seattle District Corps of Engineers For the State of Washington.* Special Public Notice. Army Corps of Engineers, Regulatory Branch, Seattle Washington.

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straightening of the channel has occurred to increase stormwater conveyance because most non-Airport development in the area lacked stormwater management. Ecologically valuable logs and other woody debris are nearly absent. These conditions have reduced aquatic habitat complexity, shading from riparian vegetation, and floodplain storage, and they have degraded water quality.

10. Channel modifications to Miller Creek are most pronounced in the Vacca Farm area (Sheet 1, Exhibit C, and Exhibit D). Here the channel is ditched, re-aligned near the perimeter of a peat deposit, and cleared of native riparian vegetation. These modifications were made prior to 1938, and have persisted since then to allow farming of up to about 25 acres of wetland.

11. Similar historic land uses resulted in similar degraded wetlands and streams in the Des Moines Creek basin. In this basin, wetlands located on the Tyee Valley golf course were farmed prior to 1938. Some wetlands have been subjected to excavation and peat mining.

12. Wetland Delineation and Classification. The Port has used scientifically accepted methods and standards to evaluate the presence of wetlands, the function of these wetlands, project impacts to these wetlands, and mitigation measures to avoid and compensate for project impacts.

13. The identification and delineation of wetlands are described in the *Wetland Delineation Report for Seattle-Tacoma International Airport Master Plan Update Improvement.* These studies were completed using the methods required in the *Washington State Wetland Identification and Delineation Manual* and the *Wetland Delineation Manual* of the U.S. Army Corps of Engineers (ACOE). Areas that were determined to be wetland were flagged, surveyed and mapped. Data was collected in the wetlands and adjacent uplands to document the dominant vegetation types, soil conditions, shallow groundwater conditions, and the general ecological condition of the area.

14. In addition to identifying vegetated wetlands, the studies identified streams and other drainage features that convey natural surface waters at least seasonally. Where these areas were independent of wetlands and were determined by the ACOE to be "waters of the U.S." they were surveyed, mapped, and included in further analysis. The ACOE made site visits to confirm wetland

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identifications and boundary delineations between July 1998 and November 2000. The ACOE review of delineated wetland is documented in a *Memorandum for the Record (MFR): Field Review and Jurisdictional Summary* in February 2001. All modifications requested by ACOE during those site visits have been made and are reflected in the wetland mapping and analysis for the project.

15. Independent of the ACOE wetland determination, Ecology also reviewed wetland conditions and the wetland delineation. Ecology determined in July of 1998 that certain areas on the Vacca Farm that meet the wetland hydrology criteria but are exempt from federal regulations (the Prior Converted Cropland) would be considered wetland and waters of the State. Project impacts to these waters of the State have been identified and mitigation provided. The mapping of Prior Converted Cropland has also been provided in the wetland delineation or mitigation plans since 1999 (NRMP Figure 2.1-4). The mitigation plan provides on-site and off-site mitigation both for the fill impacts (0.92 acres), and for the 980 linear feet (0.25 acres) of the Miller Creek channel impacts.

16. Ecology assigns wetland ratings (Category I, II, III, and IV) based on rarity, general habitat conditions, and other features. Categories are assigned independent of any specific evaluation of all the wetland functions that a more detailed functional assessment would provide. While the rating approach helps identify a general ecological value that a wetland may provide, it cannot be used to infer what the specific functional performance of a wetland may be. Likewise, the ratings are assigned independent of the level of human disturbance or degradation that a wetland may have been subjected to. Most of the wetlands filled by the project are rated as Category II and Category III wetlands. Even the supposedly higher quality Category II wetlands here are functionally degraded wetlands. For example, the Category II wetlands that occur in the Vacca Farm area are degraded by farming and hydrologic alterations. The Category II Wetland 18 and Wetland 37 are functionally degraded by residential development, grazing, ditching, land clearing and logging.

17. In her testimony, Ms. Azous claims a large percentage of wetlands hydrologically connected to Miller Creek will be filled. Ms. Azous is incorrect. I have prepared graphs showing the

actual percentages of the impacts to the various wetland categories (Exhibit E). These graphs are similar to those prepared by Amanda Azous, except that my analysis is based on current data. That relevant data includes the wetlands in Tub lake, Lake Reba and from recent Port studies north of the Airport. Even this updated data undoubtedly underestimates the wetland acreage in the area because the Port does not have access to most properties and aerial surveys (such as those relied on by Ms. Azous) are notoriously unreliable.

18. The MPU impact of the project to hydrologically connected wetlands in the Miller, Walker, and Des Moines Creek watersheds are presented below. When addressing potential impacts to the Miller Creek estuary and nearby Puget Sound, the wetland impacts to both Miller and Walker Creek watersheds must be combined as the two creeks confluence upstream of the estuary and Puget Sound. For this analysis, wetlands and waters of the US total 149.5 acres[3] and a net loss of 7.44 acres (about 5%) of wetlands connected to the creek systems occurs.

Table 1. Summary of impacts to "hydrologically connected" wetlands and waters of the U.S. located in the upper watersheds[a] of Miller, Walker, and Des Moines Creeks.

Watershed[b]	Total	Impact	Change
Miller Creek	79.1/ 112.8	10.48	-9.3/ -13.2%
with mitigation		7.18	-6.4/ -9.1%[c]
Walker Creek	36.5	0.26	- 0.7%
Des Moines Creek	59.5	1.29	- 2.2%

[a]The upper watersheds are as follows: upstream of SR 509 for Miller Creek, upstream of Des Moines Memorial Drive for Walker Creek, and upstream of Borrow Area 1 for Des Moines Creek.

[b]The range for the Miller Creek watershed results from including 33.7 acres of Arbor Lake and Burien Lake because lake ecosystems provide many physical, biological, and ecological functions that wetlands provide. Lake Reba, Tub Lake, and Northwest Ponds are open water (aquatic bed, and unconsolidated bottom) palustrine wetlands that are integrated into larger wetland areas and are also included in the relevant calculations.

[c]The calculation represents a net impact that accounts for wetland restoration at the Des Moines Way Nursery, Lora Lake, and Wetland A17 sites (3.30 acres). The restoration of 6.6 acres of prior converted cropland to jurisdictional wetland at the Vacca Farm site is not included.

19. No matter what the "percentage" loss, the Port's mitigation plans will compensate for all of the functions lost the filling of wetland areas identified in these tables. I am not aware of any

[3] This value underestimates the actual value as it includes only wetlands in the upper watershed and not those downstream of SR 509 and Des Moines Memorial Drive.

