Review Comments on the Low Streamflow Analysis - Summer Low Flow Impact Offset Facility Proposal, December 2001

Underlined text include edits made since the February 19th discussion with Ecology, Port of Seattle, and Port consultants. The underlined text represents a summary of the reviewer's understanding of discussions and clarifications provided at the February 19th meeting. The purpose of the meeting was to provide verbal feedback on the initial findings of our technical review of the current low-flow plan. The Port is in the process of investigating the comments and revising the plan accordingly. Material was received at the February 19th meeting and electronic files received February 22nd on CD-ROM. These materials have not been reviewed to date. Additional comments may be forthcoming.

Review Scope and Limitations

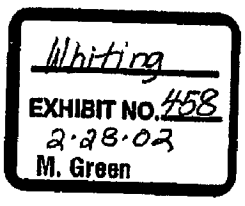
The December 2001 Low Flow Analysis Flow Impact Offset Facility Proposal (Low Flow Report) has been reviewed against the current conditional 401 Certification and 10/30/01 facilitated meeting notes. Review also includes an evaluation of consistency in hydrologic modeling and demonstration of feasibility to achieve the performance objectives identified by the Washington State Department of Ecology (Ecology) and Port of Seattle (Port). The Low Flow Report supplements the Port's Comprehensive Stormwater Management Plan (SMP).

These review comments comprise findings and recommendations for Ecology's consideration of the revised Low Flow Report's compliance with applicable conditions of 401 Certification. The conclusion of this review is that additional refinements are needed prior to concurrence with the revised impact numbers in Miller Creek, and for demonstration of sufficient and timely water collection for Walker creek. Additional comments directly related to the updated report and modeling work are also provided for your consideration.

King County's review has been limited to the HSPF hydrologic modeling, the impact assessment, and the conceptual design of related facilities. With the exception of the external HSPF hydrologic inputs and outputs, the review of the embankment modeling is performed by Ecology staff with expertise in that area.

Review of a stormwater management plan is primarily a review of design concepts and assumptions to determine if the proposed mitigations demonstrate a feasible approach to comply with the identified performance goals. As the proposed Master Plan Update (MPU) development projects move from the planning stages to development of construction plans, the proposed low-flow mitigations may need to be updated to reflect any change in conditions. Prior to construction of specific projects, additional review and approval of the final construction drawings and associated technical information reports is typically performed by local permitting agencies. A similar process is recommended for the development proposals covered by the 401 Certification. It is recommended that Ecology and the Port develop a plan to oversee and monitor compliance with the mitigations set forth in the Stormwater Management Plan and Low Flow Report. One option is to create an Ecology "Compliance Team", representing the necessary disciplines, to work with the Port to achieve compliance with the goals and objectives laid out in the SMP and related documents. Oversight and monitoring are key elements to successful implementation of any stormwater management plan.

Above discussion is mostly repeated from previous review comments. Not discussed at meeting.



1. ***Walker Creek comments include,***

- Reserve storage filling analysis assumes 11.5 acres of tributary impervious area from SDW2 subbasin. This is not consistent with modeling that shows 7.5 acres of impervious will be tributary to reserve storage vault.

- Reserve storage filling analysis assumes 14.6 acres of tributary impervious area will be collected from SDS3A subbasin. No details found to demonstrate how this will be accomplished. Note: needs to demonstrate the capture of winter volume only.

- Vault filling analysis is showing up to 213 days to fill the vault. Reviewer's preference would be to avoid fill times greater than 60 days.

  The indication was that the table summarizing the filling analysis has incorrect numbers indicated for the tributary area. The actual filling analysis assumed ~16.3 acres of impervious as indicated in Appendix J HSPF input file (name either IMPFILL.INP or IMPLOW.???). This 16.3 acres of impervious is located in SDS3A subbasin north of catchbasin SDW2-9. The collection point is shown on modified grading plan sheet C122 (Appendix F).

  Following review comments made.

