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ENVIRONMENTAL HEARINGS OFFICE

POLLUTION CONTROL HEARINGS BOARD
FOR THE STATE OF WASHINGTON

AIRPORT COMMUNITIES COALITION, Appellant, v. STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY; and THE PORT OF SEATTLE, Respondents.	No. 01-133 DECLARATION OF DR. JOHN STRAND IN SUPPORT OF ACC'S MOTION FOR STAY (Section 401 Certification No. 1996-4-02325 and CZMA concurrency statement, issued August 10, 2001, Related to Construction of a Third Runway and related projects at Seattle Tacoma International Airport)

Dr. John Strand declares as follows:

1. I declare the following from personal knowledge and am competent to testify thereto before the Board if necessary.

2. I am an internationally recognized fisheries biologist with over 25 years experience specializing in studies to determine potential effects of human activities on aquatic resources. I received my Ph.D. in Fisheries Biology from the University of Washington in 1975 and currently am the Principal Biologist for Columbia Biological Assessments. I am also an adjunct faculty member of the Environmental Sciences and Regional Planning Program at Washington State University Tri-Cities. I am a Certified Fisheries Professional and have extensive experience assessing the ecological risks from discharges of contaminants to surface

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waters on sensitive aquatic species and their habitats. I also have substantive local knowledge, having studied the fate of stormwater residuals in both Miller and Des Moines Creeks for the Airport Communities Coalition (ACC), an organization composed of the Cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila and the Highline School District. With the King County Department of Natural Resources, I also recently investigated the fate and effects of combined sewer overflows on aquatic life in the Duwamish River. In addition, a considerable part of my professional career has been spent evaluating the environmental impacts of engineered structures on water resources including a wide variety of projects and field studies in Washington, California, Alaska, British Columbia, Guam and Venezuela. Attached hereto as Exhibit A is a true and correct copy of my Curriculum Vitae.

3. I understand that the ACC has filed an appeal with the Pollution Control Hearing Board (NPCHB) challenging the Washington Department of Ecology's (Ecology) Water Quality Certification (Order #1996-4-02325) for the Port of Seattle's (Port) Master Plan Update Improvements for Seattle-Tacoma International Airport (STIA). I also understand that ACC has requested a stay of the effect of the Water Quality Certification until the questions it has raised concerning compliance with the Clean Water Act have been resolved by the PCHB. I am submitting this declaration in support of ACC's appeal and motion for stay because I am convinced that Ecology's 401 Water Quality Certification will not protect the valuable and remaining water resources around STIA and will, in fact, result in likely harm to these sensitive streams and their aquatic life.

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4. I have previously reviewed and evaluated the database that the Port submitted to Ecology in support of their request for a Water Quality Certification. Attached hereto as Exhibit B is a true and correct copy of comments that I submitted to Ecology on December 13, 1999, on behalf of the Citizens Against SeaTac Expansion. While this comment letter set forth my opinion regarding the impacts of the Port's stormwater on the project creeks, I am submitting this declaration to reiterate, reinforce, and expand on my opinion that the project creeks are valuable water resources worthy of the Board's utmost review and Clean Water Act protection.

5. In preparing this declaration, I have reviewed the documents and scientific literature listed in Exhibit C. In addition, I have, on behalf of and with the help of the ACC, conducted water quality sampling surveys in the streams surrounding STIA: In April and August 2000, corresponding to the wet and dry seasons, respectively, water, sediment, and fish tissue samples were collected at selected sites in Miller and Des Moines Creeks. The objective of this sampling was to determine the nature, extent, and potential sources of pollution entering or already present in Miller and Des Moines Creeks. Chemicals of particular interest were heavy metals, petroleum hydrocarbons, and other organics (glycols). In continuing investigations, conventional water quality measurements (temperature, pH, turbidity, hardness, dissolved oxygen, nutrients) are conducted at the same sites monthly. Actual and suspected pollution events are also investigated as they occur. Sampling, sample handling, and analyses follow methods outlined in PSEP (1996a, 1996b, 1996c) or by the USEPA (1979). A Washington

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Department of Ecology certified analytical laboratory performs the metals and organic chemical analyses.

6. For the reasons presented in this declaration, I believe there is evidence that violations of Toxic Substances (water quality) Criteria in Miller Creek and Des Moines Creek, particularly for copper, lead, and zinc, occur as a result of stormwater discharged by the STIA, and will continue, and potentially worsen as a result of the Port's Master Plan Update Improvements. Glycols associated with de-icing of aircraft at STIA are routinely found in winter in the project creeks at concentrations known to be toxic to fish and other aquatic life. Periodic whole effluent testing of stormwater from the Port's outfalls documents residual toxicity, highlighting the need for stormwater treatment. Although the Port indicates they will retrofit all stormwater outfalls that do not currently receive treatment to improve water quality, looking closer at the Port's *Comprehensive Stormwater Management Plan* (Parametrix 2000a) indicates that a final decision on retrofitting has not been made and that evaluation continues. In other cases, the Port indicates that costs of retrofitting may be prohibitive, suggesting that retrofitting is not certain. There also is evidence that fill already stockpiled by the Port at STIA, contains residual chemicals (PCBs and DDT) that have the potential to percolate the fill pile to groundwater, ultimately contaminating area wetlands and surface waters. Flow reductions in project streams as a result of the proposed airport construction and operation have not been established with any degree of accuracy with the result that simulations conducted by the Port may underestimate summer low-flow impacts and overestimate the contributions of proposed

mitigation and natural mitigating factors. Finally, in the context of addressing low flows on the project streams, the Port's management approach to monitor the quality of detained or discharged stormwater, and only when a problem is encountered, take steps to mitigate impacts, doesn't provide reasonable assurance that valued aquatic resources will not be impaired.

7. Although disturbed, the project streams (Miller Creek, Walker Creek, Des Moines Creek, Gilliam Creek) still support a diverse and abundant fish fauna and are worthy of protection. Both coho and chum salmon are known to spawn and rear in Miller Creek, Walker Creek, and Des Moines Creek. (Hillman et al. 1999). Chinook salmon frequent the outfalls of Miller and Des Moines Creeks in Puget Sound during their outmigration (Parametrix 2000a). Both the Miller Creek and Des Moines Creek Watersheds are also exploited by resident cutthroat trout (Parametrix (2000a); Miller Creek may include an anadromous race of cutthroat trout. Warm water fish species including yellow perch, black crappie, largemouth bass, and pumpkinseed sunfish have been found in the upper reaches of both watersheds (Parametrix 2000b). Prickly sculpin, three-spined stickleback, and crayfish also occur throughout each watershed (Parametrix 2000b). Gilliam Creek supports many of the same species of fish as found in Miler Creek, Walker Creek and Des Moines Creek. Of considerable interest and importance is the recent finding of juvenile Chinook salmon in Gilliam Creek (personal communication, April 2000, Ryan Partee, City of Tukwila, Tukwila, Washington). Chinook is a listed species under the Endangered Species Act.

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8. In the context of what is known about the natural resources of the project streams, it should be pointed out that the Port's analyses of impacts for the proposed Master Plan Update Improvements are inadequate because the Port has yet to undertake a quantitative survey of the fish and other aquatic organisms found in the project streams. In other words, the Port has not established a baseline condition. This is a critical deficiency because the appropriateness of regulatory approval and mitigation must be assessed, using this baseline, before approval of the proposed project can be granted.

9. Several constituents (metals, fecal coliforms, turbidity) associated with STIA stormwater in Miller and Des Moines Creeks have historically and presently violate State of Washington (State) Water Quality Criteria (Chapter 173-201A WAC). Exceedances of water quality criteria for the metals copper, lead, and zinc are of particular concern given their designation as Toxic Substances. Metals data from 1995-1996, presented by the Port in 1997, indicated that concentrations of copper, lead, and zinc in STIA stormwater discharges (at outfall) greatly exceeded State and U.S. Environmental Protection Agency (USEPA) Toxic Substances Criteria, in some instances by more than an order of magnitude. For example, at the stormwater outfall to Miller Creek (see 1997 report page 35), total recoverable copper concentrations ranged from 4.2-82.9 ug/L. The State's criterion is 5.3 ug/L. The Port's 1997 data also indicated that concentrations (4.7-14.8 ug/L) of total copper upstream of STIA exceeded the State's criteria. That Miller Creek was unable to assimilate the STIA discharges, however, is confirmed by downstream sampling data showing total copper concentrations of 0.72-44 ug/L. In other words,

even after dilution in Miller Creek, the concentrations of copper still exceed Water Quality Criteria. For total recoverable lead in Miller Creek, the values at the outfall, upstream, and downstream were <0.5-21.6 ug/L, 5.2-34.7 ug/L, and <0.5-106 ug/L, respectively, again showing that the influence of lead additions at the outfall persist downstream. The State criterion for lead is 16 ug/L. The values for total recoverable zinc at the outfall, upstream, and downstream were 15-525 ug/L, 37-69 ug/L, and 2.3-295 ug/L., respectively, again showing a similar relationship. The State criterion for zinc is 33.7 ug/L. Based on the dissolved metals concentrations (see data presented on page 35), Toxic Substances Criteria are still exceeded by as much as an order of magnitude.

10. It is evident that the concentrations of copper, lead, and zinc downstream of the discharges exceeded applicable toxic substances criteria. In their various reports, the Port also does not provide evidence that would support a scientifically valid conclusion that stormwater from STIA does not impact either Miller or Des Moines Creeks downstream of their respective outfalls. Persistence of the influence of stormwater downstream, and at the magnitudes illustrated above suggests the need for treatment of the waste streams, or connections to the Industrial Waste System (IWS).

11. Metals data from 1998-1999, presented by the Port in 1999, confirm that exceedances of toxic metals criteria continued to occur at the Port's stormwater outfalls to the creeks. In addition, the downstream stations, where sampled, show that the influences of STIA stormwater discharges persist in the receiving waters. What appears missing in the 1999 report,

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however, is any indication that the Port sampled upstream of STIA. The Port's failure to maintain the original sampling protocol in this regard greatly diminishes the value of their stormwater-monitoring program. Data presented by the Port in their most recent Annual Stormwater Monitoring Report (2000) confirm that exceedences of toxic metals criteria in the Port's stormwater discharges continue today.

12. In my opinion, STIA stormwater adversely impacts the water quality of Miller and Des Moines Creeks. The Port's sampling data confirms that STIA stormwater greatly contributes to exceedences of toxic metals criteria in the receiving waters.

13. The 1997, 1999, and 2000 Annual Stormwater Reports prepared by the Port include comparator concentrations for metals, fecal coliforms, turbidity and other water quality parameters in stormwater. Comparator concentrations are based on stormwater data collected by other authorities (e.g., City of Bellevue, City of Portland). These comparators are found in Table 21 in the Port's 1997 report, in table 4 in the Port's 1999 report, and in Table 4 of the 2000 report. While these data maybe of some scientific interest, these data do not address the question of whether documented exceedances in water quality criteria in Miller and Des Moines Creeks are attributable to stormwater discharges from STIA. What is germane in this case is a comparison of the concentrations of metals discharged to Miller and Des Moines Creeks with the applicable State Water Quality Criteria. It really doesn't matter if the concentrations of metals in Miller Creek are the same as the concentrations of metals occurring in surface waters near

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Bellevue or Portland. All this means is that the Cities of Bellevue and Portland are also not in compliance with applicable Water Quality Criteria.

14. Additional evidence that STIA stormwater adversely affects the aquatic resources of Miller Creek is found in the sediments below Lake Reba, into which the Port discharges its stormwater (Port 1997 [see Table 4]). Values for copper in sediments from three samples above Lake Reba were 17.4, 8.4, and 9.9 mg/Kg dry weight, while copper in sediments from three samples below lake Reba were 22.3, 47.8, and 19.7 mg/Kg dry weight. The quantities of copper below the impoundment are substantially greater than the quantities of copper above the impoundment. A similar relationship for lead exists above and below Lake Reba. Lead in sediments from three samples above Lake Reba were 39, 34, and 38 mg/Kg dry weight, while lead in sediments form three samples below Lake Reba were 77, 172, and 56 mg/Kg dry weight. Levels of zinc in three samples above Lake Reba were 105, 90.2, and 94.1, mg/Kg dry weight, while zinc values in three samples below Lake Reba were 165, 402, and 148 mg/Kg dry weight.

15. While Washington has not adopted Sediment Quality Standards-Chemical Criteria for Freshwater Sediments, the copper, lead, and zinc values in sediments below Lake Reba exceed standards adopted in Canada, which are good indicators of water quality problems. For example, all the values for copper in sediments below Lake Reba exceed the Lowest Effects Level (16 mg/Kg dry weight) for copper from the Guidelines for the Protection and Management of Aquatic Sediments in Ontario (Persuad et al. 1993). Similarly, all the values for lead and zinc in sediments below Lake Reba exceed the Lowest Effects Levels for lead (31 mg/Kg dry weight)

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and zinc (120 mg/Kg dry weight) from the Guidelines for the Protection and Management of Aquatic Sediments in Ontario Guidelines (Persuad et al. 1993). (Lead in sediments above Lake Reba also exceeds the Canadian Guidelines but only slightly.) This is some of the most compelling evidence that stormwater from STIA has impacted Miller Creek. Based on the Canadian Guidelines, there is a high probability that sediment concentrations of copper, lead, and zinc occurring below Lake Reba are toxic to greater than five percent of the aquatic genera inhabiting this site.

16. While it is unknown precisely how far downstream the impacts of copper, lead, and zinc occur in Miller Creek and Des Moines Creek, it is evident from recent (April and August 2000) ACC water quality surveys, that copper, lead, and zinc are bioavailable to aquatic life in both Miller and Des Moines Creeks. Copper, lead, and zinc residue levels in cutthroat trout from upper Miller Creek (S 157th PL crossing) were 6.5, 0.31, and 137 mg/Kg dry weight, respectively in the wet season (April). The dry season (August) data at the same location on Miller Creek were 6.5, 0.74, and 145 mg/Kg dry weight, respectively. Comparable data from upper Des Moines Creek (S 200th Street crossing) collected in the wet season (April) were 4.3, 0.34, and 129 mg/Kg dry weight, respectively. No trout were collected at this location during the dry season. While Washington has not adopted water quality standards based on tissue residue concentrations, the lead and zinc concentrations found in cutthroat trout in the upper reaches of both Miller Creek and Des Moines Creek exceed the tissue screening concentrations (TSCs) for lead (0.32 mg/Kg dry weight) and zinc (100 mg/Kg dry weight) used by Shepherd (1999) in

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ecological risk assessments. These data indicate that lead and zinc are chemicals of concern that require more detailed investigation and additional control.

17. Glycol-based de-icers and anti-icers, used in de-icing aircraft at STIA, which are required to drain only to the IWS are also presently found in the project streams. The Port's Annual Stormwater Monitoring Reports for 1999 and 2000 indicate that glycols occur in stormwater at STIA outfalls that discharge both to Miller and Des Moines Creeks. While the IWS at STIA is designed to collect aircraft de-icers and anti-icers reaching the tarmac, glycols in de-icers and anti-icers are still routinely detected at six of the Port's stormwater outfalls: SDN1, SDN2, SDN4, SDE4, SDS1, and SDS3. Outfalls SDN1, SDN2, and SDN4 are located on the north end of the STIA and discharge to Lake Reba on Miller Creek. Outfalls SDE4, SDS1, and SDS3 are located at the south end of STIA and discharge to the East Tributary or Northwest Ponds on Des Moines Creek.

18. The concentrations of glycols entering the project streams vary widely and are not trivial. For example, glycols of 12, 810, and 364 mg/L were found in SDE4, SDS1, and SDS3 outfall discharges, respectively, following aircraft de-icing on January 11-12, 2000 (Port 2000). The most recent data from February 2001, indicated that glycols of 46.7, 48.7 and 419.4 mg/L were found in stormwater being discharged from the same three outfalls, respectively (Port 2001). The majority of the glycols at each discharge were propylene glycol.

19. The ACC also detected propylene glycol in duplicate samples from Des Moines Creek on February 9 and 19, 2001 at S 200th Street, just south of the Tyee Valley Golf Course.

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Propylene glycol was not detected in duplicate samples on either of these dates in the West Tributary of Des Moines Creek at 192nd Street, which is above any known influence of STIA. These finds suggest that this glycol entered Des Moines Creek on the West Tributary below 192nd Street, or entered on the East Tributary somewhere above the confluence of the West and East Tributaries. The likely source of this contamination was one of the STIA outfalls: SDE4, SDS1, or SDS3. The concentrations of propylene glycol in these four samples ranged between 11 and 17 mg/L. Because this is propylene glycol, the source is likely an aircraft anti-icer and not an aircraft de-icer or auto/truck anti-freeze that are mainly ethylene glycol based.

20. At issue is the toxicity of the de-icing or anti-icing agents. In particular, it is the presence of additives in the commerce de-icer or anti-icer that account for most of the toxicity (Hartwell et al 1995). Some examples of additives found in de-icers and anti-icers that may affect toxicity include: sodium nitrite, sodium benzoate, borax, diethylene glycol, ethylene oxide, acetaldehyde, dioxane, high-molecular weight polymers, polyamines, triazoles, and urea, (MacDonald et al. 1992; Hartwell et al. 1995; Lokke 1984).

21. It is my opinion that de-icers and their additives can be toxic to aquatic life at relatively low concentrations (1.8-8.7 mg/L), which I base on the work of Hartwell et al. (1995). Hartwell et al. (1995) determined that the 7-day LC_{50} for commercial anti-icer to fathead minnow ranged between 24.2 and 43.3 mg/L, based on the concentration of total glycols in the test solution. By definition, these results indicate that the LC_{25} or LC_{10} (the concentrations killing 25% and 10% of the test population in 7 days) will occur at lower concentrations of total glycols,

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that is, in the range of glycol concentrations found recently by the ACC. Hartwell et al. (1995) also observed that gill pathology (edema, respiratory cell hypertrophy, and proliferative bronchitis) occurred in fish exposed to anti-icer at 17.6 mg/L propylene glycol. It is reasonable to assume that a fish with these symptoms will die if the exposure continued at this same level. Hartwell et al. (1995) also observed toxicity and similar gill pathology in fathead minnows exposed to stormwater from a stream receiving winter runoff from a large commercial airport. In these tests, which included detailed chemical monitoring, the LC_{50} ranged between 1.8 and 5.4 mg/L total glycols. The concentrations of total glycols cited in the 1999 and 2000 Annual Stormwater Monitoring Reports, and in the February 2001 stormwater analyses (Port 2001) also exceed the concentrations reported by Hartwell et al. (1995) to be toxic to aquatic life.