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scientific research that shows scientifically based critical thresholds, above which water chemistry, food web support, or invertebrate communities in downstream areas are significantly altered (as alleged by Ms. Azous).

20. Assessing Wetland Impacts and Functions. In addition to determining wetland areas affected by the project, impacts to wetland functions were evaluated. This study identified the beneficial biological and physical (hydrologic and water quality) functions that wetlands provide to the local area and their larger basins. The assessment was based on observing the physical and biological characteristics of the wetlands and surrounding areas, and using professional judgement to categorize the opportunity for wetlands to provide various functions. This is a common method used to characterize wetland functions. Exhibit F provides a summary of the Port's functional assessment.

21. Functional assessment methodologies for wetlands typically identify and evaluate a suite of physical and biological attributes of wetlands that are indicative of wetland functions. Several functional assessment methodologies were used for guidance in preparing the functional assessment[4]. There are no standard quantitative procedures for obtaining direct measurements of wetland functions, nor are any required by the Department of Ecology or the Army Corps of Engineers.

22. The scientific literature documenting most wetland functions generally consists of a relatively small number of direct measurements of function made at a relatively small number of wetlands. From this data, attempts are made to characterize various physical and ecological attributes that would indicate the functional performance of other wetlands, but there are no standard assessment methods that are applicable to the range of wetlands types found in Washington State or the project area.

23. The Department of Ecology has recently developed a predictive model to estimate wetland functions in a variety of wetland types in western Washington (Washington Functional

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[4] These methods include locally developed *Wetland and Buffer Functions: Semi-Quantitative Assessment Methodology Draft Users Manual* (Cooke Scientific Services 1996), *Wetland and Buffer Functions: Semi-Quantitative Assessment Methodology Final Working Draft Users Manual* (Cooke Scientific Services 2000), *Wetland Evaluation Technique*, Department of the Army, U.S. Army Corps of Engineers (1987), and Indicator Value Approaches as described in Hruby, T., W. Cesanek, and K. Miller. 1995. *Estimating relative wetland values for regional planning*. Wetlands 15: 93-106.

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Assessment Methodology or WFAM)[5]. This model was not available at the time the Port's studies were conducted. The models does not model functions of slope wetlands, the most common and functionally important wetland type affected by the project. The model does not quantify wetland functions and does not allow comparison of functions across wetland types. Further, since the assessment methods in WFAM are generalized for all of lowland western Washington, they compare wetlands to the characteristics of typical undisturbed wetlands with optimal function. This is a significant detriment to assessing wetlands in a local urbanized area, because the significance of the functions remaining in degraded wetlands may be underestimated. WFAM also requires "best professional judgement" to assess "opportunity" (e.g. whether a wetland actually performs a function). *See* Exhibit G. The methods assess capability of a wetland to perform a function based on models and the actual environmental characteristic of a wetland. Since in an impact analysis, we ultimately want to know if a wetland is performing a function and if the project will enhance or degrade that function, the most critical component of a WFAM uses the same method used by the Port. It is my opinion the WFAM method provides a framework for users with a relatively limited understanding of wetlands. For experienced wetland ecologists, best professional judgment provides a more thorough analysis of wetland functions.

24. Ms. Sheldon testifies that WFAM could be used on 41 percent of the wetlands affected by the MPU. While it could be used on 41 percent of the individual wetlands, the wetlands it could apply to are small, and account for only about 24 percent of the wetland impact area. This leaves a significant void and the need for a second methodology to address the functions of over 75 percent of the wetland area. In my opinion, using two different functional assessment methodologies for the same project area could result in inconsistencies and would not improve the overall reliability.

25. Regardless of the above concerns, I have recently applied the WFAM method on the two largest impact areas for which it is appropriate (Wetland 23 and impacted wetlands at Vacca Farm). The findings are shown in Exhibit H. These areas collectively represent about 54 percent of the depressional

[5] *Methods for Assessing Wetland Function. Volume I. Riverine and Depressional Wetlands in the Lowlands of Western Washington.* Washington Department of Ecology, publication #99-115. 1999.

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wetlands that WFAM addresses. Comparing the WFAM results to findings of the functional assessment report, I found the report resulted in determinations that were equal to or greater than the WFAM results. There is no merit to the testimony that the Port's functional assessment may underestimate functions.

26. Assessment of Direct Wetland Impacts. The impact analysis used engineering designs for Master Plan projects mapped on wetland and stream maps so direct impacts to streams and wetlands could be determined. These impact areas were calculated using engineering design data and survey maps of delineated wetland boundaries that were incorporated into GIS map layers. Permanent direct impacts occur where fill is permanently placed in wetlands. Temporary direct impacts occur where, on a temporary basis, fill or other activities occur in wetlands during a portion of the construction period. In these areas, following construction, and per Section 404 definitions that state "*Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to preconstruction contours and elevations after construction are not included in the measurement of loss of water of the United States*"[6]. Consistent with Council of Environmental Quality regulations (40 CFR 1508.20), the temporary impacts will be rectified by restoring the affected environment. Temporary impacts[7] result primarily from the need for temporary erosion and sediment control facilities (including sediment fencing, drainage swales, and stormwater management ponds) during the construction period.

27. Assessment of Indirect Wetland Impacts. Indirect wetland impacts to wetland functions were defined as potential wetland impacts (excluding filling) that could affect the existence and ecological function of wetlands located near areas developed as part of the Master Plan. The methodology for evaluating these impacts was to consider the changes to wetland conditions or

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[6] See page 117 in *Final Regional Conditions, 401 Water Quality Certification Conditions, Coastal Zone Management Condition Consistency Responses, for Nationwide Permits for the Seattle District Corps of Engineers For the State of Washington.* Special Public Notice. Army Corps of Engineers, Regulatory Branch, Seattle Washington.

[7] The *Natural Resource Mitigation Plan* proposes wetland mitigation for all permanent and temporary wetland impacts. Because the duration of temporary impacts exceeds 1-year, mitigation for these temporary impacts includes restoration of the affected area (see the *Natural Resource Mitigation Plan*, Section 5.2.4) Parametrix 2000) and restoration of Wetland A17 (2.85 acres of wetland and 8.6 acres of upland) as required by conditions D.4. of the amended Water Quality Certification..

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characteristics that could occur from the project, and evaluate what effect these changes could have on wetland functions.

