Appendices

Appendix A: Work Order Scopes (WO#8 and WO#10)

Appendix B: Project Delivery Process – Workshop Meeting Notes & Flow Diagrams

Appendix C: Guiding Questions

Appendix D: Expert Review Panel Resumes

Appendix E: Bibliography of Provided Review Documents

Appendix F: October 20, 2011 Expert Panel Workshop Meeting Notes

Appendix G: October 21, 2011 Stakeholder / Expert Panel Meeting Notes

Appendix H: Additional Panel Reference Citations

Appendix A

Work Order Scopes (WO#8 and WO#10)

Work Order Request

Wastewater Treatment Division
Design Review and Project/Program Management Services on a Work Order E000198E10 with MWH Americas, Inc.

Scope of Work
Work Order No. 8

Project Title: Independent Review of Project Scoping and Implementation Practices Performed by the River and Floodplain Management Section and Associated Sections of the Water & Land Resources Division (WLRD) within the King County Department of Natural Resources and Parks (DNRP)
Project No. 421066, Subproject No. 400, Phase 001
WTD Division Director: Pam Elardo, Project Sponsor
WLR Division Director: Mark Isaacson
Project Manager/Phone: David St. John (DNRP), 296-8003
Additional Client Contact Name/Title/Phone: Christie J. True, DNRP Director

Project Background, Objective and Constraint

The Water and Land Resources Division (WLRD) River and Floodplain Management Section implements projects addressing conditions on the Cedar, Sammamish, White, Green, S.F. Skykomish, and Snoqualmie river systems within King County. These programs and projects are primarily built to prevent flooding and recover salmon but must mitigate for a variety of conditions present in the various reaches of the rivers.

As part of its emphasis on increased efficiency and effectiveness, the Department of Natural Resources and Parks requests an independent review of WLRD's River and Floodplain Management Section projects to evaluate how well the project scoping and implementation practices address the policy objectives to protect public safety, prevent property damage, recover salmon and provide recreation. The expert review should consider the assumptions, soundness of concept, design standards and practices and construction methods of the projects. The Consultant will assess how projects are identified, scoped, controlled, implemented, and monitored for effectiveness in meeting objectives. The Consultant's work will culminate in a memorandum or report that identifies effective actions and approaches, concerns, and recommendations for improvements where they are advisable.

Safety Concerns

Without effective methods and processes for identifying, scoping, controlling, implementing, or monitoring the effectiveness of projects, there is reduced certainty that projects are appropriately and adequately addressing public safety. For example, Section staff and citizens have recently identified spanning logs and logjams along a reach of the Cedar River that may pose a hazard to both human health and infrastructure (bridges).

Environmental/Permits

Not applicable to this project.

Community Issues

The community-at-large is concerned about public safety hazards caused by spanning logs and logjams, with specific note of current circumstances along a reach of the Cedar River in unincorporated King County. There are varying opinions about whether or not King County can design and construct projects that will meet multiple objectives.

Consultant Scope/Required Discipline

The Consultant Task Leader must be an experienced project manager and team leader with understanding of the specific policy context for the work of the River and Floodplain Management Section. The Consultant team must include a civil/environmental engineer, and the team must include expertise in geomorphology, river hydraulics, and habitat ecology with an emphasis in salmon habitat needs.

Work will include the following activities:

- Identification of the Task Leader for the project. The Task Leader will serve as the main point of contact for the Expert Panel with the DNRP Project Manager for the duration of the project.
- Review information provided by King County, visit project sites, and clarify project objectives with the DNRP project manager.
- Develop list of potential Expert Panel members with expertise in the areas of concern identified during the information review activities. The Expert Panel is expected to include four to five members, representing the various interests and objectives of river and floodplain projects. Expert Panel members will include technical and scientific experts (ideally with direct, recent experience working with rivers in King County or the Puget Sound basin) and subject matter experts and practitioners (ideally from or with experience representing institutions which have successfully addressed similar issues, potentially from outside of the Puget Sound area).
- Define scope of questions to be addressed by Expert Panel and boundaries for recommendations. It is anticipated that the Expert Panel will primarily address questions of programmatic guidance and implementation, and will not provide detailed review of the program's policy direction or the technical objectives of individual projects, except as appropriate for a "case study" exercise.
- Develop list of questions to be posed to the Expert Panel.
- Develop protocol for engaging Expert Panel through site visits, workshops, staff interviews, conference calls, etc.
- Obtain commitments from Expert Panel participants and address the related administrative and contracting needs

- Prepare work plan

Deliverables will include the following:

1. Work plan
2. Draft and final list of Expert Panel members
3. The Expert Panel assembled and secured through the necessary contracting mechanisms
4. Draft and final list of questions to be posed to Expert Panel
5. Phase 2 work plan (as a future work order)

King County Responsibilities

The King County DNRP Project Manager will provide to the Consultant, for use in their reviews, relevant background materials regarding the activities of the River and Floodplain Management Section that are the focus of this independent review. These materials may include maps, a copy of the existing Flood Management Plan, applicable guidance and/or specifications used in the implementation of these activities, standard checklists of appropriate review items, and other materials.

Deliverables / Schedules

Item	Due Date
1. Secure Consultant Team Lead	August, 2011
2. Kick-off Meeting with King County	August, 2011
3. Develop and finalize questions to be answered by the panel and provide opportunity for input from stakeholders	August - September, 2011
4. Progress Meeting No. 1 with King County	September, 2011

Budget ($ or Hours)
154 hours

Work Order Request

Wastewater Treatment Division
Design Review and Project/Program Management Services on a Work Order E000198E10 with MWH Americas, Inc.

Scope of Work
Work Order No. 10

Project Title: Independent Review of Project Scoping and Implementation Practices Performed by the River and Floodplain Management Section and Associated Sections of the Water & Land Resources Division (WLRD) within the King County Department of Natural Resources and Parks (DNRP)
Project No. 421066, Subproject No. 400, Phase 002
WTD Division Director: Pam Elardo, Project Sponsor
WLR Division Director: Mark Isaacson
Project Manager/Phone: David St. John (DNRP), 296-8003
Additional Client Contact Name/Title/Phone: Christie J. True, DNRP Director

Project Background, Objective and Constraint

The Water and Land Resources Division (WLRD) River and Floodplain Management Section, Rural and Regional Services Section, and Stormwater Services Section implement projects addressing conditions on the Cedar, Sammamish, White, Green, S.F. Skykomish, and Snoqualmie river systems within King County. These programs and projects are primarily built to prevent flooding and recover salmon but must mitigate for a variety of conditions present in the various reaches of the rivers.

As part of its emphasis on increased efficiency and effectiveness, the Department of Natural Resources and Parks requests an independent review of these projects to evaluate how well the project scoping and implementation practices address four policy objectives: protect public safety, prevent property damage from flooding, recover salmon, and provide recreation. The expert review should consider the assumptions, soundness of concept, design standards and practices and construction methods of the projects. The Consultant will assess how projects are identified, scoped, controlled, implemented, and monitored for effectiveness in meeting objectives. The Consultant's work will culminate in a memorandum or report that identifies effective actions and approaches, concerns, and recommendations for improvements where they are advisable.

Safety Concerns

Without effective methods and processes for identifying, scoping, controlling, implementing, or monitoring the effectiveness of projects, there is reduced certainty that projects are appropriately and adequately addressing public safety. For example, Section staff and citizens have recently identified spanning logs and logjams along a reach of the Cedar River that may pose a hazard to both human health and infrastructure (bridges).

Environmental/Permits

Not applicable to this project.

Community Issues

The community-at-large is concerned about public safety hazards caused by spanning logs and logjams, with specific note of current circumstances along a reach of the Cedar River in unincorporated King County. Community members have also expressed a concern that the subject projects are not contributing effectively to the recovery of salmon. There are varying opinions about whether or not King County can design and construct projects that will meet multiple objectives.

Consultant Scope/Required Discipline

This scope addresses the implementation of tasks by the Expert Panel undertaking the review of project scoping and implementation practices performed by the River and Floodplain Management Section and associated sections of the Water & Land Resources Division (WLRD) within the King County Department of Natural Resources and Parks (DNRP). MWH will serve as the Expert Panel Coordinator. This scope assumes that the Expert Panel members have been chosen and retained under appropriate contracting mechanisms; sufficient initial program background materials have been assembled for the Expert Panel's use; and a complete draft of the Guiding Topics and Questions has been developed to guide the Expert Panel's review work.

Work will include the following activities:

- Convene the Expert Panel for a Review Workshop with King County staff, and any additional group meetings necessary to effectively implement the scope. This will include one day in the field to visit project sites relevant to the review, and one day at MWH's office to discuss observations. It is assumed that all Expert Panel members will complete one trip to Seattle over a two day period for this workshop.
- Review the background material provided by King County and other parties as preparation for work plan development and execution.
- Revise, as necessary, the draft Guiding Topics and Questions that will guide the review. It is anticipated that the Expert Panel will primarily address questions of programmatic guidance and implementation, and will not provide detailed review of the program's policy direction or the technical objectives of individual projects. These aspects of project guidance and implementation may be accounted for, as necessary and appropriate, within a project "case study" exercise should the Expert Panel undertake this approach as part of their review.
- At a high-level, the Expert Panel activities will include:
    - A conference call with MWH staff to review scope of work

  - Review of King County documents
  - Site visit and presentation / Q&A session with King County
  - A meeting with MWH to present/review the findings
  - Summary of recommendations associated with particular area of expertise
  - Review of compiled findings document
- Compile information from Expert Panel and analyze for the purpose of preparing a report summarizing the assessment findings and providing recommendations / opportunities to improve project scoping and implementation practices.
- Address any administrative matters related to convening the Expert Panel and managing its work.
- Coordinate, through periodic meetings and other means, with the DNRP Director's Office Project Manager to ensure effective project implementation. This is primarily a responsibility of the Expert Panel Coordinator.

Deliverables will include the following:

1. Final work plan for the Expert Panel's tasks
2. Revised list of Guiding Topics and Questions that will guide the Panel's review tasks
3. Draft report of findings and recommendations
4. Final report of findings and recommendations, reflecting revisions to the draft as necessary
5. Presentation of the final report to the DNRP Director's Office and others as identified by the DNRP Director's Office
6. All materials collected or created during the implementation of this Scope of Work

King County Responsibilities

The King County DNRP Project Manager will coordinate with the Panel Coordinator to ensure effective project implementation. This will entail maintaining the overall project delivery schedule and addressing administrative matters associated with contracting between King County and MWH. This may also entail, for example, acting as a liaison between the Expert Panel and King County program staff and others interested in this project, and participating in meetings and discussions with the Expert Panel to support their understanding of the subject matter.

Deliverables / Schedules

Item	Due Date
1. Expert Panel convened for Kick-Off Meeting (Conf Call)	October 7, 2011
2. Expert Panel work plan and revised Focus Questions	October 14, 2011
3. Initial meeting of the Expert Panel including QA Session with King County and site visits	October 20 & 21, 2011
4. Expert Panel summarizes findings and recommendations	November 2011
5. Convene expert panel for working meetings as necessary	November 2011
6. Draft report of findings and recommendations	November 18, 2011
7. King County provides comments on draft report	November 28, 2011
8. Final report and presentation of findings and recommendations	December 9, 2011
9. All project materials and invoices, project close-out	December 16, 2011

Budget ($)
See Attached

Work Order Request

Wastewater Treatment Division
Design Review and Project/Program Management Services on a Work Order E000198E10 with MWH Americas, Inc.

Scope of Work
Work Order No. 10 – Change No. 1

Project Title: Independent Review of Project Scoping and Implementation Practices Performed by the River and Floodplain Management Section and Associated Sections of the Water & Land Resources Division (WLRD) within the King County Department of Natural Resources and Parks (DNRP)
Project No. 421066, Subproject No. 400, Phase 002
WTD Division Director: Pam Elardo, Project Sponsor
WLR Division Director: Mark Isaacson
Project Manager/Phone: David St. John (DNRP), 296-8003
Additional Client Contact Name/Title/Phone: Christie J. True, DNRP Director

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Environmental/Permits

Not applicable to this project.

Community Issues

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- Convene the Expert Panel for a Review Workshop with King County staff, and any additional group meetings necessary to effectively implement the scope. This will include one day in the field to visit project sites relevant to the review, and one day at MWH's office to discuss observations. It is assumed that all Expert Panel members will complete one trip to Seattle over a two day period for this workshop.
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- Revise, as necessary, the draft Guiding Topics and Questions that will guide the review. It is anticipated that the Expert Panel will primarily address questions of programmatic guidance and implementation, and will not provide detailed review of the program's policy direction or the technical objectives of individual projects. These aspects of project guidance and implementation may be accounted for, as necessary and appropriate, within a project "case study" exercise should the Expert Panel undertake this approach as part of their review.
- At a high-level, the Expert Panel activities will include:
    - A conference call with MWH staff to review scope of work

  - Review of King County documents
  - Site visit and presentation / Q&A session with King County
  - A meeting with MWH to present/review the findings
  - Summary of recommendations associated with particular area of expertise
  - Second site visit by Expert Panel to review specific project sites
  - Review of compiled findings document
- Compile information from Expert Panel and analyze for the purpose of preparing a report summarizing the assessment findings and providing recommendations / opportunities to improve project scoping and implementation practices.
- Address any administrative matters related to convening the Expert Panel and managing its work.
- Coordinate, through periodic meetings and other means, with the DNRP Director's Office Project Manager to ensure effective project implementation. This is primarily a responsibility of the Expert Panel Coordinator.

Deliverables will include the following:

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The King County DNRP Project Manager will coordinate with the Panel Coordinator to ensure effective project implementation. This will entail maintaining the overall project delivery schedule and addressing administrative matters associated with contracting between King County and MWH. This may also entail, for example, acting as a liaison between the Expert Panel and King County program staff and others interested in this project, and participating in meetings and discussions with the Expert Panel to support their understanding of the subject matter.

Deliverables / Schedules

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4. Expert Panel summarizes findings and recommendations	November 2011
5. Convene expert panel for working meetings as necessary	November 2011
6. Draft report of findings and recommendations	November ~~18~~29, 2011
7. Second Site Visit by Expert Panel	December 5, 2011
~~7.~~8. King County provides comments on draft report	~~November 28~~December 9, 2011
~~8.~~9. Final report and presentation of findings and recommendations	~~December~~ January~~9~~, 2012~~1~~
~~All project materials and invoices, project close-out~~	~~December 16, 2011~~

Budget ($)

~~See Attached~~Not to Exceed $25,000.00~~116,070.46~~

Appendix B

Project Delivery Process:
Workshop Meeting Notes & Flow Diagrams

Independent Review of Project Scoping and Implementation Practices
Water and Land Resources Division

Recorder: Jeffrey Schmidt / Karen Ditz

Date: Tuesday 13 September 2011 **Time:** 9am - 3pm

Attendees (King County)	**Attendees (MWH)**
David St. John, Steve Bleifuhs, Clint Loper, Diane Concannon, Will Mansfield, Don Althauser and Jon Hansen	Jeffrey Schmidt and Karen Ditz

The processes and activities described below are based on information provided by three (3) groups within the Water and Land Resources Division:

- Stormwater Services Group
- River and Floodplain Management Group
- Rural and Regional Services Section- Ecological Restoration and Engineering Services (ERES) Unit

The Ecological Restoration group designs, implements and monitors habitat restoration projects within various basins throughout King County. Projects are ranked and prioritized internally based on recommendations from salmon recovery plans, and the group is made up of approximately 15 scientists, engineers, and project managers. The group has a wide variety of technical experts and will cross-matrix with other technical experts within the WLRD, using outside consultants as necessary. Projects overlap frequently with Floodplain Management projects, and often these two groups share the work and funding responsibility.

The Stormwater Services Group has a $2M annual budget which is funded primarily through DOE and FEMA grants. Stormwater projects are largely prioritized by complaints or other agency directions, with stormwater damages becoming a primary driver. The group has 16-18 staff made up primarily of engineers, and will often cross-matrix with other groups or obtain consultant help as necessary to obtain technical expertise. This group has the capacity to provide their own Resident Inspectors on construction efforts

The River and Floodplain Management Group oversees 500 different facilities, including 119 miles of levees and revetments. The County maintains these facilities as budgets allow. In 2008 the group's budget was $3M and had a staff of 10-11 people. In 2008 the King County Flood Control District was created which has increased this group's budget to $35M per year and an increase in staffing to 34 professionals, divided up by basin teams, primarily made of up engineers and ecologists. The group provides cradle to grave services, from planning and policy through design, construction, and operations/maintenance, but occasionally cross-matrixes with other groups and hires outside

consultants as required. A Flood Hazard Management Plan was created by the group in 2006 and continues to serve as the official plan for prioritizing upcoming projects. The group prepares all the major mapping of King County rivers and provides this info to FEMA. The group feels it is still understaffed for the level of work under their purview and has requested additional staff. For construction projects, road crews will be utilized for small jobs and contractor procurement for large projects.

The WLRD is currently completing a review of PM practices, tools, and templates. This included a GAP analysis and will result in a WLRD PM Manual by the end of the year.

Review of WLRD Project Implementation, Design, and Construction Processes

The below information summarizes the various steps and processes as presented by staff from the three capital improvements groups identified above and in attendance at the workshop.

Initiation/ Planning Phase

1) Identify Project Manager

Each group has a slightly different way to identify a Project Manager.

Ecological Restoration and Engineering Services Group: Unit manager works with Project Sponsor (internal KC staff) to identify the right individual based on skills and availability.

River and Floodplain Management Group: Supervising Engineer / Senior Staff select PM

Stormwater Group: The PMO group determines the PM based on availability. Stakeholder group participates as well.

2) Project initiation

Stormwater Group: Baseline scope, schedule and budget are provided to the PM.

Ecological Restoration and Engineering Services Group + River and Floodplain Management Group: Project sponsor initiates request for project with high level project description, purpose, and goals statements. Project manager oversees development of the initial scope, schedule and budget. Core Team reviews the scope, schedule and budget. Team creates charter. Charter reviewed by project supervisor and affected managers.

At this stage, there is a specific focus on project goals and objectives. This information is established at Project Initiation and Project Scoping stage.

3) Create The Project Management Plan (and Assemble the Project Team)

Ecological Restoration and Engineering Services Group: Initial Project Management Plan elements identified before the kick-off meeting. Specific elements of the plan created with input from team members, stakeholders, mgrs, as appropriate. The Project Plan includes an initial risk assessment,

any procurement requirements, ROW needs, initial RAM, health and safety requirements, communication plans (internal and external), stakeholder outreach plan, permitting plan, WBS . The PMP and its subsidiary elements are updated and/or implemented throughout the project.

At this stage, the Team refines the goals and objectives, schedule and cost estimates. The groups being interviewed in the workshop use excel for scheduling simple projects. MS Project is used for scheduling more complex projects.

Antiquated budgeting / accounting system called "ARMS". In 2012, King County is moving to ABT which will link with the current PRISM system. This will provide the Team with the ability to track expenditures on a live basis. At present, the Teams cannot track costs on a real time basis. It can take up to 3 months for expenditures to show in the accounting system.

Any regulatory activities are also incorporated into the schedule and are shown on the WBS.

At this stage, the Project Manager assembles the project team as well.

4) Kick Off Meeting

The Project Manager conducts a kick-off meeting with all staff and sponsors. The Project Sponsor transfers information to the project team. Team reviews the scope, budget, objectives and schedule.

Attendees include project supervisors, project managers, ecologists and other scientists, engineers, community relations, etc. May include internal stakeholders.

At this stage, the Team determines which technical studies and assessments need to occur and recommend sequencing and timing of activities (e.g. Geotechnical / Hydraulic Modeling / Engineering).

For the Stormwater Group – the information collected in the kick off meeting is passed to the Project Management Office (PMO) to manage the Project Managers / Resources / Consultants / Procurement. The PMO is responsible for monitoring the PMs and the project status. This is not true of the other groups being interviewed. *Are other groups going to adopt this process? Not really appropriate for the other groups because they are smaller*. However, Project Supervisors are assigned in the other groups to oversee the work in a similar capacity.

If necessary, external consultants will be selected via King County's procurement methods. The external consultants will participate in the project kick off meeting and will assist the Team with the feasibility / alternatives analysis activity.

