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 No. 01-160 DECLARATION OF WILLIAM A. ROZEBOOM IN SUPPORT OF ACC'S REPLY ON MOTION FOR STAY (Section 401 Certification No. 1996-4-02325 and CZMA concurrency statement, Issued August 10, 2001, Reissued September 21, 2001, under No. 1996-4-02325 (Amended-1))

William A. Rozeboom declares as follows:

1. I am over the age of 18, am competent to testify, and have personal knowledge of the facts stated herein.

2. I have reviewed the declarations of Steven G. Jones, Joseph Brascher, Donald W E. Weitkamp, Paul S. Fendt, and the Port of Seattle's Memorandum Opposing ACC's Motion for Stay, all filed by Foster Pepper & Shefelman, PLLC. I have also reviewed the declarations of Ann Kenny, Eric Stockdale, Kelly Whiting, and the Department of Ecology's Response to Appellant's Motion for Stay, all filed by the Attorney General of Washington. I offer responses to the above documents, most of which include some reference to my declaration filed previously in support of ACC's Motion for Stay.

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3. I have also reviewed other recent declarations filed by the Port and Ecology, not identified above, in addition to very large quantities of emails, reports, internal memoranda, and other documents obtained by the ACC from Ecology, the Corps of Engineers, and other agencies through Public Disclosure Requests by the ACC. These documents have been provided to me by the ACC for information and review. I have reasonably comprehensive knowledge of all publicly available documents involving SeaTac hydrology and natural resource issues, and the positions taken on those issues by the Port and Ecology from October 1999 to date.

4. The declaration of Steven Jones, ¶3, discusses Port responses to public comments and attaches as exhibits copies of the Port's responses to comment letters received from Amanda Azous, Dr. Peter Willing, Dr. John Strand, and Tom Luster, together with the original comment letters, all of which were filed by the ACC. The materials provided by Mr. Jones however fail to include my comment letter, also filed by the ACC, or the Port's response to that letter. In order that the record be more complete, my comment letter of February 15, 2001 is attached as Exhibit A, the Port's response to that comment letter is attached as Exhibit B, and my follow-up comment letter of June 25, 2001 is attached as Exhibit C. These documents show that there are many significant issues which have been raised previously and which the Port and Ecology in my opinion have failed to satisfactorily address.

5. Most of the points I will make in this Declaration fall into one of three broad categories of disagreement with the Port and Ecology. First, I strongly disagree with the Port and Ecology's assertions as to the adequacy of the calibration of the HSPF modeling used to assess

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stream low flow impacts to Walker and Des Moines Creeks. Second, I strongly disagree with the Port and Ecology's assertions that effects of Industrial Wastewater System improvements on stream low flow impacts can or should be ignored. Finally, I very strongly disagree with the Port and Ecology's assertions that the significant problems and deficiencies in the low flow mitigation plan can be adequately resolved with the conditions proposed in Ecology's 401 Certification. There also are miscellaneous errors and points of disagreement which do not fall into the above categories.

6. The Declaration of Ann Kenny, ¶19, states that the Port "*agreed to comply with the King County Surface Water Design Manual*". This statement is misleading and inaccurate. The Port agreed to comply with only the technical provisions of the Manual, and negotiated an exemption from what the Port considered to be "procedural" requirements. In particular, the Port claimed exemptions from King County requirements for Drainage Reviews and Financial Guarantees. If the Port had fully complied with the King County Surface Water Design Manual (KCSWDM), the airport improvements would have been subject to a Large Site Drainage Review (KCSWDM Section 1.1.2) and through that process might have incurred additional flow and water quality requirements beyond the KCSWDM minimum requirements. In the initial King County review findings (Paragraph 3, Enclosure 1, Letter dated September 15, 2000 from King County/Bissonnette to Ecology/Luster), King County states, "*If processed under King County regulations, this project would have exceeded the threshold for Large Site Drainage Review and would have been subject to the procedural requirements whereby performance*

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standards are tailored specific to the proposed development." From the King County reviewer's recent declaration (Whiting, Page 5, top bullet) it is stated that *"Enhanced water quality treatment, beyond the Manual's basic menu may be warranted based on the monitoring data presented in the SMP"*. The record should show that the project is not in compliance with the King County regulations and, had such compliance been required, that enhanced water quality treatment would have likely been required.

7. The Port of Seattle's Memorandum opposing ACC's Motion for Stay, at Page 11, Line 8, states *"It bears emphasis that Mr. Rozeboom concedes that there is sufficient water to meet the low flow needs. See Rozeboom, ¶4."* This is incorrect. No such statement or concession was made by me regarding sufficient water to meet low flow needs.

8. I am in partial agreement with the Port and Ecology as to the adequacy of the HSPF model calibration for this project. I agree that some of the calibration is adequate, but strongly disagree that all of the calibration is adequate in light of the range of purposes to which the models are being employed. I disagree in particular with the statement by Fendt, ¶24, that *"The calibration approved by King County in the SMP is also applicable to the Low Flow Analysis."* It is my opinion that the HSPF model calibration to Miller Creek is adequate for a range of applications, but that calibration to Walker and Des Moines Creek is not. The hydrologic processes affecting surface-runoff peak flows are different from the hydrologic processes affecting groundwater-seepage low flows, and successful calibration to peak flows

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does not assure successful calibration to low flows. My overall opinion of the current (September 2001) calibration of the models being used for this project is as summarized below.

HSPF Model -- Flow Regime	Calibration Adequate?
Miller Creek – Peak Flow	YES
Miller Creek – Low Flow	YES
Walker Creek – Peak Flow	YES
Walker Creek – Low Flow	NO
Des Moines Creek – Peak Flow	YES
Des Moines Creek – Low Flow	NO

My statements in the remainder of this declaration focus on the Walker Creek and Des Moines Creek low flow models which are in my opinion deficient.

9. I believe that my assessment of the HSPF model calibration is more or less consistent with the opinions of the King County reviewer retained by Ecology, and possibly the Port's own consultants with credible expertise in HSPF modeling. The King County reviewer's declaration (Whiting, Page 7, Line 7) states that *"These calibrations have been accepted for purposes of SMP flow control mitigations."* However, the King County reviewer does not provide any endorsement or acceptance of the model calibration relative to low flow analysis or mitigation. Instead, he recommends further documentation and discussion of the accuracy of the calibrations in predicting upper-stream low flows (Whiting, Page 7, Line 18). Aqua Terra, the Port's consultant responsible for modeling flows and impacts in Miller and Walker Creeks, states (Brascher, ¶11) that *"The HSPF Modeling that will be included in the final version of the Low Flow Analysis will be peer reviewed and endorsed by Norman Crawford, the hydraulic engineer who actually developed the model itself."* By inference, there is an expectation by the Port's own consultant that

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the current HSPF model(s) will be revised, presumably to correct some deficiency, prior to inclusion in a final low flow analysis. Also, Brascher's statement indicates that the current models have either not been subjected to a competent peer review or that there has been no public disclosure of the results of a competent peer review which may have already occurred.

10. The Port's submittals fail to provide credible information regarding the adequacy of the HSPF model for Des Moines Creek. From the declaration of Aqua Terra / Brascher, ¶4, Aqua Terra performed the modeling of surface water flows for Miller and Walker Creeks, but that *"Parametrix performed the modeling for Des Moines Creek in consultation with other subconsultants."* In the declaration of Parametrix project manager Fendt at ¶2, it is notable that HSPF experience is absent from Mr. Fendt's summary of qualifications. The declaration of Brasher at ¶13 states his opinion that the results of the HSPF model constitute an *"accurate assessment of the impacts on the flows of . . Des Moines Creek"*, but it is not apparent how he could have reached this opinion when the modeling for Des Moines Creek was performed by others apparently not associated with Aqua Terra. In all of the declarations filed by the Port and Ecology, I have been unable to locate a declaration for any person directly responsible for the HSPF low flow modeling of Des Moines Creek.

11. Statements have been made to the effect that my analyses and conclusions are based on a single year of data (Weitkamp, Page 10, Line 19; Fendt, ¶24). This is incorrect. My previous declaration at ¶9 presented a plot of a single year of data (upper Walker Creek, 1991) as an illustration of problems which occur over the period of record for model calibration. One of the

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problems is that the calibration for Walker Creek exaggerates the low flows in late summer and discounts the low flows in June and July. The model simulation has flows which recede more rapidly, and later into the fall, than is indicated by the actual gage data. The table below examines this issue further, considering the full period of record for which calibration data are presented in the SMP for Walker Creek.

WALKER CREEK STREAMFLOW DATA AT UPPER GAGE, CFS
RECORDED = ACTUAL STREAMFLOW DATA RECORDED BY KING COUNTY
SIMULATED = HSPF MODEL RESULTS FOR SAME PERIOD

	MINIMUM FLOW - RECORDED					MINIMUM FLOW - SIMULATED		
	Jun-Jul	Aug-Sep	Difference			Jun-Jul	Aug-Sep	Difference
1991	1.2	1.3	-0.1		1991	0.94	0.83	0.11
1992	1.2	1	0.2		1992	0.85	0.71	0.14
1993	0.9	0.8	0.1		1993	1	0.71	0.29
1994	0.89	0.73	0.16		1994	0.73	0.64	0.09
1995	0.13	0.12	0.01		1995	0.87	0.74	0.13
1996	0.85	0.41	0.44		1996	0.87	0.74	0.13
	AVERAGE FLOW - RECORDED					AVERAGE FLOW - SIMULATED		
	Jun-Jul	Aug-Sep	Difference			Jun-Jul	Aug-Sep	Difference
1991	1.55	1.62	-0.07		1991	1.17	0.98	0.18
1992	1.37	1.31	0.06		1992	1.01	0.82	0.19
1993	1.46	0.87	0.60		1993	1.35	0.82	0.53
1994	1.17	0.93	0.24		1994	0.92	0.72	0.20
1995	0.77	0.70	0.08		1995	1.05	0.90	0.15
1996	1.25	1.78	-0.53		1996	1.20	1.02	0.18
AVG	1.26	1.20	0.06		AVG	1.12	0.88	0.24

Two key conclusions can be drawn from this summary examination of the calibration data for the Walker Creek upper gage. First, the actual minimum flow recorded for the months of June and July is about as low (see 1995) or is lower (see 1991) than in the months of August and September,

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representing 2 out of 6 years or 30 percent of all years of calibration record. Second, the actual data show that average flows during June and July are on average quite close (within about 5% or 0.06 cfs) to average flows in August and September. The simulated flows, on the other hand, suggest incorrectly that average flows in August and September are significantly lower (by about 21% or 0.24 cfs) than those in June and July. We repeat our previous point that the analysis should pay appropriate attention to the actual data, and that the actual data in this instance do not support the Port's apparent conclusions that Walker Creek low flows occur only in the period of August 1 through October 31, and that mitigation should be provided for that period only.

12. The statement was made that calibration to low flows was accurate because mass balance was achieved (Brascher, ¶14). While I agree with the importance of attaining mass balance, I disagree with this statement, in its present context, for two reasons. First, attainment of mass balance for a long-term (annual or multi-year) period does not provide any assurance that suitable mass balance is attained for the low-flow summer months which in this case is the period of specific interest. Second, the examination presented above of the calibration data for the Walker Creek upper gage show that mass balance was not achieved at that gage for summer low flow months. The data show that for the 6-year period of calibration data, the simulation results on average underestimate the actual flows by about 11% (1.12 vs 1.26 cfs) for June and July, and underestimate the actual flows by about 27% (0.88 vs 1.20 cfs) for August and September. Not only are the low flows consistently under-simulated, but for this gage the data suggest that the simulation data are biased towards too-low flows in late summer and early fall. One practical

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implication of under-simulation is that reliance on the Port's model might cause false conclusions to be drawn regarding whether future low streamflows show evidence of project low flow reductions. For instance, using the actual data, low flow impacts would be indicated (for climate conditions such as during the calibration period) if average August-September fell below 1.2 cfs, but using the Port's model, no mitigation would be offered until the average flows fell below 0.88 cfs. I do not dispute that calibration data may have been accurate for other gages. My point remains that the calibration to low flows is poor or unknown for the upper gages on Walker and Des Moines Creeks.

13. The statement has been made (Brascher, ¶16) that one of the ACC reviewers (presumably meaning me) suggested that calibration should have been done using only the gage located in the upper basin of these watersheds. That is not correct. The actual statement, which may be found on page 8 of my February 2001 letter (Exhibit A) is given below.

> We recognize that model calibration is a challenging process and that data reliability is often an issue. However, because the purpose of this work is to address and mitigate conditions in the upper basin (airport) areas of the watershed, calibration efforts should place more emphasis on matching upper basin flows unless those data are confirmed to be unreliable. The current calibration effort is deficient because it has placed too much emphasis on matching conditions at the lower gage, and has prematurely discounted the more-important upper basin data.

14. The statement is made by Brascher, also at ¶16, that King County has stated that the upper gage is less reliable than the lower gage for Walker Creek. However, no evidence or supporting documentation is provided to show that King County ever made such a statement, and there is no discussion of the specific data quality/reliability issues. The gage data for upper Walker

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Creek cannot be so readily or easily dismissed on hearsay information, particularly since gages typically tend to be more reliable at low flows (which are of interest here) than at high flows for which field streamflow measurements are more difficult to obtain.

15. The statement has been made (Brascher, again at ¶16) that if calibration was based on gage data for the upper basin, then the model would have been out of calibration. This seems to be a concession that the model is not well calibrated to the upper basin gage. It is my opinion that the calibration effort should seek to understand the physical processes affecting each individual stream and to model these accordingly, rather than ignore available data which may be difficult to model or reproduce. For example, in the case of Des Moines Creek (for which low flow modeling was performed by persons unknown), we have previously identified several calibration issues including groundwater processes which would likely result in difficulty in reproducing low flows and attaining mass balance at both the upper and lower gages. The relevant text from Page 7 of my February 2001 comment letter is repeated below.

> Another groundwater-related problem with calibration is that it has overlooked possible stream losses to groundwater in the lower part of the basin. Figure B1-3 groundwater mapping shows that the Des Moines Creek below about elevation 200 feet does not intersect the regional groundwater table. This transition area corresponds roughly to the location of a knickpoint described in SMP page P-2 where the Des Moines Creek channel gradient increases and where bed sediments change from fine grained materials to relatively coarse materials with boulders, cobbles, gravel, and fine sand. Considering the evidence of the streamflow data, it seems likely that the lower part of Des Moines Creek includes a "losing reach" which has cut through the perching layer which supports the regional shallow groundwater table. The physical condition of a losing reach would be consistent with streamflow data at the mouth which show unexpectedly low flow peaks and volumes relative to streamflow data for the headwater areas. It is possible that the "poor calibration" problems described by SMP page B1-13, and the difficulty in

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reconciling measured flows at the upper and lower gages, could be rectified if the presence of a losing reach were confirmed.

16. Statements are made to the effect that the Port's analysis is accurate because it is based on 47 or nearly 50 years of flow record for each stream (Fendt, ¶¶13, 15, Weitkamp, ¶16). Such statements are misleading in that they fail to acknowledge that the analysis is based fundamentally on about six years of streamflow record and 47 years of rainfall record. If the calibration is poor, as appears to be the case for the upper gages for Walker and Des Moines Creeks, then the HSPF modeling effort has produced a 47-year series of synthetic streamflow data which are similarly poor. Given a choice between 1) a 47-year sequence of unreliable synthetic flows based on a very poor calibration and 2) a six-year sequence of actual recorded flows, it is my opinion that the actual recorded flows should provide useful data and most certainly should not be ignored in favor of a longer synthetic sequence of dubious accuracy.

17. It is stated (Kenny, ¶21) that "*by the time Ecology issued the 401 Certification in August every single issue pertaining to the adequacy of the stormwater plan had been successfully resolved and the SMP amended to reflect those changes.*" This is misleading on at least two counts. First there are numerous stormwater and related issues described in my recent review and follow-up letters (See Exhibits A and C) which in my opinion have not been successfully resolved. Second, at the time of those review comments, the SMP included the low flow analysis and low flow mitigation plan as one element of the SMP document, and the low flow analysis had clearly become the greatest remaining hurdle to approval of the SMP. I consider it misleading for Ecology to assert that every single issue had been successfully resolved when the primary remedy was to

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remove the low-flow analysis from the SMP discussion and to process it as an independent document. This resolution is inconsistent with King County review requirements (KCSWDM Section 2.3) that drainage review documents include specific Technical Information Report materials including "Special Reports and Studies." Under King County regulations, special reports and studies serve to "further address the site characteristics, the potential for impacts associated with the development, and the measures which would be implemented to mitigate impacts". The project low flow analysis would most likely be a required special study under the King County drainage review process. The "successful resolution" described by Kenny required ignoring substantive technical issues which in my opinion remain unresolved, as well as apparent non-compliance with the procedural requirements of the King County Surface Water Design Manual.

