

# Agenda

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## ENVIRONMENTAL SERVICES COMMISSION MEETING

450 - 110th Avenue NE (City Hall)  
Conference Room 1E-113  
Thursday 6:30PM  
October 17, 2013  
Regular Meeting

- |   | <u>Page No.</u> | <u>Action</u> |
|---|-----------------|---------------|
| 1. Call to Order – Brad Helland, Chair  |                 |               |
| 2. Oral Communications<br>Note: Three-minute limit per person, maximum of three persons<br>for each side of topic.<br>Additional presentation may be heard at Agenda Item 8.  |                 |               |
| 3. Approval of Agenda *   | 1               | X             |
| 4. Approval of Minutes * <ul style="list-style-type: none"><li>• September 19, 2013</li></ul>   |                 | X             |
| 5. Reports & Summaries <ul style="list-style-type: none"><li>• Council Calendar *</li><li>• ESC Calendar *</li><li>• West Side Storage Project *</li><li>• Wastewater System Plan Update *</li><li>• City Comprehensive Plan Update *</li></ul> |                 |               |
| 6. New Business   |                 |               |
| 7. Director's Office Report   |                 |               |
| 8. Continued Oral Communications  |                 |               |
| 9. Adjournment  |                 |               |

\* Materials included in packet

# Materials separate from packet

Wheelchair accessible. American Sign Language (ASL) interpretation available upon request by calling (425) 452-6466 (v) at least 48 hours in advance. Assistance for the hearing-impaired: Dial 711.

**CITY OF BELLEVUE  
ENVIRONMENTAL SERVICES COMMISSION  
MEETING MINUTES**

Thursday  
September 19, 2013  
6:30 p.m.

Conference Room 1E-113  
Bellevue City Hall  
Bellevue, Washington

**COMMISSIONERS PRESENT:** Vice Chair Swenson; Commissioners Cowan, Mach, Morin<sup>1</sup> and Wang

**COMMISSIONERS ABSENT:** Chair Helland

**OTHERS PRESENT:** Deputy Director Bob Mulvey, Pam Maloney, Kit Paulsen, Joe Harbour, Jay Hummel, Councilmember John Stokes<sup>2</sup>

**MINUTES TAKER:** Laurie Hugdahl

**1. CALL TO ORDER:**

The meeting was called to order by Vice Chair Swenson at 6:30 p.m.

**2. ORAL COMMUNICATIONS - None**

**3. APPROVAL OF AGENDA**

**Motion made by Commissioner Cowan, seconded by Commissioner Mach, to approve the agenda.**

Deputy Director Mulvey stated that the Solid Waste Contract Vendor Selection Summary under *Reports and Summaries* would be removed from the agenda. This will most likely be moved to next month or until the negotiations with the new vendor are complete.

**Motion passed unanimously to approve the agenda as amended (4-0).**

**4. APPROVAL OF MINUTES**

July 11, 2013 Regular Meeting Minutes

**Motion made by Commissioner Cowan, seconded by Commissioner Wang, to approve the minutes as presented. Motion passed unanimously (4-0).**

**5. REPORTS AND SUMMARIES**

- Update on 2014 Solid Waste Contract Vendor Selection  
*Postponed to next meeting*

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<sup>1</sup> Commissioner Morin arrived at 6:38.

<sup>2</sup> Councilmember Stokes arrived at 7:01 p.m.

- Shoreline Master Plan

Kit Paulsen, Watershed Planning Team Supervisor, gave an update on the Shoreline Master Plan. She explained that after the Council meeting in July (summarized in the ESC packet) staff has been working to finalize the Shoreline Master Program. One approach to this is concurrency review of the code. At the same time staff is meeting with Ecology to clarify any misunderstandings or editorial issues as well as substantive issues. Development Services staff has met with Ecology twice and will be bringing the findings forward to the Council on October 7. There will be a number of briefing sessions with Council on the contents of the Shoreline Master Program and the areas where there are still substantive issues with Ecology. These have not been scheduled yet. Staff will be going through the Cumulative Impacts Analysis to say whether or not the package will offset any impacts. Ms. Paulsen stated that she has reminded the Development Services Staff to keep the ESC and the Parks Commission abreast of issues.

Commissioner Wang asked if there has been any resolution on the setback issue. Ms. Paulsen thought that that was an issue which would be included in the Cumulative Impacts Analysis. It is still the Planning Commission's recommendation, but the Council has some questions about what the content of the Shoreline Master Program is and won't move to adopt it until a series of briefings is completed. Commissioner Mach thought that this issue had already gone through Ecology. Ms. Paulsen replied that there have been no negotiations with Ecology about this. Council has directed Development Services staff to meet with Ecology and clarify any misunderstandings, but Council has retained any negotiations for their purview. Right now the City is still under the old Shoreline rules. The proposed changes have to go through Ecology and get their concurrence before being applied. Ms. Paulsen stated that Ecology does not want to make a ruling on this until they see the full package of the Cumulative Impacts Analysis. She stressed that the Council is well aware of the ESC's position on the buffer issue.

Vice Chair Swenson asked if the City Council has had any discussion about the points raised by the ESC. Ms. Paulsen clarified that the Council has not had any discussion about the content of the draft yet. That discussion will occur after the Cumulative Impacts Analysis.

#### Information

- Council Calendar

Deputy Director Mulvey solicited any comments or questions about the Council Calendar. There were none.

- ESC Calendar

Deputy Director Mulvey restated that the update on the Solid Waste Contract would be rescheduled to the October meeting.

## Presentations

- City Comprehensive Plan Update

Pam Maloney, Water Resources Planning Manager, Utilities Department, reviewed staff's proposed changes to the three elements of the Comprehensive Plan that most touch the Utilities' lines of business; those include the Environmental Element, the Capital Facilities Element, and the Utilities Element. She referred to the table on pages 17-23 in the ESC packet. She reviewed the proposed changes staff is recommending that were considered the most significant (highlighted yellow in the packet).

### Utilities Element

Ms. Maloney stated that staff is proposing adding policy language in support of the asset management approach (pipes, pump stations, reservoirs). Commissioner Morin asked for clarification of what "assets" are. Ms. Maloney stated that the term refers to management assets including pipes, pump stations, and reservoirs. Commissioner Morin asked if "assets" used in this sense are thought of in terms of depreciation. Ms. Maloney affirmed that the City follows accounting practices for depreciating asset value of the assets. Commissioner Morin commented that he feels the broad language is a good approach because it doesn't tie the hands of the City to follow a certain course.

Commissioner Mach noted that the proposed changes in content were summarized for them, but asked for more information about crafting the actual language. Ms. Maloney explained that the Planning Commission and Comprehensive Plan Team have invited comments from many different boards and commissions as well as 1-public stakeholders. The Comprehensive Plan Team will eventually craft language based on input received from many different sources. Right now staff is just looking at the content issues. Ultimately the Planning Commission will recommend the new Comprehensive Plan policy language to the City Council for adoption. Commissioner Mach asked if the policies would eventually require program or procedure changes for staff. Ms. Maloney explained that many of the proposed changes are catching the policies up to best practices that staff already uses. She reiterated that several of these are broad policies, but there are already other more specific ones.

Ms. Maloney then discussed the proposal to add a broad policy statement that fully captures the Solid Waste Utility mission to provide a convenient, efficient, environmentally-friendly and unobtrusive solid waste collection system. Commissioner Wang expressed concern about the general language. Ms. Maloney reiterated that there is more specific language following this in the Utilities Element of the Comprehensive Plan. Vice Chair Swenson concurred and emphasized that it is essential to have this type of general language in the Comprehensive Plan in order to strengthen the City's position. Ms. Maloney agreed that this makes the city's

authority even stronger. Commissioner Morin stated that he likes the broad language because it protects the activities of the utilities. Ms. Maloney added that the budget item requests always have to cite policies.

Commissioner Mach referred to UT 25 regarding water quality education and recommended more of an emphasis on education including partnering with public schools. Ms. Maloney noted that the City provides curriculum for schools and the Stream Team utilizes all sorts of connections with school districts. Vice Chair Swenson agreed with Commissioner Mach that education is extremely important. He referred to a *Times* series on the health of the oceans and stated that it is critical that we teach the children.

Commissioner Mach recommended spelling out the acronyms such as LOS. Ms. Maloney concurred, and indicated that staff would clarify all of the acronyms.

### Environmental Stewardship Policies

One of the proposed additions for the Environmental Stewardship Policies is to add a policy about aquatic habitat. The reason this is being proposed is to emphasize the desire of the community to have a healthy aquatic habitat throughout the City based on the application of Best Available Science. This requires public and private collaboration because data about the streams is necessary to determine how to best invest resources. The proposed changes would state that the City should be the steward of information relative to aquatic habitat on public and private property, and should develop a plan leading to overall habitat improvements throughout the City. The proposed language would be broad enough to not oblige the City to take certain actions, but to make the best decision about investing resources.