22. Whole effluent testing of STIA stormwater as required in their National Pollution Discharge Elimination System Permit has also detected toxicity in the Port's stormwater (see Table 7-15, page 7-25, *Biological Assessment* [Parametrix 2000b]). In effluent from SDN1, the percent survival of daphnia ranged between 10 and 80 percent over three test dates, the most recent 1/24/99. Mean survival over these three tests was only 40 percent. Percent survival of fathead minnow ranged between 40 and 78 percent, with a mean of 60 percent. Whole Effluent Testing (WET) at the Port's stormwater outfalls also demonstrates that at two other outfalls (SDN4 and SDE4), percent survival was as low as 75 and 63 percent, respectively, on at least one of the four dates when tests were conducted, indicating that toxicity occurs more often than the Port would have us believe. This level of toxicity is not trivial and indicates that acute (short-

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term) toxicity of fish and other aquatic life can occur in Miller Creek, into which the discharge of SDN1 flows. The above testing approach does not address chronic (longer-term) toxicity that could occur at much lower concentrations of stormwater.

23. The Port wants us to believe that "the quality of stormwater from STIA will improve in the future for several reasons. First, areas where stormwater is currently not treated will be retrofitted to improve water quality. Second, for areas with new impervious surfaces, stormwater will be detained and treated."

24. These statements suggest that the five or six major stormwater outfalls (SDN1, SDN2, SDN4, SDE4, SDS1, and SDS3) that now discharge to Miller and Des Moines Creeks will be retrofitted to improve water quality, yet this is not what is indicated in the *Comprehensive Stormwater Management Plan* (Parametrix 2000c). Section 7.1.5 indicates that a final decision to retrofit certain stormwater basins with additional detention, e.g., wet vaults or detention vaults, has not been made and that evaluation of the need continues. This affects both the SDE4 and SDS3 drainage basins, which outfall to Des Moines Creek at the south end of STIA. The reason for the delay is the cost in providing (constructing) additional detention.

25. Of the stormwater basins that discharge to Miller Creek at the north end of the STIA, only SDN1 could be retrofitted with additional detention capabilities but this too is subject to change. The Port in Section 7.1.4.1 indicates that they could also approve another alternative to improve treatment, although this alternative is yet to be determined. And, according to Table

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7-8, the SDN2 and SDN4 will not receive a retrofit as the presently employed best management practices, e.g., bioswales, filter strips, are believed to be effective.

26. According to the *Comprehensive Stormwater Monitoring Plan*, all of the SDS1 basin drainage was transferred to the IWS, although there still is a discharge from this basin that likely includes a contribution from STIA. For example, as recently as February 2001, stormwater from SDS1 still contained a total glycols concentration of 48 mg/L, which was mostly (43 mg/L) propylene glycol (Port 2001).

27. So I must ask, what really will change? Will stormwater quality at the existing six outfalls likely improve with the proposed construction at STIA? The Port's proposed retrofit will not, in my opinion, improve the existing situation. The Port's assertion that "stormwater quality will improve in the future," is also misleading and without scientific basis.

28. To provide a site for the Third Runway, the Port proposes to fill a ravine west of the airport with twenty (20) million cubic yards of fill. The fill would be stabilized in part by a retaining wall, fifteen stories high and close to fifteen hundred feet long. Underneath the 20 million cubic yards of fill, the Port proposes to construct an enormous rock drain field to "capture" groundwater and transport it down slope in the hope of supporting the streams and wetlands below. Chemicals associated with fill materials at the fill placement site at STIA have the potential to percolate through the fill pile to groundwater, contaminating wetlands and surface waters. The Soil Acceptance Criteria contained in the Section 401 certification are seriously flawed and do not preclude the acceptance of chemically contaminated fill for use at the

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third runway site. Already, there is evidence that fill, e.g., Hamm Creek Restoration Project sediments, already stockpiled at STIA, contains residual chemicals (PCBs, and DDTs). Chemicals in fill would also have the potential to directly contaminate wetlands and surface waters through runoff following seasonal rains.

29. The Section 401 certification uses the State's Model Toxic Control Act (MTCA) to set the standard for acceptable fill for the third runway project. The fundamental purpose of MTCA is to cleanup existing contaminated or hazardous waste sites. MTCA sets reasonable standards for the amount of toxic material that can be left in a contaminated site. MTCA does not purport to clean-up to natural or background conditions. Instead, MTCA recognizes that there is a certain level below which it is not practical or feasible to clean. These standards are not, nor have they ever been, meant to contaminate clean property up to some predetermined level. To the best of my knowledge, the STIA property where the fill is being placed was free of contamination prior to any fill placement. It is my professional opinion that MTCA does not apply and should not be used for the purpose of screening soils or sediments for use on the STIA Third Runway Fill Project. It is an inappropriate standard for determining the quality of fill material to be placed in the area of wetlands and streams that are now in relatively pristine condition and which contain significant aquatic life.

30. The Section 401 certification Soil Fill Acceptance Criteria are supposed to preclude chemical contamination. However, they are fundamentally flawed in their lack of a consistent and statistically meaningful approach to determine the location and extent of any

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contamination contained in candidate fill materials. Statistically rigorous sampling approaches exist, e.g., systematic grid system (Gilbert 1982), over sampling and compositing (Skalski and Thomas 1984) and are used routinely to survey sites for buried waste, yet no such approach is adopted in the 401 certification Soil Fill Acceptance Criteria. While such an approach need not be undertaken at State-certified borrow pits, they should be required at all sites like the First Avenue Bridge and Hamm Creek where contamination is known to occur.

31. In the past year, I have repeatedly advised the Ecology, the Army Corps of Engineers and the USEPA of my serious concerns about the inappropriate use of MTCA as a fill acceptance criteria for the third runway site. Attached hereto are true and correct copies of my letters to the agencies on this topic: Ex. D, August 31, 2000 letter to Tom Luster, Washington Department of Ecology; Ex. E, December 19, 2000 letter to Charles Findley, U.S. Environmental Protection Agency; and Ex. F, February 16, 2001 Comment letter to DOE and the Army Corps of Engineers.

32. There are also problems with the Port's Low Stream Flow Analyses (see Comprehensive Stormwater Management Plan [Parametrix 2000a]) in that the predictions may underestimate summer low flow impacts and overestimate the contributions of proposed mitigation and natural mitigating factors. For example, one option that the Port proposed in mitigation of predicted low stream flows is the use of "additional storage volume in the base of selected detention facilities, that can be used to store winter (wet) season runoff until needed to support low flows in the summer (dry) season." According to Mr. William Rozeboom of

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Northwest Hydraulic Consultants, Seattle, Washington (also working on behalf of ACC and submitting comments), some of the proposed detention facilities that are to be used in this way do not have "dead storage" capacity for reserve storm water release, with the result the total proposed storage falls short of the target volumes. Mr. Rozeboom also points out that the potential mitigating effect of the "fill infiltration discharge" from the proposed runway embankment to Miller Creek is overestimated, and that the "IWS lagoon lining improvements" would specifically reduce recharge for Walker and Des Moines Creeks. For these reasons and others (see the full text of Mr. Rozeboom's comments, attached to his declaration in support of ACC's request for stay), the Port's conclusion indicating that base lows will not be diminished beyond the values presented in Table 5 (page 18) of the Biological Assessment – Supplement (Parametrix 2000) is in serious doubt. Clearly, flow reductions have not been established with any degree of certainty.

33. From a fish or fish habitat perspective, it is my opinion, that if flows in the project streams fall much below 1.0 cfs, impacts to anadromous as well as resident fish species will likely occur, and over most of the length of the streams on the project site. If flows diminish, depths will surely decrease resulting in elevated temperatures and lower dissolved oxygen concentrations. Fish and other mobile aquatic life could be displaced to other reaches of the stream where preferred conditions persist. Diminished flow and depth could also limit movement of fish throughout the stream length and conceivable lead to stranding and mortality of larger fish.

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34. Finally, the Port's Low Flow Analysis/Flow Impact Offset Facility Proposal is incomplete and denies opportunity for meaningful scientific comment. The Port's management approach is to monitor the quality of detained or discharged stormwater, and only when a problem is encountered, will it take steps to mitigate the impacts of altered water quality. For example, if the problem is low dissolved oxygen, the Port will aerate. How the waters in the proposed detention vaults or the stream will be aerated, we aren't told except in a very general way. While several types of aeration devices are listed on page 18 , including microbubble diffusers, gas injection, mechanical aerators, etc., there is no commitment at this time to any of these technologies. It may be expected that one or more of these devices will work better than others but this has not been determined. This plan is not ready for scientific scrutiny.

35. There is also the important issue of how frequently to monitor the stored stormwater during discharge. For example in the case of dissolved oxygen, the Port proposes a weekly monitoring requirement for the operational period, August through October which may not detect early signs of degradation. Dissolved oxygen, can change very quickly (in a matter of hours) in response to biochemical oxygen demand, rainfall, and even air temperature. I therefore cannot agree with the Port's assertion that "water quality of stored water is not expected to change." More frequent monitoring, at least daily for dissolved oxygen, turbidity, and temperature during the operational (discharge) period is necessary to assure that degradation does not occur. Modeling and bench-scale testing should have been required of the Port to determine how long-term (three month) detention can change the basic properties of stormwater.

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36. While it may be of interest to undertake a long-term assessment (10 years) of benthic insect productivity in the project streams (see page 34), as demonstrated by the Benthic Index of Biotic Integrity (BIBI), this kind of biological monitoring also will not detect potential early impacts associated with the discharge of detained stormwater to the project streams. In other words, harm to the resource could occur before it was detected. There is also no real BIBI baseline for the project streams because so few samples have been collected to date from which the BIBI can be calculated. Using this approach, one will also have to wait several years to see a trend in the data that had sufficient statistical reliability to determine if benthic invertebrate productivity was being altered. In my opinion, then, it's a stretch to suggest as the Port does on page 34, "this monitoring will be able to be used in assessing any biological effects of the flow offset facility in the receiving water." Instead of the BIBI, use of either laboratory or *in situ* bioassays aimed at determining potential bioaccumulation and toxicity of metals and other chemicals is one approach that would provide more timely indications of whether or not stored stormwater was having an impact on the receiving water.

37. The monitoring requirements contained in the Section 401 Certification should not be the basis for approving the low flow mitigation plan. If monitoring detects a problem it usually means that the stream(s) has/have suffered some degree of harm. More importantly, the streams will continue to undergo harm until the problem(s) is /are rectified. If the monitoring is flawed as the Port's monitoring appears to be, the degree of harm incurred could be all that more. Reasonable assurance that the water quality will not be impaired, in my opinion, should not be

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based on monitoring alone. Rather, it should be based on a facility design that is well grounded on scientific principles, a learned assessment of the potential problems, laboratory experimentation (not experimentation on the streams), and external peer review. *See also* my comment letters to Ecology and the Corps dated June 20, 2001 (Exhibit G), and August 6, 2001 (Exhibit H).

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

DATED this 11th day of September, 2001, at Richland, Washington.

John Strand, Ph.D.

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EXHIBIT A

John A. Strand, Ph.D., Fellow A.I.F.R.B.
Environmental Scientist

Dr. Strand is an internationally recognized environmental scientist specializing in studies to determine potential effects of human activities on aquatic resources. During his 26 years (post Ph.D.) of experience, he has conducted a wide variety of projects, large and small, in Alaska, California, Idaho, Washington, British Columbia, Guam, and Venezuela. These included field studies to evaluate environmental impacts of engineered structures, and field and laboratory studies to assess ecological and health risks from discharge of contaminants to surface waters, including sewage, storm water, oil, other organic chemicals, radionuclides, and heavy metals. Dr. Strand also has developed watershed management plans and regional restoration and monitoring plans.

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Education:

Ph.D.; University of Washington; Fisheries Biology; 1975
M.S.; Lehigh University; Biology; 1862
A.B.; Lafayette College; Biology; 1960

Employment:

1999- Principal Biologist, Columbia Biological Assessments, Richland, WA. Also, Adjunct Faculty, Environmental Sciences and Regional Planning Program, Washington State University Tri-Cities, Richland, WA.
1996-1999; Water Quality Planner, King County Department of Natural Resources, Seattle, WA.
1993-1995; Senior Biologist and Group Leader, EA Engineering, Science, and Technology, Inc., Redmond, WA.
1990-1993; Restoration Manager and Co-Chair, *Exxon Valdez* Oil Spill Restoration Planning Working Group, NOAA/NMFS; Auke Bay, AK.
1969-1990; Senior Research Scientist and Manager, Battelle, Pacific Northwest Laboratory, Richland and Sequim, WA. Also, Affiliate Faculty (1987-1991), School of Fisheries, University of Washington, Seattle, WA.

Registration/Certification:

Fellow, American Institute of Fisheries Research Biologists; 1993
Certified Fishery Scientist (No. 442), American Fishery Society; 1969

Specialized Training:

Health and Safety Training for Hazardous Waste Sites; 1996; 1997; 1998
Wetland Delineation, Shoreline Community College; 1996
Litigation Support Short Course, EA Engineering, Science, and Technology, Inc.; 1994
NEPA Refresher Training, US Forest Service; 1991

Experience:

Aquatic Toxicology and Risk Assessment----In 2000, investigated the effects of stormwater on fish and other aquatic life in Miller, Walker, and Des Moines Creeks, King County, Washington. From 1996 to 1998, studied ecological and human health risks of combined sewer overflows in the Duwamish River and in Elliott Bay, Washington. In 1995, prepared sampling plans to study fate of metals and organic contaminants in groundwater and marine sediments in Liberty Bay, Washington. At a gold mine in Southeast Alaska in 1994, assessed human health risks for arsenic discharged in treated tailings pond effluents. In 1990, evaluated survey design and sampling procedures to determine the fate of oil refinery and coking plant wastes in sediments and benthic biota in Amuay Bay, Venezuela. In 1980, developed exposure pathway models and determined potential ecological and human health risks associated with metals and radionuclides released from a hypothetical uranium mine and smelter at three locations in British Columbia.

Resource Management and Planning---- In 1999, appointed to King County Biological Review Panel with responsibility to evaluate King County policies and programs most relevant to conservation of salmon. In 1995 evaluated NMFS biological opinion and conducted field studies to assess potential impacts of construction and operation of a proposed gold mine on endangered spring and summer run chinook salmon in the Salmon National Forest, Idaho. From 1992-1993, was Federal Co-chair of *Exxon Valdez* Oil Spill Restoration Planning Work Group in Anchorage, Alaska. Responsible for developing a restoration plan, and for designing, implementing and reviewing long-term restoration and monitoring projects for injured resources and human services. From 1987-1990, helped prepare the *Sequim Bay Watershed Management Plan* in an effort to mitigate cumulative effects of nonpoint source pollution from timbering, road building, agriculture, marina operations, and failed septic systems throughout the Sequim Bay watershed in Washington.

Regulatory Compliance ----Conducted numerous National Environmental Policy Act reviews for nuclear power plants, a nuclear fuels reprocessing facility, a hydroelectric impoundment, petroleum and synthetic fuels refineries, a gasoline pipeline, an acoustic measurement facility, and general construction projects. For example in 1994, directed an environmental assessment of alternate sites for construction of replacement housing at McChord Air Force Base, Washington. In 1985-1987, managed an environmental assessment of the Navy's Southeast Alaska Acoustic Measurement Facility near Ketchikan, Alaska. Also conducted Section 316 (a) (b) Demonstrations of Compliance with the Clean Water Act. For example in 1994, designed monitoring plans to address "special conditions" of National Pollution Discharge Elimination System (NPDES) permit renewals at two coastal power plants in California. In 1988, performed chemical analyses and bioassays in support of NPDES Permit renewals at oil industry facilities in Port Valdez and Cook Inlet, Alaska

Selected Publications and Presentations:

Strand, J., K. Stark, K. Silver, C. Laetz, T. Georgianna, T. McElhany, K. Li, and S. Mickelson. 1998. Bioaccumulation of Chemical Contaminants in Transplanted and Wild Mussels in the Duwamish River Estuary, Puget Sound, Washington. *In* Proceedings of Puget Sound Research '98. Puget Sound Water Quality Action Team. March 12-13, 1998, Seattle, Washington.

Strand, J.A., V.I. Cullinan, E.A. Crecelius, T.J. Fortman, R.J. Citterman and M.L. Fleischmann. 1992. Fate of Bunker C fuel oil in Washington coastal habitats following the December 1988 Nestucca oil spill. *Northwest Sci.* 66 (1):1-14.

Cullinan, V.I., E.A. Crecelius, and J.A. Strand. 1991. Evaluation of Lagoven, S. A., Refinery Environmental Monitoring Plan of Amuay Bay, Venezuela. Final Report. Prepared for Bariven Corporation by Battelle, Pacific Northwest Laboratories, Richland, Washington.

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EXHIBIT B

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December 13, 1999

Permit Coordination Unit
Department of Ecology
P.O. Box 47703
Olympia, WA 98504-7703
ATTN: Tom Luster,
401 Certification Coordinator

Subj: Determining Whether the Washington Department of Ecology (Ecology) Has a Scientifically Adequate Basis to Certify Compliance, Under Clean Water Act Section 401, for the Port of Seattle's Project Proposed in Public Notice Nos. 1996-4-02325 and 1999-4-02325

Dear Mr. Luster:

On behalf of Citizens Against Seatac Expansion (CASE), I have undertaken a review and evaluation of pertinent and readily available literature in an effort to answer the subject question. It is Ecology's responsibility under the Clean Water Act to certify that the Port's proposed project will not violate applicable water quality criteria and will not harm aquatic resources inhabiting the project site. In undertaking this effort, I have relied on my relevant education, specialized training, and professional skills acquired over a 40-year career as an environmental scientist (see attached Curriculum Vitae).

I approached this task by first determining whether water quality in surface waters near Seattle-Tacoma International Airport (STIA) has been impacted by stormwater runoff from the Port of Seattle's ongoing operations at STIA. I addressed both historical and present conditions. I next looked at whether conditions in the receiving waters might improve following the filling of the subject wetlands and subsequent installation and operation of the proposed stormwater retention facilities at STIA. My opinion in this matter was based primarily on reviewing three documents prepared by the Port of Seattle:

- *Storm Water Receiving Environment Monitoring Report for NPDES Permit No. WA-002465-1. Volume 1, and 2 (Technical Appendices). June 1997.*

- *Annual Stormwater Monitoring Report for Seattle-Tacoma International Airport for the Period July 1, 1998 through June 30, 1999. September 1999.*

- *Preliminary Comprehensive Stormwater Management Plan. Master Plan Update Improvements. Seattle-Tacoma International Airport. Technical Appendices. October 1999.*

I also reviewed and included applicable citations from the scientific literature when the need arose. My conclusions and the detailed evaluations on which they are based are can be found in the succeeding sections:

Conclusions

In my opinion, for the following reasons, the Port has not provided sufficient information to enable Ecology to conclude, on a scientifically defensible basis, that there is reasonable assurance that the Port's discharges will comply with applicable water quality standards:

- Violations of toxic substances criteria in Miller and Des Moines Creeks, particularly for copper and zinc, occur as a result of stormwater discharged from STIA. These violations occurred historically and occur currently. This finding suggests that additional waste treatment (additional connections to the Industrial Waste System at STIA) may be required before stormwater impacts to area surface waters diminish.

- At present (based on the Port's 1999 report), an insufficient number of samples are being collected pursuant to demonstrating compliance with applicable toxic substances criteria. Sampling upstream of STIA no longer occurs.

- The potential effects of de-icers and anti-icers in stormwater discharged to area surface waters cannot reasonably be quantified without conducting WET tests during de-icing events.