18. Port and Ecology responses to my comments on the low flow impacts of the Industrial Wastewater System (IWS) seem to have focused on the footprint of impervious surface at the IWS lagoons and IWS Lagoon 3 in particular (Kenny, ¶35; Ecology's Response, Page 12, Line 7; Port's Response, Page 10, Line 13; Fendt, ¶34) My comments have apparently been mis-interpreted, and will be clarified here. My concern is not with the relatively-small footprint of the lagoons, but rather with the fact that these lagoons have to some extent functioned historically as infiltration ponds and have allowed some fraction of the water from the entire IWS collection area, approximately 300 acres, to be infiltrated to groundwater at IWS Lagoons 1 and 2 which are located at the groundwater basin divide between Walker and Des Moines Creeks. A description of the

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condition of the IWS lagoons at issue was provided on Page 9 of my February 2001 comment letter and is repeated below.

> The IWS has a direct significant impact on seepage and base flows in the Walker and Des Moines Creek systems by its removal of large areas of basin which would naturally form the headwater recharge areas for those streams. Until recently, the effects of these diversions have been partially offset by infiltration recharge to groundwater from the three IWS storage lagoons which are located near the groundwater divide between Walker and Des Moines Creeks.
>
> Our source of information on the history and status of the IWS system is a recent hydrogeologic study by Associated Earth Sciences, Inc., "Hydrogeologic Study, Industrial Waste System (IWS) Plant and Lagoons, Seattle Tacoma International Airport," prepared for Port of Seattle, June 21, 2000. Lagoon 1 has been used to store wastewater since 1965. Lagoon 2 was built in 1972 and "is utilized during times of heavy rainfall events." Lagoon 3 was constructed in 1979 and "is used to provide excess storage capacity for industrial wastewater in the event that Lagoons 1 and 2 reach capacity." The bottoms of the lagoons most regularly in service - Lagoons 1 and 2 - were reportedly "composed of compacted gravelly sand" which should have a relatively high infiltration capacity. A program to install leak prevention liner systems in the lagoons has been underway since 1996: Lagoon 1 was lined in 1996, Lagoon 2 was lined in 1997, and construction documents have been prepared for Lagoon 3 to be lined in the near future.

My point is that the unlined IWS lagoons have historically allowed potentially significant volumes of groundwater recharge from water collected from hundreds of acres of the IWS collection system, and that IWS system leak reduction efforts, such as lining of Lagoons 1 and 2 in particular, seem likely to have some impact on stream low flows. While the lagoons were not constructed or operated with the objective of achieving infiltration to groundwater (Fendt, ¶31) the unlined lagoons have nonetheless served to perform an infiltration function. It is my opinion that these effects should be addressed in the assessment of airport impacts to stream low flows.

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19. It is apparently argued by the Port and Ecology that the IWS lagoon leak reduction efforts (such as lagoon linings) should not be considered in the low flow analysis since these linings already exist and because Section 401 Certification is not being sought for those activities. I respond that year 1994 is clearly identified in the SMP (Page 2-2) as the base year to define existing airport land use conditions, and that the lagoon linings are not grandfathered as they were constructed subsequent to that regulatory base year. Second, while Section 401 Certification is not being sought directly for the IWS improvements, the proposed stormwater system clearly does rely on IWS expansion to accommodate a significant amount of the increased runoff resulting from the airport Master Plan Update (MPU) improvements. MPU improvements are expected to add approximately 305 acres of new impervious surface to the airport, of which approximately 67 acres or 22% will be diverted away from the storm drain system (which discharges to the area streams) and into the IWS system (which discharges directly to Puget Sound).

20. The statement is made by Fendt, ¶30, that I contended that the IWS Lagoon 3 is in the Walker Creek groundwater contribution area. The intent of my previous declaration at ¶11 has been misconstrued and will be clarified here. First, I did not state or intend to suggest that Lagoon 3 is in the Walker Creek groundwater contribution area. It is not. My point was and is that the IWS service area—that is the area from which water is captured and removed from the stream systems and diverted into the IWS system—occupies a significant portion of the area mapped by SMP Figure B2-2 as comprising the Walker Creek groundwater contribution area. To my knowledge, the IWS system has been progressively enlarged through the period for which calibration

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streamflow data are provided in the SMP; the future year 2006 footprint of the IWS service area is shown by SMP Figure B2-23. If one overlays this footprint of the IWS service area (Figure B2-23) over the Walker Creek groundwater contribution area (Figure B2-2), it can be seen that the IWS service area captures (and diverts into the IWS system) nearly one half of the non-contiguous groundwater recharge area for Walker Creek. It follows that the IWS system could potentially cause up to about a 50% reduction in Walker Creek groundwater recharge and stream base flows relative to a pre-airport basin condition. Examination of the groundwater basin mapping further shows that IWS lagoons 1 and 2 (both constructed in gravelly sand and expected to be leaky prior to being lined in 1996-97) straddle the groundwater divide between Walker and Des Moines Creeks. Lagoon 1 mostly overlies the Des Moines Creek groundwater basin while Lagoon 2 mostly overlies the Walker Creek groundwater basin. Prior to these lagoons being lined, one or both likely provided some groundwater recharge which in turn supported Walker Creek low flows. It is my opinion that Walker Creek low flows may be particularly sensitive to IWS expansion and IWS system leak reduction efforts, including but not limited to lining of Lagoons 1 and 2. My previous declaration at ¶¶12 and 13 provided an analysis of the available data relevant to this issue and found that either the data indicate a significant (about 0.5 cfs) decline in Walker Creek low flows over the 1991-1996 period of calibration data, or that the model calibration and streamflow data are too poor to draw any conclusions about anything.

21. The statement is made (Fendt, ¶38) that excavation in the borrow pit area would cause an increase in recharge to the shallow regional aquifer. This misses my concern which

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involves gravel mining effects on flow timing, not recharge quantity. In light of the detailed assessments which have been made to identify low flow timing benefits of embankment construction in the Miller Creek basin, it seems unbalanced that there has been no comparable assessment of potentially-adverse low flow timing impacts resulting from mining in the upper Des Moines Creek basin to obtain the materials for embankment construction.

22. The statement is made (Fendt, ¶29) that I (Rozeboom) am confused over *"the fact that the SMP is not intended to show precise size of low flow mitigation vaults – only their probable locations."* Mr. Fendt's response does not allay my concern, as identified in my previous declaration at ¶17, that the SMP causes confusion for me and probably others because it identifies locations for low flow mitigation vaults which are different from the locations identified in the Low Flow Mitigation Plan. More complete details of this conflict between the SMP and Low Flow documents as to the probable locations of facilities were previously provided to Ecology in a letter by me dated August 6, 2001, as follows.

> The (Low Flow) document is inconsistent with the Stormwater Management Plan (SMP) as to what reserve storage facilities are proposed. One of our comments on the SMP was that, while reserve storage was included in some preliminary facility drawings, there was no comprehensive summary of what facilities were proposed to provide reserve storage. From the present (July 23, 2001) low flow analysis document, it appears that the facilities being proposed are those identified for each stream after the divider sheets titled "Summary of Low Stream Flow Mitigation Vault Storage and Filling." These parts of the low flow analysis document identify the following facilities: for Miller Creek - Vaults NEPL, Cargo, SDN2X/4X, and SDN3X; for Des Moines Creek - Vaults SDS3 and SDS4; and for Walker Creek – Vault F. However, these are different from the facilities for which preliminary reserve storage designs have been provided in the December 2000 SMP and recent SMP addenda. Very recently, on July 2, 2001, the Port (by Parametrix) provided Ecology with "Deliverable 7A (Miller Creek)" SMP revisions which included Exhibits C150 and C151 showing reserve stormwater storage and reserve stormwater release from Vaults C1, C2,

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and G1. These are different from the reserve storage vaults which are identified in the low flow analysis. With the conflicting documentation in hand, it is uncertain what is actually being proposed.

The SMP final versions of Figures C150 and C151, transmitted as part of a large set of SMP replacement pages by Parametrix to Ecology on July 27, 2001, continues to show reserve storm water releases from Vaults C1 and G1. Again, these vaults are different from the facilities identified in the Low Flow plan as providing reserve storage for purposes of low flow mitigation. If the intent of the SMP, as stated by Mr. Fendt, is to show the locations of the low flow vaults in relationship to the proposed stormwater detention vaults, then the SMP has failed to achieve that intent.

23. The statement is made (Fendt, ¶85) that "*the mere fact that there is not a technical manual for the low flow proposal does not mean it is not feasible or based on sound engineering*" and "*the constructability and engineering issues are far from unique and do not raise feasibility concerns.*" I agree fully that it is feasible to engineer and construct vaults and pipes. At issue is whether those vaults and pipes will function as intended and will provide sufficient flow rates and quantities to mitigate for the low flow impacts of airport activities. From my review work of stormwater facilities at Snoqualmie Ridge, I have experience reviewing many "unique" stormwater facilities including flow splitters and enclosed storage vaults which have been designed and engineered without specific guidance from technical manuals. From that experience, it is my opinion that lack of an applicable technical manual creates a significant opportunity for design oversights and/or errors which can adversely affect facility performance. It is further my opinion

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that there is currently a high risk that the Port's low flow plan, if approved in its present draft form and without the scrutiny of ongoing public review, will fail to achieve its intended mitigation objectives. I base this opinion in part on the track record of design and analysis errors and oversights by the Port's consultants. For example, the Port's November 1999 and August 2000 versions of the project Stormwater Management Plan contained very serious analysis flaws which were identified only by the diligence of the ACC's review of the project documents and subsequently by King County's review efforts. As an example of a recent construction plan design oversight, the Port issued runway embankment construction plans in January 2001 which could have substantially de-watered one of the wetlands which the project is claiming to protect. That design oversight was identified by me on behalf of the ACC and brought to Ecology's attention as Comment 20f of my February 2001 letter (Exhibit A). The situation was subsequently addressed by the Port and I responded as shown below with Comment 43 from my letter of June 2001 (Exhibit C) .

> We appreciate that the Port recognizes the need for additional analyses and management solutions to the challenge of pumping erosion control water from a pond which will be excavated, within a wetland, to a depth which is about 9 feet below the seasonal groundwater level. However, this is a situation which should have been identified and corrected prior to Port approval of the construction plans[1] and specifications which describe this work. The oversight illustrates that the Port's "systematic, critical construction plan review process" (Port response 41) is fallible and would benefit from additional independent review.

1Port of Seattle major contract construction plans titled "Third Runway - Embankment Construction - Phase 4", Work Order #101346, Project STIA-0104-T-01, approved 1/25/01. The accompanying two-volume Project Manual, including Specifications, is dated January 29, 2001.

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Again, for the reasons and history given above, it is my opinion that there is a high risk that the Port's low flow plan, if approved in its present incomplete draft form and without the scrutiny of ongoing public review, will fail to achieve its intended mitigation objectives.

24. It has been stated (Kenny, ¶33) that *"Ecology was reasonably assured that the (low flow) impacts had been appropriately identified and that the proposed mitigation was technically feasible."* I fail to understand how there can be assurance of impacts being appropriately identified when the accuracy and adequacy of low-flow model calibration is clearly at issue, as evidenced by Ecology's Certification Condition I.1.a.iii which requires a discussion of the accuracy of the calibration and a statement of the adequacy of the calibrations for the purpose of low flow simulation. As to the technical feasibility of the proposal, it is my opinion that feasibility has been demonstrated at only a highly conceptual level and that there is presently no assurance that this conceptual plan can or will be successfully implemented. It is noteworthy that the King County's review of the low flow impact analysis (See low flow impact analysis letter dated August 3, 2001 from King County/Bissonnette to Ecology/Kenny, Page 1) identified several inconsistencies and/or gaps in the low flow analysis with *"the potential to affect facility design and plan effectiveness beyond a trivial amount."* The declaration of the King County reviewer confirms (Whiting, Page 6, Line 13) that the low flow plan has *"some unresolved design challenges."* My point, which the King County comments seems to support, is that conceptual-level technical feasibility provides no assurance that unresolved, non-trivial, design challenges can or will be adequately resolved.

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25. Ecology's water quality certification for this project includes four pages (22 through 25) containing 137 lines of conditions affecting mitigation of low flow impacts. Attorneys for Ecology (Ecology Response, Page 9, Line 17) argue that these conditions are sufficient to ensure that low flow impacts will be offset. In my opinion the conditions as proposed are for many reasons insufficient to provide any such assurance. The single greatest problem with the conditions is the requirement that the revised low flow plan be submitted within 45 days, and then that there is no opportunity or requirement for subsequent review or approval of the revised plan. This time frame is in my opinion far too short to suitably address the outstanding issues, and I would anticipate that at least two or three additional cycles of review would be necessary to produce an adequate plan. Other of the conditions provide insufficient direction to know what would constitute an acceptable plan. For example, what exactly happens if the revised report (per Ecology Condition I.1.a.iii) concurs with our suggestion that the upper-basin calibration is very poor and not adequate for the purposes of low flow simulation? The conditions only require that an analysis and statement be made—the consequences of the findings are not addressed. Furthermore, because the Port's consultants have already declared that the models are in their opinion accurate (Fendt, ¶23; Brascher, ¶13), Ecology's condition that the Port provide a statement of model adequacy seems to be a rather futile exercise.

DATED this 8 day of October, 2001, at Tukwila, Washington.

William A. Rozeboom

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EXHIBIT A

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February 15, 2001

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ATTN: Jonathan Freedman, Project Manager

Washington State Department of Ecology
Shorelands and Environmental Assistance Program
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ATTN: Ann Kenny, Environmental Specialist

Subject: Comments on stormwater, hydrology, and hydraulics aspects of proposed 3rd runway and related development actions at Seattle-Tacoma International Airport, Corps Reference No. 1996-4-02325.

Northwest Hydraulic Consultants has been retained on behalf of the Airport Communities Coalition to provide technical reviews of stormwater, hydrology, and hydraulics elements of proposed development actions at SeaTac airport. Our comments on the November 1999 version of the project stormwater management plan and related environmental documents were submitted to Ecology and the Corps in a series of three letters dated 11/24/99, 5/3/2000, and 7/31/2000. Our comments on the August 2000 version of the stormwater management plan were submitted to Ecology (but not the Corps) in a series of four letters dated 9/7/2000, 9/21/2000, 9/25/2000, and 9/27/2000. The purpose of this letter is to record our review comments on the December 2000 version of the documents listed below.

- "Comprehensive Stormwater Management Plan; Seattle-Tacoma International Airport Master Plan Update Improvements" dated December 2000 by Parametrix, Inc. Also reviewed were the separately-bound (as Volumes 2 through 4) Comprehensive Stormwater Management Plan Appendices A through Z dated December 2000. (SMP)

- "Natural Resource Mitigation Plan; Seattle-Tacoma International Airport; Master Plan Update Improvements" dated December 2000 by Parametrix, Inc. Also reviewed were the separately-bound Natural Resource Mitigation Plan Appendices A-E Design Drawings dated December 2000. (NRMP)

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- "Wetland Functional Assessment and Impact Analysis; Master Plan Update Improvements; Seattle-Tacoma International Airport" dated December 2000 by Parametrix, Inc. (WFA)

Our qualifications to perform this review were described in our letter of November 24, 1999, and are repeated here. Mr. Rozeboom has over 20 years of specialized experience in surface water hydrology and hydraulics, including over 6 years as principal reviewer of all Master Drainage Plan, Stormwater Management Plan, and Storm Drainage Technical Information Report documents for the 1,300-acre Snoqualmie Ridge project currently under construction in the city of Snoqualmie. The Snoqualmie Ridge project is similar to the 3rd runway project in that it is a large site development which is subject to the requirements of the Washington State Department of Ecology Stormwater Management Manual and the King County Surface Water Design Manual (KCSWDM). Dr. Leytham has over 20 years of specialized experience in surface water hydrology and hydraulics, including serving as technical advisor to King County on flow control aspects of the 1990 and 1998 versions of the KCSWDM. Dr. Leytham was also responsible in 1990 for the original development of the Miller Creek basin HSPF simulation model which has since been modified by others for purposes of 3rd runway impact assessments and facility designs. Vitae for Mr. Rozeboom and Dr. Leytham are attached for reference.

Our review of the current Stormwater Management Plan and related documents has identified numerous technical deficiencies in the analyses and preliminary designs which present a risk of significant adverse impacts to the natural stream and wetland systems if the current documents are approved as a basis for mitigation of project impacts. The risk of adverse impacts is heightened by uncertainty over what performance standards will be eventually negotiated and applied for the final design of stormwater facilities, and the absence of a process for regulatory review of final drainage design plans for this large and complex project.

Our comments follow.

