King County
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February 22, 2001

Ann Kenny
Senior Permit Specialist
Washington State Department of Ecology
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008-5452

Dear Ms. Kenny:

King County is pleased to be able to continue providing assistance the Washington State Department of Ecology (DOE) by making our technical review capacity and knowledge of local stormwater conditions available for the review of the Port of Seattle's Comprehensive Stormwater Management Plan (SMP) for Master Plan Improvements at SeaTac International Airport. This effort continues to set an excellent example of how State and local government can work cooperatively to provide the region with high quality service, especially in these times of fiscal stress for government services.

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 the 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. Compliance with the Design Manual is, however, a good start towards mitigating the impacts of this large and complex project.

It is also important to remember that this review is limited to those development activities identified by the Port of Seattle as being Master Plan Update Improvements. While other projects of varying magnitude are being proposed for this area, only those projects included in the formal SMP submission were reviewed for this comment letter. No assumption of concurrence with the technical details or effectiveness of additional projects should be assumed without our specific written comment.

The SMP demonstrates a sound conceptual strategy for complying with the technical provisions of the King County Surface Water Design Manual and, for the most part, effectively demonstrates that the proposal improvements can fully comply with Drainage Manual requirements.

We have several general recommendations. Reviewers did find a number of factual errors, modeling discrepancies, and inconsistencies throughout the report that we recommend correcting prior to our concurrence. While most of these appear to be minor errors attributable to the multiple iterations and edits which the document has gone through, several of them have the potential to affect facility design and plan effectiveness beyond a trivial amount. We strongly recommend that these problems be remedied prior to final permit approval.

Due to the number of minor corrections needed prior to final approval, we recommend that needed revisions to the December 2000 plan be completed through replacement pages, rather than a completely new draft. Enclosure 2 includes a list of the technical review comments, organized into six groups to help facilitate resolution. The final product should be a final version of the document that incorporates the necessary corrections and any additional technical memoranda or addenda in a single document. This final document would allow the public and permitting agencies to locate all relevant documentation relating to the permitting decision and mitigation requirements in a single document, greatly easing record keeping and documentation of compliance.

This is a complex stormwater plan on a very large and active site. There are numerous facilities to be constructed, in several watersheds, over a period of years, and successful operation of the stormwater system will require close coordination of design, construction, and operation of the numerous facilities. We also anticipate that there will be changes to the stormwater mitigations outlined in the plan over the next few years as the projects reach the final design stage. We recommend that DOE consider creating a full-time compliance/implementation monitoring effort to assist the Port of Seattle in successfully implementing the features of this plan. The County has, in the past, required applicants to fund a full-time inspector for large and complex sites such as this in order to be able to provide the applicant with timely review and inspection services. We suggest that the DOE consider a similar action.

Our specific comments are provided as enclosures to this letter. Enclosure 1 provides general commentary on how well the SMP responds to the specific core requirements of the King County Surface Water Design Manual, as well as an overview of the review scope and limitations.

Enclosure 2 provides specific review comments on the SMP and its appendices. There are a series of general comments, a series of comments on specific basins, and a series of comments tied to specific pages in the documents. The last few pages in Enclosure 2 provide suggested ways to group the comments, in the form of a checklist, which we believe will ease resolution of remaining comments by addressing similar and related issues at the same time.

Enclosure 3 provides an annotated copy of meeting notes that document the facilitated agreements between the Port and DOE which were reached during an earlier part of the review process. Our annotations comment on how effectively the SMP documents the implementation of the actions previously agreed to.

Thank you for this opportunity to work together on behalf of the region. If you have questions regarding our detailed comments, please contact David Masters, Central Puget Sound Watershed Coordinator, at (206) 296-1982, or Kelly Whiting, Drainage Services Section Senior Engineer, at (206) 296-8327.

Sincerely,

Pam Bissonnette
Director

PB:tv F912

Enclosures

cc: The Honorable Ron Sims, King County Executive
Ray Helwig, Northwest Regional Director, Washington State Department of Ecology
Paul Tanaka, Deputy County Executive
Tim Ceis, Chief of Staff, King County Executive Office
Kurt Triplett, Deputy Directory, Department of Natural Resources
Nancy Hansen, Manager, Water and Land Resources Division (WLRD)
Debbie Arima, Assistant Manager, WLRD
Curt Crawford, Supervising Engineer, Drainage Services Section, WLRD
Kelly Whiting, Senior Engineer, Drainage Services Section, WLRD
Joanna Richey, Manager, Strategic Development Section, WLRD
David Masters, Central Puget Sound Watershed Coordinator, WLRD

ENCLOSURE 1
OVERVIEW OF REVIEW SCOPE AND LIMITATIONS

The December 2000 Comprehensive Stormwater Management Plan (SMP) was reviewed for consistency with technical provisions of the 1998 King County Surface Water Design Manual (KCSWDM). The enclosures to this letter detail findings regarding compliance . The review has found that in most areas the SMP includes stormwater mitigations consistent with the standards set forth in the KCSWDM. In a few areas issues have been raised which would need to be addressed prior to King County Department of Natural Resources (KCDNR) being able to issue a statement of concurrence. It is recommended that KCDNR review staff work directly with technical staff from the Washington State Department of Ecology (Ecology) and the Port of Seattle (Port) to address these issues, and related issues raised through recent public comment process, through specific update replacements to the December SMP.

Review is limited to those development activities identified by the SMP as being Master Plan Update Improvements. Projects not identified under the SMP were not reviewed and therefore no concurrence can be given. Review comments are limited to compliance with minimum technical standards of the 1998 King County Surface Water Design Manual (KCSWDM). Compliance with King County's technical standards may not be sufficient for project approval under other codes and regulations, and does not mitigate all potential impacts of development. Specifically excluded from the review scope are all procedural requirements of the KCSWDM. If processed under King County regulations, this project would have exceeded the threshold for Large Site Drainage Review and would have been subject to procedural requirements whereby performance standards are tailored specific to the proposed development. Review was performed per the KCSWDM technical requirements which would have applied under Full Drainage Review (see excerpts from KCSWDM in text box on page 2).

Review and concurrence with a stormwater management plan is primarily on a conceptual level to determine if the proposed mitigations appear feasible and could comply with the identified performance goals. Prior to construction of specific projects, additional review and approval of the final construction drawings and associated technical information report is usually performed. It is recommended that Ecology and the Port develop a plan to oversee and monitor compliance with the mitigations outlined in the final SMP. As the proposed Master Plan Update (MPU) development projects move from the planning stages to development of construction plans, the proposed stormwater mitigations will also need to be updated to reflect any changes. Oversight and monitoring are key elements to successful implementation of any stormwater management plan. One option is to create a "Compliance Team", representing the necessary disciplines, to work with the Port to achieve compliance with the goals and objectives laid out in this and other related documents.

It is not known what legal vesting this SMP affords the future development activities identified within. The SMP includes projects where specific flow control and water quality mitigation approaches and conceptual plans have been identified, but which are to be refined during final design. The SMP also lists other development projects which do not have specific mitigations identified (see Table A-3 discussion in Enclosure 2). Stormwater standards are evolving faster now than ever before. Both Ecology and King County have major updates to their respective standards scheduled in 2001, in response to Clean Water Act and Endangered Species Act initiatives. It may be warranted to review the final designs for consistency with the performance goals of current standards and the SMP with associated permit conditions.

RELEVANT EXCERPTS FROM 1998 KCSWDM

1.1.2.4 LARGE SITE DRAINAGE REVIEW

Large Site Drainage Review is applied to development proposals that are large and/or involve resources or problems of special sensitivity or complexity. Because of the large size and complexities involved, there is usually a greater risk of significant impact or irreparable damage to sensitive resources. Such proposals often require a more definitive approach to drainage requirements than that prescribed by the core and special requirements in Sections 1.2 and 1.3; it may be appropriate to collect additional information about site resources, use more sophisticated models, and prepare special studies not specified in this manual. Large Site Drainage Review entails preparation of a master drainage plan (MDP) or limited scope MDP which is reviewed and approved by DDES.

1.1.4 DRAINAGE DESIGN BEYOND MINIMUM COMPLIANCE

This manual presents King County's minimum standards for engineering and design of drainage facilities. While the County believes these standards are appropriate for a wide range of development proposals, compliance solely with these requirements does not relieve the professional engineer submitting designs of his or her responsibility to ensure drainage facilities are engineered to provide adequate protection for natural resources and public and private property.

Compliance with the standards in this manual does not necessarily mitigate all probable and significant environmental impacts to aquatic biota. Fishery resources and other living components of aquatic systems are affected by a complex set of factors. While employing a specific flow control standard may prevent stream channel erosion or instability, other factors affecting fish and other biotic resources (such as increases in stream flow velocities) are not directly addressed by this manual. Likewise, some wetlands, including bogs, are adapted to a very constant hydrological regime. Even the most stringent flow control standard employed by this manual does not prevent increases in runoff volume which can adversely affect wetland plant communities by increasing the duration and magnitude of water level fluctuations. Thus, compliance with this manual should not be construed as mitigating all probable and significant stormwater impacts to aquatic biota in streams and wetlands, and additional mitigation may be required.

In addition, the requirements in this manual primarily target the types of impacts associated with the most typical land development projects occurring in the lowland areas of the County. Applying these requirements to vastly different types of projects, such as rock quarries or dairy farms, or in different climatic situations, such as for ski areas, may result in poorer mitigation of impacts. Therefore, different mitigation may be required.

OVERVIEW OF CORE AND SPECIAL REQUIREMENTS

Core Requirement #1 Discharge at Natural Location
The Master Plan Update (MPU) development activities will result in substantial modifications to the constructed and natural drainage systems within the STIA area. Below is a summary of STIA areas per the landuse tables in Appendices A and B. The differences in basin sizes can mostly be attributed to diversions of stormwater runoff to the Industrial Waste Treatment System (IWS).

Summary of Drainage Basin Areas (acres)

	Calibration	PreDev	PostDev
Des Moines STIA	1672	1585	1577
Walker STIA	234	234	234
Miller STIA	1247	1212	1184
Total STIA Storm	3153	3031	2995
Des Moines IWS	285	331	375
Walker IWS	0	0	0
Miller IWS	0	86	80
Total STIA	3438	3448	3450

Note: numbers taken from landcover tables (except SDW2 predev from HSPF input file)

Core Requirement #2: Downstream Analysis
Downstream analysis is provided in Appendix P of the document. Identified downstream problems include channel erosion and potential existing flooding problems in Miller Creek. The associated on-site mitigations for these problem types include,

Channel erosion - apply Level 2 streambank erosion standard

- The Level 2 standard is the base standard being applied across the project site. Most of the project site is being retrofitted back to predevelopment conditions corresponding to 75% forested, 15% grass, and 10% effective impervious. This will serve to reduce the existing rates of erosion, although the benefit will be diminished further downstream due to other existing development not having been retrofitted to the same level of protection. Implementation of the Des Moines Creek Basin Plan and development and implementation of a Miller/Walker Creek Basin Plan will help address stormwater needs across the entire basins.

Existing flooding problem - match 100-year peak flows

- The SMP includes the matching of 100-year peak flows as a specific performance goal and was achieved through the flow control mitigations proposed. Note: those facilities with specific comments in Enclosure 2 will need to have their flow control performance reassessed once comments have been addressed.

Core Requirement #3: Flow Control
This review has identified some inconsistencies between proposed mitigations and the associated levels of protection to downstream properties and natural resources.

Landcover Issues:

- SDW 2 1994 existing landuse produces lower peak flows and durations than that used as predev conditions for this outfall. For example, the calibration run (1994 landuse) had 1.71 acres of effective impervious, the predev conditions has 3.31 acres of impervious (3.05 acres in last submittal). This is

due to the realigned subbasin boundaries which are proposed under developed conditions. The landuse assumptions in this basin do not meet the requirements of the 1998 KCSWDM. This is a repeated comment.

- SDW2 same issue: Additionally, there is a significant switch in SDW2 from a predominantly outwash soil type to an almost exclusively till soil type. Because of this, the flow control facilities are targeting a flow condition which is significantly higher than the stream currently sees.
- SDW2 related issue: The effect of using future subbasins to determine existing instream flows during summer low-flow periods is expected to have an opposite effect. The higher % impervious and lower % outwash soils would provide less groundwater recharge and thus would be expected to generate a lower existing condition summer instream flow (simulated average august-september flow is 0.033 cfs). Therefore, the difference between existing and future low flow conditions would be underestimated.
- A somewhat generous determination was made during the second review of the flow control mitigations that the problem with using future subbasin to determine existing release rates and in-stream flow conditions was primarily limited to the SDW2 (Walker Creek) drainage areas. Strict compliance with KCSWDM would require that all facilities be designed using existing subbasins for these determinations. For other subbasins it appears to be a situation whereby moving internal subbasin lines result in landcovers perhaps being moved from one subbasin to another but that the overall flow control requirements are being met for each threshold discharge area. This is why the above comments are limited to the SDW2 subbasin.

- SDN4/4x More impervious is being modeled under pre-project conditions than existed in the 1994 existing condition model. From inspection, it appears that there are no changes between the 1994 subbasin and the 2006 subbasins that would explain the increase in imperviousness used to set target flow conditions. This potentially could effect the ultimate facility size.

- ASR - First Review: Reviewer unable to concur with the future condition landcover assumption of 0% effective impervious. As modeled, the pre-project landcover assumptions produce lower flow durations than future conditions for all but the largest peak flow events.