- The Port has failed to consistently follow proper quality assurance procedures when collecting and analyzing stormwater samples, thereby diminishing the credibility of the data reported.

- The Port's reports include questionable conventions, e.g., use of inappropriate comparators, perhaps erroneously labeling high or unexpected analytical results as outliers, and not truthfully reporting qualified data, that undermine the scientific validity of the Port's conclusions.

- The Port has not adequately supported its assertion that the proposed stormwater management activities (installation of larger detention basins) will result in substantial improvements in the water quality of either Miller Creek or Des Moines Creek. This conclusion is based mainly on the lack of simulation modeling to address the fate of metals and other chemicals discharged in stormwater at the project site. As a result, the Port has not provided adequate information to enable Ecology to develop conditions that would insure compliance with the water quality standards, Chapter 173-201A WAC.

Historical (1995-1996) Stormwater Discharges to Miller and Des Moines Creeks

While there are several constituents (metals, fecal coliforms, turbidity) associated with STIA stormwater in Miller and Des Moines Creeks that have historically violated State of Washington Water Quality Criteria, the metals copper and zinc are of particular concern given their designation as toxic substances. In both creeks, the Port has presented metals data for stations at the STIA stormwater outfalls, upstream of the outfalls, and downstream of the outfalls. These data are presented as either total recoverable or dissolved metal. The State's toxic substances criteria for these metals are based on the dissolved fraction. The Environmental Protection Agency's (EPA) toxic substances criteria for these metals are based on total recoverable metal. In both cases, the hardness of the water influences calculation of the metal criteria.

Data presented by the Port in 1997 indicated that concentrations of both copper and zinc in STIA stormwater discharges greatly exceeded applicable State/EPA toxic substances criteria, in some instances by more than an order of magnitude. For example at the stormwater outfall to Miller Creek (see 1997 report page 35), total copper concentrations ranged from 4.2-82.9 ug/l. The EPA criterion is 4.4 ug/l. The Port's 1997 data also indicated that concentrations (4.7-14.8 ug/l) of total copper upstream of STIA were at or slightly exceeded the EPA metals criteria. That Miller Creek was unable to assimilate the STIA discharges, however, is confirmed by downstream sampling data showing total copper concentrations of 0.72-44 ug/l. For zinc in Miller Creek, the values at the outfall, upstream, and downstream were 15-525 ug/l, 37-69 ug/l, and 2.3-295 ug/l., respectively, again showing that the influence of zinc additions at the outfall persisted downsteam. The EPA criterion for zinc is 33.7 ug/l.

The concentrations of copper and zinc downstream exceeded the applicable toxic substances criteria. The Port's 1997 Report does not provide evidence that would support a scientifically valid conclusion that STIA does not impact Miller and Des Moines Creeks downstream of their respective stormwater outfalls. Persistence of an influence of stormwater downstream, and at the magnitudes illustrated above, also suggests the need for treatment of the waste streams. Additional connections to the Industrial Wastewater System (IWS) at STIA should be considered.

Present (1998-1999) Stormwater Discharges to Miller and Des Moines Creeks

Data presented by the Port in 1999 confirm that exceedences of toxic metals criteria continue to occur at the Port's stormwater outfalls to the creeks. In addition, the downstream stations, where sampled, show that the influences of STIA stormwater discharges persist in the receiving waters. What appears missing in the 1999 report, however, is any indication that the Port sampled upstream of STIA. The Port's failure to maintain the original sampling protocol in this regard greatly diminishes the value of their stormwater monitoring program.

In my opinion, the Port has failed to demonstrate that STIA stormwater does not adversely impact the water quality of Miller and Des Moines Creeks. To the contrary, the Port's sampling data confirms that STIA stormwater greatly contributes to exceedences of toxic metals criteria in the receiving waters. The Port's reminder on page 22 of their 1999 report that the Water Quality Standards apply to receiving waters and not the discharges from their outfalls also is of little consequence if the Port fails to present data from both above and below their outfalls.

Potential Effects of De-Icers and Anti-Icers Discharged to Surface Waters

The Port tends to diminish the potential for toxicity from glycols and the additives found in glycol-based de-icers and anti-icers, which are employed at STIA. LC50 values for invertebrates and fish are generally greater than 1000 mg/l for pure ethylene glycol (Cowgill et al., 1985; Hartwell et al. 1995), although bioassays of commercial de-icer or anti-icer chemicals have resulted in toxicity at much lower concentrations of the parent compound. Hartwell et al., 1995 suggested that this response was attributable to additives and contaminants. For example, Fisher (1994 [in Hartwell et al. 1995]) reported that the 48-hour LC50 for stormwater runoff contaminated with aircraft de-icers or anti-icers ranged between 1.9 and 8.7 mg/l total glycols for *Daphnia magna*, and 1.8 and 5.4 mg/l for *Pimephales promelas*. These values were for combined ethylene and propylene glycols in the stream, and were consistent with toxicity levels found by Hartwell et al. (1995), who tested the commercial chemicals in the laboratory. Hartwell et al. 1995 also reported finding sublethal effects (histological changes in gills) in *P. promelas* following seven days of exposure to 17.6 mg/l propylene glycol. The levels where toxic effects were observed by Fisher (1994) and (Hartwell et al. 1995) are substantially below the concentrations of total glycols (up to 158 mg/l) reported in the Port's 1999 monitoring report.

Some examples of additives found in de-icers and anti-icers that may affect toxicity include: sodium nitrite, sodium benzoate, borax, diethylene glycol, ethylene oxide, acetaldehyde, dioxane, high-molecular weight polymers, polyamines, triazoles, and urea, (MacDonald et al. 1992; Hartwell et al. 1995; Lokke 1984). At issue here is whether the Port ever conducted whole effluent toxicity testing on the runoff during a time when aircraft were de-iced at STIA? It would not appear that they did.

It is uncertain from the text whether the outliers included in Figure 11 of the Port's 1999 Report are, in fact, outliers. Maybe what are called outliers are actually real values within the natural range of variance for this data, and that additional samples will need to be taken to decrease this variance. It would appear that Figure 11 reports a mean value and the spread of data (box plots) over the year. However, only a single grab sample followed by a composite sample are collected during each sampling interval. It is unclear which sample results are included in Figure 11. Clearly, additional samples need to be collected and analyzed before the Port can comment intelligently on the fate of these materials in their stormwater and in affected surface waters.

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It is interesting to note that at the bottom of page 27 of the 1999 report, the Port mentions the finding of high BOD in samples from SDE4, SDS3, SDN1, SDN3, and SDN4, which the Port attributes to an acetate-based runway (ground) de-icing chemical. Glycols were found at low concentrations (15-113 mg/l) in these samples, which suggests that the Port should be asked why they do not also analyze for acetate-based de-icers? Are acetate-based de-icers more toxic than glycol-based de-icers?

Technically speaking, the Port has only begun to address the issue of de-icers and anti-icers. They have not addressed toxicity in any meaningful way, particularly with regard to the additives found in commercially available de-icing or anti-icing chemicals. Without toxicity testing during de-icing events, they have not in my opinion provided information sufficient to enable Ecology to conclude that de-icers/anti-icers pose no risk to surface waters as a result of their use at STIA.

Use of Water Quality Comparators

In both the 1997 and 1999 reports, the Port includes comparator concentrations for metals, fecal coliforms, turbidity and other water quality parameters in stormwater. Comparator concentrations are based on stormwater data collected by other authorities (e.g., City of Bellevue, City of Portland). These comparators are found in Table 21 in the Port's 1997 report and in table 4 in the Port's 1999 report.

While these data maybe of some scientific interest, these data do not address the question of whether documented exceedences in water quality criteria in Miller and Des Moines Creeks are attributable to stormwater discharges from STIA. What is germane in this case is a comparison of the concentrations of metals in Miller and Des Moines Creeks with the applicable State or Federal water quality criteria. It really doesn't matter if the concentrations of metals in Miller Creek are the same as the concentrations of metals occurring in surface waters near Portland or Bellevue. All this means is that the City of Bellevue and the City of Portland are also not in compliance with applicable water quality criteria. How the Port has used these comparators is not good science and could be construed as an effort to bias the results of their monitoring.

Reporting of Qualified Data

The Port also failed to properly report data as qualified by their analytical laboratory, King County Environmental Laboratory (Metro). Both Microtox and metals data from Miller Creek and De Moines appear to be affected by this omission. Many results of analyses of samples collected in 1996 (in January, May, June, August, September, October, and November) were qualified with an "H," which indicates that the sample (s) exceeded the holding time before being analyzed. See Volume 2, Technical Appendices of the Port's 1997 report. These same data, however, were not qualified when reported in Volume 1 of the same report.

For example, in Table 19 on page 35 of Volume 1, which reports metals concentrations in Miller Creek, a range of values of 0.72-44 ug/l for total copper is entered for the downstream stations. There is no qualifier for copper in the table or accompanying text, yet in the King County (Metro) Lab Analytical Report for October 4, 1996 (see Volume 2), the copper concentration for sample MC4 (Lab ID L9668-10), which is a downstream station on Miller Creek, is qualified as "H." This sample is reported to contain 0.044 mg/l or (44 ug/l) total copper. This must be the sample that was included in Table 19 in Volume 1.

It also appears that "H-" qualified Microtox data were entered into Table 1 on page 8 of Volume 1. For example, King County's Analytical Report, that included results of samples collected from Miller Creek on January 20, 1996, reported the results of a Microtox bioassay for sample MC1 (Lab ID L7724-3) as "H" qualified, yet no such qualifier is entered into Table 1 in Volume 1, nor is one included in the text.

Reporting qualified data as unqualified is not appropriate and violates proper quality assurance procedures. It allows a bias to affect the data, which has no place in good science. Reporting qualified data as unqualified may also have violated the conditions of the Port's NPDES permit. In my opinion, the samples should have been collected again. At issue is how the results might have changed if the Port or their consultant followed protocol? It is incumbent on Ecology to catch glitches like these.

Transport and Fate of Stormwater Discharged from STIA

What else that appears missing from the pertinent literature are the results of any simulation modeling that addresses the fate of chemicals (e.g., metals, de-icers/anti-icers, etc.) discharged to Miller and Des Moines Creeks in STIA stormwater. With so much at stake, it might have been expected that the Port would undertake such a study. Ecology also should have required this of the Port. Simulation modeling should be used to address compliance with the applicable water quality criteria, and test the efficacy of alternative wastewater treatment options.

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Lokke, H. 1984. Leaching of ethylene glycol and ethanol in subsoils. *Water Air Soil Pollut.* 22:373-387.

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Thank you for the opportunity to comment on this issue. I am available at your convenience to discuss any of my comments in greater detail.

Yours very truly,

/s/

John A. Strand, Ph.D.
Principal Biologist

attachment: Curriculum Vitae

cc: Rick Poulin
Greg Wingard
files

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EXHIBIT C
Documents and Scientific Literature Reviewed

Gilbert, R.O. 1982. Some Statistical Aspects of Finding Hot Spots and Buried Radioactivity. TRANS-STAT: Statistics for Environmental Studies, Number 19. PNL-SA-01274. Pacific Northwest Laboratory.

Hartwell, S.I., D.M. Jordahl, J.E. Evans, and E.B. May. 1995. Toxicity of aircraft de-icer and anti-icer solutions to aquatic organisms. *Environ. Toxicol. And Chem.* 14:1375-1386.

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August 31, 2000

Mr. Tom Luster,
"401" Permit Coordinator
Permit Coordination Unit
Washington Department of Ecology
P.O. Box 47703
Olympia, WA 98504-7703

Subj: Port of Seattle's Airfield Project Soil Fill Acceptance Criteria

Dear Mr. Luster:

At the request of the Airport Communities Coalition (ACC), I have reviewed and evaluated the Port of Seattle's (Port) Airfield Project Soil Fill Acceptance Criteria, with particular interest in the process employed to certify that fill accepted by the Port is free of chemical contamination. In my evaluation, I examined sediment characterization reports and phase I and II environmental assessments obtained from the Department of Ecology (DOE) to see if fill materials already accepted and stockpiled by the Port are, in fact, free of contamination. At issue is the appropriateness of the Acceptance Criteria and whether or not fill already stockpiled is contaminated as to constitute a risk for area streams, wetlands, and aquifers. In undertaking this assessment, I have relied on my education, specialized training, and professional skills acquired over a 40-year career as a Fisheries Biologist and water quality planner (see attached Curriculum Vitae).

Conclusions

A summary of my conclusions, discussed in detail below, is as follows:

1) The Port of Seattle's Soil Acceptance Criteria are seriously flawed and do not preclude the acceptance of chemically contaminated fill. The soil or sediment samples collected do not provide reasonable assurance that candidate fill materials are not chemically contaminated, and it is likely that examples of such contamination already exist on site.

2) There is evidence that soils, e.g. Hamm Creek Restoration Project sediments, already accepted and stockpiled by the Port, contain residual contamination that increases the risk for area natural resources.

3) The Model Toxics Control Act (MTCA) standard is not appropriately used as the criteria to screen candidate soils for use in the proposed third runway embankment.

4) Even if used, MTCA Method A Soil Cleanup Levels do not afford natural resources of the site much protection if fill containing chemicals up to the clean-up level run off to area streams.

My opinions and the detailed evaluations on which they are based are found in the following sections:

The Port's Airfield Project Soil Fill Acceptance Criteria Are Flawed.

Among a number of requirements, the Port's Soil Fill Acceptance Criteria are supposed to preclude chemical contamination. They are fundamentally flawed in their lack of a formula for how many samples per unit of soil or sediment need to be collected to test chemical purity. Reviewing various sediment characterization reports or phase I or II environmental assessments for lands from which soils were already accepted by the Port indicates the significance of this problem. Generally, fewer than six samples were collected for chemical analyses for every 100,000 CY of soil or sediment accepted by the Port. All to often, the decision on how many samples to take was apparently left up to the consultants hired by the Port, who do not seem to have a consistent rule for calculating how many samples per unit soil to collect.

As an example, let's look at the 85,000 CY of soil from the First Avenue Bridge accepted by the Port from the Washington Department of Transportation (WDOT) in the Second Quarter 2000 (see letter from Paul Agid, POS to Chung Yee, WDOE dated July 27, 2000). It turns out that initially, only five samples were analyzed for petroleum contamination and potentially toxic metals (see Letter from Tom Madden, WDOT to Beth Clark, POS Environmental Section dated Nov.29, 1999). Significantly, one of those samples revealed total petroleum hydrocarbons (TPH) exceeding the Method A Soil Cleanup Level of 200 mg/Kg (actual value was 870 mg/Kg). The consultant then collected three additional samples. These samples also contained TPH in excess of the Method A Standard, but no other samples were collected. It was recommended that some of the fill be set aside for additional testing, but the vast majority of the soil was accepted and transferred to the Port of Seattle. Some 85,000 CY, then, were accepted on the basis of only four samples.

The record in the case of fill from the Hamm Creek Restoration Project, although not complete (part of Sediment Characterization Report [USCOE 1997] is missing), indicates that the 80,000 CY of Hamm Creek Restoration Project sediments (see Letter from Elizabeth Clark POS to Roger Nye (WDOE) dated Feb. 4, 2000) were accepted by the Port of Seattle on the basis of only two samples. Four samples were actually collected but composited down to two samples prior to chemical analyses. In a Memorandum to the Port of Seattle's Paul Agid from Beth Doan dated March 24, 1999, there is a caveat that "indicates the samples were composited over large areas and depths, and that there was potential for hotspots to go undetected."

Stockpiled Fill Is Chemically Contaminated.

Fill materials stockpiled by the Port of Seattle are obviously contaminated. The results of the analyses of the Hamm Creek sediments are summarized in the Memorandum from Beth Doan to Paul Agid dated March 24,1999. The two composited samples analyzed were found to contain PCBs and DDT above Puget Sound Dredge Disposal Authority (PSDDA) levels (6.9 and 160 ug/Kg, respectively), meaning that these materials were not suitable for open water disposal. Using PSSDA's convention of normalizing PCBs to total organic carbon content, some of sediments contained PCBs exceeding 12,000 ug/Kg. The Memorandum from Beth Doan also indicates that sediments from this site failed follow-up bioassays, meaning they proved toxic to aquatic life. Although not stated in the Doan Memorandum, there is evidence that hexachlorobenzene and 1,2,4-trichlorobenzene were detected at levels exceeding the State of Washington Sediment Management Standards (WAC 173-204-320) (USCOE 1997). In the Doan memo, it was noted that 10,000 CY of candidate fill material were not even analyzed. Presumably, these sediments was also included in the 80,000 CY transferred to the Port of Seattle from the USCOE in 1999. It was also interesting to learn from the Doan Memorandum that Boeing subsequently tested the Hamm Creek sediments but didn't detect either PCBs or DDT. It seems that, in spite of the fact that the two sets of analyses produced significantly different results, the Port of Seattle still accepted these fill materials for use in their third runway embankment.

Clearly there is evidence that significant quantities of fill presently stockpiled by the Port for use on the third runway embankment contain chemicals that exceed two sets of sediment quality standards (PSSDA and the State of Washington Sediment Quality Standards).

MTCA Is Being Misused.

The fundamental purpose of MTCA and MTCA Method A is to clean up contaminated or hazardous waste sites. They are not meant to chemically contaminate clean property up to some predetermined level, in this case, the MTCA Method A Cleanup Levels. The site where the third runway embankment is to be built is not a hazardous waste site. It is, to the best of my knowledge, free of known chemical contamination. Clearly, MTCA does not apply and should not be used for the purpose of screening soils or sediments for use in the third runway. I will not dwell on this critical point as you have already received similar comment from Greg Wingard of the Waste Action Project (see his letter to you of May 4, 2000).

Clearly, including any contaminated soils or sediments in the fill pile runs the risk of harming area natural resources, particularly wetlands and fishery resources. Any chemicals in the fill pile have the clear potential of percolating through the pile to groundwater, ultimately contaminating wetlands and surface waters that may be connected to the groundwater stream. This same groundwater also may be connected with the aquifer from which drinking water is obtained. As an aside, any discharge to groundwater could be a violation of WAC 173-200, the State of Washington's groundwater law. Chemicals also can directly contaminate wetlands and surface waters through runoff following seasonal rains.

Method A Soil Cleanup Levels Affords No Protection to Natural Resources.

Even if used, MTCA Method A Soil Cleanup Levels (WAC 173-340-740) do not afford natural resources of the site much protection if fill containing chemicals up to the clean-up level run off to area streams. For example, the Method A Cleanup Level for lead is 200 mg/Kg, yet the Lowest (ecological) Effects level for lead in the Guidelines for the Protection and Management of Aquatic Sediments in Ontario, Canada (Persaud et al. 1993) is only 31 mg/Kg. The New York Department of Conservation (1994) classifies sediments containing 30-100 mg/Kg lead as moderately contaminated, requiring special handling when being dredged.

