CSI Program Update: Status Report

MWPAAC E&P Subcommittee
December 4, 2014

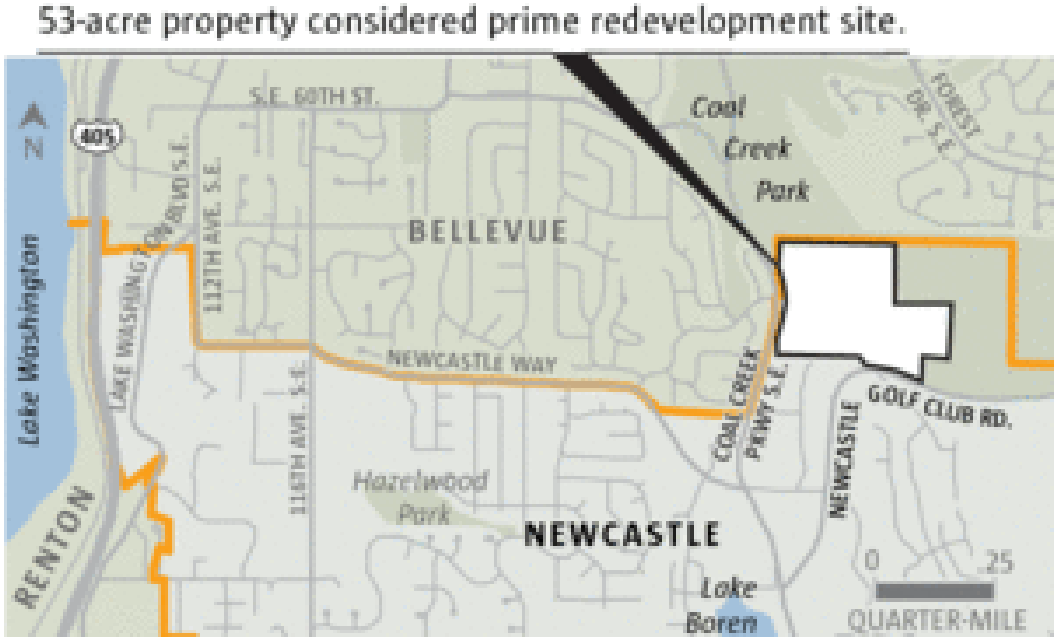
King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Today's Presentation

- Overview of CSI Program Update Status
- Current Activities
  - Local Agency Meetings to discuss initial results of Regional Needs Assessment
  - Modeling work
- Upcoming activities
  - Conceptual projects
    - Process to develop conceptual projects
    - Carry over conceptual projects

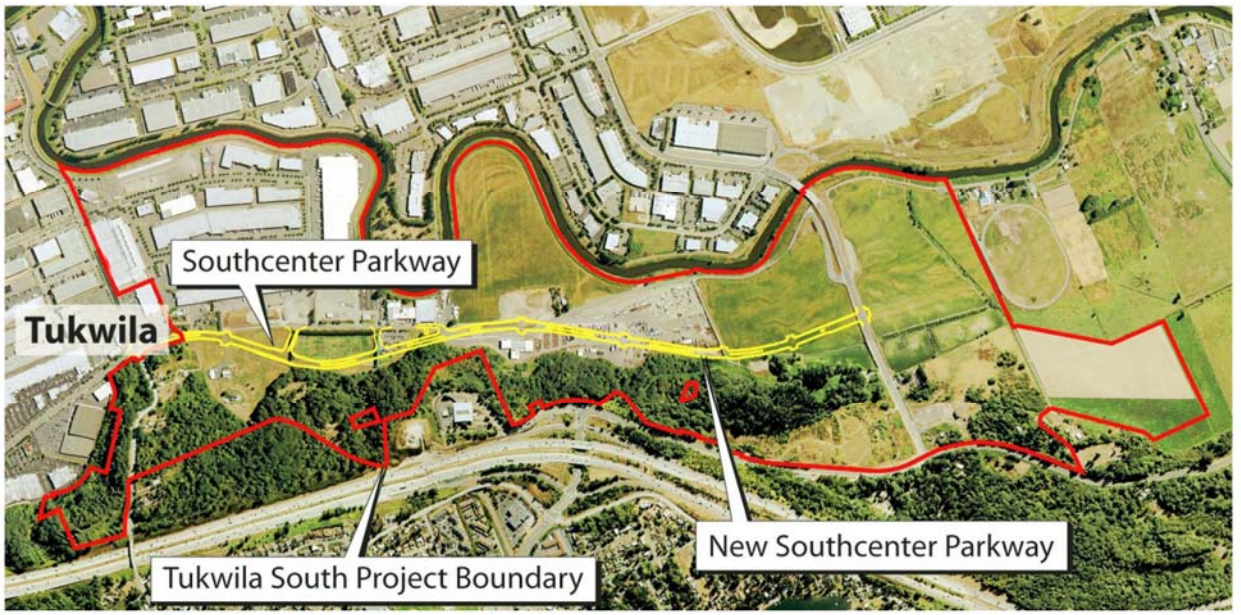
Local Agency Meetings

- Verification of large redevelopment areas
  - Newcastle: Mutual Materials Site
  - Auburn: ICON Materials