- SASA - Landcover assumptions of offsite subbasins differ from the calibration model. Additionally, unsure whether all future projects identified as being served by SASA are accounted for in the model (e.g., Westin Hotel, Fire Station, etc. as listed in Table A-3).

Subbasins whose Level 2 flow control performance has not been fully demonstrated.

Subbasin	Reason
SDW2	See above landcover comments. Infiltration feasibility should be assessed.
SDN2X/4X	See above landcover comments for SDN4/4X subbasins.
ASR	See above landcover comments. Offsite flow through issue needs to be addressed. Infiltration feasibility should be assessed.
SASA	See above landcover comments. Also, provide conceptual design of proposed facility.
SDN3	Flow duration performance does not meet performance standard at 50% of the pre-project 2-year flowrate.
SDS POC #1	Only one SDS POC flow control performance provided. Unable to determine which POC the results correspond to. For the one provided, the number of flow cutoffs used on the flow duration curve at low flows is insufficient to determine compliance. The first cutoff is at 0.0 cfs and the second cutoff is at 0.75 cfs (greater than 50% 2-year). Several cutoffs need to be added at and below 50% of the 2-year, in order to verify compliance.
SDS POC #2	Only one SDS POC flow control performance provided. Unable to determine which POC the results correspond to. For the one provided, the number of flow cutoffs used on the flow duration curve at low flows is insufficient to determine compliance. The first cutoff is at 0.0 cfs and the second cutoff is at 0.75 cfs (greater than 50% 2-year). Several cutoffs need to be added at and below 50% of the 2-year, in order to verify compliance.

Subbasins where modeled hydraulics do not match conceptual design. Reviewer does not anticipate any significant design changes resulting from addressing the below comments. To verify performance of the as-designed facilities the modeling must closely resemble the conceptual design.

SDW1A	Vault appears gravity drained and should have stage variable discharge curve. Vault overflows to Pond or to Infiltration (overtopping may occur if stage-discharge modified). Is pond discharge to infiltration pump, or gravity? If gravity, staged-discharge should be variable. If pumped, does POS want to dedicate the lower foot or so of storage to discharge only to infiltration. The total volume infiltrated to groundwater would likely be increased significantly by this approach.
SDW1B	Discharge from pond to infiltration, stage variable or constant. Appears to be gravity drained so should be stage variable. The two outlets from the pond should be the discharge to wetlands and the discharge to flow-splitter. The flow-splitter should be modeled with all low-flows going to infiltration and high-flows going to stream. The flow control point of compliance would be the high-flow discharge from flow-splitter. Note:

Core Requirement #4: Conveyance Systems
The SMP has indicated that all existing conveyance systems provide at least a 10-year level of capacity. All new conveyance systems will be designed to at least a 25-year level of capacity and will meet the spill containment provisions of the KCSWDM.

The project site includes the somewhat unique challenge of conveying flows down from the runway elevation to the detention and sediment control ponds at the foot of the embankment. The SMP provides in Appendix W, conceptual designs of special energy dissipation structures that will be used to control the high velocity flows at those outfalls.

Core Requirement #5: Erosion and Sediment Control
The SMP provides preliminary erosion and sediment control plans for the proposed 3rd runway embankment. Additionally, the SMP indicates that an erosion control specialist will be responsible for overseeing the installation and performance of these facilities. This is an important aspect of achieving effective erosion/sediment controls on projects of this size.

Of primary concern is the close proximity of several of the sediment ponds to the stream channels. However, this cannot be avoided due to the close proximity of the final embankment to the stream channels. Any overtopping, bypassing, or failure of these ponds would likely discharge sediment to Miller Creek due to the short flowpaths from the ponds to the stream. Extreme diligence on erosion control is warranted to minimize sediment transport from disturbed soils (e.g., the embankment fill) to the final sediment ponds. This would include, but is not limited to,

- soil stabilization and cover measures on all disturbed soils.
- minimizing the "open" (without cover measures) areas to only those portions of the project site which are being actively worked.
- further minimizing the areas being actively worked during the wet season (October 1 through April 30), and before forecasted precipitation events.
- Frequent inspections of the erosion and sediment control facilities by the erosion control specialist.
- Daily inspections of the sediment ponds in close proximity to the stream channels during the wet season, and
- contingency plans developed beforehand to address potential problems which may be encountered with any of the erosion and sediment control BMPs, with emphasis on the sediment ponds serving as the last line of defense prior to discharge to stream.

Core Requirement #6: Maintenance and Operation
This KCSWDM Core Requirement is mostly procedural in nature, written specific to implement King County's policies and codes. This review is limited to compliance with the technical aspects of the

KCSWDM and specifically excludes procedural requirements specific to King County. Therefore, Ecology should ensure that adequate provisions and agreements are made to ensure the proper maintenance and operation of stormwater facilities on this project site.

The following is the reviewers understanding of maintenance and operation responsibilities at the project site: All facilities on the project site are to be maintained by the Port of Seattle, or their designee. Where maintained by others, Port of Seattle is ultimately responsible for proper maintenance and operations under their NPDES permit.

Review comments include the evaluation of feasibility of maintenance for all vaults with a depth to invert (measured from final surface grade) exceeds 20 feet. Most vaults in the SMP exceed the KCSWDM maximum depth criteria, however, if the SMP can demonstrate that these facilities can be adequately accessed and properly maintained, there would be justification for allowing this design criteria to be exceeded.

Additionally, the above ground vault proposed in the SDN7 subbasin has issues regarding maintenance access and structural feasibility concerns. An assessment of this, and any other, above ground vaults should be provided to address structural design and maintenance access feasibility.

Core Requirement #7: Financial Guarantees and Liability
Again, this Core Requirement is specific to procedures required under King County policy and code. The intent is to ensure that there is adequate funding available to ensure completion of the required mitigations. It requires that construction be completed, or the posting of bonds and other financial guarantees prior to final permit approval.

There are substantial costs associated with the proposed mitigations. Many of the facilities are proposed as underground vaults to avoid the perceived wildlife attractants of open ponds. The largest of the eight flow control vaults will have 88 acre-feet of storage, nearly 4 acres in area at 25 feet of live storage depth. The Port has provided a memo indicating the feasibility of the structural design of this facility. A commonly used estimate of vault construction costs is $5- per cubic-foot. With a total flow control and water quality new vault volume of 201.8 acre-feet, the total cost in flow control vaults alone is at $44 million. Note: SMP uses a vault cost of about $12- per cubic foot for assessing infeasibility of some water quality retrofits. This value would put the total estimated total vault cost at $105.5 million.

Core Requirement #8: Water Quality
With the exception of the ASR site, it has been determined that the water quality facilities have been sized in accordance with the KCSWDM Basic Water Quality Treatment Menu. Detailed comments can be found in the following sections. The more significant comments include,

Discharge monitoring data indicates high Cu concentrations and low total suspended solids off of the existing runway areas. This would tend to indicate most of the Cu is in the more toxic dissolved form. As current runways are being treated with the same water quality treatment BMPs as proposed for the third runway, similar results may be expected. Compliance with the KCSWDM basic water quality menu may not be sufficient to control metals, nor are the BMPs found in the basic menu intended to adequately control metals. Ecology requested that an evaluation be performed to determine if the storm system could be retrofitted with enhanced water quality treatment if monitoring results indicate the need. A statement was added that the SMP projects "would not necessarily preclude" the addition of enhanced treatment needs to be reviewed by Ecology for adequacy.

Table 7-8 and Page 7-9- Correction made to equation on Page 7-9 for sizing of a wetvault for subbasin SDN1 which had been off by a factor of 3.0.

- The corresponding value in the table needs to be updated.
- The equation on page 7-9 needs a bracket after 3*. The factor of 3 is applied to all landcovers, not just impervious.

- The service area of this facility appears to have been reduced. This is a retrofit facility, explanation needed as to why the existing drainage area to the SDN1 vault has been reduced.

The SMP has identified approximately 80 acres of existing pollution generating impervious surfaces that are not practical to retrofit with water quality treatment at this time. Under the KCSWDM requirements, areas not being redeveloped are not required to be retrofitted with water quality treatment unless they will be collected into the same treatment facility proposed for redeveloped areas. Therefore, this is not an issue for concurrence with the KCSWDM.

The KCSWDM does not set standards for industrial wastewater systems, such as the IWS system. Compliance with the KCSWDM basic water quality treatment goal of 80% TSS removal has not been verified, as the removal efficiency of the IWS system is not provided in SMP. Evaluation of the IWS system capacity using future landcover, storage capacity, and processing rates indicated that the IWS lagoons are not predicted to overtop to stream. The biggest concern is the sustainability of the assumed future processing rate. As the IWS outfall is proposed to be redirected to the sanitary sewer which may include constraints on allowable processing rates, the issue of potential overtopping should be addressed once future maximum processing rates have been determined. The SMP results do not support the contention of the IWS feasibility report, that sufficient storage exists to allow the IWS discharge to be slowed or stopped during storm events. Since specific future storm volumes cannot be reliably predicted, the IWS operation appears to require near maximum processing rates (3.2 to 4.0 mgd) whenever lagoon #3 is receiving inflows. Any additional areas being rerouted to IWS and not included in the analysis would also warrant evaluation. Note: The modeled future IWS service area includes 410 acres of impervious and 24.6 acres of grassed pervious area. The ultimate storage volume is modeled as 76.9 million gallons, and the maximum sustained processing rate is assumed whenever lagoon #3 is storing wastewater.

Special Requirement #1: Adopted Area Specific Requirements
This would include the Des Moines Creek Basin Plan. The SMP mitigations do not rely on construction of the regional detention facility for mitigating existing or new impervious areas. However, the SMP indicates that if conditions change (e.g., the regional facility is constructed prior to MPU development), that the SMP mitigations will be revised. Since this alternative approach was not analyzed by the SMP, Ecology review and approval of the plans and sizing for final construction may be necessary. The applicant is an active member of the Des Moines Creek Basin Committee.

Special Requirement #2: Floodplain/Floodway Delineation
A copy of a detailed floodplain analysis on Miller Creek is included in SMP Appendix J. MPU development has been identified within the floodplain delineation. The 156th/154th roadway realignment in the Vacca farm area, and a relatively small displacement from the 3rd runway embankment near where Miller Creek turns west towards SR509. Calculations provided demonstrate that the roadway realignment is fully compensated for in the Vacca farm area. The embankment calculations indicate that an additional 5 cubic yards is displaced by the embankment footing. The indication is that the base floodplain elevation was determined to not rise due to this amount of displacement, which in turn will not affect the flood carrying capacity of the stream.

The future condition floodplain analysis appears to assume stream flows in the constructed channel will flow across the top of the gravel substrate. Under low flow conditions it is possible that the stream flow will be primarily through the gravel, and there may be no observable surface flow. This condition would likely change over time, as the substrate evolves through stream processes. This is more of a biological issue beyond the scope of the KCSWDM.

Special Requirement #3: Flood Protection Facilities
This special requirement is not applicable as none of the streams are restrained by levees or revetments in the vicinity of the project site.

Special Requirement #4: Source Control

The SMP proposes the use of source control BMPs, many of which are currently being applied to maintenance and operations of the site. Two new source control BMPs which are proposed for the site under the SMP. These include retrofitting of existing non-coated metal roofs to prevent leaching of metals, and the implementation of improved landscape management guidelines to minimize the use of pesticides and fertilizers to managed landscape areas, including the infield areas surrounding the runways and taxiways. Both of these source control BMPs are consistent with the requirements of the KCSWDM.

Source control issues identified in the ASR site. The conceptual plans indicate that fuel transfer and storage will occur at this site. This issue should be addressed by the SMP. Spill containment is of particular concern due to the highly permeable outwash soils underlying the site.

Special Requirement #5: Oil Control
Several areas within the project site meet the threshold for high-use sites under the KCSWDM criteria. Most of these areas are being, or are proposed to be, diverted to the IWS which has oil control and spill containment provisions, as regulated as an industrial wastewater discharge rather than a stormwater discharge. One additional area was identified under the SMP as meeting the high-use threshold, the Terminal Drives. The SMP proposes to either install treatment BMPs to this area, or to divert these areas to the IWS. Both alternatives appear to be feasible.

ENCLOSURE 2: Specific Review Comments

General Comments - All Basins

1. Fill Calibration Parameters

Prior to the 8/00 SMP submittal an agreement was made that the airport fill calibration parameters would be the same between the different basin models (Project-2006), with the exception of DEEPFR. DEEPFR would be set specific to the basin, consistent with other PERLNDS. A comparison of the Fill parameters documented in different parts of Appendix A are summarized in the tables below. Numbers which are bolded indicate inconsistencies in how "Airport Fill" parameters have been characterized in the different sources.

Resolution: Fill parameters in Project-2006 should be consistent throughout Appendix A and across the different basins, with the exception of DEEPFR which should be set same as other PERLNDS in specific basin. Note: This comment may effect the documented flow control facility performance in all subbasins that include airport fill.