Taking this example a step further, if the fill contained lead up to the MTCA maximum, and if the lead was in a physical-chemical form that was biologically available, it is not unreasonable to assume that fish or other aquatic life in a wetland or stream receiving runoff from the fill pile will be exposed to harmful levels of the metal. Leachate containing 200 mg/Kg lead is harmful! This same case can be made other chemicals, e.g., PCBs, DDT. The point is that the Canadian and New York Standards for many chemicals are significantly lower than the Method A Soil Cleanup Levels for those same chemicals. All one has to do is compare the Canadian and New York Standards with the Method A Soil Cleanup levels for these other chemicals. There is no scientific or regulatory justification for allowing the Port of Seattle to use Method A in this context, as if it were cleaning up a contaminated environment, rather than despoiling a clean one. If WDOE allows the Port of Seattle to use such criteria that will not protect the natural resources of the site, there can be no reasonable assurance that water quality will be protected. In fact, as noted above, actions to date based on these criteria may have already allowed importation of chemically contaminated fill onto the site.

Thank you for the opportunity to comment on this important issue. I am available at your convenience to discuss any of my comments in greater detail.

Yours very truly,

John A. Strand

John A. Strand, Ph.D.
Principal Biologist

cc: ACC

AR 008427

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EXHIBIT E

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December 19, 2000

Charles E. Findley
Acting Regional Administrator
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Region X
1200 Sixth Avenue
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Subj: Your Letter to Christopher Gower of October 20, 2000, Regarding Third Runway Contaminated Fill Complaint.

Dear Mr. Findley:

I am a scientist (*Curriculum Vitae* attached) retained by the Airport Communities Coalition (cities of Burien, Des Moines, Federal Way, Normandy Park, Tukwila and by the Highline School District) to assess environmental issues related to the Port of Seattle's proposed third runway project. I have more than 25 years experience (post Ph.D.) in such matters and specialize in studies to assess ecological and human health risks from discharge of contaminants to surface and groundwater. In the course of my assessment, data came to my attention suggesting that the Port of Seattle (POS) was accepting contaminated fill for use in the runway project. After analyzing what was known, I prepared a comment letter dated August 31, 2000, which was sent to agencies with responsibility for such matters. At the same time, Mr. Chris Gower, a local resident concerned with protection of Miller Creek apparently submitted a complaint letter to your office concerning the fill. I understand that you responded to that letter on October 20, 2000.

Mr. Gower kindly forwarded to me a copy of your letter that provided some initial reactions to Mr. Gower's concerns. In doing so, your letter also addressed matters on which I commented in my letter to agencies dated August 31, 2000. In particular, your letter addressed the POS Soil Fill Acceptance Criteria and its use of the Model Toxics Control Act (MTCA) Method A Soil Cleanup Levels as the appropriate standard to screen candidate fill materials for placement at Seattle-Tacoma International Airport (STIA). In light of the initial reactions reflected in your letter, I feel obligated to respond and ask that the U.S. Environmental Protection Agency (USEPA) reflect on these issues in greater depth.

As you may already know, I have identified serious environmental concerns with how the POS has approached the task of obtaining clean (uncontaminated) fill material for the proposed Third Runway at STIA. I also have a different scientific opinion than that of the POS as to the ecological implications of contamination found by the U.S. Army Corps of Engineers (USACOE) in the sediments dredged from Hamm Creek and placed at STIA.

The concerns center on the fact that chemical contaminants associated with fill materials at the fill placement site have the potential (if not the probability) to percolate through the fill pile to groundwater, ultimately contaminating wetlands and surface water that may be connected to the groundwater stream. Chemicals in the fill would also have the potential to directly contaminate wetlands and surface waters through runoff following seasonal rains. More details for these opinions and their bases are presented in the discussion below:

MTCA Method A Soil Cleanup Levels are not Soil Fill Standards.

The October 20, 2000, letter reflects some misunderstanding as to the purpose of MTCA and the MTCA Method A Soil Cleanup Levels. That letter (paragraph two) states "EPA does not have authority to "audit" the MTCA program and oversee implementation of MTCA rules, including MTCA Method A fill standards, which are applicable in this instance." While MTCA is not within the USEPA's jurisdiction, filling of federal jurisdictional wetlands is a joint concern of USEPA and other federal agencies. It is on this basis that USEPA should be concerned. In any event, the reference to MTCA Method A fill standards is very misguided: it suggests that the USEPA thinks that MTCA Method A is about fill standards. I assure you it is not.

The fundamental purpose of MTCA and the MTCA Method A Soil Cleanup Levels is to clean up existing contaminated or hazardous waste sites. The law sets reasonable standards for the amount of toxic material that can be left in a contaminated site. This standard also recognizes that there is a certain level below which it is not practical or feasible to clean. These standards are not, nor have they ever been, meant to contaminate clean property up to some predetermined level. To the best of my knowledge, the STIA property where the fill is being placed was free of contamination prior to any fill placement. MTCA does not apply and should not be used for the purpose of screening soils or sediments for use on the STIA Third Runway Fill Project.

The third paragraph of the October 20, 2000-letter states that "there are no existing federal or state standards for upland soil placement." To some extent, this begs the question that even so-called uplands soil placement may result in contamination of federally protected waters and wetlands. Further, the absence of a particular standard does not excuse adopting one that is very likely to cause environmental harm. Assuming the goal is to avoid environmental degradation, the selection by the POS of MTCA Method A to screen candidate fill materials makes no sense, especially when proven approaches such as USEPA's Ecological Risk Assessment Framework (USEPA 1996) are available.

For example, the October 20, 2000-letter states "that the presence of contamination does not automatically translate into risk to the surrounding environment because the contaminant may be of very low concentration and/or bonded to the soil particles and therefore not expected to be mobile." It also states, "other factors such as oxygen concentration and pH also affect the release of materials." I would agree that these are all key factors to assess when determining if chemicals in soil or fill are mobile, can be bioaccumulated, and eventually pose risk for ecological receptors in the surrounding environment. Unfortunately, no such studies were done to address the above informational needs with regard to, for example, fill from the Hamm Creek Restoration Project site. There was a minimum of testing (chemical analyses), as I explain in the next section of my letter. There also is no evidence presented that any independent scientist ever attempted an assessment of chemical transport and fate, even when chemicals were found in the candidate fill materials, such as the Hamm Creek dredge spoils. Clearly, a risk assessment approach should have been adopted for the admittedly controversial Hamm Creek fill materials.

The POS Airfield Project Soil Fill Acceptance Criteria do not Assure Fill Quality.

Among a number of requirements, the POS Soil Fill Acceptance Criteria, to which your October 20, 2000-letter refers, are supposed to preclude chemical contamination. However, they are fundamentally flawed in their lack of a consistent and statistically meaningful approach to determine the location and extent of any contamination contained in candidate fill materials. Statistically rigorous sampling approaches exist, e.g., systematic grid system (Gilbert 1982), over sampling and compositing (Skalski and Thomas 1984) and are used routinely to survey sites for buried waste, yet no such approach is recommended in the POS Soil Fill Acceptance Criteria. While such an approach need not be undertaken at State-certified barrow pits, they should be required at all sites like the First Avenue Bridge and Hamm Creek where contamination is known to occur. In light of not providing consistent and statistically meaningful guidance to the POS consultants (and other factors), there is no basis for the October 20, 2000-letter's assessment of the POS Soil Fill Acceptance Criteria document (see the next to the last paragraph of the letter) to the effect that "this (document) was developed to insure a level of quality control on soil delivered on site."

Reviewing the various sediment characterization reports or phase I or II environmental assessments for lands from which soils were <u>already</u> accepted by the POS indicates the significance of this problem. As an example, let's look at the 85,000 CY of soil from the First Avenue Bridge accepted by the POS from the Washington Department of Transportation (WDOT) in the Second Quarter 2000 (see letter from Paul Agid, POS, to Chung Yee, WDOE, dated July 27, 2000). It turns out that initially only five samples were analyzed for petroleum contamination and potentially toxic metals (see letter from Tom Madden, WDOT, to Beth Clark, POS Environmental Section, dated Nov.29, 1999).

Significantly, one of those samples revealed total petroleum hydrocarbons (TPH) exceeding the Method A Soil Cleanup Level of 200 mg/Kg (actual value was 870 mg/Kg). The consultant then collected only three additional samples to delineate the apparent hotspot. These samples also contained TPH in excess of the Method A Standard but no other samples were collected. Even though the hot spot was not fully delineated, the vast majority of the soil was accepted and transferred to the POS. Some (an unspecified amount) was set aside for future testing. Eighty-five thousand cubic yards (85,000 CY), then, were accepted on the basis of only four samples. In this case, the consultants are remiss for not fully delineating the hotspot found in the initial round of sampling. Because they did not follow a systematic sampling approach and collected so few samples, they also could not guarantee that other hotspots didn't exist and go undetected.

The POS also accepted 80,000 CY of sediments removed from Hamm Creek on the basis of only two samples (see letter from Elizabeth Clark, POS, to Roger Nye, WDOE, dated Feb. 4, 2000). Four samples were actually collected but composited down to two samples prior to chemical analyses. In a Memorandum to Paul Agid, POS, from Beth Doan, USACOE, dated March 24, 1999, a caveat is included that "indicates the samples were composited over large areas and depths, and that there is a potential for hotspots to go undetected." Although the POS's Mr. Agid has since written to the WDOE downplaying contamination concerns, this communication from USACOE, "purveyor" of the Hamm Creek fill warning of "hotspots", raises the question of how quality control (environmental safety) of the soil delivered on site can be assured if scientifically representative samples were not tested? In the case of the Hamm Creek dredge spoils from a known contaminated site, how can anyone assure the quality of 80,000 CY on the basis of only two composited, four total, samples?

Some Stockpiled Fill is Chemically Contaminated

The claim on the second page of the October 20, 2000-letter (paragraph one) that even though "some of the fill (Hamm Creek sediments) was found to exceed Puget Sound Dredged Disposal Analysis (PSDDA) screening levels for things such as PCBs and DDT, this is not relevant" is scientifically unsupportable. To the contrary, demonstrating that PCBs and DDT occurred in Hamm Creek sediments at 160 and 14 ug/Kg, respectively, is, indeed, relevant to assessing the potential ecological risks associated with the use of Hamm Creek sediments at STIA. These results are particularly relevant since there is considerable uncertainty as to the actual quantities of PCBs, DDT, and other chemicals contained in the Hamm Creek sediments. So very little of the candidate dredged material for placement at STIA was analyzed (only four samples were analyzed by the USACOE from 80,000 CY dredged from Hamm Creek), and no follow-up study was undertaken to determine the mobility and bioavailability of PCBs and DDT known to contaminate these materials. An additional 10,000 CY of candidate fill material from Hamm Creek were not even analyzed by the USACOE. Presumably, these sediments were included in the 80,000 CY transferred to the POS from the USACOE in 1999.

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In the Doan Memorandum, which I referred to earlier, it is not probative of anything that Boeing (1990) also tested the Hamm Creek sediments but didn't detect either PCBs or DDT. It seems that, in spite of the fact that the two sets of analyses produced significantly different results, the POS still accepted these materials for use in their third runway embankment. At minimum, the disparity in results should have triggered additional sampling to determine which results were correct.

While the POS states that they used the results of both the Boeing and USACOE studies to certify the Hamm Creek sediments (see letter from Paul Agid, POS, to Ray Hellwig, WDOE, dated Sept. 15, 2000), the POS appears to have relied more on the Boeing data. This despite the Boeing study being completed in1990, and being undertaken for a purpose other than screening candidate fill materials for the Third Runway at STIA. The Boeing study was designed and conducted as a Phase II Environmental Assessment in anticipation of a property transfer. In my opinion, the Boeing study is significantly out of date and only increases the uncertainty with which the chemical content of the Hamm Creek fill materials can be viewed. Concentrations of chemicals in wetland sediments at the Hamm Creek Restoration Project site could have increased appreciably in 10 years, attributable to transport and deposition by both tidal currents and annual flooding of the Duwamish River. Concentrations of chemicals in upland deposited (dredged) sediments at the Hamm Creek Restoration Project site also could have increased over this time period due to unauthorized dumping and runoff from West Marginal Way.

There are other problems in using the results of the Boeing study to certify the Hamm Creek sediments. The locations sampled by Boeing in their 1990 survey are not the same as the locations sampled by the USACOE in 1997. The detection limits for most chemicals analyzed by Boeing's chemists in 1990 were also higher than the detection limits for the chemicals analyzed by the USACOE chemists in 1997 (see letter from Paul Agid to Ray Hellwig, WDOE, dated Sept. 15, 2000). As well, the method of compositing sediment samples employed in the Boeing study could have diluted contaminated sediments with clean sediment, so that concentrations of chemicals in composited samples, those chemically analyzed, fell below applicable chemical detection limits. Any one, two, or all three explanations, might account for Boeing's failure to detect PCBs and DDT in Hamm Creek sediments, which is the key difference between the Boeing and USACOE studies, and which increases the uncertainty associated with the Boeing results.

In my opinion, the two studies do not complement each other, and beg the question, why wasn't a third, independent, sediment survey undertaken. Actually, neither study is competent to determine the quantities of chemical residues in Hamm Creek sediments because neither study was undertaken for the expressed purpose of screening sediments for the Third Runway. And for the above reasons, if we were to rely on only one study, it would not be the Boeing study.

Thank you for the opportunity to comment on this important issue. Because the USEPA's October 20, 2000-letter will undoubtedly be cited by some as indicating that the POS's acceptance of fill has a "clean bill of health" it is important that the USEPA take the time to consider the matter in greater depth. Therefore, I would appreciate the opportunity to meet with you and your staff to discuss the issue further.

Yours very truly,

John A. Strand

John A. strand, Ph.D.
Principal Biologist

Attachment: *Curriculum Vitae*

cc: Nancy Brennan-Dubbs
Peter Eglick
Jonathan Freedman
Ralph Graves
Ray Hellwig
Gary Jackson
Anne Kenny
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Kitty Nelson
Tom Sibley
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Gordon White
Greg Wingard
files

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EXHIBIT F

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February 16, 2001

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ATTN: Ann Kenny, Environmental Specialist

Subj: Determining Whether the U.S. Army Corps of Engineers (USACOE) Has a Scientifically Adequate Basis to Issue a Permit, Under the Clean Water Act (CWA) Section 404, for the Port of Seattle's (Ports) Project Proposed in the Second Revised Public Notice No. 1996-4-02325.

Dear Mr. Freedman and Ms. Kenny:

On behalf of the Airport Communities Coalition (ACC), I have undertaken a review and evaluation of pertinent and readily available literature in an effort to answer the subject question. It is the USACOE's responsibility under the CWA to assure the public that the Port's proposed project will not harm the wetlands, surface waters, and fishery resources inhabiting the project site. The latter includes concern for chinook salmon, a federally threatened species in Puget Sound, known to frequent the estuarine reaches of streams that are affected by the Port's project In undertaking this effort, I have relied on my relevant education, specialized training, and professional skills acquired over a 25-year career (post Ph.D.) as a fisheries biologist (see attached Curriculum Vitae).

I am concerned that the Port's declared future construction and operation will harm area fish and fish habitat in the proposed project area. There also is evidence that the Port's current operations already impact the fishery resources in project streams. Although disturbed, the project streams (Miller Creek, Walker Creek, Des Moines Creek) still support a diverse and abundant fish fauna and are worthy of protection. Both coho and chum salmon are known to spawn and rear in the Miller Creek, Walker Creek, and Des Moines Creek Watersheds (Hillman et al. 1999). Chinook salmon frequent the outfalls of Miller and Des Moines Creeks in Puget Sound during their outmigration (Parametrix 2000a). Both watersheds are also exploited by resident cutthroat trout (Parametrix 2000a); Miller Creek may include an anadromous race of cutthroat trout. Warm water fish species including yellow perch, black crappie, large mouth bass, and pumpkinseed sunfish have been found in the upper reaches of both watersheds (Parametrix 2000a). Prickly sculpin, three-spined stickleback, and crayfish also occur throughout each watershed (Parametrix 2000a).

I approached this evaluation by first assessing the effects on fish and fish habitat of the proposed relocation of Miller Creek and associated instream enhancements. I next addressed the concern that fill already stockpiled at Seattle-Tacoma International Airport (STIA) to build a third runway is chemically contaminated and poses a risk for area streams, wetlands, and aquifers. Additionally, I determined whether water quality in surface waters near STIA is being degraded by stormwater runoff from the Port's ongoing operations at STIA. I addressed both historical and present conditions. I also looked at the Port's preferred alternative to augment flow in Des Moines Creek using Seattle Public Utility (SPU) water. I next looked at whether or not conditions in the receiving waters might improve following the subsequent installation and operation of proposed stormwater detention facilities downstream of the STIA. In a related assessment, I addressed possible low stream flows in summer and their associated impacts. Finally, I determined if the Port has addressed the potential cumulative impacts of the proposed construction projects.

My opinions in this matter are based primarily on reviewing the many assessments of impact prepared by the Port in support of their Section 404 Clean Water Act Permit Application. I evaluated each assessment by answering three questions: 1) did the Port or their consultant present the most appropriate information, 2) was the information complete and credible, and 3) was the information properly analyzed and interpreted? I also reviewed and included applicable citations from the scientific literature when the need arose. My conclusions and the detailed evaluations on which they are based can be found in the succeeding sections:

Conclusions

In my opinion, for the following reasons, the Port has not provided sufficient information to enable the USACOE to conclude, on a scientifically defensible basis, that current operation and declared future construction and operation will not harm area wetlands, streams, and fisheries resources in the project area.

- All impacts on fish and fish habitat from the proposed relocation of Miller Creek have not been addressed. Notable omissions include the likely impacts of elevated temperatures and lowered dissolved oxygen (DO) concentrations that will occur following construction because of insufficient shading and the failure to achieve design minimum flow depths in the stream channel during summer low flow conditions. This would likely displace fish to other reaches of Miller Creek and lead to fish stranding and mortality. The addition of spawning gravels without providing interstitial fine materials (sand and silt) could intermittently eliminate surface flow during summer low flow conditions, also increasing the likelihood of fish stranding and mortality. The rerouted Miller Creek could be vulnerable to additional dewatering due to its location over peat on the former Vacca Farm.

- The Port's Soil Acceptance Criteria remain seriously flawed and do not preclude the acceptance of chemically contaminated fill. There is evidence that fill, e.g., Hamm Creek Restoration Project sediments, already stockpiled at STIA, contains residual chemicals (PCBs, and DDT) that have the potential to percolate through the fill pile to groundwater, ultimately contaminating area wetlands and streams. Model Toxics Control Act (MTCA) Soil Cleanup Levels are not appropriately used as the criteria to screen soil for use in building the third runway.

- Violations of toxic substances (water quality) criteria in Miller Creek and Des Moines Creek, particularly for copper and zinc, occur as a result of stormwater discharged at STIA, and will continue, and potentially worsen as a result of the Port's proposed project. These violations occurred historically and occur currently. While the distances downstream in each stream where impacts still occur are not known, protection of resident and anadromous fish species, including federally threatened Chinook, known to occur at the mouths of project streams, require that the Port conduct transport, fate, and effects modeling of metals and other chemicals in their stormwater. This should be required before a decision on the Port's proposed project is made. The Port must also address the need for additional waste treatment beyond what has been proposed.