Commissioner Mach expressed some concern that this might require property owners to do something in the future. Ms. Maloney explained that the intent of the policy was not to create obligations for property owners. Councilmember Stokes added that it would also give the City the opportunity to talk to people about this.

Commissioner Morin asked if trees are considered part of the stream and habitat ecosystem. Ms. Maloney replied that trees are mentioned in the Comprehensive Plan and are a focus in the Planning and Community Development Department because there are concerns about the impact of the shrinking tree canopy on the City. This would fall under Land Use regulations. She noted that over recent time the canopy has shrunk 20% due to development. Utilities staff didn't focus specifically on that during policy review, but there is a lot of interest from others. These three elements were reviewed by Utilities because they most closely impact the Utilities Department; however, Ms. Maloney welcomed any additional comments or concerns about policies in other elements from the ESC. Commissioner Morin expressed concern about the tree canopy, especially as it relates to preservation or restoration. He referred to the widening of

520 as an example of the shrinking of the tree canopy. Ms. Maloney added that this is happening citywide.

Vice Chair Swenson concurred with Commissioner Morin's concerns. He noted that one place the ESC is involved with canopies is along the streams. He recommended that language concerning the temperature of streams be also included. There was general discussion about the importance of preservation and restoration of the canopy because of a concern about surface water temperature.

Vice Chair Swenson commented that a municipality generally controls 20-30% of the land in rights-of-way. Street trees can be extraordinarily critical in cooling the pavement. He recommended encouraging language in support of this. Councilmember Stokes commented that Bellevue typically does a good job with landscaping the streets, but that is something to watch out for to make sure it isn't cut when there are financing restrictions. Ms. Maloney stated that she would craft some language regarding the proposed language and bring it back in October for consideration.

Vice Chair Swenson raised a question about the proposed change to EN 36. He recommended adding "littoral" in addition to "riparian" so that the lakes would be included as well.

Next steps:

Ms. Maloney indicated she will incorporate Commission comments for their approval in October.

Ms. Maloney stated that staff will then work with others across departments to craft policy language to take to the Planning Commission. The draft policy updates will come back to the ESC for review in early 2014. Councilmember Stokes encouraged the Commission to bring up any additional issues that might come up.

- Sewer Lake Line Report

Jay Hummel, Senior Engineer, Utilities Engineering, spoke about the condition assessment of the sewer lake line that the City has been doing for the last couple years. The City is wrapping up Phase 1 of a multiphase program. Mr. Hummel reviewed some background on the Lake Washington lake lines. There are almost 15 miles of sewer lake line in Lake Washington plus 10 pump stations and 8 flush stations. The majority of the sewer pipe lines were constructed in the 1950's-60's. There are mostly cast iron "CI" pipes (10 miles) with about four miles of Asbestos Cement "AC" pipes.

Some of the challenges the City has with the condition assessment are because the system is old and difficult to access; ongoing maintenance and future replacement and/or rehab will be difficult due to limited access; there is an environmentally sensitive shoreline; and there are extensive residential improvements. Even though there are challenges, there is a

concern that as the pipes age, there will be more pipe failures with associated resultant economic, environmental, and social costs. The majority of lines are buried in the lakebed, although some are onshore. Minimal cleanouts make maintenance and condition assessment difficult. Line blockages are difficult to locate and repair due to limited access points. The pipe evaluated was generally within 15 feet of shore and about 5 feet or less deep.

Commissioner Morin asked about a hypothetical situation where a property owner built a swimming pool over the lake lines, and the City wanted to replace the lines. He asked whose responsibility it would be to uncover the lines and to replace the pool.

Mr. Hummel stated that one of the objectives of Phase 1 was to determine viable condition assessment tools and methods in order to determine expectancies of remaining useful life of pipes. Another objective was to exercise prudence in choosing from a variety of methods. The scope of Phase 1 included initial investigative work to gather information on the lake line system because staff realized that the existing maps were based on drawings and approximations. A pipe survey was done using GPR (Ground Penetrating Radar) and GPS (Global Positioning System) technology to determine the horizontal and vertical pipe locations. Another scope item was to obtain a collection of pipe samples for testing by taking advantage of limited and opportunistic locations. Lab testing was done to determine evidence of corrosion, pipe wall thickness, and structural integrity. Flyers were sent out to the public notifying them of the condition assessment work that would be conducted. A diver used a water jet to expose the full perimeter of the pipe prior to obtaining pipe samples. A silt curtain was put in place to surround and contain the disturbed area.

Mr. Hummel summarized that the work completed during Phase 1 Condition Assessment included public outreach via mailer identifying upcoming field work to be done; in-water survey and mapping to locate portions of pipe; ultrasonic testing to measure pipe wall thickness (CI pipe only); pipe material samples (“coupons”) tested to evaluate pipe wall structural integrity; and the City’s Geographic Information System (GIS) was supplemented by the new data.

General conclusions for cast iron pipes based on seven samples are that there is minor localized surface corrosion and pitting; there is minimal loss of wall thickness; and the mortar lining inside the pipes has some degradation (but metal surfaces did not have evidence of corrosion). Based on the samples taken, the corrosion rate of cast iron pipe is expected to be slow. Of the three samples of asbestos cement pipe, two samples showed loss of calcium over nearly 50% of wall thickness indicating diminished wall strength (range 42-64%). This could mean that failures (pipe breaks) could occur with increasing frequency over time if the pipes are subjected to external loads (e.g. walls or rockeries over pipes, boats/barges running aground), seismic events, or vigorous cleaning operations.

## Phase 2 Condition Assessment Approach

Based on what was successful in Phase 1, staff plans to collect additional pipe samples in water/on land; obtain samples from a broader range of pipes within the system; perform pipe sample testing and evaluation; review lake line overflow and break history at various locations; and research more advanced methods of rehabilitation and replacement. The results of Phase 1 and 2 condition assessments will provide valuable data for ongoing management of the utility assets. The City will create a ranking system for organizing lake line assets to prioritize pipe replacements. After that, staff will schedule pipe replacements by priority and by year to be completed.

In Phase 1, staff gained a much better idea of what needs to be dealt with, including what works, what doesn't work, pipe material test results, and location information. Phase 2 is scheduled to take place from 2014-2016. After Phase 2, staff intends to begin public education of the condition assessment program, continue pipe sampling program whenever possible, look for improvements to condition assessment techniques, and look for improvements to ongoing maintenance.

### Q&A

Commissioner Wang asked about the status of a project in Meydenbauer Bay in which a lake line was supposed to be replaced partially on land. Mr. Hummel explained that the project will go out to bid next January, and be constructed from late spring to late fall 2014. The project will replace about 1200 feet of pipe on land.

Commissioner Cowan asked about similarities between failure rates of cast iron pipes in the ground versus cast iron in the lake. Mr. Hummel said he didn't have information on the history of that, but it is something staff wants to look at more closely. He noted that cast iron is a much stronger pipe than asbestos cement. AC pipe over time softens as it ages.

## **6. NEW BUSINESS**

Councilmember Stokes apologized for being late. He stated that the Council has directed staff to develop a contract with Republic. He recommended that the ESC receive the staff report and recommendations, as well as the motion and the rationale for choosing the contractor that was read into the record at the Council meeting. He discussed some of the reasons that Republic had been selected such as rates, long-term sustainability of the company, and the consistency of having the same service provider. Additionally, Bellevue has not and will not sign the ILA with the County for the long-term solid waste disposal and work on the transfer station is continuing.

Councilmember Stokes gave a brief update on the King Conservation District Task Force. He stated that this has been an interesting process in terms of the

connection between rural areas, farms, and the cities. The ESC will be receiving more information on this in the future.

The City has received eight applications for the vacant ESC position. There will be a panel consisting of Councilmember Stokes, Nav Ota, and Chair Helland who will be interviewing the week of October 21 with a goal of having a new commissioner in November.

Commissioner Wang asked if the Council added any enforcement power to the Solid Waste contract. He expressed concern that for the past several years the current contractor has been operating as Allied Waste, but is still running the Rabanco trucks and several different-colored trucks. His understanding is that the new contract says all the trucks have to all be the same. Councilmember Stokes commented that consistency is important to the Council. He explained that there are penalties built into the contract.

**7. DIRECTOR'S OFFICE REPORT**

Deputy Director Mulvey announced that this was his last meeting because this was his last week with Bellevue. Joe Harbour, Assistant Director for O&M, will be filling in next month, and other staff members will be filling in over the next couple months until the position is filled. Mr. Mulvey explained that he has accepted a position with the City of San Diego.