  Table showing fill times should show correct acreages used in analysis.
  There appears to be additional impervious area (outside of the fill embankment) tributary to this collection system.
  Recommend avoiding fill times greater than 60 days. Discussion included an evaluation of how many years would have had fill times significantly longer than 60 days, if analysis still reports fill times greater than 60 days.
  Plan should include some discussion of the operation of the manually controlled seasonal flow-splitter in catch basin SDW2-9. The objective is to capture runoff from the Walker Creek non-contiguous groundwater basin during the winter storm season only.

- Comparison of 1994 HSPF models (SMP calibration model and current low flow model) shows a net reduction of only 0.2 pervious groundwater acres (0.025% reduction). This minor change in landcover appears inconsistent with the 0.03 cfs lowering of the simulated 2-year 7-day low flow (3.8% reduction).

  Response is that the non-contiguous groundwater PERLND provides more unit-area baseflow than some other PERLNDs. The updated groundwater routing and landcover analysis resulted in a reduction of the non-contiguous groundwater PERLND which is indicated to be responsible for the reduction in the simulated 1994 2-year 7-day low flow.

- The 47 year flow frequency analysis and occurrence distribution chart for Walker Creek (1994 conditions) currently shows 17 annual low flow events occurring in June/July. This is very different than information presented during the 2001 facilitated meetings, when the August 1 start date was proposed. If the updated flow frequency data is correct, some consideration should be given to the implications on the proposed mitigation.

  Indication is that the problem has been researched and the flow frequency analysis included in the 12/01 low flow report is inaccurate.

- HSPF parameter settings used for low flow analysis were found to be consistent with SMP calibration. A difficulty described in the calibration work was not being able to generate enough volume from the

basin to match observed flows. This is apparent in the Appendix A hydrograph comparisons and Table 3-5 summary table. A possible source of additional stream volume has been identified by ~~public comments~~ the ACC as the IWS storage lagoons which were unlined during much of the calibration period. The upgrades to the IWS treatment facility are not defined as a master plan project and therefore not included in the SMP or Low Flow reports. If IWS lagoon infiltration is included in 1994 conditions, a regulatory determination would need to be made as to whether low-flow mitigation would be required for this non-master plan IWS lining project. If no mitigation would be required, it is difficult to predict whether accounting for other sources of baseflow in the calibration would change the low-flow impact numbers.

The current revised mitigation proposal provides low-flow offset mitigation for 100 acres of lost pervious groundwater area. *Note: externally modeled embankment areas are considered pervious in this summary.*

Recommendation was made that a validation report be prepared to evaluate the revised 1994 condition models (all three streams) against the SMP 1994 calibration models and determine whether the base model calibrations should be adjusted.

Other problems with the observed data were reported by the modeler and include summer periods where recorded baseflow increases across the low-flow season. Modeler indicated that the HSPF groundwater storage decay coefficients cannot produce this result, and this observed data is inconsistent with other years and typical stream response in this region. Portions of the observed record show changes to observed baseflow not consistent with normal hydrologic response (e.g., small summer storms generating significant and immediate increase in base flows). Modeler also indicated discrepancies exist between the gauge record and manually collected measurements at the gauge location. Discussions with stream gauging staff indicated the focus of the gauging station was to collect peak flow data. Without a constant controlled cross section at the gauge, the accuracy of observed low flow record is questionable.

Miller Creek comments include,

- The point of compliance (POC), defined at SR509 crossing, should include MC7B and MC7 in the 1994 HSPF stream model. The area associated with the MC7B subbasin (1994 model: 46.5 pervious acres) becomes the 2006 SDW1B subbasin (groundwater included to POC in 2006 model). Perhaps the point of compliance in the HSPF model should be the outlet of RCHRES16 in both 1994 and 2006 models. An additional benefit is that RCHRES16 would also include the MC7 subbasin which loses 4 pervious groundwater acres and was found to be the furthest downstream subbasin subject to STIA related landcover changes. (~50 pervious acres) *Note: RCHRES16 would include subbasin M10 (also east of SR509) that should not influence impact analysis since M10 does not involve STIA related landcover changes.* Same for M16.