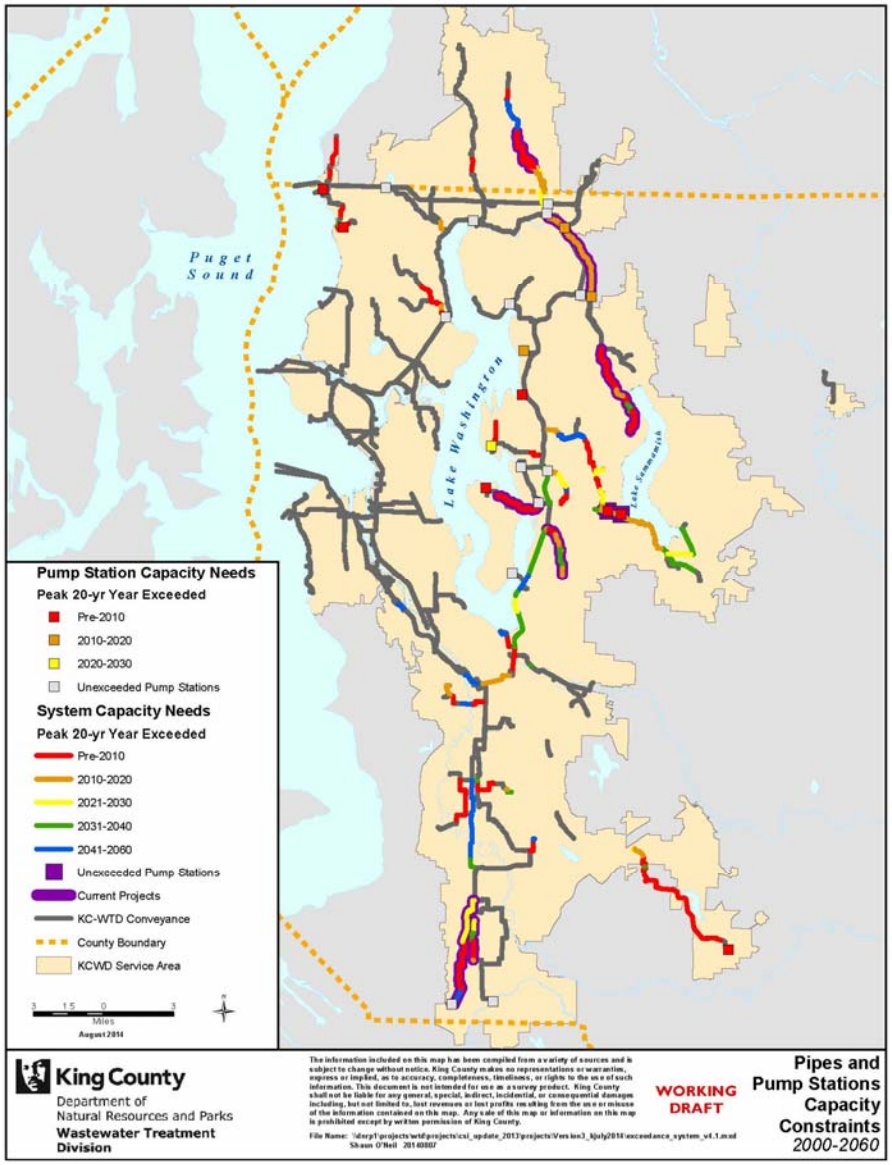
Local Agency Meetings

- Updates to model and/or forecast data
  - Snohomish County: Point Wells
  - Tukwila: South Project
  - Lake Forest Park: Southern Gateway