Data Source	LZSN	INFILT	LSUR	SLSUR	KVARY	AGWRC	INFEXP	INFILD	DEEPFR
Apndx A Attch B	7.5	0.02	300	**0.15**	0.00	**0.900**	2.00	n/a	0.10
Table A-4	7.5	0.02	300	**0.07**	n/a	**0.900**	2.00	n/a	0.10
Miller	7.5	0.02	300	**0.07**	0.00	**0.900**	2.00	2.00	0.33
Walker	7.5	0.02	300	**0.07**	0.00	**0.996**	2.00	2.00	0.00
Des Moines	7.5	0.02	300	**0.07**	0.00	**0.900**	2.00	2.00	0.55
10/00 Review Work & 6/30 Parametrix Memo	7.5	0.02	300	**0.07**	0.00	**0.900**	2.00	2.00	Basin specific

Data Source	BASETP	AGWETP	CEPSC	UZSN	NSUR	INTFW	IRC	LZETP
Apndx A Attch B	0.00	0.00	**015**	0.28	0.25	6.00	**0.15**	**0.70**
Table A-4	0.00	0.00	**0.10**	0.28	0.25	6.00	**0.15**	**0.60**
Miller	0.00	0.00	**0.10**	0.28	0.25	6.00	**0.15**	**0.60**
Walker	0.00	0.00	**0.10**	0.28	0.25	6.00	**0.50**	**0.25**
Des Moines	0.00	0.00	**0.10**	0.28	0.25	6.00	**0.15**	**0.70**
10/00 Review Work & 6/30 Parametrix Memo	0.00	0.00	**0.10**	0.28	0.25	6.00	**0.15**	**0.60**

2. Use of 0.000 acres of PERLNDS -

It was pointed out in previous review comments and during the facilitated meetings that some versions of HSPF read 0.000 as a blank entry and will set the value to the default of 1.00. Therefore, it remains necessary to remove or "comment out" of all PERLNDS with acreages set to 0.000. An example of how this can be done is found in the Des Moines Creek calibration file, where unused PERLNDS have ***** in

AR 017621

the place of the 0.000 acreages. HSPF identifies three *** as a comment line and does not execute that line. The line could also be deleted.

This existence of this problem with HSPF input files was confirmed by the reviewer. In the two versions tested both read a blank entry as 1.00 and one read a 0.000 entry as 1.000. The problem appears to be a matter of which version of HSPF is being used. Since the SMP proposes that final design work will include a reassessment of required detention volumes, it must be assumed these files will be used in the future and without control over which version is used. Also, it is not possible to confirm the SMP HSPF version used by reviewing input files and summary statistics.

For example, Pre-Project subbasins SDS-6, SDS-5, DM-2, DM-3, all have one or more PERLNDS with zero acreages. If read as 1.00, the total acreage of SDS-6 and SDS-5 are more than doubled. This would result in larger allowable release rates in the facilities serving these subbasins. Under Project-2006 conditions there are fewer PERLNDS with zero acreages. This potentially could have impact on facility performance and demonstration of compliance.

MC24 - PERLND 16 (to RCHRES 11 and 24) The acreage is set to 0.00.
MC9 - PERLND 54: The acreage is set to 0.00.

Resolution: Remove or comment-out all PERLNDS with 0.000 acreages in the Miller Creek Pre-Project and Project-2006 input files, the Walker Creek Pre-Project and Project-2006 input files, and the Des Moines Creek Pre-Project and Project-2006 input files. Comment also applies to any 1994 existing condition input files.

3. **Dam Safety Regulations** and Applicability should be discussed in SMP Volume I Section 3. SMP should identify which facilities will likely be subject to dam safety requirements. If any, a summary of the general dam safety requirements should be included. The inundation studies and related requirements will not be requested by KCR at this stage of facility planning. Usually, these requirements do not preclude the construction of "dams", but rather address the safe operation and maintenance of such facilities. Note: storage volume determination is made at dam crest.

WAC 173-175-020 Applicability. (1) These regulations are applicable to dams which can impound a volume of ten acre-feet or more of water as measured at the dam crest elevation. The ten acre-feet threshold applies to dams which can impound water on either an intermittent or permanent basis. Only water that can be stored above natural ground level and which could be released by a failure of the dam is considered in assessing the storage volume. The ten acre-feet threshold applies to any dam which can impound water of any quality, or which contains any substance in combination with sufficient water to exist in a liquid or slurry state at the time of initial containment.
(2) For a dam whose dam height is six feet or less and which meets the conditions of subsection (1) of this section, the department may elect to exempt the dam from these regulations. The decision by the department to exempt a dam will be made on a case-by-case basis for those dams whose failure is not judged to pose a risk to life and minimal property damage would be expected (downstream hazard class 3).
(3) These regulations do not apply to dams that are, or will be, owned, by an agency of the federal government which has oversight on operation and maintenance and has its own dam safety program for periodic inspection of completed projects. The department will continue to be the state repository for pertinent plans, reports, and other documents related to the safety of federally owned dams.
(4) These regulations do not apply to transportation facilities such as roads, highways, or rail lines which cross watercourses and exist solely for transportation purposes and which are regulated by other governmental agencies. Those transportation facilities which cross watercourses and which have been, or will be, modified with the intention of impounding water on an intermittent or permanent basis and which meet the conditions of subsection (1) of this section shall be subject to these regulations.
(5) These regulations do not apply to dikes or levees constructed adjacent to or along a watercourse for protection from natural flooding or for purposes of floodplain management.
(6) These regulations do not apply to concrete or steel water storage tanks.
(7) These regulations do not apply to FERC licensed projects and to FERC exempted projects. The department will continue to maintain a repository for pertinent plans, reports, and other documents related to the safety of FERC licensed and FERC exempted projects.

Miller Creek

HSPF Model / Flow Control

1. HSPF input files not provided in Appendix B2 for calibration run. Input files were obtained from Aqua Terra Consultants on 01/02/01 (Aqua Terra provided the professional certification of Appendix B2).

   - Resolution: Include input files used to generate all model results presented in SMP. Of particular interest are the 1994 existing condition runs. The indication is that 1994 landcover was assigned to future 2006 subbasins, which has generated comments below.

2. Table B2-2, PERLND parameters do not match HSPF input file for DEEPFR and UZSN. Indication is that Table values are incorrect and that the table was taken from an earlier version. Reviewer cannot determine if other tables and figures are similarly outdated, or represent current calibration.

   Resolution: Include updated Table B2-3 and verify other tables and figures are current.

3. The subbasin maps provided in Appendix B2 do not correspond to the subbasins used in the calibration model.

   Resolution: Subbasin delineation should be consistent with hydrologic model. Appendix B should use 1994 subbasins consistent with the model and figures.

4. MC16 - landuse different in calibration, pre-project and project-2006 HSPF input files. The difference is very small, but does reflect a reduction in impervious and till and an increase in outwash soils between pre-project and project-2006 conditions. Although likely unnoticeable in the results, the discrepancy should be removed.

   MC4 - pre-project landcover has more impervious and till soils than the calibration. Although this subbasin is not being retrofitted with flow control (see #5 below), the pre-project runoff should not be greater than the calibration run (with 1994 landcover).

   Resolution: update landcover acreages.

5. Subcatchments MC1 - MC4 are showing a 4.1 acre net increase of impervious cover. Subcatchments MC5 - MC7 show a 6.0 acre net reduction in impervious cover. As these subcatchment combine within a 1/4 downstream, the KCSWDM would consider these catchments a single threshold discharge area with a net reduction of impervious cover of 1.9 acres, and therefore would be exempt from flow control requirements under KCSWDM.

   The SMP indicates that possible future commercial development may occur in this area. The SMP does not provide flow control storage for this future development since the amount of development and location has not yet been determined. However, since the SMP is modeling future conditions with the removal of all non-road impervious areas, and is using this to offset adjacent subbasins with increased impervious coverage, the SMP project-2006 landcover assumptions should be applied as the existing condition landcover for future development activities in the buyout area.

   Recommendation: That a condition be placed on possible future development in the buyout area to meet the project-2006 landcover assumptions of the SMP (no impervious cover except for

existing roads), whichever is more protective. This could be incorporated into the SMP, or possibly included as a permit condition.

6. Flow Control Facility Specific Comments

- **SDN1, SDN1-LWR** - Proposed 5.6 acre-foot vault serving total catchment of 13.24 acres impervious, and 8.05 acres grass. Storage corresponds to 5.1 inches of storage per impervious acre, 3.1 inches per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges match flow durations above 50% 2-year pre-project and likely controls 100-year peak flows below target condition. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

  Review Comment: The flow frequency analysis of the HSPF facility outflow timeseries appears to be inaccurate. The DSN summary table (DSN #102) at the front of Appendix A and the flow duration graph show flows up to 0.857 cfs. The flow frequency analysis of the facility outflow shows no peak annual flow over 0.731 cfs. If consistent, the largest peak annual flow would be 0.857. The corresponding computed 100-year should still be less than pre-project.

  Resolution: The statistical analyses on the outflow timeseries should be recomputed and the results verified. Resolution is not expected to adversely affect the demonstrated performance.

- **CARGO** - Proposed 4.5 acre-foot vault serving catchment of 8.12 acres impervious. Storage corresponds to 6.6 inches of storage per acre. Target release rates consistent with 75-15-10 landcover. Facility discharges match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

- **NEPL** - Existing 4.03 and proposed 13.9 acre-foot vault serving catchment of 26.29 acres impervious and 10 acres grass/landscape. Storage corresponds to 8.2 inches of storage per impervious acre, or 5.9 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

  Review Comments:

  - Under the current KCSWDM, the performance of existing facilities is considered "vested" and would not require retrofitting. Requirements for flow control retrofitting of existing development is being proposed for inclusion in the County's and State's stormwater regulations in 2001, to be applied when sites are being redeveloped. . NEPL is shown in Table A-3 as being scheduled for redevelopment (expansion) sometime between 2006 and 2010. No stormwater mitigations have been proposed for the future redevelopment of NEPL

  - This catchment is within the drainage area tributary to the Miller Creek Regional Detention Facility, constructed to provide flow controls for upstream development, which includes NEPL and most of the north end of the airport. By providing on-site retrofit storage for all airport discharges tributary to MCRDF, there should be a net improvement in the ability of the MCRDF to provide flow control to non-airport areas.

  - Although using the 75-15-10 landuse assumptions, this sub-catchment is being treated somewhat differently. The pre-project impervious area (4.23 acres) did not exist in the 1994 calibration model (NEPL was not constructed until 1998), but was used to provide release rates capable of supporting the retrofit performance standard. An alternative approach would have been to apply a more typical till soil calibration to the pre-project pervious areas, as supported by the geotechnical

evaluation in SMP Appendix X. This approach would be expected to require an additional six acre feet of storage above the already substantial retrofit volumes proposed.

- Although technically outside the scope of this review, King County review staff supports the SMP proposed retrofit strategy for the existing NEPL.
- Future expansion is scheduled for NEPL between 2006 and 2010. This future project, as well as several others, are not believed to be included in the mitigations proposed by the SMP. Therefore, no review or concurrence can be given.
- NEPL discharges routed through two "run of the river" F-tables. These F-tables act on the timeseries and have been shown to alter the discharges in previous SMP submittals. The use of these non-existent reservoirs in the model are not needed as the COPY command performs the desired action without potentially altering the timeseries. During the calibration process, it was indicated that "run of the river" F-tables imposed a one timestep lag each time they are used. A two hour lag of NEPL discharges is not representative of actual hydraulic conditions. Previously these "run of the river" F-Tables were removed from the models at the reviewer's request. It is not known why they have been reintroduced into the modeling for this SMP. Note: the run of river F-tables are downstream of the NEPL point of compliance for flow control, so does not effect evaluation of mitigation performance.

Resolution: No action requested.

- **SDN2X/4X** - Proposed 14.9 acre foot vault serving catchment of 51.57 acres impervious and 33.38 acres grass/landscape. Included in this catchment area is 33 acres of drainage area served by IWS pump stations which removes smaller runoff events from the storm system. Storage corresponds to 3.49 inches of storage per impervious acre, or 1.89 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

  For subcatchments SDN4 and SDN4X, the pre-project impervious cover is greater than the calibration run (1994 landcover). Impervious in the calibration run is 2.61 acres, and 3.68 in the pre-project model. The application of the pre-project 75-15-10 landcover assumptions should not result in more impervious cover than existed in 1979 or 1994. This elevates allowable release rates above the intended 75-15-10 standard.

  Resolution: Resolve conflict in pre-project landcover assumption. Reevaluate facility performance to demonstrate compliance with flow control standard. Resolution may effect the ultimate size of this facility.

- **SDN3/3X** - Proposed 25.6 acre foot vault serving catchment of 36.56 acres impervious and 25.17 acres grass/landscape. Storage corresponds to 12.6 inches of storage per impervious acre, or 4.2 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges control 100-year peak flows below target conditions, and nearly matches flow durations from 50% 2-year through the 50-year. If facility refined to fully match flow durations, the performance would be equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

  Review Comment: The KCSWDM allows a tolerance in matching the flow duration curve at all points along the pre-project curve, except at the 50% 2-year level. At this point on the curve, the facility discharge must match, or be slightly below the pre-project level. The HSPF duration output shows the facility outflow duration curve slightly above the target curve at 50% of the 2-year flowrate, 0.71 cfs. This conclusion is supported by the tabular duration comparison, which indicates the curves first cross at 0.75 cfs (durations not analyzed at 0.71 cfs).

