FY2016-17 BES Budget – Questions from Portland Utility Board (March 4, 2016)

Questions for Both Bureaus:

1. What KPIs/metrics are they using currently to track the CIP work, such as % of projects on time, on budget?
    - Engineering Costs as a percentage of total expenditures.
    - Change orders on construction contracts
    - Safety record
    - Public involvement effectiveness through a post project survey
    - MWESB participation as total percent of dollars to certified firms
    - Accomplishment rate as the percentage of budgeted work accomplished within the year.

2. Are those multi-year capital projects in the current budget submissions that may be over-budget or off scheduled called out in the budget submission?

    Each year the budget submission includes our current estimate of budget and schedule required to complete the project. Variance from baseline is not reported in the budget submission. The Bureau does have a well-defined change management process to address necessary change. All information about prior budget and schedule values are retained and available within our system. For example, we have recently provided information to PUB regarding year-over-year changes in the CIP. Providing information on other periods is possible (but requires a commitment of staff time to assemble information).

Questions for BES:

1. Are they using the latest projected ranges of change in hydrology due to climate change to right size their stormwater facilities for future scenarios of higher intensity and duration storm events?

    Through the BES Resiliency Plan, we are starting to evaluate what the range of projected changes are from climate change and how that could affect facility sizing and performance. A policy recommendation on updating design storms to address climate change risk may be included in the BES Resiliency Plan, depending on the findings of the technical analysis.

    As far as we are aware, the "projected ranges of change in hydrology due to climate change" have not been determined at a specific enough level for the Portland area to make a policy recommendation on design standards. However we do incorporate uncertainty into our hydrologic and hydraulic models and can evaluate a wide range of historic rainstorms including high intensity and long duration events to determine how a system design will respond to those conditions. We have flow monitors in place throughout the City and regularly calibrate and update our hydrologic and

hydraulic models to account for new storm event information, such as what occurred in Oct. and Dec. 2015.

Prior discussions with experts at PSU, OSU, UW, etc. indicate that analysis has not yet been done to specify how the downscaled climate models translate to a range of potential changes in design storms. If a PUB member believes this information regarding projected changes in hydrology is available, we would welcome a discussion. The Water Bureau has done an analysis of potential ranges of changes in hydrology for the Bull Run Watershed, however that information does not translate directly to Portland because the Bull Run area has its own unique microclimate. BES will be building on the WB analysis for the BES Resiliency Plan analysis.

The BES Resiliency Plan is a two-year effort starting in FY15-16. The purpose of the BES Resiliency Plan is to develop a prioritized approach to improving BES resiliency to earthquakes and climate change. The results of the BES Resiliency Plan will be used to integrate resiliency further into the BES Capital Improvement Program (CIP) and BES policy such as stormwater facility design standards.

There are a variety of ongoing university research projects evaluating the potential impact of climate change on the Portland area climate and BES is staying involved in these efforts to understand how their results can inform the Resiliency Plan and analysis of predicted hydrology changes. The Pacific Northwest Climate Impacts Research Consortium is assisting in downscaling global climate models to a local level to provide a variety of potential future scenarios. Global climate models show a range of potential future conditions ranging from hotter and wetter scenarios to hotter and drier scenarios. Some models are currently showing that the total annual rainfall volume in the Portland area may remain relatively constant, however the timing and type of precipitation may change to include a greater frequency of intense rainfall events, longer and more frequent drought periods in the summer, and less snowfall in the mountains. There is more work to do through the BES Resiliency Plan to understand the range of potential future hydrology scenarios and how those scenarios will affect stormwater facility sizing and performance before bringing a policy recommendation to address climate change risk through design criteria.

Additional climate change considerations we will be evaluating in the BES Resiliency Plan include likely flood inundation areas on the Willamette and Columbia Rivers and smaller streams under future climate change scenarios (assisted by a PSU and Bureau of Planning and Sustainability research project) and the potential for hotter weather and longer periods without rain to affect the health of green infrastructure. Other significant predictions of climate change in the northwest include less snowfall and hotter summers, which will likely result in more widespread and intense forest fires and warmer stream temperatures. Through the BES Resiliency Plan, BES will be developing cost and benefit analyses of projects and policy changes to address climate change risk and prioritizing those actions that will reduce risk most efficiently and effectively.

2. Several of the planning documents that are the basis of the watershed management teams project proposals are quite old. Should we consider a refreshed look at those projects in light of the stormwater asset management work, and changing environmental factors? An understanding of actual benefits of these projects in the description would be helpful (stream miles opened, volume of stormwater treated, etc.