28. The activities that could potentially result in indirect impacts were fully evaluated in the WFAIA.

29. Hydrologic Impacts. A large number of hydrologic and engineering studies were completed to assure the accuracy of the wetland impact analysis and these key studies were included as appendices to the WFA report. The impact analysis also relied on water quality analysis reported in the *Biological Assessment-Master Plan Update Improvement Projects* (Parametrix 2000). Hydrogeologic investigations evaluated the movement of water through the runway embankment using a variety of modeling methods. The studies found that for wetlands located downslope of the embankment, small increases in groundwater would be available. The result would be that wetlands downslope of the embankment would receive increased groundwater during the late spring and summer months.[8] There are no studies that show wetlands would receive less water or be subjected to more drying. Though groundwater monitoring in wetlands located adjacent to the embankment is ongoing and will continue post-construction, the embankment design and the groundwater studies provide reasonable assurance that wetland hydrology will not be significantly altered.

30. For the past several years, I have examined the perimeter of the existing fill embankment for the airport and the base of recently placed fill material. Near the base of the existing embankment, there are several locations where groundwater seeps from the fill and supports wetlands. One of the most prominent area where wetlands exist next to the existing embankment at a portion of Wetland 28, near the IWS 3 lagoon (see Sheet 5, Exhibit C). These observations indicate that embankment construction will eliminate water sources that result in the elimination of wetlands. What is more telling

[8] While the models indicate more groundwater would be discharging into the wetland for an extended period of time, the slope wetlands do not pond water, and hydrologic impacts related to increased flooding would not occur. Native vegetation in the wetlands is tolerant of wet to moist soils throughout the summer months, and plant die-off due to wetness is unlikely. However, monitoring of vegetation will occur. Drainage channels located at the base of the embankment provide an opportunity to decrease or increase water flow to wetlands if monitoring indicates this is necessary.

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are observations made in areas where new embankment has been placed between 1998 and 2001. In these areas pre-construction conditions were residential neighborhoods or other uplands with no pre-existing wetlands, springs, or persistent surface water. Following embankment construction, I have observed several locations where the drainage swales at the base of the embankment contain standing or flowing water for long periods (several weeks or more) between rainy periods. In some cases, wetland vegetation is beginning to grow in these swales, further indicating the extended hydroperiod created by seepage from within or beneath the embankment. Upon completion of the project, the water source from the embankment will be directed to remaining downslope wetlands as shown in the NRMP (See design sheets C5-C9 and L1 in Exhibit D).

31. The concerns of ACC over excess water level fluctuations in the wetlands located downstream of the embankment are not valid. Hydrology studies show that somewhat more water will be present and that water will be more evenly distributed throughout the year. The wetlands occur on slopes and there is no opportunity (due to topographic gradients) for the existing limited areas of shallow surface water that is occasionally present in a few localized depressions (less than 3 inches deep) to impound water further. Thus, increased flooding will not occur and floodwater impacts to vegetation and other wetland functions will not occur. The embankment design and mitigation design for the replacement drainage channels (Appendix D of the NRMP) provide flexibility in distributing this water to the remaining wetlands.

32. Matching pre-fill hydrologic patterns as a performance standard for wetlands located downslope of the embankment is not scientifically warranted. Implementation of such a performance standard would imply that wetland vegetation and is so sensitive to wetland hydrology, that any change in hydroperiod would alter vegetation and functions. In nature, wetlands with similar vegetation and habitat conditions can have varying hydrologic conditions, and the hydrologic condition in any wetland can vary year to year, or seasonally.[9] There are no criteria or detailed studies I am aware of that would

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[9] See Appendix L of the NRMP, pages L-2 through L-5, and pages 108-108 in National Research Council. 2001. *Compensating for Wetland Losses Under the Clean Water Act.* National Academy Press, Washington, D.C.

allow one to determine if an increase in wetland hydroperiod (increased soil saturation) predicted by the project would impair or enhance wetland functions.

33. For forested and pasture wetlands in Puget Sound, I am not aware of studies that show saturation to the surface will result in greater plant production, nutrient export, or stream flow attenuation compared to saturation at 10 inches. In fact, productivity of red alder may be below average on saturated or nearly saturated soils compared to upland sites.[10] Nutrient export could be reduced if surface flows are eliminated, but there is no evidence this would occur, evaluations indicate groundwater discharge in the wetlands and water discharged from the embankment would increase slightly. Slope wetlands with saturated soil do not provide significant streamflow attenuation functions because they have little or no water storage capacity.

34. The NRMP and Impact Assessment report evaluate potential impacts to these wetlands. Coupled with the detailed hydrologic analysis, the studies show there will be sufficient groundwater and flow that emanates from the embankment to keep existing *and enhanced* functions viable. The embankment and mitigation design affords flexibility in distributing water to these wetlands (See NRMP Appendix D) to optimize wetland conditions during the monitoring period. The NRMP wetland mitigation is designed to actually *improve* the functions of these wetlands through the enhancement plantings and removal of detrimental land uses that currently reduce functional performance below optimal levels.

35. Avoidance and Mitigation of Wetland Impacts. The primary strategy in addressing potential project impacts was avoidance and minimization of impacts to wetlands and streams. A critical part of the impact analysis was to evaluate, at each location where wetlands were impacted, if design alternatives were available to eliminate or reduce wetland and stream impacts. This analysis is summarized in the NRMP at Table 4.1-1, Figure 4.1-1, and Figure 4.1-2. An important element of this review was the determination that a MSE wall along a portion of the west side of the third runway

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[10] Harrington c> and P. Courtin. 1994. *Evaluation of Site Quality for Red Alder.* In:Hibbs, D., D. De Bell, and R. Tarrant. *The Biology and Mangement of Red Alder.* Oregon State University Press, Corvallis, Oregon. See page 147, 151-152.

embankment would reduce wetland and stream impacts. The MSE wall design avoids relocating Miller Creek in a second location and avoids impacts to over 2 acres of higher quality wetlands. If the wall were not part of the project, the potential environmental impacts to Miller Creek and wetlands would be greater.

36. The key actions taken to avoid impacts are listed in Exhibit I. The result is the design of a "least damaging practical alternative" to avoid and minimize wetland and stream impacts. Where impacts to wetlands and streams were found to be unavoidable, compensatory mitigation is proposed such that there is no net loss of wetland functions or area.

37. Mitigation Summary. The compensatory wetland and stream mitigation projects and their area are summarized in Exhibit J. This attachment shows that for the 18.37 acres of permanent and the 2.05 acres of temporary impact, over 178 acres of land will be permanently protected as mitigation. The on-site mitigation includes ecological improvement to over 112 acres of land and over 1.4 miles of streams. On-site mitigation occurs as enhancement of over 22 acres of wetland, re-establishment of 3.30 acres of previously filled wetland, rehabilitation of over 8.6 acres wetland, and enhancement of over 54 acres of stream and wetland buffers. The plan also includes preservation of over 2 acres of wetland and 21 acres forest buffer.