1. There is no clear and consistent definition of stormwater control standards to which the Port has committed to adhere. Although the SMP describes storm water control standards and target flow regimes at some length in Chapter 2 of the SMP, the standards discussed appear to still be under negotiation with Ecology. Ecology's current proposal to modify the NPDES permit[1] for SeaTac International Airport would extend permit coverage to stormwater discharges associated with the Third Runway and Master Plan Update projects. However, in the draft of the modified permit, project stormwater detention requirements are specified in Special Condition S14 as, "*All construction actions taken by the Permittee shall provide sufficient detention and/or shall use existing available detention capacity, in accordance with the* <u>*Stormwater Management Manual for the Puget Sound Basin*</u> *or its approved equivalent, to prevent an increase in the peak flow rate or flooding frequency of Miller Creek and Des Moines Creek.*" The problem with this language in the draft permit is that it specifies (requires?) a stormwater standard for the Third Runway and Master Plan Update projects which is less stringent than the SMP "updated" detention standards (SMP section

[1]Ecology held a February 12, 2001 public hearing on the proposed modification to NPDES Permit No. WA-002465-1. The deadline for written comments on the proposed modification is February 26, 2001, which is 10 days after the deadline for public comments on the Section 404 Permit application for the same project.

2.1.4) sought by others at Ecology as a condition of Section 401 Certification for those same projects. The December 2000 SMP (page 6-3) indicates that "*the hydraulic design of the facilities will be reevaluated and detention volumes adjusted as appropriate to ensure that the Port's stormwater management standards are met.*" However, the "Port's stormwater standards" appear to be defined by the SMP (page 2-1) as being "in the King County and Ecology Manuals" and those manuals do not describe or require the "updated" detention requirements found in SMP Section 2.1.4. These inconsistencies in proposed standards are of concern and lead us to question whether the Port will implement designs per the updated standards cited in the current SMP or is anticipating future negotiations which will allow the facilities to be reevaluated and detention volumes to be reduced per the less stringent standards in the King County Manual or as required by the NPDES permit.

2. The lack of detailed stormwater plans, plus the lack of a clearly-defined review process for this very complex project, makes it likely that post-SMP detailed engineering and revisions to stormwater facility designs will fail to meet Ecology and King County performance expectations. The recent history for this project, particularly the major flaws in both the November 1999 and August 2000 versions of the project SMP, highlights the need for an independent design review to supplement the Port's quality assurance and review processes. Lack of an established review process is a very major concern given that the current SMP does not establish exactly what facilities and hydraulic controls will be constructed.

   Stormwater drainage regulations for the project site are defined by the King County Surface Water Design Manual (KCSWDM) as adopted by the city of SeaTac. The KCSWDM begins (Chapter 1) by describing the drainage review procedures necessary to implement the King County surface water policies and to ensure compliance with the manual's technical requirements. However, the Port has consistently claimed to be exempt from the KCSWDM drainage review requirements as well as all other KCSWDM "procedural" requirements[2]. The proposed project will have a long timeline and there will likely be a need for design adjustments to address unanticipated conditions which arise in the future. Without explicit descriptions in the SMP of the facilities and hydraulic controls to be constructed, plus certainty of ongoing, independent, competent review, there can be no reasonable assurance of project compliance with either King County surface water policies or Ecology conditions of approval for Section 401 Certification.

3. KCSWDM Core Requirement 7: Financial Guarantees and Liability. (Similar to Ecology's Minimum Requirement #11.) The objective of this "procedural" core requirement is to ensure that development projects have adequate financial resources to fully implement the stormwater management plan and that liability is not unduly incurred by local governments. The present SMP does not address the costs of the proposed improvements or offer any financial guarantees. Using costs presented in SMP Appendix M, a single 12.6 acre-foot vault

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[2]Procedural issues were previously raised in our comment letter dated November 24, 1999. The Port's response to those comments, in a "Response to 401/404 comments" document dated March 10, 2000, stated that the Port's Interlocal Agreement with the City of SeaTac includes an exemption from "specific County permitting procedures." In the same document, the Port response to our comment on drainage review requirements begins with the statement, "This comment refers to a procedural process that the Port is not obligated to follow."

for water quality treatment would cost $7,258,675 or about $13 per cubic foot. SMP page 6-5 shows that a total of 207.2 acre-feet of stormwater vaults are proposed. At $13/cubic foot, the proposed stormwater vaults alone would cost over $117,000,000. The SMP does not address or satisfy the applicable King County and Ecology requirements for financial guarantees, and provides no assurance of sufficient funding to construct the facilities being proposed.

The importance of costs and financing is also cited in a letter report dated November 10, 1999 to the US Army Corps of Engineers by Keith Macdonald, Ph.D., of CH2M Hill, who was hired by the Port to "prepare an objective, independent, peer review of the natural resources mitigation program" for the proposed Master Plan Update Improvements. Dr. Macdonald states that "Obviously, the success of the mitigation depends on the effectiveness of implementation and monitoring. . .It is critical that sufficient guaranteed funding be available. . ."

4. Sizing of stormwater facilities has relied on unsupported assumptions regarding future Industrial Wastewater System (IWS) capacity for processing airport runoff without overflows to the natural creek systems. If these assumptions are not achieved, the stormwater facilities proposed in the SMP may be undersized. The core questions are whether the IWS storage lagoons can be significantly expanded as has been proposed[3], and what future processing rate can be achieved. SMP page 7-15 indicates a requirement for AKART (all known available and reasonable methods of treatment) recommendations for handling of IWS flows to be fully implemented by June 2004, and that the recommended alternative is for IWS treated effluent to be discharged to a King County DNR facility at Renton. An important implication of this AKART requirement is that the current IWS configuration and capacity discussed in the SMP (Section 4.2.2.2) may be largely irrelevant to the future IWS configuration and capacity. According to the SMP, negotiations are ongoing for determining (future) IWS pre-treatment standards, flow limits and timing and other issues. The Storm Drain System (SDS) is being sized to accommodate year 2006 conditions and therefore needs to be compatible with the year 2006 IWS system which meets AKART requirements.

<u>Proposed lagoon expansion is incompatible with safe airport operations</u>. The FAA has published guidelines in Advisory Circular 150/5200-33 dated 5/1/97, titled "Hazardous Wildlife Attractants on or Near Airports." The proposed expansion of IWS Lagoon 3 falls under the Advisory Circular's definition of a wastewater treatment facility (definitions are given by SMP page 4-7). Section 2 of the Advisory Circular, "Land Uses that are Incompatible with Safe Airport Operations" recommends that any new wastewater treatment facilities or associated settling ponds be sited no closer than 10,000 feet from turbine aircraft movement areas. The existing third lagoon is located within 2,000 feet of the runway, and the proposed new expansion area is within 3,000 feet of the runway. The proposed expansion of the lagoon facilities, as assumed for purposes of SMP facility design, appears to be in direct conflict with these FAA guidelines which have been applied elsewhere in the project to preclude on-site mitigation for loss of wetlands.

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[3]SMP Table 4-5 shows that the proposed expansion of IWS Lagoon 3 will add about 145 acre-feet of total storage. This significant volume is equal to about 45% of all other new stormwater storage volume proposed per SMP Table 6-2.

Feasibility of proposed IWS discharge rate is not established. The future processing rate to be achieved by the IWS system is a variable which has yet to be designed and/or negotiated. Based on system performance predictions in the latest IWS design report[4], it is clear that consideration is being given to a processing rate which is substantially less than the 2.4 to 4 MGD treatment rates examined in the SMP (Table 4-2).

The IWS storage volumes which are assumed in the SMP presume that Lagoon 3 will be expanded from its current volume of 26 MG to a future volume of 72 MG. That future volume is not proposed or described in the IWS design report. Instead, the design report (page D-1) indicates that the required lagoon size is dependent on the available release rate--a 47 MG lagoon would be required for a release rate of 4 MGD while a larger 67 MG lagoon would be required for a release rate of 2 MGD. The report does not indicate what release rate would be associated with a 72 MG lagoon. The proposed expansion to 72 MG is understood to have been established as simply "the maximum possible capacity within the available area[5]."

The IWS design report provides information to suggest that there are benefits to having a lower processing rate. The report (page 4-4, Alternative A3) cites a major cost incentive for having a reduced IWS processing rate of 1 MGD in that effluent "can be metered to KCDNR at a controlled rate during off-peak hours, which is an operating benefit to KCDNR and a cost savings to the Port. . . the annual operating costs are approximately half of Alternative A1[6]: $2.9 million versus $5.8 million." The IWS design report however does not identify what size of lagoon would be required, for a 1 MGD processing rate, to prevent overflows into the SDS or directly into Des Moines Creek.

Due to an apparent conflict with FAA guidelines, it is uncertain whether the IWS lagoon capacity can be significantly expanded as has been assumed. Because of the unknown outcome of future negotiations between the Port and King County DNR, it is uncertain what future IWS release rates will be permitted, and whether any emergency/flood-event restrictions might be imposed on IWS releases[7]. These uncertainties are problematic for ensuring the adequacy of the proposed stormwater system because IWS capacity has a direct impact on the size of required stormwater facilities, yet the IWS system is being designed and permitted through processes which appear to be largely independent of the design and review

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[4] "Addendum to IWS Engineering Report" dated April 1998 by Kennedy/Jenks Consultants.

[5] Information provided by email from Ecology (Chung Yee), with reference to a letter dated November 10, 1999, from Michael D. Feldman of the Port to Kevin Fitzpatrick of Ecology.

[6] Alternative A1 involves enlarging Lagoon 3 to 47 MG and discharging 4 MGD to King County. Disadvantages to Alternative A1 include :"Very high annual operating costs for the first 20 years. . ." and "A new pretreatment permit with KCDNR must be obtained and complied with."

[7] Other documents obtained for review purposes (not part of the SMP) included sizing calculations for Lagoon #3 dated February 2000 by Kennedy/Jenks Consultants. That document discussed several "additional considerations" to support construction of a lagoon with more storage volume, including: "Downstream system owners may prohibit IWS flows from being released during high-flow events."

processes for stormwater system planning. In the presence of these uncertainties, there can be no reasonable assurance that water quality standards will be met.

5. Problems similar to those resulting from SDS-IWS interdependence above are also found in a need for coordination between SDS facilities and low flow augmentation facilities. Specifically, a new proposal for reserve storage to augment low streamflows appears to have been added at the SMP at the last minute. SMP page 6-6 references "managed release of stormwater from reserved storage" but the summaries of stormwater facility volumes (SMP Table 6-2 and equivalent tables in other documents) do not contain any allowance for "reserved storage." The SMP is internally inconsistent in that the SMP page 6-6 list of factors which would mitigate low flow impacts fails to include the proposal from SMP page 6-10 that water for low flow augmentation will come from a well within the Tyee Valley Golf Course. Significant problems with SMP underestimation of low flow impacts and overestimation of mitigating factors are identified in other comments later in this letter. This comment focuses mostly on the unaddressed practical challenges of adding reserve storage capabilities to already-large stormwater facilities.

Under the current proposal for streamflow augmentation (from the Low Streamflow Analysis, pg 15), the Port will construct "additional storage volume in the base of selected detention facilities" to store winter season runoff until needed to support low flows during the dry season. The Low Streamflow Analysis (pg 20) further indicates that about 16.0 acre-feet of reserve storage would be required to mitigate for estimated low flow impacts. (In other comments we describe why low flow impacts have been underestimated.) Several of the proposed detention facility exhibits presented in SMP Appendix D do have some "dead storage" capacity for reserve storm water release, but the total storage (based on spot checks) appears to fall short of the target amounts. There is no tabulation on the exhibits or elsewhere of how much stormwater reserve is to be provided in total or at each facility: our spot checks required estimation of volumes from facility dimensions. A check of Vault G1 (Exhibit C151) found that the design detention volume (9.2 acre-feet) would not be available given the facility dimensions and the depth of water being allocated to dead storage. Operation of these facilities may be impractical as now configured. For example, a valve box to control reserve releases from Vault G1 would need to be either buried at about 35 feet depth (hard to operate) for runway-grade access or, for a more reasonable shallow depth, the valve box would need to be accessed and operated from a difficult-access ledge on the embankment terrace. The deepening of the vaults to provide reserve storage has caused some vaults to exceed King County maximum cover requirements and will necessitate special designs to ensure structural integrity. The reserve (dead) storage layer at the base of the detention facilities function will accumulate and concentrate settleable solids and particulate-based pollutants from the airport stormwater runoff; that "dead storage" water would later be released under very low-flow conditions with little or no opportunity for dilution of any concentrated pollutants. There is also a potential for development of anaerobic conditions in the dead storage zone which would further worsen the quality of the "reserved" water. Our point is that the "reserve stormwater" plans are new to the SMP design/review process. They are at a highly preliminary stage of development and require significant further work prior to a detailed design review which could offer any assurance that the plans are feasible or capable of providing useful low-flow mitigation.

6. While it appears that many of the gross inconsistencies in previous HSPF models have been resolved, we remain surprised by the lack of checks on the hydrologic simulation results and lack of effort to explore apparent data irregularities. This comment focuses on calibration deficiencies for Des Moines Creek.

The hydrologic model calibration report for Des Moines Creek indicates (SMP pages B1-13 and B1-14) that model results under-simulate recorded base flows at both of the upper-basin gages used for model calibration. The justification offered for under-simulation of inflows at Tyee Pond is a speculative *"it seems unlikely that enough rainfall can get into groundwater to support 0.35 base flow"* and a presumption that the stream should be gaining water in its lower reaches. The explanation offered for under-simulation of flows at the SDS3 outfall is that *"it is unknown what phenomenon could produce this base flow. One explanation is that the flow monitoring device will not register zero flow."* In our opinion, further efforts should be made to evaluate the reliability of the available data. In the case of the SDS3 gage, we are unaware of any flow monitoring devices which, properly installed and maintained, would fail to register zero flow. Failure to register zero flow, if true, could reflect a problem with the gage and should be explored to determine if there are also problems with the high-flow data being reported from the gage. Given the questions over low flow calibration for both the East Branch (Tyee Pond) and West Branch (SDS3) tributaries to Des Moines Creek, the model results should be checked against the low flow data which are available for King County Gage 11F, Tyee Weir, below the confluence of these headwater streams. The calibration report does include one plot of peak daily flows at a "Golf Weir" but we could not locate any discussion of those results.

There are inconsistencies and problems with the Des Moines Creek model treatment of area groundwater conditions represented by Figure B1-3. The calibration report text (pg B1-10) indicates inflow of groundwater from 1,240 acres of area which is noncontiguous with the surface watershed; this is inconsistent with the model input sequence which has only 512 acres. Also, our independent measurement of the Des Moines Creek noncontiguous area (per Figure B1-3) yielded about 850 acres of total area. Another groundwater-related problem with calibration is that it has overlooked possible stream losses to groundwater in the lower part of the basin. Figure B1-3 groundwater mapping shows that the Des Moines Creek below about elevation 200 feet does not intersect the regional groundwater table. This transition area corresponds roughly to the location of a knickpoint described in SMP page P-2 where the Des Moines Creek channel gradient increases and where bed sediments change from fine grained materials to relatively coarse materials with boulders, cobbles, gravel, and fine sand. Considering the evidence of the streamflow data, it seems likely that the lower part of Des Moines Creek includes a "losing reach" which has cut through the perching layer which supports the regional shallow groundwater table. The physical condition of a losing reach would be consistent with streamflow data at the mouth which show unexpectedly low flow peaks and volumes relative to streamflow data for the headwater areas. It is possible that the "poor calibration" problems described by SMP page B1-13, and the difficulty in reconciling measured flows at the upper and lower gages, could be rectified if the presence of a losing reach were confirmed.

AR 007146

We recognize that model calibration is a challenging process and that data reliability is often an issue. However, because the purpose of this work is to address and mitigate conditions in the upper basin (airport) areas of the watershed, calibration efforts should place more emphasis on matching upper basin flows unless those data are confirmed to be unreliable. The current calibration effort is deficient because it has placed too much emphasis on matching conditions at the lower gage, and has prematurely discounted the more-important upper basin data.

7. In our letter of Sept 21, 2000, we pointed out that the modeling had not made any use of King County stream gage 42C which measures flows in Tributary 0371A (a.k.a. Walker Creek) near 281 S 171st Place, a short distance downstream from the Walker Creek wetland. That gage provides direct information on flows in the headwater reach of this stream below the area of the proposed 3rd runway, and is more meaningful than the lower gage near the mouth for calibrating a streamflow model which is intended to examine streamflow effects of the 3rd runway. However, in the December 2000 SMP, there is again no mention or use of the available stream gage data for upper Walker Creek. The calibration is deficient for its failure to use this readily available streamflow data.

8. The Walker Creek calibration for low flows was achieved with a model adjustment which appears to be inconsistent with actual basin characteristics. In order to simulate flow volumes (and low flows), the Walker Creek model (SMP page B2-51) has included groundwater flows from 630 acres of till grass lands located in the (surface topography) Des Moines Creek basin, based on groundwater mapping shown by SMP Figure B2-23. However, our review of the same groundwater mapping does not show support for this acreage. We have measured the identified "Noncontiguous Walker Creek groundwater area" to be only about 690 acres in total, before adjustment for impervious surfaces. From Figure 2-1 and aerial photos, probably about one half of that total area consists of impervious surfaces which should be collected in either the IWS or other piped storm drain system and should not be available for groundwater recharge. These data checks indicate that the groundwater recharge area required (630 acres) to balance the measured Walker Creek flows is much greater than the available groundwater recharge area (about 350 acres) indicated by the available mapping. We do not know if the difficulty in simulating sufficient flow volume in Walker Creek is related to apparently similar problems in reproducing recorded flow volumes in the upper Des Moines Creek basin.