- The potential effects of de-icers in stormwater discharged to area surface waters cannot reasonably be quantified and assessed without collecting additional information and conducting toxicity tests during de-icing events. The data available to date and the scope of the proposed third runway project suggest that such effects will be harmful and have not been adequately addressed by the Port

- The proposed modification for the Port's *National Pollution Discharge Elimination System Waste Discharge Permit* does little to safeguard fish and other aquatic life in Miller Creek and Des Moines Creek, as each receives significant volumes of stormwater from the STIA. There is no requirement to sample stormwater above and below each outfall, nor is there a requirement to model the transport and fate of key chemicals contained in stormwater. By continuing to report the concentrations of chemicals and conventionals at each outfall prior to their discharge, the Port can maintain their claim that stormwater from STIA is no worst than what occurs in other urban areas, and has no effect on the aquatic life in Miller and Des Moines Creeks. The Port persists in this view without regard to whether or not their discharges, including those from the proposed third runway project, are degrading and will continue to degrade the water quality of project streams.

- The Port has offered several different flow augmentation plans for Des Moines Creek but has indicated that use of Seattle Public Utility (SPU) water is the preferred alternative. While the Port has decided to dechlorinate SPU water using sodium sulfate, the Port has neither assessed the efficacy of this treatment method nor the fate of chlorinated by-products that will surely form in Des Moines Creek if SPU water is used for augmentation. The Port's assertion that removal of chlorine is the only treatment required has not changed and remains inaccurate. Fluoride residual also found in SPU water can have both lethal and sublethal effects on fish and other aquatic life and may not be easily reduced to harmless levels employing current waste treatment technology. The Port should be required to model the transport, fate, and potential effects of chlorine residuals and fluoride over the greater length of Des Moines Creek including its outfall to Puget Sound. Only then can the Port provide reasonable assurance that the use of SPU water will not harm fish and other aquatic life inhabiting Des Moines Creek, including chinook salmon, a federally listed species, that occurs at the creek mouth during outmigration.

- New stormwater discharges on Miller Creek are not evaluated for their potential to cause increased local scouring that would diminish the quality of habitat for fish and other aquatic species. There also is no specific assessment of potential impacts on fish or fish habitat from either the construction or the operation of the proposed stormwater retention facilities.

- Flow reductions in project streams as a result of proposed airport construction and operation have not been established with any degree of certainty. Simulations conducted by the Port may underestimate summer low flow impacts and overestimate the contributions of proposed mitigation and natural mitigating factors. If flow in either project stream falls below 1.0 cfs, depth and wetted area will be reduced, resulting in increased temperatures and lowered DO tensions. Fish movement could be limited and conceivably lead to fish stranding and mortality of larger fish. While we don't know if these impacts will occur, neither does the Port because of flawed simulation modeling. The Port must review and revise their analyses as necessary, decreasing the uncertainty with which their results are presently viewed.

- Each of the proposed construction projects, as presently described and assessed, stand alone and are not evaluated for their overall (cumulative impact) on the aquatic resources of Miller Creek and Des Moines Creek. Aquatic ecological risk assessment could be used to characterize the cumulative risks from exposure of fish and other aquatic life to multiple chemicals and altered water quality factors.

The detailed evaluations on which the above conclusions are based are found in the following sections.

Miller Creek Relocation and Associated Instream Enhancements Do Not Protect Fishery Resources

The impacts on fish habitat of relocating Miller Creek are not even addressed by the Port. Clearly, relocation of Miller Creek will result in nearly total elimination of the fish and invertebrate communities presently found in the 980-feet of Miller Creek to be filled accommodating the embankment of the runway. The Port is remiss for not addressing the magnitude of this impact and instead, would rather dazzle us with their suggestion that the relocated Miller Creek, complete with new riffles, pools, and replacement of woody debris, will provide a net gain in fish habitat. It could be years before the relocated creek will attain the level of production achieved presently, assuming that the Port knows what level of fish production presently occurs. Unfortunately, neither the Port nor its consultants have recently undertaken a quantitative fishery survey in Miller Creek.

As described in the Natural Resource Mitigation Plan (NRMP) (Parametrix 1999) and the Joint Aquatic Resources Permit Application (JARPA) (Parametrix 2000b), the physical design (stream gradient, channel depth, size of gravel, placement of large woody debris, etc.) of the 980-foot Miller Creek Relocation Project is based on habitat requirements for cutthroat trout. The planned features include: shading with native plants to minimize temperature increases during the summer; higher velocity riffles to maintain oxygen levels and reduce sedimentation; and the placement of logs, rocks, and other structures to provide refuge.

While the proposed design appears to incorporate habitat requirements of cutthroat trout, the descriptions of the project found in both the NRMP (Parametrix 1999) and the JARPA (Parametrix 2000b) do not include scientific citations (references) in support of the proposed design standards. Also, no scientific data or calculations are provided to assure the scientific reviewer that the proposed design does, in fact, meet requirements for cutthroat trout, yet the scientific literature is replete with this information (Moore and Gregory 1988; Heggenes et al. 1991; Hall et al. 1997; Rosenfeld et al. 2000). In evaluating the proposed project design, I am left with the impression that I should simply "trust them to do the right thing." I must ask whose (which scientist's) fish habitat design standards are we using? This design was based on someone's studies, done where? Has this particular design been used elsewhere? Did it work? What were the shortcomings? How was this design changed to accommodate local features?

Clearly, there are elements of the proposed design that are suspect. For example, if Parametrix implements the design for relocating Miller Creek as presently conceived, summer water temperatures in the relocated reach will likely exceed the preferred summer maximums for cutthroat (Hall et al. 1997) and other species for several years following construction, and perhaps longer. Oxygen concentrations also will likely be depressed. In my opinion, it will take at least three to five years, perhaps longer, for riparian vegetation to grow tall enough to provide any meaningful shading (canopy) in this reach of Miller Creek, even if the introduced native shrubs and trees all survive and achieve average growth each season. As a result, cutthroat and other aquatic life will likely be displaced to other reaches of the stream where temperature and oxygen meet their preferences or tolerances. This condition could exist each summer for a few years or for a longer period of time, until the riparian vegetation grows tall enough to establish a functional stream canopy.

There also will likely be a problem achieving the performance standard of a minimum flow depth of 0.25 feet for the stream channel during 0.5-cfs summer low flow conditions (see page 5-4 of the NRMP [Parametrix 1999]). Mr. William Rozeboom of Northwest Hydraulic Consultants, Seattle, Washington (personal communication, November 2000), indicates that the NRMP documents do not include hydraulic calculations to determine whether or not the proposed low-flow channel would maintain the stated goal of a minimum 0.25 feet in depth at a 0.5-cfs flow rate. In the absence of such data, Mr. Rozeboom performed his own analyses of hydraulic characteristics presented on pages 5-7 and 5-9 of the NRMP (Parametrix 1999) for the proposed 6-inch deep low-flow channel, assuming a Manning "n" roughness value of 0.035, an average bed slope of 0.22%, and bed and top widths of 6 feet and 8 feet, respectively. Mr. Rozeboom determined that these hydraulic data presented in the NRMP would indicate a normal flow of about 0.15 feet for a flow of 0.5 cfs. He also determined that if pool and riffle conditions developed in the proposed channel geometry, the critical-flow depth of flow in 6-foot wide riffle sections (such as over the 6-foot wide notches in the weir logs) would be about 0.06 feet.

Mr. Rozeboom identified another feature of the proposed construction that could cause even lower depths of summer-period flow and a risk of the stream going dry through portions of the reconstructed reach. This risk comes from the proposal to shape a 6-inch deep low-flow channel on a 32-foot wide, two-foot thick "bed" of spawning gravels, which is to overlay a geotextile fabric that isolates the gravel from the underlying native soils. The spawning gravels are to consist of pebbles ranging from about 0.2 inches in diameter to 1.5 inches in diameter (see page 42 of Revised Implementation Addendum, NRMP [Parametrix, 2000c]). In Mr. Rozeboom's opinion, without interstitial fine materials (sand and silt), these gravels will have a high porosity and a correspondingly high capacity to convey (allow) subsurface flow. It was Mr. Rozeboom's opinion that this high subsurface flow capacity is likely to reduce, and might intermittently eliminate, surface flow through the relocated and reconstructed reach.

Mr. Rozeboom's findings indicate that the 0.5-foot minimum flow depth will not be maintained under summer low-flow conditions. Failure to achieve the design minimum flow depth supports my opinion that summer water temperatures in the stream could exceed preferred summer maximums for cutthroat trout (Hall et al. 1997) and other aquatic species. A reduction in depth to 0.15 feet in the relocated main channel and 0.06 feet in riffles could also limit movement of all but the smallest fish throughout the relocated reach and conceivably lead to stranding and mortality of larger fish. Use of spawning gravels without interstitial fine materials (sand and silt) to prevent subsurface flow could increase the potential for thermal stress and stranding.

Dyanne Sheldon of Sheldon & Associates, Inc., Seattle Washington (also working on behalf of ACC and submitting comments) suggests that the rerouted Miller Creek will be vulnerable to additional dewatering because the relocated stream bed will be located over peat on the former Vacca Farm. Ms. Sheldon indicates that this is the reason Parametrix proposed a geotextile liner. Peat does not allow for the creation of a stream channel with gravel substrates. If a liner wasn't used, the water would simply disappear into the peat until the peat became saturated, at which time, a pond would be formed.

Ms. Sheldon goes on to say that where this design was used previously (North Creek) to create a stream channel and floodplain wetlands, again over peat, "the weight of gravel, rocks, woody debris, plus the water on a fabric liner caused the peats in the floodplain wetland to rebound to approximately 18 inches higher in elevation than it was designed." She also says that the geotextile fabric will leak where cables attached to large woody debris pierce the fabric and are anchored to the substrate. If Ms. Sheldon is right, there is no reason to think that the proposed mitigation project will be successful.

The proposed instream enhancement projects, of which there are four, are located south of the former Vacca Farm on Miller Creek and include removing man-made structures (weirs, footbridges, driveways, riprap, and old tires), restoring the natural flow of the stream, and introducing large woody debris to the new stream channel.

For the most part, the Port's proposal to remove man-made structures (weirs, footbridges, driveways, riprap, and old tires) is appropriate for improving fish habitat in Miller Creek. At issue, however, is whether or not the overall project and, in particular, what is installed in lieu of man-made structures to stabilize the bank will be a net enhancement and, will remain during storm events. According to the 1999 NRMP (page 5-63), the existing condition of the mitigation site is characterized by riparian vegetation that consists primarily of lawns and some trees, which "does not provide shade, bank stabilization, or habitat complexity." Under existing conditions, the banks are stabilized by introduced measures including tire riprap that is proposed for removal as an instream enhancement project. Since the existing riparian vegetation is incapable of providing bank stabilization, it follows that removal of the existing bank protection works will cause an increase in bank erosion and stream sediment for whatever period it takes for stabilizing riparian vegetation to develop. The local turbulence caused by the proposed introduction of large woody debris to the channel will likely cause additional bank erosion and stream sediment loading during the period it takes for the stream channel to reach a new equilibrium.

The NRMP (Parametrix 1999) recognizes the need to implement erosion control measures to stabilize eroding banks but does not identify which specific measures would be employed, nor examine whether or not the measures would be effective. Table 5.2-6 (pg 5-64) referenced by the plan on page 5-71 does not provide proposed mitigation projects and appears to be cited in error.

In my opinion, what this means is that fish will try to make a living in a less fish-friendly environment, at least in the short-term. Miller Creek, as a result of storm-induced changes, will not likely meet cutthroat requirements (Hall et al. 1997). This could go on for years until the stream stabilizes and establishes a more or less permanent meander. As a consequence, it is likely that follow-up restoration will be required and that the stream will have to be monitored routinely.

Third Runway Fill Stockpile Contains Potentially Harmful Chemicals that Could Impact Wetlands, Surface Waters, and Fishery Resources at the Project Site

I have found nothing in my reading of the new Section 404 application materials that suggests the Port has adopted new and improved *Soil Fill Acceptance Criteria*. My concern is that chemical contaminants associated with fill materials at the fill placement site have the potential (if not the probability) to percolate through the fill pile to groundwater, ultimately contaminating wetlands and surface water that may be connected to the groundwater stream (see letters to Tom Luster, Washington Department of Ecology (WDOE), on August 31, 2000, and to Charles Findley, U.S. Environmental Protection Agency (USEPA), on December 19, 2000). Chemicals in the fill would also have the potential to directly contaminate wetlands and surface waters through runoff following seasonal rains.

At issue is the appropriateness of the Port's Soil Fill Acceptance Criteria, with particular interest in the process employed to certify that fill accepted by the Port is free of chemical contamination. Also at issue is whether or not fill already stockpiled is contaminated, constituting a risk for area streams, wetlands, and aquifers.

The fundamental purpose of MTCA and the MTCA Method A Soil Cleanup Levels is to clean up existing contaminated or hazardous waste sites. The law sets reasonable standards for the amount of toxic material that can be left in a contaminated site. This standard also recognizes that there is a certain level below which it is not practical or feasible to clean. These standards do not, nor have they ever, allowed the <u>contamination of clean property</u> up to some predetermined level. Further, the absence of a particular standard to screen soils for uplands placement does not excuse adopting one that is very likely to cause environmental harm. To the best of my knowledge, the STIA property where the fill is being placed was free of contamination prior to any fill placement. MTCA does not apply and should not be used for the purpose of screening soils or sediments for use on the STIA Third Runway Fill Project.

Among a number of requirements, the Port's Soil Fill Acceptance Criteria are supposed to preclude chemical contamination. However, they are fundamentally flawed in their lack of a consistent and statistically meaningful approach to determine the location and extent of any contamination contained in candidate fill materials. Statistically rigorous sampling approaches exist, e.g., systematic grid system (Gilbert 1982), over sampling and compositing (Skalski and Thomas 1984) and are used routinely to survey sites for buried waste, yet no such approach is adopted in the Port's Soil Fill Acceptance Criteria. While such an approach need not be undertaken at State-certified barrow pits, they should be required at all sites like the First Avenue Bridge and Hamm Creek where contamination is known to occur.

Reviewing the various sediment characterization reports or phase I or II environmental assessments for lands from which soils were already accepted by the Port indicates the significance of this problem. As an example, let's look at the 85,000 CY of soil from the First Avenue Bridge accepted by the Port from the Washington Department of Transportation (WDOT) in the Second Quarter 2000 (see letter from Paul Agid, Port, to Chung Yee, WDOE, dated July 27, 2000). It turns out that initially only five samples were analyzed for petroleum contamination and potentially toxic metals (see letter from Tom Madden, WDOT, to Beth Clark, Port, dated Nov.29, 1999). Significantly, one of those samples revealed total petroleum hydrocarbons (TPH) exceeding the Method A Soil Cleanup Level of 200 mg/Kg (actual value was 870 mg/Kg). The consultant then collected only three additional samples to delineate the apparent hotspot. These samples also contained TPH in excess of the Method A Standard but no other samples were collected. Even though the hot spot was not fully delineated, the vast majority of the soil was accepted and transferred to the Port. Some (an unspecified amount) was set aside for future testing. Eighty-five thousand cubic yards (85,000 CY), then, were accepted on the basis of only four samples. In this case, the Port is remiss for not fully delineating the hotspot found in the initial round of sampling. Because they did not follow a systematic sampling approach and collected so few samples, they also could not guarantee that other hotspots didn't exist and go undetected.

The Port also accepted 80,000 CY of sediments removed from Hamm Creek on the basis of only two samples (see letter from Elizabeth Clark, Port, to Roger Nye, WDOE, dated Feb. 4, 2000). Four samples were actually collected but composited down to two samples prior to chemical analyses. In a Memorandum to Paul Agid, Port, from Beth Doan, USACOE, dated March 24, 1999, a caveat is included that "indicates the samples were composited over large areas and depths, and that there is a potential for hotspots to go undetected." Although the Port's Mr. Agid has since written to the WDOE downplaying contamination concerns, this communication from USACOE, "purveyor" of the Hamm Creek fill warning of "hotspots", raises the question of how quality control (environmental safety) of the soil delivered on site can be assured if scientifically representative samples were not tested? In the case of the Hamm Creek dredge spoils from a known contaminated site, how can anyone assure the quality of 80,000 CY deposited on the airport site on the basis of only two composited, four total, samples?

In fact, it is likely that fill materials already stockpiled by Port are contaminated. The results of analyses of Hamm Creek sediments summarized in the Memorandum from Beth Doan to Paul Agid dated March 24,1999, show that the two composited samples analyzed were found to contain PCBs and DDT at 160 and 14 ug/Kg, respectively.

Sediments from the Hamm Creek site also failed follow-up bioassays indicating they were toxic to aquatic life, and could be toxic to aquatic life again, if they entered streams on the project site with runoff. Because so very little of the candidate dredged material for placement at STIA was analyzed (only four samples were analyzed by the USACOE from 80,000 CY dredged from Hamm Creek), there is considerable uncertainty as to the actual quantities of PCBs and DDT, and other chemicals contained in Hamm Creek sediments. Efforts to better understand the mobility, bioavailability, and toxicity of the PCBs and DDT known to contaminate these materials should have been undertaken. An additional 10,000 CY of candidate fill material from Hamm Creek were not even analyzed by the USACOE. Presumably, these sediments were included in the 80,000 CY transferred to the Port from the USACOE in 1999.

While the Port states that they used the results of both USACOE (1997) and later Boeing studies (1990) to certify the Hamm Creek sediments (see letter from Paul Agid, Port of Seattle, to Ray Hellwig, WDOE, dated Sept. 15, 2000), the Port appears to have relied more on the decade-old Boeing data. The Boeing study was completed in 1990 and was undertaken for a purpose other than screening candidate fill materials for the Third Runway at STIA. The Boeing study was designed and conducted as a Phase II Environmental Assessment in anticipation of a property transfer. In my opinion, the Boeing study is significantly out of date and only increases the uncertainty with which the chemical content of the Hamm Creek fill materials can be viewed. Concentrations of chemicals in wetland sediments at the Hamm Creek Restoration Project site could have increased appreciably in 10 years, attributable to transport and deposition by both tidal currents and annual flooding of the Duwamish River. Concentrations of chemicals in upland deposited (dredged) sediments at the Hamm Creek Restoration Project site also could have increased over this time period due to unauthorized dumping and runoff from West Marginal Way.

There are other problems in using the results of the Boeing study to certify the Hamm Creek sediments. The locations sampled by Boeing in their 1990 survey are not the same as the locations sampled by the USACOE in 1997. The detection limits for most chemicals analyzed by Boeing's chemists in 1990 were also higher than the detection limits for the chemicals analyzed by the USACOE chemists in 1997 (see letter from Paul Agid to Ray Hellwig, WDOE, dated Sept. 15, 2000). As well, the method of compositing sediment samples employed in the Boeing study could have diluted contaminated sediments with clean sediment, so that concentrations of chemicals in composited samples, those chemically analyzed, fell below applicable chemical detection limits. Any one, two, or all three explanations, might account for Boeing's failure to detect PCBs and DDT in Hamm Creek sediments, which is the key difference between the older Boeing and more recent USACOE studies, and which increases the uncertainty associated with the Boeing results.