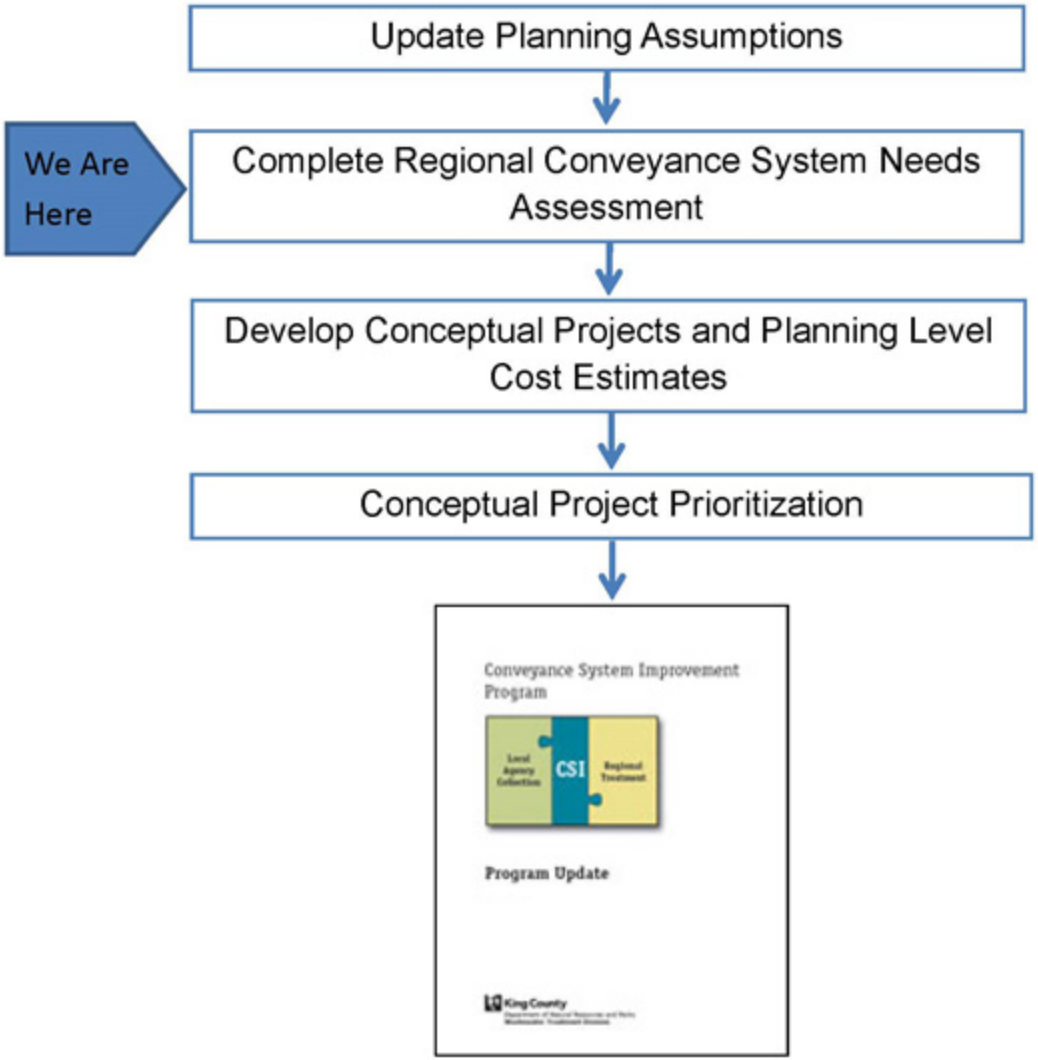


Completing Regional Needs Assessment

- Incorporate input from local agencies
- Migrate from MOUSE to MIKE URBAN



CSI Program Update – Process



Development of Conceptual Projects

7 Process to Develop Planning Level Conveyance System Improvements Alternatives

7.1 Alternatives Considered

Generally, there are seven ways to solve capacity constraints in the King County conveyance system. They include:

1. parallel pipes,
2. replacement pipes,
3. storage to shave peak flows,
4. upgrades to pump stations,
5. replacement of pump stations,
6. flow diversions to other conveyance facilities, and
7. I/I reduction.

The first six options were used to develop a list of projects that will meet all the projected conveyance needs for the CSI Update. This list will be considered a "baseline" against which any I/I reduction effort can be evaluated. Therefore, no I/I reduction was assumed in developing the CSI Update conveyance facility projects.

7.2 Steps in Evaluating Alternatives

The CSI basin planning effort that was conducted in 2000 – 2003 resulted in some preferred alternatives that have been carried forward to this CSI Plan Update. Information from the I/I Program's monitoring and modeling effort was used to update the flow projections in the CSI planning basins. Therefore, some of the CSI Planning alternatives from 2003 and prior are not sufficient to meet the updated conveyance demands. In basins that did not result in a preferred alternative in the CSI Planning process, or in which the preferred alternative is not currently sufficient to meet the latest demand forecast, a new alternative has been proposed.

Development of Conceptual Projects

The general information used and steps taken to develop new alternatives are as follows:

1. Existing pipe and pump station capacities were compared with projected peak 20-year flows by decade through saturation (considered to be 2050).
2. The year when new capacity is needed to achieve/maintain 20-year flow capacity was determined. This occurs when the 20-yr peak flow projection exceeds the current capacity of the pipe/pump station.
3. An assessment was made as to whether it would be more probable that we parallel or replace an existing pipe in the area of restricted capacity. Factors that were considered include:
   - Condition of pipe (end of useful life?)
   - Pipe material
   - Age of pipe
   - Room in corridor for parallel pipe (this information not often available at this level of planning)
   - Number of existing pipes

   For example, if it appears that a pipe or pump station is nearing the end of its useful life, then it was assumed that it would be replaced. If there are already multiple pipes within a corridor and all of them have many years of useful life left, then it was assumed that one of the smaller pipes would be replaced with a larger one to meet the forecasted demand. The other existing pipe(s) could be used to convey flow while the smaller/older pipe is being replaced.
4. After deciding whether to parallel or replace the pipe, the estimate of peak "saturation flows to convey through new pipe was made along with an appropriate pipe size. The CSI Plan Update pipes have a safety factor of 25% applied to the projected 2050 20-yr peak flows. The proposed facilities in the Update include this safety factor in the size of the project required. See Section 7.4 below for further discussion of the safety factor.
5. Possible routes for new pipes were investigated. Aerial photos, parcel information, and topography were used to determine potentially suitable routes for new pipelines.
6. Some factors that were considered in evaluating possible routes included:
   - Stream crossings (microtunneling)
   - Major street crossings and culvert crossings (jack and bore)
   - Wetlands
   - Public Rights of Way
   - Topography
   - Water bodies
   - High water tables
   - Etc.

   Generally, stream and wetland crossings were avoided, if possible. Major street crossings were minimized. Public Rights of Way were preferred to private property routes.
7. The software program Tabula (see Section 10 for description) was used for estimating construction costs for planned facilities, according to likely route/location of new facilities. King County cost factors (sales tax, allied costs, and contingency) were then

Development of Conceptual Projects

applied to derive planning level project cost estimates for each identified conveyance project.

8. If the condition of the pipes indicate they will not need replacing, then a check was made to determine if storage or diversion would be less expensive than paralleling downstream pipes. Generally, storage will be more cost-effective when it can preclude paralleling long stretches of downstream pipe. The amount of flow that needs to be "shaved" from the peak flow determines how much storage is required. The smaller the amount of flow that needs to be shaved, the more likely storage will be cost-effective. A storage curve was developed for each site of interest to determine how much storage would be required to keep the downstream flow under the pipes' capacities. Methods used to estimate storage curves and an example curve is contained below in section 7.3.