**8. CONTINUED ORAL COMMUNICATIONS - None**

**9. ADJOURNMENT**

The meeting was adjourned at 8:14 p.m.

# 2013

## Council Calendar

**October 13**

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**October**

- 7** Consent: Motion to Award AC Water Main Replacement (2013) - Phase 3 (Scott/ Paul)
- Consent: Motion to Award PRV Replacement (2013) - (Scott/Paul)

- 21** Consent: Motion to Award Sanitary Sewer Repairs (2013) (Scott/Paul)
- Consent: Motion to Award Sanitary Sewer Rehabilitation (2013) (Regan)

**November**

- 4** Consent: Resolution authorizing the execution of Prof Svcs Agree w/Osborn Consulting for Kelsey Creek Swr Stab (Regan)

- 18** Consent: Motion to Award Storm Repairs (2013) - Phase I (Regan)
- Consent: Motion to Award AutoCAD to GIS Migration Contract (Margaret)
- Consent: Motion to Award Commercial Meters (2013) (Regan)

Key:

Agenda item description – **Consent:** Waste Reduction & Recycling Grant

**Assistant Director's Name or designated staff** that will  
be available to attend Mayor's meeting

**Staff Name** – material content expert

**2013 Pending Council**

Bellevue/Redmond Consolidation of Sewer Agreements

Katie/2013Calendars/Pending Council Calendar

Updated 7/8/13

# 2013

## Environmental Services Calendar

October 13						
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### October

- 17** City Comp Plan Update (Pam)  
Wastewater System Plan -  
Provide Draft Plan (Pam/  
Doug)  
West Side Storage Project  
(Doug/Paul)

### November

- 21** 2013 Solid Waste Contract  
Performance Review (Lucy/  
Susan)  
Phantom/Larsen Lakes Drain-  
age Investigation (Paul)  
Tentative - City Comp Plan  
Update (Pam)  
Tentative - Water Rate Design  
(Lucy)  
Wastewater System Plan -  
Open House 1 hour before  
regular meeting (Pam/  
Doug)  
Wastewater System Plan Disc-  
uss/Respond to questions  
about draft plan (Pam/  
Doug)

### December

- 19** Draft NPDES 2014 Stormwa-  
ter Mgmt. Program (Paul/  
Phyllis)  
Tentative - City Comp Plan  
Update (Pam)  
Water System Plan Update -  
Introduce Policies (Pam/  
Doug)

### January

- 16** Waste Water System Plan -  
ESC Recommendation to  
Council for Adoption of  
Draft Plan (Pam/Doug)

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**Pending – ESC:**

Status Reports on the following issue will be made when there are significant development:

*Nothing pending at this time.*

**Katie/2013 Calendars/Pending ESC Calendar**

**Updated 1/4/2013**



# MEMORANDUM

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DATE: October 8, 2013  
TO: Environmental Services Commission  
FROM: Paul Bucich, Storm and Surface Water Technical and Policy Advisor  
PHONE: 458-4596  
SUBJECT: West Side Operating Area Water Storage Project

## **Action Required at this Time**

This briefing is to inform you of the results of an investigational study to determine if Bellevue's existing water storage can satisfy the immediate water needs in the West Operating Area. The attached study was conducted by RH2 Engineering. No action is required from you at this time.

## **Background**

The 2006 Water System Plan identified a need for additional water storage in the West Operating Area of the City. This need was primarily driven by the anticipated growth in the downtown central business district and the plans for redevelopment within the Bel-Red Corridor. In 2010 the Utility completed an evaluation of publicly owned sites for potential development of a new water storage reservoir. Four potential sites were identified:

- The Pikes Peak Reservoir site located in Bridle Trails State Park
- The Woodridge Reservoir site located 124<sup>th</sup> Ave SE and SE 15<sup>th</sup> St.
- The Meydenbauer Reservoir site located at 9500 SE 7<sup>th</sup> St.
- A new site in Watershed Park located west of I-405 and just north of Bellevue city limits within the City of Kirkland.

This past year, residents of the Bridle Trails area and members of the Bridle Trails Community Club as well as the Bridle Trails Park Foundation expressed significant concerns with the siting of an expanded reservoir within the Bridle Trails State Park. In their opinion, expansion of the existing 1 million gallon reservoir to 4.5 million gallons would impact the existing vegetation, trails, and use of the park in an unacceptable manner.

Following conversations with the interested parties as well as with the State Parks Ranger for Bridle Trails State Park, and recognition by Utility staff that the search should include privately owned parcels to make sure all feasible locations are investigated, the Utility developed a scope of services with a consultant to assist in evaluation of additional parcels. This work was approved by the Council but was not executed. In addition, the

Utility developed a public outreach and engagement strategy plan for greater inclusion of the public in the site evaluation and selection process. It was our intent to formally begin this public engagement process in late July; however we delayed this to complete an evaluation of the viability of optimizing existing available water storage.

RH2 Engineering was retained to evaluate the potential to balance existing water storage within the utility service area to satisfy the growing water needs in the West Operating Area. This recently completed study concludes that there are viable options to satisfy the immediate water needs. A copy of this report is attached for your review.

In summary, this evaluation shows that through improvements to our existing transmission capabilities, we can move the required volume and rates of water from the East Operating Area to the West Operating Area without significant level of service impacts to the East Operating Area. The evaluation examined five transmission main alternatives and compared a triple bottom line assessment of those alternatives against a generic water storage project located in the West Operating Area. Since an actual site has not been selected for a reservoir, some assumptions had to be made concerning neighborhood impacts, environmental impacts, and long term operational costs. Where assumptions were made, the triple bottom line assessment sheets make note of them.

A public meeting will be held with the Bridle Trails Community Club and the Bridle Trails Park Foundation on October 15<sup>th</sup>. Details of that discussion will be brought forward at the ESC meeting on the 17<sup>th</sup>.

### **Next Steps**

Utilities staff will soon initiate the consultant selection process to begin preparation of the necessary plans and specifications to implement the preferred alternative.

The Utility will be updating the Water System Plan in 2014. This work will inform future needs for water storage across the city and influence decisions on timing and locations for land acquisition for future storage reservoir needs.

### **Attachment**

September 27, 2013 letter from RH2 – evaluation of alternatives.



RH2 ENGINEERING, INC.  
www.rh2.com  
mailbox@rh2.com  
1.800.720.8052

September 27, 2013

Mr. Doug Lane, P.E.  
Utilities Department/Engineering Division  
City of Bellevue  
450 110<sup>th</sup> Avenue NE  
PO Box 90012  
Bellevue, WA 98009-9012

WASHINGTON  
LOCATIONS

BOTHELL  
MAIN OFFICE  
22722 29<sup>th</sup> Drive SE, Suite 210  
Bothell, WA 98021

BELLINGHAM

EAST WENATCHEE

ISSAQUAH

RICHLAND

TACOMA

OREGON  
LOCATIONS

NORTHERN OREGON  
MAIN OFFICE  
6500 SW Macadam Avenue, Suite 125  
Portland, OR 97239

SOUTHERN OREGON  
Central Point

COASTAL OREGON  
North Bend

*Sent via: Email and US Mail*

**Subject: EOA-WOA Transmission Main Evaluation**

Dear Mr. Lane:

This letter summarizes the results of RH2 Engineering, Inc.'s, (RH2) preliminary analyses performed to evaluate alternatives for transmission main improvements to convey water from the City of Bellevue's (City) East Operating Area (EOA) to the West Operating Area (WOA) during concurrent water supply disruption and fire flow emergency conditions. These analyses were performed using existing computer models of the City's water system. This letter report summarizes the results of the preliminary analyses and the operational conditions used in the hydraulic models.

**BACKGROUND**

The City's 2006 *Water Comprehensive Plan (WCP)* forecasted a future storage deficiency in the City's WOA and a future storage surplus in the EOA. Subsequently, rezoning of the Bel-Red Road corridor has accelerated the timeframe and increased the projected storage deficit in the WOA. Construction of an additional 3.5 million gallons (MG) of storage in the WOA is currently being considered to resolve this storage deficiency for the medium term (until roughly 2030). As a short-term alternative to constructing new storage in the WOA, the WCP suggests that a transmission main could be constructed to convey supply from the City's East Operating Area (EOA) to the WOA in the event of a water supply emergency. The City contracted with RH2 to perform preliminary analyses to identify opportunities for transferring stored water from the EOA to the WOA and compare the relative costs of doing so to the previously identified costs of constructing additional storage in the WOA.

The City's water utility Capital Improvement Program currently includes capital improvement plan (CIP) #W-104, which will construct a new WOA inlet and transmission main; possibly in either Bel-Red Road or SE 8<sup>th</sup> Street, within the current 7-year CIP window. Although the additional transmission capacity that will be contributed by CIP #W-104 is considered in the transmission main analyses presented herein, the cost of CIP #W-104 was not included in the cost estimates for the transmission main alternatives. The City's recent conversion of the Lake Hills 520 Zone to a 530 Zone was also considered in the transmission main analyses.