Resolution: It appears that the performance of this facility could be improved by slight increase in the bottom orifice diameter, and possibly raising the height of the second orifice. These would be minor refinements that affect storage requirements in opposite directions. Therefore, the expected facility size would be similar to currently modeled. Note: the above refinements may allow for a larger diameter second orifice which may help fill out the discharge duration curve to reach higher on the pre-project curve, and perhaps allow for smaller required volume.

- SDW3A - Proposed 7.0 acre-foot vault and 14.8 acre-foot pond serving catchment areas of 8.22 acres impervious and 22.23 acres grass/landscape. Storage corresponds to 31.8 inches of storage per impervious acre, or 8.6 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

  The large storage volumes for this sub-catchment are due to the existing site conditions with low impervious cover and large amount of outwash soils being replaced primarily by runway fill. Existing condition % impervious is 6% and the outwash soils are 76% of the basin. The outwash soils contribute very little to allowable release rates. Projects on these soil types often must infiltrate to meet performance standards. Incorporating infiltration in this design would require presettling.

  Pond is shown with side-slopes at approximately 3:1, and therefore would not require fencing per the KCSWDM.

  Resolution: No action requested.

- SDW1A - Proposed 7.4 acre-foot vault and 25.5 acre-foot pond serving catchment areas of 15.42 acres impervious and 37.41 acres grass/landscape. The design includes an infiltration facility able to infiltrate stormwater at a rate of 0.3 cfs. Storage corresponds to 25.6 inches of storage per impervious acre, or 7.5 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

  The vault (FTAB 147) is being modeled with a constant 0.15 cfs discharge until 16 feet of storage when overtopping of the overflow structure occurs. The conceptual design would indicate a gravity discharge system that would have a head-variable discharge curve (from zero to 0.15 cfs) before overflow. If modeled with head-variable discharge the facility may have overtopped and discharged more than 0.15 cfs to infiltration facility.

  Resolution: the stage-discharge curve revised and the vault storage reevaluated, or detail as to how the constant discharge will be achieved. (note: pump systems are discouraged in systems with available head.)

  The conceptual drawings show vault overflows to Pond G. Model sends overflows to infiltration facility.

  Resolution: Include separate discharge column in FTAB 147 sending overflows to pond. The vault overtopped slightly during simulation, but overtopping may be significant if head-variable discharge curve is used.

  The pond (FTAB 247) is being modeled with a constant 0.15 cfs discharge and a separate head variable discharge to stream. No details are provided as to how the constant discharge will be achieved. The connection between the detention pond and the infiltration facility is not shown in conceptual design. Is this a pump facility?

No conceptual design of infiltration facility (FTAB 47) provided. Conceptual design showing profile and section and seasonal high groundwater should be provided. How was head variable infiltration rate determined (maximum infiltration rate should not exceed field measured rate)? What is length of tank? What is trench width? SMP should provide some detail on sizing and design of this newly proposed stormwater facility.

It has become standard practice to require monitoring and/or full scale rate tests of infiltration facilities after construction. Our experience has shown infiltration facility performance to be widely variable. This is currently being required of larger projects via the County's "In-Operation" public rule. Written guidelines have been developed for performing these tests and could be provided. Ecology may want to consider some level of post-construction monitoring of the proposed infiltration facilities.

SDW1A pond is shown with side-slopes steeper than 3:1, and therefore would require fencing per the KCSWDM. Include fence on conceptual plan.

- **SDW1B** - Proposed 37.91 acre-foot pond serving catchment areas of 26.95 acres impervious and 23.64 acres grass/landscape. The design includes an infiltration facility able to infiltrate stormwater at a rate of 0.2 cfs. Storage corresponds to 9.6 inches of storage per impervious acre, or 2.7 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

  The assumed infiltration rate is based on Appendix F. This area is referenced as Infiltration Area 3. The recommended infiltration capacity of this area has increased to 0.20 cfs from 0.15 cfs in the original report. Page 1of the report should be updated to reflect the increase. The report uses a design infiltration rate of 2.7 in./hr., which is the average of the results from the two best tests. The test that had lesser infiltration (TP307 at 0.42 in./hr.) was not used in determining a representative rate. Figure 3 shows Infiltration Area 3, but the Location ID numbers from the table are not found on the map.

  The outlet configuration of the pond reservoir is not modeled same as shown in the conceptual design. The pond reservoir is modeled with a constant 0.20 cfs discharge to infiltration trench and a head variable discharge to stream. The conceptual design shows two gravity discharges, one to adjacent wetlands and one to a downstream flow-splitter. Whereas, a typical downstream flow splitter would send all flows below 0.20 cfs to the infiltration pond, and would maintain 0.20 cfs during larger runoff events that discharge to stream. Up to 1.0 feet of stage in the pond, the runoff is split almost evenly between infiltration and stream. Modeling the system with a typical low-flow splitter would result in increased volumes infiltrated which may benefit the low-flow analysis.

  - It appears that this system can drain via gravity and no pumps would be required. Stage-discharge curves should be head-variable when gravity drained.
  - Flow splitter should be included in model as a 2 outlet reservoir.
  - Pond outlet should be 2-outlet: wetland discharges and discharges to flow-splitter. Discharges to downstream flow-splitter should be modeled as single discharge. Compliance would be verified by summing stream discharges from flow-splitter and wetland discharges from pond.
  - How was infiltration facility sized, tank length, trench width, design infiltration rate, what head versus infiltration-rate function was used (maximum infiltration rate should not exceed field measured rate)?
  - Provide conceptual design of infiltration facility showing profile section, with seasonal high groundwater.
  - It has become standard practice to require monitoring and/or full scale rate tests of infiltration facilities after construction. Our experience has shown infiltration facility performance to be

widely variable. This is currently being required of larger projects via the County's "In-Operation" public rule. Written guidelines have been developed for performing these tests and could be provided. Ecology may want to consider some level of post-construction monitoring of the proposed infiltration facilities.

- How was the discharge to wetland evaluated? If it is not modeled as separate discharge, there is no way to determine rate, volume or frequency of discharge to wetlands? This discharge should be modeled as separate outflow from pond. Normally, wetlands are mitigated with low flows rather than the infrequent large storm events. It is unclear what the mitigation strategy is for wetland recharge.
- Appendix D, Sheet C133 shows West Side Office within the pond storage area. The KCSWDM requires that facilities be on-line at the time that improvements are made. Improvements typically refer to impervious surfaces, but may include the embankment fill for this project. This may pose timing problems in coordinating the removal of the office and the operation of the pond.
- The timeseries output to WDM for reinfiltration in SDW1B is the constant flow-split from the pond. The actual infiltrated timeseries is available as the second discharge from FTABLE 257. As was done with SDW1A, this should be the timeseries transferred to WDM for reinfiltration.
- Pond is shown with side-slopes steeper than 3:1, and therefore would require fencing per the KCSWDM.

Walker Creek

HSPF Model / Flow Control

1. HSPF input files not provided in Appendix B2 for calibration run. Input files were obtained on 01/02/01 and again on 01/12/01.

   Resolution: Include input files used to generate any model results in SMP.

2. Table B2-3, PERLND parameters do not match HSPF input file for AGWRC and INTFW. Indication is that Table values are incorrect and that printed table was taken from an earlier version of the calibration report. Reviewer cannot determine if other tables and figures are similarly outdated, or represent the current calibration.

   Resolution: Include updated Table B2-3 and verify other tables and figures are up-to-date. Have person performing calibration review the report as assembled for printing.

3. The subbasin maps provided in Appendix B2 do not correspond to the subbasins used in the calibration model.

   Resolution: Subbasin delineation should be consistent with hydrologic model. Appendix B should use 1994 subbasins consistent with the model and figures.

4. Subbasin 21 includes 133% of the basin acreage represented in Table B2-7. The problem appears to be in the portion of subbasin 21 which is not tributary to the stream gauge used for calibration, so would not effect the calibration results or mitigation assessment. However, this should be cleaned up in the calibration, pre-project, and post-project HSPF input files.

   Resolution: The correction is to scale down the acreages of those PERLNDS in subcatchment 21 that use MBLKs 1 and 2 by 66%.

5. The acreages used in the calibration HSPF input file differ from those presented in Table B2-7. A second Walker Creek HSPF input file was received on 01/02/01 from Aqua-Terra. Indication is that a last minute refinement to the numbers in Table B2-7 took place. It is reported that the revised acreages were tested and did not have any significant effect on the calibration results. However, this has not documented in the calibration report. Regardless of their magnitude, these inconsistencies should be resolved and the calibration results updated to reflect the latest reported existing soil/landcover data.

   Note 1: Problems associated with the frequently changing landuse acreages has been pointed out in previous review comments. The calibration model represents 1994 "existing" landcover and soil types and should not require changing in the final draft.

   Note2: The HSPF calibration input files were formally submitted to Ecology via e-mail on January 12 and forwarded to King County on January 16. The "official" input file has landcover acreages which match Table B2-7. No updates or discussion were provided as to changes in the calibration results. It is understood that minor changes to the mass balance (none greater than 0.01) resulted from the updated calibration file. The magnitude of the differences is not the issue. All input files should represent the input files which were used to generate the results presented in the plan. Rather than switching the files, this might have been more appropriately handled with an "addendum" submitted by the firm stamping the calibration report which documents the differences in the files and associated results.

6. Predev landcover acreage for subbasin SDW2 uses 3.31 acres of effective impervious. This was a topic of discussion during the facilitated meetings. It was agreed that the effective impervious would not exceed the 1994 landcover acreage used in the calibration report for MC8b. This is 1.71 acres in the 12/00 calibration run. This was a concession by the reviewer to not require the use of existing subbasins to determine allowable release rates throughout the project site. The review call was that in most POS subbasins it did not make a significant difference since existing landcover was being swapped between adjacent outfalls draining to the same threshold discharge area. However, MC8b (194 subbasin) and SDW2 both outfall to the same location and the release rates should be based on what drains there under existing conditions with 75-15-10 landcover assumptions applied. This agreement has not been implemented in the 12/00 SMP. This agreement did not consider a dominant shift from outwash to till soils which diminishes the effectiveness of the 75-15-10 standard.

   The sum of all impervious areas in STIA subbasins (see yellow line on subbasin maps) is increased from 3.79 acres of impervious under 1994 conditions to 4.89 acres under predeveloped conditions. Due to the rules applied to the 75-15-10 landcover approach, the predeveloped impervious area should never exceed 1979 or 1994 conditions.

   Resolution: Model the SDW2 predeveloped landcover as agreed to in facilitated meetings. Check other STIA Walker subbasins (MC8 and MC9) to ensure proper soil/landcover assumptions. Reassess SDW2 flow control facility performance.

7. MC8b has 55% till soils and SDW2 has 95% till soils. Note: Both subbasins outfall at the same location. This will elevate the allowable release rates above what this outfall would discharge to Walker creek if the 1994 subbasin delineation was used to apply release rates. As discussed at the facilitated meetings, using the 1994 subbasin delineation is consistent with the KCSWDM, whereas, using the future condition subbasin delineation was not. The resolution discussed at the facilitated meetings only addressed the impervious cover. Note: The SDW2 facility is located on outwash soils and is well above the reported high water table. Infiltration at this facility may be feasible. The SMP states that infiltration is a high priority and that infiltration has been incorporated into the designs where feasible. The feasibility of infiltration has not been evaluated outside of SDW1A, SDW1B, NEPL, and facilities located within the fill embankment. Incorporating infiltration in this design would require compliance with presettling requirements.

   Recommendation:

- If permit is granted, a condition should be included that during final design, the feasibility of infiltration at this site will be evaluated and infiltration provided to the extent feasible.

- If SMP is to be revised, the infiltration feasibility should be assessed. The predeveloped site should be modeled based on soil conditions of the 1994 subbasin delineation (intent of 9/00 comment and discussions during facilitated meetings).

8. PERLND 45 Airport Fill - Future Project-2006 - SDW2: The PWATER parameters AGWRC, IRC, LZETP do not match Table A-4 or the Miller Creek parameters. This was topic of previous discussions and it was agreed that the fill parameters would be the same across the 3 basins, with the exception of the DEEPFR, which would be specific to each basin. This comment was not made in recent reviews, as this problem appears to have been recently reintroduced into the models.

   Resolution: Set all fill parameters the same across all basins (DEEPFR excepted), which should be consistent with the airport fill calibration report and statistical evaluation results found in Appendix A.

9. Upper Walker Creek gauge record - King County stream gauge number 42C was located just downstream of the large headwater wetlands. There is a fair gauge record at the stream location, as well as several field measurements, during the calibration period. A quick check of the calibration model revealed a good low-flow match, but an underestimation of peak events. This is generally consistent with the calibration results at the downstream gauge. It would provide better validation of the calibration and low-flow analysis to include comparisons made at the upstream gauge.

10. Low Flow Analysis - See specific comments in the back of this section. Concerns include the use of future subbasins to define existing in-stream flows and the double application of precipitation to the fill embankment.

11. Out of basin groundwater transfers - the Project-2006 model should account for the reduction of pervious surfaces in the Des Moines creek model under Project-2006. Using Table 4-1 there appears to be net reduction in pervious landcover of ~115 acres.

Des Moines Creek

HSPF Model / Flow Control

1. Calibration HSPF Input File: Subbasin DM25 (SDS-3) landcover does not match landcover acreages in Table B1-1.

2. Calibration HSPF Input File: Subbasin DM26 (SDS-2,5,6,7) All PERLNDS have 100% AGWO sent to RCHRES 43, except for Till Grass (PERLND 26). This appears to be error, and 8 acres of AGWO for PERLND 26 should be directed to RCHRES 43.