- PERLND80 discharges should be routed to the appropriate downstream point (e.g., RCHRES35).

- The new embankment model surface discharge timeseries should be routed to the same point as other surface discharges (SDW1A=RR247 rather than RR47 and SDW1B=RR570 rather than RR257). Current routing bypass flow-splitters which serve to proportion runoff to be infiltrated. *Note: Pervious embankment areas removed could be reinstated with Flat Outwash Grass SURO parameter setting from the embankment recharge analysis. The effect on infiltration facility groundwater recharge would be small, but would complete the surface runoff water balance.*

- PERLND 80 should not receive direct precipitation. PERLND 80 should only receive embankment model timeseries of groundwater seepage from drain layer. (114.8 acres)

- Under future 2006 conditions, the total acreage of surface/interflow runoff that was confirmed removed from the HSPF stream model was 113.05 acres. Runoff from a total of 114.81 acres of embankment was imported into the stream model. The difference is small and may be accounted for in the newly ~~added~~ defined non-contiguous groundwater areas. However, the AGWO component of 72.48 acres of PERLND45 needs to be removed. (Total swing of ~238 groundwater acres (50+114.8+72.5) in model. Note: ~127.5 acre net change to Table 2 groundwater).

  The above problems had been investigated prior to the meeting. There was concurrence that these items need to be addressed. There was discussion about the significance of these changes on low flows. Modeler indicated that there were reasons to believe the effect on the analysis may not be as significant as review comments might indicate. For example, PERLND 80 receives lateral groundwater inflow which should reduce the affect of the direct precipitation, PERLND45 does not generate much baseflow.

  Recent ACC comments include reports of discrepancies between the 2000 Ecology embankment study and the HSPF modeling performed in the low-flow analysis. This would affect the location of the PERLND80 groundwater outfalls. The above review comments include moving the PERLND80 outfall further downstream. However, the above review comments indicate that PERLND80 should discharge to the same stream reaches as used for the same geographical area under the SMP calibration and pre-/post-condition models. Nearly all of the time delay and attenuation associated with groundwater occurs in the PERLND routing, as opposed to the relatively free-flowing stream reaches. The above review comments are intended to ensure that all STIA landcover changes are accounted for with the in-stream low-flow comparison.

- The response to request for clarification on outfall location of drain layer collection swales was not found.

  This issue will be researched and clarified. This comment concerns collection swales located at the Northwest corner of the embankment.

- HSPF parameter settings used for low flow analysis were found to be consistent with SMP calibration. The Appendix A hydrograph comparisons and summary table show a reasonable match to observed gauge records. The current revised mitigation proposal is based on an increase of 55+ acres of gained pervious groundwater area (see above comments). *Note: externally modeled embankment areas are considered pervious in this summary.*

  Discussion included the reviewer's recommendation that a validation report be prepared to evaluate the need to refine the model calibration based on the updated 1994 landcover and groundwater routing.

3. *Des Moines Creek comments include,*

- The comparison of simulated and recorded streamflow data is provided at gauge site 11C. This is the Tyee Pond (east fork) gauge rather than the golf course weir (gauge 11F) where the point of compliance has been defined. No data or discussion was found in the low flow report comparing the revised existing condition simulation of low flows against the Tyee Golf Course weir gauge data

  Comment discussed. The 11F gauge was not used as the period-of-record for recorded flows is not within the 1991-1994 timeperiod.

- A permit condition requested that Des Moines Creek facilities be evaluated for an earlier start time. This request was in response to information indicating that there would be a month, or more, of storage left in the vault at the end of current proposed offset period. The future condition with offset shows similar base flow reductions in July that perhaps could be mitigated with an earlier start time, without losing mitigation later in the year. No indication in the current report that this issue was evaluated.