For the above reasons, if we were to rely on only one study, it would <u>not</u> be the Boeing study. Further, in my opinion, the two studies do not complement each other, and beg the question, why wasn't a third, independent, sediment survey undertaken. Neither existing study was undertaken for the expressed purpose of screening sediments for the Third Runway. Clearly, such a study should have been undertaken.

There is evidence that fill, e.g., Hamm Creek Restoration Project sediments, already stockpiled at STIA, contains residual chemicals (PCBs, and DDT). This suggests that other fill materials stockpiled by the Port could also be contaminated. The MTCA Soil Cleanup Levels are not appropriately used as the criteria to screen soil for use in building the third runway. As a consequence, the Port's Soil Acceptance Criteria are seriously flawed and do not afford natural resources much protection from chemicals up to the MTCA Soil Cleanup Levels.

Metals Exceedences of State of Washington Toxic Substances Criteria Will Continue and Potentially Worsen if the Port's Proposed Project Is Approved

While there are several constituents (metals, fecal coliforms, turbidity) associated with STIA stormwater in Miller and Des Moines Creeks that have historically violated State of Washington Water Quality (Toxic Substances) Criteria (Chapter 173-201A WAC), the metals copper and zinc are of particular concern given their designation as toxic substances. In both creeks, the Port has presented metals data for stations at the STIA stormwater outfalls, upstream of the outfalls, and downstream of the outfalls.

Data presented by the Port (1997) indicated that concentrations of both copper and zinc in STIA stormwater discharges greatly exceeded applicable State/U.S. Environmental Protection Agency (EPA) Toxic Substances Criteria, in some instances by more than an order of magnitude. For example at the stormwater outfall to Miller Creek (see 1997 report page 35), total copper concentrations ranged from 4.2-82.9 ug/L. The EPA criterion is 4.4 ug/L. The Port's 1997 data also indicated that concentrations (4.7-14.8 ug/L) of total copper upstream of STIA were at or slightly exceeded the EPA metals criteria. That Miller Creek was unable to assimilate the STIA discharges, however, is confirmed by downstream sampling data showing total copper concentrations of 0.72-44 ug/L. For zinc in Miller Creek, the values at the outfall, upstream, and downstream were 15-525 ug/L, 37-69 ug/L, and 2.3-295 ug/L., respectively, again showing that the influence of zinc additions at the outfall persisted downstream. The EPA criterion for zinc is 33.7 ug/L.

The concentrations of copper and zinc downstream exceeded the applicable Toxic Substances Criteria. The Port's 1997 Report does not provide evidence that would support a scientifically valid conclusion that STIA does not impact Miller and Des Moines Creeks downstream of their respective stormwater outfalls. Persistence of an influence of stormwater downstream, and at the magnitudes illustrated above, also suggests the need for treatment of the waste streams before discharge to project streams.

Data presented by the Port in 1999 confirm that exceedences of toxic metals criteria continue to occur at the Port's stormwater outfalls to the creeks. In addition, the downstream stations, where sampled, show that the influences of STIA stormwater discharges persist in the receiving waters. What appears missing in the 1999 report, however, is any indication that the Port sampled upstream of STIA. The Port's failure to maintain the original sampling protocol in this regard greatly diminishes the value of their stormwater-monitoring program.

Unknown is how far downstream the impacts of copper and zinc occur in Miller Creek and Des Moines Creek. Unfortunately, the Port makes no effort to model the fate of their stormwater. Although much dependent upon the volumes of stormwater discharged, it is my opinion that potentially harmful concentrations of copper and zinc in stormwater could persist over the entire length of each creek, to their outfalls. Both resident and anadromous fish inhabiting Des Moines Creek and Miller Creek are vulnerable, including juvenile chinook, a federally threatened species, that occurs at the mouths of both creeks during outmigration.

The Port has failed to demonstrate that STIA stormwater does not adversely impact the water quality of Miller and Des Moines Creeks. The Port's own sampling data confirms that STIA stormwater greatly contributes to exceedences of toxic metals criteria in the receiving waters. The Port also cannot say that conditions in the project streams will not worsen if the project is approved. The addition of new impervious area will increase the volume of stormwater discharged to project streams and also increase the quantities of metals and other chemicals contained in stormwater that is discharged to project streams. While flow mitigation as proposed by the Port will decrease the effects of sediments and sediment bound metals and other chemicals, flow mitigation will do less to decrease the concentrations of metals and other chemicals that are already in solution; that have already partitioned to the aqueous phase. The Port's reminder on page 22 of their 1999 report that the Water Quality Standards (Toxic Substances Criteria) apply to receiving waters and not the discharges from their outfalls also is of little consequence if the Port fails to present data from both above and below their outfalls, over the greater length of each stream.

More recently (1999), Cosmopolitan Engineering Group (Cosmopolitan) reported the results of metals analyses at the Port's STIA outfalls (see Table 15, page 6-2). They indicated that the only metal to exceed historical highs was lead at 0.010 ug/L but this concentration did not exceed the receiving Water Quality (Toxic Substances) Criteria for lead of 0.032 mg/L (calculated at 56 mg/L total hardness). While the information on lead is not particularly important, to not include a parallel interpretation of the copper and zinc levels also reported in Table 15; that is, comparisons of copper and zinc levels to applicable water quality (toxic substances) criteria, is a serious breech of scientific ethics. If the authors did, they would have had to agree that many of the copper and zinc values did exceed their applicable water quality (toxic substances) criteria, e.g. the copper and zinc values for outfall SDN3 adjusted for 33.5 mg/L hardness (Feb-99); the copper and zinc values for outfall SDN4 adjusted for 34.2 mg/L hardness (Dec-98). The point is however, despite the Port's caveat that they should not be held to the applicable Water Quality (Toxic Substances) Criteria in their pipes (at their outfalls), it is intuitive that as the water runs off to the creeks from STIA's outfalls, that for some unspecified but substantial distance downstream of these outfalls, the concentrations of metals will exceed applicable Toxic Substances Criteria.

There is Still Insufficient Information to Say That De-Icers Pose No Risk to Surface Waters as a Result of Their Use at STIA

Activities associated with implementing the Master Plan Update Improvements, if approved, will include adding new impervious surfaces including a third runway, new taxiways and new aircraft parking area. This action to enlarge the airport, in my opinion, will result in greater use of de-icers with the potential for increased runoff of de-icer and anti-icer residues to project streams. De-icers (glycols, acetates) and their additives (sodium nitrite, sodium benzoate, borax, high molecular weight polymers, polyamines, triazoles) (Lokke 1984; MacDonald et al. 1992; Hartwell et al. 1995) are toxic to aquatic life at relatively low concentrations (1.8-8.7 mg/L) (Hartwell et al. 1995). De-icers, as they degrade, also increase biological oxygen demand (BOD) decreasing DO tensions.

Cosmopolitan (1999), during the winter of 1998-1999, studied the potential effects of de-icers (sodium or potassium acetate) on DO in downstream detention ponds (Lake Reba and Northwest Ponds) on Miller Creek and Des Moines Creek, respectively, after two runway deicer events (Dec 19-24, 1998; Feb 8-9, 1999) at STIA. Cosmopolitan's work was stimulated by earlier Port results (1999) that found high BOD in water samples from five stormwater outfalls (SDE4, SDS3, SDN1, SDN3, and SDN4 at STIA), which was attributed to acetate-based runway deicing chemical.

Cosmopolitan determined that trends in DO fluctuated widely over the course of the study but generally followed trends in rainfall. During dry periods, DO decreased to below saturation. Conversely, DO increased during periods of rainfall. De-icing chemicals were also found to pass rapidly through both Miller Creek and Des Moines Creek after rainfall and runoff began following deicing events. Cosmopolitan concluded that DO was not reduced in either Miller Creek or Des Moines Creek as a result of de-icing events.

In my opinion, Cosmopolitan (1999) cannot say unequivocally that the sag in DO, which follows each de-icing event by two weeks, is not due at least in part to the breakdown of de-icer in Northwest Ponds and Lake Reba. What the data in Figures 4 and 5 (pages 4-19, 4-20) indicate is that during dry periods, the BOD increases in response to bacterial decay of organic materials that have accumulated in the sediments of these water bodies during past runoff events. This we should expect. Then when it rains, DO in these water bodies increases due to aeration during runoff. One cannot separate the effects of the de-icer from other organic materials that enter the ponds as runoff, that also will eventually degrade and decay, increasing BOD, and decreasing DO concentrations. Despite Cosmopolitan's conclusion to the contrary, there is evidence of an impact (depression) on DO in Des Moines Creek at the Golf Course Weir following the Feb 8-9, 1999 deicing event (see Figure 4, page 4-19).

Further, de-icer does not pass through the system as quickly as Cosmopolitan suggests. The de-icer material as acetate will become associated (adhere to) soil and sediment particles as it runs off. As it enters the Northwest Ponds and Lake Reba, some or most of it will settle out to the bottom where the organic fraction will degrade and decay. Because it is winter and temperatures are relatively low, bacterial decay will be slow, which suggests that the two-week time lag before the oxygen sag was observed may not be unrealistic.

That sodium or potassium acetate entering the system as runoff is not the only material that can increase conductivity is also not convincing. Cosmopolitan's assertion that conductivity is a good tracer for de-icer chemicals requires further support. The metals Cu, Pb, and Zn, all common to stormwater, also could contribute to higher conductivity. Clearly, metals dynamics as well as the dynamics of de-icers are one and the same with the dynamics that stormwater exhibits.

I agree that rainfall does affect DO concentrations in the Northwest Ponds and in Lake Reba but this does not explain all the variation that is observed in the 1998-1999 data. To determine whether or not de-icing chemicals impact the system (depress DO) would require a better understanding of all the factors affecting DO in the system. Additional events will need to be followed and more data will need to be collected preceding deicing events. Cosmopolitan followed only two deicing events in the Winter 1998-1999. While Cosmopolitan (2000) also studied the potential effects of de-icers on DO concentrations during the Winter 1999-2000, too little deicer entered Northwest Ponds and Lake Reba to contribute much to our understanding of the problem.

Technically speaking, the Port has only begun to address the issues of de-icers. They have not addressed toxicity in any meaningful way, particularly with regard to the additives found in commercially available deicing chemicals. In the absence of toxicity testing during de-icing events, they have not provided information sufficient to eliminate the likelihood de-icers are a substantial detriment to surface water quality as a result of their use at STIA, and would be greater detriment if the third runway were built.

The Port's Proposed Modification to the National Pollution Discharge Elimination System (NPDES) Waste Discharge Permit Still Does Not Safeguard Fish and Other Aquatic Life in Project Area

The proposed NPDES Permit modification still does little to safeguard fish and other aquatic life in Miller Creek or Des Moines Creek, as each receives significant volumes of stormwater from the STIA. Any CWA Section 404 and 401 approvals, which assume that this permit will protect the waters and aquatic resources of project streams, would be flawed. The proposed permit modification changes very little when compared with the existing permit, yet the volume of stormwater will increase, as will the quantities of metals and other chemicals entering the project streams increase, if the Port's project is built.

There is no requirement in the permit to sample stormwater above and below each outfall, nor is there a requirement to model the transport and fate of key chemicals contained in stormwater in each watershed. By continuing to report the concentrations of chemicals and conventionals at each outfall prior to their discharge, the Port can maintain their claim that stormwater from STIA is no worst than what occurs in other urban areas, and that it has no effect on the aquatic life in Miller and Des Moines Creeks.

Des Moines Creek Flow Augmentation Preliminary Design Using SPU Water Still Leaves Too Many Unanswered Questions

While the Port has decided to employ sodium sulfite tablets to dechlorinate SPU water (Kennedy/Jenks 2000); that is, if they implement their preferred alternative, the Port has not presented any data on the efficacy of this treatment approach. With most dechlorination alternatives, there is residual free chlorine that can react with natural humic materials in the receiving waters to form a variety of chlorination by-products. In other words, most dechlorination systems are not 100 percent effective. As I stated in my initial reviews of the Port's plans forwarded to Tom Luster, WDOE, on August 21, 2000, and September 5, 2000, even with dechlorination, there is still a need to access (model) the fate, transport, and potential bioeffects of chlorine and chlorinated by-products with each treatment alternative the Port considers, because chlorine and chlorinated by-products are toxic to fish and other aquatic life at very low levels, i.e., 3-6 ug/L. Only in this way will the public be assured that the trout and salmon in Des Moines Creek will be protected.

The Port's assertion that removal of chlorine is the <u>only</u> treatment required has not changed and remains inaccurate. As I said in my earlier letters to Tom Luster at WDOE, fluoride is also found in SPU water at 1.0 mg/L, which is above the lethal or sublethal toxicity limits for many aquatic species. For example, using data from Angelovic et al. (1961) and Pimental and Bulkley (1983), the LC_{50} (lethal concentration for 50% of the test population) for rainbow trout exposed to sodium fluoride at a hardness of 12 mg/L (typical hardness of Des Moines Creek in wet season) was estimated to be 0.2 mg/L (Foulkes and Anderson 1994). Fluoride was also found to mask olfaction and adversely affect migration in salmonids (chinook and coho salmon) at concentrations < 1.0 mg/L (Damkaer and Dey 1989).

Fluoride also may not be reduced to harmless levels employing current waste treatment technology. Principal fluoride removal methods are precipitation by lime, absorption on activated alumina, or removal by an ion exchange process, all of which are expensive, and may not remove fluoride below 1-2 mg/L level (Liu et al. 1997). This level of efficacy, as determined in my previous assessment, will not be fully protective of fish and other aquatic life.

While the Port has acknowledged that there could be differences in temperature between SPU water and Des Moines Creek water, it only proposes to address the potential effects of different temperatures after flow augmentation begins. The Port's plan "includes monitoring and testing during the first year of operation to determine the effects of various temperature settings on downstream temperatures, and determining optimal augmentation rates to achieve desired results." Clearly, if it proceeds as it says, there could be serious impact (thermal shock to fish and other aquatic life) in Des Moines Creek during the first year of augmentation. The alkalinity and pH will be lower in drinking water when compared with Des Moines Creek and also may have to be adjusted upward to avoid osmotic shock.

The unknown is the extent to which changes in ambient water quality will occur over the length of Des Moines Creek if SPU water is used for augmentation. To address this unknown, the Port will need to complete its application and prior to agency approval, carefully model the transport and fate of chlorine residuals, fluoride, and other water quality parameters, taking into consideration differences in treatment efficacy, flow regime, and rate of augmentation. Only in this way, can the Port provide the agencies with sufficient scientific information to determine whether or not there is reasonable assurance that treated SPU water will not harm fish and other aquatic life, including federally threatened chinook, that occur in Puget Sound at the mouth of Des Moines Creek.

Discharge Velocities of Proposed Stormwater Detention Facilities Not Established

Additional temporary and permanent stormwater detention facilities and outfalls are to be constructed to allegedly mitigate impacts from the proposed third runway construction activities and new, impervious surfaces. Seven temporary ponds, four permanent ponds, and two treatment facilities are to be constructed and operated.

In my opinion, additional point-source discharges to Miller Creek will occur with the possibility of increased local impacts if all the proposed stormwater detention ponds and treatment facilities are built. Below each outfall on the creek, there will be an area of scoured substrate, which will likely increase or decrease in size as a function of discharge velocity. Scoured stream substrate is poor habitat for fish and other aquatic species.

While the Comprehensive Stormwater Management Plan prepared by Parametrix (2000d) includes the volumes and discharge velocities for existing detention facilities on Miller Creek, the discharge velocities for the proposed outfalls are not presented. It is suggested in the Preliminary Comprehensive Stormwater Management Plan (Parametrix 2000d) that flows and water quality from the proposed stormwater detention facilities will meet requirements of King County's Surface Water Design Manual (KCC 9.04) but there is no specific assessment of potential impacts associated with the construction of these facilities. Again I am left with the impression that I should simply "trust them" to build facilities that have little or no adverse impact but without the design data and analysis on which to base that trust.

Low Stream Flow Impacts are Underestimated

There are likely significant problems with the Port's Low Stream Flow Analyses (see Comprehensive Stormwater Management Plan [Parametrix 2000d]) in that the predictions may underestimate summer low flow impacts and overestimate the contributions of proposed mitigation and natural mitigating factors. For example, one option that the Port proposed in mitigation of predicted low stream flows is the use of "additional storage volume in the base of selected detention facilities, that can be used to store winter (wet) season runoff until needed to support low flows in the summer (dry) season." According to Mr. William Rozeboom of Northwest Hydraulic Consultants, Seattle, Washington (also working on behalf of ACC and submitting comments), some of the proposed detention facilities that are to be used in this way do not have "dead storage" capacity for reserve storm water release, with the result the total proposed storage falls short of the target volumes. Mr. Rozeboom also points out that the potential mitigating effect of the "fill infiltration discharge" from the proposed runway embankment to Miller Creek is overestimated, and that the "IWS lagoon lining improvements" would specifically reduce recharge for Walker and Des Moines Creeks. For these reasons and others (see the full text of Mr. Rozeboom's comments), the Port's conclusion indicating that base lows will not be diminished beyond the values presented in Table 5 (page 18) of the Biological Assessment – Supplement (Parametrix 2000) is in serious doubt. Clearly, flow reductions have not been established with any degree of certainty.

Again, we are left with the impression that we should simply "trust" the Port; that their analyses are accurate, and that declared future STIA development will not further diminish flows during the summer (dry) season. From a fish or fish habitat perspective, it is my opinion, that if flows fall below 1.0 cfs, impacts to anadromous as well as resident fish species will likely occur, and over the entire length of the streams on the project site. If flows diminish, depths will surely decrease resulting in elevated temperatures and lower DO tensions. Fish and other mobile aquatic life could be displaced to other reaches of the stream where preferred conditions persist. Diminished flow and depth could also limit movement of fish throughout the stream length and conceivable lead to stranding and mortality of larger fish.

There is increased likelihood that low stream flow impacts on fish and other aquatic life in project streams will occur. Because of flawed simulation modeling, the Port does not possess scientifically credible information to indicate that impacts will not occur. It is incumbent upon the Port to complete its application and prior to agency evaluation revise its analyses as necessary, addressing the issue raised above.

Cumulative Impacts Are Not Assessed

Unfortunately, there is no attempt to link any of the proposed construction projects on either the Miller Creek or Des Moines Creek Watersheds, yet there is potential for cumulative impacts. Each of the proposed construction projects or discharges in their respective watersheds, as presently described and assessed, stand alone and are not evaluated in the context of the overall change that Miller Creek, Walker Creek, or Des Moines Creek will undergo if the Port is permitted to build the third runway. Even if the Port does not believe there will be cumulative impacts, they are remiss for not considering this possibility and providing a rational assessment. Their work must be viewed as incomplete if they do not carry out this assessment.