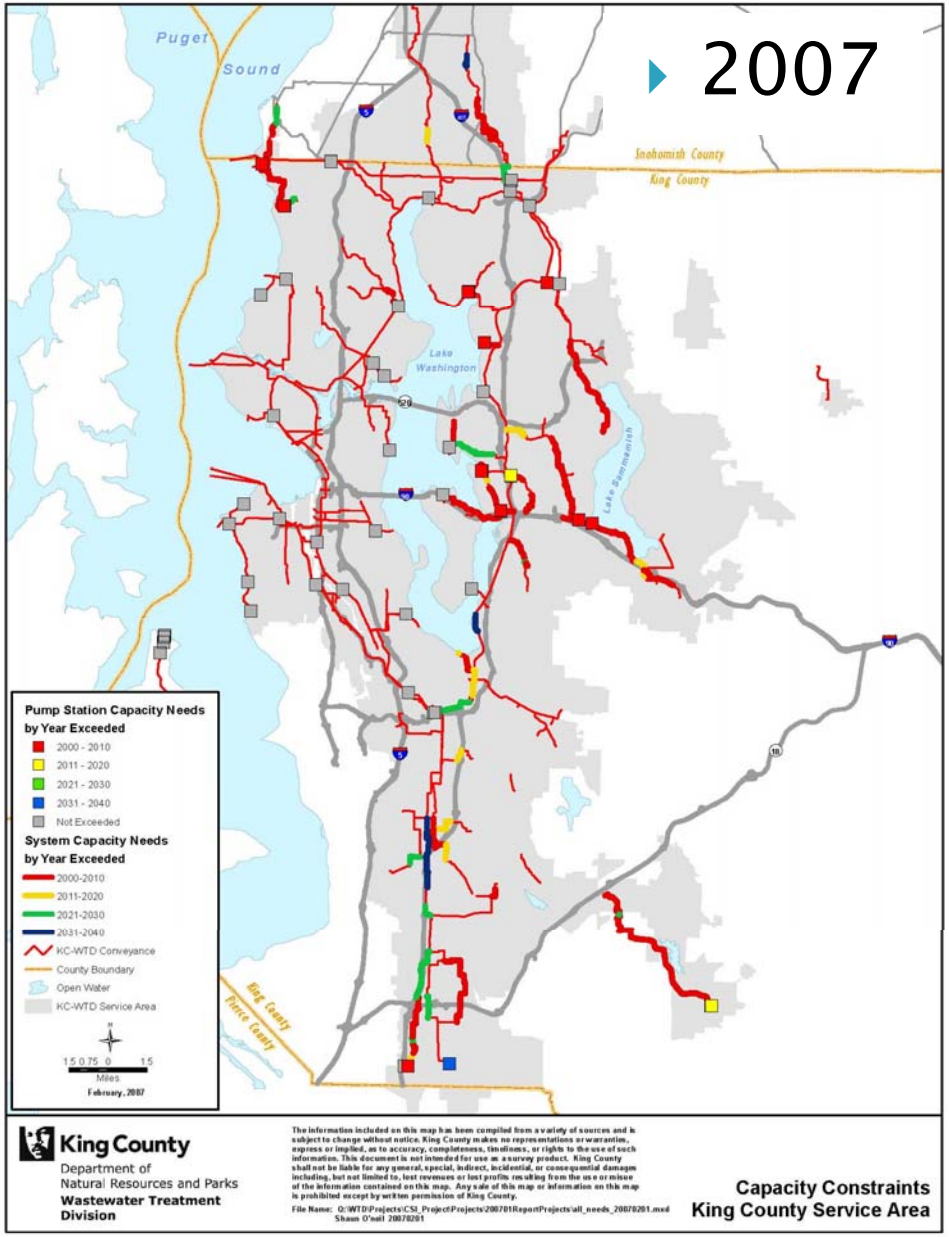
   Flow diversions can also be an effective way to minimize conveyance costs. For example, instead of paralleling the entire Factoria Trunk, a pumped diversion is proposed to take the upstream flow a shorter distance to the Eastside Interceptor. This reduced the planned project cost by more than half.
9. If storage or diversion proved to be a less expensive option in the analysis, it was assumed that the CSI Update project will be storage or diversion instead of paralleling.
10. Storage projects can provide flow relief for multiple pipe reaches downstream. Therefore, if storage was selected to meet the needs for a particular project, the downstream benefits from providing storage were evaluated. Sometimes an iterative process is used to find the optimal combination of storage, diversion, and downstream parallel/replacement costs. In the case of Issaquah, Sammamish Plateau and Eastgate, an iterative process was conducted to provide the optimal storage sizes in each area.
11. Possible locations of new storage facilities were then evaluated. In general, it is better to have a storage facility wherein the flow enters and exits by gravity, precluding the need for pumps and associated electrical and mechanical equipment. An assessment was also made to determine whether a "box" storage or underground pipe storage might be preferred. Generally, using large pipes as underground storage is less expensive than box storage.
12. Once a draft list and figures for proposed facilities was completed, local agency officials were consulted to gather their input regarding particular issues in their communities. Plans for future road and/or utility projects were obtained and evaluated for coincident benefit. Local agency representatives provided valuable input regarding problems with proposed sites/routes and provided suggestions on how or where to locate facilities. This input was used to modify the proposed facility list and update cost estimates.