  This issue, documented in previous review comment and permit condition, will be evaluated.

- Both reserve storage vault outfalls are not directly to stream, but rather to the edge of wetland areas. While both wetlands (Wetlands 44 and NW Ponds) typically provide base flow discharge all year, the wetland edge in late summer could be expected to absorb a significant portion of the proposed low-flow offset mitigation. For Des Moines Creek, a preferred outfall location would be to an in-stream point downstream of the ponds (e.g., near the confluence).

  This comment will be investigated. The existing SDS4 outfall location would provide a more direct in-stream discharge point. Indication was this would be investigated. Also, there was an indication that the SDS3 outlet swale (current low-flow discharge point) may have a continuous flow source.

  Review comment remains that a more direct outfall location is recommended. Monitoring program should include some manner of determining success in delivering the offset flows to the natural drainage system (e.g., stream or open-water portion of wetland).

  For Walker Creek, the first appearance of the stream is believed to be where Wetlands 44 discharges under Des Moines Drive. The current low-flow outfall location will be to the open channel serving to collect embankment drain layer flows. This channel should be flowing year round from the embankment and/or offset flows. The proposal to discharge offset flows combined with this continuous discharge seems reasonable, but monitoring plan should include a proposal to confirm offset flows are reaching the natural drainage system.

  Comment discussed. Monitoring program should include some manner of determining success in delivering the offset flows to natural drainage system.

- HSPF parameter settings used for low flow analysis were found to be consistent with SMP calibration. This is essentially the same calibration (HSPF parameter settings) used in the Des Moines Creek Basin Plan. However, landcover data and groundwater routing has been revised considerably since the basin plan model. Appendix A now includes hydrograph comparisons for Des Moines Creek. However, hydrographs and summary tables are not for the gauge nearest the point of compliance, but rather use the upstream easterly branch gauge. The low flow comparison data shows a less than good match to observed gauge records. It is difficult to predict how

additional calibration refinements might affect the low-flow mitigation proposal. The current revised mitigation proposal is based on a reduction of 90 acres of lost pervious groundwater area.

Review comment discussed. It is difficult for reviewer to not accept a development proposal's calibration that is consistent with the final basin plan performed by King County. The proposed mitigations have been found to be generally consistent with the basin plan performance objectives for flow controls.

The reasons for the poor match should be evaluated as part of the recommended evaluation of the ramifications on the existing calibration considering the revised 1994 landcover and groundwater routing. The existing basin plan model calibration and groundwater routing should be included as a baseline condition.

4. *Water Quality comments include,*

Preface: Reviewer has no data to indicate that the reserve storage water will have quality problems. The reserve storage vaults are found to be generally consistent with the King County design criteria for wetvaults. Monitoring data on wetvault discharges is limited. A request was made for the reviewer to research available wetvault monitoring data. There has been some data collected on Bellevue's Lakemont Park wetvault, but the final report does not include field measurements, such as pH or temperature. There was also no dissolved oxygen results reported. An inquiry has been placed with the City of Bellevue to see if there was additional data collected and not reported. Pollutant concentration data is reported but differences in the landuse and treatment facility sequences makes reviewer skeptical that this would reliably predict the condition of the airport reserve storage facilities. Lakemont facility sequence: wetvault, sandfilter, flow control. STIA facility sequence: biofilter, wetvault(reserve storage), flow control.

- Reserve storage vaults act as flow-through with a secondary discharge of stored water through the detention facility. Under the contingency that there may be water quality issues with the reserve storage, monitoring and treating only the low flow discharge is a concern.

  Discussed reviewer preference to maintain the reserve storage water quality in a dischargeable condition due to flow-through configuration with alternate outlet. The discussion included a proposal to take the reserve storage off-line once full. Reviewer indicated a preference to have turn-over and flow-through conditions for same reasons as wetvaults. It is recommended that monitoring plan include periodic checks of reserve storage water quality, rather than limiting monitoring to only the low-flow outlet.