3. Calibration HSPF Input File: Subbasin DM3 landcover does not match landcover acreages in Table B1-1.

4. Pre-Project HSPF Input File: External Targets includes sending flow control points of compliance to WDM. For SDS-7 vault this includes COPY 3 to WDM 126. The indication is that the SDS7 vault is controlling inflows from SDS6 and SDS7 down to the release rates generated from SDS-7 Pre-Project alone. It appears this is not the mitigation strategy intended, since the KCRTS preliminary sizing shows that Pre-Project includes both SDS6 and SDS7.

   Recommendation: Have Pre-Project HSPF Input File extract to sum of SDS6 and SDS7 to the external targets for demonstration of compliance. Currently there is not a node in the pre-project model which corresponds to this hydrologic location. This correction would help facilitate final design. Note: This comment is made as a recommendation as the overall point of compliance is downstream of this vault at the point where subbasins SDS7, SDS6, SDS2, DM7, DM8, and DM9 combine.

5. DM-1 PERLND 54: Under 1994 calibration run 3.9 acres of wetlands were modeled. Under Pre-Project and Project-2006, 14.7 acres of wetlands were assumed. This is a non-STIA subbasin, however it flows through the proposed SASA flow control facility. Non-STIA subbasins are being modeled with the same landcover assumptions in all three models (calibration, pre-project and project-2006). This assumption is to isolate hydrologic changes related to POS projects identified in the SMP.

6. Executel Pond (FTAB46) - The existing off-site pond was modeled in the Calibration and Project - 2006 runs, but was removed from the Pre-Project run. The Executel pond is located downstream of 200th and therefore does not appear in any of the Additional Points of Compliance evaluated for flow control purposes. Therefore, comment should not affect demonstration of flow control compliance. It would effect any Pre-Project evaluations further downstream.

   Recommendation: Restore the existing reservoir (FTAB 46) in the Pre-Project model.

7. Tyee Pond (FTAB 40) - Tyee Pond is not modeled under Pre-Project conditions. Not including this regional facility in the pre-project model does not effect any of the facility points of compliance used to demonstrate consistency with KCSWDM. The effect is that downstream of Tyee Pond (e.g., S 200th Street) the Pre-Project "target" conditions would be higher since offsite areas served by Tyee Pond are simulated with current landcover and no flow attenuation. When Tyee Pond is added to Project-2006 model, the regional facility flow attenuating benefits reduce flows from offsite areas (offsite landcover did not change between models). Therefore, the comparison of flows at S 200th Street represent the combined effects of onsite flow mitigations as well as the Tyee pond regional facility. Tyee Pond is modeled differently than Lake Reba and Miller Creek Regional Facility (both included in Pre-Project and Project-2006 Miller Creek models).

8. Specific Facility Comments:

SDS POC -1 (COPY 41) - This Point-of-Compliance (POC) includes SDS3A, SDS3, and SDS5 subbasins. SDS5 is proposed to bypass flow control facilities. SDS3A is served by an existing 5.4 acre foot vault. SDS3 is proposed to be served by a 88.4 acre-foot vault which will over-detain flows such that when these three subbasins combine (just upstream of NW Ponds) the Level 2 performance standard will be met. Storage corresponds to 4.7 inches of storage per impervious acre, or 2.5 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges (SDS3 only) match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

SDS3 vault significantly exceeds the 20 foot maximum depth (measured from ground to vault invert) specified in the KCSWDM. This vault depth reaches approximately 40 feet on the north-end. This design criteria is primarily for maintenance consideration. This facility is to be maintained by POS, so there may be justification for accepting this conceptual facility design. A maintenance related feasibility analysis has not been requested, to date.

Not possible to determine if the SDS-POC results presented in *Appendix A - Additional Points of Compliance* corresponds to this point of compliance or for POC-2. There is only one SDS POC presented and it is not specifically identified. Unable to confirm that these subbasins meet the Level 2 performance standard at the POC.

SDS POC-2 (COPY 4) - This Point-of-Compliance (POC) includes SDS7, SDS6, and SDS2 STIA basins. Additional offsite subbasins DM-7, DM-8, and DM-9 also drain to this POC (upstream of NW Ponds). SDS2 is proposed to bypass flow control facilities. SDS7 and SDS6 are proposed to be served by a 21.5 acre-foot vault. Storage corresponds to 6.4 inches of storage per impervious acre, or 2.2 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges (SDS6 and SDS7 only) match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

Not possible to determine if the SDS-POC results presented in *Appendix A - Additional Points of Compliance* corresponds to this point of compliance or for POC-1. There is only one SDS POC presented and it is not specifically identified. Unable to confirm that these subbasins meet the Level 2 performance standard at the POC.

Important Note: When offsite subbasins are included in a downstream point of compliance, the 10% tolerance allowed in meeting the Level 2 standard cannot be used. For most facilities the target duration curve was not exceeded at all, so this may not be a problem. Alternatively, the facility sizing and performance verification could be performed looking at only the project's contribution to the downstream point of compliance (remove offsite areas from facility analysis). If removed from analysis, brief excursions above the target duration curve, not to exceed 10%, would be acceptable.

> Resolution: Provide results for both downstream POC analyses in Appendix A. Clearly indicate which POC each set of results correspond to. See Important Note for POC-2.

SDS7/SDS6 Vault - Appendix D, sheet C140 shows a 21.5 acre-foot vault. The vault is shown above grade which presents special design and maintenance considerations. The SWDM definition of a *Detention Vault* is an underground facility, where the internal forces on the walls are partially offset by the surrounding soil. An above ground vault may require special structural reinforcing to prevent the walls from being pushed outward when the vault is filling. Most above ground water storage facilities are circular in shape (e.g., water towers) to help facilitate the structural design. Other structural design considerations (e.g., earthquake design, etc.) may be required for an above ground storage tank/vault. Structural design is normally done during the final facility design stage, and not during planning. However,

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Ecology has requested a structural design feasibility assessment on the large SDS3 vault, and may want to consider asking for a similar assessment of this above-ground facility. Maintenance access would be another consideration in an above ground vault. It is assumed that maintenance access would be from the top, as opposed to a side-door. How to get maintenance equipment onto the roof of a two-story tall structure is worth consideration during a feasibility assessment.

SDS POC - ***Appendix A - Additional Points of Compliance*** - The duration graph (assumed to represent either SDS POC-1, or POC-2) does not provide sufficient number of flow "cutoff" points at low flows to determine whether it is in compliance. The first cutoff is at flow 0.0 cfs, where both the Pre-Project and Project-2006 flow records are exceeded 100% of the time (no timesteps with zero flow). The second cutoff is at flow -13.0 cfs, which is greater than the lower limit of the range of control (50% 2-year = -8.0 cfs). It appears that the Pre-Project and Project-2006 curves cross at this point since their % time exceeded is essentially the same. The graph plots a straight line between these two points and therefore, it would appear that these timeseries have identical flow duration statistics below -13 cfs. It is more probable that -13 cfs represents the point at which the two curves cross and that between -13 cfs and 50% 2-year the Project-2006 curve is not in compliance. This comment is based on the typical interaction between predeveloped and postdeveloped flow duration curves.

> Resolution: Provide duration graph with additional cutoffs around 50% of the 2-year pre-project flow rate on both the Pre-Project and Project-2006 curves. Ideally, a point just below, a point equal to, and a point just above the bottom end of the range of control (50% 2-year) would be used. Indicate which SDS POC this graph is representing and provide similar data on the other SDS POC used in the model.

SDS4 - Proposed 12.9 acre-foot vault serving catchment areas of 32.5 acres impervious and 32.1 acres grass/landscape. Storage corresponds to 4.8 inches of storage per impervious acre, or 2.4 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

SASA - Proposed 33.4 acre-foot pond serving catchment areas of 176.7 acres impervious and 41.5 acres grass/landscape. Storage corresponds to 2.3 inches of storage per impervious acre, or 1.8 inches of storage per gross acre. Target release rates consistent with 75-15-10 landcover. Facility discharges match flow durations above 50% 2-year pre-project and controls 100-year peak flows below target conditions. This is equivalent to the KCSWDM Level 3 performance standard. KCSWDM recommends a 10% volume safety factor for facilities sized with calibrated HSPF model.

SASA facility is proposed in-line with the Bow Lake outlet. The reason for the in-line facility is to provide a single facility providing storage for the new SASA stormwater system as well as retrofit storage for the existing developed subbasins SDS1 and SDE4. These existing subbasins combine with the bow lake outfall system upstream of the proposed SASA facility. The SMP determined that it was not practical to retrofit individual stormwater vaults in SDS1 and SDE4, and the separating their outfalls from the Bow Lake outfall would require construction of a separate conveyance line under International Blvd (Hwy 99).

The KCSWDM does allow offsite areas to flow-through proposed stormwater facilities, but limits the amount of off-site flows based on a ratio of 100-year peak flows. The offsite 100-year flow (50 cfs) cannot be greater than 50% of the developed onsite 100-year flow (50% of 84 = 42cfs). Although exceeding the threshold, the proposal is on the same scale as the KCSWDM threshold. Additionally, the KCSWDM threshold was not written with flow control retrofits in mind. It seems reasonable to allow some flexibility in this threshold for projects proposing to retrofit flow controls . There is 190 acres of developed area in SDS1 and SDE4 proposed to be retrofitted by this facility.

Appendix D should include a conceptual design for the SASA facility.

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SMP Volume 1

1. Page 1-2, 3rd bullet - Feasibility of infiltration has not been assessed in several proposed facilities. It therefore is not a correct statement to say that infiltration has been incorporated into flow control facility design where feasible. See specific comment related to SDW2.

2. Page 1-2, last paragraph - Section 4 does not include information on existing subbasins. The 1994 existing subbasins are not presented anywhere in Volume 1.

3. Page 2-2, last paragraph - Monitoring of NEPL discharges is not the approach which had general agreement at the facilitated meetings. Monitoring to demonstrate performance of the existing facility has the following identified problems,

- Flow control retrofit standard is designed to recapture flow control from existing development, not to simply avoid aggravation of existing problems. Therefore monitoring against existing baseline conditions will not resolve the issue.
- There is no 75% forest, 15% grass, 10% impervious monitoring data from NEPL to compare against future monitoring data.
- Modeling has demonstrated that the existing facility is unable to meet the proposed SMP standard. The site is nearly 100% impervious. It is unclear what additional information is needed to make the determination whether flow control retrofits should be provided.
- The discussion with Ecology was to support allowing the existing NEPL site to be retrofitted to 10% existing impervious (0% actually existed). The possibility for POS to request a reconsideration of the permit conditions, if basin conditions change, exist for this site same as for the rest of the project area.

4. Page 2-5 , footnote 10. The outlet from the 154th street relocation is downstream of the MCRDF. This is based on the proposed location of the biofiltration swales.

5. Page 2-6 , Section 2.2.2 second paragraph - The KCSWDM does not identify any standards within incorporated areas. The decision as to what standard is to be required is made by the local jurisdiction with regulatory authority.

6. Page 2-6 , Section 2.2.2 third paragraph - Ecology had requested an assessment of the feasibility to retrofit the project site for enhanced water quality treatment under future permit conditions. The statement ".... the proposed drainage design would not necessarily preclude the application of future stormwater treatment..." may not be an adequate assessment of feasibility.

Chapter 3

7. Maximum duration of Open Water at Detention Ponds is specified for open water stormwater reservoirs. However, no analysis is provided which evaluates the proposed stormwater ponds. The actual duration of stormwater pond inundation is readily available from the detailed HSPF models used to evaluate pond performance. Additionally, the simplified drawdown time approach identified in section 3.1.2.4 is likewise not evaluated for any of the proposed stormwater ponds.

8. The SMP position that infiltration ponds should be avoided as they have increased periods of standing water is not substantiated. Experience has shown that infiltration ponds tend to be smaller in size, and have generally higher discharge rates (infiltration) than a corresponding detention facility. With infiltration facilities the rate of discharge (infiltration) is not restricted by a control structure with a small bottom orifice. Therefore, when the bottom of the pond is covered with water, near maximum discharge rates (infiltration) are achieved.

9. Table 4-1 - Many of the subbasins identified in this table did not exist in the 1994 "existing conditions" basin model. It appears that 1994 landcover is being applied to the future 2006 basin delineation. Therefore this is not a true comparison of 1994 runoff to 2006 runoff condition. This leads to

discrepancies such as with Walker Creek where the Pre-Project landcover assumptions are more developed than existed in 1994. It is clear that by looking at just impervious coverage that Table 4-1 indicates more impervious area draining to Walker Creek in 1994 than exists in the 1994 landcover HSPF input file. See discussion on Walker Creek SDW2 facility.

10. Page 4-5 - Mentions POS discharges to Gilliam Creek. No stormwater retrofits are proposed for these discharges. As no additional impervious is proposed in these subbasins, this approach is consistent with the current KCSWDM. However, it is not clear whether this approach is consistent with the SMP objective of meeting Level 2 flow control for all airport runoff (Volume 1, page 1-2), or relevant regulatory requirements.