Four initial alternative transmission main alignments were identified by the City for this evaluation. Two of the alternatives were based on the recommended locations suggested in the WCP, while the other two were based on the potential alignments for CIP #W-104. A fifth alternative was also identified by RH2. The analyses performed to evaluate these five alternatives are described herein.

## HYDRAULIC ANALYSES DESCRIPTION

Fire flow analyses were performed to determine the water system improvements necessary to adequately convey supply from the EOA to the WOA for a 5,500 gallons per minute (gpm) fire flow event while limiting the maximum velocity to 10 feet per second (ft/s) in the proposed EOA-WOA transmission main. Velocities in distribution mains were not derated to 10 ft/s in all locations as this would require substantial additional improvements to resolve localized areas of high velocity, which is assumed would not be economically justified given the extremely critical conditions that were modeled. The model scenario assumed a water supply emergency when all SPU/Cascade inlets are offline so that standby/emergency storage is needed. For this reason, the City's standard policy of a system-wide 10 ft/s velocity constraint was only applied to transmission mains but was not applied to distribution mains. The fire flow analyses were based on providing a minimum residual pressure of 20 pounds per square inch (psi) throughout the system under maximum day demands per DOH criteria.

Separate hydraulic models were analyzed for the WOA and EOA. To perform analyses in the WOA, the hydraulic model of the WOA from the City's 2010 System-Wide Fire Flow Analyses project was used. Fire flow analyses were performed at representative nodes throughout the Bellevue 400 Zone to evaluate various EOA-WOA transmission main alignments and to identify additional water system improvements that may be necessary to convey supply from the Lake Hills 530 Zone in the EOA to the Bellevue 400 Zone in the WOA. The analyses assumed only one fire flow demand within the system was occurring at a time.

Analyses were also performed in the EOA model to confirm that the minimum required residual pressure of 20 psi during a fire event can be maintained throughout the EOA while also providing 5,500 gpm of supply to the WOA. To perform these analyses, the preliminary calibrated hydraulic model of the EOA from the City's 2013 520 Zone Conversion project was used. Fire flow demand was input to the model at the location of the EOA-WOA transmission main connection to the Lake Hills 530 Zone. The analyses assumed only one fire flow demand within the system was occurring at a time. Analyses were performed to evaluate the various EOA-WOA transmission main alignments and to identify additional water system improvements that may be necessary to convey supply from the EOA to the WOA while maintaining a minimum residual pressure of 20 psi in the Lake Hills 530 Zone. The operational conditions used in the WOA and EOA models are shown in the tables attached.

## HYDRAULIC ANALYSES RESULTS

The existing water system has limited capacity to transfer water from the EOA to the WOA through a series of pressure reducing valves (PRV). The results of system analyses for existing representative locations are shown in **Tables 1 and 2** and indicate that the existing system can maintain a minimum residual pressure of 20 psi while providing at least 5,500 gpm to all locations in the table except at node 813. Although the existing system is currently capable of meeting the planning-level fire flow rate, the WOA reservoirs will not have sufficient volume in the future to sustain this flow rate for the required duration. If a new reservoir is not constructed at this time, the required volume could instead be transferred from the EOA reservoirs through a transmission main to meet the future storage needs of the WOA. Analyses were performed to identify alternative improvements for transferring the necessary storage volume from the EOA to the WOA while



maintaining a minimum residual pressure of 20 psi and limiting the transmission main responsible for conveying the supply to 10 ft/s or less.

**Table 1**  
**WOA Model Available Fire Flow with Inlets Offline**

Node	Location	West Operating Area Available Fire Flow (gpm)					
		Existing	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
813	10401 NE 32nd Place	3,738	3,738	3,923	3,782	3,856	3,921
1257	12241 Main Street	6,963	6,963	8,794	8,066	10,000	8,052
1414	2700 Northup Way	5,669	5,671	6,055	5,797	6,107	6,051
J-9	1252 112th Ave NE	8,529	8,529	10,000	9,800	10,000	9,710
J-5	Overlake Medical Center	7,579	7,655	9,588	8,922	10,000	8,820
J-6	1831 130th Ave NE	8,944	8,894	10,000	10,000	10,000	10,000
J-7	JC Penny	8,046	8,047	9,373	8,804	10,000	9,021
J-8	1835 Bellevue Way NE	10,000	10,000	10,000	10,000	10,000	10,000
J-10	1500 124th Ave NE	8,328	8,329	10,000	10,000	10,000	10,000

Note: Fire flow storage capacity limits the actual available fire flow in some high risk areas to 5,500 gpm. To attain the required protection in these areas, property owners may be required to install onsite fire protection improvements.

**Table 2**  
**EOA Model Minimum Residual Pressure**

Node	Location	Existing Static Pressure (psi)	East Operating Area Residual Pressure with 5,500 gpm Supply to West Operating Area (psi)				
			Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
J-22036	NE 40th Inlet	85	66	81	74	84	81
J-18735	140th Ave NE & 26th St	127	119	123	120	126	97
J-2589	Bel-Red Rd and 148th Ave	94	82	89	61	93	91
J-6760	SE 8th St and 140th Ave NE	85	84	82	84	53	66
J-42771	148th Ave NE and NE 34th St	57	45	53	45	57	54
J-34481	2041 148th Ave NE	91	79	86	63	90	88
J-27054	16201 NE 19th St	29	21	24	21	28	27
J-24286	1811 156th Ave NE	49	40	43	41	48	46
J-21203	15600 NE 8th St	52	50	46	48	52	51
J-20484	141 156th Ave SE	84	83	79	82	80	81
J-17744	15 140th Ave NE	65	65	65	65	65	58
J-1392	SE 28th Inlet	27	27	25	26	25	24
J-344	4160 150th Ave SE	21	21	20	21	21	20

Initial analyses were performed to evaluate the existing transmission capacity with adjustments to the settings of existing PRVs. If the PRV settings were modified and the velocity in the transmission mains were derated to 10 ft/s, the analyses indicate that the existing system only has the capacity to convey approximately 3,750 gpm from the EOA to the WOA, which is inadequate to meet the 5,500 gpm supply requirement that is needed if a new WOA storage facility is not constructed at this time. Without the velocity requirement applied to transmission mains, some older AC water main would experience velocities in excess of 17 ft/s in order to provide the necessary supply amount of 5,500 gpm at a residual pressure of 20 psi in the system. This was not considered a viable alternative because it violates the City's standards for velocity for transmission mains.



Additional hydraulic analyses were performed to identify viable alternatives that are capable of maintaining the velocity standard of 10 ft/s in the transmission mains while conveying 5,500 gpm from the EOA reservoirs to the WOA. The five alternatives identified included various combinations of PRV, booster pump station, and transmission main improvements. The following sections describe each of the viable transmission main alternatives that were identified. The improvements for the five alternatives are shown schematically in the attached **Figure 1** and the results of the hydraulic analyses are shown in **Tables 1** and **2**.

### Alternative A

The initial improvements for Alternative A included installation of a new 16-inch water main in NE 40<sup>th</sup> Street between the existing transmission main in 148<sup>th</sup> Avenue NE and 132<sup>nd</sup> Avenue NE. This potential alignment was identified in the City's 2006 WCP and would require that water be transferred through a new booster pump station (BPS) from the Lake Hills 530 Zone near 148<sup>th</sup> Avenue NE to the Pikes Peak 670 Zone at 132<sup>nd</sup> Avenue NE. Alternatively, the existing NE 40<sup>th</sup> BPS may be evaluated to determine the ability to upgrade the station to also supply the Pikes Peak 670 Zone. The water main improvements in addition to those identified in the 2006 WCP are necessary to extend the proposed transmission main from 132<sup>nd</sup> Avenue NE to existing transmission main in the PP670 Zone. The existing water main in the PP670 Zone at 132<sup>nd</sup> Avenue NE is undersized to transfer the necessary supply from the EOA to the WOA.

Supply from the PP670 Zone would need to be transferred back down through the Pikes Peak 550 Zone to the Bellevue 400 Zone through a series of new pressure reducing valve (PRV) stations. These and other system improvements to meet the velocity and pressure requirements of the system during a fire event in the WOA were identified and included in the hydraulic model. These improvements are as follows.

