northwest hydraulic consultants inc.

16300 christensen road, suite 350
seattle, washington 98188-3418
(206) 241-6000 - phone
(206) 439-2420 - fax
www.nhcweb.com

sacramento
vancouver
edmonton
seattle

August 6, 2001

Mr. Gordon White
Program Director
Shorelands and Environmental Assistance Program
Washington State Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

Dear Mr. White:

Re: Port of Seattle July 23, 2001 Low Streamflow Analysis

As you know, Northwest Hydraulic Consultants has been retained on behalf of the Airport Communities Coalition (ACC) to provide a technical review of stormwater facilities and related streamflow impacts from the proposed 3rd runway development at SeaTac airport. The purpose of this letter is to comment on the July 23, 2001 Port of Seattle two-volume document titled "Low Flow Analysis Flow Offset Facility Proposal." The comments here are in addition to the outstanding Stormwater Management Plan issues and uncertainties described in our letter of June 25, 2001, and summarized at our meeting on July 10, 2001.

The Low Flow Analysis is an incomplete draft document. The document's opening page states that "[T]he evaluation and low streamflow impact offset proposal is final. . ." However, the documentation of the evaluation is so poor as to make an informed review virtually impossible, and the impact offset proposal is inconsistent with other project documents. There is an absence of critical design and project operation information necessary to demonstrate how the system will function in practice. Because of these deficiencies, the present "final" proposal does not provide any assurance that impacts to low streamflows will be adequately mitigated.

Our specific comments follow.

1. The substantive narrative portion of the document, the 37-page "Draft Low Flow Analysis/Flow Effect Offset Facility Report," is clearly incomplete. Several of the sections identified in the report table of contents, and which are vital to understanding the analysis and flow offset proposal, are not provided. The missing sections of particular interest to our review include the Introduction (all but an opening paragraph) and the major section discussing Determination of Impacts to Streamflow. The document does not include any preliminary facility drawings to show the feasibility of providing the proposed storage and the proposed locations. There are no preliminary drawings to show how or where various water quality elements and features described in the text for circulation, venting, aeration, and turbidity control would be accomplished in practice. There are no preliminary

drawings showing outfall locations and outlet flow paths to demonstrate that the summer-period reserve storage flow releases could reach the streams without significant transit losses by evaporation, transpiration, and seepage. These omissions create uncertainty as to the feasibility and eventual performance of the flow offset proposal.

2. The opening paragraph of the introduction to the "Draft Low Flow Analysis/Flow Effect Offset Facility Report" states that the purpose of the report is to evaluate impacts to streamflows resulting from projects included in the Master Plan Update, and that the principal project expected to impact streamflows is the third runway embankment. We infer from this that the analysis does not address the other airport activities and projects we have identified previously as likely to cause additional reductions to minimum streamflows in Walker and Des Moines Creeks. At issue are: 1) a failure to account for low-flow impacts likely to result from the post-1994 expansion of and improvements to the Industrial Wastewater System, including lagoon linings and other leak reduction efforts; and 2) a failure to address low-flow impacts of future airport business park development at the site of proposed borrow pits which will eliminate what are now forested areas of the upper Des Moines Creek Basin.