11. IWS System -
The IWS system is regulated under an industrial NPDES permit. The SMP identifies an additional 307 acres of impervious to be diverted to IWS, with a future storage capacity of 236 acre-feet and a processing rate of 4.0 mgd. There is an expectation that the IWS outfall will be connected to the King County Metro wastewater system. Currently the IWS outfalls directly to Puget Sound. A continuous model of the IWS system was developed which indicated that based on historical precipitation, there would be no predicted overtopping of the IWS lagoons into Des Moines Creek. This results of the analysis indicated that the IWS system must maintain a processing rate greater than 3.1 mgd to avoid predicted lagoon overtopping (at 2.4 mgd the model predicts two occurrences of overtopping).

12. The IWS feasibility study indicates that there may be limitations on the allowed discharge rate to the wastewater system. Limits on allowable discharge rates may occur daily during periods when normally high wastewater flows, and/or during rainfall events where stormwater inflow/infiltration into the wastewater system is significant. As an agreement between the POS and Metro has not been reached, it is not possible to determine if the allowable discharge rates will allow IWS operation to prevent overtopping. It may be necessary to retain the current outfall to allow IWS to maintain necessary discharge rates during storm events, when it is most important that the lagoon capacity/discharge be effectively utilized to prevent overtopping to Des Moines Creek.

13. Table 4-3 - Indication is that this is the list of IWS pump stations where the limited capacity results in higher flows to be discharged to the stormwater system. As indicated in previous review comments, these pump systems need to be in the stream model to account for high flows from these drainage areas.

    - NSPS - Miller Creek model includes FTAB240 which serves area consistent with table.
    - CSPS - this pump station is not in the Des Moines Creek model.
    - SSOTFP - FTAB366 in Des Moines Creek Model. The acreage served by this pump is set to 0.000. The indication is that HSPF may read 0.000 acres as the HSPF default of 1.0 (equivalent to 12 acres due to unit conversions). The table indicates a service area of 435 square feet, which is not consistent with HSPF model, nor the expected size of service area. It does not make sense that the pump station would be installed to service such a small area.
    - NCPS - Included in Miller Creek model as FTAB242, serving an area consistent with this table.
    - NSPS - Included in Des Moines Creek model as FTAB360. However, acreage served is set to 13.2 acres in HSPF model, somewhat less than the 13.75 acre service area indicated in Table 4-3.

    It is assumed that the rest of the IWS reroutes shown in Table 4-4 are 100% flow diversions to IWS, at least to the 100-year storm level. If not, the IWS diversion structures with potential for SDS discharges should be included in the HSPF stream models.

14. Table 4-5 - The first 7 stormwater storage facilities are included in the HSPF models. The last 4 facilities are not. It is not known whether the areas served by these facilities will be retrofitted to the same target flow regime as the rest of the project site. The assumption is that they are not being retrofitted. As no future development activity has been identified for these areas, KCSWDM flow

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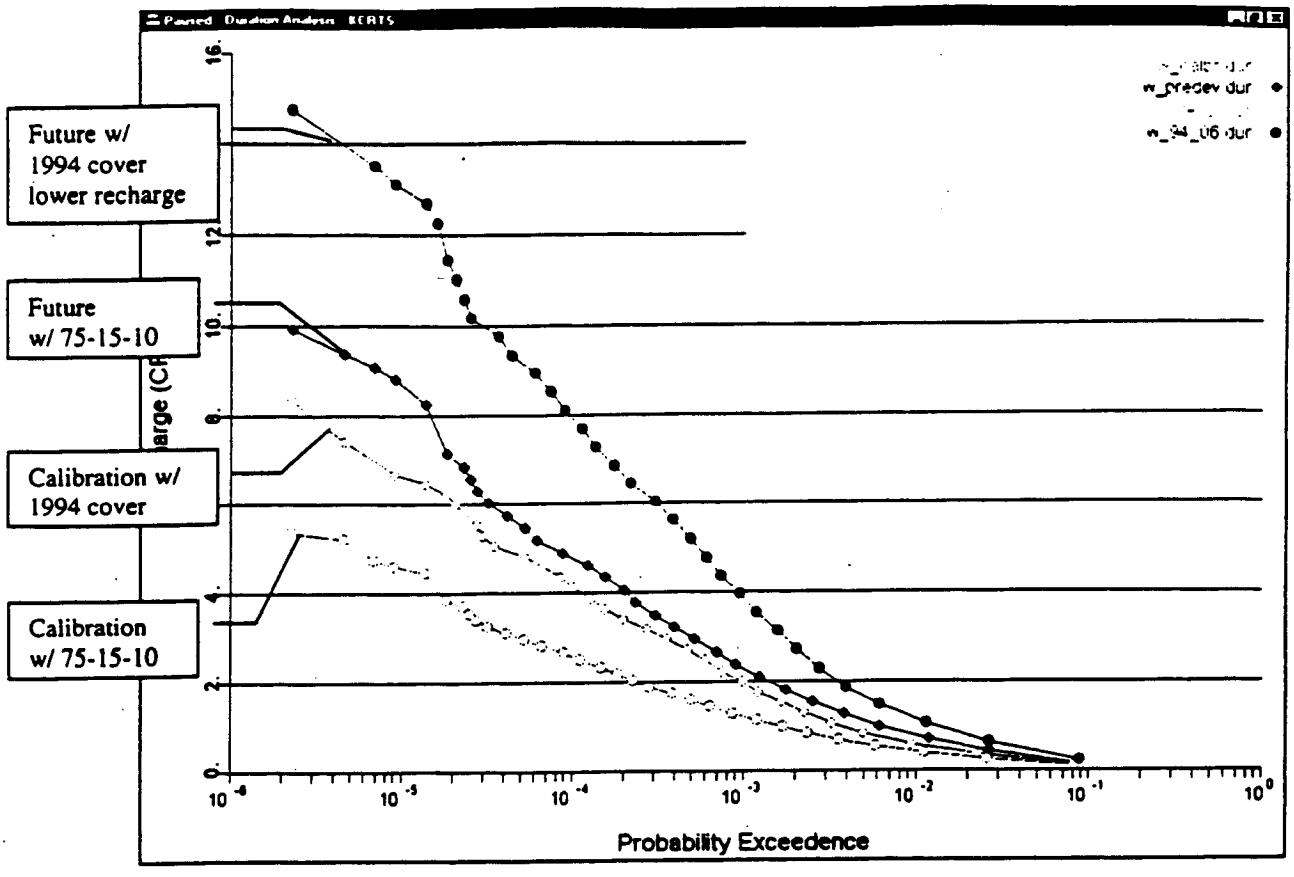
control requirements would not be applicable. However, it is unclear how these projects relate to the SMP approach of retrofitting the entire project site to the target flow regime.

15. Page 4-13, Section 4.4.3 - The use of future subbasins to determine release rates is not consistent with the standard application of the KCSWDM. The KCSWDM procedures call for using existing subbasin delineations for determining existing discharges which become the allowable release rates. A determination was made that for most of the threshold discharge areas there was not a significant difference when using the future subbasin delineation as basis for target releases rates. However, for the Walker Creek subbasin the difference in % impervious and % outwash is very significant. At the facilitated meetings it was made known that this would be a review comment, if the HSPF pre-project landuse continued to use more impervious than existed in 1994. Application of the KCSWDM requirements for existing landcover assumption is 1979 conditions, or better. Modeling Walker Creek with 3.31 acres of impervious and nearly 100% till soils is elevating the release rates significantly above what the stream saw in 1979 and 1994. Concurrence to the landcover approach for Walker Creek cannot be given.

Walker Creek Cover Type	1994 - Calibration (acres)	Pre-Project (acres)	Project-2006 (acres)
16 Till Forest		30.91	
26 Till Grass	19.21	7.16	26.82
34 Outwash Forest		1.69	
44 Outwash Grass	15.44	0.39	1.42
45 Airport Fill			6.70
54 Wetlands	0.61	1.13	
Effective Impervious	1.71	3.31	9.51
Total Acreage	**36.97**	**44.59**	**44.45**
Percent Impervious	4.6	7.4	21
Percent of Pervious Soils as Outwash	48	5.0	4.1
Percent of Pervious Soils as wetlands	5.3	2.7	0.0

The below graphic is useful in illustrating the problem. The curve with hollow diamonds represents the runoff from the 1994 subbasin with 1994 landcover (source: HSPF calibration input file). The curve with hollow circles represents the runoff from the 1994 subbasin with 75-15-10 landcover. The curve with the solid diamonds represents the runoff used as the target flow conditions for SDW2 (source: HSPF Pre-Project input file). The curve with solid circles represents the runoff from the future subbasins with 1994 landcover.

- Existing 1994 landcover (hollow diamonds) produces lower flows than the Pre-Project landcover (solid diamonds). This is not consistent with the application of the 75-15-10 landcover assumptions.
- If the 75-15-10 landcover assumptions were applied to the existing subbasin, the resulting flows (hollow circles) would be considerably lower than those used in SMP.
- Approximating 1994 landcover applied to the future subbasin produces higher flow durations (solid circles), but may produce an easier to achieve low flow condition due to lower "existing condition" recharge from increased impervious and decreased outwash soils. Although the indication is that this was done (applied 1994 landcover to 2006 subbasins), there are no HSPF input files provided which show exactly what was done.



16. Page 4-20, Section 4.5.3.1 - The stated limit for oil and grease is referenced to the 1998 KCSWDM as the performance goal for the high use site menu. However, the KCSWDM performance goal is actually less than 10 mg/L Total Petroleum Hydrocarbons, and no visible sheen. The 10-15 mg/L oils and grease may be from the Port's NPDES permit.

17. Page 4-20 Section 4.5.3.2 - The KCSWDM Basic Water Quality Menu has the performance goal of 80% TSS removal. Whereas, the IWS NPDES requirements limit the TSS concentration of the discharge (monthly average and daily maximum). The effluent TSS concentrations are summarized in the Discharge Monitoring Reports included in Appendix N. Reviewer is not able to confirm that the IWS system meets the performance goals of the KCSWDM basic treatment, since a comparison to influent data has not been presented. The performance of industrial waste processes regulated under separate NPDES permit is not typically reviewed under the KCSWDM standards.

18. Page 5-4, 2nd paragraph - Figure 4-2 does not show 1994 drainage boundaries. Current to future comparisons that do not use current drainage boundaries may not represent the actual change in hydrologic conditions.

19. Page 5-4 2nd paragraph - " However,, future development will not change the total amount of airport area draining to Miller, Walker, and Des Moines Creeks (i.e., the hydrologic divide will remain balanced and no net change to watershed area will occur)." The reviewer finds this statement to be substantially true. This SMP statement appears to be related to the Governor's Certification which includes project conditions on this subject. Compliance with the intent of the Governor's Certification is not within the scope of this review.

20. Page 6-1, Section 6.1.2.1 - "Normally, vaults are constructed underground." Appendix D shows vaults which are constructed above ground. Recommend including some discussions on how this will be implemented (e.g., special design and maintenance considerations).

21. Page 6-2, Section 6.1.2.4 - The SMP indicates that future design work may consider expanding the Miller Creek Regional Facility in order to reduce the amount of onsite detention storage required. In principle, this approach is valid. However, what is not clear is how the final design would be reviewed and approved under the permit processes required for this project site. This SMP provides no analysis of alternative flow control mitigation scenarios, so no review or concurrence can be given to any proposed future reductions in the onsite flow control facilities proposed in this SMP, as shown in Figure 6-1.

22. Page 6-2, Section 6.1.2.4 - Indicates that to avoid wildlife attractant issues, the pond expansion would be free-draining with no standing water. This definition is inconsistent with the definition of a stormwater detention which includes the reduction in the rate of discharge (not free draining), and the storage of excess water in a reservoir (standing water). Furthermore, this is different from the criteria presented earlier as the FAA guidelines for avoiding wildlife attractants.

23. Page 6-3, Section 6.1.3 - Indication is that all flow control facilities presented in this plan (see Figure 6-1) are preliminary and subject to change during final design. It is unclear how the final design would be reviewed and approved under the permit processes required for this project site. Furthermore, "ensuring that the Port's stormwater management standards are met" does not have a defined meaning. It is unclear what these standards would be (e.g., Level2, Enhanced Level 1, FAA criteria, etc.). No alternative flow control scenarios are presented by the SMP, so no review or concurrence can be given to any flow control approach, other than is summarized in Figure 6-1.

24. Page 6-11, Section 6.2.2 - same comment as for Page 6-3. Additionally, Section 6.2.2 is not an evaluation of the ability of regional detention to retrofit airport runoff to predeveloped conditions. No such analysis was included in the SMP.

25. Page 6-11, Section 6.3 - Indication is that MPU project progress will be tracked yearly against the stormwater mitigations necessary to prevent increases in peak flows. Table A-3 (Appendix A) provides some insight into the expected construction schedule, but does not provide a correlation between the timing of stormwater facility construction and MPU improvements. No review or concurrence can be provided regarding the scheduling of stormwater mitigations (flow control, water quality treatment, low flow augmentation, etc.) against scheduled site improvements.

26. Page 6-12, 1st Paragraph - Indication is that some detention facilities may need to be constructed years in advance of improvements, due to multiple MPU projects beings served by the same facility. Only comment is with the use of the phrase "may need to be". It seems that scheduling issues should be better known at this time.

27. Page 7-4, footnote 16 - The feasibility of bypassing SASA storm flows and overdetaining upstream flows has not been analyzed by SMP. It is likely feasible due to large upstream area.