- 10,700 feet of 16-inch water main:
  - NE 40<sup>th</sup> Street from 148<sup>th</sup> Avenue NE to 132<sup>nd</sup> Avenue NE.
  - 134<sup>th</sup> Avenue NE from NE 40<sup>th</sup> Street to NE 36<sup>th</sup> Street.
  - NE 36<sup>th</sup> Street from 134<sup>th</sup> Avenue NE to 130<sup>th</sup> Avenue NE.
  - 130<sup>th</sup> Avenue NE from NE 36<sup>th</sup> Street to NE 39<sup>th</sup> Street.
  - NE 39<sup>th</sup> Street from 130<sup>th</sup> Avenue NE to 124<sup>th</sup> Avenue NE.
- New LH530/PP670 BPS near NE 40<sup>th</sup> Inlet or upgrade to the existing NE 40<sup>th</sup> BPS (5,500 gpm capacity).
- PP670/PP550 PRV station at 124<sup>th</sup> Avenue NE and NE 39<sup>th</sup> Street.
- PP550/BV400 PRV station at 124<sup>th</sup> Avenue NE and NE 24<sup>th</sup> Street with 16-inch water main connection from the Pikes Peak 550 Zone to the Bellevue 400 Zone.

The results of the hydraulic analyses with the Alternative A improvements, shown in **Tables 1** and **2** for representative nodes in the system, indicate that the EOA can supply 5,500 gpm to the WOA through the proposed transmission main while maintaining a minimum residual pressure of 20 psi. With the exception of node 813, the available fire flow at all nodes in the WOA that were evaluated exceed 5,500 gpm. Improvements to increase the available fire flow at node 813 require the replacement of local distribution main that was not evaluated as part of this effort.



### Alternative B

The initial improvements for Alternative B included installation of a new 16-inch water main in NE 8<sup>th</sup> Street from 132<sup>nd</sup> Avenue NE to 151<sup>st</sup> Avenue NE. This potential alignment was identified in the City's 2006 WCP to transfer supply from the NE 8<sup>th</sup> Inlet to the WOA. To meet the velocity and pressure requirements of the system during a fire event in the WOA, additional improvements were identified and included in the hydraulic models. The additional water main improvements are necessary to extend the proposed transmission main across the KC300 Zone to the easterly terminus of the 12-inch BV400 Zone transmission main at 128<sup>th</sup> Avenue NE. The Alternative B improvements are as follows.

- 7,800 feet of 16-inch water main in NE 8<sup>th</sup> Street from 128<sup>th</sup> Avenue NE to 151<sup>st</sup> Avenue NE.
- LH530/KC450 PRV station near the NE 8<sup>th</sup> Inlet.
- KC450/BV400 PRV station at NE 8<sup>th</sup> Street and 140<sup>th</sup> Avenue NE.

The results of the hydraulic analyses with the Alternative B improvements, shown in **Table 1**, indicate that the EOA can supply 5,500 gpm to the WOA through the proposed transmission main while maintaining a minimum residual pressure of 20 psi. Similar to Alternative A, with the exception of node 813, the available fire flow at all nodes in the WOA that were evaluated exceed 5,500 gpm.

### Alternative C

The initial improvements for Alternative C included installation of a new 16-inch water main in Bel-Red Road from the existing 16-inch transmission main at the Bel-Red Inlet near 132<sup>nd</sup> Avenue NE to the westerly extent of the LH520 Zone in the EOA at 148<sup>th</sup> Avenue NE. A portion of this potential alignment, from 132<sup>nd</sup> Avenue NE to 140<sup>th</sup> Avenue NE, may be constructed as part of the City's CIP #W-104 if the new Seattle supply inlet is installed near the existing NE 8<sup>th</sup> Inlet. Therefore, the potential cost of CIP#W-104 was subtracted from the capital cost estimate for Alternative C, since those funds are allocated to serve another purpose. To meet the velocity and pressure requirements of the system during a fire event in the WOA, additional improvements were identified and included in the hydraulic models for this alternative. The Alternative C improvements are as follows.

- 10,100 feet of 16-inch water main:
  - Bel-Red Road from the Bel-Red Inlet at 132<sup>nd</sup> Avenue NE to 148<sup>th</sup> Avenue NE.
  - 148<sup>th</sup> Avenue NE from Bel-Red Road to NE 20<sup>th</sup> Street.
  - 156<sup>th</sup> Avenue NE from NE 8<sup>th</sup> Street to NE 20<sup>th</sup> Street.
- LH530/BV400 PRV station at Bel-Red Road and 148<sup>th</sup> Avenue NE.

The results of the hydraulic analyses with the Alternative C improvements, shown in **Table 1**, indicate that the EOA can supply 5,500 gpm to the WOA through the proposed transmission main while maintaining a minimum residual pressure of 20 psi. Similar to the other Alternatives, with the exception of node 813, the available fire flow at all nodes in the WOA that were evaluated exceed 5,500 gpm.

### Alternative D

The initial improvements for Alternative D included installation of a new 16-inch water main in SE 8<sup>th</sup> Street and the Lake Hills Connector from the 12-inch BV400 Zone transmission main on the east side of Interstate 405 to 140<sup>th</sup> Avenue NE. This potential alignment may be constructed as part of the City's CIP project



number #W-104 if the new Seattle supply inlet is installed at SE 8<sup>th</sup> Street and Interstate 405. The potential cost of CIP#W-104 was therefore subtracted from the capital cost estimate for Alternative D, since those funds are allocated to serve another purpose.

To meet the velocity and pressure requirements of the system during a fire event in the WOA, additional improvements were identified and included in the hydraulic models for this alternative. The additional water main improvements are necessary to extend the proposed transmission main from NE 140<sup>th</sup> Avenue to the 16-inch transmission main in 148<sup>th</sup> Avenue NE and to resolve low pressures that would result from drawing supply from the southern portion of the EOA. The Alternative C improvements are as follows.

- 19,500 feet of 16-inch water main:
  - SE 8<sup>th</sup> Street and the Lake Hills Connector from the east side of Interstate 405 to 148<sup>th</sup> Avenue NE.
  - 148<sup>th</sup> Avenue SE from the SE 28<sup>th</sup> Inlet to SE Eastgate Drive.
  - SE Eastgate Drive from 148<sup>th</sup> Avenue SE to 146<sup>th</sup> Avenue SE.
  - 146<sup>th</sup> Avenue SE from SE Eastgate Drive to SE 42<sup>nd</sup> Place.
  - SE 42<sup>nd</sup> Place from 146<sup>th</sup> Avenue SE to 145<sup>th</sup> Avenue SE.
  - 145<sup>th</sup> Avenue SE from SE 42<sup>nd</sup> Place to the Parksite Reservoir.
- LH530/BV400 PRV station in SE 8<sup>th</sup> Street west of 140<sup>th</sup> Avenue SE.

The results of the hydraulic analyses with the Alternative D improvements, shown in **Table 1**, indicate that the EOA can supply 5,500 gpm to the WOA through the proposed transmission main while maintaining a minimum residual pressure of 20 psi. Similar to the other Alternatives, with the exception of node 813, the available fire flow at all nodes in the WOA that were evaluated exceed 5,500 gpm.

### Alternative E

Alternative E is based on transferring water from the EOA to the WOA at two locations. This provides redundancy in supply to the WOA in the event of a failure of one of the transmission mains and better disbursement of the supply throughout the Bellevue 400 Zone. Under this alternative, water would be transferred from the EOA to the WOA through the existing LH530/BV400 PRV station in 140<sup>th</sup> Avenue NE and NE 26<sup>th</sup> Street and from the existing KC450/BV400 PRV station in SE 1<sup>st</sup> Street east of 136<sup>th</sup> Avenue NE. The existing KC450/BV400 PRV station is supplied by three PRV stations that transfer water from the Lake Hills 530 Zone to the Kelsey Creek 450 Zone. To meet the velocity and pressure requirements of the system during a fire event in the WOA, water main improvements were also identified and included in the hydraulic models for this alternative. The water main improvements in NE 8<sup>th</sup> Street are necessary to extend the transmission capacity from the KC450/BV400 PRV station across the KC300 Zone to the easterly terminus of the 12-inch BV400 Zone transmission main at 128<sup>th</sup> Avenue NE. The Alternative E improvements are as follows.

- 2,600 feet of 16-inch water main in 140<sup>th</sup> Avenue NE from NE 40<sup>th</sup> Street to NE 36<sup>th</sup> Place.
- 1,600 feet of 12-inch water main:
  - NE 8<sup>th</sup> Street from 128<sup>th</sup> Avenue NE to 136<sup>th</sup> Avenue NE.
  - SE 7<sup>th</sup> Street from 141<sup>st</sup> Place SE to 140<sup>th</sup> Avenue SE.



- Upgrades to the following PRV stations to confirm reliability during an emergency event.
  - LH530/BV400 PRV station in 140<sup>th</sup> Avenue NE and NE 26<sup>th</sup> Street.
  - KC450/BV400 PRV station in SE 1<sup>st</sup> Street east of 136<sup>th</sup> Avenue NE.