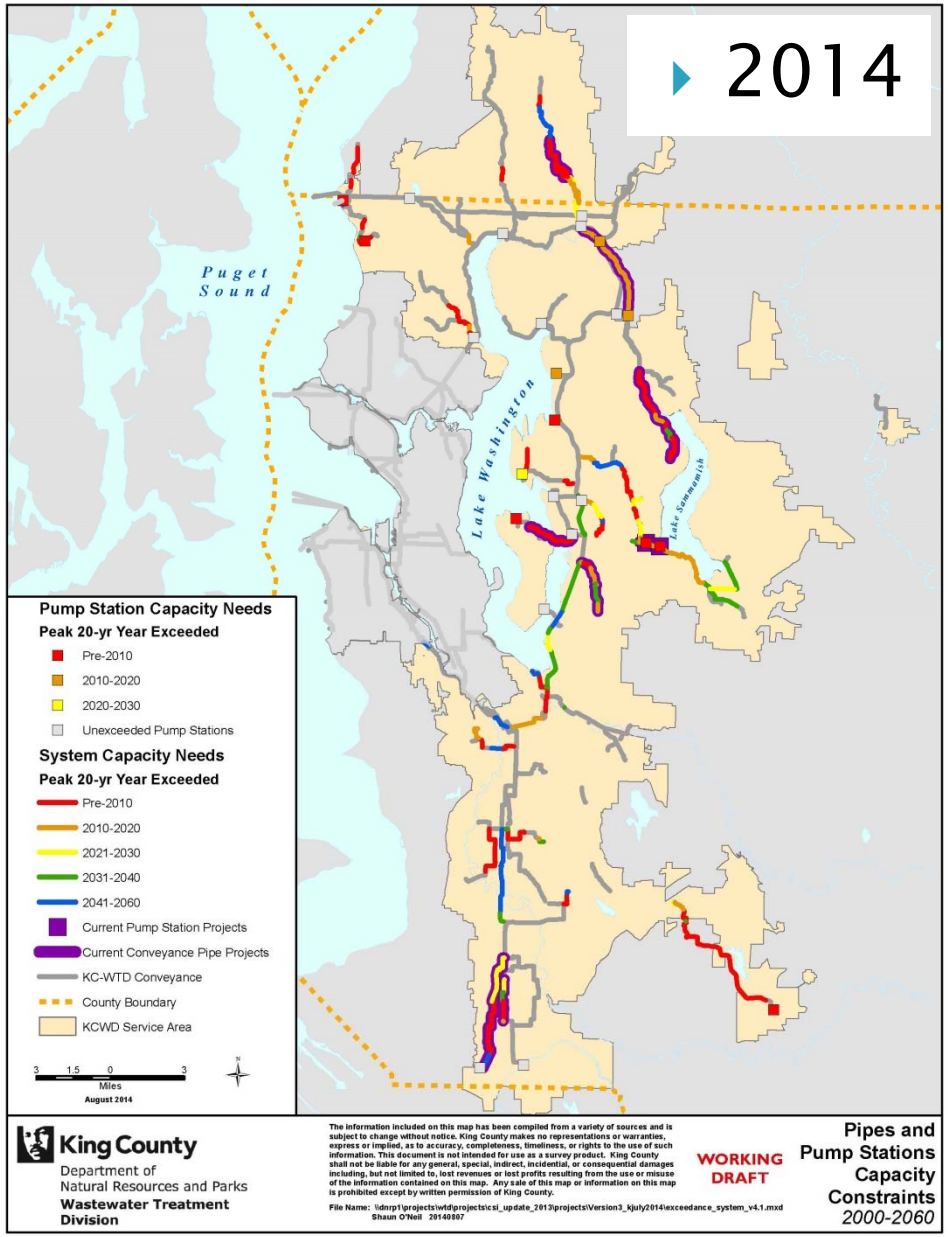
7.3 Determining Required Storage Volumes

The size of a storage facility depends not only on the estimated 20-year peak flow volumes, but also on the capacity of the downstream conveyance facility and on the shape, length, and timing of the storm hydrographs. Therefore, an estimate of the 20-year peak flow is not sufficient for sizing a storage facility.