38. The Azous testimony presents a summary of the Port's mitigation proposal. Ms. Azous has presented outdated information. I have corrected the summary and presented it below. In particular, Ms. Azous leaves out a new mitigation area (the Des Moines nursery site) and wetland restoration at Lora Lake; a total of almost 11 acres of mitigation.

Total	Wetland Creation	Wetland Restoration	Wetland Enhancement	Buffer Enhancement /Restoration	Wetland Preservation	Upland Preservation
On-Site						
112.75 (**36.44**)	0 (0.)	11.95 (11.95)	22.32 (11.16)	54.93 (10.13)	2.35 (0.24)	21.20 (2.10)
Off-Site						
65.38 (**42.19**)	29.98 (29.98)	0 (0)	19.50 (9.75)	15.90 (3.18)	0 (0)	0 (0)
Total						
178.13 (**79.35**)	29.98 (29.98)	11.95 (11.95)	41.82 (20.91)	70.83 (14.17)	2.35 (0.24)	21.20 (2.10)

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39. The 401 Certification requires the Port to execute and record restrictive covenants to protect the 167 acres of mitigation area. The covenants require that the mitigation areas be preserved in a natural state, prohibiting future development activity. The geographic scope of the mitigation areas to be protected by the covenants is depicted on the drawings in Exhibit G and elsewhere in the NRMP.

40. The ecological functions that are targeted in the design of the mitigation projects were based on the functions impacted by wetland loss (see Exhibit F). For each mitigation site, I have listed in Exhibit K the planned ecological functions to be provided at the mitigation site and the physical or ecological attributes that are included to assure the sites provide these functions. These are the types of attributes that are generally recognized as indicators of wetland function.[11]

41. Mitigation for the MPU projects focuses on impacts to streams and wetlands by restoring and enhancing stream and wetland functions, especially to Category II wetlands. In the Miller Creek basin, the 401 Certification requires the Port to implement the following specific mitigation:

- Restore natural channel morphology, habitat complexity, and instream habitat along an approximately 1.4-mile reach of Miller Creek extending from south of Lora Lake to Des Moines Memorial Drive.
- Restore and replace floodplain, floodplain wetlands, and riparian areas along the upper reaches of Miller Creek, and re-integrate floodplains and adjacent wetlands with the stream.
- Restore, replace, and enhance wetland and aquatic habitat functions to the currently degraded lacustrine, stream, floodplain, and riparian wetland system along the upper reaches of Miller Creek at the Des Moines Way Nursery site.
- Maintain wetland hydrology and base flow functions in wetlands adjacent to the embankment fill by providing surface water drainage features to convey groundwater and surface water runoff from the new embankment to downslope wetlands.
- Restore and enhance wetland and aquatic functions, and protect the long-term viability of these systems by establishing native forested buffers around wetlands and aquatic systems at Lora Lake.
- Restore habitat connectivity in the upper reaches of the Miller Creek basin by providing a forested wetland and riparian corridor connecting currently fragmented wetland, aquatic, and riparian habitats between Lora Lake and Des Moines Memorial Drive.
- Improve Miller Creek instream aquatic habitat conditions at 4 locations within this area.

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[11] See *Methods for Assessing Wetland Functions. Volume I. Riverine and Depressional Wetlands in the Lowlands of Western Washington*. Washington Department of Ecology Publication 99-115. 1999.

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42. In the Des Moines Creek basin, mitigation is designed to restore wetland and stream functions, and to mitigate for potential indirect effects to wetland hydrology. To replace functions impacted by Master Plan Update improvements and to restore and enhance aquatic and wetland habitat in the Des Moines basin, the 401 Certification requires the Port to implement the following specific mitigation:

- Enhance water quality and fish habitat, and restore stream conditions in Des Moines Creek by establishing a 100 foot wide forested buffer along at least 1,200 linear feet of the west branch of Des Moines Creek
- Restore and enhance wetland and aquatic habitat by replacing the existing turf grass wetland with a native shrub wetland at the Tyee Valley Golf Course, adjacent to Des Moines Creek
- Avoid, minimize, and mitigate potential indirect hydrology impacts to wetlands adjacent to the borrow areas by directing groundwater seepage and/or surface water runoff to wetlands near the borrow areas

43. The Port will also establish basin trust funds to promote local stream restoration projects in the Miller and Des Moines Creek basins ($150,000 in each basin).

44. Mitigation and Aircraft Safety. The Port's mitigation plan avoids creating new wetlands in the nearby stream basins for reasons of aviation safety. Wetlands provide attractive habitat for waterfowls, flocking birds, and other wildlife that pose serious hazards to aircraft. In the United States, wildlife strikes annually result in over $300 million in direct damage and associated costs, and over 500,000 hours of aircraft down time. Since 1960, at least 78 civilian aircraft and 201 civilian lives have been lost worldwide to wildlife strikes. Since 1960, at least 250 military aircraft and 120 military personnel have been lost because of wildlife strikes.[12] FAA Advisory Circular 150/5200-33 provides that land uses that are wildlife attractants, such as wetlands, must be sited no closer than 10,000 feet from turbine aircraft movement areas. The FAA imposed this requirement as a condition of in its 1997 Record of Decision (at p.26-27).

45. The Port searched for wetland mitigation sites in the Des Moines, Walker, and Miller Creek basins that could be used to provide replacement wildlife habitat; however, these basins are

[12] See *Wildlife Hazard Management at Airports, USDA and FAA,* December 1999. Pages 1-2

almost totally within the 10,000-ft exclusion area for wildlife habitat mitigation.[13] Areas more than 10,000 ft from existing runways were found to be unsuitable for mitigation due to small size, developed nature, forested condition, or lack of hydrologic conditions necessary to support wetlands.

46. Off-Site Mitigation in Auburn. The Port will construct wetland mitigation off-site on a 65-acre parcel in the City of Auburn. This mitigation will provide high-quality, diverse, forested, shrub, emergent, and open water wetland habitats and functions to a site where these functions are currently absent or degraded.

47. The off-site mitigation involves wetland restoration, wetland creation, and wetland enhancement. The mitigation establishes 17.2 acres of forested wetland, 6.0 acres of shrub wetland, 6.2 acres of emergent wetland, 0.60 acres of open water, and 19.5 acres of emergent wetland habitat. These habitats will be protected with approximately 15.9 acres of forested upland buffers.