One approach that could be taken to address the cumulative impacts of chemical additions and altered water quality is to conduct an aquatic ecological risk assessment. New risk characterization procedures are available that are quantitative, probabilistic, and provide community-level estimates for risks, and generate measures of uncertainty in the risk estimates. Estimates of risk for individual chemicals, as well as estimates of the total (cumulative) risk from multiple chemicals or conventional water quality factors can be calculated. What is required for this analysis is knowledge of the different organisms that inhabit the project streams, their toxic response to different chemicals (e.g., lethal dose to 50% of the test population [LD_{50}]), and their exposure (dose) to the same chemicals. One such risk assessment method, *Aquatic Ecological Risk Assessment, A multi-Tiered Approach* (Parkhurst et al. 1996) has recently undergone extensive validation and has been reviewed and accepted by the USEPA. The method performs well with metals, pesticides, other organic chemicals, where the exposure is in water, sediments, or from internally deposited chemical residues.

Thank you for the opportunity to comment on these issues. I am available by phone, email, or in person, to discuss any of my comments in greater detail.

Yours very truly,

John A. Strand, Ph.D.
Principal Biologist

Cc: Kimberly Lockhard
Peter Eglick

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EXHIBIT G

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Subj: Rebuttal to Port of Seattle's (Port) Response to 401/404 Comments, Reference: 1996-4-02325, April 30, 2001

Ref: Letter to Jonathan Freedman and Ann Kenny of February 17, 2001, from John Strand on the Subject of Determining Whether the U.S. Army Corps of Engineers (USACOE) Has a Scientifically Adequate Basis to Issue a Permit, Under the Clean Water Act (CWA) Section 404, for the Port's Project Proposed in the Second Revised Public Notice No. 1996-4-02325.

Dear Ms. Walker, Ms. Terzi, and Ms. Kenny:

The attached supplemental comments rebut certain of the Port's responses to my original letter regarding the proposed Master Plan Update Improvements (MPU) at Seattle-Tacoma International Airport (STIA). In some cases, the Port was totally non-responsive to my concerns, or in the case of the General Responses, the Port only partially addressed my concerns. In yet other cases, the Port was not scientifically correct, was insufficiently clear, or was misleading.

I ask that you consider my rebuttal in your final deliberations on whether or not to grant a Section 401 Certification and Section 404 Permit. My rebuttal follows the same organization as used in my February 16[th] letter. Thank you for the opportunity to again comment on these important issues. I am available by phone, email, or in person to discuss any of my comments in greater detail.

Yours very truly,

John A. Strand, Ph.D.
Principal Biologist

attachment

cc: Peter Eglick
Kimberly Lockard

Attachment

Rebuttal to the Port's Response to 401/404 Comments of April 30, 2001

The Miller Creek Relocation Project and the Issue Whether or Not the Project Design Protects Affected Aquatic Resources

The Port has now included scientific citations in support of the proposed design standards based on habitat requirements for cutthroat trout.

It also appears there is agreement that it will take several or more years before new riparian vegetative growth will improve shading along the relocated reach of Miller Creek (see Response # 1, page III-67). This raises important questions about the effectiveness of the proposed mitigation during critical periods.

The Port has still not satisfactorily addressed the question of whether or not the flow, temperature, and dissolved oxygen (D.O.) will support fish during summer months (see Response #1, see page III-67). The flow in the relocated reach will be lower than the Port states, and summer temperature and D.O. will not meet requirements to sustain cutthroat trout, at least in the short term. Whether or not the relocated reach will support fish in the long term is also in doubt.

There still is fundamental disagreement as to what constitutes an adequate assessment of impacts. The Port's analysis of impacts for this project is inadequate because the Port has not yet undertaken a quantitative survey of fish and other aquatic organisms in this reach of Miller Creek. In other words, the Port has not yet established a baseline condition. This is a critical deficiency because the appropriateness of regulatory approval and mitigation must be assessed, using this baseline, before approval of the proposed project can be granted.

Response # 10 (see page III-68) indicates that impacts of the proposed project are assessed in multiple documents: *Appendix F* of the *Final and Supplemental Environmental Impact Statements, A Stream Survey of Miller Creek, Biological Assessment*, Sect. 3.4.1 in the *Sea-Tac Runway Fill Hydrological Studies, Wetland Delineation Report*, the *Wetland Functional Impact Analysis*, and Sect 2.2.1.1 in the *Natural Resources Mitigation Plan*. This is misleading.

It is true that these reports "describe and evaluate" the subject impacts of the proposed project but not in detail, and not quantitatively for fish and other aquatic life. For example, the *Natural Resource Mitigation Plan* (Parametrix 2000a) in Sect 2.2.1.1 only locates Miller Creek geographically and addresses its stream classification. It is actually Sect. 3 in the *Natural Resource Mitigation Plan* that summarizes impacts associated with the MPU but again it only addresses impacts in a very general way. For example, it says on page 3-10 that "impacts to streams resulting from the MPU include filling approximately 980 feet of Miller Creek." It says nothing else, and unfortunately, none of the above documents address how many fish now use the reach of Miller Creek to be relocated and how many fish will be displaced or otherwise lost if the existing section is dewatered, i.e., relocated to the Vacca Farm site.

That no quantitative survey of either vertebrate (fish) or invertebrate fauna has been conducted on the project streams to date is bad science. To my knowledge there isn't even a full taxonomic list of what organisms are found in each project stream. How then can you assess the impacts of the proposed project?

Let me cite an example. In *Appendix F-Stream Survey Report for Miller Creek* (FAA 1997), it says that "resident salmonids, probably cutthroat, were observed throughout the study reach from below First Avenue S. up to the waterfall located approximately 0.2 mile upstream of South 160th Street." The point is if the surveyors had bothered to cast a net in Miller Creek they would have verified whether or not these fish were cutthroat trout or some other species.

Similarly (see the next paragraph in *Appendix F*), if proper analyses were employed, the surveyors would not have to "assume that glide and run type habitats that contained accumulations of silt and sand were inhabited by midges and worms." If they had employed Surber or other invertebrate sampling devices (USEPA 1989), they would have known that midges and worms could be found in Miller Creek.

Not even E&E, employed by the Washington Department of Ecology to conduct an independent survey of the fishery resources of project creeks, presented a complete list of the fishes inhabiting the Miller Creek and Des Moines Creek Watersheds (Pacific Groundwater Group et al. 2000). For example, E&E did not report finding prickly sculpin, yellow perch, or black crappie, yet each of these species have been recently collected in Miller Creek.

I will just add that nowhere in the Port's literature is it documented that either or both Miller Creek and Des Moines Creek contain abundant populations of crayfish, (*Pacifastacus leniusculus*), yet this species has been found throughout both the Miller Creek and Des Moines Creek Watersheds (Strand 2000, Columbia Biological Assessments, Richland, WA., personal communication).

The Third Runway Fill Stockpile and the Issue of Whether or Not it Contains Chemical Contaminants that Pose a Risk for Project Wetlands and Streams

Nothing the Port has included in their *Responses to General Comments* on the topic (see GLR2 and GLR2, page II-2 thru II-4) has resolved this matter. The Port was non-responsive to some of the key issues I raised.

The Port did not respond to my comment that the Ecology-approved *Soil Fill Acceptance Criteria* were seriously flawed, because they "lacked a consistent and statistically meaningful approach to determine the location and extent of any contamination contained in candidate fill materials." Statistically rigorous approaches exist e.g., systematic grid

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system (Gilbert 1982), over sampling and compositing (Skalski and Thomas 1984) and are used routinely to survey sites for buried waste, yet no such approach is adopted in the Port's *Soil Fill Acceptance Criteria.*

The Port also did not respond to my criticism that "neither the Boeing (1990) nor the Corps of Engineers studies (1997) were very useful in certifying the Hamm Creek sediments as free of serious contamination." For example, the Port did not acknowledge that neither study was undertaken for the expressed purpose of screening sediments for the Third Runway, that the two studies were done seven years apart, or that the two studies reported vastly different values for PCBs and DDT. While the Port did admit that the Corps of Engineers did not collect the sediments samples in "accordance with typical upland sampling protocols" (see second paragraph, page II-4 of GLR2), they also failed to acknowledge that the locations at Hamm Creek studied by Boeing and the Corps were not the same. They also chose to ignore my suggestion that a third, independent, sediment study be undertaken.

Metals Exceedences in Project Streams and the Issue Whether or Not They will Continue and Potentially Worsen if the Port's Proposed Project is Approved

The Port suggests that my statement, "the metals copper and zinc are of particular concern" is not substantiated by the results of the whole effluent toxicity (WET) testing, which they concluded did not demonstrate appreciable toxicity (see Response # 27, page III-70). The Port's response is again misleading.

To the contrary, appreciable toxicity did occur during the above referenced WET tests (see Table 7-15 on page 7-25 of the *Biological Assessment* [Parametrix 2000b]), most notably when the discharge from SDN1 was tested. Percent survival of daphnia ranged between 10 and 80 over three test dates, the most recent 1/24/99. Mean survival over these three test dates was only 40 percent. Percent survival of fathead minnow ranged between 40 and 78, with a mean of 60 percent. This level of toxicity is not trivial and begs the question, what is the level of the offending chemical(s) in the stormwater discharged at SDN1?

Also, despite the Port's statement in the *Biological Assessment* (see page 7-25), that says "Of the four outfalls tested, three met the WET performance standards, demonstrating an overall lack of toxicity in WET tests of 100% stormwater from the Port's discharges," Table 7-15 actually demonstrates that at two of the outfalls (SDN4 and SDE4), percent survival was as low as 75 and 63%, respectively, on at least one of the three or four dates when tests were conducted, indicating that toxicity occurs more often than the Port would have us believe.

Also, how can the Port suggest that metals, particularly zinc, are not of concern when they admit in Sect 7.1.3.3 of the Biological Assessment (see page 7-26), that the source of toxicity in the above mentioned WET tests conducted on SDN1, has been identified as galvanized rooftops that leach zinc?

Zinc in three of six stormwater outfalls operated by the Port exceeded the Washington State Standards of 0.072 mg/L (see Figure 10 and Table 4 in *Annual Stormwater Monitoring Report*, September 2000). Zinc concentrations in the discharge from SDN1 exceeded 0.060 mg/L, which indicated that the Port has not yet solved the problem of high zinc occurring in this discharge. Copper in four of five of the same stormwater outfalls also exceeded the Washington State Standard of 0.010 mg/L as total recoverable metal (see Figure 8 and Table 4 in the Port's most recent *Annual Stormwater Monitoring Report*, September 2000).

Also knowing that the removal rates for copper and zinc in Lake Reba are no greater than 33 percent (see Table 7-19 of *Biological Assessment*), a significant (undetermined) quantity of the copper and zinc found in the discharge from SDN1 and other outfalls passes through Lake Reba and into Miller Creek. Clearly some of this copper and zinc is biologically available and accumulated in aquatic organisms in Miller Creek.

The ACC's PIT determined that copper levels in three composite fish samples (3-5 fish/composite) of cutthroat trout in Miller Creek ranged between 4.3 and 9.4 mg/Kg dry weight, while copper in a single cutthroat trout from the outfall of Daniels Creek in Cottage Lake (reference site) was only 2.0 mg/Kg dry weight (Strand 2000, Columbia Biological Assessments, Richland, WA., personal communication). A single yellow perch collected at the same time at the Cottage Lake reference site also contained 2.0 mg/Kg dry weight of copper. Zinc levels in two composite fish samples (3-5 fish/composite) of cutthroat trout in Miller Creek were 137 and 145 mg/Kg dry weight, while zinc in the single cutthroat trout from the outfall of Daniels Creek in Cottage Lake (reference site) was only 71.3 mg/Kg dry weight (Strand, 2000, Columbia Biological Assessments, Richland, WA., personal communication). The single yellow perch collected at the same time at the Cottage Lake reference site contained 63.3 mg/Kg dry weight of zinc. Zinc concentrations in cutthroat trout from Miller Creek exceeded the tissue screening concentration of 100 mg/Kg dry weight used by Shepherd (1999) as a screening tool.

The Port also responded to my concern about metals levels in STIA stormwater by indicating that the results of instream toxicity screening studies also reported in the Port's *Biological Assessment*, see Section 7.1.3.3, page 7-24, demonstrated that stormwater from STIA did not add to toxicity levels in Miller Creek and Des Moines Creek (see Response # 29, page III-71).

While I acknowledge that the results of instream testing (see *Biological Assessment*, Table 7-14, page 7-24) indicated no toxicity, I question these results in light of the results of companion WET tests (see above). For example, where in Miller Creek in relation to the stormwater discharges were the samples for instream bioassay collected? It is a rule-of-thumb that toxicity will decrease with increase in distance downstream of an outfall, so where the samples were collected is very important. Actually, none of the stations where samples were collected for instream tests were located by distance downstream from their outfalls. At minimum, a map showing these locations should have been included.

Also, how soon after discharge (following a rain event) were the samples to evaluate instream toxicity collected? Were these samples collected from the "first flush" of the runoff period, or were the samples collected after the "peak" of runoff? Samples collected during the "first flush" are generally more toxic. Clearly, the Port is remiss for not providing the reader with a detailed and complete methodology. To do otherwise casts uncertainty on the results of the Port's tests.

Actually, the data to which the Port is referring in their response, i.e., both the instream toxicity as well as the WET test results addressed above, comes from a study in progress, a "draft" study. Unfortunately, the reader of the *Biological, Assessment* will not realize this from reviewing the text, rather he/she will need to review the reference list before this is apparent. This is not good science, and would not pass most peer reviews! This is but one indication that the Port's project should have been peer-reviewed by an independent, third party. The data the Port offers from an incomplete, unpublished and non peer-reviewed report should also not be used as a basis for the agencies' decisions here.

I should also point out that the WET and instream test protocols employed by the Port utilize only an "acute" approach of 48 to 96 hr duration. As I have said many times before, the Port also should be required to conduct chronic tests, as stormwater discharges during the rainy season can be nearly continuous.

Finally the Port responds to my concern for metals pollution by indicating that "the quality of stormwater from Sea-Tac Airport is anticipated to improve in the future for several reasons. First, areas where stormwater is currently not treated will be retrofitted to improve water quality. Second, for areas with new impervious surfaces, stormwater will be detained and treated (see Response # 32, page III-72)."

The above statements suggest that the five or six major stormwater outfalls (SDN1, SDN2, SDN4, SDE4, SDS1, and SDS3) that now discharge to Miller and Des Moines Creeks will be retrofitted to improve water quality, yet this is not what is indicated in the *Comprehensive Stormwater Management Plan* (Parametrix 2000c). Section 7.1.5 indicates that a final decision to retrofit certain stormwater basins with additional detention, e.g., wet vaults or detention vaults, has not been made and that evaluation of the need continues. This affects both the SDE4 and SDS3 drainage basins, which outfall to Des Moines Creek at the south end of STIA. The reason for the delay is the cost in providing (constructing) additional detention.

Of the stormwater basins that discharge to Miller Creek at the north end of the STIA, only SDN1 could be retrofitted with additional detention capabilities but this too is subject to change. The Port in Section 7.1.4.1 indicates that they could also approve another alternative to improve treatment, although this alternative is yet to be determined. And, according to Table 7-8, the SDN2 and SDN4 will not receive a retrofit as the presently employed best management practices, e.g., bioswales, filter strips, are effective.

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According to the *Comprehensive Stormwater Monitoring Plan*, all of the SDS1 basin drainage was transferred to the Industrial Waste System (IWS), although there still is a discharge from this basin that likely includes a contribution from STIA. For example, as recently as February 2001, stormwater from SDS1 still contained a total glycols concentration of 48 mg/L, which was mostly (43 mg/L) propylene glycol (Port 2001).

So I must ask, what really will change? Will stormwater quality at the existing six outfalls likely improve with construction of the MPU? The Port's proposed retrofit will not, in my opinion, improve the existing situation. The Port's assertion that "stormwater quality will improve in the future," is also misleading and without scientific basis.

Use of De-Icers and the Issue of Whether or Not They Pose a Risk to Aquatic Resources of the Site

In responding to my comments on the fate and effects of glycols in project streams, the Port said that "glycol-based fluids are only used to de-ice aircraft, and stormwater associated with that activity drains to the Industrial Wastewater System (IWS) (see Response #34, page III-72)." This suggests that the Port's consultant does not believe that glycols can enter area streams because the IWS, after treatment, discharges directly to Puget Sound.

To suggest that glycols from de-icing and anti-icing activities at STIA do not enter area streams is untrue, particularly since the Port's Annual Stormwater Reports for 1999 and 2000 already indicated that glycols occur in stormwater at STIA outfalls that discharge both to Miller and Des Moines Creeks. While the IWS at STIA is designed to collect aircraft de-icers and anti-icers reaching the tarmac, glycols in de-icers and anti-icers are still routinely detected at six stormwater outfalls: SDN1, SDN2, SDN4, SDE4, SDS1, and SDS3. Outfalls SDN1, SDN2, and SDN4 are located on the north end of the STIA and discharge to Lake Reba on Miller Creek. Outfalls SDE4, SDS1, and SDS3 are located at the south end of STIA and discharge to the East Tributary or Northwest Ponds on Des Moines Creek.

The concentrations of glycols entering area streams vary widely and are not trivial. For example, glycols of 12, 810, and 364 mg/L were found in SDE4, SDS1, and SDS3 outfall discharges, respectively, following aircraft de-icing on January 11-12, 2000 (Port 2000). The most recent data from February 2001, indicated that glycols of 46.7, 48.7 and 419.4 mg/L were found in stormwater being discharged from the same three outfalls, respectively (Port 2001). The majority of the glycols at each discharge was propylene glycol.

The ACC's PIT also detected propylene glycol in duplicate samples from Des Moines Creek on February 9 and 19, 2001 at S 200th Street, just south of the Tyee Valley Golf Course (Strand 2001, Columbia Biological Assessments, Richland, WA., personal communication). Propylene glycol was not detected in duplicate samples on either of these dates in the West Tributary of Des Moines Creek at 192nd Street, suggesting that this glycol entered Des Moines Creek on the West Tributary below 192nd Street, or entered on the East Tributary somewhere above the confluence of the West and East Tributaries. The likely source of this contamination was one of the STIA outfalls: SDE4, SDS1, or SDS3. The concentrations of propylene glycol in these four samples ranged between 11 and 17 mg/L. Because this is propylene glycol, the likely source is an aircraft anti-icer and not an aircraft de-icer or auto/truck anti freeze that are ethylene glycol based. Possible sources of the fugitive emissions are periodic overflows of the IWS or an incomplete or leaking IWS.

At issue is the toxicity of the de-icing or anti-icing agent. The Port indicates that Type I de-icers are not very toxic and cites a 96 hr LC_{50} for rainbow trout of 17,000 mg/L, and a 48 hr EC_{50} for the water flea of 44,000 mg/l. Unfortunately, the reference that the Port cites, which is USEPA 2000, is incomplete so that verification is not possible. The Port does not include toxicity data for Type II, Type III, or Type IV, which are likely to be more toxic because these anti-icers contain propylene glycol. The Port also does not include any chronic data or toxicity based on endpoints other than acute toxicity.