The results of the hydraulic analyses with the Alternative E improvements, shown in **Table 1**, indicate that the EOA can supply 5,500 gpm to the WOA through the proposed transmission mains while maintaining a minimum residual pressure of 20 psi. Similar to all the other Alternatives, with the exception of node 813, the available fire flow at all nodes in the WOA that were evaluated exceed 5,500 gpm.

The benefits of implementing one of the transmission main alternatives are limited to the WOA. Due to the differential in hydraulic gradients between the operating areas, the transmission main will only be capable of supplying the WOA from the EOA and not vice versa. The PRVs supplying the BV400 Zone from the transmission mains should be equipped with pressure sustaining features or other improvements should be installed in the system to prevent excessive flows being conveyed to the WOA from drawing the EOA below the City's level of service standards.

#### **IMPACT OF 560 ZONE CONVERSION**

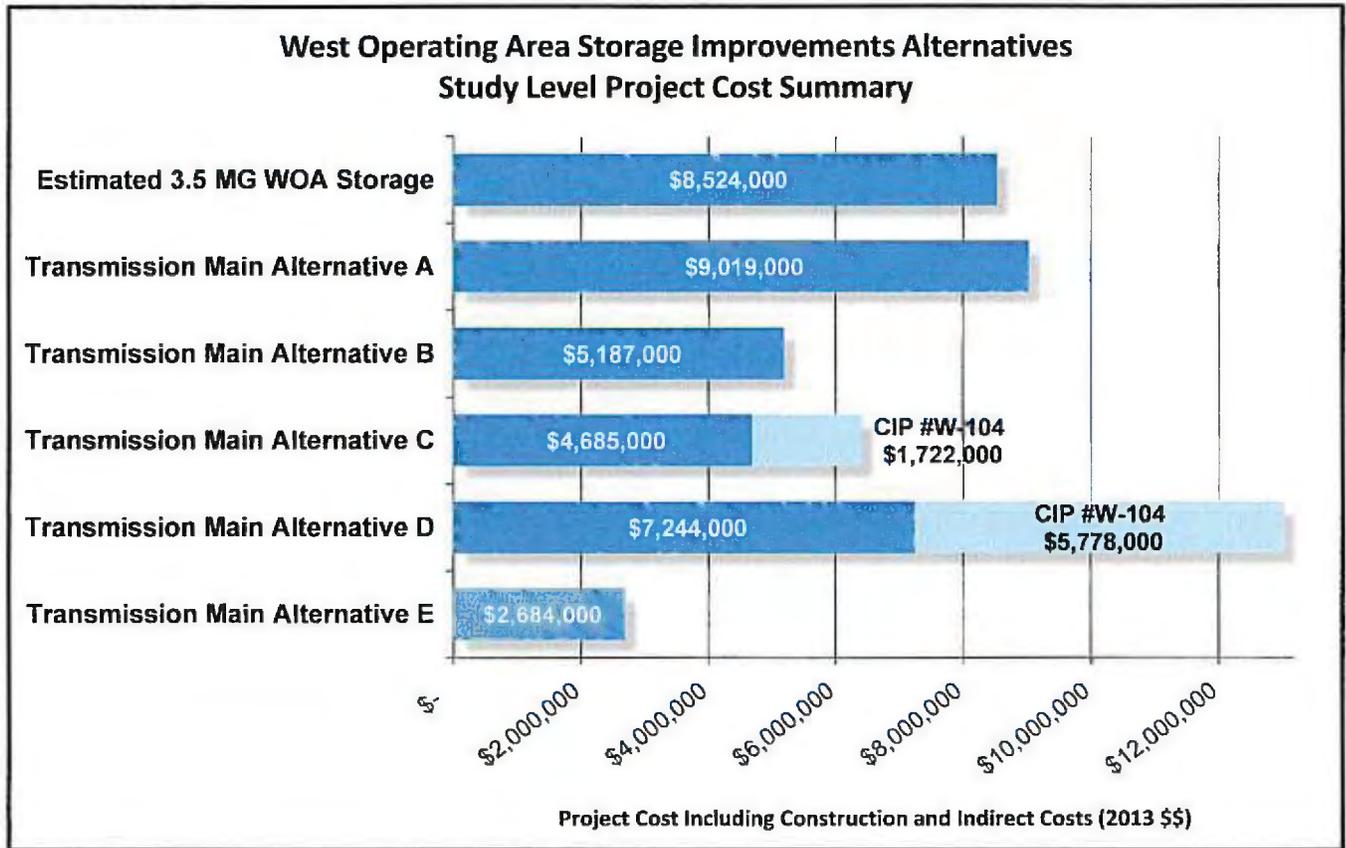
The City is currently evaluating the viability of converting a portion of the Lake Hills 520 Zone in the EOA to a 560 Zone to increase pressures in the Crossroads area of the system. Some of the improvements identified for this transmission main analysis are included in alternative improvements that were identified to complete the 560 Zone conversion. Cost reduction for both projects may be realized depending on the alternatives selected. Implementation of the 560 Zone conversion will not otherwise impact the improvements identified for the EOA-WOA transmission main alternatives.

#### **COMPARATIVE COST ANALYSIS**

Preliminary study-level cost estimates were developed to determine each alternative's relative cost for comparison with the estimated cost for constructing an additional 3.5 MG of storage in the WOA. The cost estimates were prepared to determine the relative order of magnitude of the costs for each alternative and have not been adjusted for factors such as location, roadway restoration requirements, etc. The costs for Alternatives C and D do not include the portion of the transmission main that is included as part of the City's CIP #W-104, as this project is necessary to meet other water system needs. A summary of the alternative costs are shown in **Figure 2** and an itemized list of the improvements and estimated costs are included in the attached tables. The cost shown in the figure for the additional WOA storage is the average of the three lowest cost alternatives from RH2's 2010 *West Operating Area Capacity Improvement Study*, inflated to 2013 dollars.



**Figure 2**  
**Study-level EOA-WOA Transmission Main Costs**



As shown in **Figure 2**, the study-level cost estimate for implementation of transmission main Alternative E is the lowest cost alternative.

### PRELIMINARY TRIPLE BOTTOM LINE ANALYSIS

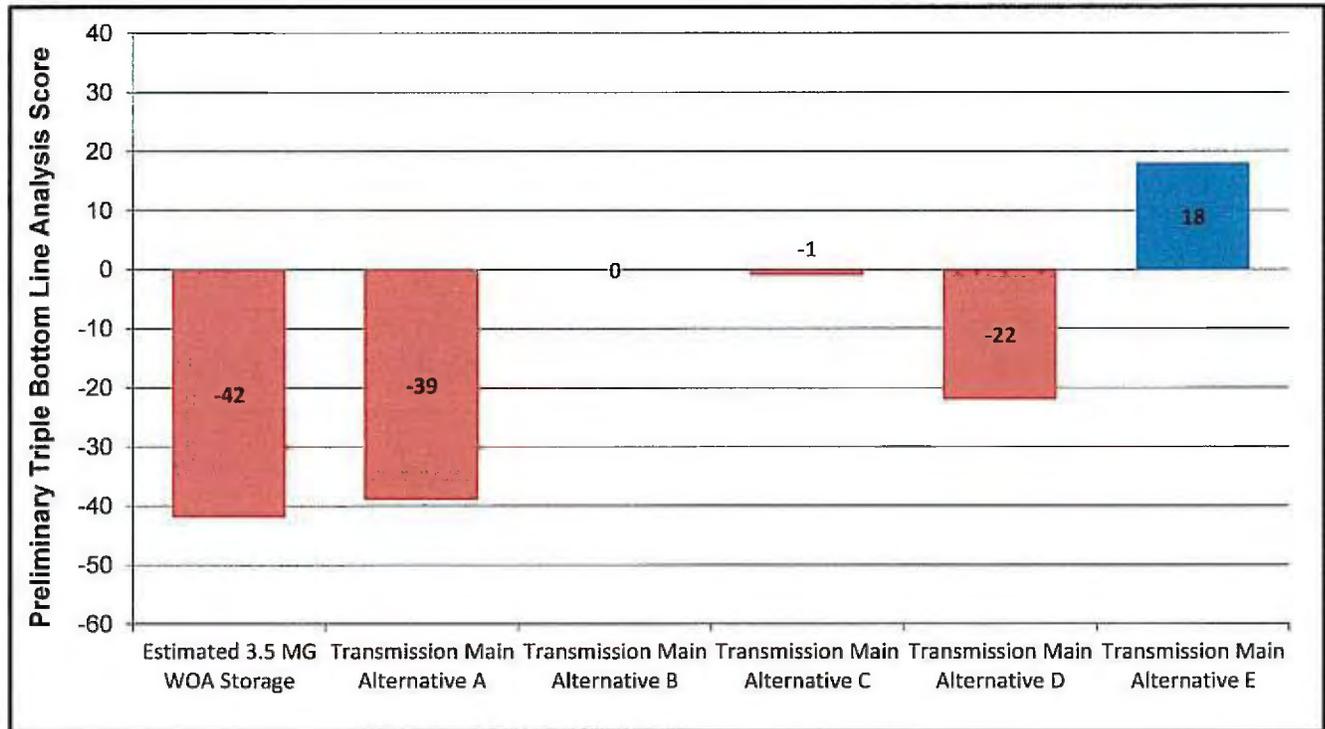
In addition to the capital costs, other ecological and social impacts should be considered when evaluating the viability of constructing transmission main to transfer water from the EOA to the WOA in lieu of constructing a new reservoir in the WOA. The triple bottom line analysis should reflect the impacts to traffic and residents as well as environmental factors that may be encountered during construction, normal operation or failure of the components in the alternatives analysis. It should also consider the timing of each alternative project with regards to future operations and maintenance needs and the remaining life expectancy of the existing water system facilities.