5) Feasibility Study / Alternatives Analysis

For ERES, there is substantial variability in the level of development of project concepts/requests received from project sponsors. Some projects include a reach-wide analysis to identify, evaluate, and rate multiple projects and multiple project alternatives. Other projects have already been

narrowed to a single project location and the team begins with an alternatives analysis that evaluates benefits, costs, and a broad spectrum of feasibility criteria to evaluate alt's and recommend a preferred alternative. usually incorporates fairly substantial feasibility work to more fully develop the project concepts and to

6) Review of Alternatives Analysis

This is only a formal process step for ERES. Other groups, however, perform a review by the Project Sponsor and internal Management team (Project Supervisors). Feasibility analyses and alternatives analyses are key steps for ERES projects. Alternatives, evaluation criteria, and recommendations of preferred alt's are reviewed by the project supervisor, sponsors and affected unit/section mgrs. Teams seek formal approval of the recommended alternative before proceeding to 30% design.

7) Select Design

After the review of the Alternative Analysis, a design is chosen to be taken to the next phase of design.

General Notes:

- Feasibility Analysis is completed based on the complexity of the project. Various ways to determine if a feasibility analysis is required. It is dependent on the scale of the project. The Team reviews the risk of implementing the project. This activity can occur at the end of this Phase. Some Teams need to validate the feasibility as soon as it is handed off to the Group. The project could have been on the CIP list for several years before being implemented by the project team. This activity includes a high level regulatory analysis.
- WBS for King County is not generic. A new WBS is created for each project. There is no standard WBS template. Project Manager's sometimes use old WBSs as a starting point.
- Many projects do not have a formal sponsor. All ERES projects have a sponsor.

30% Design:

1) Update Assessments

This includes updating the Project Plan, regulatory plan, outreach plan, etc.

2) Base Mapping

The groups generally use the in-house survey resources. In house activities are typically related to land acquisition and reviewing property boundaries, but may include other necessary tasks and preparation of relevant topographical info. If PLS level surveys are required, the Team will use outside services.

Boundaries of properties are stored within King County's GIS. There is good information but may not be fully accurate. Occasional disputes occur with land owners.

3) Drafting (CAD)

King County has one specific lead CAD resource per project.

The CAD resource will impose the first level of design standards. King County Roads standards are on the layouts as a starting point. The Division has a set of standards maintained as well.

4) Develop Draft 30% Design Documents

The Project Team develops the initial set of 30% design documents (drawings, specifications, assessments etc.) Includes OPCC cost estimate.

Project Team / Project Engineer develop the estimate of probable cost. Template cost estimates are used for preliminary costs. Generic cost items are used on these templates. Unit costs are pulled off of WASH DOT.

Project Teams have frequent team meetings (depending on the project) throughout this phase leading up to the 30% deliverable draft.

For ERES, the supervising engineer reviews and approves the design team's recommendations regarding the type and level of detail needed for engineering and engineering-related studies for the project. These studies eventually become part of the Basis of Design report, which is required for large projects. The supervising eng, who is also the Eng of Record for ERES projects, reviews these work products throughout the life of the project and provides tech assistance to the eng staff as they develop these studies and products.

5) Review of 30% Documents

Project Supervisor or the Engineer of Record reviews the draft deliverables. In ERES, the EOR and the project supervisor review 30% designs. Clients typically also input to the 30% level plan.

6) Finalize 30% Design Documents

The Project Team finalizes the 30% preliminary design documents. Could include certain specifications (limited specifications (e.g. materials) when King County completes the construction) and special assessments / studies, such as geotechnical, structural, etc.

Project Sponsor may perform an informal review. This is being considered as an improvement opportunity to the current process. This may be included in the project baselines and made standard for the County. KC has recently implemented a requirement that a formal scope, schedule and budget baseline be established and reported on a quarterly basis for projects $1M construction or larger. This may change to incorporate a review for all projects in the future. Occasionally Project Sponsors will attend meetings to keep appraised of the process throughout.

7) Conduct Public Rule Meeting

King County provides all 30% design documents to the Public and External Stakeholders for review on Large Wood Projects. This is a public meeting. Residents and stakeholders provide comment on the documents. There is a two week period for the public to comment on the design. This activity became a formal rule last year.

60% Design:

1) Continue implementation of Permit Strategy and Create Draft Permit Package

   The Team defines any new permitting requirements and determines if additional environmental studies are necessary.

2) Create Red Line Comments for 30% Design Documents

   The Team identifies any issues with the 30% design and recommends changes. There is no consistent formal documentation of red lines, aside from what is on the page. Red line format is typically an outside driven format. Internally it is the responsibility of the Drafter to merge redline markups from multiple parties as necessary, with input from the project engineer and supervisory engineer as needed. There is a color coding scheme from work completed; the Drafter will strike out for what was done and highlight what has not been done or items that need to be followed up on. Diane asks for copies of red lines to be sent back to her, which she compares to subsequent draft to see how changes have been made.

   At this stage, the Project Manager can specify additional support services needed to complete the project. Teams regularly outsource for technical skills that are not available in-house, such as geotechnical and structural services, whenever these services are needed.

3) Develop Draft 60% Design Documents

   A constructability evaluation is completed by the project engineer during the design process. WLRD is looking to hire a Resident Engineer but currently there is no one in this role at the County level. The groups have used RE's from other agencies/departments/consultants within the area to perform constructability reviews.

4) Review of 60% Documents

   There is a review, by the Project Supervisor and Engineer of Record.

5) Finalize 60% Design Documents

6) Conduct Formal Constructability Review

   When the 60% deliverables are finalized, the Project Manager engages the CMI supervisor.

7) The Project Manager, supervisory engineer, sponsor, unit's finance officer, and project supervisor review the Construction Budget to ensure funding is in place.

8) Conduct Informal Review of 60% Deliverables

   This is an internal / informal review by project sponsor. Sent to management for review if complex project.

9) Submit Necessary Permits

10) Conduct Public Rule

    This is only necessary if the design has substantially changed between 30% and 60%.

General Notes:

- The Project Plan and WBS is reviewed and updated at every stage.
- The Team makes any necessary changes to the Project Plan and WBS based on 30% documents.
- Design standards are used throughout the process.
- At 60% design, the permit documents are ready.

90% Design:

- It should be noted the Workshop was stopped at this point
- What is drastically different?
- MWH agreed to develop a process for 90% for the Team to review off-line

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Construction:

- Many past construction projects are completed by King County forces and overseen by King County Staff in the field. In these circumstances, King County staff do not track daily construction cost changes / items, or document daily reports and photographs, etc. The Construction Lead will check the plans and specifications to make sure the construction is built to the drawings.

- If construction projects are managed by external / private Construction Contractors, there is a different process than above. There are formal processes and more detailed paperwork, etc.
- If Construction is being managed and conducted by King County, 100% drawings / plans and specifications for internal crews are not normally finalized. It should be noted, there is a Construction Lead from King County to assist with construction activities

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Action Items:

- MWH agreed to develop a process for Construction for the Team to review off-line
- King County will review the documentation from the Workshop and provide feedback.

Independent Review of Project Scoping and Implementation Practices
Water and Land Resources Division

Recorder: Jeffrey Schmidt / Karen Ditz

Date: Tuesday 4 October 2011 **Time:** 10am - 12pm

Attendees (King County)	**Attendees (MWH)**
David St. John, Steve Bleifuhs, Clint Loper, Diane Concannon, Will Mansfield, Don Althauser and Jon Hansen	Jeffrey Schmidt and Karen Ditz

<u>Review of WLRD Project Implementation, Design, and Construction Processes</u>

General Comments:

- With regards to environmental permits, at 90% design, the majority of the permits have been obtained and by 100% design all permits are obtained. In addition, at 100% design all permit conditions have been reviewed.
- With regards to construction, the Project Team identifies how the construction work is going to be done during the 0-30% design stage. This includes if procurement of a construction contractor is required. This is continuously reviewed as project evolves.

Procurement Activities:

- During the 100% design phase, concurrent procurement activities occur, which includes the advertising and solicitation of bids. In addition, there is a finalization of the construction cost estimate.
- King County uses the Low Bidder selection process. The initial review is of the bid costs.
- The lowest bidder is sent a Notice of Selection
- King County's Procurement Group 'owns' the procurement process. This process is not challenged. WLRD staff is occasionally frustrated with the process. For example, the review for qualifications / insurance / etc. is done after the notice of selection is sent. This can be a tedious process because the lowest bidder may be dropped and then the next low bidder selected. This can impact the time frame of the project. If none of the bidders are qualified, there is a re-bid.
- During the procurement process there is no negotiation of T&C's. This is stated in the contracts.
- The Project Team incorporates a 6 month buffer in their schedule for this procurement to allow for any unexpected delays.
- All procurement for WLRD is done in the winter to allow for summer construction.
- After the Notice of Award is sent, the Project Team can execute the contract
- All qualifications are received and approved prior to the Notice to Proceed

Construction Phase:

1) Prepare a Conformed Set of Documents
   During this activity, the Project Team will ensure all the specifications are correct and any bid addendums have been addressed

2) Review Notice to Proceed Documents
   The Project Team reviews the pre-construction submittals with the selected construction contractor

3) Update the Project Plan
   Incorporate any changes that have occurred between 100% design and the Construction. Could include the following:
   a. Ensure permits are correct prior to construction
   b. Ensure all land is acquired prior to construction
   c. Update the Risk Register (Risks are assigned high/medium/low with probability of consequence and associated mitigation steps). This is done on a periodic basis. *Question: Is this updated during construction*? The Project Team revisits the risks that are relevant. It was recommended that this should be done at all stages of the work.
   d. Includes a spill prevention and response plan

3) Update Construction Management Plan (CMP) *if necessary*

4) Review Preliminary Submittals
   This includes a review of submittals and any necessary equipment / materials prior to the purchase. Also includes a review of the construction schedule. Format of schedule submittals may vary between departments and is dependent on who is coordinating the efforts. Could even be non-KC group such as the City of Seattle.

5) Conduct a Pre-Construction Meeting (*attended by WLRD staff*)

6) Designate a Resident Engineer (RE) for Construction Management Activities

7) Review Compliance of Environmental Permits

8) Monitor Construction Activities
   a. The RE has the authority to make certain decisions in the field. For example, the RE can identify when we go from field change to design change level (field change vs. formal RFI).
   b. Any necessary change conditions are handled by the site representative

c. If emergency conditions occur, the RE reviews the Project Plan for guidance. In addition, the RE will review the requirements of the permits. The Project Manager will still be informed and has overall responsibility for the project.
d. *Question: Are daily site reports produced*? This depends on the project requirements and if the project is being managed internally vs. external Construction Contractor. External projects have documentation requirements. However, they may not be shared daily with the PM if internally handled.
e. If there are dollar figure changes, they need to go to the PM, but minor changes in the field can be handled as a field change and don't require notification to the PM. The decision may also involve a special inspector (e.g. environmental scientist, geologist etc).
f. Weekly progress meetings are held to keep track of on-site activities and any associated changes to scope / schedule / budget.
g. Review permit compliance with construction (ongoing during construction)

9) Prepare a Punch List and Conduct a Walk Through
A walk through with the Project Team, internal staff, external design consultants, and construction contractors is conducted. Correct the punch list if necessary.

10) Notice of Substantial Completion

11) Survey As-Built Conditions
Construction Contractor prepares a survey of as-built conditions / red-line markups

12) Prepare As-Built Drawings

13) Prepare Contract Close-Out Documentation

14) Prepare Record Drawings
Record drawings are prepared by King County staff regardless of if the project is internal or external. It was noted that this activity should probably occur before the construction contracts are closed to ensure that all documentations are final and approved.

General Notes:

- A draft / outline for the Construction Management Plan (CMP) is completed before the advertisement for the bid is sent. The CMP identify roles and includes any safety regulations. The CMP is "fit to purpose" for each project; it may be simple for small projects or more complex for larger projects. It should be noted, for internal projects, CMPs are not always created.
- Add procurement activities to the 100% design phase
- There is a one-year default warranty period for all WLRD assets

Operations and Maintenance:

General Notes:

- At ~70% design, the Project Team convenes with the Operations and Maintenance (O&M) group to discuss the design and construction of the new asset. The O&M group accepts and adopts the procedures. This information is then added to the draft O&M Manual.
- It should be noted that some Groups do not have separate O&M staff. Other team members have two roles on the project. For example, emergency repair / replacement of minor assets (such as new pipe segment) – may not even include O&M groups

High level activities for O&M include:

1) Finalize O&M Plan
   After construction is completed the O&M plan is finalized. The Stormwater Services Group has a designated O&M group which can be assigned tasks. However, the Rural and Regional Services Group does not have a separate O&M group, therefore they complete the O&M activities using available staff.

2) O&M Reviews the Constructed Assets
   a. Each group has different processes for scheduling O&M activities.
   b. For the Stormwater Services Group, the lead for O&M determines the maintenance schedule for the asset.
   c. The Stormwater Services Group creates an asset list using specialized software. This software assigns an inspector to each asset
   d. Capital needs assessment for all assets is currently underway. It was stated that WLRD should start looking into the life expectancy / replacement costs earlier on in the process.
   e. The River and Floodplain Management Group conducts spring and fall inspections of their assets on an annual basis. However, inspections are conducted in emergency events (flood events / storms etc.) and post-flood inspections are conducted to review and assess the asset condition. The routine fall inspection may overlap a pre / post storm inspection. This is the case for all assets / projects. There are ~500+ facilities in this group which includes 119 miles of revetments and levees. Most assets are not county owned assets, but King County has easement rights for flood protection maintenance. King County has a database and associated templates / forms for all these inspections. This is a relatively new standardized form due to increased numbers of staff.
   f. The Stormwater Services Group has “orphaned facilities”. These could include obsolete pipes that group / division claim responsibility for. This group manages ~900 stormwater ponds and ~300 commercial facilities and an unknown number of ‘orphaned’ sites.

g. With regards to any emergency work, which includes the design for facilities requiring work after post-flood inspection, the River and Floodplain Management Group can perform emergency construction immediately (there is funding in the Group's contingency budget). However, there is a need to go back to the Board for additional adjustments. This is part of the CIP. The Board will approve the funds being placed back into CIP the next year to cover these emergency expenditures.
h. WLRD deploys flood patrols during a flood event. The flood patrols have the ability to bring in design staff or 'basin staff' as necessary to observe the problem and make a decision on how to proceed with the repair.
i. The Stormwater Services Group sends out inspectors during an event due to the level of complaints being received. There is an emergency response manual which is available for how to the group should proceed in an emergency event.
j. If a retrofit is required, a new group can modify a capital project to current standards. It requires half capital staffing and half maintenance staffing. Depends on if it's improving the functionality (capital) and just repair goes to O&M.
k. O&M includes re-vegetation, such as plantings, mowing, drip irrigation and other activities.

Monitoring:

- O&M provides informal review for the Habitat Group. The information collected during monitoring activities provides input into the O&M process. This information also provides details on the project success and any associated issues.
- Regulatory monitoring is conducted based on the permit requirements.
- Performance monitoring is conducted based on the project objectives.
- Monitoring activities are frequently conducted by outside team members. They are usually not individuals from the design / construction team
- Monitoring plan is completed near the end of the project. It was noted that it would be more beneficial to create a monitoring plan early in the project life cycle to collect data for baseline analysis.
- Effectiveness monitoring is undertaken by the Rural and Regional Services Group and the Stormwater Services Group. This includes erosion abatement / assessment monitoring which is not a regulatory task but an 'effectiveness' task. It was stated that it is not known is other groups do this.

Comments from MWH Draft Deliverable of Flow Charts

All the comments received from the meeting participants have been placed on the revised flow charts. A summary of some of the revisions are provided below:

Investigation Phase:

- Rural and Regional Services Group and the Stormwater Services Group - the Unit Manager selects the Project Manager.

30% Design:

- This Public Rule meeting is for projects that use / include large wood
- King County provides all 30% design documents to the Public for review. Plans are posted on a website along with contact information for the Project Manager / Design Engineer
- Other external stakeholders are invited to attend the project specific meeting
- This meeting is not typical of all projects

60% Design:

- After the initial review by the Project Sponsor / Engineer of Record, there may be a need to obtain additional inputs from external stakeholders, easement holders, permits, expert reports before the drawings and specifications are finalized. The Engineer of Record has to decide whether to:
    - Conduct peer review
    - Conduct a Value Engineering exercise
    - Obtain external support / receive input from experts
- The Engineer of Record, the Project Sponsor and the Supervisor are all involved in the decision making process. This is typically what happens at gateway points (especially at 60% stage). It is not just one person making these decisions.

90% Design:

- The majority of the permits have been obtained at 90% design.
- As above, there is a decision point before the 90% documents are finalized. The Engineer of Record, the Project Sponsor and the Supervisor review the alternatives for materials / construction methods at this stage.

100% Design:

- Construction procurement activities are concurrent with 100% design

General Comments:

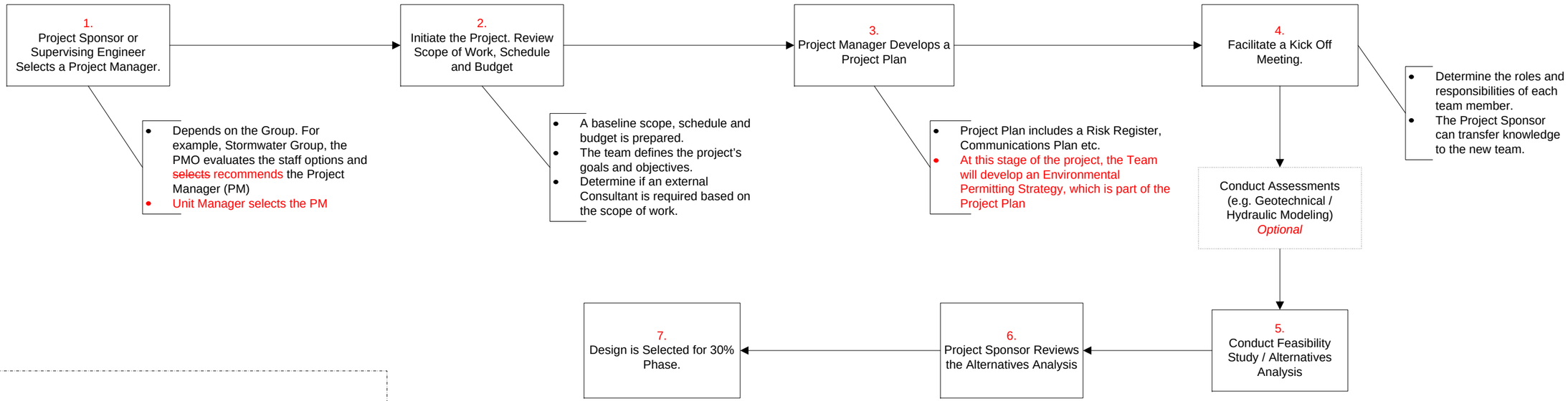
- Value Engineering is not a formalized process for WLRD. At 60% and 90% there are no formal Value Engineering activities

- There are no formal Risk Management activities. During the project life cycle, the Project Team collects information on the risks and creates mitigation measures. This activity is part of the Team's Design Process. It is up to the Project Manager to ensure the actions from the Risk Register are implemented

Independent Review of Project Scoping and Implementation Practices - Water and Land Resources Division

Draft Version (Oct 4, 2011)

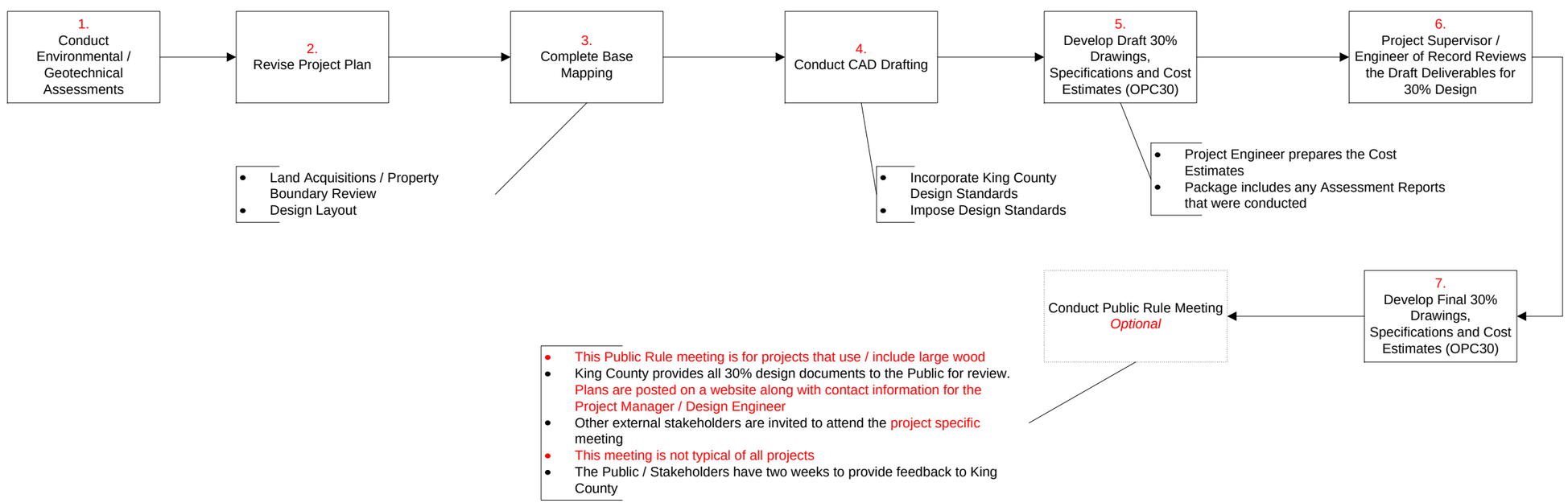
INVESTIGATION PHASE



General Notes:

- 0% to 30% the Project Team will identify how the work will be completed. E.g. Should King County procure a Construction Contractor. This activity is reviewed through the life cycle of the project

30% DESIGN PHASE



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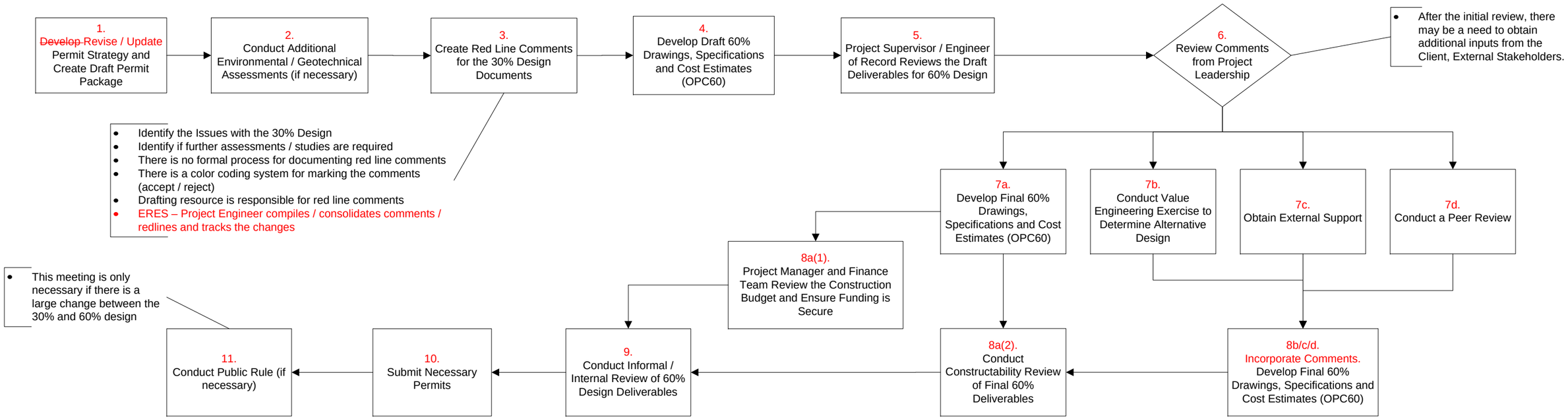
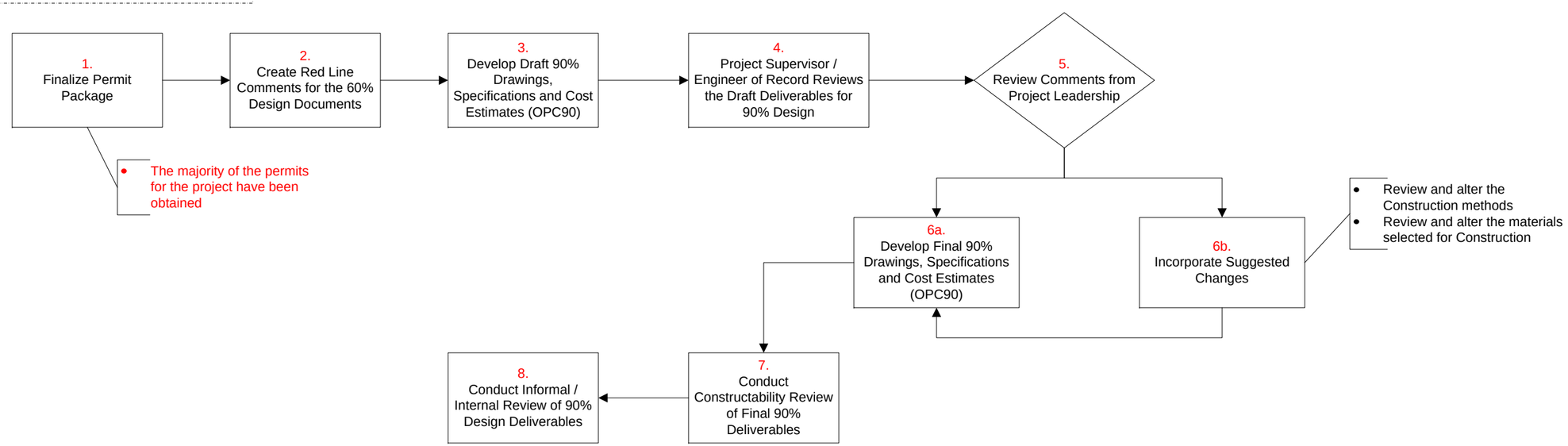
60% DESIGN PHASE



General Notes:

- At 60% and 90% there are no formal Value Engineering activities
- There are no formal Risk Management activities. During the project life cycle, the Project Team collects information on the risks and creates mitigation measures. This activity is part of the Team's Design Process. It is up to the Project Manager to ensure the actions from the Risk Register are implemented
- The Engineer of Record, the Project Sponsor and the Supervisor are all involved in the decision making process

90% DESIGN PHASE



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100% DESIGN PHASE

1. ~~Finalize Environmental Permit Applications~~ Revise Plans to Incorporate Permit Requirements / Conditions
2. Prepare Final Design Drawings, Technical Specifications and Cost Estimate
3. Project Supervisor / Engineer of Record Reviews the Draft Deliverables for 100% Design
4. Conduct Constructability Review of Final 100% Deliverables
5. Draft the Construction Management Plan
6. Prepare for Construction

- At this stage of the project, all environmental permits are obtained

Activities could include:
- Conduct Bidability Review (if External
- ~~Construction Contractors are being procured)~~
- ~~Review Construction Contractor's Safety Plan / Mobilization Plan etc~~.

PROCUREMENT (*Concurrent with 100% Design*)

1. Initiate Procurement Process for Construction Contractor.
2. Advertise the Invitation to Bid
3. Review the Received Bid Documents
4. Select Lowest Bidder
5. Notice of Selection is sent to the Construction Contractor.
6. Review Selected Construction Contractor Documentation
7. Notice of Award is sent to the Construction Contractor.
8. Execute Construction Contract.
9. Issue Notice to Proceed to the Construction Contractor.

- Upgrade the Construction Cost Estimate

General Notes:
- Construction procurement activities are concurrent with 100% design
- Lowest Bidder is the chosen procurement methodology
- Procurement could take ~6months so the Project Teams always have a 6month buffer. This is because of the Low Bid process.
- There is no negotiation of King County's Terms and Conditions

CONSTRUCTION PHASE

1. Prepare Conformed Set of Documents
2. Review Notice to Proceed Documents. Receive Pre-Construction Submittals from Construction Contractor
3a. Update Project Plan
3b. Update Construction Management Plan (CMP)
4. Review Submittals, Construction Schedule and Materials
5. Conduct a Pre-Construction Meeting
6. Designate a Resident Engineer for Construction Management Activities
7. Review Compliance of Construction Environmental Permits (if necessary)
8. Monitor Construction Activities
9. Prepare a Punch List and Conduct a Walk Through
10. Notice of Substantial Completion
11. Survey As-Built Conditions
12. Prepare As-Built Drawings
13. Prepare Contract Close-Out Documentation
14. Prepare Record Drawings

The Project Team reviews the following:
- Environmental Strategy and ensures the Permits are correct prior to Construction
- Ensures land acquisition is complete
- Updates the Risk Register (assigns probability and consequence of occurrence)

- This activity includes the management and monitoring of RFIs and Submittals

- Type of format for the schedule is dependant on the Group

- There are variations of the CMP between the Groups
- Small projects and internal projects do not always have a CMP

- Record drawings are prepared by King County staff.

Appendix C

Guiding Questions

M E M O R A N D U M

MWH

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

To:	David St. John – Government Relations Manager	**Date:**	October 18, 2011
From:	Jeff Schmidt	**Reference:**	WLDR Independent Review of Project Scoping and Implementation Practices
Cc:	Christie True, King County Bill Cranston, MWH Karen Ditz, MWH Mark Graham, MWH		
Subject:	Questions / Issues to be addressed by Expert Panel - REVISED		

Per our Project Kick-Off Meeting on August 11th and subsequent discussions, MWH has prepared the following list of questions to be addressed by the Expert Panel to provide focus during the review process. These questions are intended to establish a framework for understanding how projects are planned, designed, implemented, and maintained and for establishing the parameters and processes required for project success.

General Guidance:

The purpose of the following questions is to provide the Expert Panel with guidance related to what specific topics to be addressed during the independent review. In general, the two main areas of focus are as follows:

- Are King County project implementation practices considered appropriate, adequate, and reasonable relative to standard professional practice?
- What specific improvements could be implemented to better ensure that projects effectively balance all project objectives and meet industry standards?

The following questions have been divided into several categories to better highlight areas of focus for the review panel. The order of the categories should not be taken to indicate order of preference. Where project life cycle is referenced in the below questions, this is taken to include project planning, design, construction, operations, maintenance, and monitoring activities.

Project Effectiveness

1. Does King County effectively define project goals and objectives such that project effectiveness can be readily determined?

2. Does King County use appropriate measures to align the project design and construction to the project goals?
3. What areas of expertise are most relevant to effectively meeting the objectives of the subject projects? Does King County's project planning and implementation approach adequately incorporate these areas of expertise?
4. What decisions or actions throughout each phase of King County's project life cycle have the most significant impact on the effectiveness of a project in meeting its objectives?
5. Does King County use appropriate quantitative and qualitative measurements to evaluate the effectiveness of a project in meeting its objectives?

Balancing Project Objectives

1. What are examples of comparable external projects having multiple (and possibly opposing) objectives being effectively managed? Relative to those examples, how well does King County manage its projects?
2. How well does King County integrate various project objectives at each phase of the project life cycle?
3. What areas of expertise are most relevant to identifying projects that effectively address these multiple project objectives? Does King County's project implementation approach adequately incorporate these areas of expertise?

Use of Appropriate Standards / Practices

1. How should King County use business drivers to define the project? What business drivers are appropriate for project planning activities?
2. Does King County use appropriate principles, standards, and criteria to guide project design and implementation? Specifically this includes standards associated with engineering practices, ecological practices, recreational practices, and safety standards.
3. Does King County use proper tools, equipment, procedures, and expertise while performing construction activities?
4. Does King County use proper tools, equipment, procedures, and expertise while performing operations and maintenance activities?

Engagement of Outside Stakeholders

1. Does King County appropriately engage the funding agencies/groups when establishing the goals and priorities of projects?
2. Does King County adequately include stakeholders in defining the goals and priorities of projects?
3. Does King County communicate its project planning process, goals, and priorities clearly to external parties including stakeholders, permitting agencies, and funding entities?
4. How should King County determine project value to the stakeholders? Is stakeholder value adequately assessed during project planning?
5. Does King County adequately analyze and evaluate the effect of the project goals and design on adjacent and downstream properties and infrastructure?
6. Does King County's planning review process adequately incorporate local jurisdiction input?

7. Does King County's design review process adequately incorporate local jurisdiction input?
8. Does King County adequately notify property owners and downstream jurisdictions of construction progress and design changes and incorporate stakeholder input while construction is ongoing?
9. Does King County provide appropriate and necessary information regarding ongoing project operation and maintenance to stakeholders? Is the process for providing this information to stakeholders appropriate/adequate for supporting their understanding?

Standard Safety Components

1. Does King County have a proper, program-wide safety plan in place to ensure that the procedures and design options affording the greatest safety for river users are of primary consideration in design concerns involving a balancing of important public purposes?
2. In determining where to place a project and in selecting the design for that project, does King County adequately incorporate the project's inherent safety risks (both to workers and the general public) into design decisions?
3. How well does King County consider safety in the constructability review process?
4. Once such decisions are made, does King County appropriately monitor and manage the project's safety components during construction?
5. Does King County have an appropriate program in place to effectively monitor or operate completed projects from a safety perspective?

King County Practices

1. Does King County use an appropriate process to assemble and charter a project implementation team to ensure the team understands the project goals and priorities?
2. Does King County have an effective review process to help ensure that the project priorities and goals are met?
3. Does King County use an appropriate Value Engineering process to improve coordination between design objectives?
4. Does King County effectively use an appropriate risk assessment and risk mitigation process throughout the planning, design, and construction phases of its projects?
5. Does King County have appropriate procedures and resources in place to monitor construction to ensure adherence to the project goals, and design?
6. Does King County use appropriate measures to evaluate performance during and at the conclusion of project construction?
7. Does King County have appropriate/adequate operation and maintenance activities for initiation at the conclusion of project construction? Does King County adequately monitor the project after construction to ensure adherence to the project goals and design?
8. Does King County implement an appropriate program to complete timely and effective actions if project monitoring identifies that conditions at a constructed project are deviating from project goals and design?

Appendix D

Expert Review Panel Resumes

PAUL E. DEVRIES, Ph.D., P.E.
Water Resources Engineer/Fluvial Geomorphologist/Fisheries Biologist

Dr. DeVries has more than 23 years of experience managing and working on a large number of geomorphology, stream restoration, fisheries engineering, fish passage, fish habitat assessment, and fish population studies in fresh and estuarine waters of the western United States, including in WA, OR, ID, MT, CA, and AK. His multidisciplinary capabilities are integral to all aspects of study design, data collection and analysis, environmental impact analysis, engineering design, project management, and client/agency/public interaction. He is an Affiliate Assistant Professor in the Department of Civil and Environmental Engineering, University of Washington. He was a Member of the Washington State Salmon Recovery Funding Board Technical Panel, 2nd and 3rd Cycles, and is currently an Advisory Board Member for the University of Washington Stream Restoration Certification Program. He is also a respected researcher, and has published in peer-reviewed engineering, fisheries, and water resource journals and books.

Project Role:

Geomorphic Reach Assessment Lead

Employment History:

R2 Resource Consultants, Redmond WA 1992-present

EA Engineering Science & Technology, Lafayette CA 1986-1992

Education:

Ph.D. (Civil and Environmental Engineering), University of Washington, 2000

M.S.E. (Civil Engineering) University of Washington, 1994

B.S. (Fisheries) Humboldt State University, Arcata, California, 1986

B.S. (Environmental Resources Engineering) Humboldt State University, Arcata, California, 1986

Registration/Certification:

Professional Engineer (Civil) – Washington (37861), Oregon (80338)

American Fisheries Society, Certified Fisheries Professional, April 1999

Watershed Analysis Certification, State of Washington, Department of Natural Resources

QUALIFYING PROJECT EXPERIENCE

Dr. DeVries brings an applied, quantitative and creative perspective to geomorphic assessments that reflects his deep understanding of river engineering, geomorphology, and fisheries processes and interactions, and experience in moving from conceptual frameworks to meaningful management decisions and restoration projects. Relevant work assignments that he has managed have included:

- Geomorphic reach, flooding and erosion hazard assessments for restoration planning and design and management plan development
- Assessing and developing design specifications for aggradation and scour problems at bridges, culverts, dams, and water diversions
- Fish passage design at culverts (culvert replacement, natural channel passage design, baffle and tailwater retrofits, concrete pool and chutes), plans and specifications, permitting and construction assistance
- HEC-RAS and 2-dimensional hydrodynamic modeling of flood and avulsion risks and for use in engineering design, impact assessments, and planning

- Floodplain and channel restoration design, permitting, and construction assistance involving large wood (flood fencing and engineered log jams), side channel reconnection, and dike breaching
- Watershed analyses and fish stock assessments, and monitoring plan development for guiding restoration planning.

Examples of specific projects include:

Geomorphic Reach Assessments Coupled With River & Floodplain Restoration

S Fk Stillguamish River Geomorphic Reach Analysis and Restoration, WA

As project manager and lead geomorphologist and river engineer, Dr. DeVries supported Snohomish County Department of Public Works in the quantitative assessment of hydraulic and sediment transport processes for a 16+ mile reach. He worked as a team with County staff in collecting data for developing and calibrating a HEC-RAS model used to develop a long term sediment transport budget within the reach and for identifying floodplain connectivity projects. He also quantified and analyzed channel migration rate history throughout the reach, and used the collective results to identify geomorphically active and inactive segments, and the appropriate restoration projects consistent with local reach scale river processes. Dr. DeVries used the analysis output to identify a suite of projects at specific locations, and developed a 100% design for floodplain channel reconnection project to increase habitat diversity and provide refuge fish habitat during flooding. The project involved construction of two log jams and multiple flood fences in June-July 2011.

Floodplain Restoration Assessment & Design

Benewah Creek Floodplain Reconnection Assessment and Design, ID

As project manager and lead geomorphologist and river engineer, Dr. DeVries supported the Coeur d'Alene Tribe Fisheries Department in developing options for restoring the floodplain riparian community for an entrenched mountain meadow stream. He used floodplain stratigraphy information obtained through pit excavations with and historic photograph and LiDAR topographic analyses to determine the cause for loss of floodplain connectivity at the reach scale and identify an appropriate solution. He determined a previously proposed channel incision hypothesis to be unsupported, and identified absence of persistent beaver dams as a key missing geomorphic control. He developed simple prototype designs of alternative wood structures emulating the hydraulic and geomorphic effects of beaver dams on floodplain inundation, and worked with Kevin Fetherston of R2 to develop floodplain re-vegetation prescriptions. He developed a reach HEC-RAS hydraulic model for use in engineering design using LiDAR and RTK-GPS survey data.

Geomorphic Reach Assessments Coupled With River & Floodplain Restoration

Skykomish River Braided Reach Geomorphic Reach Analysis and Restoration

As for the South Fork Stillaguamish River project described above, Dr. DeVries supported Snohomish County Department of Public Works in the quantitative assessment of hydraulic and sediment transport processes for two reaches totaling more than 22 miles in length. He assisted the county in developing and implementing a strategic geomorphic reach analysis approach to anadromous salmonid habitat and floodplain restoration in the Braided Reach of the Skykomish River. He continues to work with the County in applying the approach on other river systems On this project, he performed a suite of quantitative geomorphic analyses and applied the results to identify specific types of fish habitat restoration projects that were consistent with reach scale natural processes. He completed designs for four large scale projects at different locations in the reach. The first project was constructed in 2009 and 2010 and involved constructing cost-effective flood fencing coupled with a strategically placed engineered log jam reinforcement structure without impacting boaters.

Christopher A. Frissell

Senior Staff Scientist
The Pacific Rivers Council
PMB 219, 48901 Highway 93, Suite A, Polson, Montana 59860

Phone: 406-883-1503/FAX 406-883-1504/Cell 406-471-3167
e-mail: hanfris@digisys.net **www:** http://www.pacrivers.org

Education: Ph.D. in Fisheries Science, Oregon State University, 1992
M.S. in Fisheries Science, Oregon State University, 1986
B.A. with High Honors in Zoology, University of Montana, 1982

Appointments:

Senior Staff Scientist, The Pacific Rivers Council, 2000-present.
Research Associate Professor, The University of Montana, Flathead Lake Biological Station, 1998-2000 (presently Affiliate Faculty status)
Research Assistant Professor, The University of Montana, Flathead Lake Biological Station, 1993-1998
Research Assistant Professor, Department of Fisheries and Wildlife, Oregon State University, 1994-1997
Postdoctoral Research Associate (Faculty), Department of Fisheries and Wildlife, Oregon State University, 1992-1994
Research Assistant (Faculty), Oak Creek Laboratory of Biology, Department of Fisheries and Wildlife, Oregon State University, 1985-1992

Fields of Interest:

Cumulative impacts of human activities and natural processes on stream habitat and stream biota
Ecology, biogeography, and conservation biology of fishes and aquatic biota in relation to landscape change
Aquatic ecosystem conservation and restoration strategies
Geomorphology and landscape ecology in design of integrated conservation reserves
Restoration and recovery planning and design

Professional Societies:
Society for Conservation Biology, 1991-present
American Fisheries Society, 1985-present
Ecological Society of America, 1987-present
North American Benthological Society, 1983-present

Graduate Students Mentored

Cavallo, B.J. M.S. in Organismal Biology and Ecology, The University of Montana, 1997. Thesis title: Floodplain habitat heterogeneity and the distribution, abundance, and behavior of fishes and amphibians in the Middle Fork Flathead River Basin, Montana.