28. Page 7-5, Section 7.1.1.5 - South 154th Street would not require detention per the current KCSWDM as less than 5,000 square feet of new impervious surface is identified. However, consistency with the SMP objective of retrofitting all MPU projects to the target flow regime has not been evaluated.

29. Page 7-10, Section 7.1.4.3 - Indicates that the roof runoff from South Satellite SDS is being sent to IWS system. This is now an existing condition, as the diversion was completed in 2000. Directing roof runoff to the IWS system is not consistent with the understood IWS plan which was explained as only receiving runoff from high pollution generating surfaces.

30. Table 7-8 and Page 7-9- SDN1 Wetvault: Correction was made to the equation on Page 7-9 for sizing of a wetvault for subbasin SDN1 which had been off by a factor of 3.0.

- Water quality facilities must be sized for the total area draining to the facility. Since this facility is combined with the detention facility, the landcover acreages should be consistent. Comparison of the landcover acreages indicated them to be consistent with the exception of 0.27 acres of airport fill draining to the facility. This acreage should be considered in the wetpool sizing.
- The corresponding value in Table 7-8 needs to be updated.
- The equation on page 7-9 needs a bracket after 3*. The factor of 3 is applied to all landcovers, not just impervious.
- The Appendix D drawings for the SDN1 vault do not include the needed wetpool volume.

31. Table 7-8 -
- The SDN6 bioswale area is incorrectly shown as wetvault volume. The number needs to be moved one column to the left.
- The SDN1 wetvault volume should be consistent with value page 7-9.

32. Page 7-15, Section 7.4 - Indication is that WET performance tests would be used for determining if alternate coating materials could be used to retrofit uncoated metal roofs. Concerns have been raised regarding the WET testing procedures used on this project site. Concerns primarily relate to the use of flathead minnows, rather than a salmonid species, and testing pollutant concentrations which are significantly lower than the median concentration presented in the SMP.

33. Appendix A - Table A-3 - There are some questions and possible inconsistencies identified in this table. There is a need to clarify some items, including latest construction schedule, the schedule for associated mitigations, and which projects have mitigations included in the SMP.

- Scope of Work indicated that review would include scheduling of construction activities versus construction of the associated mitigations. This Table does not provide sufficient information for concurrence on scheduling mitigations and development activities., such that mitigations are in place when improvements are made.
- Project to be served by SDS4 was constructed in 1996? What is schedule for implementing mitigations?
- 154th relocate - Roadway not tributary to SDN drainage system. How is road mitigated (restored) when not treated as bypass area for facilities? Much of roadway is downstream (not tributary) to MCRDF. Does SMP intend to retrofit roadway to 75-15-10? If so, how is this handled? Proposal is to retrofit all flows to target flow regime with on-site facilities, How does this relate to table indicating this project is being mitigated by MCRDF?
- Is it LANDSIDE IMPROVEMENTS or is it really LANDSLIDE IMPROVEMENTS? Unaware of any landslide issues being addressed through SMP.
- Temporary 509 interchange (5/00 - 10/00) - Do construction dates need to be revised? For all projects, or just this one?
- Relocation of Airborne Cargo, ATCT(???) - This would indicate that SASA facility needs to be currently in-place.
- Relocate ASR, ASDE, NAVAIDS - Obviate flow control for ASR? Flow control now being proposed, in Appendix Y (see comments). ASDE, NAVAIDS are unknown projects. The on-site detention ponds appear to not have been presented in SMP.
- General Comment: Many of these construction activities are indicated as having been completed. The flow control facilities indicated as mitigating the associated impacts have not been constructed?
- Westin Hotel - Believed to be outside the SDE and SDS subbasins. Landcover changes for off-site areas are not believed to mitigations for existing or future development. Please explain where in DM model the flow control mitigations are included.

- NEPL Phase I retrofit is indicated as subject to monitoring. See previous discussion on this issue. Monitoring to determine need to retrofit flow controls is not very plausible. Does the Port have flow monitoring data from NEPL under pre-developed conditions (75-15-10) which can be used as baseline?
- Additional NEPL expansion - No mitigations presented in SMP for this planned project.
- Des Moines Creek Technology Center - No mitigations presented in SMP for this planned project.
- Not clear whether projects listed in Phase III (2006-2010) are included as part of the mitigations. Understand that NEPL expansion is not. What about the SASA and Cargo projects?

Appendix Y - Stormwater Analysis of the ASR Site

Reviewer has not reviewed this material previously. No reference to this project was found in the meeting notes from the facilitated meetings. The following review comments are related to the materials found in Appendix Y.

FLOW CONTROL -

1. The performance duration curve is atypical. The facility discharge curve is either from a combined infiltration/detention facility, or the modeled post developed landcover produces less flow than the predeveloped landcover.

2. Indication is that this is a detention only facility located on outwash soils. This is not consistent with the objective of the SMP or KCSWDM to use infiltration where possible. Based on the modeling input, these soils appear well suited for infiltration. Pending the results of an infiltration feasibility analysis, it is recommended that this site infiltrate all flows up to the 100-year storm level. Incorporating infiltration in this design would require compliance with presettling requirements.

3. The facility serves 3.47 acres. Storage volume used is 219 cubic-feet (approximately equal to storage within an 8-foot deep Type II 72-inch catchbasin). The existing 0.12 acres of impervious provides the release rates which enables this site on outwash soils to not infiltrate.

Landcover	As Modeled		Calculated
	Pre-Dev	Post-Dev	Post-Dev
Outwash Forest	2.60 acres	0.00 acres	0.00 acres
Outwash Grass	0.75	3.47	2.64
Impervious	0.12	0.00	0.83 (effective)
Total	3.47	3.47	3.47
Filename (graph)	mc7apre.dur	mc7adev.dur	mc7adev2.dur
% Impervious	3.4%	0.0%	24%
% Grass	21.6%	100%	76%
% Forest	75%	0.0%	0.0%
% Outwash	100%	100%	100%

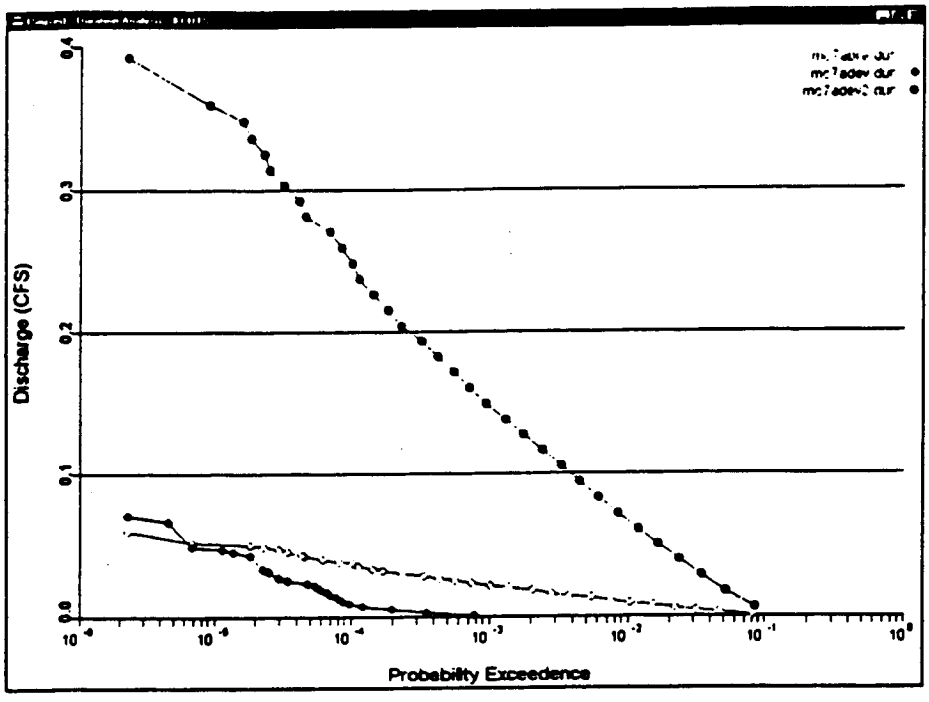
The modeled predeveloped landcover assumptions are consistent with the 75-15-10 landcover assumptions.

1. The modeled postdeveloped landcover assumptions are not consistent with the plan sheet entitled Proposed Impermeable Surface Area which shows 1.3 acres of total impervious coverage. When modeled, the postdeveloped flow durations are less than predeveloped flows over a majority of the flow range (compare the two curves with diamond shaped symbols. Note: solid symbol is post developed runoff without flow control).

2. No provision for the offsite flows which are being directed through the flow control pond. These flows may exceed the threshold requiring the offsite flows to bypass the flow control pond.

3. From the grading plan it appears that the pond side-slopes are steeper than 3:1, which would require fencing per KCSWDM. The proposed fencing does not extend around the proposed pond.

4. From the below graph it is apparent how significant the difference in post-developed landcover assumptions are (compare the two curves with solid symbols).



WATER QUALITY -

5. Appendix Y figures, - No water quality treatment facilities shown. SMP Volume I, Section 7 indicates that the driveways will be 20 feet wide and will be treated by 7.0 foot filter strips (calcs provided???) adjacent to the driveways. The driveways (with shoulders) are estimated at 25 feet in width from the crown. The gravel shoulder on the short side of the crown may not require treatment. The plan sheet entitled Grading and Paving Plan shows the collection ditch immediately adjacent to the shoulder. The design needs to be modified to provide the water quality treatment identified in Volume I, Section 7. Note: although not specifically described in the KCSWDM, it may be feasible to incorporate the biofiltration filter strip into the gravel shoulder area. The shoulder may need to be widened and meet the design criteria for filter strips. Fines may need to be added to the gravel aggregate to establish the necessary grass cover, and may require monitoring and replanting to ensure proper cover is achieved.

6. Gravel areas subject to vehicular use are usually considered pollution generating impervious surfaces. This would include the almost 1 acre of gravel surface at this site. There are provisions for infrequently used maintenance access roads, but the expected frequency of vehicular use at this site is not known to the reviewer.

7. The plan sheet entitled Proposed Impermeable Surface Area shows a structure labeled "FUEL". There are thresholds for water quality and source control requirements related to fuel storage and transfer in the KCSWDM and Ecology regulations. The SMP should include some information on the fueling activities which are planned for this site and identify what, if any, special water quality considerations are needed. The highly permeable outwash soils identified for this site might warrant special consideration (e.g., spill containment area may need to be impermeable if applicable, etc.)

Low Flow Analysis Comments -

Stormwater Management Plan -

1. Page 6-6 - Section 6.2.1.2 - Indicates the Port has reviewed the feasibility of providing infiltration facilities in Miller, Walker and Des Moines Creeks. The SMP specifically evaluates two subbasins (SDW1A and SDW1B) for infiltration feasibility. Additionally, the SDN3A and NEPL site and the fill embankment areas have been deemed unsuitable for infiltration. The results of other feasibility studies have not been presented in the SMP. Of particular interest is the ASR pond, the SDW2 pond and the SASA pond sites. Additionally, other subbasins being served by closed vaults outside of the fill embankment should be evaluated to determine the feasibility of increased infiltration.

2. Table 6-3a - Reviewer understands that the model for secondary recharge to fill embankment is counting the same stormwater that is appearing in the stream under the Project-2006 model. These different model runs represent the range of conditions which might be expected to occur, and therefore the results of these runs should not be summed.

3. The embankment secondary recharge assumed a high infiltration rate on the fill embankment, which reportedly resulted in nearly all of the rainwater being infiltrated into the embankment for long-term storage. The Project-2006 model applied the same rainwater to the surface water system which directs water to stream and to active groundwater for storage and delivery to stream. The concern is that stormwater will not be available in one, or both, of these low-flow sources in the quantity assumed by this analysis. Potentially, resulting in unmitigated baseflow impacts. This concern was raised twice during the facilitated meetings. No discussion of this issue was found in the December 2000 SMP or supplemental low flow analysis report.

4. Low flow analysis appears to be comparing future subbasins with 1994 landcover to future subbasins with 2006 landcover. This is not a comparison of current stream flows and future stream flows because of some significant changes in the landcover composition of some subbasins (i.e., Walker Creek MC8b conversion to SDW2, see below comments specific to Walker Creek).

5. No operational plan provided for low flow augmentation - How much retention storage is being proposed and where? When will water be collected? What is basis for determining when it will be released to stream? What is the release mechanism, pump, valve, automated, manual? How long can the augmentation flow rate be maintained? What is operational plan for Fall if the stored water has not been used, or will it be used every year during the statistical low flow period? There is little detail provided for this proposal to provide an actively managed low flow augmentation.

6. SMP Page 6-9, 1st bullet - KCSWDM does not specify minimum allowable infiltration rates. The sentence would read correctly if "that" was changed to "and".

7. SMP Page 6-9, Site Investigations - Pond F (SDW2), and ASR should be investigated for feasibility of infiltration.

8. SMP Page 6-9, Infiltration Rates - SDW1A modeled infiltration rate is somewhat greater than recommended in the infiltration feasibility report (7% greater in model than recommended). The significance is probably not great as the inflows to the infiltration facilities are being restricted to the recommended rate.

9. SMP Page 6-9, Infiltration Rates - SDW1B infiltration rates recommended in Appendix F are different in the report summary and the main text. The report summary recommends that a 0.15 cfs infiltration rate be used, while the report text recommends a 0.20 cfs infiltration rate. This discrepancy should be resolved and the HSPF model adjusted, if necessary.