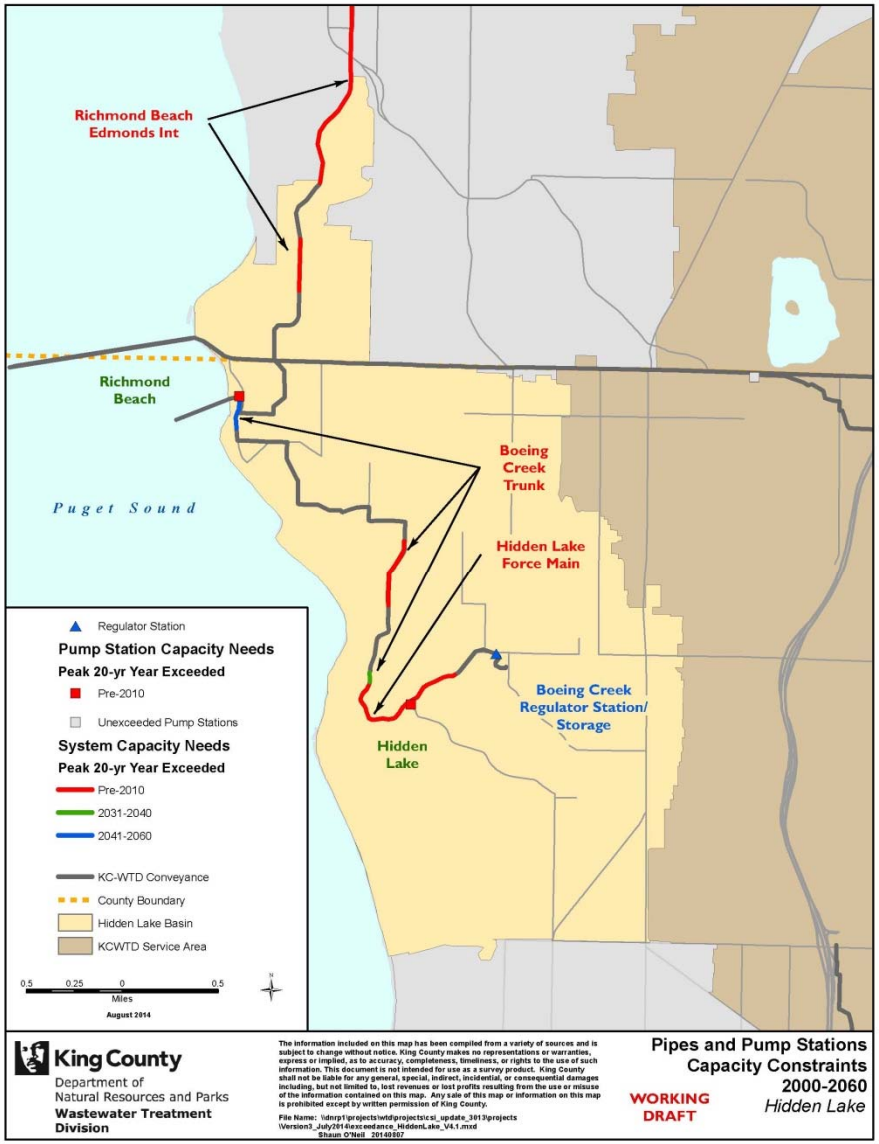
There are serious drawbacks when sizing storage using a design storm, due to the variable antecedent soil moisture and magnitudes, durations, and timing of storm flows. Therefore, King