Adams, S. B. Ph.D.in Organismal Biology and Ecology, The University of Montana, 1999. Dissertation title: Mechanisms Limiting a Vertebrate Invasion: Brook Trout in Mountain Streams of the Northwestern USA.

Hitt, N.P., M.S. in Organismal Biology and Ecology, The University of Montana, 2002, Distribution and potential invasion of introduced rainbow trout in the upper Flathead River drainage.

Carnefix, G. M.S. in Organismal Biology and Ecology, The University of Montana, 2002. Thesis title: Movements and ecology of bull trout in Rock Creek, MT.

Hastings, K. Ph.D.in Organismal Biology and Ecology, The University of Montana, 2005. Dissertation title: Long-term persistence of isolated fish populations in the Alexander Archipelago.

Appointments to Peer Review Panels and Scientific Advisory Committees:

Landscape Pattern Task Group, *State of the Nation's Ecosystems* report. 2003-2007. H. John Heinz III Center For Science, Economics and the Environment. Washington, DC. http://www.heinzctr.org/Programs/Reporting/Working%20Groups/Fragmentation/index.shtml

Science Review Team, King County Normative Flow Studies Project. 2002-2005, Seattle, WA. http://dnr.metrokc.gov/wlr/BASINS/flows/science-review-team.htm

Science Advisory Panel, Westside. Governor's Salmon Restoration Funding Board, Washington State, February 2000.

Ecological Work Group, Multi-species Framework Process and Subbasin Assessment Process, Northwest Power Planning Council 1998-2000.

Peer review panelist for U.S. Environmental Protection Agency/National Science Foundation Water and Watersheds Grants Program for 1997. 7-9 May 1997.

Scientific Group for the Governor's Bull Trout Restoration Team, State of Montana, 1994-present

Oregon Department of Environmental Quality, 1992-95: Temperature Standards Review Subcommittee of the Technical Advisory Committee, Triennial Water Quality Standards Review

Scientific Assessment Panel for amphibian species, Eastside Oregon-Washington and Upper Columbia Basin EIS, US BLM and US Forest Service, 1994

Oregon Department of Forestry, 1990-93: Technical Advisory Group for the Forest Practices Monitoring Program; Wetlands Technical Group; Stream Protection Advisory Panel

Theses and Dissertations:

Frissell, C.A. 1992. Cumulative effects of land use on salmon habitat in southwest Oregon coastal streams. Doctoral dissertation, Oregon State University, Corvallis.

Frissell, C. A. 1986. A hierarchical stream habitat classification system: development and demonstration. M.S. thesis, Oregon State University, Corvallis.

Frissell. C. A. 1982. Colonization and development of community structure in coexisting Ephemerellid mayflies (Ephemeroptera, Ephemerellidae). Senior Thesis, Watkins Scholarship Program, The University of Montana, Missoula.

Member of Board of Editors for Journals:

Conservation Biology, 1996-2000

Reviewer for Journals and Agency Publications:

Canadian Journal of Fisheries and Aquatic Sciences, Conservation Biology, Ecological Applications, Environmental Management, Fisheries, Freshwater Biology, North American Journal of Fisheries Management, Oikos, Transactions of the American Fisheries Society, Fundamental and Applied Limnology, USDA Forest Service General Technical Reports

Articles Published in Scientific Journals:

Olson, D.H., P.D. Anderson, C.A. Frissell, H. H. Welsh, Jr., and D. F. Bradford. 2007. Biodiversity management approaches for stream-riparian areas: perspectives for Pacific Northwest headwater forests, microclimates, and amphibians. *Forest Ecology and Management,* In Press.

Poole, G.C., J.A. Stanford, S.W. Running, and C.A. Frissell. 2006. Multiscale geomorphic drivers of groundwater flow paths: subsurface hydrologic dynamics and hyporheic habitat diversity *Journal of the North American Benthological Society*. 25(2): 288-303.

Poole, G. C., J. A. Stanford, S. W. Running, C. A. Frissell, W. W. Woessner, and B. K. Ellis. 2004. A patch hierarchy approach to modeling surface and sub-surface hydrology in complex flood-plain environments. *Earth Surface Processes and Landforms* 29**:** 1259–1284.

Karr, J. R., J. J. Rhodes, G. W. Minshall, F. R. Hauer, R. L. Beschta, C. A. Frissell, and D. A. Perry. 2004. The effects of postfire salvage logging on aquatic ecosystems in the American West. *BioScience* 54:1029-1033.

Hitt, N.P., and C.A. Frissell. 2004. A case study of surrogate species in aquatic conservation planning. *Aquatic Conservation: Marine and Freshwater Ecosystems*. 14:625–633.

Beschta, ,R.L., J. J. Rhodes, J. B. Kauffman, R. E. Gresswell, G. W. Minshall, J. R. Karr, D.A. Perry, F.R. Hauer, C. A. Frissell. 2004. Postfire Management on Forested Public Lands of the Western United States. *Conservation Biology* 18: 957–967.

Articles Published in Scientific Journals, continued

Hitt, N.P., Frissell, C.A., Muhlfeld, C.C. and F.W. Allendorf. 2003. Spread of hybridization between native westslope cutthroat trout, *Oncorhynchus clarki lewisi*, and non-native rainbow trout, *O. mykiss*. *Canadian Journal of Fisheries and Aquatic Sciences* 60: 1440-1451.Ebersole. J.T., W.J. Liss, and C.A. Frissell. 2003. Thermal heterogeneity, stream channel morphology and salmonid abundance in northeast Oregon streams. *Canadian Journal of Fisheries and Aquatic Sciences* 60:1266-1280.

Poole, G. C., J. A. Stanford, C. A. Frissell and S. W. Running. 2002. Three-dimensional mapping of geomorphic controls on flood-plain hydrology and connectivity from aerial photos. *Geomorphology* 48(4):329-347.

Adams, S.B., and C.A. Frissell. 2002. Changes in distribution of nonnative brook trout in an Idaho drainage over two decades. *Transactions of the American Fisheries Society*, 131:561-568.

Adams, S.B.,and C.A. Frissell. 2001. Thermal habitat use and evidence of seasonal migration by tailed frogs, *Ascaphus truei*, in Montana. *Canadian Field-Naturalist* 115: 251-256.

Adams, S.B., C.A. Frissell, and B.E. Rieman. 2001. Geography of invasion in mountain streams: consequences of headwater lake fish introductions. *Ecosystems* 296-307.

Ebersole, J.L., W.J. Liss, and C. A. Frissell. 2001. Relationship between stream temperature, thermal refugia, and rainbow trout *Oncorhynchus mykiss* abundance in arid-land streams in the northwestern United States. *Ecology of Freshwater Fish* 10:1-10.

Adams, S.A., C.A. Frissell, and B.E. Rieman. 2000. Movements of non-native brook trout in relation to stream channel slope. *Transactions of the American Fisheries Society* 129:623-638

Trombulak, S.C., and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. *Conservation Biology* 14:18-30.

Baxter, C.V., C.A. Frissell, and F.R. Hauer. 1999. Geomorphology, logging roads and the distribution of bull trout *(Salvelinus confluentus)* spawning in a forested river basin: implications for management and conservation. *Transactions of the American Fisheries Society*, 128:854-867.

Independent Scientific Group. 1999. Scientific issues in the restoration of salmonid fishes in the Columbia River. *Fisheries* 24(3):10-19.

Currens, K.P., F.W. Allendorf, D. Bayles, D.L. Bottom,. C.A. Frissell, D. Hankin, J.A. Lichatowich, P.C. Trotter, and T.A. Williams. 1998. Conservation of Pacific salmon: response to Wainwright and Waples. *Conservation Biology* 12:1148-1149.

Poole, G.C., C.A. Frissell, and S.C. Ralph. 1997. In-stream habitat unit classification: inadequacies for monitoring and some consequences for management. *Journal of the American Water Resources Association* 33:879-896.

Ebersole, J.L., W.J. Liss, and C.A. Frissell. 1997. Restoration of stream habitats in the western United States: restoration as re-expression of habitat capacity. *Environmental Management*. 21:1-14.

Articles Published in Scientific Journals, continued

Allendorf, F.W., D. Bayles, D.L. Bottom, K.P. Currens, C.A. Frissell, D. Hankin, J.A. Lichatowich, W. Nehlsen, P.C. Trotter, and T.H. Williams. 1997. Prioritizing Pacific salmon stocks for conservation. *Conservation Biology* 11:140-152.

Frissell, C.A., and D. Bayles. 1996. Ecosystem management and the conservation of aquatic biodiversity and ecological integrity. *Water Resources Bulletin* 32:229-240.

Stanford, J.A., J.V. Ward, W.J. Liss, C.A. Frissell, R.N. Williams, J.A. Lichatowich, and C.C. Coutant. 1996. A general protocol for restoration of regulated rivers. *Regulated Rivers: Research and Management* 12:391-413.

Nawa, R., and C.A. Frissell. 1994. Measuring scour and fill of gravel streambeds with scour chains and sliding bead monitors. *North American Journal of Fisheries Management* 13:634-639.

Frissell, C.A. 1993. Topology of extinction and endangerment of native fishes in the Pacific Northwest and California, USA. *Conservation Biology* 7:342-354.

Frissell, C.A., R.K. Nawa, and R. Noss. 1992. Is there any conservation biology in "New Perspectives?" A response to Salwasser. *Conservation Biology* 6:461-464.

Frissell, C.A., and R.K. Nawa. 1992. Incidence and causes of failure of artificial habitat structures in streams of western Oregon and Washington. *North American Journal of Fisheries Management* 12:182-197.

Frissell, C.A., W.J. Liss, C.E. Warren, and M.D. Hurley. 1986. A hierarchical framework for stream habitat classification: viewing streams in a watershed context. *Environmental Management* 10:199-214.

Symposium Articles Published:

Poole, G.C., J.A. Stanford, S.W. Running, and C.A. Frissell. 2000. A Linked GIS/modeling approach to assessing the influence of flood-plain structure on surface- and ground-water routing in rivers. *Proceedings of the 4th International Conference on Integrating Geographic Information Systems (GIS) and Environmental Modeling*. Held 2-8 September 2000, Banff, Alberta. B. Parks, editor.

Clancy, C., C. Frissell, and T. Weaver. 1998. Removal or suppression of introduced fish to aid bull trout recovery. *Proceedings of the Wild Trout XI Conference*, held August, 1997 in Bozeman, MT.

Li, H.W., K. Currens, D. Bottom, S. Clarke, J. Dambacher, C. Frissell, P. Harris, R.M. Hughes, D. McCullough, A. McGie, K. Moore, R. Nawa, and S. Thiele. 1995. Safe havens: refuges and evolutionarily significant units. *American Fisheries Society Symposium* 17:371-380.

Frissell, C.A., W.J. Liss, and D. Bayles. 1993. An integrated, biophysical strategy for ecological restoration of large watersheds. In D.F. Potts ed., *Changing Roles in Water Resources Management and Policy*. Proceedings of a symposium of the American Water Resources Association, held 27-30 June, 1993, Bellevue, WA.

Symposium Articles Published, continued

Frissell, C.A., and R.K. Nawa. 1989. Cumulative impacts of timber harvest on fisheries: "All the King's horses and all the King's men..." In C. Toole, (ed.), *Proceedings of the Seventh California Salmon, Steelhead and Trout Restoration Conference*. February 24-26, Arcata, CA. California Sea Grant Publication UCSGEP-89-02.

Frissell, C.A., and T. Hirai. 1988. Life history patterns, habitat change, and productivity of fall chinook stocks of southwest Oregon. In B. Sheperd (ed.) *Proceedings of the Northeast Pacific Chinook and Coho Workshop*, Bellingham, Washington, 3-4 October 1988. North Pacific International Chapter, American Fisheries Society.

Books and Book Chapters Published:

Frissell, C.A., N.L. Poff, and M.E. Jensen. 2001. Assessment of biotic patterns in freshwater ecosystems. Chapter 27 in Bourgeron, P., M. Jensen, and G. Lessard (eds.) *A Guidebook for Integrated Ecological Assessments*. Springer-Verlag, NY.

Jensen, M.E., I. Goodman, and C.A. Frissell. 2001. Design and use of aquatic biophysical classifications and maps. Chapter 26 in Bourgeron, P., M. Jensen, and G. Lessard (eds). *A Guidebook for Integrated Ecological Assessments.* Springer-Verlag, NY.

Welsh, H.H., T.D. Roelofs, and C.A. Frissell. 2000. Aquatic ecosystems of the redwood region. Pages 165-199 in R. Noss (ed.) *The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods.* Island Press, Washington, DC.

Frissell, C.A., and S.C. Ralph. 1998. Stream and watershed restoration. Pages 599-624 in R.J. Naiman and R.E. Bilby (eds.) *Ecology and Management of Streams and Rivers in the Pacific Northwest Coastal Ecoregion*. Springer-Verlag, NY.

Frissell, C.A. 1997. Ecological principles. Pages 96-115 in J.E. Williams, M.P. Dombeck, and C.A. Wood (eds.) *Watershed Restoration: Principles and Practices.* The American Fisheries Society, Bethesda, MD.

Frissell, C.A., W.J. Liss, R.K. Nawa, R.E. Gresswell, and J.L. Ebersole. 1997. Measuring the failure of salmon management. Pages 411-444 in D.J. Stouder, P.A. Bisson,and R.J. Naiman (eds.) *Pacific Salmon and their Ecosystems: Status and Future Options*. Chapman and Hall, New York, NY.

Frissell, C.A. 1996. A new strategy for watershed protection, restoration and recovery of wild native fish in the Pacific Northwest. Pages 1-24 in B. Doppelt (ed.) *Healing the Watershed: A Guide to the Restoration of Watersheds and Native Fish in the West*. The Pacific Rivers Council, Eugene, OR.

Books and Book Chapters Published, continued

Frissell, C.A., and D.G. Lonzarich. 1996. Habitat use and competition among stream fishes. Pages 493-510 in F.R. Hauer and G.A. Lamberti (eds.) *Methods in Stream Ecology*. Academic Press, San Diego, CA.

Doppelt, B., M. Scurlock, C. Frissell, and J. Karr. 1993. *Entering the Watershed: A New Aproach to Save America's River Ecosystems* . Island Press, Washington, DC.

Final Research Reports and Miscellaneous Publications since 1993:

Frissell, C.A., P. H. Morrison, S.B. Adams, L. H. Swope, and N.P. Hitt. 2000. Conservation Priorities: an Assessment of Freshwater Habitat for Puget Sound Salmon. Trust for Public Land, Northwest Regional Office, 1011 Western Suite 605, Seattle, WA. http://www.tpl.org/tier3_cd.cfm?content_item_id=9280&folder_id=262.

Frissell, C.A. 1999. An ecosystem approach for habitat conservation for bull trout: groundwater and surface water protection. Flathead Lake Biological Station, Open File Report 156-99, The Univ.of Montana, Polson, MT

Hitt, N.P. and C.A. Frissell. 1999. Wilderness in a landscape context: a quantitative approach to ranking aquatic diversity areas in western Montana. Paper presented at the Wilderness Science Conference, 23-27 May, Missoula, MT.

Montana Bull Trout Scientific Group. 1998. The relationship between land management activities and habitat requirements of bull trout. Report prepared for the Montana Bull Trout Restoration Team, Office of the Governor, Helena, MT.

Frissell, C.A. 1998. Landscape refugia for conservation of Pacific salmon in selected river basins of the Olympic Peninsula and Hood Canal, Washington. Flathead Lake Biological Station, Open File Report 147-98, The Univ.of Montana, Polson, MT.

Frissell, C.A. 1997. Ecological benefits of wildland reserves: The proposed Copper Salmon Wilderness in southwest Oregon. Flathead Lake Biological Station, Open File Report 150-97, The University of Montana, Polson, MT.

Huntington, C.W., and C.A. Frissell. 1997. Aquatic conservation and salmon recovery in the North Coast Basin of Oregon: A crucial role for the Tillamook and Clatsop State Forests. Report prepared for Oregon Trout, Portland, OR.

Williams, R.N., L.D. Calvin, C.C. Coutant, M.W. Erho, Jr., J.A. Lichatowich, W.J. Liss, W. E. McConnaha, P.R. Mundy, J.A. Stanford, R.R. Whitney, D.L. Bottom, and C.A. Frissell. In press. *Return to the River: Restoration of Salmonid Fishes in the Columbia River Ecosystem.* Independent Scientific Group, Northwest Power Planning Council, Portland, OR.

C.A. Frissell, J.L. Ebersole, W.J. Liss, B.J. Cavallo, and G.C. Poole. 1996. Potential effects of climate change on thermal complexity and biotic integrity of streams: seasonal intrusion of non-native fishes. Final Report for USEPA Environmental Research Laboratory, Duluth, MN. Oak Creek Laboratory of Biology, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR.

Final Research Reports and Miscellaneous Publications since 1993, continued

Bottom, D.L., J.A. Lichatowich, and C.A. Frissell. 1996. Variability of marine ecosystems and relation to salmon production. Report prepared for Theme 2 of the Pacific Northwest Coastal Ecosystem Region Study Workshop, Troutdale, OR, 12-14 August.

Clancy, C., C. Frissell, and T. Weaver. 1996. Assessment of methods for removal or suppression of introduced fish to aid bull trout recovery. Report prepared by the Montana Bull Trout Scientific Group for the Montana Bull Trout Restoration Team. Montana Fish, Wildlife and Parks, Helena, MT.

Frissell, C.A., J. Doskocil, J. Gangemi, and J. Stanford. 1995. Identifying priority areas for protection and restoration of riverine biodiversity: a case study in the Swan River basin, Montana, USA. Flathead Lake Biological Station, Open File Report 136-95, The University of Montana, Polson, MT.

Beschta, R.L., C.A. Frissell, R. Gresswell, R. Hauer, J.R. Karr, G.W. Minshall, D.A. Perry, and J.J. Rhodes. 1995. Wildfire and salvage logging: recommenda-tions for ecologically sound post-fire salvage logging and other post-fire treatments on federal lands in the West. The Pacific Rivers Council, Eugene, OR.

Frissell, C.A. 1993. The shrinking range of the Pacific Salmon. Report and status and range maps prepared for the Pacific Northwest Salmon Study, The Wilderness Society, Washington, DC.

Frissell, C.A., and W.J. Liss. 1993. Valley segment classification for the streams of Great Basin National Park, Nevada. Report prepared for the Cooperative Park Studies Unit, College of Forestry, Oregon State University, Corvallis, OR.

Frissell, C.A. 1993. Panacea or placebo? An ecologist's view of captive breeding. *Wild Fish* July/August 1993:7-12. The Wilderness Society, Portland, OR.

Frissell, C.A. 1993. A new strategy for watershed restoration and recovery of Pacific salmon in the Pacific Northwest. Report prepared for The Pacific Rivers Council, Eugene, Oregon. Oak Creek Laboratory of Biology, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR.

Selected Papers and Seminars Presented Since 1993 (__=presenter):

Frissell, C.A. 2007. Setting regional priorities for watershed restoration. 25th Salmonid Restoration Conference, Salmonid Restoration Federation, 9-10, Santa Rosa, CA.

Frissell, C.A., and G, Carnefix. 2007. (Abstract) Spawning abundance of bull trout (*Salvelinus confluentus*) in relation to geomorphology, temperature and roads in tributaries of Rock Creek Basin (Missoula and Granite Counties), Montana, US. Annual Meeting of the Montana Chapter of the American Fisheries Society, 13-16 February, Missoula, MT. http://www.fisheries.org/units/AFSmontana/2007%20MCAFS%20Annual%20Meeting%20Program.pdf

Selected Papers and Seminars Presented Since 1993, continued

Frissell, C.A. 2006. Post-fire management effects on streams. NCSSF Disturbance, Management, and Biodiversity Symposium, National Commission for Science and Sustainable Forestry, 26-27 April, Denver, CO.

Frissell, C.A., and G. Carnefix. 2005. (Abstract) Indicators of landscape pattern for freshwater ecosystems. 20th Annual Symposium of the US-International Association for Landscape Ecology, 12-16 March, Syracuse, NY.

Frissell, C.A. 2004. Managing risk and uncertainty: National Forest management and freshwater conservation. Regional Centennial Forum: The Forest Service In the Pacific Southwest Region. US Forest Service, 5-6 November, Sacramento, CA.

Frissell, C.A. 2001. (Abstract) What to do first with limited time, money, and staff. Watershed Restoration Workshop: Integrating Practical Approaches. Oregon Chapter of the American Fisheries Society, 13-15 November, Eugene, OR.