It is possible that base flows in the model calibration period have been supported in part by leakage from the IWS conveyance system and by seepage from unlined IWS lagoons. It is also possible, although more speculative, that irrigation runoff from the golf course may be influencing the base flows. It is difficult to provide any reasonable assurance of appropriate mitigation for airport impacts on stream base flows, or seepage flows to wetlands, when the source of those flows is so poorly understood.

9. The SMP model calibration of airport fill parameters appears to be biased towards parameters which understate the hydrologic flashiness of the fill which is being placed. Airport fill calibration is described in SMP (Appendix) page A-16; calibration results are plotted on page 4 of Attachment B to that appendix. The calibration data show that the model does a good job of representing average flows, but does not cover the full range of flows which were

measured during the calibration period.[8]. Peak flows are consistently (in 5 out of 6 events) underestimated, and low flows are consistently overestimated (by about 0.03 cfs from the 20-acre fill site being assessed). One consequence of these calibration results is that stormwater detention facilities might be slightly undersized. A second consequence of these calibration results is that any assessment of runway fill impacts on base flows, using HSPF modeling with these calibration parameters, might underestimate actual base flow impacts.

10. The SMP and related documents fail to consider the impacts to low flows in Des Moines Creek and Walker Creek which will result from recent lagoon lining improvements to the IWS system. The IWS has a direct significant impact on seepage and base flows in the Walker and Des Moines Creek systems by its removal of large areas of basin which would naturally form the headwater recharge areas for those streams. Until recently, the effects of these diversions have been partially offset by infiltration recharge to groundwater from the three IWS storage lagoons which are located near the groundwater divide between Walker and Des Moines Creeks.

Our source of information on the history and status of the IWS system is a recent hydrogeologic study by Associated Earth Sciences, Inc., "Hydrogeologic Study, Industrial Waste System (IWS) Plant and Lagoons, Seattle Tacoma International Airport," prepared for Port of Seattle, June 21, 2000. Lagoon 1 has been used to store wastewater since 1965. Lagoon 2 was built in 1972 and "is utilized during times of heavy rainfall events." Lagoon 3 was constructed in 1979 and "is used to provide excess storage capacity for industrial wastewater in the event that Lagoons 1 and 2 reach capacity." The bottoms of the lagoons most regularly in service - Lagoons 1 and 2 - were reportedly "composed of compacted gravelly sand" which should have a relatively high infiltration capacity. A program to install leak prevention liner systems in the lagoons has been underway since 1996: Lagoon 1 was lined in 1996, Lagoon 2 was lined in 1997, and construction documents have been prepared for Lagoon 3 to be lined in the near future. The flow augmentation recommendations in the 1997 Des Moines Creek Basin Plan were likely based on data which did not reflect impacts of the lagoon linings. Our point is that airport impacts to stream base flows, as well as mitigation needs, have likely been underestimated because they have not considered the effect of lining these lagoons.

11. The SMP and related documents fail to consider the additional adverse impacts to streamflows in Des Moines Creek which will result from the proposed development of Borrow Areas 1, 3, and 4 as a source of 6.7 million cubic yards of fill for the 3rd runway. Information on the proposed borrow area development is found in the Appendices C and D of the Port's December 2000 Wetland Functional Assessment and Impact Analysis,[9] and in Ecology's June 2000 Sea-Tac Runway Hydrologic Studies Report by Pacific Groundwater

[8]Calibration period was for 25 days in February 1999. According to NOAA-published rainfall data, SeaTac airport recorded approximately 5.6 inches during this period.

[9]Appendix C is a Hart Crowser memorandum dated December 8, 2000 regarding "Third Runway Project; Borrow Areas 1, 3, and 4; Projected Impacts to Wetlands." Appendix D is a Hart Crowser memorandum dated October 20, 2000 regarding "Sea-Tac Third Runway - Borrow Area 3 Preservation of Wetlands."

Group (PGG). The three borrow area sites have a combined area of approximately 217 acres and are proposed to be mined to depths as great as 100 feet below existing grade. The material to be excavated is described as glacially-deposited, slightly silty to silty sands and gravels (outwash soils).

Airphotos of the airport vicinity show that the existing land use at the borrow areas is primarily forest. Land use for these areas (a.k.a. South Borrow Area, Onsite Borrow Source Areas 1-4) is further described in the project 1996 FEIS Appendix M, pages M-2 and M-3 as "Both upland and wetland second-growth deciduous forest are prevalent components of the South Borrow Area" and "Upland coniferous forest is found in the northwest corner of the South Borrow Area."

Development (excavation) of the borrow areas will eliminate most of the remaining forest[10] in the headwater areas of Des Moines Creek. There will be several impacts to streamflows in Des Moines Creek as a result of physical impacts of the excavation work. First, the cutting of the forest and stripping the land of forest duff and organic soils will produced increased runoff volumes as well as increased peak flows. Second, depending on the eventual site grading and soils, infiltration and groundwater recharge may be reduced relative to the current forested condition. Third, summer base flows in Des Moines Creek can be expected to be impaired due to lost flow attenuation capacity, just as summer base flows impacts in Miller Creek are expected to be moderated somewhat by flow attenuation effects in the embankment fill. Finally, base flow contributions to Des Moines Creek from the borrow areas could be significantly affected if the excavations should strip away outwash materials to leave a surface exposure of till soils or if excavations should penetrate any groundwater perching horizons.

PGG Figure 4-2 shows a cross section for Borrow Area 1. Surface geology consists of a 5- to 25-foot depth of (permeable) recessional soils overlying a (relatively impermeable) till layer which is typically about 30 feet thick. Under current conditions, very little surface runoff would be expected. Precipitation in excess of the amount consumed by forest evaporation and transpiration would infiltrate through the recessional soils, encounter the till perching layer, and gradually seep laterally to provide seepage/base flow to Des Moines Creek. Grading and excavation will cause both the forest and the recessional soils to be removed from this area. The remaining (newly-exposed) surface geology will instead consist of till which will generate relatively large surface discharges (high peak flows) and relatively little seepage or base flow. Long term impacts will also be influenced by undetermined site restoration activities or conversion to non-forest land use.

PGG Figure 4-3 shows a cross section for Borrow Areas 3&4. Surface geology is variable. In the area of Borrow Area 3, which is closest to Des Moines Creek, the surface geology consists of a typically 10-foot depth of (permeable) recessional soils overlying a quite thin (less than 10 feet) lens of relatively impermeable perching layer. The current hydrologic response for the area of Borrow Area 3 would be similar to that described above for Borrow Area 1. In the area of Borrow Area 4, the surface geology consists of a thick (up to 100 feet)

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[10]Additional forested basin will be lost by development of the SASA element of the Master Plan Update Improvements.

depth of advance outwash soils overlying a perching horizon. The perching horizon beneath Borrow Area 4 connects with the perching layer beneath Borrow Area 3, such that the seepage flows from both areas eventually merge and flow (seep) together en route to Des Moines Creek. The current hydrologic response for the area of Borrow Area 4 would be generally similar to that for Borrow Areas 1 and 3 except that there would be even greater flow attenuation due to the thickness of the outwash deposit and the greater distance from Borrow Area 4 to Des Moines Creek.

The proposed excavation of Borrow Areas 3 and 4, as proposed, may leave a surface exposure of deep advance outwash soils. This soil exposure (assuming no conversion to land use with impervious surfaces) should not cause any increase in surface flows and the elimination of the forest cover will promote increased groundwater recharge. However, the proposed grading will penetrate and remove a perching layer which may currently be conveying borrow area seepage flow to the headwaters of Des Moines Creek. As a result, the base flow from these borrow areas to the upper reaches of Des Moines Creek may be significantly diminished.

In summary, the proposed development of the borrow areas is likely to result in adverse permanent impacts to Des Moines Creek, including increased peak flows and reduced base flows, which have not been assessed and for which no mitigation has been proposed.

12. There are numerous shortcomings in the evaluation of the potential low stream flow impacts described by SMP pages 6-5 and 6-6. Our comments below reference the source of that analyses which is the December 2000 Earth Tech report, "Seattle-Tacoma Airport Master Plan Update Low Streamflow Analysis."

a) The low flow analysis does not provide information to indicate the accuracy of the HSPF model in simulating low flows. Data provided in Table 1 for recorded average flows in August and September are for relatively-short periods of available record. Data provided for simulated average flows in August and September are for a much longer (1949-1996) period of simulation. These data sets are not directly comparable due to different periods of record. The report needs to provide a summary of simulated and observed monthly flows for periods of recorded data.

b) The report does not include HSPF input sequences to confirm what land uses and basin boundaries were assumed for any of the Des Moines or Walker Creek analyses. For Miller Creek, HSPF input sequences were provided only for year 2006 post-development conditions. In light of the major modeling discrepancies found in the previous SMP, and the fact that the present work is being conducted by three separate firms, it is important to confirm what models were used for each of the analyses.

c) As indicated in our above comments, model calibration appears to have relied on faulty measurements of groundwater tributary areas which are noncontiguous with the surface water basins (Figures B1-3 and B2-2). Walker Creek calibration relied on groundwater inputs from about 630 acres of noncontiguous pervious basin; however only about 350 acres of noncontiguous pervious basin appears to be actually

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available. There is also an apparent inconsistency in the modeling of noncontiguous groundwater inputs to Des Moines Creek: the text (SMP pg B1-10) indicates 1,240 acres but the model input file uses 512 acres. These inconsistencies need to be resolved if there is to be any confidence in model predictions regarding project effects on low flows.

d) Project impacts to low flows in areas of runway fill (Miller and Walker Creeks) may be underestimated because the HSPF model parameters used to simulate the fill materials produce larger low flows than indicated by the available calibration data. (See calibration plot, SMP Appendix A, Attachment B, Page 4. Wet season low flows are consistently overestimated by about 0.03 cfs from the 20-acre fill site being assessed.)

e) Project impacts to low flows in Des Moines Creek and Walker Creek have been underestimated because the assessment has ignored the post-1994 effects of lining the IWS storage lagoons.

f) Project impacts to low flows in Des Moines Creek have been underestimated because the assessment has ignored the post-1994 expansion of the IWS system by about 111 acres (per SMP page 5-4) and corresponding reduction in the Des Moines Creek tributary basin. The IWS basin expansion (Des Moines Creek basin reduction) is not reflected by the available supporting data for the low flow study. Instead, the area summaries presented with the Low Flow Study, Appendix D, Figure 3 indicate that the tributary basin to Des Moines Creek will increase by about 16 acres from 1994 to 2006.

g) Project impacts to low flows in Des Moines Creek have been underestimated because the assessment has ignored the effects of the loss of forest and excavation of 6.7 million cubic yards of outwash material from proposed borrow area sites at what are now the forested headwater areas of the basin.

In summary, insufficient information has been provided to confirm what models were used for the low flow analysis, or to establish whether the models are reasonably well calibrated for assessing low flows conditions. Furthermore, the analysis methods have overlooked several airport activities which will likely have an adverse impact on low streamflows, particularly in the Des Moines Creek basin. Individually and cumulatively, these problems result in a failure to adequately address airport impacts on low streamflows and associated water quality concerns in the affected streams, and a corresponding failure to provide reasonable assurance of adequate mitigation.

13. Estimates in the Low Streamflow Analysis (pages 5 through 9) of the mitigating effects of "Fill Infiltration Discharge" are inconsistent with the measured hydrologic response of the 1998 fill embankment as shown in SMP Appendix A. The measured runoff from the embankment indicates a relatively rapid flashy response to rainfall with rapid recession rates which are inconsistent with the statement (Low Streamflow Analysis page 6) that fill " would provide increased discharge from the fill area during the critical low flow periods in area

wetlands and streams". One of the principal problems appears to be that the PGG study[11] used as the basis for this assessment assumed a theoretical hydraulic conductivity for the fill which is far greater than the infiltration capacity which can be inferred from either the measured data or the HSPF model calibration. The PGG study (page C-4) assumed a hydraulic conductivity for the fill of 1.35×10^{-4} cm/sec (equivalent to 0.19 inches/hour) based on theoretical values for fill gradation specifications. That theoretical value is significantly greater than short term rainfall intensities associated with production of runoff during the monitoring period, and is nearly 10 times greater than the nominal infiltration rate of 0.02 inches per hour determined through HSPF model calibration (SMP page A-17). We recognize that the HSPF model infiltration parameter is not a direct measure of hydraulic conductivity. Nevertheless the difference in values shows a significant discrepancy between the fill response predicted in the Low Flow Analysis and the measured data from the 1998 fill embankment. We do not know why the observed runoff response of the fill is so different from the values predicted by PGG. However, a major discrepancy clearly exists and has caused the PGG analysis to significantly overestimate the seepage and baseflows which can realistically be expected from areas of embankment fill. There was a recommendation during recent permit negotiations for additional work which would have reconciled this discrepancy[12], but there is no record of that work ever being performed. Without further analysis such as recommended but never performed, which considers the observed data, there is no basis for claims that the fill will have a net beneficial effect on low flows.

14. Estimates in the Low Streamflow Study (pages 10 and 11) of the mitigating effects of "secondary recharge" are greatly overestimated. The secondary recharge calculation assumes a theoretical value for infiltration capacity based on the groundwater modeling (PGG study page C-4). As described in our above comment, this rate is significantly greater than the infiltration rate inferred from field measurements and HSPF model calibration. The results of the "secondary recharge" calculation are meaningless because of differences between the hydrologic response predicted in Low Streamflow Analysis and the observed runoff data.

15. Dam safety requirements established by Washington Administrative Code Chapter 173-175 and King County Surface Water Design Manual Section 5.3.1 have been overlooked in the current SMP. From the available drawings, it is apparent that Pond G, and possibly Pond D, exceed the size (and danger) thresholds which necessitate dam safety reviews. We note also that the Port has issued "Third Runway - Embankment Construction Phase 4" construction drawings and specifications dated January 29, 2001 for work which includes construction of berm embankments for Pond G, apparently without the required dam safety review.

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[11] Pacific Groundwater Group, "Sea-Tac Runway Fill Hydrologic Studies Report," for Washington State Department of Ecology, June 19, 2000.

[12] Floyd & Snider Inc, undated Final Draft, "Sea-Tac Airport Third Runway 401 Permit Negotiations, Meeting Notes Summary, October 2nd through December 8th, 2000." Resolution Pending Review dated 10/13 for Project Effect on Low Stream Flows reads in part, ". . .Results of the consultation recommend that the Hydrous model used by PGG be rerun using HSPF output for initial infiltration as input to the Hydrous model in order to analyze all components effecting base flows."

16. Based on project drawings obtained for other (non-SMP) reviews, there appears to be a dam safety issue at the proposed SASA facility. The current SMP is deficient because it fails to include any plans or design drawings for the SASA stormwater facility, and because dam safety requirements for this facility are not addressed.

17. In addition to dam safety reviews for the open water detention facilities identified above, dam safety or equivalent safety reviews are needed for proposed vaults SDS7 and G1 (Basin SDW1A) as shown in SMP Appendix D, Exhibits C140 and C151. Vault SDS7 proposes above-grade storage of 21.4 acre-feet of water volume in a rectangular structure with an above-ground water depth of 19.8 feet. Vault G1 proposes storage of about 13.8 acre-feet of water volume (detention storage plus reserve storage) with a water depth of 30 feet. There is an obvious need for a safety review to assure the structural stability of Vault SDS7. Our concerns over Vault G1 result from its close (about 20 feet) proximity to the top edge of a 140-foot high fill embankment. Furthermore, because of its proposed placement in fill, Vault G1 (and perhaps others) fails to satisfy the KCSWDM technical requirement (pg 5-37) that "Vaults shall not be allowed in fill slopes, unless analyzed in a geotechnical report for stability and constructability."

18. Many of the proposed vaults are in violation of KCSWDM pg 5-38 which specifies, "The maximum depth from finished grade to the vault invert shall be 20 feet." This requirement appears to relate to the maximum loading which a conventional vault structure can withstand without risk of structural failure. If so, then special structural designs will need to be developed for Vaults SDS3 and G1 (cover depth to about 40 feet), Vaults SDN3 and C1 (cover depth to about 30 feet), and Vaults M6 and C2 (cover depth to about 25 feet). Due to the currently-proposed depths, none of these six vault facilities are in compliance with the King County technical requirements for stormwater facilities. In some cases, this compliance problem has been caused or worsened because the facilities have been enlarged (deepened) to accommodate reserve stormwater storage for purposes of low flow augmentation. Further analysis is necessary to determine whether these facilities are viable.