48. The area of the Auburn Wetland Mitigation site is located within the *Mill Creek Special Areas Management* (SAMP) planning area, and is part of the aquatic resources restoration plan for the SAMP area.[14] The mitigation at Auburn contributes to the restoration plan by restoring forest, shrub, emergent, open water, and upland greenbelt areas (Exhibit L).

49. In-Basin Mitigation Will Replace Lost Wetland Functions. Contrary to the ACC's allegations, the mitigation plan required by the 401 Certification will fully replace the wetland functions lost to wetland filling. In fact, the in-basin elements of the mitigation plan, alone and without considering the benefits of the Auburn mitigation project will replace the wetland functions lost to filling (except for waterfowl habitat). The amount of mitigation area that the mitigation plan provides for each wetland function is summarized in Exhibit M, where the acres of impact are compared to the acres of mitigation, by function. The following paragraphs describe how the mitigation plan replaces each function

[13] This issue is addressed in Section 7.2.3 of the *Natural Resource Mitigation Plan*.
[14] Miller Creek Basin, King County Washington Aquatic Resources Restoration Plan. 1997. U.S. Army Corps of Engineers, Seattle District, Seattle, Washington.

identified in the affected wetlands. The mitigation will result in stream and riparian wetland conditions that are at least as good, and possibly better, than they are at present (prior to any fill).

50. The enhancement and restoration of wetlands and riparian buffers in the Miller and Des Moines Creek basins has been carefully planned to replace the functional attributes of the wetlands impacted by the project. The fact that mitigation actions other than wetland creation can replace the wetland functions lost, is the basis for the recommended mitigation ratios present in wetland guidelines and standards.[15] Riparian buffers (wetland and upland) are recognized as providing shade, organic carbon, water quality, and habitat functions that protect adjacent stream systems. The restoration and enhancement actions proposed by the Port's mitigation plan are expected to be especially effective in replacing and restoring functions since, concomitant with the wetland restoration and enhancement actions, because land use practices that have caused on-going degradation of wetlands and streams are being removed and replaced by the mitigation. These methods also take advantage of the naturally occurring soil and hydrologic conditions that promote the establishment of wetland and other native plant communities.

51. Ms. Azous relies on the book *Wetlands and Urbanization – Implications for the Future* that presents the results of the Puget Sound Wetland and Stormwater Management Research Program (PSWSMRP). I have completed a review of this book and visited many of the 19 wetlands that are the focus of these studies. The studies in the book are useful, but their scope is narrowly focused to a subset of 19 wetlands in urban and non-urban areas whose ecology is very dissimilar from the wetlands filled by the Port's project. The PSWSMRP wetlands are nearly all depressional wetlands that impound water, while nearly all wetlands here are slope wetlands or seasonally saturated depressional wetlands, neither of which impound water. The presence of standing water in the study wetlands results in very different wetland functions than occur at the Airport, and in many cases the finding of the study are not relevant to understanding how wetlands will change at the airport.

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[15] see Table 5 in *Water Quality Guidelines for Wetlands*, Washington Department of Ecology, Olympia Washington, 1996.

52. The following paragraphs discuss each of the functions assessed in the WFA report and describe how the mitigation plan replaces each of the functions that would be lost when the wetlands are filled. The functions considered are: (1) Resident/Anadromous Fish Habitat; (2) Passerine Bird Habitat; (3) Waterfowl Habitat; (4) Amphibian Habitat; (5) Small Mammal Habitat; (6) Organic Matter Export; (7) Groundwater Exchange; (8) Flood Storage/Desynchronization; and (9) Nutrient Retention/Sediment Trapping. The locations of the mitigation sites are mapped in Exhibit D.

53. Functions for Resident/Anadromous Fish. The new Miller Creek stream channel and in-stream enhancements at 4 locations will provide improved fish and other aquatic habitat because the features are designed with a number of beneficial features. The primary characteristics provided by the design are large woody debris (LWD), woody riparian vegetation, and substrate variability. Each of these features will enhance fish and aquatic habitat. Increased amounts of woody riparian vegetation will result in increased shade, allochthonous inputs (food sources in the form of coarse particulate organic matter [CPOM] and terrestrial invertebrates), and sources of woody debris. Increased LWD generally provides habitat complexity, including small plunge pools, fish cover, invertebrate substrates, variable water depths and velocities, etc. These conditions will provide nesting, resting, and forage habitat for fish and other aquatic life. Increased streambed variability in the form of gravel, wood, and CPOM will also increase the diversity of invertebrate habitat. The function of large woody debris and other organic matter in providing fish habitat and food resources for fish is well understood and documented.[16,17]

54. The channel is designed to provide fish habitat despite it gentle slope. The existing ditched channel provides limited fish habitat while the design features of the new channel will improve conditions for fish and invertebrates. The types of habitat and flow regimes that can be established in a low gradient creek have been considered and incorporated into the design. The channel design includes a geotextile liner for geotechnical reasons. This liner is very porous, far more porous than the peat soils

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[16] See Chapter 5 in *Streamside Management: Forestry and Fishery Interactions*, E. Salo and T Cundy eds, Institute of Forest Resources, University of Washington, Seattle.

[17] See Chapter 12 of *Stream Ecology: Structure and Function of Running Waters,* J, Allen. 1995. Kluwer Academic Publisher, Boston.

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it will be placed against, and it would not "clog" because it is incapable of acting as a filter given the large pore size of the fabric compared to the very small sized particles that are mobilized in groundwater flow. If the peat soils and fabric were to "clog," there would be no detrimental affect on the planned functions of the creek or the adjacent wetland.

55. The shallow water along the margin of Lora Lake will be improved aquatic habitat compared to existing conditions. The replacement of lawns and concrete bulkhead with plantings of riparian tree and shrub vegetation will improve aquatic habitat by providing shade and organic matter input (woody debris, leaf matter, and insects) that will support fish and other aquatic life.

56. The more than 51 acres of mitigation in Miller Creek buffer areas occurs along over 1.4 miles of Miller Creek. It consists of riparian uplands and wetland, much of which was developed as residential lawns, pasture, or a small nursery. Over 1,800 linear feet of a small tributary channel in Wetland A17 will be enhanced by removing culverts and fill, providing riparian and wetland plantings, and by placing LWD in the channel. Over 10.25 acres of riparian wetlands will be enhanced and restored in this area by controlling non-native plant species and planting areas with native trees and shrubs.. In addition, throughout the stream reach, fish enhancement including woody debris, bank improvements, and substrate improvements will be added to enhance fish habitat.