   Watershed and Engineering Services staff recognize the age of the existing watershed analysis and CIP project recommendations and are engaged in on-going discussions to reevaluate proposed projects as new information becomes available through stormwater system planning. This is an ongoing effort within a multi-year transition plan that has broad implications that range from internal organizational structure to meeting regulatory requirements to partnership and community expectations. We expect new analytical results to be ready this fall and are prepared to create a more formal reevaluation process to confirm watershed and stormwater priorities as they are currently understood and to quantify measurable benefits. This is not only an effort to refresh older planning efforts but to also improve the handoff from planning work efforts to design engineering.

3. Is there no way to retrofit the crystal springs culverts to support passage on the spring fed system? A million each and we know fish are getting through to Reed. Please provide more detail.

   All of the barriers in Crystal Springs are known juvenile fish barriers primarily due to velocity. Prior to the Crystal Springs restoration effort, all of the culverts were surveyed for fish passability by Interfluve. The assessment used both ODFW and NOAA's fish passability criteria for salmon, steelhead and lamprey. Of the two culverts in question, the Glenwood culvert was rated as the worst passage barrier in the entire system and the Bybee culvert was in the middle. The Glenwood culvert is frequently blocked by debris that exacerbates the barrier. Adults may pass through the culverts freely, as we have seen by adults in the Eastmoreland Golf Course and at Reed College, however we do not have evidence of juveniles rearing above Westmoreland Park.

Table 6. Passage scores for existing culverts on Crystal Springs Creek.

Culvert	Passage Score
S.E. Glenwood (case with weir in place)	13
S.E. Tenino	17
S.E. 28th	18
Carport	19
S.E. Umatilla	20
S.E. Glenwood (case with weir removal)	23
S.E. Bybee	24
S.E. Tacoma	25
S.E. Sherrett	25
Railroad	25
West Branch Golf Course	27
McLoughlin Blvd.	28
East Branch Golf Course	28

See *Final Culvert Assessment Report, Crystal Springs, Portland Oregon. Nov. 2008. Interfluve, Inc.*

Moreover, a more recent USGS report, Hydrologic and Hydraulic Analysis of Crystal Springs Creek in Portland Oregon, has demonstrated that removal of the Bybee and Glenwood culverts will lower the upstream extent of flooding which has significant benefits for upstream landowners and infrastructure including Highway 99, the railroad and the Eastmoreland Golf Course.

Crystal Springs Creek - S.E. Glenwood St.

inter-fluve, inc.

Field Investigation - Culvert Inventory

Date	7/31/08	Time	10:00
Personnel	Burke		
Stream	Crystal Springs Creek		
Culvert	S.E. Glenwood St.		
Culvert Materials	CMP		
Culvert Shape	Circ		
Culvert Length, ft.	75.7		
Slope, %	0.2		
Culvert Cross Section Size, ft	4.0		
Culvert Condition	Sound		
Discharge, cfs	12.0		
Water temperature, deg. F	60.00		
Perched inlet?	No, weir board across inlet		
Perched outlet?	No		
Bed material above culvert	coarse gravel with sand, D50 1"-2", rubble		
Bed Material below culvert	gravel/cobble in main flow, fines on margins		
Water depth inside pipe at inlet, ft.	1.6	outside pipe at inlet, ft.	2.5
Water depth inside pipe at outlet, ft.	2.3	outside pipe at outlet, ft.	2.3
Flow condition at inlet	smooth, controlled by weir board, hyd jump inside pipe		
Flow condition at outlet	smooth, recirculation on margins		
Avg. velocity inside pipe at inlet, ft/s	3.2	outside pipe at inlet, ft/s	1.2
Avg. velocity inside pipe at outlet, ft/s	2.5	outside pipe at outlet,	2.2
Bankfull Width, US of culvert, ft.	21.5	DS of culvert, ft.	35

Notes:

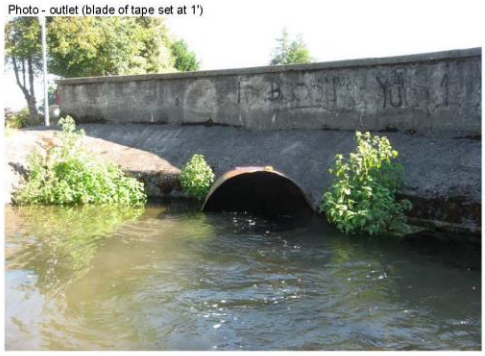
weir board across pipe limits passage, 1' drop in WS at inlet
extensive, thick (2') bed of aquatic veg fill US channel
Discharge measurement 100' DS of outlet, 12 cfs

Photo - look US

Photo - look DS

Photo - inlet (blade of tape set at 1')

Photo - outlet (blade of tape set at 1')



Crystal Springs Creek - S.E. Bybee Blvd.