Initial RNA Results Comparison

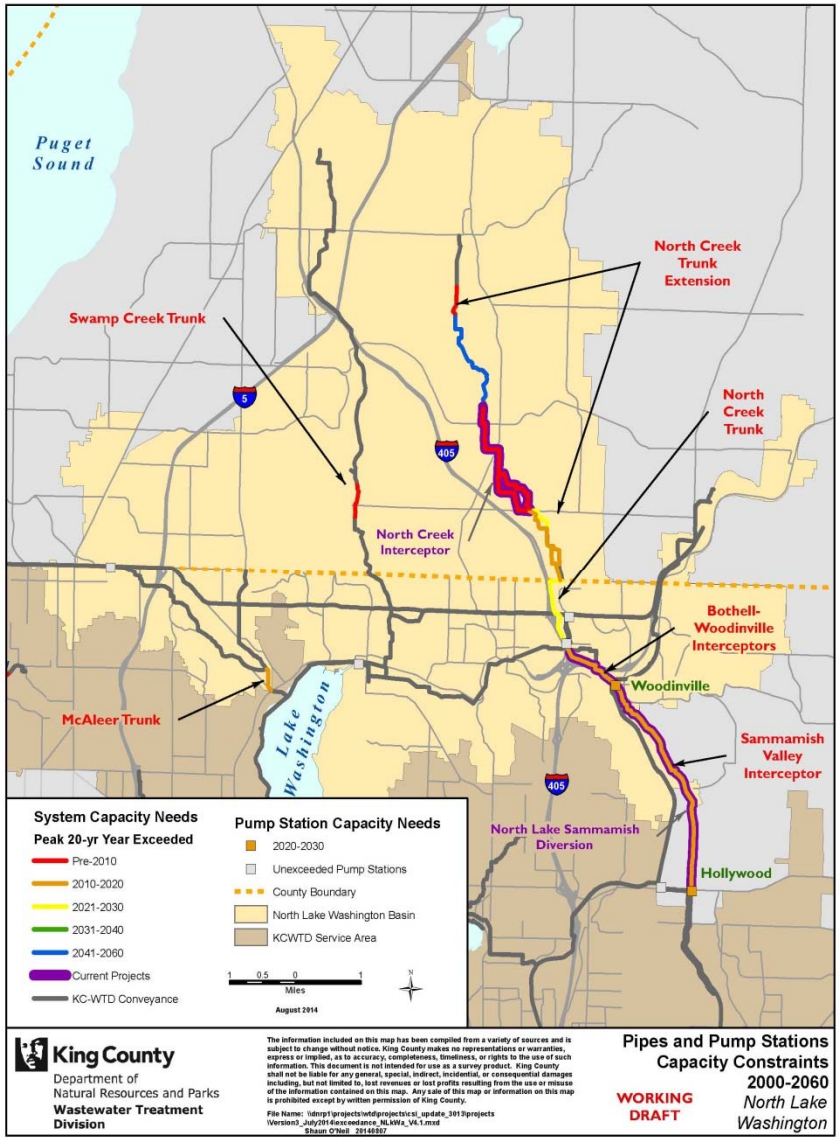




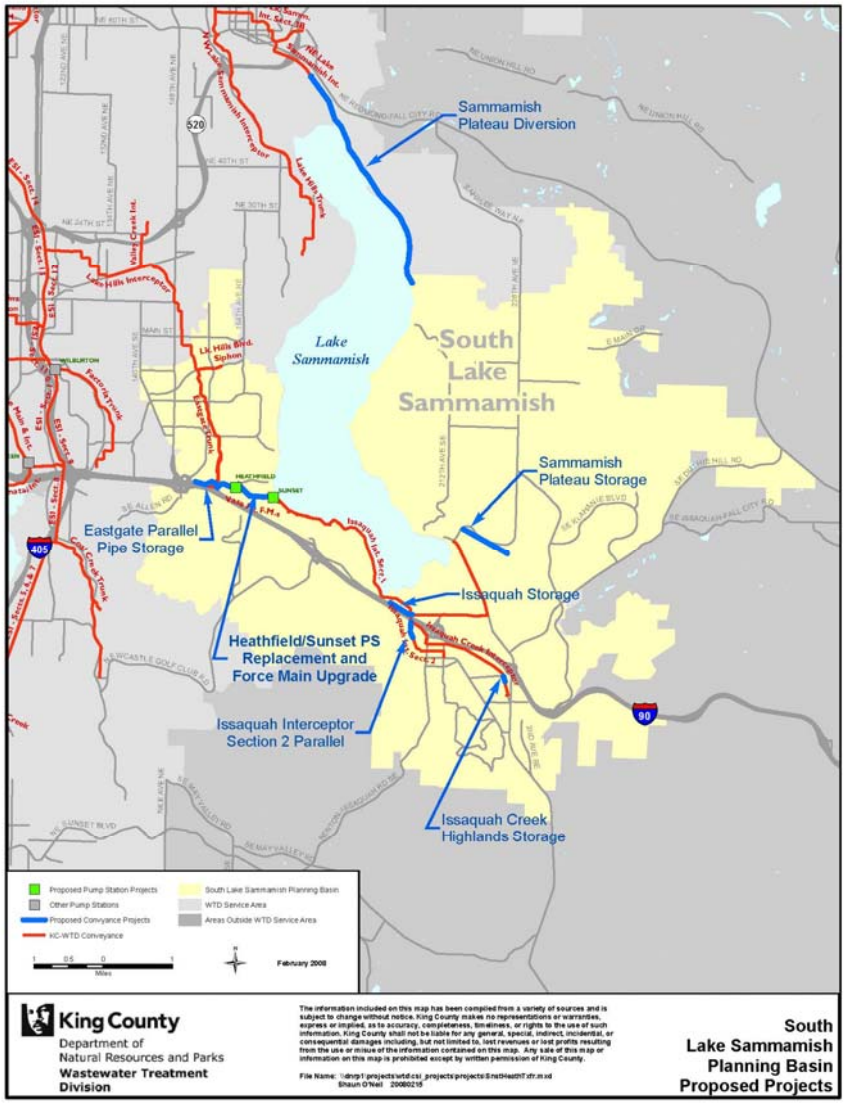
Richmond Beach

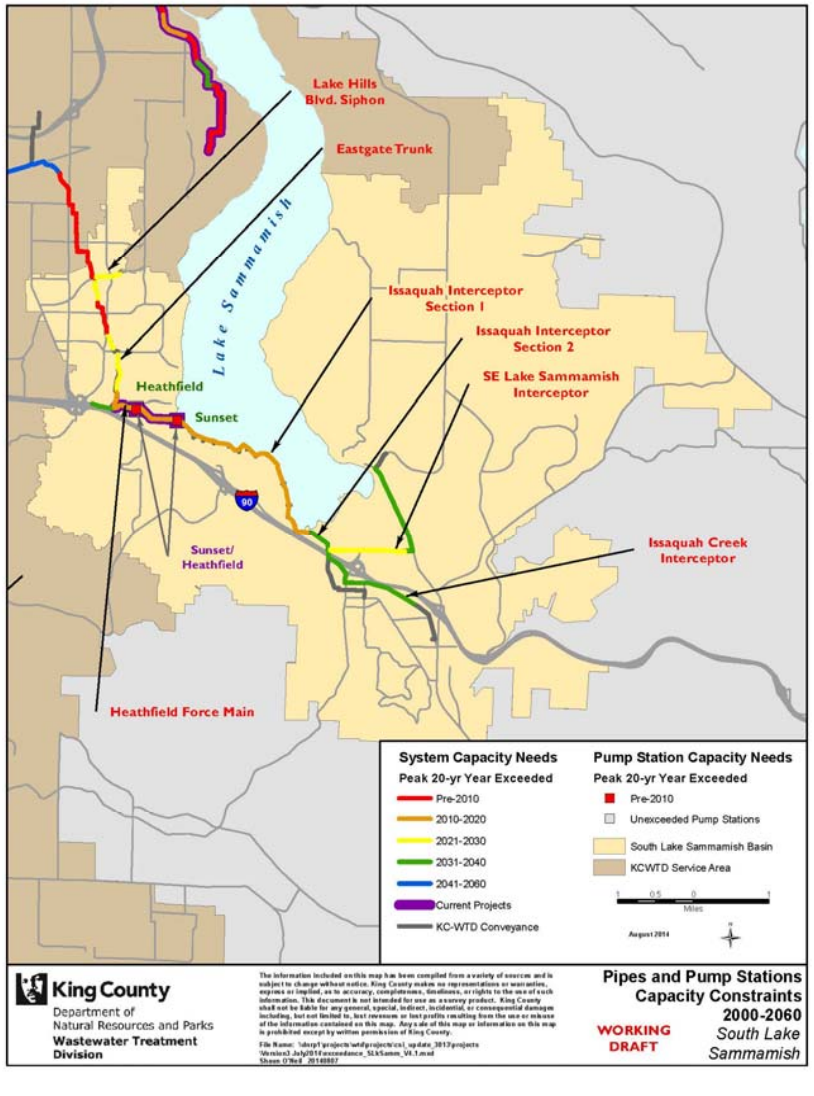


Swamp Creek Trunk

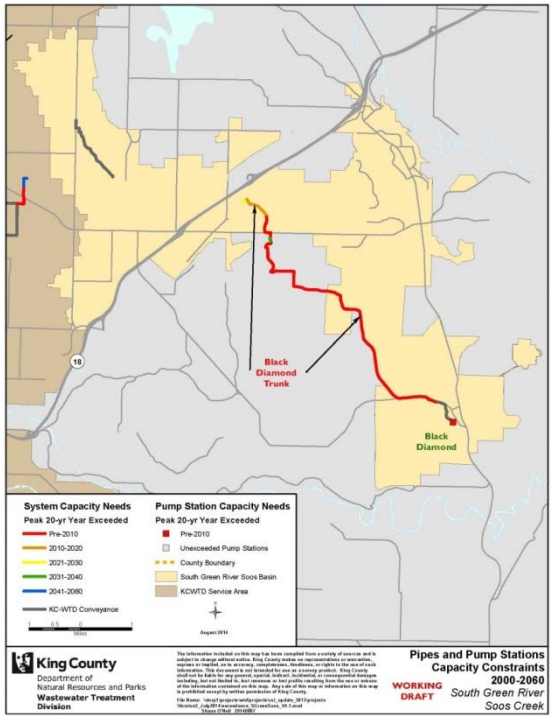


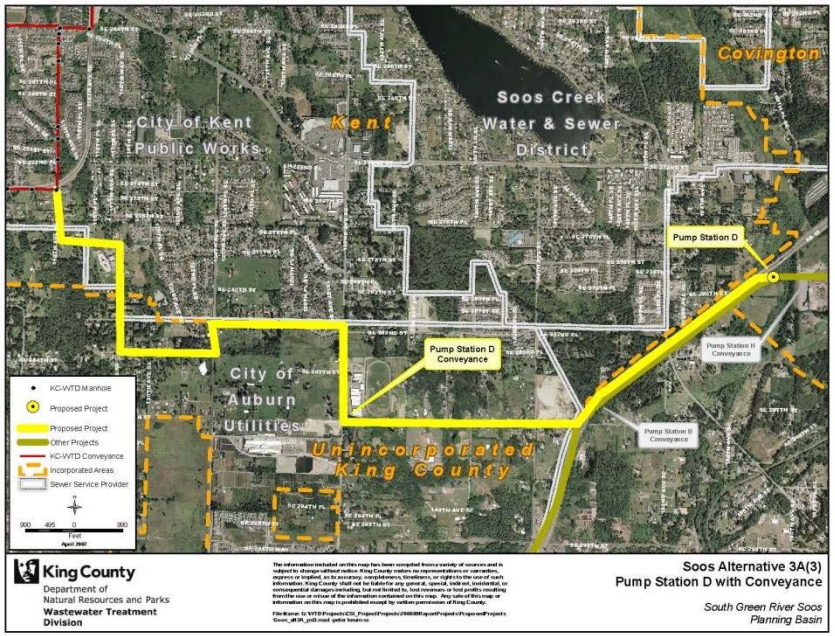
South Lake Sammamish Planning Area

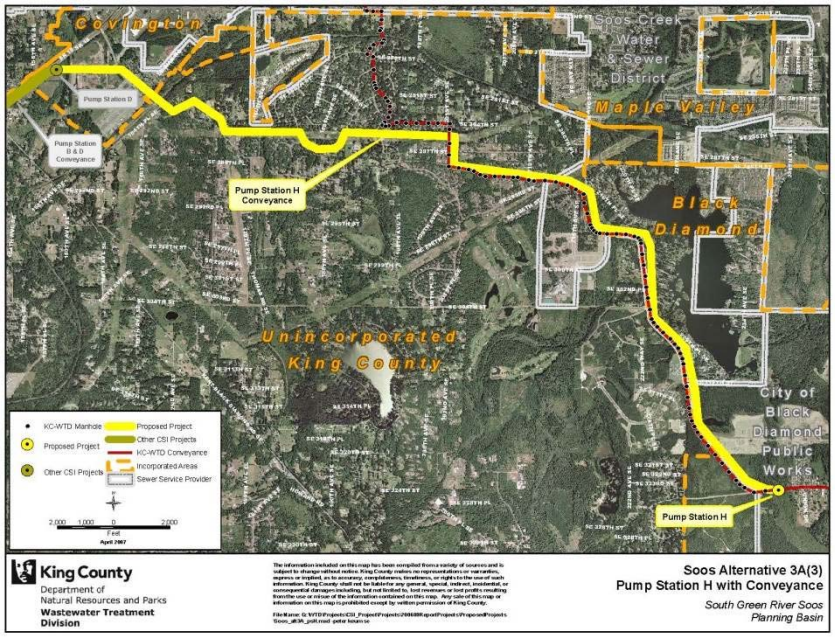




South Green River/Soos Planning Area







Next Steps

- CSI Program Update
  - Finalize Regional Needs Assessment
  - Begin development of conceptual projects
- Upcoming E&P Meeting
  - January 2015 discussion of process to develop conceptual projects.

For additional information or questions, please contact:

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