19. SMP section 3.1.2.3 discusses concerns with standing open water. A drain time calculation proposed in the SMP for addressing open water concerns is inappropriate and will underestimate actual open water durations. The drain time method is inconsistent with actual prolonged-duration precipitation conditions in the Puget Sound. Continuous simulation methods need to be used. (Also see Comments 10 and 11 of our letter of November 24, 1999.) The current SMP proposes an inappropriate methodology to assess open water durations and furthermore fails to provide any analysis, by any method, of expected open water durations in any of the stormwater facilities being proposed. The consequence of using an inappropriate analysis methodology in this instance is that the duration of standing open water is likely to be significantly underestimated and that mitigation designs (for example netting over lower cells within detention ponds) could fail to prevent the creation of open water waterfowl attractants which are incompatible with safe airport operations.

20. Insufficient information has been provided regarding proposed Erosion and Sediment Control (ESC) facilities to offer any assurance that facilities are adequately sized and will perform as intended. There is no cogent explanation of how this ESC system is supposed to function and

there are numerous potential problems inherent in the current SMP plans.. Our concerns are heightened because the Port has already issued "Third Runway- Embankment Construction Phase 4" construction plans[13] and specifications for erosion control facilities and some permanent drainage facilities, without any known independent review or approval of those plans by any regulatory agency. Further review, prior to project approval, is needed to resolve the following questions:

a) Where are the clearing limits for the proposed work? King County core requirement 1.2.5.1 requires that prior to any site clearing or grading, areas to remain undisturbed during project construction shall be delineated. For example, SMP Appendix R, Exhibit C24 suggests that there will be an undisturbed strip, which includes some wetlands, between a line marked "limits of embankment" and a proposed TESC ditch some distance downhill. Is this strip supposed to remain undisturbed? On the corresponding grading and drainage plan for the same area (SMP Appendix O, Exhibit C115) there are again no work limits shown and the plans are deficient for not identifying the grading necessary to restore the wetlands which were altered by construction of TESC facilities.

b) What is the tributary area for each of the proposed ESC facilities? What are the design flows? Have the design calculations been reviewed? Who was responsible for this review?

c) How big are the pumps being proposed for this work? (Pumps need to be of sufficient capacity and compatible with ESC processing rates and storage volume.) What is the power supply for these pumps? If gas/diesel pumps (or power generators) are proposed, how will refueling be accomplished and what safeguards will be in place to contain spills?

d) How long will these "temporary" facilities be in place. One year? Six years?

e) How are the "outer swale" ditches supposed to work? According to the geotechnical engineering report (SMP Appendix L, Figure 8) these ditches are supposed to intercept the seepage flow from the base of the embankment and convey the water to wetlands. Collection of the (clean water) seepage flow is in conflict with the use of these same ditches for conveyance of (turbid water) construction site runoff as proposed in the SMP Appendix R exhibits. Capture and routing of clean water seepage flows to erosion control facilities might overload sediment pond processing capacity, causing releases of untreated turbid water during storm events. Capture and routing of clean water seepage in interceptor swales would furthermore cause downslope wetlands to be significantly de-watered during the (multi-year?) period of construction.

[13]Port of Seattle major contract construction plans titled "Third Runway - Embankment Construction - Phase 4", Work Order #101346, Project STIA-0104-T-01, were approved on 1/25/01 by Raymond P. Rawe, Director of Engineering Services. The accompanying two-volume Project Manual, including Specifications, prepared under the direction of Raymond P. Rawe, is dated January 29, 2001.

f) Why is temporary Pond A being excavated to a depth of approximately 10 feet in the middle of a wetland? The pond location is shown by SMP Appendix R Exhibit C24; greater detail is shown on Phase 4 construction drawings. The construction drawings include a note warning the contractor to anticipate seasonal groundwater at about 1 to 1.5 feet below ground surface. It is unrealistic to expect that a simple geotextile membrane as proposed will succeed in keeping the surrounding groundwater out of this pond. It is probable that the pond will be constantly recharged by the wetland water supply and that pumping from this pond will be functionally equivalent to pumping from the wetland. In addition to adverse impacts on the wetland, it is likely that ESC facilities have not been sized to accommodate this water.

The above questions result in part from a failure to recognize or satisfy the procedural, design review provisions of the King County and Ecology requirements. In this instance, the lesser requirement is defined by Ecology's Stormwater Program Guidance Manual, which specifies that a development site of this size must prepare a Large Parcel Erosion and Sediment Control Plan[14], comprising both a narrative report plus site plans, to demonstrate compliance with minimum requirements. The current erosion control site plans do not demonstrate compliance with minimum erosion control requirements, and give rise to numerous concerns which, individually and cumulatively, create a significant risk of recurring uncontrolled releases of construction site runoff.

21. The plans do not show how runoff from the face of the MSE wall, or from the face of the embankment, will be conveyed to the stormwater detention facilities. There are two issues. First, drainage must be provided from terraces on the face of the wall and the face of the embankment drainage in order to prevent erosion damage and to minimize the possibility of surface saturation which might result in localized slope failures. Second, this water must be conveyed to the stormwater detention facilities which will provide the required Level 2 flow control. Plans in SMP Appendix O, Exhibit C115 show that undetained surface runoff collecting at the bottom of the embankment, and also from the airport security road, would be discharged directly into adjacent wetlands without any peak flow detention as required by King County and Ecology regulations.

22. SMP Page 3-7 states, "*Several examples of water-induced slope failures have occurred recently, including one airport embankment project in Telluride, Colorado, that resulted in airport closure for one year. The slope failure was primarily attributed to stormwater build-up within the embankment.*" Because of the height of the proposed 3rd runway embankment, and the potentially catastrophic consequences of a slope or wall failure, the design documentation for the SeaTac project should identify the specific design and environmental factors which were associated with those failures. For example, were previous failures associated with poorly-draining fill materials, inadequate construction methods, or insufficient drainage systems? Were previous failures associated with specific climatic conditions such as unusually intense cloudburst events or an unusually prolonged rainfall event or closely-

14 See "Stormwater Erosion and Sediment Control for Large Parcel Construction", Department of Ecology Report WQ-R-93-012 1 #4 of 5. Also available at http://www.ecy.wa.gov/pubs/wqr93013.pdf

spaced series of intense events? Careful examination of the causes of known recent water-induced slope failures is a necessary, but missing, first step to ensure that the 3rd runway project does not repeat whatever errors or oversights may have been responsible for past slope failures.

Based on our review of the Stormwater Management Plan documents, there are at least two drainage issues affecting the fill embankment which should be addressed and resolved prior to project approval.

a) There appears to be a significant discrepancy between the embankment theoretical infiltration properties assumed by geotechnical specialists responsible for the design of the embankment and the embankment infiltration properties inferred through stormwater runoff model calibration to data from the 1998 embankment by other specialists responsible for the design of stormwater management facilities. The geotechnical analysis of the embankment and wall, and design of internal drainage systems, should account for a range of worse-case scenarios which might result from variable (or uncertain) infiltration properties. For instance, if the unexpectedly-low observed infiltration capacity was suspected to be a result of periodic applications of tackifiers or emulsions or other surface treatments for erosion control during construction, then the embankment geotechnical analysis should anticipate perching horizons and saturated zones within the embankment. Review of past slope failures should consider whether discrepancies between theoretical and actual infiltration rates may have been a contributing factor.

b) Drainage from the steps in the wall and embankment should be designed to handle cloudburst rainfall quantities computed against the surface area of these features, rather than the plan view. It is not apparent that the SMP has given any consideration to either the specific scenario of wind-driven (non-vertical) precipitation or the more general surface runoff drainage needs for the face of the wall and embankment. Review of past slope failures should assess the role and significance of surface drainage from the face of the embankment (or wall) as a contributing factor.

23. The proposed construction excavation for Pond D, as shown by SMP Appendix D, Exhibits C133 through C134.1, is very likely to intercept the local shallow regional groundwater table and to significantly disrupt the water supply to Wetland 39. We question the accuracy of groundwater levels shown by Exhibit C134.1 which suggests the maximum seasonal water level in the vicinity of the pond would be slightly below the proposed pond bottom at elevation 336.0. There is strong evidence to suggest that the excavation proposed for Pond D, to depths as great as 25 feet below grade, will intercept the local groundwater table. First, the Hart Crowser study of local groundwater conditions (SMP Appendix L) found that the shallow groundwater table is typically 10 feet below existing ground level. Second, there is an existing surface expression of groundwater at Wetland 41a which is in the footprint of Pond D. Finally, it can be seen from Exhibit C133.1 that Wetland 39 (shown but not labeled on the exhibit) begins at about elevation 348 feet, 12 feet above the proposed bottom of pond.

24. The NRMP (page 3-10) asserts that compensatory storage will be provided to mitigate for approximately 5.24 acre-ft of floodplain storage which will be lost due to embankment fill. However, our review of the proposed design has found that the compensatory storage will fail to provide any mitigation for loss of storage during frequently-occurring flood events. Loss of compensatory storage for frequently-occurring events (such as floods with return periods in the range of 2 to 10 years) might result in increased peak flows and erosion during those events.

Grading plans for the proposed compensatory floodplain area are shown by NRMP Appendix A, Sheet STIA-9805-C2. A hydraulic analysis for the associated reach of Miller Creek is presented in SMP Appendix J. The main problem with the proposed design is that the compensatory floodplain will be separated from the (relocated) stream channel by a ridge typically 2 to 4 feet higher than the floodplain. Also, the relocated channel will include a constructed 32-foot wide high flow section, independent of the floodplain, which will provide significant flow conveyance within the main channel. The ridge separating the main channel from the floodplain is apparent from the grading plans and also from NRMP Figure 5.1-6, titled "Typical Cross-Section of Miller Creek Floodplain Enhancement." The SMP hydraulic analysis shows that under major 100-year flood conditions this ridge (which has a top elevation of about 265 feet) is expected to be overtopped by depth of only about 0.5 feet. During less extreme events, the ridge will prevent floodwaters from entering the compensatory floodplain. There is no explanation for why a ridge is proposed which would prevent floodwater access to the floodplain mitigation area for all but extreme events. The compensatory floodplain design, as currently proposed, is insufficient to fully mitigate for the hydraulic effects of the embankment fill. The consequence, as stated above, is for increased peak flows and erosion during frequently-occurring flood events.

25. The proposed mitigation objectives for the Miller Creek relocation project are described by NRMP Table 5.1-2 (NRMP page 5-4). However, there are no calculations or other design information to demonstrate that the goals and design criteria will be accomplished with the design now proposed. From comparison of the December 2000 and August 1999 versions of the NRMP, we infer that some of the problems with the initial design have been recognized, but a revised design has yet to be developed which would accomplish the past or current performance objectives. The main problems are that the relocated channel is likely to go dry during low flow periods if it is constructed, as proposed, over a two-foot thick bed of highly-permeable spawning gravels. We notice that the design criteria in the December 2000 NRMP is to "Construct low flow channel 8 feet wide with 1:1 slopes and 0.5 ft deep to convey summer base flows" and does not identify a minimum flow depth which would prevent fish stranding. By contrast, the performance standard in the August 1999 NRMP (Table 5-1.1) was clearly established as a minimum flow depth of 0.25 ft at 0.5 cfs. We have commented previously that the proposed 8-feet wide channel will almost certainly not support a minimum flow depth of 0.25 cfs, especially if it is constructed over top of highly permeable gravels which will convey significant sub-surface flow. Another change between the August 1999 and December 2000 NRMP document is that the earlier (1999) design criteria was that "100 year flood flows will overtop the channel into the floodplain" whereas the current (2000) criteria is that "flows greater than the annual peak flow will overtop the channel and inundate the adjacent floodplain restoration." However, the hydraulic properties (width, slope, depth)

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for the relocated channel as shown in current design drawings (Appendix A to December 2000 NRMP) are essentially unchanged from the hydraulic properties as shown in previous versions of the design drawings. Our point is the NRMP fails to provide any calculations to indicate that the proposed relocated reach of Miller Creek channel will accomplish its changing design objectives. Our independent review suggests that the channel design as now proposed will fail to accomplish performance goals for minimum depth of flow and for floodplain inundation.

In summary, there continue to be numerous deficiencies in the analyses and preliminary designs which present a risk of significant adverse impacts to the natural stream and wetland systems if the December 2000 versions of the Comprehensive Stormwater Management Plan and Natural Resource Mitigation Plan are approved as a basis for mitigation of project impacts. We request on behalf of the Airport Communities Coalition that, prior to regulatory certification or approval of the proposed 3rd runway project, the applicant be required to respond to the issues we have raised in this letter, and that we be granted the opportunity to provide follow-up review and comment on that response.

Sincerely,

NORTHWEST HYDRAULIC CONSULTANTS, INC.

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EXHIBIT B

Northwest Hydraulics Consultants, February 15, 2001 letter

The responses in this section have been prepared from the Port's perspective and knowledge.

1. It is the Port's belief that stormwater standards are described in the *Comprehensive Stormwater Management Plan*. Water quantity (flow) control standards are described in Section 2.1. Water quality management standards are described in Section 2.2. Changes to the described standards are subject to the review and approval of Ecology.

2. The Port believes the stormwater plans provided in the *Comprehensive Stormwater Management Plan* provide appropriate detail to evaluate potential stormwater impacts from the Master Plan Update projects. The protection standards are clearly detailed, and the plan shows the feasibility of providing the mitigation required to comply with the standards. In the event that modifications to the plan are necessary due to project adjustments or unanticipated field conditions, the modifications are subject to review and approval by Ecology. The standards would remain unchanged, even if the mechanism for meeting those standards were changed.

3. As part of the §401 certification process, Ecology engaged King County as a consultant to review and comment on the Port's *Comprehensive Stormwater Management Plan*. The Port has addressed all of the comments of the King County reviewers and, based on King County's review and the Port's response to the County's comments, Ecology has reasonable assurance the *Comprehensive Stormwater Management Plan* will comply with state water quality standards.

4. The Port, as a Washington municipal corporation, need not post a bond to guarantee completion of the stormwater management facilities planned as part of the Master Plan Update improvements. As a political subdivision of the State, the Port enjoys the benefits of RCW 4.92.080, which exempts the State from bond requirements.

As described in Section 7.1.5.1 of the *Comprehensive Stormwater Management Plan*, the cost estimate for the 12.6 acre-foot vault described in Appendix M is for a vault if it were to be constructed in a completely built-out area (access freeways in subbasin SDE-4). The cost estimate is presented to demonstrate that retrofitting of this specific area is not reasonably practicable. This cost estimate does not apply to areas of new construction.

5. The expansion of Industrial Wastewater System Lagoon 3 is under construction and will be completed no later than 2003, to provide at least 72.0 mg of storage, as indicated in Table 4-2 of the *Comprehensive Stormwater Management Plan*. While construction is not complete, the plans have been bid and under construction for one season. The contractor has not identified any issue about completing the construction as designed.

The Industrial Wastewater System is already treating wastewater at the rate of 4.0 mgd (the "future" rate described in the *Comprehensive Stormwater Management Plan* Table 4-2). The discharge line has capacity in excess of the treatment rate. Lagoons 1 and 2 contain 1.6 mg and 3.3 mg, indicated in *Comprehensive Stormwater Management Plan* Table 4-2. Thus, the future treatment rate and storage capacity data stated in the *Comprehensive Stormwater Management Plan* are fully supported.

As stated in *Comprehensive Stormwater Management Plan* Section 7.5, "the recommended AKART (all known available and reasonable treatment) alternative is to discharge treated effluent from the Industrial Wastewater Treatment Plant to the King County DNR East Division Reclamation Plant at Renton (EDRPR). This alternative will eliminate or reduce Industrial Wastewater System discharge to Puget Sound. Industrial wastewater system flows will continue to be treated by the Industrial Wastewater

Treatment Plant to remove oil and grease as well as total suspended solids before flowing to the EDRPR." The marine outfall will be retained and will continue to be permitted, and will be available for discharge, if necessary, to allow discharge of flows in excess of the maximum rate accepted by the EDRPR. The storage-discharge analysis presented in Section 4.2.2 and Appendix Z demonstrates that no untreated flows would occur in the 50-year King County Runoff Time Series period of record and no overflows would occur to Miller or Des Moines Creek. In fact, modeling showed that there would be no predicted overflow with future buildout at a processing rate of just 3.1 mgd, which is 78 percent of treatment capacity and less than one-half of outfall capacity. Additional treatment capacity may be available when all known available and reasonable treatment (AKART) has been implemented.

6. It is the Port's belief that the Industrial Wastewater System lagoon complies with the siting standards of the Federal Aviation Administration's Advisory Circular 150/5200-33. As required by the Circular, wildlife hazard mitigation techniques such as surface aerators, netting, and/or covers will be employed at the new Industrial Wastewater System lagoon. The site will be monitored and adaptively managed as described in the *Wildlife Hazard Management Plan* to eliminate and minimize wildlife hazards to aircraft. A key difference between constructing the Industrial Wastewater System lagoons and new wetland mitigation within 10,000 feet of runways is that wildlife and habitat management at mitigation sites is contrary to the mitigation objectives and reduces the effectiveness of the mitigation. For these reasons, even though the Port's wetland mitigation proposes on-site mitigation to fully mitigate the non-habitat wetland impacts, off-site mitigation is proposed to mitigate avian habitat at a location where there is no potential for wildlife or habitat management to reduce aviation hazards.