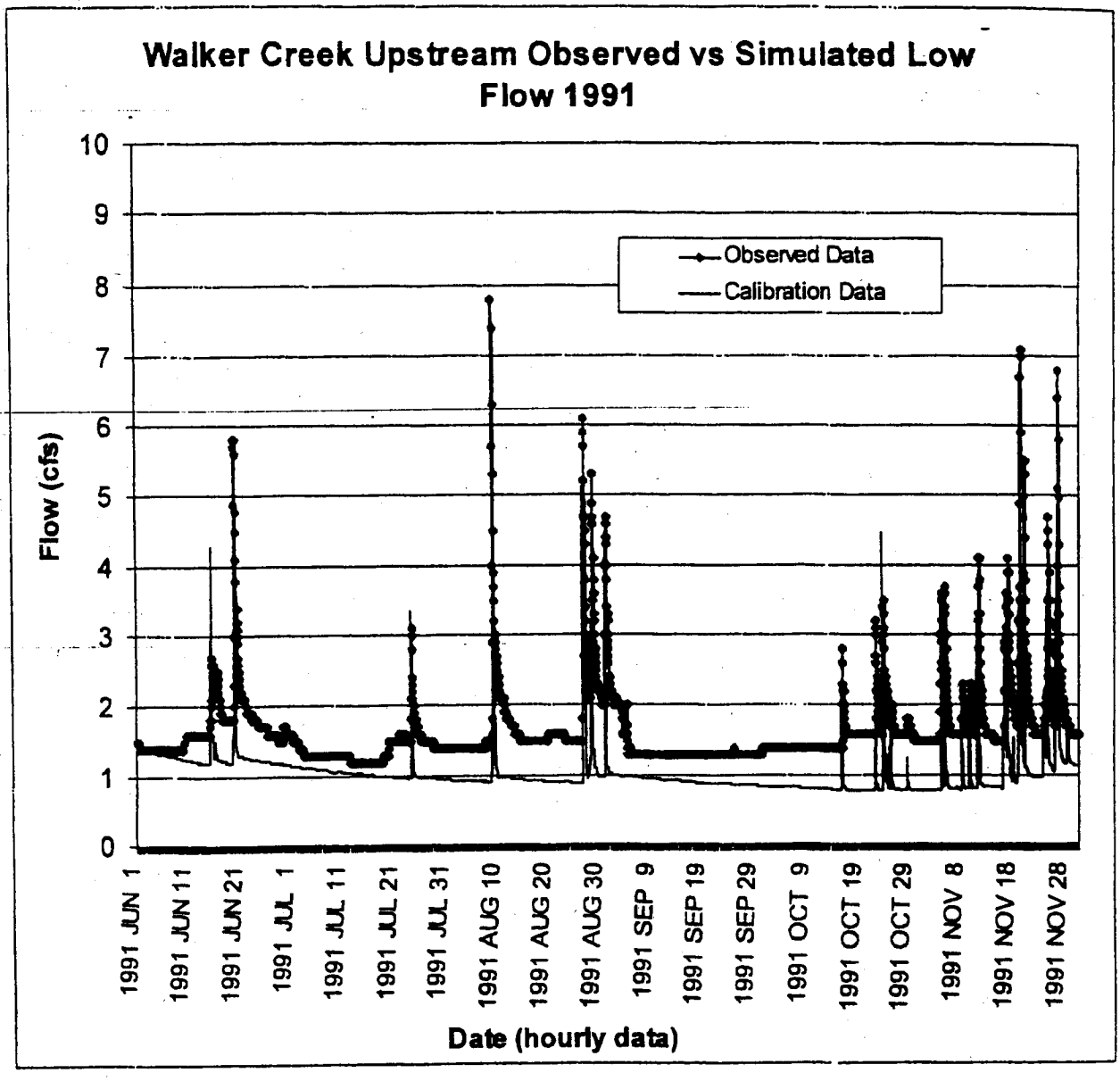
3. The document is inconsistent with the Stormwater Management Plan (SMP) as to what reserve storage facilities are proposed. One of our comments on the SMP was that, while reserve storage was included in some preliminary facility drawings, there was no comprehensive summary of what facilities were proposed 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, 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.

4. The magnitude of dry-period transit losses from the storage facilities to the streams needs to be examined and accounted for at all reserve storage facilities. In particular, if flow paths include open ditches, then seepage losses (to groundwater or to supply transpiration by bank vegetation) could be significant and would need to be accounted for. If flow paths are via dispersal or infiltration systems which are set back some distance from the stream or which provide wetland recharge, then transpiration losses could be significant and would need to be accounted for. An evaluation of transpiration losses should examine the flow path and estimate the acres of soils that are hydraulically connected to the flow path. This would be a function of topography as well as soil type. Such an analysis should include the effects of routing low flows through storage facilities such as the Miller Creek Detention Facility. The magnitude of transit losses by plant transpiration, assuming grass, would be in the order of one inch per week. At this rate, transit losses of 0.1 cfs (representing approximately the total amount of reserve storage flow for each stream) would occur if the flow path were hydraulically connected to about 17 acres of vegetation. The Miller Creek

Detention Facility may provide the opportunity for a hydraulic connection and transit losses of this magnitude.