Ebersole, J.L., Colden V. Baxter, Hiram W. Li, and William J. Liss, and Frissell, C.A. 2001. (Extended abstract) Detecting temporal dynamics and ecological effects of smallmouth bass invasion in northeast Oregon streams. *In*: Proceedings, American Fisheries Society Special Symposium: Practical Approaches for Conserving Native Inland Fishes of the West. Montana Chapter and Western Division of the American Fisheries Society, 6-8 June, The University of Montana, Missoula, MT.

Carnefix, G., C. Frissell, and E. Reiland. 2001. (Extended abstract) Complexity and stability of bull trout (*Salvelinus confluentus*) movement patterns in the Rock Creek drainage, Missoula and Granite counties, Montana. *In*: Proceedings, American Fisheries Society Special Symposium: Practical Approaches for Conserving Native Inland Fishes of the West. Montana Chapter and Western Division of the American Fisheries Society, 6-8 June, The University of Montana, Missoula, MT.

Frissell, C.A. 1999. (Abstract) Groundwater processes and stream classification in the montane West. Invited paper, Symposium #7: Aquatic Classification Schemes for Ecosystem Management: Making the Transition from Methods Development to Application and Validation. Annual Meeting of the Ecological Society of America 7-12 August, Spokane, WA.

Frissell, C.A. 1999. Fisheries and watershed processes: strategies for protection and restoration. Invited paper, Annual Meeting of the Cal-Neva Chapter of the American Fisheries Society, 24-27 March, Redding, CA.

Frissell, C.A. 1999. Surface-subsurface flow linkages in rivers and their importance for river flow conservation. Invited paper, Symposium on Water Quality and Hydropower Re-licensing, Annual Meeting of the Cal-Neva Chapter of the American Fisheries Society, 24-27 March, Redding, CA.

Frissell, C.A. 1999. Dams, uncertainty, and the salmon ecosystem. Keynote Address, Annual Meeting of the Idaho Chapter of the American Fisheries Society and The Wildlife Society, 4-6 March, Boise, ID

Frissell, C.A. 1998. Climate forcing of thermal habitat in Pacific Northwest rivers: Buffering effects of floodplain forests and hyporheic processes. (Abstract)

Symposium on Climate Change Impacts to Freshwater Fish Habitats, Annual Meeting of the American Fisheries Society, 23-27 August, Hartford, CT.

Selected Papers and Seminars Presented Since 1993, continued:

Frissell, C.A. 1998. Ecosystem concepts in large-scale restoration. (Abstract). Montana Chapter of the American Fisheries Society, 3-5 February, Helena, MT.

Frissell, C.A. and B.J. Cavallo 1997. Aquatic habitats used by larval western toads (*Bufo boreas*) on an intermontane river floodplain and some landscape conservation implications (Abstract). Annual Meeting of the Ecological Society of America, 10-14 August, Albuquerque, NM.

Stanford, J.A. (presented by C.A. Frissell). 1997. Conservation and enhancement of alluvial rivers: the importance of hyporheic linkages. (Abstract). Symposium on Ecological Effects of Roads, Society for Conservation Biology, 7-10 June, Victoria, British Columbia, Canada.

Frissell, C.A., and G.C. Poole . 1997 Management of Riparian Zones in Western Montana: Present Issues and Emerging Challenges. (Abstract). Annual Meeting of the American Fisheries Society, 23-28 August, Monterey, CA.

Frissell, C.A., and J.T. Gangemi. 1997. Roads and the conservation of aquatic biodiversity and ecological integrity. (Abstract). Society for Conservation Biology, Victoria, British Columbia, Canada, 7-10 June.

Frissell, C.A. 1997. Spatial assessment of biological status and biodiversity loss. Invited seminar, National Research Center for Statistics and the Environment, University of Washington, Seattle, WA, 14 January.

Frissell, C.A., and B.J. Cavallo 1996. Thermal and hydrologic diversity of aquatic habitats mediated by floodplain complexity and hyporheic flow exchange in an alluvial segment of the Middle Fork Flathead River, Montana, USA. (Abstract). Annual Meeting of the N. Am. Benthological Society, Kalispell, MT, 3-8 June.

Frissell, C.A. 1995. Ecological principles for watershed restoration. (Abstract). Invited paper for Workshop on Watershed Restoration: Principles and Practices, Annual Meeting of the American Fisheries Society, Tampa, FL, 27-31 August.

Frissell, C.A. 1995. Managing native fish and their ecosystems: let's get (spatially) explicit! (Abstract). Invited panel presentation at Montana Chapter of the American Fisheries Society, Chico Hot Springs, MT, 6-10 February.

Frissell, C.A. 1995. Birth in the fast lane: sediment transport, human disturbance, and reproductive strategies of salmonid fishes in Pacific Northwest streams. (Abstract). Invited paper for Symposium on Influence of Geomorphic Processes on Terrestrial and Aquatic Ecosystem patterns and Processes, Annual meeting of the Ecological Society of America, Snowbird, UT, 31 July-3 August .

Frissell, C.A. 1995. Resource management impacts on bull trout populations. Invited panel presentation for Searching for Solutions: Solving the Bull Trout Puzzle Science and Policy Conference, Andrus Center for Public Policy, Boise State University, Boise, ID, 1-2 June.

Frissell, C.A. 1995. Watershed dynamics: natural pattern and process and some consequences for ecosystem management. Invited presentations at Managing Terrestrial Ecosystems Relative to Past and Present Disturbances: A Workshop

Integrating Fire, Range, Fish and Wildlife Habitat and the Practice of Silviculture in the Northern Region. U.S. Forest Service, Missoula, MT, 14-16 March.

Selected Papers and Seminars Presented Since 1993, continued:

Ebersole, J.L., C.A. Frissell, and W.J. Liss (Ebersole and Frissell, co-presenters). 1995. Invasion of non-native fishes in northeast Oregon and western Montana streams: potential impacts of climate change. (Abstract). Oregon Chapter of the American Fisheries Society, Ashland, OR, 15-17 February.

Frissell, C.A. 1994. Watershed restoration strategies. (Invited presenter and session convenor) Watersheds '94 Expo, US Environmental Protection Agency and Center for Streamside Studies, University of Washington. Bellevue, WA, 27-30 September.

Frissell, C.A. 1994. A hierarchical approach to restoration of riverine ecosystems. Invited paper at Symposium on Aquatic Habitat Restoration in Northern Ecosystems, Alaska Chapter of the American Fisheries Society, Girdwood, AK, 20-22 September.

Frissell, C.A. 1994. An integrated, biophysical strategy for ecological restoration of large watersheds (Abstract). Annual Conference of The Universities Council on Water Resources, Big Sky, MT, 3-5 August .

Frissell, C.A., and J. A. Stanford. 1994. Designing a watershed reserve network to protect and restore aquatic biodiversity in the northern Rocky Mountains (Abstract). Annual meeting of the Montana Chapter of the American Fisheries Society, Billings, Montana, Billings, MT, 9 February.

Frissell, C.A. 1994. The Endangered Species Act: principles for the protection and recovery of fishes. Invited panel presentation, annual meeting of the Idaho Chapter of the American Fisheries Society, McCall, ID, 24-26 February.

Frissell, C.A., W.J. Liss, B. Doppelt, and D. Bayles. 1993. A new, ecologically based restoration strategy for Pacific salmon in the Pacific Northwest (Abstract). Annual meeting of the American Fisheries Society, Portland, OR, 29 August-2 September.

Technical Workshops Organized:

Organizer and coordinator of Science Panel on Roads and Watersheds, sponsored by Pacific Rivers Council, 10-11 November 2006, Forest Grove, OR.

Organizer and coordinator of the Recovery Science Panel for the Western Native Trout Campaign. Sponsored by Pacific Rivers Council, meeting 2-3 March 2002, Portland, OR.

Organizer and coordinator of Biodiversity Workshop, Consortium for the Study of North Temperate Montane Ecosystems. A cooperative research venture of The University of Montana and Montana State University, supported by the NSF EPSCoR program. 4 February, 1997 Missoula, MT.

Scientific Workshop on Large Basin Restoration: South Umpqua River. 16-18 September 1992, Roseburg, Oregon. Sponsored by The Pacific Rivers Council.

Scientific Workshop on Large Basin Restoration: Lower Rogue River. 21-23 October 1992, Gold Beach, OR. Sponsored by The Pacific Rivers Council.

Other Workshops Attended by Invitation (since 1994):

(With E. Bishop) Scientific Workshop on Large Basin Restoration: Grande Ronde River (co-organizer). 21-22 March 1993, La Grande, OR. Sponsored by The Pacific Rivers Council.

(With W.J. Liss and R.K. Nawa) Stream Classification Workshop for staff of Oregon Department of Fish and Wildlife, 6-7 February 1990, Portland, OR.

Invited Review Panelist, Workshop on Linking Habitat Characteristics to Salmon Data. 29-30 September 1999, National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, WA.

Invited participant, Yellowstone to Yukon Aquatic Conservation Science Workshop. 20-22 August 1999, Flathead Lake Biological Station, The University of Montana, Polson, MT.

Invited Panelist, Workshop on Options for Restoring Salmon Habitat in the Mainstem Snake and Columbia Rivers. Pacific Northwest National Laboratory-Battelle, 19 August 1999, Kennewick, WA

Panelist at State of Oregon/National Marine Fisheries Service Memorandum of Agreement Committee Workshop: Cumulative Effects of State and Private Forest Practices on Salmon Habitat. 21 April 1998, Salem, OR.

Invited participant in a scientific workshop, Multiple Stressors in Ecological Risk Management. Sponsored by the Society for Environmental Chemistry and Toxicology and the USEPA, 13-18 September 1997, Pellston, MI.

Society for Conservation Biology Workshop: Communicating with the Media (panel member). 9 June 1997, Victoria, British Columbia, Canada.

Invited speaker for a workshop, Continuing Education in Ecosystem Management. Sponsored by the University of Idaho. Catchment scale processes and linkages between landscape and stream conditions. 31 January 1997, Moscow, ID.

The Nature Conservancy, Aquatic Classification Workshop (invited presenter). 9-11 April 1996, Cedar Creek Farm, MO.

Kenai River Community Forum (keynote speaker and panelist). The Nature Conservancy of Alaska, USEPA and USFWS, 19-21 April, Soldotna, AK.

Conservation Biology and Management of Interior Salmonids (invited presenter and session co-moderator). USDA Forest Service Intermountain Research Station and Utah State University, 4-5 October 1995, Logan, UT.

Eastside Ecosystem Planning Workshop. Sierra Club Legal Defense Fund, 16 December 1994, Portland, OR.

Co-instructor at workshop series on Watershed Restoration and the "Rapid Biotic Response Strategy" for Riverine Ecosystem Restoration, sponsored by The Pacific Rivers Council, 1993-95, California, Oregon, and Washington.

Fire/Salvage and Aquatic Ecosystems Policy Workshop. The Pacific Rivers Council, 15 December 1994, Portland, OR.

Panel on Forest Health Issues, Native Forest Network annual conference, 13 November 1994, Missoula, MT.

Workshop on Watershed/Fisheries Cumulative Effects Analysis, sponsored by Headwaters, The Pacific Rivers Council, USDA Forest Service, and Bureau of Land Management. 29 September-2 October, 1994, Ruch, OR.

Other Workshops Attended by Invitation (since 1994), (continued)

Boise Funders' Scoping Meeting, sponsored by Bullit, Harder, and Lazar Foundations, 30-31 August 1994, Boise, Idaho. Workshop for a statewide process to prioritize restoration of watersheds and salmon populations, by invitation of Oregon Senate President Bill Bradbury, 18 May 1994, Salem, OR.

Scientific Task Force on Conservation Strategies for Protection of Proposed Wild and Scenic Rivers in California, The Pacific Rivers Council, 22 Feb. 1994, Davis, CA

Other Presentations (Selected):

Scientists Briefing for U.S. Senate staff on post-fire logging and forest management and freshwater resources. Washington, D.C., 18-19 September 2006.

Invited testimony on federal land management and the future of salmon and aquatic biodiversity in the Pacific Northwest, to the U.S. House of Representatives, Subcommittee on National Parks and Public Lands, Washington, D.C., 11 March 1993.

Briefing for Congressional representatives and staff on federal lands management and conservation and recovery of salmonid fishes and riverine ecosystems, Washington, D.C., 22 January 1993.

Invited testimony to the 1991 Oregon State Legislature, on panel representing the Oregon Chapter of the American Fisheries Society, on the status of native fishes, impacts of forest practices on fish habitat, and the need or changes in environmental regulation.

Invited testimony to the Oregon Board of Forestry Forest Issues Forum, December 1990, on cumulative impacts of forest practices on native aquatic species and the need for changes in forest management.

Worked with Oregon Public Broadcasting to describe our research project and its significance in a 15-minute segment of the television program, Oregon Field Guide, first aired in June 1990.

Presented seminars, informal presentations, lectures, and discussions at research review meetings, as guest speaker in classrooms and public interest groups, at state board meetings, at workshops, and on field trips with foresters, geotechnical personnel, fishery and watershed managers, and conservationists.

Yung-Hsin Sun
Principal Engineer

EDUCATION:

BS/BSc, Civil Engineering, National Chiao Tung University , 1986
MS/MSc, Civil Engineering, National Taiwan University, 1988
PhD, Civil and Environmental Engineering, University of California, Los Angeles, 1994

LICENSES:

Professional Engineer - Civil, California, C 62911, 2002

SUMMARY:

Mr. Sun has a broad background of water resources planning and management. He specializes in system optimization, surface and groundwater hydrology, statistical and time series analysis, stochastic process and control theory. In addition to large-scale optimization model, Mr. Sun has extensive experiences in statistical, hydrological, hydraulic, and hydrodynamic modeling. Mr. Sun was recognized as the person who introduced generalized network algorithm to water resources planning and management. He also participated in many water transfer negotiations, testified before State Water Resources Control Board hearings, and provided litigation support. He recently developed a hydrologic index for the Yuba River basin, which was adopted by state-wide policies as an addition to the current water year index system.

EXPERIENCE:

MWH:

2008 - Program manager/technical lead, Central Valley Flood Management Planning Program
Dr. Sun served as the program manager for the Central Valley Flood Management Planning Program, as part of DWR?s FloodSAFE California Initiative, a multifaceted initiative to improve the flood and floodplain management in the State and especially in the Central Valley. Working with DWR leadership team, Dr. Sun formulated and directed the strategy development and execution to generate main products such as the descriptive document for the State Plan of Flood Control, the Flood Control System Status Report, and the first version of the Central Valley Flood Protection Plan, as stipulated in a series of 6 flood and land use management bills signed into law in October 2007.

2008 - Project Manager, California Building Standards Code Update Project
Dr. Sun served as the strategic advisor for the California Building Standards Code Update Project, conducted by the DWR per the Health and Safety Code Section 50465, to develop recommendations to Commission for construction in areas receiving protection by the facilities of the Central Valley Flood Protection Plan where flood levels are anticipated to exceed three feet for the 200-year flood event. This project is a component of FloodSAFE California

Initiative, and a related project to the Central Valley flood Management Planning Program. Dr. Sun?s responsibility is to ensure the consistency between policy directives between this project and that for the Central Valley Flood Management Planning Program, and direct the team, including building code experts, in developing code update recommendations with public support and assistance from a Technical Advisory Committee. The efforts led to the adoption of the first proposal package by the California Building Standards Commission in January 2010.

2008 - 2008, Project manager/Lead of expert panel , Technical Review of the Draft Long-Term Central Valley Project/State Water Project Operational Criteria and Plan Biological Assessment

Dr. Sun served as the facilitator of the review to establish the review panel, commissioned by Reclamation, to evaluate of the draft Biological Assessment for the Long-Term CVP/SWP Operations Criteria and Plan (OCAP) before submitting to U.S. Fish and Wildlife Service and National Marine Fisheries Service. The scope of review includes the approach and effects for the operation of CVP/SWP system on the listed aquatic species in the Sacramento-San Joaquin river system. The approach of accounting for climate change and its effects on aquatic species were also included in the review. In working with Reclamation, Dr. Sun developed the guidelines for panel members in the review process, and led a technical support team to provide experts with necessary technical supports and coordination with Reclamation for information distribution and clarification. He also organized the preparation of the summary report for Reclamation by consolidating inputs and comments from the experts in the review panel.

2007 - 2009, Technical Lead, Multi-agency Water Management Work Group Lead, San Joaquin River Restoration Program

Dr. Sun served as the Water Management Workgroup lead in the San Joaquin River Restoration Program, which is a comprehensive program to implement the October 2006 Settlement Agreement among Reclamation, National Resources Defense Council, and Friant Water User Authority. to restore flows to the 150-mile San Joaquin River from Friant Dam to the confluence of Merced River, ensure irrigation supplies to Friant Water users, and restore a self-sustaining fishery in the river. The Water Management Workgroup is composed of agency representatives from Reclamation, USFWS, CDFG, USACE, CDWR, and consultant team. The charter of the Water Management Workgroup (one of four major workgroups under the program) is to develop the Restoration Flow Guidelines, a water management plan to recirculate, reuse the Restoration Flow for delivery back to Friant Division to offset the water supply impacts from the Settlement. Analyses on water rights, water supply, flood management, water quality, and accounting are also included in the scope of workgroup.

2007 - 2008, Project Manager, State Water Project Energy Load and Resources Planning Tool Evaluation

Dr. Sun served as the project manager for the evaluation of a new planning tool for the State Water Project power load and resources planning. He developed the framework for assessing the adequacy for existing collection of planning tools, and the requirements for a new tool for compatibility with the new operation requirements by California ISO requirements and revised internal business practice. Dr. Sun also organized interview and preliminary screening process

to identify a short list of vendors for further evaluation based on a series of design scenarios, conducted in conjunction with DWR staff, for their decision needs.

2006 - 2007, Technical Manager, Water Supply Portfolio Development for Urban Water Management Plan

Dr. Sun completed a white paper on water supply portfolio for San Luis Water District as part of the development of an urban water management plan in anticipation of becoming an M&I purveyor. The paper included review of various sources of water, required institutional arrangement, and potential contribution to water supply reliability including the feasibility of water supply plans proposed by the developers.

2006 - 2007, Project Manager, Reconnaissance-level Study on Water Resources Opportunities

Dr. Sun conducted a reconnaissance-level study to evaluate water resources opportunities to leverage the large quantity of treated wastewater of the Sacramento Regional County Sanitation District. The study included the evaluation of potential partners in developing water resources opportunities and potential arrangements that may be required for such opportunities. Preliminary political, institutional, and environmental considerations were also included. The formulated strategy was incorporated in the District's water recycling master plan.

2005 - 2006, Project Manager, CALFED Program to Meet Standard

Project manager for developing a report for the Program to Meet Standards as mandated in the Water Supply, Reliability, and Environmental Improvement Act (Public Law 108-361) to authorize federal participation in CALFED activities. The purpose of this authority and direction is to provide greater flexibility in meeting the existing water quality standards and objectives for which the CVP has responsibility and reduce the demand on water from New Melones Reservoir used for that purpose, and to assist the Secretary of Interior in meeting any obligations to CVP contractors from the New Melones Project. The report summarizes the activities and compliance of Bureau of Reclamation with the authorization and is anticipated to submit to Congress in January 2006.

2005 - 2006, Project Manager, CALFED Program Assessment

Dr. Sun participated in development a report using the program assessment reporting tool (PART) to assess the implementation of CALFED program by the Department of the Interior as required by the Office of Management and Budget (OMB) according in consistent with the Water Supply, Reliability, and Environmental Improvement Act (Public Law 108-361). Dr. Sun participated in developing specific performance goals and measurements and compiling supporting evidence to demonstrate the accomplishments and justify future funding. The resulting report was used by Reclamation to complete their reporting responsibility with OMB.

2004 - 2004, Hydrologic modeling QA/QC, Stony Creek Fan Conjunctive Use Project

Provided critical review and strategic planning for CALSIM II modeling to evaluate the potential water supply benefits of alternatives currently under consideration.

2004 - 2005, Technical Lead, Orland Unit Water Users Association 2005 Water Transfer Proposal to Environmental Water Account
Prepared the white paper on water rights, hydrologic conditions and water availability for the Stony Creek as part of the water transfer proposal. Participated in transfer negotiation with the representative of the Environmental Water Account and staff from the Bureau of Reclamation and the Department of Water Resources.

2003 - 2004, Technical Lead, Water Supply Infrastructure Master Plan
Dr. Sun participated in the development of the water system infrastructure plan which focused on the near- and long-term capital improvements to the PCWA water distribution system to meet rapidly growing retail and wholesale demands. He completed the review of available water supply, assessment of corresponding water supply reliability, and formulated the long-term surface water development strategy. He also directed the development of PCWA-systemwide CALSIM application to evaluate the water allocation strategy in consideration of water supply reliability, demand level, and regular operation and maintenance activities. Scenarios of unexpected interruption of water supply were also evaluated.