7. The Industrial Wastewater System is already treating at the rate of 4.0 mgd, which demonstrates feasible treatment rates. Negotiations are on-going to determine the allowable rates of Industrial Wastewater System discharge that can be routed to the King County DNR East Division Reclamation Plant at Renton (EDRPR). Routing water to EDRPR does not diminish the amount of treatment capacity that has already been proven, but instead simply provides an alternative discharge location. Under any future scenario, if operational requirements dictate a change in treatment, processing rate, outfall capacity, or other changes that could potentially increase surface water discharges to Miller or Des Moines Creeks, the Port would be obligated to evaluate potential impacts, obtain necessary permits, and provide mitigation.

8. The release rate evaluated in the *Comprehensive Stormwater Management Plan* is the proposed rate for the Industrial Wastewater System. As described above in Response #7, any changes to the treatment rate would be evaluated for impacts to the storm drainage system.

9. The Port will operate the Industrial Wastewater System in a manner consistent with the Port's NPDES permit and any conditions imposed by Ecology in its approved §401 certification. In the event that the processing rate or operations change, the Port would evaluate impacts, if any, on surface waters and seek approval from Ecology if modifications to the *Comprehensive Stormwater Management Plan* are needed.

10. The increase in storage capacity will be accomplished by expanding Industrial Wastewater System Lagoon 3, an existing facility. Runoff from small storms is stored in Lagoons 1 and 2, which are netted to prevent bird attraction. Runoff from larger storms would require the use of Lagoon 3. Bird attraction during larger storms is less of a concern, because open water will form in many other depressional areas as well, thus reducing the likelihood of bird attraction specifically to Lagoon 3. As required by Advisory Circular 150/5200-33, wildlife hazard mitigation techniques such as surface aerators will be employed at Lagoon 3. The site will be monitored and adaptively managed as described in the *Wildlife Hazard Management Plan*.

11. The tables referenced in the comment indicate live storage volume modeled and available for runoff control. Reserved storage is not included in the live storage calculations and is therefore not included in the referenced tables.

The list of low stream flow mitigation on page 6-6 of the *Comprehensive Stormwater Management Plan* describes the Port's proposed mitigation. The Tyee Golf Course well is not a "proposed" flow augmentation source to mitigate the Port's low stream flow impacts. See General Response GLR 7 on instream flow mitigation. The discussion on page 6-10 of the *Comprehensive Stormwater Management Plan* describes the Des Moines Creek Basin Committee proposal for flow mitigation. The *Low Stream Flow* analysis concluded that low flow impacts from the development of the Master Plan Update projects could be mitigated by the reserved stormwater storage. This will not conflict with King County's plans to also have a well available to mitigate existing impacts.

12. The collection and storage of surface water in underground facilities (e.g., cisterns) is not a new concept; this practice has historically been used to store water for many uses. Long-term storage of water is the basic concept of wetponds and wetvaults, which are considered pollutant removal best management practices. Stormwater that flows to the detention facilities and reserved stormwater storage has been treated by best management practices before it flows to the vaults. "Dead" sediment storage would be provided, so that water drawn from the facilities would not re-entrain remaining settled material, if any. Reaeration will be accomplished for the small flow from the facilities using passive aeration systems such as drip towers or cascades over roughened surfaces.

Exhibit C151 incorrectly labels Vault G1 with a required volume of 9.2 acre-ft. As reported in the *Comprehensive Stormwater Management Plan* Table 6-2 and Appendix A, the actual required volume is 7.4 acre-ft, which is provided in live storage in Vault G1.

The required low stream flow mitigation design is under review by King County. Reserve and live storage volumes will be confirmed as part of this review.

13. The Des Moines Creek calibration is under review by King County. The model has been calibrated and checked against the King County Gage 11F. Review of the SDS3 gage during the period in question shows that the recorded hourly low flows approach 0.06 cfs (and the corresponding calibrated flows are very close to 0.00 cfs). Thus, even if the monitoring device has been in error, the correction for that error would have been insignificant.

14. The area of noncontiguous groundwater included in the model (512 acres) is measured from interpretation of best available data. Additional interpretation of the information may yield different results by different reviewers. In addition, groundwater areas can change in area depending on seasons, variations between different climate years, and human factors such as water withdrawals. The evaluation of groundwater area used in the model was based on professional judgment and an evaluation of the significance of groundwater areas on calibration results.

15. The selection of a location to calibrate a model is subjective. Calibration of the models used for this analysis emphasized matching overall watershed conditions, and therefore utilized the lower gages.

16. Data from gage 42C is being used to improve the Walker Creek model. Preliminary results suggest that this data will enhance the calibration of the model.

17. It is difficult to quantify the size of the groundwater basin discharging to a particular point. Groundwater basins do not necessarily correspond to the surface basins defined by topography. The 630 acres used in the model resulted in an approximate match with measured low flow volumes.

18. Irrigation runoff from the golf course or leakage from the Industrial Wastewater System lagoon does not have any influence on the Walker Creek base flows, based on the fact that both are located in the Des Moines Creek surface water and groundwater basins some distance from the Walker Creek basin.

19. In preparing the plot of observed daily flows from the 1998 embankment fill for February 1999, measurements of pond volume were not made every day. On those days where no actual measurement was taken, the 'observed' daily flow was recorded as "zero." This does not mean that there were no inflows to the pond, but instead reflects days when no pond volume was measured.

20. The existing Industrial Wastewater System lagoons were shown in the calibration and future development models as water features. There is no change in the modeling input for the lagoons from pre development to post development. The expansion of Lagoon 3 and lining of the expansion area was not included in the modeling because it is not a Master Plan Update project. Moreover, the lining area (approximately 5 acres) is insignificant compared to the total impervious area and the relatively small impacts on low stream flows. Modeling of the Industrial Wastewater System lagoon areas will be modified to reflect the lining.

21. The potential hydrologic impacts of the borrow areas were not evaluated in the *Comprehensive Stormwater Management Plan* because the Port believes that modifications are considered temporary and reversible, as opposed to the construction of permanent new impervious areas and airport facilities. However, the Port believes that it is inaccurate for the commenter to assert that the hydrologic impacts of the use of the borrow sources have not been evaluated. As noted in the comment, the *Wetland Functional Assessment and Impact Analysis*, Appendices C and D, evaluate the potential impacts of the excavation of the borrow sources on wetlands, propose a plan for avoiding or mitigating those impacts, and address the post-excavation topography and drainage facilities in the areas of the borrow sources. Appendix C specifically states that "[m]itigation [of impacts from Borrow Area 1] will also include the use of a stream setback averaging 200 feet to protect Des Moines Creek from the potential impacts of borrow development activities." In addition, Appendix D makes clear that the drainage swale designed for use in Borrow Area 3 will ameliorate the changes in groundwater flow that are anticipated to occur as a result of the excavation of that Borrow Area. Finally, "reclamation of the borrow area[s] will be accomplished in accordance with Washington Department of Natural Resources criteria and the Port of Seattle landscape plans. Once final grades have been established, the drainage swale and adjacent slopes will be protected from erosion using the same techniques demonstrated to be effective by the embankment construction to date. The excavation slopes will be dressed and hydroseeded with a bonded fiber matrix. The swale will be protected with erosion control matting until grass is established as part of the post-excavation site reclamation." Appendix D at page 8.

The feasibility of stormwater control in the borrow areas is not an issue, based on the lack of limitations regarding location and feasibility of stormwater facilities in borrow areas, e.g., land areas, wetland impacts, or size requirements. Infiltration facilities are feasible in the types of soils found in the borrow areas, allowing for the mitigation of potential base flow impacts.

Field investigations and soil classification conducted in the borrow areas, along with a comparison of soil gradation tests from field samples indicate that groundwater infiltration will increase in Borrow Areas 3 and 4 because more permeable soils will be exposed, while Borrow Area 1 may show reduced infiltration. As noted above, development and reclamation plans for Borrow Area 1 will include measures to enhance on-site infiltration (e.g., terraced slopes and benches) to the extent this is necessary.

Field investigations and soil classification conducted in the borrow areas, along with a comparison of soil gradation tests from field samples indicate that groundwater infiltration will increase in Borrow Areas 3

and 4 because more permeable soils will be exposed, while Borrow Area 1 may show reduced infiltration. As noted above, development and reclamation plans for Borrow Areas 1, 3 and 4 will include measures to enhance on-site infiltration (e.g., terraced slopes and benches) to the extent this is necessary. These plans will be submitted to the appropriate permitting agencies for review.

22. Review of air photos of the borrow areas demonstrate that much of the area was formerly neighborhoods acquired by the Port in past mitigation buy-outs. Much of the soil was modified (soil or organic materials removed) when the area was residential. Nevertheless, hydrologic modifications described will occur, although to a lesser degree than described in the comment.

While it is possible in some instances that grading would reduce surface infiltration, it is more likely that the removal of less-permeable perching layers and till will in fact increase the potential for infiltration and recharge that could increase baseflows to Des Moines Creek.

23. The Port believes the "headwaters" of Des Moines Creek are misrepresented in the comment as the borrow area locations. The west branch of Des Moines Creek originates as a well-defined, dredged channel from Northwest Ponds (the drainage area of which extends about a mile north of the Northwest Ponds), which are located approximately one-half mile upstream of 200th Street. The east branch of Des Moines Creek originates in drainage channels (with a drainage basin extending approximately 0.7 miles north of the lake) flowing to Bow Lake, which is located approximately 1 mile north of 200th Street.

24. See response to Comment 21 above.

25. The Port believes there is no basis for asserting that there will be adverse impacts from the borrow areas. Mitigation, if necessary, can be provided in the borrow areas with no impacts to operations or borrow area feasibility.

26. Refer to Technical Appendix B, Volume 3, of the *Comprehensive Stormwater Management Plan*.

27. The *Low Streamflow Analysis* report did not include supplemental Hydrologic Simulation Program-Fortran (HSPF) analyses. The *Low Streamflow Analysis* report used results from the HSPF analyses contained in the *Comprehensive Stormwater Management Plan*. Refer to the *Comprehensive Stormwater Management Plan* technical appendices A and B for HSPF input sequences.

28. See response to comment #14 above regarding groundwater basins.

29. See response to comments 19, and 21 above.

30. See response to comment #20, on Industrial Wastewater System lagoon lining.

31. The Hydrologic Simulation Program-Fortran (HSPF) modeling includes the baseflow impact to all creeks due to new impervious surface constructed since 1994. The diversions to the Industrial Wastewater System area since 1994 are evaluated in the *Comprehensive Stormwater Management Plan* comparison of 1994 conditions with 2006 conditions.

32. See responses to comments 23, 24 and 25 regarding the borrow areas. The borrow areas are not forested headwaters of Des Moines Creek.

33. The models used were described in the *Low Streamflow Analysis* report (pages 2-7). The Hydrologic Simulation Program-Fortran (HSPF) modeling for the *Comprehensive Stormwater Management Plan* was used for the low streamflow analysis. As a result, there are no differences in the

modeling for the two analyses. All permanent hydrologic impacts related to the Master Plan Update were evaluated.

34. The Port believes the commentor compared the matrix conductivity used in the Pacific Groundwater Group's analysis to the INFILT parameter in the Hydrologic Simulation Program-Fortran (HSPF) model developed for the *Comprehensive Stormwater Management Plan*. However, for comparison to HSPF model parameters, it is more appropriate to compare the HSPF INFILT parameter to the hydraulic conductivity of the bulk fill (Kbulk). It should also be recognized that Kbulk is not exactly equal to INFILT. Pacific Groundwater Group's Kbulk value of 0.085 in/hr (6x10-5 cm/sec) compares to the HSPF INFILT value of 0.02 in/hr. Based on this comparison, the difference is less than implied by the commentor. However, differences do exist between the amount of infiltration allowed by the two models. The following paragraphs explain the origins of the various values and application of results of the analysis.

The hydraulic conductivity used for the secondary recharge analysis was based on a database of measurements by others, and well-established algorithms that use soil particle size distribution. In this case, the percents of sand and silt expected of the entire fill were calculated based on geotechnical engineering plans for the fill. The resulting percents of sand and silt were considered representative of the soil matrix between gravel and cobbles. No flow was assumed to occur through the gravel/cobble fraction of the fill. As a result, the bulk hydraulic conductivity was lower than the matrix conductivityby the formula:

Kbulk = Kmatrix * (1-gravel fraction)

Where:
Kbulk =bulk hydraulic conductivity
Kmatrix = matrix hydraulic conductivity

In this case Kmatrix = 1.35x10-4 cm/sec, Kbulk = 6x10-5 cm/sec, and gravel fraction = 0.55.

INFILT for the Third Runway fill was established based on calibration of the HSPF model to Phase I fill runoff data spanning a one-month period in February 2000. At that time the Phase I fill had been contoured, densified by rolling, and treated to reduce erosion. It was virtually free of vegetation except on the slope.

The difference between the HSPF calibration result and the hydraulic conductivity implied by the particle size distribution was recognized at the time the secondary recharge analysis was performed. However, it was the opinion of more than one hydrogeologist that runoff from the completed fill would likely be less than suggested by the limited Phase I runoff monitoring data. It was recognized that stormwater designs based on the HSPF model would therefore overestimate as-built runoff, underestimate infiltration, and therefore overestimate impacts to streams in low flow periods. Because of the resulting conservative stormwater component designs, the HSPF model was not altered and the secondary recharge analysis proceeded independently.

35. A sensitivity analysis was performed in the Pacific Groundwater Group's secondary recharge analysis using reasonable assumptions for the widths of the infiltration filter strips (30 and 75 feet). Reducing Kbulk causes a reduction in estimated secondary recharge and increasing the filter-strip width causes an increase in the volume of water infiltrated (and a reduction in rate due to the increased infiltration area). By reducing the modeled Kbulk to a value equal to the HSPF model parameter (0.02 in/hr), estimated secondary recharge would be reduced by about 55% for a 75-foot filter strip (from about 22 to 10 in/yr) and by about 75% for a 30-foot filter strip (from about 48 to 12 in/yr). The secondary

recharge values estimated with the HSPF INFILT values used for Kbulk (10-12 in/yr) are less than will likely occur under the eventual built condition.

36. Dam safety design procedures defined in WAC 173-175 are followed for pond designs. All ponds requiring the Dam Safety review will incorporate that review process into the design process. If Dam Safety review is required, plans will be finalized in compliance with those regulations. All ponds constructed thus far have been exempt from a dam safety review.

37. See response to comment #36 above.

38. A geotechnical report for stability and constructability of the vaults will be completed as part of final design. Significant geotechnical evaluation of the embankment will be completed, as required to conform to all applicable regulatory requirements.

39. The depth requirement to which this comment refers is listed in the King County Stormwater Design Manual under the heading "Access Requirements." The specified depth is not a structural requirement. No depth limit is stated in the requirements under the heading "Structural Stability," on page 5-37 of the King County Stormwater Design Manual.

The Port maintains its own facilities. Due to the size and scale of operations at the Sea-Tac Airport, the Port is able to provide the necessary equipment to access and maintain these vaults.

Cast-in-place vaults will be designed and stamped by a licensed structural engineer.

40. The stormwater detention facilities will be constructed and operated consistent with the Port's *Wildlife Hazard Management Plan*. Standards for stormwater facilities are included in the *Wildlife Hazard Management Plan*. If the facilities fail to meet those standards, there are viable and feasible alternatives to retrofit the facilities to reduce wildlife attraction. Since the 1980's, the Port has staffed a full time wildlife biologist at the airport to assist in reducing and managing wildlife hazards. Accordingly, in the event of a problem, mitigation will be identified and implemented.

41. The Port believes the details described in the comment are included in plans at the appropriate level of design progress. The Port has a systematic, critical construction plan review process. Plans are reviewed at multiple design milestones by more than eight qualified Port environmental staff and consultants. In addition, the Port's individual National Pollution Discharge Elimination System (NPDES) permit requires significantly more extensive planning, implementation, and monitoring than the requirements of most construction sites in the state of Washington. Most construction sites in Washington are permitted under the General NPDES Permit for Construction Stormwater. The Port's NPDES permit requires that site-specific monitoring plans be prepared for construction projects. The Port is also required, through the Governor's Certification, to provide third-party oversight of all Master Plan Update construction activities for temporary erosion and sedimentation control. This third-party oversight is a condition of the Port's NPDES permit. The Port has a full-time temporary erosion and sedimentation control expert on staff, and monitors each of the construction sites as required by site-specific monitoring plans approved by Ecology. Problems found at the North Employee Parking Lot construction site in 1997 were effectively resolved to allow completion of the site during the wet season with no further problems.

The Port's temporary erosion and sedimentation control design and implementation procedures currently have more than three years of proven performance on large earth embankment projects, including one of the wettest winters on record. Facilities such as pumps, swales, and treatment ponds have been constructed and operated with no uncontrolled discharges.

Temporary erosion and sedimentation control is most effectively implemented with a sound. detailed plan, overseen and monitored by experts, adjusted and adapted to unique conditions at each site. using new and innovative techniques. The Port's approach to temporary erosion and sedimentation control for Master Plan Update projects meets all of these requirements.