I am also surprised that the Port did not comment on my statement that "de-icers and their additives are toxic to aquatic life at relatively low concentrations (1.8-8.7 mg/L)," which I based on the work of Hartwell et al. (1995). Hartwell et al. (1995) determined that the 7-day LC_{50} for commercial anti-icer to fathead minnow ranged between 24.2 and 43.3 mg/L, based on the concentration of total glycols in the test solution. By definition, these results indicate that the LC_{25} or LC_{10} (the concentrations killing 25% and 10% of the test population in 7 days) will occur at lower concentrations of total glycols, that is, in the range of glycol concentrations found recently by the ACC's PIT. Hartwell et al. (1995) also observed that gill pathology (edema, respiratory cell hypertrophy, and proliferative bronchitis) occurred in fish exposed to anti-icer at 17.6 mg/L propylene glycol. It is reasonable to assume that a fish with these symptoms will die if the exposure continued at this same level. Hartwell et al. (1995) also observed toxicity and similar gill pathology in fathead minnows exposed to stormwater from a stream receiving winter runoff from a large commercial airport. In these tests, which included detailed chemical monitoring, the LC_{50} ranged between 1.8 and 5.4 mg/L total glycols.

Clearly, the concentrations of total glycols cited in the 1999 and 2000 Annual Stormwater Monitoring Reports, and in the February 2001 stormwater analyses (Port 2001) exceed the concentrations reported by Hartwell et al. (1995) to be toxic to aquatic life.

I also disagree with the Port's assertion that use of de-icers and anti-icers at STIA will be "infrequent and minimal, and that "further studies are not likely to change the findings reported thus far (see Response # 38, page III-73)." What will happen during a hard winter where de-icing or anti-icing will be the norm for two weeks or more?

Clearly, because the Port still finds glycols in their stormwater, and because the Port will not acknowledge scientific studies demonstrating that de-icers and anti-icers are toxic to aquatic life at levels now found in stormwater entering the project streams, additional investigations of the fate and toxicity of de-icers and anti-icers used by the Port should be undertaken before any decisions are made on the Port's application for additional airport construction and facilities.

Mitigation of Low Stream Flow Impacts by Detaining and Releasing Stormwater Stored in Detention Ponds and Vaults

The Port now says it will no longer need additional sources of water, e.g., Seattle Public Utilities (SPU) water or well water, to mitigate low summer flows in project creeks (see General Response GLR7, pages II-7 thru II-8). They have proposed to manage the release of stormwater detained during the rainy season.

I would, however, caution the use of detained or stored stormwater because of the same reason I cautioned the use of SPU or well water. There will be differences in water quality that will have to be reconciled before its release into Des Moines Creek. Even assuming that the stormwater will be treated in the sense that particulates will be removed (settle out), this does not guarantee removal of all toxic chemicals, metals or organics, nor does it assure D.O. and temperature compatibilities? Stored waters could be devoid of D.O. and harmful to the biology of receiving waters. Temperatures of stored waters also will need to be the same, or nearly the same, as the temperatures of the receiving waters to avoid temperature shock for fish and other aquatic life.

Cumulative Impacts Are Not Assessed

The Port gives essentially a non-response to my comment that "each of the proposed construction projects or discharges stand alone and are not evaluated in the context of the overall change that Miller Creek, Walker Creek, or Des Moines Creek will undergo if the Port is permitted to build the third runway.

While the *Comprehensive Stormwater Management Plan* may evaluate cumulative impacts of changes in flow of individual drainage basins (see Response # 48, page III-73), this is but one of many potential impacts the Port should evaluate cumulatively. As an example of another cumulative impact to assess, what about the changes in water quality (e.g., turbidity) that could potentially occur if construction stormwater from multiple projects is allowed to simultaneously enter the project creeks? Similarly, what changes in water quality (e.g., metals) will occur if new impervious surfaces are added in several basins draining to the project creeks?

What is required is a full (quantitative) assessment of impacts of each individual construction project and how they change the water quality of the project creeks; then, an assessment of the overall impact that all of the proposed projects have on the water quality of the project creeks. Finally, the potential impacts of the Port's proposed projects must be assessed in relation to how the existing non-Port projects have already affected the water quality of the project creeks (watersheds). I repeat, I see no attempt to undertake a cumulative impact analysis of this kind, yet it is required by the *National Environmental Policy Act Regulations* (40 CFR 1500).

In response to Response # 49 (page III-73), an aquatic ecological risk assessment, e.g. Parkhurst et al. (1996) is a useful approach to assess potential cumulative impacts that chemicals in stormwater can have both individually and in concert. Estimates of risk (toxicity) from chemicals discharged to surface waters from individual projects can be addressed as well as the estimates of total (cumulative) risk from chemicals discharged to surface water from all of the projects. All of this must occur before an informed decision can be made on the Port's application.

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EXHIBIT H

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August 6, 2001

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ATTN: Ann Kenny

Subj: The Port of Seattle's (Port) Low Flow Analysis/Flow Impact Offset Facility Proposal, prepared by Parametrix, Inc., July 2001.

Dear Ms. Walker, Ms. Terzi, and Ms. Kenny:

At the request of the Airport Communities Coalition (ACC), I have evaluated the Port's plan to use detained stormwater to augment summer low flows in Miller, Walker, and Des Moines Creeks. I offered some initial comments on the use of detained stormwater for this purpose in my *Rebuttal to the Port's Response to 401/404 Comments*, dated June 20, 2001, based on a general response (GLR7, page II-7) to comments to the Port's Sect 404 Permit Application. I earlier (September 2000) commented on the Port's plans to use either Seattle Public Utilities water or well water for this purpose. In undertaking this effort, I have relied on my education, specialized training, and professional skills acquired over a 26-year career (post Ph.D.) as an environmental scientist (see attached *Curriculum Vitae*).

Conclusions

In my opinion, for the following reasons, the Port has not provided sufficient information to enable the Washington Department of Ecology (Ecology) or the Army Corps of Engineers to conclude with reasonable assurance that detained stormwater, proposed for

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use in offsetting impacts of low summer flows in project creeks, will not harm the valued aquatic resources of the Miller Creek and Des Moines Creek Watersheds.

- Violations of toxic substances (water quality) criteria in Miller Creek, Walker Creek, and Des Moines Creek, particularly for copper and zinc, occur as a result of stormwater discharged at Seattle-Tacoma International Airport (STIA); and will continue, and potentially worsen as a result of the Port's proposed flow impact offset facility. There is the distinct possibility that sediments in detention vaults will turn anoxic, bringing about a change in the ionic state of metals (more metals will be in the dissolved state), resulting in greater bioavailabilty and toxicity downstream of the detention vaults, once the detained stormwater is released. Before any approval is issued which would in effect involve experimentation with the creeks, the Port should be required to model and undertake bench-scale tests to determine the transport, fate, and potential toxic effects of metals residues discharged from detention vaults to project streams.

- The presence of fecal coliforms of human origin from airplane wastewater in Des Moines Creek raises the possibility that other human pathogens (bacteria, viruses, and protozoa) enter Des Moines Creek and will collect and persist in sediments of the proposed detention vaults, posing potential human health risks when they are discharged to the project streams to augment summer low flows.

- No procedures are in place to manage accumulated sediments in the proposed stormwater detention facilities. The key questions is, how the Port will safely remove and dispose of sediments enriched in metals, other chemicals, and possibly human pathogens (bacteria, viruses, and protozoa) without their release to the creeks. This is a significant issue.

- The Port's proposed monitoring plan is incomplete. It lacks detail and some elements, e.g., the frequency of sampling, the Benthic Index of Biotic Integrity, may be insensitive to detecting early signs of degradation from chemical residuals found in detained stormwater discharged to the project creeks. All too often the plan indicates that "final design specifications will be submitted to Ecology for their approval prior to the plans implementation," which denies rigorous scientific peer review. The Port also proposes to only report problems with detention facilities in their annual report and not when they are encountered, and only to Ecology and not other responsible resource agencies, e.g. Washington Department of Fish and Wildlife (WDFW). Perhaps more importantly, reasonable assurance that the water quality in the project creeks will not be impaired, should not be based on just monitoring, let alone imperfect monitoring, as it seems in this case. Rather, it should also include a facility design that is grounded on accepted scientific principles, a learned assessment of the potential problems associated with its operation, bench-scale experimentation, and external peer review.

The detailed evaluations on which the above conclusions are based are found in the following sections:

The Plan Diminishes the Toxic Effects of Metals in Stormwater Discharged from Seattle-Tacoma International Airport.

The Port's representation of the status of metals in stormwater discharges from STIA is totally incorrect. The Port would have us believe that metals are a non-problem in the project creeks and that water quality will only improve if the Master Plan Update Improvements are implemented. Despite the Port's caveats that metals concentrations are reported as "total recoverable metals" and not dissolved metals as in applicable Water Quality Criteria, or that reported metals concentrations are "less than typical urban runoff," the truth remains that concentrations of metals (copper and zinc) in stormwater discharged to Miller and Des Moines Creeks have repeatedly exceeded Washington Water Quality Criteria (Port 1997, 1998, 1999). I have often commented that use of these caveats are not good science and could be construed as an effort to bias the results of the Port's compliance monitoring (see my letter to Tom Luster, Permit Coordinator, Department of Ecology, dated December 13, 1999). I should also add that data presented by the Port in their most recent Annual Stormwater Monitoring Report (2000) confirm that exceedances of toxic metals criteria continue to occur at the Port's stormwater outfalls to the creeks.

The Port is also incorrect in its inference that it is in compliance with Washington Water Quality Criteria because it is required by their National Pollution Discharge Elimination Permit to conduct and report the results of Whole Effluent Testing (WET) of its stormwater discharges. The point is that the Port's treatment of "metals" on page 21 of their *Low Flow Analysis Report/Flow Impact Offset Facility Proposal* would have us believe that WET has not detected any toxicity in their stormwater, yet appreciable toxicity did occur recently in the discharge from SDN1 (Parametrix 2000). Percent survival of daphnia ranged between 10 and 80 percent over three test dates, the most recent 1/24/99. Mean survival over these three tests was only 40 percent. Percent survival of fathead minnow ranged between 40 and 78 percent, with a mean of 60 percent. This level of toxicity is not trivial and begs the question what is (are) the offending chemical (s) in the stormwater discharged in SDN1? For detailed comment on this topic, please see my letter to Jonathan Freedman and Ann Kenny on February 16, 2001, and in my letter to Muffy Walker, Gail Terzi, and Ann Kenny on June 20, 2001.

More importantly and in the context of the new materials presented in the Port's *Low Flow Analysis Report/Flow Impact Offset Facility Proposal*, the Port does not address the fate (including bioavailability) of metals detained in vaults over the period of intended storage. There is a need to follow potential changes in the ionic state of metals in detained stormwater as a function of time in storage and dissolved oxygen concentration.

If sediments collected at the bottoms of detention vaults turn anoxic (become oxygen depleted), there is a real potential for reducing conditions as opposed to oxidation conditions to prevail, with the result that metals bound to particulate matter will partition to the water column and persist in a more ionic, bioavailable state (Cooke et al. 1993). This could render residual metals more toxic, increasing the risk to valued aquatic resources in the project streams. The Port indicates that the detention vaults will not become anoxic but says elsewhere that it may be necessary to aerate, which suggests that the Port really doesn't know what will happen in the detention vaults. This tells me that the Port cannot at this time provide reasonable assurance that stored stormwater, if used to offset summer low flows, will be compatible in quality with the streams into which it is discharged. What should be required, as a minimum before any approval is considered, is additional modeling and bench-scale testing subject to peer review to determine if long-term (three month) detention brings about a change in the ionic state of metals, greater bioavailability, and possibly higher toxicity.

The Proposed Plan does not Address the Fate and Possible Human Health Effects of Enteric Bacteria, Viruses, and Protozoa that Occur and Persist in Stormwater Detention Vaults.

The Port proposes monitoring a number of important water quality parameters or constituents in stormwater detention vaults including temperature, turbidity, dissolved oxygen, and metals, but fails to address enteric bacteria, viruses, or protozoa that also could occur there. Fecal coliforms in the Port's stormwater have long exceeded Washington Class AA Water Quality Criteria (Port 1997, 1998, 1999, 2000). More recently, we learned from the Port's *Microbial Source Tracing Study* (Port 2001) that coliforms collected in Des Moines Creek in May 2000 included those of human origin, some of which originated in airplane wastewater at STIA.

Because human coliforms have been found in Des Moines Creek, it is not unreasonable to assume that other enteric human pathogens, e.g., bacteria, viruses, and protozoa (*Cryptosporidium, Giardia*), also enter the project streams. The issue to be resolved, then, is whether or not these agents will occur and persist in the proposed detention vaults at concentrations high enough to pose a risk to human health, once the stored stormwaters are released (flushed out of the detention vaults) to the project creeks. Our concern is the potential risk that pathogens pose to humans who will manage the detention vaults or will continue to use the project creeks for recreation, e.g., wading, fishing, or clam digging at the mouth of the creeks.

The key question is how long enteric bacteria, viruses, and protozoa [*Cryptosporidium, Giardia*] remain viable (alive) and infective after being shed by their human host. The available scientific literature (there are many studies over the last 30 years) indicates that human enteric bacteria, viruses, and protozoa can persist and are infective for considerable lengths of time in both fresh and marine waters. For example, enteric viruses can last for 130 days in marine waters but can survive even longer in freshwater (Vasconcelos 2001). They also die off sooner if not associated with particulate matter; that is, they are left in the water column unbound (Vasconcelos 2001). Human enteric viruses also can remain infective if bioaccumulated by other living organisms, e.g., fish and shellfish (Weingold et al. 1994). Colder water temperatures seem to prolong their viability. Bacteria may not last as long as viruses in either the water column or in sediments. Some protozoa form resting stages (cysts) that can remain viable and infective even longer than viruses. Based on the scientific literature, then, if human enteric bacteria, viruses, and protozoa collect in the sediments on the bottoms of detention vaults, they could persist and remain infective for several months, which is about the length of time the Port contemplates detaining stormwater.

No Plan is in Place to Manage Accumulated Sediments in the Proposed Detention Vaults.

The draft plan also doesn't address how accumulated sediment (particulate matter) in the detention vaults will be managed. It will not take long for particulates to settle out, although this will depend on the size and weight of the particles. The point is that sediment will accumulate in the vault bottoms requiring periodic removal and disposal. The key question is, how will the Port safely remove and dispose of accumulated sediments without some release of sediments downstream, which could pose a risk for the aquatic resources of the project streams and possibly facilities operators and other humans using the stream. As we already established, the accumulated sediments will be rich in metals, which could be more bioavailable and toxic to fish and invertebrates. These sediments also may contain enteric microorganisms, which could infect human operators and other humans downstream.

The Proposed Monitoring Plan is Incomplete and Denies Opportunity for Meaningful Scientific Comment

The Port's management approach is to monitor the quality of detained or discharged stormwater, and only when a problem is encountered, will it take steps to mitigate the impacts of altered water quality. For example, if the problem is low dissolved oxygen, the Port will aerate. How the waters in the vault or the stream will be aerated, we aren't told except in a very general way. While several types of aeration devices are listed on page 18, including microbubble diffusers, gas injection, mechanical aerators, etc., there is no commitment at this time to any of these technologies. It may be expected that one or more of these devices will work better than others but this has not been determined. This is purported to be a plan ready for scientific scrutiny, but clearly, based on my experience, it is not!

There is also the important issue of how frequently to monitor the stored stormwater during discharge. For example in the case of dissolved oxygen, the Port proposes a weekly monitoring requirement for the operational period, August through October (see page 32), which may not detect early signs of degradation. Dissolved oxygen, can change very quickly (in a matter of hours) in response to biochemical oxygen demand, rainfall, and even air temperature. I therefore cannot agree with the Port's notion on page 33 that "water quality of stored water is not expected to change," and recommend more frequent monitoring, at least daily for dissolved oxygen, turbidity, and temperature during the operational (discharge) period. Again, what should be required is modeling and bench-scale testing to determine how long-term (three month) detention can change the basic properties of stormwater.

While it may be of interest to undertake a long-term assessment (10 years) of benthic insect productivity in the project streams (see page 34), as demonstrated by the Benthic

Index of Biotic Integrity (BIBI), this kind of biological monitoring also will not detect potential early impacts associated with the discharge of detained stormwater to the project streams. In other words, harm to the resource could occur before it was detected. There is also no real BIBI baseline for the project streams because so few samples have been collected to date from which the BIBI can be calculated. Using this approach, one will also have to wait several years to see a trend in the data that had sufficient statistical reliability to determine if benthic invertebrate productivity was being altered. In my opinion, then, it's a stretch to suggest as the Port does on page 34, "this monitoring will be able to be used in assessing any biological effects of the flow offset facility in the receiving water." Instead of the BIBI, use of either laboratory or *in situ* bioassays aimed at determining potential bioaccumulation and toxicity of metals and other chemicals is one approach that would provide more timely indications of whether or not stored stormwater was having an impact on the receiving water.

Throughout the monitoring plan, reference is made to provisions that the Port's final design specifications will be submitted to Ecology for their approval prior to the plans implementation. For example, on page 25 it says that the "Operation and Monitoring Plan will be finalized and submitted to Ecology after final design of the facility is completed and before operation commences." Clearly, the plan is incomplete if the final design specifications for monitoring have not yet been developed. Why then are we reviewing this draft? Perhaps more importantly, why is Ecology attempting to review the plan before it is complete? To do so only denies rigorous scientific peer review let alone meaningful public input on whether there is reasonable assurance that water quality standards will not be violated.

Also questionable is the provision on page 28 to include in an annual data report submitted to Ecology, a discussion of any water quality problems that were encountered during the year, and also the immediate actions taken by the Port to address any problem(s). Why shouldn't the Port be required to immediately report to Ecology, as well as other responsible resource agencies, when a problem is encountered on the creeks. The WDFW would certainly want to know if water low in dissolved oxygen was being released to Miller, Walker, or Des Moines Creeks, especially if coho salmon were on spawning grounds in those streams. Coho salmon spawn in the project creeks during the Port's period of proposed discharge, July through October.

Monitoring, however, should not be the basis for approving (certifying) the proposed project. The Port appears to seek Ecology's approval with a vague promise that if anything does go wrong the Port will fix it. Because the Port does not know what will happen (they haven't done their homework), monitoring in this case could be viewed as a "pass" to risk the integrity of the streams. If monitoring detects a problem it usually means that the stream(s) has/have suffered some degree of harm. More importantly, the streams will continue to undergo harm until the problem(s) is /are rectified. If the monitoring is flawed as it appears the Port's monitoring is, the degree of harm incurred could be all that more. Reasonable assurance that the water quality will not be impaired, in my opinion, should not based on monitoring alone, as it seems in this case. Rather, it should be based on a facility design that is well grounded on scientific principles, a learned assessment of the potential problems, laboratory experimentation (not experimentation on the streams), and external peer review.

We have only just received the Port's proposal to use detained stormwater to offset impacts of summer low flows in the project streams: hence the timing of submittal of these comments. Please consider these comments in your final deliberations on whether or not to grant a Section 401 Certification and Section 404 Permit. Thank you for the opportunity to again comment on the Port's proposed Master Plan Update Improvement projects. I am available by phone, email, or in person to discuss any of my comments in greater detail.

Yours very truly,

John A. Strand, Ph.D.
Principal Biologist

Attachment (*Curriculum Vitae*)

cc: Peter Eglick
Kimberly Lockard

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