2003 - 2004, Technical Lead, Sacramento County Water Agency Zone 40 Master Plan
Analyzed surface water supply reliability based on CALSIM II results to develop diversion patterns for Central Valley Project (CVP) contract entitlements and pending water rights for diverting excess water in the Sacramento River from the Freeport Regional Diversion Project with East Bay Municipal Utilities District (EBMUD).

2002 - 2007, Technical Lead, Program-wide Water Operations Work Group Lead , Oroville Facilities Relicensing Program
Organized and executed public workshops on operations modeling for cross-resource discussion among stakeholders. Developed CALSIM II and HYDROPS operations model, WQRRS temperature model, and HEC-RAS. Supported DWR staff in critical review of hydrologic and hydraulic modeling results for operations? consistency and reasonableness. Served as one of operations modeling coordinators for modeling strategic planning, data communication, and result dissemination for this $3.1M project.

2002 - 2004, Technical Lead, Upper San Joaquin River Basin Storage Investigation
Directed hydrologic analyses for preliminary evaluation of 17 dam alternatives, and performed detailed hydrologic analysis to identify potential project benefits as part of this $14.5M program. Reviewed numerical models of Friant Dam operation and developed methodology and protocols for single purpose analysis for various purposes, including flood control, water supply, environmental restoration, and water quality. Served as Modeling Lead for hydrologic studies in the evaluation of new reservoirs on the San Joaquin River (up to 2 million acre-feet) for water supply, ecosystem restoration, flood control, and hydropower purposes. Directed hydrologic analyses for preliminary evaluation of 17 dam alternatives and performed detailed hydrologic analysis.

2002 - 2003, Project Manager, Delta Mendota Canal Recirculation Study, Phase 1

Provided technical support to USBR staff in the feasibility study required by the SWRCB in Decision 1641 as part of the conditions for granting DWR/USBR joint point of diversion at the Delta. Flows recirculated through the Delta Mendota Canal would help to meet San Joaquin River flow standards at Vernalis during the pulse flow period. The impacts of the recirculation proposal would be evaluated by using CALSIM for water quantity and DSM2 (San Joaquin River portion and the Delta portion) for water quality. Using the most updated information on westside return flow and riparian diversion, a methodology and necessary modifications to CALSIM codes were developed to disaggregate CALSIM outputs to the resolutions required for DSM2. The disaggregation methodology in CALSIM II used updated information on westside return flow and riparian diversion, to disaggregate CALSIM outputs to the resolutions required for DSM2.

2002 - 2008, Project Manager, Sacramento River Water Reliability Study
Dr. Sun served as project manager to provide technical support to the Bureau of Reclamation, Placer County Water Agency, the City of Roseville, and the City of Sacramento to develop a Sacramento River diversion that is consistent with the April 2000 Water Forum Agreement to meet the water supply reliability needs of the Placer-Sacramento region, while promoting ecosystem preservation along the lower American River. The proposed alternative was a joint diversion of 235 mgd, a water treatment facility of the same capacity, and major transmission pipelines to the existing distribution systems of local cost-sharing partners. The study was developed under the feasibility study authorization provided by Public Law (PL) 106-554, Appendix D, Division B, Section 103. The project is a cornerstone of the Water Forum Agreement and could provide additional flexibility for Central Valley Project (CVP) operation, allowing implementation of the new CVP municipal and industrial shortage policy in the American River basin. The project also would facilitate opportunities for CALFED regional planning, conjunctive management, and water transfer programs.

2002 - 2002, Hydrologic Modeling QA/QC , Utah Lake Drainage Basin Water Delivery System of the Bonneville Unit, Central Utah Project
Provided critical review of modeling approach and implementation to the Central Utah Water Conservancy District for the preparation of the environmental impact statement.

2002 - 2002, Project manager/Technical lead, CALSIM II Application to Long-Term Planning
Provided a presentation to District?s general manager and staff and prepared a technical memorandum on the development and potential applications of CALSIM II in the assessment on reliability of water supply from the Central Valley Project in District?s long-term planning process.

2001 - 2002, Project Manager, Sacramento-San Joaquin River Basins Comprehensive Study: Lower San Joaquin River Study
As part of the Sacramento-San Joaquin River Basins Comprehensive Study to respond to California's davestated 1997 Flood, this project is to developed empirical flow split relationships for Delta waterways. Accountable for hydraulic modeling of channel modification alternatives in

Paradise Cut area, using hydrodynamic models such as UNET and DSM2, and developing preliminary alternatives for passing flood flows through the Delta.

2001 - 2001, Project Manager, Plan of Study for Sacramento River Diversion Project Feasibility Study:
Served as project manager of the Plan of Study for a regional diversion project in the Sacramento metropolitan area to provide surface water supply to Sacramento and Placer counties to meet the projected growth. The purpose of a Plan of Study is to provide a complete overview of the background, project development, potential cost-sharing partners, potential project tasks, budgets, and schedule of completion.

2001 - 2002, Project Manager, Sacramento-San Joaquin River Basins Comprehensive Study: Lower Sacramento River Study
As part of the Sacramento-San Joaquin River Basins Comprehensive Study to respond to California's devastated 1997 Flood, this project is to analyzed tide cycles during the 1997 flood to locate downstream flood flow influence boundary in the Delta. Based on the different scenarios of the riverine flood routing of the Sacramento and San Joaquin Rivers, this project is to investigate the potential effects on the Delta stage and flows in various locations in response to upstream operations. Multiple scenarios of different storm centering were used to cover all possible flooding conditions evaluated in the Comprehensive Study. This study also evaluates the applicability of the hydrodynamic model of the Department of Water Resources, DSM2, to flood studies in light of the fact that the hydrodynamic model used in Comprehensive Study, UNET, was constructed in two parts, one for the Sacramento River, and another for the San Joaquin River. The coverage of the Delta is incomplete.

1998 - 1998, Technical Support, Environmental Impact Statement for Allocation of Water Supply and Long-term Contract Execution, Central Arizona Project
Designed and populated the content for the Web site for public distribution of the EIS for Allocation of Water Supply and Long-term Contract Execution, Central Arizona Project.

QA/QC, Delta Water Supply Project
Dr. Sun provided QA/QC and served as initial modeling lead for preparation of environmental compliance documentation. He developed project alternatives and a modeling strategy for environmental documentation purposes, provided technical reviews on water rights and water supply and water quality modeling results.

OTHER COMPANIES:

1999-1999, Technical Lead, Expert Witness, Hydrologic Analysis for the Hearing of Yuba County Water District and Oroville-Wyandotte Irrigation District before the State Water Resources Control Board
Mr. Sun performed a basin-wide hydrologic analysis for Yuba County Water District to support their petitions for changes in place of use and purpose of use. He performed an unimpaired flow analysis for the South Fork of Feather River basin, and constructed an operational model for

OWID's South Fork Feather Project for water supply and power generation analysis. These analyses were performed using only public information without any inputs from OWID due to the nature of the hearing. The simulated operations are highly representative, and the results were presented in the hearing before the State Water Resources Control Board

1999-1999, QA/QC Manager, Groundwater Model QA/QC for Litigation Support to North Kern Water Storage District

Served as the pseudo opponent, Mr. Sun evaluated and critiqued the parameter estimations and subsequent assessments of the groundwater model that was developed for testimony in supporting North Kern Water Storage District in the litigation against Kern Delta Water District. He performed the state-of-the-art parameter estimation and uncertainty analysis for the groundwater model development as part of the model evaluation and critque process.

1999-1999, Project Engineer, Impact Assessment for the Central Valley Project Improvement Act Restoration Fund Collection

Performed the impact analysis for the Central Valley Project Improvement Act Section 3407(d) restoration fund collections for the Bureau of Reclamation based on the simulated delivery from PROSIM and SANJASM. Developed an interactive EXCEL model to facilitate the evaluation of fund collection goal achievement, payment fluctuation control, and payment equity issue.

1999-1999, Expert witness on statistical analysis, Temporary Water Transfer Hearing before the State Water Resources Control Board

Testified as an expert witness in the Proceeding before State Water Resources Control Board on the statistical inference on water conservation of Natomas Central Mutual Water Company. Performed the statistical analysis on consumptive use and provided critiques on the analysis by the State Water Resources Control Board staff.

1999-1999, Technical Lead, Evaluation of New Bullards Bar Operation in 1997 Flood

To support Yuba County Water Agency in potential court case for 1997 flood event, evaluated the consequences of alternative operations that Yuba County Water Agency could have taken during the flood in January, 1997. Performed flood routing analysis and the impact analysis on the historic and alternative operations.

1999-2000, Technical Lead, Evaluation of the operation of New Don Pedro Dam in 1997 Flood Event

Provided litigation support to Turlock Irrigation District in the trial for flood damage in City of Modesto and Weatherbee Lake areas during the 1997 flood. Evaluated the hydrologic conditions and flood operation of the San Joaquin River Basin. Developed a hydrologic routing model for the event.

1998-2000, Technical lead/Expert Witness, Hydrologic Analyses Supporting the Sacramento Valley Water Users in the Bay-Delta Hearing before the State Water Resources Control Board

Perform the hydrologic analyses for the Sacramento Valley Water Users, an affiliation of water purveyors in the Sacramento Valley. He evaluated the historical records of cross-Delta flow, the impairments of Sacramento Valley water users, and unimpaired conditions of Sacramento-San Joaquin Delta hydrology and Sacramento Valley. He evaluated the Delta hydrology simulated by DWR DSM to determine the impacts on Delta hydrology from the south Delta exports for CVP and SWP. He performed the reverse flow analysis for the central and south Delta to correlate the daily pump operation and the flow directions in the Old and Middle Rivers. He was listed as a potential expert witness for the Bay-Delta Hearing before the State Water Resources Control Board.

1998-1999, Technical Lead, Hydrologic Analysis and Water Right Applications for the Big Rock Project

Mr. Sun performed hydrologic analysis, frequency analysis, groundwater seepage evaluation, evaporation estimation, and the probable maximum precipitation estimate for the blueline streams to support the water right application for direct diversions and storage at the proposed reservoir in the Big Rock Project of LucasFilm, Ltd. in Marin County, California

1998-1998, Technical Lead, Engineering and Hydrologic Evaluation of Foothill Reservoirs in the Colusa Basin

Mr. Sun performed initial hydrologic evaluation of foothill reservoirs along the 31 tributaries to the Colusa Basin Drain for Colusa Basin Drainage District. Analyses performed include flood frequency analysis, unit hydrograph synthesis, cross-basin transposition of hydrologic information, damage frequency analysis, and benefit assessments. Innovative theoretical and empirical approaches were implemented to overcome the difficulties associated with lack of data.

1998-1998, Project Engineer, Hydrologic Data Collection Evaluation for the Surface Water Data Reduction Program

Mr. Sun evaluated the current practice of surface water data collection and process for Sacramento Municipal Utility District. He formulated a strategic plan for future expansion and improvement on the database software and operational process

1998-2000, Technical Lead, Litigation Support to Truckee Carson Irrigation District

Provided litigation support to Truckee Carson Irrigation District in the trial (US v. Truckee-Carson Irrigation District) before the Federal Court for the District of Nevada for recoupment under the Truckee-Carson-Pyramid Lake Water Rights Settlement Act. Reviewed the implementation history of the Operation Criteria and Plan for the Newlands Project, Truckee Carson Irrigation District diversions and deliveries, and relevant USGS gage records and errors.

Developed alternate calculations for repayment liability of Truckee Carlson Irrigation District for diversions above authority.

1997-1998, Project Engineer, Rehabilitation/Replacement Of The Raw Water Facilities Of Contra Costa Water District

Conducted the site inspection for the raw water facilities (river diversions, canals, pumping plants, outlets and other infrastructure) for the Contra Costa Water District, and assisted in the assessment of the rehabilitation/replacement needs of Contra Costa Water District. He designed and directed the overall inspection reporting system using CAD adn GIS, and two customized databases for canal deficiency and photodocumentation fo the facilities, including user interfaces to facilitate the evaluation with detailed information on thousands of facilities. He was also responsible in completing the final summary report on assessments, recommendations, and cost estimates.

1997-1997, Technical Lead, Feasibility Analysis of Parks Bar Reservoir in Yuba County, CA

Mr. Sun developed an HEC-5 model for Yuba County Water Agency to evaluate the yield and supply reliability of the proposed Parks Bar Reservoir. The project is a parallel study of Waldo Project, aiming at secure local municipal demand and Delta transfer demand through groundwater banking system.

1997-1997, Technical Lead, Supplemental Hydrologic Analysis for Department of Water Resources and Yuba County Water Agency Settlement Agreement

Performed supplemental hydrologic analysis to support the negotiation of the Settlement Agreement between the Department of Water Resources and Yuba County Water Agency. He participated in the negotiation of the Settlement with DWR to relieve the duty of YCWA from the outcome of the SWRCB Bay-Delta Hearing. He performed trend analysis on groundwater storage in the Yuba County, south of Yuba River. Historic records were collected and compiled for the evaluation of changes in storage and level from 1960 to present. He developed tools that include data management database and contouring utilities to facilitate the consolidation of the massive amount of measured data.

1997-1997, Technical Lead, Stockton East Water District Pipeline Forensic Investigation project

Mr. Sun was Associate Engineer on the Stockton East Pipeline Forensic Investigation project. He performed hydraulic analysis on a sudden eruption of a major pipeline during the flooding condition in 1997. He formulated alternatives of operational and structural improvement for the pipeline to prevent similar incidents in the future.

1997-1997, Project Engineer, Water Supply Pipeline Rehabilitation project

Evaluated the pipeline integrity of San Juan Water District for the Water Supply Pipeline Rehabilitation project. He performed the structural analysis for the support of a 40-inch main pipeline cross a river canyon, and participated in design of the cross-canyon flume.

1997-1998, Technical Lead, Feasibility Analysis of Waldo Reservoir Project in Yuba County, Phase I

As Associate Engineer, Mr. Sun developed a HEC-5 simulation model for Yuba County Water Agency to evaluate the yield and supply reliability of proposed Waldo Reservoir, which is considered a potential source for local water supply and water transfer

1997-1998, Project Engineer, Groundwater Impact Update for the Sunrise Douglas Specific and Community Plans

Mr. Sun conducted regional groundwater impact and water quality analyses for an urban development in Sacramento County for Sunrise Douglas Specific and Community Plans. He employed a finite element groundwater flow model to evaluate the contaminant transport originated from the nearby USEPA Superfund sites and the consequent impacts on the safety of drinking water supply. Field groundwater sampling tasks were also performed.

1996-2000, Technical Lead, Lower Yuba River Hearing on Water Right Issues of Yuba County Water Agency

Served as an expert witness in the water right hearing before the State Water Resources Control Board for the Yuba County Water Agency. He developed a Yuba River Index that is comparable to the Sacramento Valley Index in SWRCB 1995 Water Quality Control Plan to be used as an indicator of water supply conditions in the Yuba River basin. The Index is currently incorporated in all related SWRCB decisions and DWR CALSIM model. He evaluated the hydrologic conditions in the Yuba River Basin and the operation of Yuba County Development Project for Yuba County Water Agency. Mr. Sun performed unimpaired flow analysis to evaluate the water availability in the Yuba River Basin. He performed basin-wide hydrologic simulations by using the YCWA HEC-5 model he improved over the years for determining water availability, impacts of upper basin impairment, impacts of SWRCB proposed flow and temperature requirements, and consequential system operation for power and agricultural demands. He also constructed a statistical temperature model for the Lower Yuba River to evaluate the feasibility of the temperature requirements proposed by SWRCB, YCWA, and DFG.

1995-1996, Project researcher, post doctoral fellow, Optimal Automatic On-demand Canal Control System Design

As a Postdoctoral Fellow for the Dept. of Civil and Environmental Engineering, UCLA, Mr. Sun conducted research for the optimization of irrigation canal operation. He participated in developing a reliable automatic gate control methodology suitable for an on-demand aqueduct system in Brazil

1995-1996, Postdoctoral Fellow/Technical Lead , Optimization Of Water Distribution System With Blending Requirements

As a Postdoctoral Fellow for the Dept. of Civil and Environmental Engineering, UCLA, Mr. Sun conducted research for Metropolitan Water District of Southern California on the optimization of water distribution system with blending requirements. The study is to address the concerns of local agencies on the blending of different surface water sources (State Water Project and Colorado River). Mr. Sun applied a multicommodity network flow model in the optimal water allocation to secure the amount and quality of delivered water in the distribution system

1993-1996, Technical Lead, Optimal Design Of Soil Vapor Extraction Systems

As a Doctoral candidate and later, a Postdoctoral Fellow for the Dept. of Civil and Environmental Engineering, UCLA, Mr. Sun conducted research for the optimal design of soil vapor extraction systems. He established a mixed integer nonlinear optimization framework to optimally select the locations of extraction wells and their corresponding pumping schedules. He also performed sensitivity analysis of the optimal design of soil vapor extraction systems, including the effects of heterogeneity, multiple contaminants and rate-limited mass transfer

1992-1993, Technical Lead, Optimization Of Southern California Regional Water Distribution System

As a Graduate Student Researcher for the Dept. of Civil and Environmental Engineering, UCLA, Mr. Sun conducted research for the optimization of water distribution systems. He applied an embedded generalized network algorithm to efficiently solve the distribution optimization problem for water supply system of the Metropolitan Water District of Southern California for long-term planning. The application of a generalized network algorithm was the first in water resources planning and management

1990-1991, Technical Lead, Real-time Reservoir Operation During Floods

As a Research Assistant for the Dept. of Civil Engineering, National Taiwan University, Taiwan,

Conducted research for real-time reservoir operation during floods. He participated in the development of an optimization model for reservoir operation and risk analysis using real-time streamflow forecast. He was responsible for the real-time streamflow forecast.

1986-1988, Technical Lead, Synthesis and Forecast of Average ten-day Streamflow

As a Graduate Student and Teaching/Research Assistant, Dept. of Civil Engineering, National Taiwan University, Taiwan, Mr. Sun researched the 10-day streamflow forecast and synthesis in Tanshui River Basin, Taiwan. The intervention model increases the forecasting accuracy by addressing the severe impacts of typhoons with intervention analysis. The section model focuses on the seasonality analysis in streamflow synthesis.