42. Detailed temporary erosion and sedimentation control plans will be developed prior to construction, as required by the Port's National Pollution Discharge Elimination System permit. Also see response to Comment #41 above.

43. See response to comment #42 above.

44. See response to comment #42 above.

45. Temporary erosion and sedimentation control facilities will be in place as long as they are needed. Depending on the location in the construction and drainage basin, some facilities will be needed for one construction season, while others may be needed for the life of the construction (approximately 6 years).

46. As described in the *Natural Resource Mitigation Plan* (Section 5.2.3 pages 5-101 through 5-106), following construction, the outer drainage channels will serve to collect and convey seepage water to wetlands located downslope of the embankment. The temporary construction use is to collectrunoff from the construction area for diversion to a sedimentation pond and treatment. Temporary and permanent impacts to wetlands resulting from these channels have been evaluated in the *Wetland Functional Assessment and Impacts Analysis* report (Section 4.2; Table 4-5, on page 4-13).

47. Pond A and the adjacent pump pit are located in wetlands because this is the lowest part of the west-side construction area and the point to which storm water will flow during construction. These ponds are part of the temporary erosion and sedimentation control system protecting Miller Creek from potential short-term construction impacts. These ponds will be removed as soon as the adjacent disturbed ground can be revegetated and sediment is no longer a risk.

The geotextile lining is not intended to keep groundwater out of the pond, and there is some potential for Temporary Pond A to intercept a portion of the shallow groundwater that in part maintains the hydrology of Wetland 37a. We conservatively estimate the potential flow from natural groundwater into the empty pond would be on the order of 2 to 10 gpm (0.005 to 0.022 cfs). The area of wetland potentially impacted by this would be limited to between 20 and 50 feet downslope of Pond A. This volume of flow is insignificant to the wetland as a whole, except possibly during the late summer months.

It is important to note that the impact to wetland hydrology would be seasonal and temporary. The pond only needs to be pumped out when it is needed for temporary storage of storm water, typically only during the period of say October to April. Impact in winter is expected to be minimal since other hydrologic inflows will likely be sufficient to maintain moisture levels within the surficial wetland soils irrespective of any drainage effects due to Pond A. Impacts would be potentially greater in the summer, if the pond was drawn down and intercepted shallow groundwater flow that is feeding downslope wetland. However, the Port has no plans (and no need) to operate the pond except during storm events.

A management solution the Port proposes is to maintain water in the pond during the summer, when little or no stormwater retention capacity is needed. This would reduce or eliminate the drainage effect on the adjacent wetland. If necessary, management of pond levels throughout the year could be tied to anticipated weather conditions, with the water level only drawn down by pumping when storms are expected.

Based on the results of further analysis, an alternative management proposal for Pond A being considered by the Port includes placing a sheet-pile wall (or cofferdam) around the pond to isolate it from the groundwater flow that is sustaining Wetland 37a. In this alternative, sheet piles would be installed to the top of the glacial till at an anticipated average depth of 15 feet below ground surface. The sheet piles would prevent groundwater from entering Pond A, and thus prevent drawdown of groundwater levels in the adjacent wetland.

The cofferdam would divert some local shallow groundwater flow, forcing diverted water around the ends of the cofferdam, and possibly lowering water levels in the wetland area downslope of the pond as a consequence. To mitigate this, a collector/distributor trench filled with gravel (a "French drain") will be built around the outside of the cofferdam. The French drain will collect shallow groundwater that would otherwise tend to mound on the upslope side of the cofferdam, and conduct it around to the downslope side of the cofferdam. The water in this gravel-filled trench will be available to maintain water levels in the shallow wetland soils, with no volume reduction or delay to the seepage, and no introduction of channelized surface-water flow in the wetland.

48. The Port has successfully completed and implemented complex temporary erosion and sedimentation control plans for its embankment projects. The Port's National Pollution Discharge Elimination System permit already requires the detail and performance recommended in the comment, which is not typically required by applicants reviewed under the King County and Ecology Stormwater Management manuals.

49. The surface water runoff from the mechanically stabilized earth wall will be conducted laterally in the wall terraces to catch basins. The catch basins are part of the storm drainage system that includes piping and energy dissipation before delivery to the various detention facilities.

50. The Port's design includes engineering input on the embankment failure at the Telluride Airport. The factors that contributed to the failure at Telluride include:

- Failure to recognize the potential dangers of constructing embankment fill slopes atop old debris slides and other indicators of geologic instability. The natural slopes at the Third Runway site are stable by comparison;
- The Telluride construction site was in extreme topography near the top of a mountain in the Rockies, with steep slopes subject to instability, and very different from the Puget Sound lowlands;
- Failure to include in the embankment design adequate drainage to prevent the buildup of pore pressure, which was blamed as the primary cause of failure at Telluride. The Third Runway project includes a substantial drainage blanket designed expressly to prevent such dangerous build-up of pore pressures;
- The Telluride embankment materials were composed of weak shales and residual soils, which are prone to swelling. In contrast, the glacial materials that will be used at the Third Runway site are inherently stronger and more geologically stable;
- The location of the Telluride fill above a fault helped exacerbate seepage problems and contributed to the embankment failure. Such conditions are <u>not</u> present at the Third Runway site;

The relevant lessons of the Telluride Airport embankment failure have been fully incorporated in the Third Runway embankment design.

51. The Port believes the use of 1998 stormwater runoff data for the Phase 1 embankment likely skews the results toward low infiltration rates, when the bulk of the fill is in fact expected to have infiltration rates in excess of at least 0.19 inch per hour. The skew is deliberate in that it over-emphasizes stormwater runoff from the embankment, and ensures that stormwater management infrastructure is conservatively designed. However, the Hydrologic Simulation Program-Fortran (HSPF) will not yield reliable results for expected rates of infiltration and groundwater recharge through thick unsaturated zones such as created by the embankment fill, because HSPF is primarily a surface flow analysis tool, not a groundwater flow model.

The fill infiltration modeling in the Pacific Groundwater Group report is more concerned with understanding impacts to aquifers, and uses higher infiltration rates than does HSPF. These higher rates are more consistent with the expected water transmission properties of the fill, and the surface of the fill under long-term conditions (grassed, with wormholes and other macro porosity that will encourage infiltration). The Pacific Groundwater Group results support comparable modeling work on embankment infiltration performed by the Port (see Appendix C, *Embankment Infiltration and Seepage Studies, Draft Geotechnical Engineering Analyses and Recommendations, Third Runway Embankment, pages C-1 through C-12*Hart Crowser, December 4, 2000). Similar rates of infiltration used by Hart Crowser are also conservative in addressing the likelihood for perched zones of saturation to occur within the fill.

The embankment design considers observed fill drainage characteristics as well as analysis of infiltration on fill stability, and incorporates appropriate measures such as using relatively high conductivity soils for the outer part of permanent embankment slopes.

52. The bench drainage channels have been designed to conduct 200 percent of the peak flow for the 100-year, 24-hour storm event. Cloudburst rainfall and horizontal rainfall fall well within these sizing criteria.

53. The potential impact of permanent stormwater detention ponds on the hydrology of downslope wetlands has been analyzed in the *Wetland Functional Assessment and Impact Analysis* report (see Section 4.3.2.12 pages 4-64 through 4-67; and Appendix I). Groundwater data for this area, in relation to the ground elevation, is shown in Appendix I and discussed in the *Wetland Functional Assessment and Impact Analysis* report. Because of the excavation, a small indirect impact to the uppermost section of Wetland 39 could occur where the pond is excavated below the elevation of the wetland. However, Pond D has been designed to infiltrate water into the soil and with an additional orifice to discharge treated stormwater to the wetland as a means of preventing such an indirect impact.

All pond designs and temporary and permanent erosion and sediment controls include a site-specific evaluation. A primary aspect of pond siting involves test borings and test pits in the proposed locations. Standard pond design methods are followed in each case. Design of each pond proceeds from the site-specific data so that the pond is designed to be above the observed water table levels at each site.

54. The areas described as Vacca Farm and the Miller Creek relocation sites are landscapes that have been heavily altered by decades of human impacts. The changes include watershed development with houses, roads, and commercial development; channelizing Miller Creek; excavations in the Miller Creek Detention Facility, and construction of the facility; Lora Lake excavation; farming and farm drainage; and land clearing in the floodplain. It is difficult to replicate a natural system that retains existing habitat (small stream habitat) when that habitat probably did not exist prior to human alterations and other factors influencing this habitat (watershed development) are present. However, the proposed Miller Creek relocation, considering many of the limitations of the project area, will replace the limited natural functions that this highly altered portion of Miller Creek provides, and restore many functions that have been lost by previous actions.

For example, the existing stream channel is actually located on the edge of the floodplain, several feet above the existing bottom of the "valley" through which the channel flows. If the channel were constructed in the bottom of the floodplain with the low profile and flat floodplain, it would lose definition and no longer function as a section of stream channel that is present now. It is therefore necessary to construct a channel with "built-up" walls to define the flow channel.

The 5.24 acre-feet of 100-year floodplain storage will mitigate the loss of 100-year floodplain storage as described in the *Natural Resource Mitigation Plan* (Table 4.1-2 page 4-7; Section 5.1.2 pages 5-26 through 5-43). The relative floodplain storage is matched at each depth of flooding depth, thereby mitigating impacts of small floods. The relocated channel has increased conveyance capacity when compared to the existing channel. The area through which Miller Creek will be relocated is a broad, shallow backwater area that stores flood flow even during less frequent events. The proposed channel will convey flows as indicated in the *Natural Resource Mitigation Plan* (Sections 5.1.1.2 and 5.1.1.6 pages 5-5 through 5-16), and spill over to the floodplain with flows in excess 40 cfs, which is less than the mean annual flow (See page 5-12 and Table 5.4-1). The relocated channel and the floodplain "swale" are connected at the south end of the new creek, which is the point that will control the water surface level in the floodplain. The area draining to this point includes drainage from Des Moines Memorial Drive, Lora Lake, and overflow from the new channel.

The channel will overflow with flows in excess of 40 cfs. The 100-year flood elevation in the vicinity of the relocated channel represents a large shallow backwater area that could be characterized as more of a "lake" than a conventional streamside floodplain. The floodplain will receive water from other sources as well as overflow from the creek channel. Natural levees that separate the main channel from the floodplains are frequently found in nature.

55. See response to #54 above.

56. The channel design is virtually unchanged from the previous *Natural Resource Mitigation Plan* (Section 5.1.1 in Parametrix, August 1999). Changes in text were primarily a result of questions and comments from reviewers that required clarification. The assertion that the channel will go dry by flowing through highly permeable stream material is incorrect. The gravel specifications include fine sands and silts to specifically avoid the problems that were asserted by the reviewer.

Channel hydraulics in the relocated reach of Miller Creek are influenced by high water table and downstream water surface elevations, in addition to the channel configuration, slope, and roughness. The existing channel has a similar channel cross-section that meets the flow depth criteria. The flow depths, as described in the *Natural Resource Mitigation Plan* (Section 5.1.1.6 page 5-12) are expected to be met. In the event that design standards are not met and the stream is not providing appropriate habitat, Table 5.1-7 (page 5-21) of the *Natural Resource Mitigation Plan* provides performance standards and contingency measures that can be implemented.

EXHIBIT C

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Subject: Follow-up comments on stormwater, hydrology, and hydraulics aspects of proposed 3rd runway and related development actions at Seattle-Tacoma International Airport, Corps Reference No. 1996-4-02325.

Northwest Hydraulic Consultants has been retained on behalf of the Airport Communities Coalition to provide technical reviews of stormwater, hydrology, and hydraulics elements of proposed development actions at SeaTac airport. Our comments on the December 2000 version of the project stormwater management plan and related environmental documents were submitted to Ecology and the Corps in a letter dated February 15, 2001.

Responses to public comments, including those submitted by NHC, were made in a document dated April 30, 2001, by or on behalf of the Port of Seattle. The purpose of this letter is to provide our follow-up comments based on those Port responses.

Follow-up comments are provided below for each of the numbered points in our comment letter and in the Port's response. Those documents do not share a common numbering system. In order to facilitate cross-referencing to the prior documents, each comment below begins with "NHC xx; Port xx" to reference the corresponding comment and response numbers from our comment letter of February 15, 2001 and the Port's response document of April 30, 2001.

1. NHC 1; Port 1. In our opinion there is a need to eliminate ambiguity as to what stormwater standards will be applied for this project. A clear commitment is needed that the "updated" standards described in SMP Section 2.1.4 will be followed, and are not subject to further negotiation. Vague references to "the Port's stormwater management standards" (SMP page 6-3) are inappropriate and should be eliminated. Also, as noted in our original comment, it

is of concern that the now-approved major modification to the SeaTac Airport's NPDES permit has a requirement for stormwater management standards which are less stringent than the updated standards described in the SMP.

2. NHC 2; Port 2. The response does not address the substantive concern regarding the absence of a clearly-defined, post-SMP review process. The recent history for this project, particularly the major flaws in both the November 1999 and August 2000 versions of the project SMP, highlights the need for an independent design review to supplement the Port's quality assurance and review processes. Without certainty of ongoing, independent, competent review, there can be no reasonable assurance of project compliance with either King County surface water policies or Ecology conditions of approval for Section 401 Certification.

3. NHC 2; Port 3. The response is inconsistent with our understanding of the status and scope of the review work being conducted by King County. First, while the response asserts that the Port has "addressed all of the comments of the King County reviews," it is apparent from the record of subsequent Ecology-County-Port meeting notes that the King County review is an ongoing process which was not satisfied or concluded by the Port's initial responses. Second, the King County review was limited in several respects and did not consider airport impacts from non-Master Plan Projects (such as the post-1994 IWS expansion, IWS lagoon linings, or borrow pit mining) and did not assess compliance with state water quality standards. Our understanding of the study scope is based in part on the following statement from the second paragraph of King County's February 22, 2001 review findings letter: "*As with our previous review of this project, it is important to keep in mind the limitations of the work that we have performed. First, this review is limited to ascertaining whether the SMP attained minimum compliance with 1998 King County Surface Water Design Manual. Compliance with the technical provisions of the Design Manual does not mitigate all potential impacts of development and may not provide sufficient information to allow for approval under other codes and regulations.*"

4. NHC 3; Port 4. The response does not address the substantive concern regarding the cost of the proposed facilities and, per the Port's own consultant, that "Obviously, the success of the mitigation depends on the effectiveness of implementation and monitoring. . .It is critical that sufficient guaranteed funding be available. . ."

5. NHC 3; Port 4. Our comment on the unit cost of stormwater vaults was based on information provided in the SMP for Vault SDE-4. We examined the costs for all facilities shown in SMP Appendix M and selected Vault SDE-4 because 87% its costs were found to be determined by factors of basic structure cost, excavation, and backfill, all of which should be independent of whether the area had been previously developed. In contrast, we purposefully did NOT use unit cost information for SDS-3 Vault 3 which was found to have total unit costs about double those for SDE-4 due to significant (about 44% of total) costs relating to pre-development issues of removing existing pavement and constructing a new taxiway. If the Port's cost estimates are reliable, then the cost data provided in SMP Appendix M for Vault SDE-4 should provide a reasonable basis for estimating vault costs for areas of new construction. Given the Port's reluctance to provide cost estimates for storage vaults and ponds to provide peak flow control, it is of concern that the Port is using the costs

in Appendix M as justification that it is "not reasonably practicable" to construct Vault SDE-4 so that previously-developed areas can meet state water quality standards. Also see Comment 4 above.

6. NHC 4; Port 5 and 6. Response noted.

7. NHC 4; Port 5, 7, 8, and 9. Responses noted.

8. NHC 4 and 19; Port 10 and 40. The response fails to provide any analysis of the frequency and duration of standing open water in Lagoon 3 or other open water facilities. The Port's position seems to be that a realistic analysis of the frequency and duration of standing open water is irrelevant since bird attraction hazards will be controlled by other mitigation techniques.

9. NHC 5; Port 11. The amount of any "reserve storage" being proposed at stormwater facilities needs to be consistently included in SMP tables and exhibits. We agree that a distinction is needed between live storage and reserve storage.

10. NHC 5; Port 12. We disagree with the premise that the reserve storage proposal described in the SMP is a historical practice. The proposed reserve storage is not a water supply cistern from which water is regularly recharged and regularly withdrawn. The proposed reserve storage is also unlike the dead storage in a water quality wetpond in which a plug of old water is pushed out with each new storm event. Instead, the proposed reserve storage scheme involves a dead storage zone below the detention live storage. The reserve storage will be filled with the first fall or early winter storm and then function entirely as dead storage for up to nine months, accumulating whatever materials or pollutants might precipitate from the live storage zone during that time. Our point is that all of the reserve storage water will function like a dead storage zone for a very prolonged period prior to the water being put to use, and that the summer-period quality of the reserve storage water, and its suitability for low flow augmentation, is uncertain.

11. NHC 6; Port 13. Response that "The model has been calibrated and checked against the King County Gage 11F" is noted. Further comment will be offered once the results of that calibration and checking are made available for public review.