- The revised conceptual drawings show several walls, effectively creating long flowpaths with length-to-width ratios greater than 5. With this design, the elevation of the inlet pipe is of lesser concern than with other vault configurations.

- The revised conceptual drawings show a substantial amount of contact area between water and concrete. If water is exposed to bare concrete for extended periods, high pH conditions may be created. It is recommended that the proposed water quality monitoring be expanded to include monitoring and reporting of pH results. Also, it is recommended that consideration be given to coating of reserve storage vault walls to avoid extended water-concrete contact.

  Indication is that monitoring plan will be revised to include pH monitoring. Additionally, the comment related to the coating of vault walls will be considered as part of construction, or as part of a contingency plan.

- The King County Surface Water Design Manual (KCSWDM) recommends recirculation pumps when wetpool depths are greater than 6 feet. This would include both facilities. This recommended design criteria may be difficult to implement with the enhanced flowpath configuration of the vaults.

- Final design and O&M plan will need to make provisions for annual maintenance. With maintenance scheduled to occur during wet season, there will need to be provisions for reserve storage drawdown and possibly bypass. The need for special design considerations and operating procedures should be considered to ensure surface water discharges associated with drawdown and maintenance will meet applicable flow control and water quality standards.

  All of the above comments discussed.

5. *General Modeling comments include,*

- Reviewer thinks the future condition hydrographs are important documentation of the low flow plan and should not have been removed from the report.

  It is reported that these hydrograph figures have been updated per the new simulations. Indication is that they will be included in the report. Reviewer preference would be for inclusion as hard-copy as well as electronic files. *Note: It is possible that these hydrographs were included with the electronic files received on January 25th.*

- It is recommended to have only one HSPF stream model defining 1994 existing conditions, used for the low-flow report and for the base calibration, as documented in the SMP. How would the new 1994 landcover and groundwater routing affect the base calibrations?

  See recommendations for a validation report to investigate the need to refine model calibrations.

- *Note: current analysis shows same impact level at calculated 2-year level and for the greatest annual difference of 4-year test period.* Where impact assessment is based on 4 years of embankment data, the previously accepted approach was to use the greatest annual difference (out of 4 years) to define impact.

  Discussed. No action requested, but reserves the right to perform impact calculation as agreed to during the 2001 facilitated meetings.

- Section 2.5.2 provides response to permit condition asking what reductions in in-stream low flows look like in the stream. Review comments focused on the early summer period where flow offset is not proposed and future condition hydrographs (previous submittal only) showed similar magnitude reductions in base flow.

  > "The late spring and early summer periods are when fish typically grow at the greatest rate. It is difficult to put these early summer hydrologic changes into perspective without an evaluation of what these flow reductions will look like in-stream. Will fish be forced into pools at times they currently are not? Will the number of available pools be reduced? Will this change the spatial distribution of fish? Will juvenile fish be subject to increased predation? Will there be impacts to invertebrate diversity and/or abundance? Will there be shifts in timing and duration of insect hatches?"

  The analysis provided uses between 1-3 cross sections per stream and associated rating curves for that section. The rating curves appear to be averaged into a single rating curve from which an average change in water depth and width are calculated and graphically scaled. There are no biological conclusions drawn from the analysis to answer questions raised or to support the position of no biological impacts from base flow reductions in early summer. (See also Walker Creek modeling comment).

  No action item discussed. Reviewer defers the usefulness of this analysis to Ecology staff with biological expertise. Reviewer understands the substantial amount of detail needed to develop results supportive of meaningful biological predictions. The determination as to whether more detailed evaluations be performed should be contingent on whether the results will be used in decision making. In Des Moines Creek, the 0.08 cfs reduction in baseflow appears to account for as much as 25% of the in-stream flow at 200th Street (e.g., July 18, 1970). From another perspective, in some years the offset flows (currently proposed to start on July 24th) is predicted to comprise 25% of the total in-stream flow. Of course, the above percentages would diminish if you

looked further downstream. This reviewer is not able to draw biological conclusions from these predicted hydrologic changes. Both the Port and Ecology indicated they would consult their biological experts to determine the need for further action.