5. The report provides no information on how the proposed constant flow releases will be accomplished in practice. Short of a closely monitored system which is actively managed in perpetuity, this is a technically challenging assignment. Flows will need to be released at heads varying from about zero to 10 feet at the release point (based on some preliminary designs) through small orifices which will be prone to plugging. If all storage facilities are operated for simultaneous flow release in proportion to their storage volumes, then facility release rates as low as 0.01475 cfs (Des Moines Vault SDS4) and 0.0129 cfs (Miller Creek Cargo Vault) are indicated. Flow rates this small, assuming a 5 foot head, would require an orifice with a diameter smaller than 0.5 inches. King County normally requires that flow control orifices be no smaller than 1.0 inches to minimize the likelihood of blockage. The report provides no assurance that constant-release flow release controls are feasible for this application.

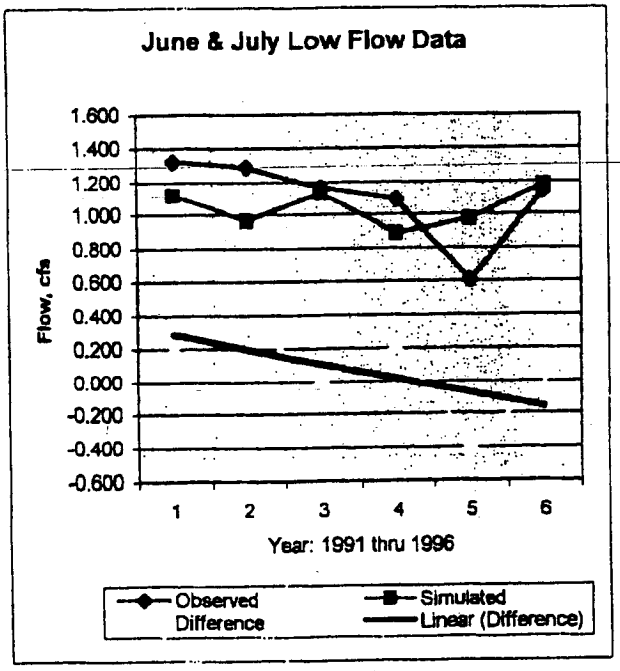
6. For Walker Creek, the calibration of simulated (HSPF) low flows to recorded low flows at the upper basin gage is very poor. HSPF simulation results for all calibration years (1991-1996) produce base flows which become progressively smaller from June through October, with the lowest flows of the year generally occurring in October. These simulation results formed the basis for the low flow analysis report finding that the summer low flow period for Walker Creek begins on August 1 and ends on October 31. However, this pattern and definition of low flow period is inconsistent with the actual streamflow record. The recorded data show that the lowest flows of the year actually occurred in June and/or July in half of the years with recorded data. In our opinion, definition of the low flow period should rely more on the actual data and less on the model data given that the calibration is so poor. Visual inspection of the recorded streamflow data for 1991-1996 suggests that the season where low flows are of concern should be extended to cover at least the period of July 1 through October 31. A comparison of Walker Creek simulated and recorded streamflows for 1991 is given in the figure below to illustrate the basis for this comment.