Field Investigation - Culvert Inventory

Date	7/31/08	Time	8:30
Personnel	Burke		
Stream	Crystal Springs Creek		
Culvert	S.E. Bybee Blvd.		
Culvert Materials	Concrete		
Culvert Shape	Circ		
Culvert Length, ft.	79.0		
Slope, %	0.3		
Culvert Cross Section Size, ft	3.8		
Culvert Condition	Sound		
Discharge, cfs	12.0		
Water temperature, deg. F	60.00		
Perched inlet?	no, slight embed		
Perched outlet?	no		
Bed material above culvert	fines/pea gravel, small rock sill at entrance		
Bed Material below culvert	1" gravel main flow, rock at outlet, fines/organics at margins		
Water depth inside pipe at inlet, ft.	1.7	outside pipe at inlet, ft.	1.5
Water depth inside pipe at outlet, ft.	1.75	outside pipe at outlet, ft.	2
Flow condition at inlet	smooth, contraction along inlet walls		
Flow condition at outlet	smooth		
Avg. velocity inside pipe at inlet, ft/s	3.2	outside pipe at inlet, ft/s	2.3
Avg. velocity inside pipe at outlet, ft/s	2.9	outside pipe at outlet,	2.8
Bankfull Width, US of culvert, ft.	21	DS of culvert, ft.	22

Notes:
USGS gage just US of culvert
duck pond DS
Discharge measurement 100' US of inlet, 12 cfs

Photo - inlet (blade of tape set at 1')

Photo - outlet (blade of tape set at 1')

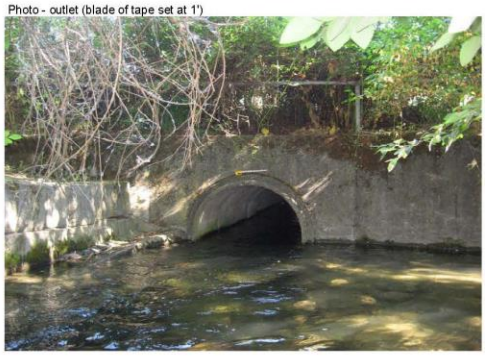


Photo - look US

Photo - look DS

4. Please provide estimates of actual fish habitat availability above proposed culvert replacements (not just the miles of stream).

Prior to the construction of any of the Crystal Springs culverts, BES contracted with ICF International to evaluate the potential restoration benefits of the most immediate restoration actions in Crystal Springs, as well as additional future projects in Johnson Creek using a commonly used habitat model Ecosystem Diagnosis & Treatment (EDT). (See "*Johnson Creek Salmonid Potential with Future Urban Development, Climate Change and Restoration: 2009 to the 2040s", March, 2011, ICF International*.) The report looked at both the existing conditions, individual projects vs. cumulative benefits, as well as habitat benefits assuming climate change impacts. The following tables are extracted from the report; however the report provides a breakdown of benefits per life stage for coho, chinook and steelhead on pgs. 39-41. Furthermore, the analysis shows a significant increase from the synergistic effect of all of the projects combined. Examining the projects in isolation underestimates the total benefit. For example, the benefit of the SE 28th project was zero but increased significantly when other downstream culvert replacements were included in the assessment. Moreover, as indicated in Table 15, the benefits of the restoration projects in Johnson Creek and Crystal Springs are beneficial for salmon even accounting for climate change impacts.

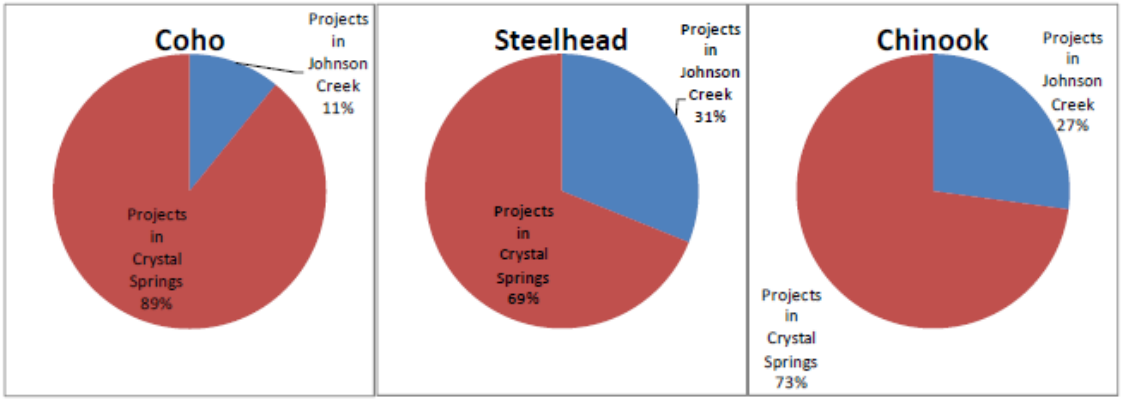
Table 9. Increase in Habitat Potential (in Numbers of Adult Salmonids) with Crystal Springs Creek Future Restoration Projects