New Comment Not Discussed: Although indicated in multiple locations that the predicted changes to wetted stream channel widths and depths are drawn to scale in Figure 2-5. The Des Creek width reduction numerically indicated is greater than the graphical representation. No action recommended if additional analysis on this subject is not requested.

6. *General Monitoring comments include,*

- The proposed embankment hydrologic monitoring appears to be limited to one-time post construction infiltration rate tests. The low flow study's characterization of embankment infiltration and attenuation should be monitored over time to supplement monitoring of the actively managed low flow offset facilities. Monitoring should include data collection which relate to operational infiltration performance, timing (attenuation) of embankment drain layer discharges, and delivery of offset discharge to stream.

  Comment discussed. Indication was that a more substantial monitoring strategy for the embankment hydrologic performance would be investigated.

  Additional comment discussed: This comment was raised here due to the connection to the long-term performance of the embankment (in many ways now serving as a stormwater facility). Past review comments have included the recommendation that infiltration type BMPs be used to encourage infiltration into the embankment. In response to a review comment and associated permit condition a 2000 memo was included which discusses some existing design features included on the embankment. The memo further indicates that artificially increasing the amount of infiltration may create stability problems. Additionally, problems may be experienced if the embankment were to have a restricted outlet. Reviewer does not feel that the use of simple infiltration BMPs would violate these recommendations, but rather would provide increased assurance that the embankment infiltration assumptions are realized. Discussion included several reasons why this recommendation will not be implemented.

7. *Embankment Model comments include,*

- Available embankment recharge was calculated by summing impervious SURO runoff with pervious AGWI runoff. An alternative approach would have been to introduce the impervious SURO as surface lateral inflow (SURI) and then use the resulting AGWI timeseries. An independent evaluation of the two approaches was performed and included an infiltration rate filter (k=1.35x10^-4 cm/sec) as described was used. The two approaches were found to generate similar results with the method used generating slightly more water available to the embankment than did the alternative approach.

- Figure 5-4 shows Slice 1 Model Output for Test Period 1991-1994 represents the discharge from the deepest embankment cross section. However, the drain-layer outflow timeseries is shown with a very flashy response. This doesn't appear to be consistent with understanding of a homogeneous embankment. Possible problems with this timeseries should be investigated. To a lesser extent, the seepage (downward flow through till) timeseries is also flashier than other cross sections.

  This is due to the presence of type1 fill material behind the MSE wall. This fill is free draining which produces the spikiness of the drain layer discharge timeseries.

- Results and statistics should be based on this same test period. For example, references to Table 3-1 indicate that the inflow mass balance numbers represent the 1991-1994 test period. Response to inquiry indicated the volumes shown in Table 3-1 include the 7 year wet-up period. Results and statistics should be limited to the 4 year test period, therefore representing only the flows imported into the stream model.

- Of interest would be the mass balance information of the embankment model outflow timeseries for the same test period. This could be added to Table 3-1.

- The embankment model report (Appendix B) indicates that the embankment model generated 3% more volume in Miller and 4% more volume in Walker. This may be due to changes between the embankment water storage at the start/finish of the simulation. Some increase in volume seems reasonable for this reason. The reason for the volume change should be confirmed. Do these numbers represent test period 1991-1994 only, or do they include the entire wet-up period?

- If the embankment models are run again, the test period should be extended 2-3 months to ensure inclusion of the low flow event associated with water year 1994.

  All of the above observations were discussed, and were previously discussed with Ecology's technical review lead for the embankment modeling.

8. ***Specific Clarifications included below,***

- Page 1-2 #5: Reviewer contends that infiltration facilities were of significance in the previous low-flow plan. As noted in the previous low-flow comments, significant areas outside the embankment footprint will continue to drain to these infiltration facilities. The extra non-infiltrated volume coming off the surface of the embankment would constitute a small percentage of the total infiltrated volume in these facilities.