A preliminary triple bottom line analysis is attached and a summary of the City's scoring of the items is shown in **Figure 3**. The analysis evaluated the various impacts and benefits of a new WOA reservoir and an EOA-WOA transmission main based on the five alignment alternatives described in this letter report. Each item that was considered in the analysis was given a weighting factor between 1 and 5 that indicates the relative importance of the element. A weight factor of 5 indicates items that are considered the most important in the analysis. The relative economic, social and environmental impacts were scored either a -2, -



1, 0, 1 or 2 for each item that it was applicable. A score of 2 in the table indicates that the item has a significant economic, social or environmental advantage over the other alternatives. A score of -2 indicates that the item has a significant economic, social or environmental disadvantage over the other alternatives. The economic score reflects the relative financial cost of the item being considered. The social score reflects the relative impact on people and the community. The environmental score reflects the relative impact to the environment and the City's goals for sustainability. A cursory environmental review, which considered sensitive areas currently mapped by King County, was performed for the purposes of this analysis. Further environmental investigation and analysis is recommended if the City elects to consider these alternatives further.

**Figure 3**  
**Preliminary Triple Bottom Line Analysis Summary**



The preliminary triple bottom line analysis indicates that Transmission Main Alternative E is the most favorable alternative when considering the economic, social and environmental impacts of the alternatives. The remaining transmission main alternatives and the estimated 3.5 MG WOA Storage alternative scored significantly lower than Transmission Main Alternative E. If the City elects to evaluate any of the transmission main alternatives further in a subsequent phase, the triple bottom line analysis could be further refined. Some items, however, require policy decisions to be formed by the City before they can be quantified in the triple bottom line analysis. Further refinement of the analysis should be performed once these decisions are made.

### CONCLUSION AND NEXT STEPS

The analyses described in this letter report indicate that construction of an EOA-WOA transmission main and associated improvements is likely less costly than constructing additional storage in the WOA. However, other factors should be considered to determine the most appropriate improvements for



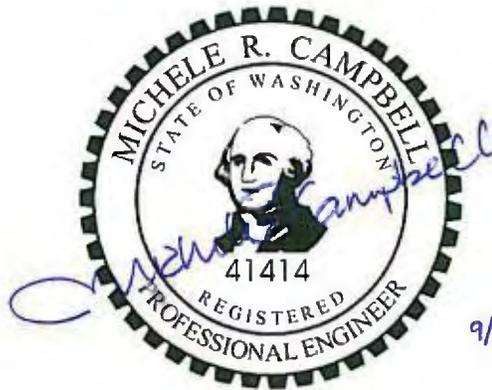
resolving the projected future storage deficiency in the WOA. Since the transmission main analyses described herein were performed for the purposes of determining the general order of magnitude costs for an EOA-WOA transmission main, the analyses should be further refined if the City elects to pursue this further. Prior to continuing with additional analyses, it is recommended that the distribution of demands in the models be confirmed, as well as the reservoir level setpoints, PRV settings, and other facility operational conditions. Additionally, the City updated its database of node elevations in 2012 and these elevations should be imported into the WOA model. Following these model updates, the alternative analyses may be evaluated to further optimize the identified improvements. The cost estimates may also be refined to identify more accurate construction costs for the specific projects and the triple bottom line analysis elements may be further defined.

If you have any questions regarding the analyses, please call Michele Campbell at (425) 951-5394 or Tony Pardi at (425) 951-5312. Thank you for the opportunity to assist with this project.

Sincerely,

**RH2 ENGINEERING, INC.**

Michele R. Campbell, P.E.  
Project Engineer

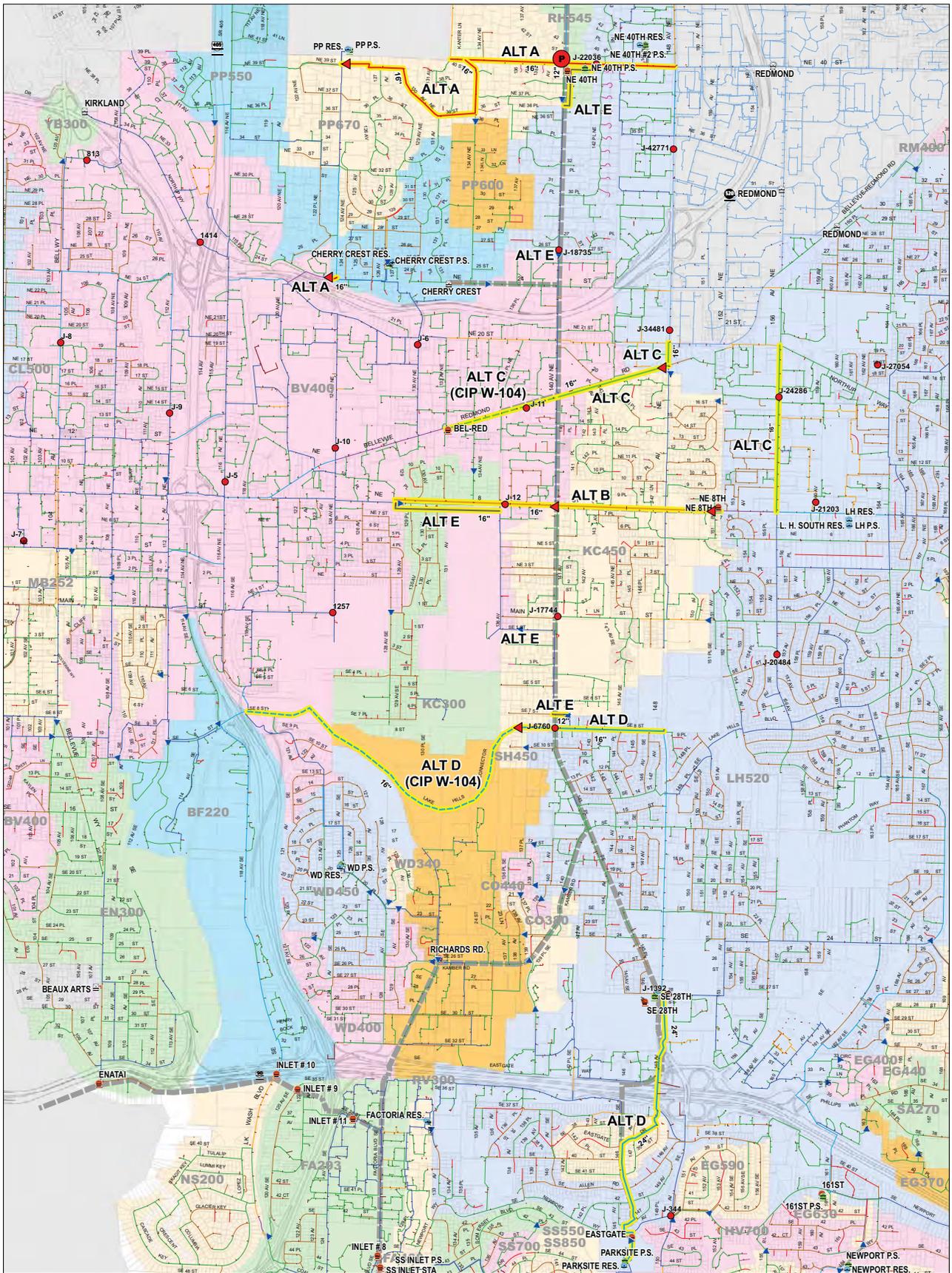


Tony V. Pardi, P.E.  
Project Manager



RMW/TVP/MC/jq/ms

- Attachments:
- Figure 1: Transmission Main Alternative Improvements
  - Hydraulic Model Operational Conditions
  - Preliminary Study-level Cost Estimate
  - Preliminary Triple Bottom Line Analysis

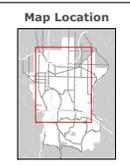


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Plot Date: 6/12/2013

Legend	
	PRV
	Reservoir
	Seattle Meter
	Pump Station
	Interline
	Seattle Supply Line
	<b>Diameter</b>
	< 4"
	4"
	6"
	8"
	10"
	12"
	14" & 16"
	> 16"

**Figure 1**  
**Transmission Main Alternative Improvements**  
**CITY OF BELLEVUE**  
**EOA-WOA TRANSMISSION MAIN EVALUATION**



This map is a graphic representation derived from the City of Bellevue Geographic Information System. It was designed and intended for use by City of Bellevue staff use only; it is not guaranteed to survey accuracy. This map is based on the best information available on the date shown on this map.