12. NHC 6; Port 14. Response appears to have mis-interpreted or has not addressed our observation of an internal inconsistency in the SMP. The calibration text (SMP page B1-10) states that there is groundwater inflow from 1,240 acres of non-contiguous area. This is inconsistent with the model input sequence which shows inflow from only 512 acres. The Port's response suggests that groundwater inflow is highly dynamic, variable, and that interpretation is subject to professional judgement. The SMP should in our opinion be internally consistent in describing the relevant factors and modeling assumptions. Also see Comment 15 below.

13. NHC 6; Port 15. Given the availability of upper-basin data, we disagree with the choice of calibrating primarily to lower gages and in matching overall watershed conditions. Our

opinion as stated previously is that because the purpose of this work is to address and mitigate conditions in the upper basin (airport) areas of the watershed, calibration efforts should place more emphasis on matching upper basin flows unless those data are confirmed to be unreliable. Emphasis on overall watershed conditions and lower-basin data will tend to mask impacts and mitigation needs from airport development activities in the upper basin.

14. NHC 7; Port 16. Response that "Data from gage 42C is being used to improve the Walker Creek model" is noted. Further comment will be offered once the results of that model improvement are made available for public review.

15. NHC 8; Port 17. The response does not address the substantive discrepancy between the 630 acres of Walker Creek non-contiguous groundwater basin assumed for model calibration, the approximately 690 gross acres (before IWS diversions) of available non-contiguous groundwater basin based on groundwater mapping (SMP Figure B2-23), and the approximately 350 acres of available non-contiguous groundwater basin once IWS areas are removed. The available mapping data suggest that diversions to the IWS system from this groundwater recharge area and implementation of IWS leak detection and repair programs could potentially cause a nearly 50% reduction in the base flows of Walker Creek. Our point is that it is difficult to provide any reasonable assurance of appropriate mitigation for airport impacts on stream base flows, or seepage flows to wetlands, when the source of those flows is so poorly understood.

16. NHC 8; Port 18. The Port response suggests with apparent certainty that leakage from the IWS lagoons does not have any influence on Walker Creek base flows. This certainty is inconsistent with Port responses 14 and 17 which suggest that groundwater inflow is highly dynamic, variable, and that interpretation is subject to professional judgement.

17. NHC 9; Port 19. Response noted.

18. NHC 10; Port 20. The response fails to address the substantive concern that post-1995 lining of the IWS lagoons has and/or will cause low streamflows in Des Moines (and possibly Walker) Creek to be reduced below the low streamflows which would have occurred during base year (1994) conditions. SMP Section 2.1.2 (page 2-2) discusses selection of the base year. Our point remains that airport impacts to stream base flows, as well as mitigation needs, have likely been underestimated because they have not considered the effect of lining these lagoons.

19. NHC 11; Port 21. Response noted. We agree that many of the potential impacts can be suitably mitigated by future reclamation activities, providing that the borrow pit areas are reclaimed to a forested basin condition. However, the SMP and related documents offer no assurance or commitment that the borrow sites will be reclaimed to a forested condition.

20. NHC 11; Port 21. The Port response does not address our comment of effects on Des Moines Creek flows due to lost flow attenuation capacity. The Port's low streamflow analysis makes the claim that summer flows in Miller Creek will be improved due to attenuation effects in the fill material which will be imported for the third runway

embankment. Because significant quantities of that same fill is being excavated (to depths of up to 100 feet) and exported from borrow pits in the upper Des Moines Creek basin, it follows that there will be some corresponding impairment of summer flows in Des Moines Creek.

21. NHC 11; Port 22. Response noted.

22. NHC 11; Port 23. Response noted. Our use of "headwaters" is intended to reflect the fact that the forested areas in question are in the upper portion of the basin where Des Moines Creek appears to be a gaining stream, and that low streamflows in Des Moines Creek are sustained, in part, by runoff from these forested areas.

23. NHC 11; Port 24. See Comment 20 above.

24. NHC 11; Port 25. We disagree with the assertion that there will be no adverse impacts from borrow pit activities. See Comments 19 and 20 above.

25. NHC 12a; Port 26. The response is inadequate and avoids the question of how well the HSPF model reproduces summer flows for the months of August and September.

26. NHC 12b; Port 27. Response noted.

27. NHC 12c; Port 28. The response is inadequate. Our point, again, is that it is difficult to provide any reasonable assurance of appropriate mitigation for airport impacts on stream base flows, or seepage flows to wetlands, when the source of those flows is so poorly understood.

28. NHC 12d; Port 29. Response noted.

29. NHC 12e; Port 30. See Comment 18 above.

30. NHC 12f; Port 31. We are confused by the response. According to the SMP, the analysis of base year 1994 conditions was made using existing (1994) land uses superimposed on future (year 2006) subbasin boundaries. Our understanding of the HSPF streamflow modeling is that areas tributary exclusively to the IWS system (as of the year 2006 basin boundaries used for both existing and future conditions) were not included in the HSPF models. With this methodology, it is impossible for the SMP to have evaluated the baseflow impact in Des Moines Creek due to the diversion of 111 acres of basin area to the IWS system. Our point is that project impacts to low flows in Des Moines Creek have been underestimated because the assessment has not accounted for the post-1994 expansion of the IWS system.

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31. NHC 12g; Port 32. See Comments 19, 20, and 22 above.

32. NHC 12; Port 33. See Comments 25 through 31 above. We repeat our original comment here. Insufficient information has been provided to confirm whether the models are reasonably well calibrated for assessing low flows conditions. Furthermore, the analysis

methods have overlooked several airport activities--IWS expansion, IWS lagoon lining, borrow pits--which will likely have an adverse impact on low streamflows, particularly in the Des Moines Creek basin. Individually and cumulatively, these problems result in a failure to adequately address airport impacts on low streamflows and associated water quality concerns in the affected streams, and a corresponding failure to provide reasonable assurance of adequate mitigation.

33. NHC 13 and 22a; Port 21, 34 and 51. The responses provide a plausible explanation of how surface contouring, densification, and application of bonded fibre matrix for erosion control could have caused the monitored embankment runoff to generate far more surface runoff (and allow far less infiltration) than would be consistent with theoretical values for the embankment fill. We agree that the surficial effects of these practices should diminish over time due to weathering and biological actions. However, no information is given to address the uncertain consequences of the layers of densified soils and bonded fiber matrix which are being buried within the body of the embankment and which will not be exposed to significant weathering or biological actions.

34. NHC 14; Port 35. Response noted. See Comment 33 above.

35. NHC 15; Port 36. Response noted. We recognize that the full dam safety review will require design drawings more advanced than those presented in the SMP. However, given the size and complexity of this project, the SMP should provide a summary table to identify which of the facilities being proposed will require Ecology review and approval, prior to construction, for compliance with dam safety regulations. Also, Ecology should confirm whether a dam safety review is needed for Pond G prior to the start of construction of that facility per the "Third Runway - Embankment Construction Phase 4" drawings and specifications dated January 29, 2001 which have been approved by the Port and issued for bid.

36. NHC 16; Port 37. See Comment 35 above.

37. NHC 17; Port 38. We disagree with the response which proposes deferring substantive issues of the feasibility of certain facilities until final design. The facilities at issue are Vault SDS7 and Vault G1. Vault SDS7 proposes above-grade storage of 21.4 acre-feet of water volume in a rectangular structure with an above-ground water depth of 19.8 feet. Vault G1 proposes storage of about 13.8 acre-feet of water volume (detention storage plus reserve storage) with a water depth of 30 feet. There is an obvious need for a safety review to assure the structural stability of Vault SDS7. Our concerns over Vault G1 result from its close (about 20 feet) proximity to the top edge of a 140-foot high fill embankment. Furthermore, because of its proposed placement in fill, Vault G1 (and perhaps others) fails to satisfy the KCSWDM technical requirement (pg 5-37) that "Vaults shall not be allowed in fill slopes, unless analyzed in a geotechnical report for stability and constructability."

38. NHC 18; Port 39. Response noted.

39. NHC 19; Port 40. See Comment 8 above.

40. NHC 20, 20a, 20b, and 20c; Port 41, 42, 43, and 44. Responses noted. However, they fail to answer the specific technical questions presented in our comments 20a, 20b, and 20c.

41. NHC 20d; Port 45. Response noted.

42. NHC 20e; Port 46. The response does not address the conflict between use of the outer swales to collect (clean water) seepage from the toe of the embankment and convey the water to wetlands with the use of the same ditches for conveyance of (turbid water) construction site runoff to erosion control treatment facilities. One consequence of this conflict is that erosion control treatment facilities may be undersized. (This relates to the unanswered, technical questions from our previous comment 20b: "What is the tributary area for each of the proposed ESC facilities? What are the design flows? Have the design calculations been reviewed?")

43. NHC 20f; Port 47. We appreciate that the Port recognizes the need for additional analyses and management solutions to the challenge of pumping erosion control water from a pond which will be excavated, within a wetland, to a depth which is about 9 feet below the seasonal groundwater level. However, this is a situation which should have been identified and corrected prior to Port approval of the construction plans[1] and specifications which describe this work. The oversight illustrates that the Port's "systematic, critical construction plan review process" (Port response 41) is fallible and would benefit from additional independent review.

44. NHC 20; Port 48. See Comment 40 above.

45. NHC 21; Port 49. The response provides an adequate proposal for drainage from the MSE wall, but fails to provide a proposal for collecting runoff from the face of the sloping embankment. Specifically, the response does not address our comment that SMP Appendix O, Exhibit C115 shows that undetained surface runoff collecting at the bottom of the embankment, and also from the airport security road, would be discharged directly into adjacent wetlands without any peak flow detention as required by King County and Ecology regulations.

46. NHC 22 and 22a; Port 50 and 51. Responses noted. See Comment 33 above.

47. NHC 22b; Port 52. Response noted.

48. NHC 23; Port 53. The response does not adequately address our concern that the proposed construction excavation for Pond D, as shown by SMP Appendix D, Exhibits C133 through C134.1, is very likely to intercept the local shallow regional groundwater table and to significantly disrupt the water supply to Wetland 39. These are the same exhibits as presented

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[1]Port of Seattle major contract construction plans titled "Third Runway - Embankment Construction - Phase 4", Work Order #101346, Project STIA-0104-T-01, approved 1/25/01. The accompanying two-volume Project Manual, including Specifications, is dated January 29, 2001.

in Appendix I of the Port's Wetland Functional Assessment and Impact Analysis. At issue is the degree to which the shallow regional groundwater table will be intercepted and the feasibility of providing returning some flow from the Pond to the wetland. Site soil boring logs and a much better understanding of the source of water supply to Wetland 41a and the upper end of Wetland 39 are needed for this issue to be resolved.

49. NHC 24; Port 54. Response noted.

50. NHC 25; Port 55. The response states that "The relative floodplain storage is matched at each depth of flooding depth. . ." but does not provide any hydraulic calculations to support the assertion that sufficient compensatory floodplain storage is being provided. The response has clarified that the compensatory storage area is intended to function like a lake subject to backwater from Miller Creek at the south end of the storage area. Our original comment had assumed that floodwater was supposed to enter the compensatory storage area by overflows along the full length of relocated channel. With our new understanding of how this system is supposed to work, there are questions of whether the ditch which connects Miller Creek to the compensatory storage area has sufficient hydraulic capacity in the initial design, and what long-term maintenance of this ditch will be required.

51. NHC 26; Port 56. The response fails to address our comment that there are no calculations or other design information to demonstrate that the goals and design criteria for the Miller Creek relocation project will be accomplished with the design now proposed. Absent a high local groundwater table throughout the full reach of relocated channel, it remains our opinion that the relocated channel, as designed, will at least intermittently fail to achieve the target minimum flow depth of 0.25 feet during low-flow (0.5 cfs) periods. The Natural Resource Mitigation Plan (page 5-14) indicates that the relocated channel will be located in an area with peat soils, but we are unable to locate information in that or other documents to show whether the local water table is sufficiently high to keep these peat soils saturated throughout the summer months.

52. NHC 26; Port 56. There is an apparent mis-communication over the characteristics of the stream substrate spawning gravels to be used for the relocated reach. The Port response states, "The gravel specifications include fine sands and silts to specifically avoid the problems that were asserted by the reviewer." However, that response seems inconsistent with the stream substrate description presented under the heading of "Stream Substrate" in the Natural Resource Mitigation Plan (NRMP) and which formed the basis for our assumption that the stream substrate material will be highly permeable. NRMP page 5-19 states that "Substrate in the relocated channel will consist of gravel, course sands, and cobble material" and also that "The flow velocity criteria for the channel were set to maintain suitable substrate for fish by minimizing the accumulation of fine-grained material." Our concern as expressed previously is that the relocated channel is likely to go dry during low flow periods if it is constructed, as proposed, over a two-foot thick bed of highly-permeable spawning gravels.

In summary, there continue to be numerous unresolved deficiencies in the analyses and preliminary designs which present a risk of significant adverse impacts to the natural stream and wetland systems if the December 2000 version of the Comprehensive Stormwater Management Plan and Natural

Resource Mitigation Plan are approved as a basis for mitigation of project impacts. We request on behalf of the Airport Communities Coalition that, prior to regulatory certification or approval of the proposed 3rd runway project, these deficiencies be resolved.

Sincerely,

NORTHWEST HYDRAULIC CONSULTANTS, INC.

William Rozeboom

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EXHIBIT D

9/8/00

SMT

The Third Runway Update – *talking points*

1. The Puget Sound Regional Council gave the go-ahead for the 3RW in 1996 without in-depth consideration of alternatives proposed in Snohomish and Pierce Counties.

2. ECY has been reviewing the runway and related STIA Master Plan Improvement proposals since '96.

3. Over this same period we have been to court regarding the validity and administration of the Port's NPDES Industrial Stormwater Waste Discharge Permit. We have prevailed over challenges to the Port's permit.
   - Note: this a.m. we received a copy of a 60 notice of intent to sue from RCAA/CASE to the Port of Seattle for numerous violations of the NPDES Permit and the CWA. A cover letter included the argument that ECY cannot consider a 401 Certification in light of the NPDES violations.

4. From the beginning, our issues/primary areas of concern have remained essentially the same:
   - Natural resource mitigation (a NRMP), primarily wetland mitigation (two sub-basins)
   - Wildlife hazard management (WLHMP) and wetland mitigation consistent with needs relating to BASH – need for agreements with the FAA
   - Water Quality – stormwater management (SWMP)
   - Consistency between the NRMP and the SWMP
   - Cumulative and indirect impacts from associated and/or nearby projects
   - Flow augmentation for Des Moines Creek
   - Clean fill criteria
   - ESA
   - CZM consistency
   - HPAs
   - Shoreline Permit Exemptions for off-site wetland mitigation in Auburn (65 acres)

Each major issue has multiple sub-issue and sub-sub-issue dimensions, some of which are considerably more serious than the totality of numerous other entire projects e.g., cumulative impacts associated with DOT SR-509 construction; flow augmentation and the need for a water right change.

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5. Under great pressure we issued a 401 in 1998. Without adequate documentation, we heavily conditioned the 401 to protect our objectives and assure compliance with pertinent laws and regulations.

   - The Port first appealed, but then withdrew its application for certification.

6. ECY reconstructed its approach with Port in '98.
   - Changed players and process
   - Maximum clarity regarding our environmental objectives e.g., would not allow further degradation to sub-basins require in-basin/on-site wetland mitigation; Level-II SW detention; etc. (difficulty here is function of number and complexity of issues – and the Port's adversarial nature.)

7. Capacity concerns.
   - Contracted with King County (the Port's dime) for review of the Port's SWMP.

8. Problems in relationship with the Port diminished, but fundamental problems remained.
   - POS culture is not conducive to non-adversarial nature – environmental staff are hired to second guess ECY/regulators every step of the way (can mean big bucks e.g., $100 plus million for DM Creek RDF)
   - Mission of the Port
   - Port has continued to underestimate:
     - ECY resolve to achieve its environmental objectives
     - What is takes to provide **adequate documentation on time**
     - Pressure from/and effectiveness of the opposition

9. Political pressure has only intensified from both directions (articles today in Highline News and Seattle Weekly).
   - Legislators
   - Mic Dinsmore and the Governor
   - The Gravel Studies (and Maury Island area-wide arsenic contamination spin-off)
   - ACC, RCAA, and CASE – and individual citizens, constant barrages of letters challenging proposal (meetings this week), threatening law suits. Concerns include:
     - Project has changed, need to renotice
     - Proposals inadequate (ACC has big bucks too, hired consultants to challenge every aspect of the Port's proposal [NW HG, Rachael Pascal…])

10. Current status: The Port reapplied last September, and the current 401 clock runs out at the end of the month. The issues are the same, project review related problems have not gone away. It is not yet clear if we will continue the effort to make a defensible decision by the end of September, or we will advise the Port to withdraw (again) its application.
    - Meeting with King County yesterday.
    - We are close – we are there on some concerns, working through remaining SW related concerns…………