  Comment discussed and generally agreed with.

- Page 3-3, Section 3.4.1 - Statement that facilities have been designed to be retrofitted according to the 2001 Ecology Stormwater Manual generates the following comments,
  - Enhanced water quality treatment is only shown for the low-flow offset outlet. Water exiting the reserve storage vault into the flow control vault would bypass enhanced treatment and monitoring.
  - The enhanced WQ treatment is shown to indicate feasibility of retrofitting the proposed system, if monitoring data demonstrates a need.
  - Unclear whether adequate fall exists for a SDW2 filter.
  - Maintenance feasibility may be a concern for the SDS3 filter, since the filter is approximately 30 feet below existing grade.
  - Review of the filters against the State manual's performance objectives and design criteria was not performed.
  - Alternatives exist to basic sand filtration that have been shown to effectively target particular pollutants of interest. For example, improved metals removal has been shown with leaf compost based filtration media, while an alternate iron infused media would be recommended for improved phosphorous removal. This may be worth considering depending on the findings of proposed water quality monitoring.

    Above comments were presented. There has not been a determination made by this reviewer as to consistency with the 2001 Ecology manual.

- Page 3-6, 2nd paragraph - Collection of temperature data from existing NEPL and SDS3A vaults is proposed to "characterize the expected temperature of the reserve stormwater discharges." These vaults, although similar in size, are not operated as wetpool facilities. Except during large storm events, the only water in the vault will be in the sump area. It is a stretch to say that temperature results will characterize the reserve stormwater. The reserve stormwater would be expected to be more similar to that found in a wetvault facility.

- Page 3-6, Section 3.4.4 - Indication is that the potential for elevated BOD resulting from runway de-icing activities are not a concern because "these events move through the stormwater management system in a matter of hours". This statement is inconsistent with design and operation of reserve storage vaults which will act to capture and retain water during, and after, vault filling.

- Page 3-8 1st bullet - airfield water quality treatment BMPs are better described as filter strips.

- Page 3-8 3rd bullet - indicates that nutrients, if present in the reserve storage vault, will not be a concern because the reserve storage outlets do not drain to lakes or ponds. This statement is inaccurate, SDS3 reserve storage vault discharges to NW Ponds, and SDW2 drains to the large headwater wetlands. Both reservoirs have an open water component that would meet most definitions of being ponds. Neither of these reserve storage vaults are shown to discharge directly to stream channel as this paragraph indicates.

  Nutrients are not expected to be a problem. The collection areas are to be maintained consistent with the Landscape Management Plan presented in the SMP. This plan is considered a source control BMP in that it limits the use of pesticides and fertilizers on the managed landscape (infield areas around runways).

- The low flow report includes some references to standards or performance goals found in the newly adopted 2001 Ecology manual. King County staff has not performed a review for consistency of low flow or SMP related mitigations against the State manual. In general, the stormwater mitigations proposed under the SMP and low flow plan are thought to meet or exceed new State standards in terms of retrofitting of existing areas (areas not proposed to be redeveloped) and proposed low flow mitigations. However, other issues such as enhanced water quality treatment and specific BMP sizing are believed to have changed under the new Ecology manual.

  All of the above clarifications were discussed and generally understood.

9. *General Discussion*

- Observation for discussion: As per 10/30/01 facilitated meeting, only DM1994, MIL2006, and WLK2006 models needed to be rerun.

  The reason for the additional runs was a reassessment of landcover and groundwater routing. Comparison of landcover tables and associated maps did not reveal any obvious discrepancies. The net effect is a lowering of the target 1994 in-stream flows for all three streams. However, landcover and groundwater routing changes in the 2006 models were also implemented such that mitigation for Walker Creek increased, Des Moines Creek reduced by 0.02cfs, and Miller Creek mitigation is no longer proposed.