1984-1985, Student Research Assistant, Frequency Analysis for Short Duration Rainfall

As a Student Research Assistant, Dept. of Civil Engineering, National Chiao Tung University, Taiwan, Mr. Sun conducted research for Frequency Analysis for Short Duration Rainfall. He performed frequency analysis on the hourly precipitation in Hsin-Chu. Evaluated and compared the fitness of plotting position methods and theoretical distributions for the hourly precipitation data

ORGANIZATIONS/MEMBERSHIPS:

Chinese Institute of Engineering
American Society of Civil Engineers (ASCE)
American Geophysical Union
Floodplain Management Association
Phi Tau Phi Scholastic Honor Society of the Republic of China

PUBLICATIONS:

Regional groundwater management with health risk assessment, Proceedings of North American Water and Environment Congress 96, ASCE, Anaheim, CA, June 22-28., 1996

Mixed Integer Nonlinear Optimization of Soil Vapor Extraction Systems, Ph.D. dissertation, Dept. of Civil and Environmental Engineering, UCLA, Los Angeles, CA., 1994

Review of the Efficient Utilization Techniques for Industrial Water Use, Industrial Technology Research Institute, Hsinchu, Taiwan (in Chinese)., 1993

An intervention model for average 10 day streamflow forecast and synthesis, J. of Hydrology, 151, 35-56., 1993

Development of an Optional Data Collection Strategy for Hemet Groundwater Basin Management Program, Dept. of Civil and Environmental Engineering, UCLA, Los Angeles, CA., 1994

Synthesis and Forecast of Average Ten-Day Streamflow, Master thesis, Dept. of Civil Engineering, National Taiwan University, Taipei, Taiwan (in Chinese)., 1988

Modeling reservoir evaporation losses by generalized networks, J. of Water Resources Planning and Management, ASCE, 122(3), 222-226., 1996

Optimization of Water Distribution System with Blending Requirements, Dept. of Civil and Environmental Engineering, UCLA, Los Angeles, CA., 1996

Mixed integer nonlinear optimization of soil vapor extraction systems, Proceedings of 22nd Annual Conference of the Water Resources Planning and Management Division, ASCE, Boston, MA, 883-886., 1995

Generalized network algorithm for water supply system optimization, J. of Water Resources Planning and Management, ASCE, 121(5), 392-398., 1995

Chapter 3: Groundwater systems, in Civil and Environmental Engineering Systems: Advanced Applications, John Wiley and Sons, Inc., 1997

Automatic canal system control optimization, Proceedings of 24th Annual Conference of the Water Resources Planning and Management Division, ASCE, Houston, TX, 537-542., 1997

Mixed integer nonlinear optimization of soil vapor extraction system, Proceedings of American Geophysical Union 1994 Fall Meeting, San Francisco, CA., 1994

Optimal management of pumping periods for pump-and-treat groundwater remediation, Proceedings in American Geophysical Union 1996 Fall Meeting, December, San Francisco, CA., 1996

Location and time-varying optimization of soil vapor extraction system design, J. of Water Resources Planning and Management ASCE, 124(1), 47-58., 1997

Optimal automatic on-demand canal control system design, ASCE, 3(2), 59-67., 1997

Optimization of Regional Water Distribution System with Blending Requirements, J. of Water Resources Planning and Management, ASCE, 126(4), 229-235., 2000

Soil vapor extraction system design by combinatorial optimization, Water Resource Research, 32(6), 1863-1873., 1996

An ARMA-type section model for average 10 day streamflow synthesis, Water Resources Management, 10(5), 333-354., 1996

Optimization of a large-scale water distribution system by the embedded generalized network algorithm, Proceedings of American Geophysical Union 1993 Fall Meeting, December, San Francisco, CA., 1993

Optimization of water distribution system with blending requirements, Proceedings of North American Water and Environment Congress 96, ASCE, Anaheim, CA, June 22-28., 1996

Frequency analysis for short duration rainfall, Proceedings of Annual Meeting of the Chinese Institute of Civil and Hydraulic Engineering, Taiwan (in Chinese)., 1985

Optimization of soil vapor extraction system design, Proceedings of North American Water and Environment Congress 96, ASCE, Anaheim, CA, June 22-28., 1996

Reliability Analysis of the Metropolitan Water District's Water Distribution System, Phase I: Development of Analytical Methodology, Dept. of Civil and Environmental Engineering, UCLA, Los Angeles, CA., 1994

Development and Application of Real-Time Optimal Operation Model of Tanshui River Basin Reservoirs (III): Hourly Model, Dept. of Civil Engineering, National Taiwan University, Taipei, Taiwan (in Chinese)., 1991

Water Management Goals and Real-time Operation Consideration for Implementing San Joaquin River Restoration Flow , Proceeding of the 5th Biennial 2008 CALFED Science Conference, Global Perspectives and Regional Results: Science and Management in the Bay-Delta System, pg 252, Oct 22-23, 2008., 2008

Doug Whittaker, **Ph.D. ● Confluence Research and Consulting**

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Environmental and outdoor recreation researcher and planning consultant. Expertise includes recreation in river and marine settings; crowding, congestion, use conflicts, and capacities; recreation infrastructure development; instream flows for recreation; attitudes toward urban wildlife and management; and integrating recreation and ecological management strategies.

Professional Experience

1998 to present	Researcher and planning consultant with Confluence Research and Consulting
1995 to 1998	Research Assistant, Colorado State University
1988-1993	Outdoor Recreation Planner, Bureau of Land Management and National Park Service
1985-1987	Research Assistant, Recreation Resources, Oregon State University

Education

Ph.D.	Human Dimensions of Natural Resources	Colorado State University	2000
M.S.	Forest Management	Oregon State University	1987
B.A.	Geography	University of Vermont	1983

Research and Planning Projects

Involved in over 65 major recreation planning or research projects for more than 25 federal, state, local, non-profit, or private agencies/organizations, including all of the major U.S. federal land managing agencies, state land managing agencies in Alaska and Oregon, several non-profit groups, and private utilities. Extensive experience with NEPA and related planning and environmental review processes, as well as FERC licensing processes. A list of representative projects includes:

Hydropower impacts on recreation / relicensing / navigability / water rights

Hydrokinetic energy projects and recreation	Department of Energy & NPS
Workshops on flow-recreation concepts and methods	Federal Energy Regulatory Commission
North Umpqua River OR navigability study	State of Oregon
Spokane Falls WA aesthetics study	Sierra Club, Center for Justice
Sultan River WA flow-recreation studies	Snohomish County Public Utility District
New River VA flow-recreation studies	Appalachian Power Company
McCloud River CA flow-recreation studies	Pacific Gas and Electric
Grand Canyon AZ recreation monitoring review (dam effects)	GC Monitoring and Research Center
Carmen-Smith whitewater boating study	Eugene Water and Electricity Board
Lower Kern River CA whitewater boating study	Southern California Edison
Upper Klamath River CA flow-recreation studies	PacifiCorp
John Day River OR navigability adjudication	State of Oregon
Clear Creek Whitewater Park CO flow-recreation study	Colorado Water Conservation Board
Upper North Fork Feather River CA flow-recreation study	Pacific Gas & Electric
Clackamas River OR flow-recreation and boating studies	Portland General Electric
Pit River CA flow-recreation studies	Pacific Gas and Electric
Hells Canyon ID / OR hydropower relicensing studies	Idaho Power
Shepaug River CT flow-recreation study	Shepaug River Association
Chelan River WA whitewater boating study	Chelan Public Utilities District
Idaho Snake River Basin water right adjudication studies	USFS and Dept of Justice
Virgin River, UT / AZ / NV	BLM – St. George Field Office
North Umpqua River OR whitewater boating study	PacifiCorp
Birch Creek National Wild River AK flow-recreation study	BLM – AK State Office
Delta National Wild River AK flow-recreation study	BLM – AK State Office
Dolores River CO flow-recreation study	BLM – Denver Service Center
Gulkana National Wild River AK flow-recreation study	BLM – AK State Office

River corridor planning and research

Merced River CA Plan	Yosemite National Park
Lake Clark National Wild Rivers AK – Values workshop	Lake Clark National Park
Kenai River AK recreation use study	Alaska State Parks
Grand Canyon AZ social impacts monitoring plan	Grand Canyon National Park
Chattooga River SC / GA recreation capacity analysis	US Forest Service
Delta National Wild and Scenic River AK user survey	BLM – Glennallen District
Situk River AK recreation user survey	USFS, ADF&G, AKDNR
Colorado River Management Plan (Grand Canyon AZ)	Grand Canyon National Park
Pit River and Lake Britton CA recreation studies	Pacific Gas and Electric
Gulkana River AK recreation use study	BLM – Glennallen District
Lower Sheenjek AK Wild and Scenic river study	NPS and Arctic National Wildlife Refuge
Kanektok, Goodnews, and Togiak Rivers AK recreation study	Togiak National Wildlife Refuge
Brooks River AK bear viewing	Katmai National Park
Kenai River AK carrying capacity study	Alaska State Parks
Susitna Basin AK Recreation Rivers Management Plan	Alaska Dept. of Natural Resources
Nenana River AK Corridor Planning	Alaska Dept. of Natural Resources
Deschutes River OR recreation use study	Oregon State Parks

Trail planning or other projects

Poe Reach on North Fork Feather River trail study	Pacific Gas and Electric
Kodiak Island AK road-accessible trails survey	City and Borough of Kodiak
Ketchikan Trails Plan, Alaska	City of Ketchikan, Tongass National Forest
Juneau Trails Plan, Alaska	City/Borough of Juneau, Tongass NF, AK DNR
A guide to allocating river use	River Management Society
Anchorage Wildlife Plan and Study	Alaska Department of Fish and Game

Journal Publications, Technical Reports, and Book Chapters

Published 20 refereed articles in various journals: Human Dimensions of Wildlife, Society and Natural Resources Leisure Sciences, Environmental Management, River Management Society Journal, Hydro Review, Wildlife Society Bulletin, Rivers, Journal of Parks and Recreation Administration, and Journal of Leisure Research. Published over 60 technical reports (from projects) and 10 book chapters or invited papers on various research and planning topics. Includes three "guides" to hydropower and recreation impact assessment in river or marine settings (1993, 2006, 2010).

Experience in Legal Settings

Have participated as a consultant or expert witness in eight legal trials or hearings, including preparing expert witness reports, depositions, expert testimony, and assisting with opposing expert witness cross examinations.

Professional Service

Former national vice president and Alaska chapter president of River Management Society.
Provided scientific reviews for several journals, including: Environmental Management, Journal of Leisure Research Leisure Sciences, Human Dimensions of Wildlife, Wildlife Society Bulletin, River Research & Applications, Ursus.

International Experience

Attended International School of Brussels, Belgium (1977-79). Year-long trips in 1984 and 1994-95, including NZ, Australia, Southeast Asia, China, Russia, Nepal, India, and Europe. Several month-long trips in Mexico, Nepal, China, Ecuador, and Thailand from 1997-2011.

Full curriculum vitae available upon request

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tyount@sapereconsulting.com

Tracy Yount

Mr. Yount is a proven manager of energy, natural resource, and governmental affairs programs in the Pacific Northwest. His approach is to develop program strategies that are stakeholder inclusive, outcome based, and scientifically sound. His programs consistently achieved established objectives while managing costs and providing value to stakeholders.

Mr. Yount worked his way through the technical and management ranks by successfully implementing projects and programs with diverse stakeholder interests over the past 20 years. His approach is to identify objectives, define the system being impacted, incorporate stakeholder interests, then create technically credible programs that deliver both environmental and economic value.

Mr. Yount has extensive experience negotiating with the Bonneville Power Administration, Northwest Power and Conservation Council, public and private utilities, Tribes, industry associations, and regulatory agencies in the Pacific Northwest. This coupled with his experience as a Director of a Pacific Northwest utility brings a valuable perspective to energy and natural resource programs.

Select accomplishments of Mr. Yount:

- Hydro Power Utility Director of a $100M plus natural resource program that resulted in the first dam on the Columbia River to eliminate partial season fish spill
- Directed the Research and Development of new fish hatchery technologies resulting in increased fish health while drastically reducing water consumption,
- National Laboratory Deputy Director of the United States largest smart grid demonstration project,
- Conceptualized and negotiated the world's first application of large hydroelectric generation for offsetting greenhouse gases,
- Project Manager for the permitting, design, construction, testing and startup of a new 40 MW generation facility in 45 days during the 2001 energy crisis.

Professional Interests

Mr. Yount's interests include the policy and practical nexus between energy technologies, environmental objectives, and regulatory frameworks.

Education

- Bachelor of Science - Engineering, Architecture, and Construction Management, Washington State University
- Cascade Management Series, Daniel Evans School of Public Affairs, University of Washington
- Leadership from Within Management Series, Chelan County PUD
- Leadership Development Program, Center for Creative Leadership, San Diego
- 2008 Stakeholder Relations Instructor, Willamette University Utility Management Program

Appendix E

Bibliography of Provided Review Materials

Bibliography of Submitted Documents:

Information Provided by King County:

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2. Capital Services Unit Project Management Processes Protocols Tools and Templates
3. Cedar River Major Projects Map 1993 – 2020
4. Cedar River Upcoming Projects Map 2010
5. Corps of Engineers, FEMA Design and Engineering Manual
6. Draft GAP Analysis from Project Management Manual 2011
7. Green River External Advisory Review Panel Report, Feb 2010
8. Habitat Restoration Prioritization Process
9. King County Administrative Policies and Procedures
10. King County. "Cedar Rapids Floodplain Reconnection - Project History and Current Status." PowerPoint Report.
11. King County. "Cedar River Large Wood Study Mid-Term Report." PowerPoint Report.
12. King County Comp Plan
13. King County Construction Inspector's Daily Report Forms
14. King County Construction Roles and Responsibilities
15. King County Disagreements and Conflicts Procedures
16. King County DNRP WLRD Rivers Management Survey Report – Draft dated October 28, 2011.
17. King County documents regarding Salmon Conservation Planning http://www.kingcounty.gov/environment/animalsAndPlants/salmon-and-trout.aspx
18. King County Erosion and Sediment Control Daily Lead (ESCL)
19. King County Erosion and Sediment Control Daily Log
20. King County Flood Control District Capital Project Prioritization for Rivers Program
21. King County Flood Hazard Management Plan 2006
22. King County Flood Warning Instruction Book
23. King County Guidelines for Bank Stabilization
24. King County Large Wood Reference List – Draft V 12/31/09
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27. King County River Management Program Biological Effects Analysis
28. King County Public Rules and Regulations – Procedures for Considering Public Safety when Placing Large Wood in King County Rivers. March 31, 2010
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32. Lower Tolt River Floodplain Reconnection Project Summary Sheet (from site visit)
33. Lower Tolt River Logjam Photos
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35. NRCS Stream Restoration Design
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37. PIP – King County Project Worksheets and Forms

38. "Process-based Principles for Restoring River Ecosystems." Beechie, Sear, Olden, Pess, Buffington, Moir, Roni, Pollock. 2010. Bioscience. 60(3): 209-222.
39. "Recreational Use of King County's River Systems." Report to King County WLRD. Carol MacIlroy Consulting Corporation. June 2009.
40. River and Floodplain Management Example Projects:
    a. Belmondo (Work Authorization / Scope / Design Memo / Record Drawings)
    b. Cedar Rapids (Work Authorization / Scope / Specifications / Basis of Design Report / Record Drawings)
    c. Cedar River Trail 2B (Work Authorization / Scope / Record Drawings)
41. River Recreational Use Study
    a. Rivers Management Survey Overview and Scope
    b. Rivers Management Survey Questions
    c. Biedenweg, K., and K. Akyuz. 2010. Floating the Cedar River: A Field Study from Summer 2010 – DRAFT
42. Stormwater Services – Capital Services Unit Info
    a. CSU CIP Prioritization
    b. CSU CM & Inspection Products
    c. CSU Fairwood 15 Pipe Replacement
    d. CSU Organization and PM Tools
    e. CSU Quality Control Design Products
    f. CSU Reference
    g. CSU Survey
    h. Janike Slough Safety Map
    i. CSU CADD Standards
    j. CSU product line
    k. WLRD - Stormwater Emergency Response Protocols, Policies, Procedures, and Responsibilities, 2009
    l. Neighborhood Drainage Assistance Program
43. SRFB Funding Requirements
44. Surface Water Design Manual
45. SWM CIP Management Systems Reference Manual – Table of Contents Only
46. Technical Services Agreement Scope of Services – Lower Tolt River
47. Washington State Integrated Streambank Protection Guidelines
48. WLRD Project Management Manual Charter
49. WLRD Project Management Manual Draft Outline
50. WLRD Project Management Manual Draft Table of Contents 90% (10/21/11)
51. WLRD Project Management Manual Findings Report – DRAFT GAP Analysis (Info Only)
52. WRIA and Puget Sound Salmon Recovery Plans
    a. Programmatic SEPA for Maintenance and Repair – Rivers Program
        i. Environmental Checklist
        ii. SEPA Mitigated Determination of Non-Significance for The King County Flood Protection Facility Maintenance and Flood Damage Repair Program
    b. Final Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan

Stakeholder Provided Information:

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2. Cedar Rapids Levee Setback and Floodplain Restoration Project Plans (2008)
3. Cedar Rapids Levee Setback Repair Project Plans (2009)
4. Cedar Rapids Levee Setback and Floodplain Reconnection Project – Response to November 7, 2008 Flood Damages
5. Collison, A. and A. Simon. "Beyond Root Reinforcement: the hydrologic effects of riparian vegetation on riverbank stability."
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7. Heirman, B. 2009 "Seniors - A Look at Phony Salmon and Steelhead Recovery." Snohomish County. November 2009.
8. Hey, R.D. "Applicability of Geomorphological Procedures for River Restoration."
9. History of Large Woody Debris Construction on the Soleduck River at Sappho. Washington. April 4, 2009.
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11. Kaufman, R.L. and P.A. Johnson. "Adaptive Improvements to Design Guidelines for Stream Restoration Structures."
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14. Kondolf, G.M and P. Downs. "Learning from River Restoration Projects."
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18. Large Woody Debris Methods Tech Specs
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20. Letter from Dow Constantine, dated 3/21/11 to Denis Law (Mayor of Renton) regarding Cedar Rapids Levee Setback
21. Letter from Martha Parker to MWH dated 9/12/11 regarding Independent Review Project
22. Letter from River Safety Council dated 11/12/11 to Mark Isaacson, Division Director for King County Dept. of Natural Resources and Parks, regarding King County River Construction Process.
23. MacBroom, J.G. "Merging River Mechanics and Fluvial Morphology for River Management."
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25. Perry, S. and J. Gracie. "Regional Survey of Performance Monitoring of Stream Restoration Projects."
26. Ripp, B. and R. Prager. "Analytical procedures for determining the embedment length for root wad bank protection."
27. Schwar, M.T. and Jerry Bernard 1998. "What Level of Engineering is Needed for Restoration Projects?" Discussion Session Summary and ASCE River Restoration and Wetland Engineering Conference. 1998.

28. Schwartz et al. 2006 “Urban Stream Restoration: Guidance for Monitoring and Assessment Protocols.”
29. Simon, A. and Langendoen, E.J. “A Deterministic Bank-Stability and Toe-Erosion Model for Stream Restoration” – USDA-ARS National Sedimentation Laboratory.
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Appendix F

October 20, 2011

Expert Panel Workshop Meeting Notes

Independent Review of Project Scoping and Implementation Practices
Water and Land Resources Division

Expert Review Panel Debrief and Stakeholder Meeting
Draft Meeting Minutes

Recorder: Jeff Schmidt

Location: King County Offices – Chinook Conf Room

Date: Thursday, October 20, 2011

Time: 8:15am – 12:30pm

Attendees (King County)	Attendees (Consultant)
Don Althauser, Steve Bleifuhs, Dave Galvin, Jon Hansen, Clint Loper, Will Mansfield, and David St. John	Bill Cranston (MWH) Paul DeVries (R2 Resources Consulting) Chris Frissell (Independent Consultant) Jeff Schmidt (MWH) Yung-Hsin Sun (MWH) Doug Whittaker (Confluence Research) Tracy Yount (Sapere Consulting)

Introduction

1. Introduction: Bob Burns, Deputy Director of the DNRP gave a brief welcome and overview of the project goals and issues, focusing on the need for King County to provide a balanced approach to WLRD projects.
2. Steve Bleifuhs' provided an overview of the King County Organization, including distribution of a Water and Land Resources Division (WLRD) Organizational Chart.
3. King County WLRD has three business lines with CIP functions, Stormwater Services Section, Ecological Restoration and Engineering Services Unit (Rural and Regional Services Section), and River & Floodplain Management Section.
4. The River & Floodplain Management group provides services to the King County Flood Control District (KCFCD), a separate entity within King County. The group maintains over 119 miles of levees and revetments, and also sponsors, designs, and constructs CIP projects associated with these facilities and with reducing flood risk along the County's major rivers.
5. Flood control projects are largely driven by the 2006 Flood Hazard Management Plan (FHMP) which sets priorities for upcoming projects.
6. Although many of these river facilities have been in place since the 1950's, the group's maintenance budget was previously only $3M annually until 2008 when it was increased to $35M annually as part of formation of the KCFCD..

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7. There are two federal levees in the Green River Basin, one of which is a federally certified levee (FEMA accredited)
8. King County contains all of part of four state-identified Water Resource Inventory Areas (WRIAs). Salmon habitat/recovery plans were developed and adopted for each WRIA. Staff within the River and Floodplain Mgmt group are organized by WRIAs; however, this organizational format is not followed by the other two CIP groups, where staff work in project teams, but can be assigned to projects in a variety of basins. For each of the three CIP groups, projects are prioritized and integrated into 6-year Capital Improvements Plans. The lists are reviewed and updated annually based on funding available and opportunities or emergencies that arise. The KCFCD approves annual CIP lists for Rivers. The habitat restoration and stormwater units have separate project prioritization procedures, but project prioritization lists are consolidated prior to submittal of the annual CIP budget. Ultimately these 6-year CIP lists are reviewed and approved by King County Council. Flood risk reduction, stormwater services, and salmon recovery projects often have some overlap, and in these cases the combined project benefits are factored into the prioritization decisions.

King County PM Practices:

1. King County WLRD is currently developing a Project Management Manual to standardize PM practices. PM's are encouraged to obtain Project Management Institute (PMI) certification. PM's use a combination of software project management tools, including Excel and MS Project and an MS Access project tracking tool. WLRD is currently working with the Wastewater Treatment Division to develop PRISM software for project and contract information tracking and reporting beginning in 2012.
2. What are the risk procedures for the County? Risk management occurs at 2 levels, one level within the project team and one involving the King County Risk Management Group and assigned legal advisors from the King County Prosecuting Attorney's Office, as appropriate. Most project teams regularly perform a risk assessment for major projects, with the degree of formality and documentation varying among CIP groups.
3. Is there a post-project risk review? Projects are monitored due to permits, performance issues, and evolving site conditions. While there is not a specific written plan to address post project risk monitoring, KC owns the long term responsibility for the projects, so frequent follow up at project sites is common. Annual and post flood inspections are conducted on flood facilities in order to identify damage and/or maintenance needs.
4. Value Engineering is not a requirement on these size projects and the County does not intend to establish a formal value engineering process for all projects. However, the Division does use several tools to solicit outside review and input where appropriate. Peer reviews by private consultants are common on complicated projects to obtain an outside perspective on the work. For extremely large projects or those with unique issues, WLRD has employed value engineering on a case by case basis.