57. The Tyee Valley Golf Course Mitigation Area is over 6 acres in size and includes restoration of wetland and buffer functions that are currently lacking due to the golf course. The area includes over 700 linear feet of Des Moines Creek. Enhancement of floodplain wetlands and 100 foot wide stream buffers will provide indirect improvements to fish and aquatic habitat (woody debris, shade, organic matter). In addition, restoration of floodplain wetlands (converting golf course vegetation to shrub wetland) will increase carbon production, some of which will be exported to the stream during flood events, rainy periods, or through movement in groundwater (in the form of dissolved organic carbon).

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58. The 65-acre Auburn mitigation could provide some fish habitat. Some warmwater fish may use the open water and flooded emergent portion of the wetlands.

59. Functions for Passerine Birds. The increased amounts of woody and forest vegetation will provide additional and improved habitat for forest-dwelling bird species. Planting trees and shrubs around Lora Lake will increase forage opportunity for some birds such as kingfisher. Vegetation in the Miller Creek buffer mitigation area, and wetland and buffer plants at the Tyee Valley Golf Course mitigation site, will produce insects that a variety of passerine birds forage upon.

60. The 65-acre Auburn mitigation site will provide multi-canopied forested, shrub, and emergent wetland communities. The complex vegetation structure and plant communities (containing vertical diversity, snags, debris structures, and food sources) will provide high quality habitat to a variety of forest and wetland bird species. These elements will provide resting, nesting, and foraging habitat for passerine birds. Because of the diversity of habitats at this site and the absence of the past and on-going disturbances to the impacted wetlands, the areas will provide increased habitat functions for birds, small mammals, and amphibians (see *Wetlands and Urbanization: Implications for the Future*, pages 187-188).

61. Functions as Waterfowl Habitat. The Miller and Des Moines Creek mitigation sites are not planned to provide waterfowl habitat functions, for reasons of aviation safety. The Auburn mitigation site will provide waterfowl habitat in open water areas, submergent aquatic bed vegetation, and seasonally flooded emergent vegetation. These areas will provide a diversity of cover and food sources that will provide habitat for waterfowl, including feeding, resting, and nesting habitat. The habitat in Auburn will also benefit other wildlife groups such as passerine birds, wading birds, small mammals, and raptors.

62. Functions for Amphibian Habitat. In Puget Sound, amphibian species using non-flooded wetland and riparian wetlands typically prefer habitats dominated by woody plant communities. The conversion of farmland, lawn, golf course and developed buffers to shrub wetlands, forested wetlands

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and forested buffers will improve habitat conditions for amphibians. The restored floodplain wetlands will provide habitat for adult amphibians and breeding habitat (logs and forest soils) for species that breed in non-aquatic habitat (e.g., red-backed salamander, ensatina). The removal of concrete from the margin of Lora Lake will provide breeding habitat for amphibians that require surface water for breeding. The wetland and buffer enhancements that replace lawns and homes in the Miller Creek Wetland and Buffer Mitigation Area and on the Tyee Valley Golf Course will improve provide improved habitat for adult terrestrial amphibians. Improved habitat for terrestrial breeding amphibians (e.g., red-backed salamander, ensatina) will be provided by increased amounts of forest vegetation and woody debris in the Miller Creek buffer and riparian wetlands. The mitigation site will also improve amphibian dispersal because of improved connections to other habitat (e.g. to Vacca Farm, Lake, or other wetlands adjacent to the Golf Course).

63. The 65-acre wetland mitigation site in Auburn will establish open water ponds with flooded emergent vegetation will provide breeding and rearing habitat for several amphibian species. The open water will provide habitat for the adult phases of aquatic species.

64. Habitat Functions for Small Mammals. Small mammal habitat at the mitigation areas will improve as a result of the new vegetation to be planted in the riparian areas. Restoring wetlands will improve habitat for small mammals by creating a diversity of forage and cover habitat for them. Logs and woody vegetation added to the site will provide denning and forage. The new South 154th Street bridge will span the floodplain and allow unimpeded passage of small mammals. The restoration also improves habitat connectivity to Wetlands 1 through 9, which are located north and east of the site.

65. Planting vegetation in riparian areas and restoring wetlands in the Tyee Valley Golf Course mitigation area will improve habitat for small mammals by creating a diversity of forage and cover habitat compared to the existing turf grass.

66. At the wetland mitigation in Auburn, the existing tall grasses on the site provide habitat for small mammals. However, conversion of the area to forest and shrub wetlands will improve habitat

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for forest and wetland-associated mammals. The increased vegetation structure will provide a greater variety of denning areas, a greater diversity of food sources, and greater cover than are on the site at present.

67. Organic Matter Export Functions. There are relatively high levels of dissolved organic carbon (DOC) in Miller Creek (see pages 7-19 through 7-22 of the *Biological Assessment* for the project). The high levels of DOC are found upstream and downstream of wetlands to be filled by the project. The large areas of peat soil in the upper portion of the basins (at Tub Lake –about 15 acres; and at the Vacca Farm area and the wetlands located north of the existing airfield –39 acres) are a likely source of DOC to the creek. The planned mitigation does not result in the destruction of any peat system. In fact, the grading of the Vacca Farm area for mitigation purposes will result in a net removal of only about 0.1 acres of peat soil.[18] The addition of productive wetland plant communities and lowering the land surface elevation would return peat forming processes by reducing the oxidation of organic carbon to carbon dioxide gas, and promote decay pathways that result in production of DOC and further accumulation of peat. For these reasons, there is no reason to believe that DOC concentrations in the creek would be altered. In the Des Moines Creek basin, restoration of shrub plant communities on mowed golf course wetlands that occurs on about 5.5 acres of peat wetland will enhance organic matter production and export to Des Moines Creek.

68. The Port proposes restoring a woody plant community on existing wetlands or riparian areas where vegetation has been removed. In this situation, woody plant parts and leaf litter, which are much more resistant to decay than the algae or other plants expected in open water habitats, will accumulate on the soil surface. In addition, the root system of these plants will contribute organic matter to the deeper soil layers. In an anaerobic soil environment, this organic matter would contribute to accumulation in soils and anaerobic nutrient cycling processes such as denitrification, methanogneisis, etc. The fact that the Port's mitigation sites at Vacca Farm and the Tyee Golf course

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[18] There are 0.59 acres of peat soil that are filled by the project in the Vacca Farm area, as shown in Table 3-1 of the *Wetland Functional Assessment and Impact Analysis Report.*

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currently have organic soils and wetland hydrology, yet lack the critical plant production component because the sites are now lawn or golf course further assures that more natural ecological systems can be readily established.