10. SMP Page 6-10 - The statements that using infiltration ponds will increase the period of standing water are not substantiated. Unlike detention facilities with restricted outlets, infiltration facilities are free-

draining with no restrictions placed on the rate of discharge (maximum design infiltration rates). There has been no analysis of any of the proposed facilities for consistency with the stated policy on wildlife attractants. The facilities have all been modeled with continuous flow models (HSPF and KCRTS) where periods of standing water can readily be extracted and analyzed. See DM Basin Plan evaluation of NW Ponds where the recommended alternative was chosen, in part, to minimize wildlife attractants. Nor has the simplified approach of a maximum allowable "drawdown time" been presented for any of the facility designs.

Port of Seattle, Seattle-Tacoma Airport Master Plan Update, Low Streamflow Analysis, Earth Tech, Inc., December 2000.

1. Hydrologic modeling approach double counts the precipitation - The same rainwater that is being introduced into the fill embankment for extended storage until summer low flow periods is the same rainwater being discharged from active groundwater storage due to PERLND infiltration, being infiltrated in the proposed infiltration facilities, and being stored in retention vaults for actively managed low flow augmentation.

2. The 1994 landcover model appears to use the 2006 subbasin delineation. This analysis does not truly represent the existing instream low flow conditions. The problem is greatest for subbasins like MC8b being converted into SDW2. It appears less significant for Miller and Des Moines as the points of analysis are further downstream where the swapping of subbasin landcover areas under 2006 conditions will tend to cancel out (e.g., impervious moved from one subasin appears in an adjacent subasin, etc.)

3. Only miller creek 2006 conditions HSPF input file was included in the appendices of this report. Input file representing 1994 landcover not provided in this report, nor in SMP(assumed to be applied to 2006 subbasin delineation). No input files provided for Walker or Des Moines Creek.

4. HSPF input files should be provided using a non-proportional font. The two Miller Creek 2006 input files provided are poorly formatted. Columns do not line up with headers, and numbers shift left and right as you move down the columns. These files are not presented in a readily reviewable format.

5. Table G-2 - of the four non-responding properties were assumed to withdraw stream flows at a combined rate that is 250% of the rate assumed for the 4 properties (excluding orchard) who indicated water use. This seems to be an inconsistent assumption since most of the responding properties indicated no water withdrawals.

6. Page 6-10 No discussion of the planned use of stormwater retention for use in summer low-flow augmentation. The SMP Appendix D drawings show some locations of proposed retention storage. The low flow report indicates some rates of discharge needed to maintain stream flow during critical periods, but no further information is provided. Insufficient detail provided to determine if approach is viable.

7. Walker creek drainage area - From Table 4-1 it appears that approximately 115.4 acres of new impervious is being added to the Project-2006 landcover assumptions in Des Moines Creek (SDS2 and SDS4 AGWO not tributary to Walker). This acreage should be removed from the offsite groundwater source in the Project 2006 Walker Creek model.

8. Is the offsite groundwater being sent to the point of compliance for the low flow analysis?
9. The low flow analysis appears to be restricted to the contributions of SDW2 under 1994 and 2006 conditions, so may not effect low flow numbers at 12th Ave S, but would affect low-flow numbers downstream of the large headwater wetlands (i.e., flows downstream of Des Moines Way).

10. Cannot determine what was assumed for subbasin delineation or PERLND/IMPLND acreages for Walker 1994 landcover model. If using 2006 subbasins with 1994 landcover the 1994 stream flows presented in the low flow analysis are not representative of actual 1994 conditions (1994 and 2006

subbasins have significantly different 1994 landcover). No Walker or Des Moines Creek HSPF input files provided for low flow analysis.

11. Pond F (SDW2) should be investigated for feasibility of infiltration.

12. Walker Creek low flow analysis should be confirmed using observed flow data from gauge 42C which was located just downstream of Des Moines Way. Comparisons to the basin calibration model showed very good low-flow correlation of the calibration model flows to the manually measured flow readings.

December 2000 SMP, Suggested Grouping of Comments for Resolution.

GROUP 1A: ASR Site and Appendix

____1. Flow Control design consistent with future landcover (e.g., ~0.83 acres future effective impervious not modeled).

____2. Assess ASR pond site for infiltration feasibility.

____3. Assess whether offsite flows can be directed through facility.

____4. Reassess flow control performance

____5. KCSWDM fencing requirements

____6. Water Quality treatment for all pollution generating surfaces (i.e., ~1 acre of gravel surface subject to vehicular use).

____7. Water quality treatment facilities (filter strips) are incompatible with conceptual design. Filter strips are not shown. No room between edge of shoulder and conveyance ditch to provide filter strips.

____8. Storage and transfer of fuel is assumed due to a box marked "FUEL" on the plan sheet. This has potential water quality, source controls, and other applicable rules/regulations should be dealt with. Concern of fuel storage on gravel surface above outwash soils. Spill containment measures, as applicable, should include an impervious containment area.

____9.

APPENDIX B2 MILLER AND WALKER -

____1. Resolve discrepancies between tables and input files (acreages, PERLND parameters, etc).

____2. Provide HSPF input files that generate the calibration results presented in the report.

____3. Verify output results presented reflect current calibration. Update as needed.

____4. Provide maps showing existing subbasins used in calibration.

____5.

AR 017645

GROUP 2: Walker Creek -

____6. Remove landcovers with 0.00 acreages from HSPF input files, Pre-Project, Project-2006 and Project-1994 (if exists).

____7. Model "Airport Fill" consistent with Appendix A and other basin models. Note: Appendix A appears to be internally inconsistent.

____8. Use existing subbasin landcover to define existing "in-stream" flows. Provide input files used in low-flow analysis.

____9. Use existing subbasin landcover, with 75-15-10 rule applied to define flow control allowable release rates.

____10. Assess SDW2 pond site for infiltration feasibility.

____11. Reassess flow control compliance

____12. KCSWDM fencing requirements. Show fence as needed on plan.

____13. Reassess low-flow statistics

____14. Future condition model should account for change in pervious landcover (in Des Moines Creek model) when evaluating the out of basin groundwater transfers. There is ~115 acres of impervious added which would reduce the amount of groundwater recharge to Walker Creek.

____15. 11/7 - RESOLVED: Hart Crowser and PGG concur, per email, that excavation for temporary Pond B will not breach the aquitard. The Port will evaluate additional mitigation measures to reduce seepage inflow. Details and/or notes re: potential mitigation measures to reduce seepage will be provided in the revised HNTB drawings included as an SMP appendix.

____16.

AR 017646

GROUP 3: Miller Creek Pre/Post

____1. Remove landcovers with 0.00 acreages from HSPF input files, Pre-Project, Project-2006 and Project-1994 (if exists).

____2. Model "Airport Fill" consistent with Appendix A and other basin models. Note: Appendix A appears to be internally inconsistent.

____3. SDN4/4X impervious landcover discrepancy. Reevaluate SDN2X/4X vault flow control performance.

____4. MC16, MC4 landcover discrepancies.

____5. Low Flow Analysis - Apply precipitation only once.

____6. Low Flow Analysis - Assumed water usage of non-respondents to survey

____7. Low Flow augmentation proposal (retention/reuse). Storage provided, operational plan.

____8. SDW1A hydraulics and infiltration

- Pre-infiltration vault stage-discharge relationship. (stage variable or constant)
- Evaluate vault overtopping under gravity drain conditions
- Overflows from vault going to detention or infiltration (design shows to detention, model sends to infiltration)
- Is infiltration discharge from pond via a pump system? Should be indicated if correct. Should be modeled was variable stage-discharge if not.
- Provide sizing information and conceptual design of infiltration facility.
- KCSWDM fencing requirements
- Post-construction infiltration performance verification.

____9. SDW1B hydraulics and infiltration

- Infiltration discharge stage-discharge relationship. (stage variable or constant)
- Model hydraulics don't match design (e.g., constant discharge, flow-splitter, maintaining discharge to stream at flows less than infiltration flow-split.
- Wetland discharges. Why only recharge during large infrequent events? How was wetland recharge evaluated without any modeling specific to this separate outfall? Model pond with 2 outlets: to wetland, and to flow-splitter. Model flow-splitter as two outlet reservoir, to infiltration, and to stream. Note: most flow-splitter will send all flows less than infiltration design rate to infiltration. Follow this approach, or demonstrate how flow-splitter will maintain constant discharge to infiltration and head variable discharge to stream.
- Is infiltration discharge from pond via a pump system? Should be indicated if correct. Should be modeled was variable stage-discharge if not. Appears gravity drain is feasible and therefore should be used.
- How will removal of "West Side Office" be handled in conjunction with pond construction?
- Timeseries extracted to WDM for "reinfiltration" is taken from a different point than was done with SDW1A. Why? The infiltrated discharge is available as second discharge from FTAB257, but not used. What is reasoning of taking this subbasin's flows out prior to being infiltrated?
- Provide sizing information and conceptual design of infiltration facility.

- KCSWDM fencing requirements
- Post-construction infiltration performance verification.

____10. Conceptual plan for infiltration facilities. Plan, x-section, seasonal high GW, testing locations, etc.

____11. SDN1 vault conceptual plan showing wetpool storage.

____12. SDN1 - Fix inconsistency with facility outflow flow frequency results.

____13. SDN3/3X - Facility not strictly in compliance at low end. Try enlarging bottom orifice, and perhaps raising 2nd orifice.

____14. Point of compliance analysis at Lake Reba outflow. Facilitated Meeting action item.

____15.

Group 4: Des Moines Creek

____1. Remove landcovers with 0.00 acreages from HSPF input files, Pre-Project, Project-2006 and Project-1994 (if exists).

____2. Model "Airport Fill" consistent with Appendix A and other basin models. Note: Appendix A appears to be internally inconsistent.

____3. DM3 landcovers don't match summary table for calibration model.

____4. DM1 PERLND 54 acreage discrepancy calibration vs. pre-project and project-2006.

____5. Adjust SASA sizing as needed.

____6. Provide conceptual design of SASA facility.

____7. DM26 PERLND 26 AGWO

____8. IWS pump stations with overflows to stream are not modeled with assumptions consistent with Table 4-3.

____9. SDS POC - The duration results does not provide sufficient number of flow cutoffs at low-flow end to determine if compliance is met.

____10. SDS POC - Indicate which POC these results represent. Provide the other POC results also.

____11. SDS POC#2 - If offsite subbasins are included in POC analysis, the 10% tolerance cannot be used. Alternatively, the POC#2 could be setup to only look at the project site's contribution to this downstream hydrologic point (i.e., add an additional node to model to separate out the project site and offsite flows)

____12. Include Executel Pond in pre-project model.

____13. Include Tyee Pond in pre-project model. Will affect the S 200th POC results.

Group 5: Volume 1 and Other Appendices

____1. Structural Feasibility above ground vaults

____2. Maintenance Feasibility above ground and deeper than standard vaults.

____3. Consistency of infiltration feasibility report, is the SDW1B recommended infiltration rate 0.15 cfs or 0.20 cfs?

____4. Volume 1 comments. Infiltration feasibility statements, use of 2006 subbasins to define existing instream flows and predeveloped release rates.

____5. Table A-3 - Comments/Questions

- Do dates reflect current schedule (e.g., SDS4, SR509)?
- What is corresponding mitigation schedule?
- Which projects include mitigations in SMP, which do not?
- Is SASA really sized for fire station, Westin Hotel, etc.? Needs to be discussed, since future landcover cannot be verified with level of mapping in SMP.
- 154th/156th Relocation Flow Control
- "LANDSLIDE" or "LANDSIDE" improvements?

____6. Page 7-9 SDN1 wetvault sizing needs to account for the airport fill draining to the vault. The Appendix D conceptual drawings need to show the wetpool storage. Clearly indicate wetpool storage as different from retention for flow augmentation.

____7. Found several vaults with extra dead storage which appear to be stormwater retention for low-flow augmentation. How will this be operated? How much storage? Etc. This level of information should be included in SMP.

____8. Table 7-8 updates not addressed

____9.

AR 017650

Group 6: Low Flow Analysis

____1. Use of future subbasins to define existing instream flows.

____2. Summation of resultant outflows from multiple HSPF runs representing the range of expected hydrologic conditions.

____3. Evaluation of infiltration feasibility overstated. Infiltration feasibility has not been assessed in Walker or Des Moines basins.

____4. Operational plan for actively managed retention storage and low-flow augmentation. How much retention storage is being provided? When will it be stored? When will it be applied to stream?

____5. Water withdrawal assumptions for survey non-respondents. Why all assumed to withdraw when most respondents indicated no water withdrawal? Why is the assumed rate of withdrawal significantly greater than those that responded (Orchard execpted)?

____6. Maintenance Feasibility above ground and deeper than standard vaults.

____7. HSPF input files used to generate results. No 1994 existing condition models provided. Only Miller Creek 2006 model provided (twice). HSPF input files should be provided in a non-proportional font. The input files provided (two versions of Miller 2006) are poorly formatted, columns do not line up correctly, which is needed to facilitate review.

____8. Consistency of infiltration feasibility report, is the SDW1B recommended infiltration rate 0.15 cfs or 0.20 cfs?

____9. Upper Walker Creek gauge should be used to confirm low-flow analysis assumptions for 1994 existing conditions. The comparison of flows at 12th Ave S. should be retained.