Project Drivers:

1. At a site scale, project drivers need to look at two key questions, "what is the benefit of a project" and "what is the detriment of not performing a project". Federal and State regulations, including Endangered Species Act (ESA) and FEMA requirements will also impact what projects are completed and how these are implemented.
2. ESA needs continue to be a driver for the County's participation in, and implementation of the salmon recovery plans in each WRIA, as well as for river and floodplain projects in areas used by ESA-listed species. In general, King County's approach has been to be proactive in conducting voluntary habitat protection and restoration projects and programs and in incorporating features into its projects to make them more consistent with ESA requirements. This approach has largely avoided legal or enforcement challenges related to ESA. Factoring in the needs of listed species is an important driver for both prioritization of projects and for specific design approaches that are used at individual project sites.

Stakeholder Issues:

1. Stakeholder involvement is encouraged at the Countywide planning level to establish project priorities and approaches and has included involvement in the salmon conservation plans for each WRIA, as well as the 2006 FHMP. Stakeholders may include such entities as property owners, other jurisdictions, regulatory agencies, tribes, and other interested community members. The amount and nature of specific stakeholder involvement for an individual project is determined as part of the scoping of the project and varies considerably on a project to project basis. Large projects typically involve stakeholder input as early as 30% Design, and may involve them at additional steps in the design as necessary. Stakeholders typically have more influence over Salmon Recovery Funding Board projects than flood control projects.
2. Stakeholder involvement has been increasing since the 1990's, specifically for use of large wood. As an example, in recent years KC has changed the orientation of logs facing into the channel to go from upstream facing to downstream facing per discussions with recreational stakeholders. Stakeholders have also played a role in the development of the King County Large Wood Protocols. Initially, in 1997 a Boaters Safety Advisory Committee was formed and Division staff worked with that stakeholder group for many years. During the mid-2000's, stakeholder input was more informal for several years until a new and more formal stakeholder process was initiated in 2009 through King County Council adoption of an ordinance, and Division issuance of a public rule in 2010 to specify the process for this stakeholder interaction.
3. To address recreational safety issues, Focus Groups have occasionally been brought into the project between the 30% and 60% design stage to solicit specific design input. These focus groups have included a broad cross section of river safety experts, first responders, and user groups.
4. Stakeholder follow up on large wood placement is typically completed using e-mail lists and project web sites to distribute design plans and explain project rationale. Other stakeholder processes are undertaken depending on the project and the site specific stakeholder issues and needs.

5. In the case of large wood projects, a checklist is initiated at the 30% design review meeting with stakeholders and includes checks at the 30% level, 60% level (if the design approach changes significantly), final design, and adaptive management phase of the project.

Design Standards / Criteria:

1. There is no general policy for 100-year flood (inundation) protection. The desired level of protection is instead developed for a specific project based on project-specific factors. In many areas, 100-year protection may not be adequate, while in other situations there is currently less than 100-year protection and it is infeasible to increase it as part of a project design. Typically the level of protection established for a flood risk reduction project has been based on both scientific and policy considerations. Often times the design standard for stability of levees is 100-year or greater, but the standard for overtopping / inundation of lands behind the levee is less than 100-years, depending on historical levee heights and surrounding floodplains.
2. King County has a program to map and re-map river floodplains in partnership with FEMA, and sets priorities for this mapping program for the many rivers in its jurisdiction. Typically each river system floodplain is re-evaluated and potentially re-mapped on a 5- to 10-year basis. Typically floodplain models are created by consultants, but King County is the responsible entity.
3. There are different goals and objectives for traditional flood protection projects and habitat projects. The goal of restoring floodplain connections and natural channel processes (i.e. dynamic conditions) to reduce flood hazard and improve habitat, needs more effective communication with the public. The widespread lack of understanding within the general public of the vision and likely outcomes of restoring river processes and floodplains has created problems, especially if the community is expecting a well defined and confined channel, which is now expected to deform and meander.
4. KC has a significant property buy-out program for acquiring properties and moving residents out of harm's way. To date, all but one property acquisition has been voluntary. FEMA does not allow condemnation of properties as a method of flood control.
5. Project features can be designed to be fixed or deformable. Some features may even be intended to adjust so that project elements may migrate during flood events. These specific criteria for project elements should be determined as part of the basis for the project design. Engineered log Jams and log clusters that are secured with chains are usually not intended to move. Features such as these have remained secure and in their constructed location and configuration for nearly all King County projects. In the one instance (Cedar Rapids), chained log clusters broke free during a flood event. King County has taken responsibility for the inadequacy of design calculations and construction oversight and has remediated the situation and paid for all necessary cleanup and replacement costs.
6. The major factors for large woody debris (LWD) projects are 1) restoring an element of the floodplain system which may be currently missing due to past management practices; 2) Siting 3) anchoring any fixed wood features through the use of cables, chains and/or ballast, and 4) aesthetic impacts (though King County has not traditionally considered aesthetics to be a project driver). King

County commented that permitting agencies are somewhat narrowly focused on LWD, but the panel mentioned that some small wood has also been shown to be effective, though not able to be anchored.

7. The Panel asked King County if there is a policy or explicit decision to manage 'trained wood' differently than naturally recruited wood. The Panel asked if there has ever been a discussion to adapt King County infrastructure to accommodate this work, i.e. modify the bridge to handle wood in the channel as opposed to removing the wood. Currently there is not an active policy addressing this. However, current KC design manuals and standards due require new or replacement bridges to fully span the 100-year floodplain and allow sufficient freeboard (3-ft) for passage of wood.
8. King County regulates its floodplains on the basis of a "zero-rise" (aka "No Rise") standard that requires that any development in a floodplain cannot result in an off-site increase in the 100-year flood elevation. This is intended to limit the flood-related impacts of any proposed project. The Panel suggested that this "No Rise" / no adverse impacts approach to floodplain management is very difficult to manage in rivers. The Panel also noted that basing no-rise analyses on a 1-dimensional hydraulic model may not show 'real life' behavior. King County staff responded that floodplain modeling to evaluate no-rise is typically done with the most current FEMA-accepted model for regulatory purposes, and this model is typically a 1-D model.

Project Monitoring, Operations, and Maintenance:

1. Project monitoring has been fragmented in the past and frequently driven by regulatory requirements. WLRD has implemented an effectiveness monitoring program for the large habitat restoration projects on mainstem rivers. Salmon monitoring is undertaken by KC and the SRF Board. KC monitoring for salmon recovery focuses on both fish use and habitat changes due to the physical channel and floodplain responses to County projects. The habitat changes are easier to link to the effects of specific CIP projects. Examples of current monitoring efforts include the use of time series of aerial photos to identify changes in rates of channel migration, field surveys of changes in channel geometry, vegetation transects, etc. While it's difficult to tie changes in fish populations to an individual project action, you can track fish use of a specific site. Improvements in fish habitat may take decades to show improvement on fish population / productivity.
2. Two recent surveys of recreational users have been performed, one utilizing a phone survey to a random sample of King County residents coupled with an on-line survey to gauge attitudes regarding river management across the broad spectrum of County residents, the second asking boaters and recreational users a series of questions as they left the Cedar River during the summer of 2010. The phone survey tried to differentiate responses between recreational users, general public, and land owners. The phone survey had over 1700 respondents.
3. The River and Floodplain Management group coordinates closely with the Sheriff's Office on a programmatic scale regarding river hazards, especially as they relate to recreational use. Specifically, KC has an established protocol for investigating potentially hazardous large wood accumulations in County rivers. Complaints are investigated by River and Floodplain Management in conjunction with the Sherriff's Office, to evaluate whether the wood is creating a flood or erosion or

recreational use hazard. If the wood is found to be hazardous, a range of management actions are available.

4. Adaptive management for CIP projects involving large wood is based on project level changes. Typically the protocol is to look at 1) public safety concerns/risks (determined by Sheriff's Marine Unit), 2) damage to facilities (KC's decision to act), 3) project area recruitment of wood (high level decision to remove or leave in place); and 4) ecological performance. These adaptive management protocols are currently being updated and anticipated for completion in the spring of 2012.
5. King County implemented a temporary Personal Floatation Device (PFD) Ordinance this summer. This was temporary as it was easier to get passed by the County on shorter notice and deemed critical given heavy rains and snowmelt from last winter that greatly increased flows in local rivers.
6. The 2006 FHMP requires inventory of wood in rivers and baseline years for comparison. A pilot study is currently underway on the Cedar River.
7. Most WLRD projects do not require ongoing operations per se, though many stormwater projects and some river and floodplain projects will require some level of ongoing maintenance activity.

NOTE: the workshop was followed by a King County led site visit to the Lower Tolt River Floodplain Reconnection Project

AGENDA

MEETING PARTICIPANTS		
Name	Organization	Role
Jeff Schmidt	MWH	Project Lead
Bill Cromston	MWH	Consultant
TRACY Yount	Sapere Consulting	Panel Member
Steve Bleifuhs	King County	King County staff
PAUL DeVries	R2	Panel Member
DAVE GARVIN	King County	KC Staff
CLINT LOPER	"	"
Chris Frisrell	Subcontractor MWH	
DAVID ST JOHN	KING COUNTY/ DNRP DO	DNRP DO Project Mgr
Yung-Hsin Sun	MWH	Panel member
WILLIS MANSFIELD	KING COUNTY	KING COUNTY STAFF
DOUG WHITTAKER	CONFLUENCE RESEARCH	RECREATION PANEL MEMBER
Don Althauser	King Co WLR-SWS	Managing Engr / EOR
JON Hansen	King Co WLRD-ERES	Project Manager

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Appendix G

October 21, 2011

Stakeholder / Expert Panel Meeting Notes

Independent Review of Project Scoping and Implementation Practices
Water and Land Resources Division

Stakeholder Meeting Minutes

Recorder: Jeff Schmidt / Qianru Deng

Location: MWH Offices - Mt. Rainier Conf Room

Date: Friday, October 21, 2011

Time: 9:00 am – 10:30 am

Attendees (MWH / Expert Panel)	Attendees (Stakeholders)
Qianru Deng (MWH)	Karen Bergeron (KC – WRIA 9 Habitat Project Coord.)
Chris Frissell (Independent Consultant)	Yvette Lizee-Smith (Snoqualmie Watershed Forum)
Jeff Schmidt (MWH)	Roger Lowe (Stakeholder)
Yung-Hsin Sun (MWH)	Martha Parker (River Safety Council)
Doug Whittaker (Confluence Research)	Chuck Pillon (Stakeholder)
Tracy Yount (Sapere Consulting)	Scott Stolnack (KC – WRIA 8 Salmon Recovery Coord.)
	Ron Straka (City of Renton)

Stakeholder Meeting (9 am)

1. Jeff Schmidt introduced the project and the reason for this meeting with stakeholders, indicating that due to expert panel member's time constraints, we would try to keep the discussions to one hour. The meeting attendees then introduced themselves and their association with the project.
2. Martha Parker asked about the make-up of the King County design team. Yung-Hsin Sun confirmed that her concerns were about the project design teams and whether structural and geotechnical expertise were involved. The concern originated from failure at the Cedar River and concerns over stability of project materials.
3. Roger Lowe asked Yung-Hsin about projects in California and expressed concerns about the transferability of that project experience to King County rivers. Dr. Sun explained that in fact many of the policy issues dealt with in California are directly applicable to King County, even though the nature of the rivers may be somewhat different. Roger also explained that the Cedar River is rather small, and the topography does not allow function as claimed by King County; there are also problems like erosion and instability, which made Roger question the river suitability for these types of levee setback projects.
4. Roger also suggested that the panel look at the 2006 King County Flood Hazard Management Plan (FHMP), which he believes is simply a list of projects to be completed, but has no real flood hazard management plan or design flood descriptions. This area is a geologically active area and this is not addressed in the FHMP. Roger indicated his desire that MWH should review this

management plan and provide comment to King County. *(Note that this specific review is not part of the WLRD Review project scope - JGS).*

5. Doug asked Roger to give examples of what should be included in the plan. Roger indicated that flood prediction, river capacity, analysis of river changes over time should be included. Jeff then mentioned that King County has indicated that this document will likely be revised in 2012.
6. Roger indicated that the lack of appropriate information in the plan shows lack of competence on King County's part to address these flooding issues.
7. Roger also noted that King County needs to decide whether projects are intended to restore natural conditions or figure out "what actually works" for restoring salmon. Doug asked Roger to be more specific and Roger gave the following:
    a. Limiting factor analysis: big difference in salmon population can be seen when studied in 1995 against 1850. Our rivers are no longer 'natural'
    b. Estimated river salmon return on the Cedar dropped from 500,000-700,000 in 2000 to 30,000-40,000 in 2011.
8. Martha asked what happened to the salmon and why was the run decreased? Chuck mentioned that the Canadians have identified some viruses that harmed the Sockeye Salmon and this could be a contributing factor here as well, though there is no data yet to support this.
9. Roger added that ocean condition should be looked at in case these are governing salmon return. He thought that harvest may also play a big role, though to what extent is currently unknown. His conclusion is that we need to take a more comprehensive view of salmon returns.
10. Yvette asked the Expert Panel whether they would seek inputs from stakeholders beyond this meeting, other than just work with King County. Jeff ensured her that the panel would like to hear from the stakeholders if they have specific concerns, perspectives and recommendations. These comments should be passed on to David St. John at King County who will then pass these concerns on to MWH and the Expert Panel.
11. Roger expressed the concern that the public is not aware of what's going on, and that the County needs to be more transparent on project goals and objectives. He also suggested studying which stream and what part of that stream are doing the best for salmon, which could be a good indicator of what's been done correctly.
12. Martha asked Yung-Hsin about flood control, and whether level set-back projects increase river capacity. Yung-Hsin indicated that levee set-back projects are to 1) store flow, and 2) convey flow. Set-back levees may not always be designed for flood control purposes. They might increase the temporary storage, but there are a lot factor impacting the flood control effectiveness. Martha is concerned that there is no technical evidence regarding flood control benefits of past levee set-back projects.
13. Roger raised concerns that problems were seen with set-backs from other projects (e.g., set-backs in Green River slows down flow and raises river level at that point), but such potential problem were not identified by King County. Yung-Hsin asked whether there is technical evidence of the impact. Roger said no. Yung-Hsin then suggested hydraulic model being done to reflect the changes in river systems resulting from these river improvement projects.

14. Ron added that several factors are usually considered during a project design and implementation: flood control, erosion control, fish habitat protection, and land protection regulations/standards. If the river was left to react "naturally", there will be no benefits for salmon. The practices in the 1950's when many levees were built did not have modern standards or models to predict flood control, levee stability, tree recruitment, erosion, etc. Is letting the river 'go wild' equal to natural conditions? What about downstream impacts from upstream reach naturalization? Are these being adequately evaluated? Does the public view naturalization as a problem when they see bank erosion, emergency repairs, and trees falling into the river in these urban areas?
15. Doug asked if stakeholders perceive how the County handles the tension of the public not understanding the County designs and how these projects resolve the various river issues.
16. Martha mentioned that the City of Renton was not aware of the levee setbacks until she gave the City drawings. Ron indicated that the City was in fact aware of these levees but was not part of the design process. Ron also mentioned that extensive studies of the Cedar River have been completed in regards to fish populations and location. Communication with citizens has not fully explained the design plan to allow for meandering / natural stream conditions. He also mentioned that there are a lot of agencies monitoring the process, such as the permitting agencies, and that permitting may be a way to mitigate project impact.
17. Roger suggested exploring a two-channel approach, with one higher level channel suitable for flood control and another channel to provide habitat for salmon (such as an oxbow).
18. Roger indicated that the peak flood flow of the Cedar River is not natural, being higher and flashier than traditional storms. This could be a result of not allowing for watershed storage. The Green River does not have this issue as it is dam regulated.
19. Chuck indicated that Roger and their team have identified problems and made correct predictions since 1995 regarding project failures. Chuck also indicated that there is a lack of project oversight and feels that these projects have not shown any real benefit, and yet King County continues to move forward with additional projects of a similar nature. He expressed a need to 'learn from the river' and be cognizant of potential magnitude of downstream damage from these projects, such as damage to the City of Renton on the Cedar River. Chuck predicted the failure of engineered wood on the Cedar, which became dislodged and could have resulted in severe damage of Renton's bridge infrastructure, as well as erosion of 50,000 CF of sediment.
20. Ron indicated that a flood control project always needs to balance public safety and salmon recovery. There are always risks, and the City has wrestled with log jams on their bridges for over 100 years. Renton has been evaluating whether these new KC projects increase this risk.
21. Tracy asked stakeholders if they understand the process King County uses to define fish protection vs. flood control projects. Do they know where to engage with the County? Roger believes that the County invites people to meetings and hearings, but they do not act upon inputs from the public and skillfully avoid being responsive.
22. Martha gave examples of the hearing in 1997 which gave rise to the Boating Safety Advisory Committee which was community created, but King County claims credit for. She also feels that

this current review process is largely the result of community efforts and not initiated from a County desire to self audit.

23. Yvette commented that the design process is iterative during design and implementation and additional stakeholders beyond the adjacent stakeholders need to be included. Doug asked whether they were aware of 30% progress meetings with stakeholders and if they prefer an earlier involvement to enhance influence. Yvette agreed that stakeholders were aware of the 30% design milestone but that earlier input would be valuable.
24. Roger suggested comparing river areas with recent changes against those without. He emphasized that King County needs to look at all rivers with recreational uses and factor these uses into all studies. Doug asked Roger if the public safety component of project implementation is effective. Roger replied that it is not effective at all and gave an example that King County promised to develop comprehensive safety standard but this has not being done to date.
25. Scott indicated that he hopes the Panel will ensure King County's plan is being properly developed and vetted using a scientific basis and that variable project elements will be considered in developing future guidelines.
26. Yung-Hsin asked the stakeholders if the process of project implementation is a continual dialogue or developed in pieces? Martha suggested that it has been communicated in pieces. Ron indicated that monthly meetings and sub-committee meetings were held for more habitat-related discussion. In addition, there are advisory committee and technical committee to review projects, budgets, and the flood hazard control plan.
27. Yung-Hsin asked whether salmon recovery and flood control are two parallel processes or if they overlap, and also asked about the common vision of promoting public safety. Ron indicated that the two processes do overlap and are integrated at some level. This includes coordination between the WRIA prioritization, SRF Board Funding, and KCFCD Advisory Committee. Scott confirmed that collaboration exists on past projects, but there is no formal integration of the two directions. Ron added that flood protection is usually the higher priority and mitigation of flooding impacts is required on all projects.
28. Doug asked whether or not King County reviews river projects on a watershed basis, or on a river segment by segment basis. Roger indicated that in his experience King County has not considered the River as a whole but is only looking at each individual reach as a separate entity. Yvette and Scott disagreed with this assessment.
29. Yvette indicated that the Panel needs to ensure that future projects are based on a sound engineering plan with proper consultation of all entities and stakeholders and that the community fully understand the project goals, objectives, and process.

AGENDA

MEETING PARTICIPANTS		
Name	Organization	Role
Jeff Schmidt	MWH	Project Lead
SCOTT STOLNACK	King County / WRIA 8 SRC	Technical coordinator for salmon recovery (WRIA 8)
TRACY Yount	Sapere Consulting	Panel member
YVETTE LIZÉE-SMITH	SNOQUALMIE WATERSHED Forum	WATERSHED COORDINATOR
KAREN BERGERON	KING CO / WRIA 9	GREEN / DUWAMISH HABITAT PROJECT COORDINATOR
DOUG WHITTAKER	CONFLUENCE RESEARCH	PANEL MEMBER - RCC
MARTHA PARKER	RIVER SAFETY COUNCIL	STAKEHOLDER
Chris Frissell		Subcontractor to MWH
ROGER LOWE	self	rlowepe@main.net
Yung-Hsin Sun	MWH	Panel member
Ron STRAKA	City of Renton	Stakeholder
Qianru Deng	MWH	Take notes.
CHUCK PILLOW	SELF	" "

King County

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Appendix H

Additional Panel Reference Citations

Additional Panel Reference Citations

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