69. In the Vacca Farm and Miller Creek relocation area, the new creek channel is designed to have overbank flow during the 1-year and higher storm events. Smaller storms will flood portions of the floodplain through backwater flooding. As floodwaters recede, export of dissolved and particulate organic matter from the floodplain to the stream will occur at higher levels than would currently be expected because greater amounts and types of organic matter (leaves, twigs, branches, etc.) will be on site and available for export to the creek. In other mitigation areas, replacing of grass-dominated riparian areas adjacent to the streams or Lora Lake with native woody riparian vegetation will increase the amount and diversity of organic matter (i.e., readily decomposable leaves and woody debris that is slower to decompose) available to aquatic habitats.

70. The high productivity expected in forest and shrub wetlands will result in accumulations of organic matter in the saturated soil of the restored wetland. Groundwater movement through the site and flooding will transport dissolved organic matter to Miller and Des Moines Creeks. Placement of logs in Miller Creek and development of a natural riparian zone will help trap organic debris in the stream channel, where it will be available for processing by aquatic invertebrates, thus benefiting the food chain. At present, for example, the mowed golf course and the plowed fields of Vacca Farm are unable to export organic matter to adjacent streams because they are mowed, plowed, and or harvested each year. There are few or no trees or shrubs present on these sites, and riparian contributions to instream processes are unsupported. As ecological benefits of the mitigation are explained in the documents Ms. Azous claims to have reviewed, her statements that the "*Vacca Farm purposefully lacks habitat for biological processes*" demonstrates her fundamental misunderstanding of the Port's proposals and the ecological conditions in the project area.

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71. Ms Azous has claimed reductions in riparian wetland systems located adjacent to creeks are certain to affect productive capacity and therefore fish production. She cites research by R. Wotton[19] as a source of data relevant to his issue. However, the cited research does not address riparian wetlands, riparian wetland functions, or loss of riparian wetlands. It does not address functional links between wetlands and streams and indeed does not contain the word wetland. In fact, fish habitat and production in the stream will be enhanced by the proposed mitigation. The relevant literature demonstrates the importance of riparian forests (either wetland or upland) to the functioning of stream ecosystems. This research also indicates that the existing wetlands and riparian areas are performing sub-optimally due to the types of vegetation present. [20]

72. Wetland mitigation in Auburn will promote organic matter export functions because, the wetland will be in the floodplain and also have a seasonal hydrologic connection to the Green River. As the flood and other surface waters drain, fine particulate organic matter (FPOM) and dissolved organic matter will be exported to downstream systems via the existing ditch systems. During periods of groundwater discharge, particulate and dissolved organic matter would be discharged from the site.

73. <u>Ground Water Exchange Functions</u>. The ground water exchange functions of the impacted wetlands has been evaluated in detail by the Port (see Appendices B, C, D, E, F, G of the WFAIA report. The project's impacts to this function has been avoided by project design and mitigated through low flow mitigation.

74. <u>Flood Storage.</u> The Vacca Farm and Miller Creek relocation/mitigation site is designed to replace the small amount of floodplain filled by the project (8,500 cubic yards) and provide a net increase (9,600 cubic yards). Additional floodplain will be created in restoration areas near Lora Lake. The overall significance of the wetlands and farmland in providing this function will not change. No other changes to on-site flood storage functions occur. Following construction, the 100-year flood plain of Miller Creek is protected in the mitigation sites.

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[19] Dissolved Organic Matter and Trophic Dynamic. 1988. BioScience 38:172-178.

[20] *Importance of organic debris dams in the structure and function of stream ecosystems.* Ecology 61:1107-1113.

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75. The Auburn mitigation site is hydrologically connected to the Green River floodplain via a series of ditches. The site is designed to store floodwater during 100-year flood events.

76. <u>Nutrient/Sediment Trapping Functions</u>. Although the water quality functions of the existing wetlands will be lost when these wetlands are filled, the overall project, including the planned mitigation, will fully replace these water quality functions and is likely to result in improved water quality in Miller, Walker, and Des Moines Creeks. This is true for several reasons.

77. First, a number of the existing wetlands that will be eliminated or impacted by Master Plan Update improvements do not provide optimal water quality treatment functions. The treatment function in some of these wetlands is sub-optimal due to a short residence time (as inferred by wetlands on slopes, small size, topography that limits ponding and storage of water, and channelized flow) and a lack of dense emergent vegetation.

78. Second, the proposed stormwater management facilities will include water quality treatment. This will primarily consist of biofiltration swales and filter strips, as well as wet vaults where biofiltration is not feasible. These water quality treatment facilities will be constructed to meet Ecology and NPDES requirements. These facilities will be at least partially effective in replacing the water quality functions of the wetlands to be filled.

79. It is noteworthy that existing wetlands (to be filled) receive untreated stormwater runoff from non-STIA areas. For example, existing wetlands downslope of 12th Avenue South receive untreated stormwater runoff from 12th Avenue South and provide treatment (at less than optimal rates) prior to discharge to Miller Creek. Following construction of the embankment, runoff will be treated by water quality treatment BMPs, which should enhance the biological functions of the remaining wetlands.

80. Third, and perhaps most important, construction of Master Plan Update improvements and mitigation measures will improve the quality of water draining to the streams and wetlands because

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existing land uses that contribute pollutants to the wetlands and Miller Creek will be replaced by natural vegetation.[21]

- For areas within development footprints, existing pollution-generating areas within the acquisition area (e.g., lawns, streets and driveways) that currently lack water quality treatment facilities will be removed. These areas will be replaced with embankment and other facilities with stormwater management BMPs.
- For areas to remain undeveloped, but not specified as mitigation, the removal of residential and commercial land-uses will eliminate pollutant sources, including failing septic tanks, fertilizer, runoff, and other potential pollutants (pesticides, pesticide residues). If redevelopment of these areas occurs, then stormwater management standards for water quality treatment and runoff rates must be met at the time of development. These standards would exceed the baseline condition (lacking any stormwater BMPs), and maintain water quality benefits compared to the current condition.
- For areas in the Vacca Farm mitigation area, the restoration of farmed areas in the Miller Creek floodplain with native wetland vegetation will reducing erosion, pollutant sources, and increase the area's water quality treatment capacity to remove nutrients and pollutants from Miller Creek and stormwater runoff from adjacent areas.
- For Miller Creek and Wetland A17 mitigation areas, the enhancement of wetlands and buffers will eliminate pollutant sources, including failing septic tanks, fertilizer, runoff, and other potential pollutants (pesticides, pesticide residues). Planting of these areas native upland and wetland vegetation will reduce erosion, pollutant sources, and increase the area's water quality treatment capacity to remove nutrients and pollutants from Miller Creek and stormwater runoff from adjacent areas.
- For mitigation along on the Tyee Valley Golf Course and along Des Moines Creek, removal of golf course uses would remove fertilizer and pesticide runoff to the creek. Planting of these areas native upland and wetland vegetation will reduce pollutant sources and increase the area's capacity to remove nutrients and pollutants from Des Moines Creek and stormwater runoff from adjacent areas.