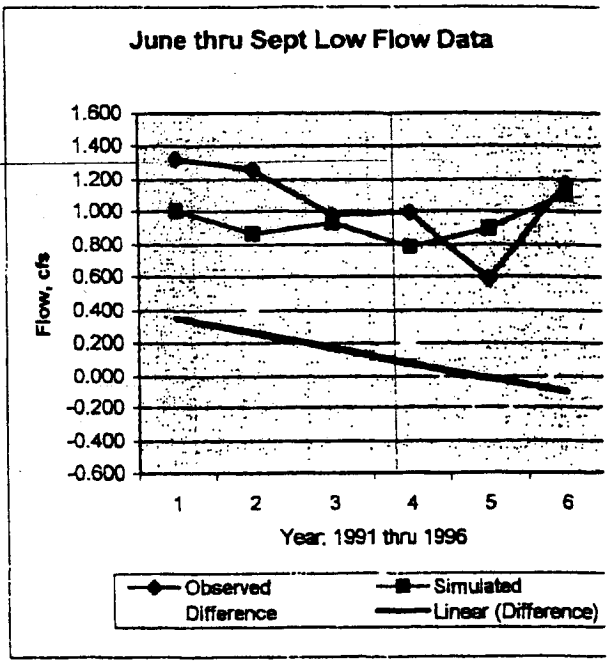


7. We have commented previously that Walker Creek appears to be vulnerable to low streamflow reductions as a result of impervious surface diversions to the Industrial Wastewater System. This comment was based on groundwater mapping shown by SMP Figure B2-23 which showed that the IWS service area covers nearly half of the non-contiguous groundwater recharge area for Walker Creek. We speculated that IWS expansion, and IWS leak reduction activities, could potentially cause progressive reductions in low streamflows. The low flow report's calibrated Walker Creek HSPF model data and the corresponding recorded data provides the basic information necessary to examine whether changes in streamflow are in fact occurring, unrelated to climatic variability.

   The existing conditions Walker Creek hydrologic model serves to simulate streamflows for the land use conditions which existed in 1994. If the model were perfectly calibrated to the 1994 condition,

then differences between the recorded and simulated data for other years could indicate changes in basin conditions. We examined the average summer low flow at the upper basin gage for each year of record, to see if the recorded (actual) flows were changing relative to the simulated flows. For this evaluation, days with observed and/or computed flows greater than 1.5 cfs (representing surface runoff) were excluded from the calculation of average summer low flows. Average value for simulated and recorded low flows were computed for each year, and plotted as a time series. The results are shown below.





We have two alternative interpretations of these results. One interpretation is that there is a pronounced declining trend in the observed data relative to the simulated data for the same period. The analysis shows that summer streamflows are declining independent of climatic variability, and that there has been an average summer low flow reduction of about 0.5 cfs over the period 1991 to 1996. The alternative interpretation is that the Walker Creek HSPF model calibration to low flows, in conjunction with uncertainty as to the quality of observed streamflow data, is too poor to draw any conclusions about anything. Under the first interpretation, the proposed low streamflow mitigation of 0.09 cfs for Walker Creek is probably insufficient to compensate for actual airport impacts. Under the second interpretation, there is substantial uncertainty as to whether the HSPF model is useful for assessing low streamflow impacts or devising a mitigation plan for Walker Creek.

8. The Walker Creek flow offset proposal includes installation of an impervious liner for approximately six acres of swale, in order to establish a dependable water supply for the reserve storage vault. We understand that the swales would be lined primarily to ensure that runoff from runway impervious surfaces is not lost to groundwater, and is available to provide reserve storage. (Note that the previous December 2000 Low Streamflow Analysis by Earth Tech concluded that nearly all of the

runway runoff would infiltrate to groundwater.) It seems counterproductive for this project to assert on one hand that runway runoff will infiltrate to groundwater (minimizing low flow impacts) and then propose the forced capture of that same runoff (maximizing low flow impacts) to support a low flow offset plan.

9. The low streamflow analysis fails to provide any low streamflow calibration data for Des Moines Creek, such as was provided for Miller and Walker Creeks. Without such data, it is not possible to provide an informed review of the low streamflow analysis or mitigation plan for Des Moines Creek.

In summary, the current low streamflow analysis and mitigation plan leaves too many unanswered questions to provide reasonable assurance that low streamflow effects of airport activities are understood or will be adequately mitigated. On behalf of the ACC, we thank you for your consideration of these comments.

Sincerely,

NORTHWEST HYDRAULIC CONSULTANTS, INC.

for William A. Rozeboom, P.E.
Senior Engineer

cc: Ann Kenny, Ecology Shorelands and Environmental Assistance Program
Peter Eglick, Helsell Fetterman LLP, FAX (206) 340-0902
Kimberly Lockard, Airport Communities Coalition, FAX (206) 870-6540

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