Restoration Project	Coho	Steelhead	Chinook
Fish Passage Improvements (, Tacoma, Glenwood, and Bybee)	1	1	7
Fish Passage Improvements (Umatilla to Tenino)	9	2	9
Westmoreland Pond	4	3	1
28th Avenue Habitat Restoration	0	0	0
Sum of gains from individual projects	14	6	17

Table 12. Relative Increase in Habitat Potential (in Numbers of Adult Salmonids) in Johnson Creek and Crystal Springs Creek from Multiple Planned Restoration Projects

Evaluation	Coho	Steelhead	Chinook
Combined projects in Johnson Creek	18	14	19
Combined projects in Crystal Springs Creek	148	31	51
Sum of gains from 2009 to future restoration	165	50	73

Figure 12. The Relative Percent Contributions to Increased Habitat Potential from Multiple Restoration Projects Allocated between Johnson Creek and Crystal Springs Creek



5. Is there a report or document that articulates the efficacy of the Watershed Investment Program? How are these projects tracked and maintained over time?

The intent and objectives of the Watershed Investment Program are to have an effective, efficient way to move smaller watershed projects from planning to funding and implementation, and to leverage other resources and partnership opportunities in a timely manner.

We evaluate the program every couple of years with an eye to those goals. Attached is report provided to CIPAC in late 2013, and we are currently working on the next one.

One of the primary program objectives is leveraging resources. While we can't calculate all of the volunteer opportunities and partnership benefits leveraged, or the indirect contributions of other bureaus, we do track the grants and other bureau/agency cash contributions leveraged (see attached - 22% across all projects currently.) Grant opportunities have varied over the years for this kind of work.

The program is not intended to achieve a specific set of environmental/watershed health metrics (e.g., xx miles of stream restored), as the projects that come through WIF are a mix of restoration and stormwater projects of different types, across all watersheds, with various drivers. WIF is really a funding mechanism that funds projects from multiple watershed programs.

Projects are tracked and maintained the same way as any other CIP project. Each individual project's objectives and efficacy are monitored and evaluated within the context of the specific watershed where it's located:

- Example: Johnson Creek projects (WIF, other CIP, grants, etc.) are monitored and results reported in the Johnson Creek Project Effectiveness Monitoring reports (e.g., last report from 2012: https://www.portlandoregon.gov/bes/article/428010).
- Example: Fanno and Tryon Creek projects are included in F/T Project Implementation Report, WQ monitoring trend reports, photo monitoring of projects

Like other CIP projects, WIF projects are tracked as BES assets and have long-term maintenance by either BES or the partner bureau (often PP&R).

6. Are there any plans to conduct a comprehensive review of the Street tree / Tree Program / Watershed revegetation programs, their overlapping roles, and the funding needs and benefits provided to multiple bureaus?

There are currently no plans to conduct a comprehensive review because the Watershed Revegetation Program (WRP) is part of the Wastewater Group and is a separate program from the Environmental Services Tree Program (ESTP) in Watershed Services.

The ESTP plant street and yard trees to manage stormwater and protect human health by improving watershed health and the environment. The ESTP works with partners such as Friends of Trees, on-call BES tree planting contractors, and property owners to plant trees.

The WRP provides adaptive, cost-efficient vegetation solutions that benefit stormwater management and water quality by improving watershed health in two core program areas:

- Natural area vegetation management and enhancement
- Water quality facility vegetation management

The WRP delivers vegetation management and enhancement projects that further the goals of the Portland Watershed Management Plan, the Comprehensive Plan, and the Citywide Systems Plan by establishing or maintaining the City's green assets. The WRP works with BES Design and Construction staff in planning and implementing vegetation in support of Capital Improvement Projects (CIP) associated with pipe and stream enhancement projects. The WRP also provides services for Capital Improvement Projects in other bureaus such as the Portland Water Bureau, Portland Bureau of Transportation, and Portland Parks and Recreation. The costs for these services are fully reimbursed. Some of the typical vegetation management and enhancement activities include:

- Riparian revegetation to improve water quality

- Invasive species control
- Aquatic and terrestrial habitat enhancement
- Canopy development and protection

The WRP provides vegetation maintenance for City-owned stormwater management facilities (SMF) such as green streets, proprietary stormwater facility devices, and regional water quality facilities (e.g. ponds, treatment wetlands). This includes design, planting and establishing vegetation in new SMFs, and plan review and field inspections during construction. Trees planted in SMFs are considered “street trees” because they are located in the right-of-way; however, they are project related trees triggered by the Stormwater Management Manual or other landscaping requirements.