81. Amanda Azous[22] asserts that a loss in the wetlands alter the removal of an important plant nutrient, nitrogen. She states that eliminating the nitrogen removal capabilities of wetlands will alter the food web and increase the supply of nitrogen at the mouth of the creeks. She later (paragraph 22) argues that wetlands are "*important sources of nutrients and freshwater to coastal and estuarine environments*". These are contradictory statements, and no evidence is offered to support either. In reality, the project will remove sources of pollutants to wetlands, Miller, Des Moines and Walker Creeks by removing land uses that contribute nitrogen and other pollutants to them. The replacement of lawns,

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[21] The influence of land use on the water quality conditions of runoff water is well documented, and include studies in Washington (see *Fundamentals of Urban Runoff Management* R. Horner, J. Skupien, E. Livingston, and H. Shaver. 1994. page 38; as well as other regions (*Los Angeles County 1994-2000 Integrated Receiving Water Impact Report.* Los Angeles County Department of Public Works. 2000; *Sources of Pollutants in Wisconsin Stormwater.* Bannerman et al. 1999. Natural Science and Technology, 28:241-259).

[22] See *Pre filed testimony of Amanda Azous*, paragraph 10.

golf courses, farmland, streets and driveways, and home sites with natural vegetation would restore a natural pattern of nitrogen cycling to the landscape which would not be beneficial because naturally vegetated wetlands and buffers do not contribute ecologically damaging levels of nitrogen in runoff waters. Riparian buffers and wetlands have high capabilities to remove nitrogen from surface and groundwater by microbial (denitrification) and plant uptake processes. Wetlands and riparian buffers also contribute nitrogen to the system through nitrogen fixation (both microbial and through vegetation, particularly red alder).

82. Water quality functions in the Miller Creek Wetland and buffer mitigation area will improve for several reasons. Many impacts to the riparian wetlands and the stream will be removed as a result of the project and mitigation. For example, several dozen houses and buildings, lawns, driveways, etc. will be removed from the mitigation area, thus removing features and land uses that contribute to the degradation of water quality. There are at least 68 septic systems located near wetlands, and contaminated dirt has been removed on 24 sites that are near wetlands. At least 3 sites near wetlands and streams grazed livestock that contribute to the degradation of water quality and prevent native vegetation from growing in wetlands or buffers. Outside of the mitigation area, removing streets and residential land uses will reduce the amount of pollutant loading to the wetland and stream system. Restoration of these disturbed areas will increase their capacity to provide water quality functions by establishing natural nutrient cycling pathways.

83. At the Tyee Valley Golf Course mitigation area, the removal of turf grass and turf grass management actions from the wetland and buffer areas will remove sources of nutrients and pesticides. Planting shrub and forest vegetation will provide natural pathways for nutrient uptake and cycling.

84. Wetland mitigation in Auburn consists of creating and enhancing depressional wetlands with channelized discharge. The large size of the wetland basins and relatively small amount of discharge water expected during most conditions will result in high retention rates for sediment and nutrients. The site will have a surface water connection to the Green River flood during flow events that

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exceed 8,500 cubic ft per second. At these flow levels, the wetland area will flood as a result of backwater conditions from the Green River. During flood events the wetland is expected to remove nutrients and sediments from floodwaters.

85. Summary. A goal of the mitigation projects is to offer equal or better physical and biological functions and values compared to existing conditions. The planning of the mitigation has included review and modification by Ecology's experts with this goal in mind. Based on my professional opinion and experience, the mitigation proposed does offer equal or better functions than the pre-development wetland functions. This assessment includes consideration of the suite of functions provided by all of the in-basin mitigation and the waterfowl habitat and other of functions provided by the mitigation in Auburn. The in-basin mitigation provides aquatic and terrestrial habitat functions, protects water quality in the creek systems, and restores a more natural level of ecological function to degraded wetland and buffer habitat. These in-basin benefits more than replace the in-basin functions impacted. Out-of-basin, in Auburn, waterfowl and other habitat functions are significantly improved above baseline conditions.

86. In my experience working as a professional wetland ecologist, I have had the opportunity to observe nearly all the wetland mitigation plans for major projects in the Puget Sound area that involve wetland impacts. In my opinion, the wetland mitigation required by this 401 Certification exceeds the mitigation requirements that have typically been imposed on other projects. The mitigation requirements of this 401 Certification are detailed and comprehensive, and they fully mitigate for the impacts of wetland filling. Substantial resources have been devoted to the planning, design, and regulatory review of the mitigation plan, to avoid and minimize direct and indirect impacts to wetlands and other aquatic resources. Avoidance of and mitigation for impacts has been exhaustively considered on a function by function basis, as explained in this declaration. The mitigation will result in one of the largest wetland mitigation sites in Puget Sound. I am unaware of any 1.4-mile reach of stream in Washington where adjacent residential land uses were removed and its riparian wetlands and buffers

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restored to natural conditions. The large ecological lift that will occur at the in-basin mitigation sites and at the site in Auburn will be protected in perpetuity by restrictive covenants. The temporal impacts of the mitigation will be positive and substantial in the long run. The benefits can be thought of as similar to compounding interest, where the ecological benefits gained by over 178 acres of functioning upland, wetland, and riparian areas will increase over time, far outweighing short-term risks that are mitigated by an extensive 15-year monitoring program. The mitigation replaces all functions provided by the impacted wetlands and it will result in water quality and other ecological benefits to the remaining wetlands and streams. There are substantial requirements for monitoring, oversight, and enforcement regarding to assure implementation ultimately provides functioning mitigation. Based on these factors, I conclude that with regard to wetlands and streams, beneficial uses will be protected, water quality will not be degraded, and state water quality standards will be met.

I declare under penalty of perjury under the laws of the state of Washington that the foregoing is true and correct.

Executed at Seattle, Washington, this 6th day of March 2002.

James C. Kelley

James C. Kelley, Ph.D.

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