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**City of Bellevue**

EOA-WOA Transmission Main Evaluation  
 Hydraulic Analyses Operational Conditions  
 West Operating Area

**Demand**

<b>Total Demand (gpm)</b>	18,013
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**Tanks**

Label	Zone	Initial Elevation (ft)
30111	400 Bellevue	379
99999	400 Bellevue	392.00
30051	400 Bellevue	370.60
30011	550 Pikes Peak	542
30071	335 Clyde Hill	323
30061	335 Clyde Hill	323
30041	500 Clyde Hill	447.40
30101	252 Meydenbauer	245

**Reservoirs**

Label	Zone	Hydraulic Grade (ft)
450_400_Prv43	520 Lake Hills	430.6
17001	Seattle	Offline
20023	Seattle	Offline
20051	Seattle	Offline
20073	Seattle	Offline
30021	Seattle	Offline
BEL_RED_INLET_20033	Seattle	Offline
CV_RV300_1	400 Woodridge	Offline
CV_RV300_2	400 Woodridge	Offline
LH520	520 Lake Hills	Offline
NS200	220 Bellefield	Offline

**Pumps**

Label	Status	Zone
10031	Off	670 Pikes Peak
10091	Off	450 Woodridge
10032	Off	670 Pikes Peak
10012	On	670 Pikes Peak
10033	Off	670 Pikes Peak
10021	On	550 Pikes Peak
10011	On	670 Pikes Peak
10051	On	500 Clyde Hill
10052	On	500 Clyde Hill
10092	On	450 Woodridge
10053	On	500 Clyde Hill

**PRVs**

Label	Elevation (ft)	Hydraulic Grade Setting (Initial) (ft)	Pressure Setting (Initial) (psi)	Status (Initial)	Zone
1	311	335	10	Active	335 Clyde Hill
3	90	265	76	Active	300 Entai
4	73	241	73	Active	252 Meydenbauer
5	58	0	80	Active	252 Meydenbauer
7	40	0	73	Active	220 Bellefield

**City of Bellevue**

EOA-WOA Transmission Main Evaluation  
 Hydraulic Analyses Operational Conditions  
 West Operating Area

**PRVs**

Label	Elevation (ft)	Hydraulic Grade Setting (Initial) (ft)	Pressure Setting (Initial) (psi)	Status (Initial)	Zone
8	294	428	58	Active	450 Woodridge
9	196	369	75	Active	400 Woodridge
11	84	384	130	Active	400 Woodridge
12	255	368	49	Active	400 Woodridge
13	165	292	55	Active	300 Kelsey Creek
14	114	0	75	Active	300 Kelsey Creek
17	394	661	116	Closed	670 Pikes Peak
22	169	319	65	Active	335 Clyde Hill
23	112	303	83	Active	335 Clyde Hill
24	167	243	33	Active	230 Medina
25	102	252	65	Active	252 Meydenbauer
26	61	241	78	Active	252 Meydenbauer
28	154	0	0	Active	400 Bellevue
34	34	207	75	Active	220 Bellefield
35	327	465	60	Active	450 Woodridge
43	225	375	65	Active	400 Bellevue
47	218	379	70	Closed	400 Bellevue
49	306	373	29	Active	400 Bellevue
52	433	587	67	Active	600 Pikes Peak
85	28	208	78	Active	220 Bellefield
90	130	208	34	Active	220 Bellefield
116	260	378	51	Active	400 Bellevue
127	394	0	68	Active	550 Pikes Peak
131	53	247	84	Active	250 Hunts Point
132	64	0	77	Active	250 Hunts Point
133	157	247	39	Active	252 Meydenbauer
134	115	293	77	Active	300 Entai
135	122	0	53	Active	252 Meydenbauer
136	236	252	7	Active	252 Meydenbauer
156	146	0	59	Active	300 Kelsey Creek
177	100	199	43	Active	220 Yarrow Bay
178	124	198	32	Active	220 Yarrow Bay
20021	364	391	12	Active	400 Bellevue
20031	166	0	103	Active	400 Bellevue
20061	384	0	5	Inactive	400 Bellevue
99999	326	0	30	Closed	400 Bellevue
Dummy_252	236	252	7	Active	252 Meydenbauer
PRV20071	26	0	118	Active	300 Entai

**FCVs**

Label	Elevation (ft)	Flow Setting (Initial) (gpm)	Status (Initial)	Zone
20041	332.00	400.00	Closed	400 Bellevue
20051	80.00	2,200.00	Closed	Seattle
20071	26.00	1,500.00	Closed	300 Entai
BEL_RED_INLET	166.00	7,300.00	Closed	400 Bellevue
Cherry_Crest_Inlet	364.00	7,300.00	Closed	Seattle
Cherry_Crest_Reservoir_Supply	364.00	3,500.00	Inactive	Seattle

**City of Bellevue**

EOA-WOA Transmission Main Evaluation  
Hydraulic Analyses Operational Conditions  
West Operating Area

**PBVs**

<b>Label</b>	<b>Elevation (ft)</b>	<b>Hydraulic Grade Setting (Initial) (ft)</b>	<b>Pressure Setting (Initial) (psi)</b>	<b>Status (Initial)</b>	<b>Zone</b>
Dummy_valve	384	0	90	Inactive	Seattle
93	249	0	50	Inactive	400 Bellevue
985a	185	0	10	Inactive	400 Bellevue
1a	311	0	5	Inactive	400 Bellevue
11803b	326	0	35	Inactive	400 Bellevue

**City of Bellevue**

EOA-WOA Transmission Main Evaluation  
 Hydraulic Analyses Operational Conditions  
 East Operating Area

**Demand**

<b>Total Demand (gpm)</b>	12,432
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**Tanks**

Label	Zone	Initial Elevation (ft)
Lake_Hills_N_30081	520 Lake Hills	516
Lake_Hills_S_30091	520 Lake Hills	508
NE40th_30021	NE 40th Res	392.5
Newport_30121	520 Lake Hills	509
Parksite_30131	520 Lake Hills	502.9
Sammamish_30191	270 Sammamish	243.5

**Reservoirs**

Label	Zone	Hydraulic Grade (ft)
161st_Inlet	Cascade	Offline
CESSL_to_RV300_Inlet_20051	CESSL	Offline
Eastgate_Inlet_20082	TESSL	Offline
Kirkland_Meter_200	545 Rose Hill	Offline
NE8th_Inlet_20041	TESSL	Offline
NE40th_Inlet_20014	TESSL	Offline
TESSL_Pump_LH520_20061	TESSL	Offline

**Pumps**

Label	Status	Zone
10021	Off	520 Lake Hills
10022	On	520 Lake Hills
10023	Off	520 Lake Hills
10061	Off	520 Lake Hills
10062	Off	520 Lake Hills
10071	On	520 Lake Hills
10072	Off	520 Lake Hills
10101	Off	TESSL

**PRVs**

Label	Elevation (ft)	Hydraulic Grade Setting (Initial) (ft)	Pressure Setting (Initial) (psi)	Status (Initial)	Zone
10	234.56	352.16	51	Active	330 Redmond
14	305.45	418.44	49	Active	400 Redmond
15	160.32	333.26	75	Active	330 Redmond
16	218.31	331.3	49	Active	330 Redmond
17	215.3	332.9	51	Active	330 Redmond
19	320.2	470.08	65	Active	400 Redmond
20	327.78	477.66	65	Active	400 Redmond
22	334.3	433.45	43	Active	400 Redmond
23	228.35	336.73	47	Active	330 Redmond
34	320.43	417.28	42	Active	400 Redmond
37	237	0	59	Active	380 College Hill
38	284	422.35	60	Active	380 College Hill
39	280	418.35	60	Active	440 College Hill

**City of Bellevue**

EOA-WOA Transmission Main Evaluation  
 Hydraulic Analyses Operational Conditions  
 East Operating Area

Label	Elevation (ft)	Hydraulic Grade Setting (Initial) (ft)	Pressure Setting (Initial) (psi)	Status (Initial)	Zone
40	154	262.38	47	Active	300 Richards Valley
42	291	429.35	60	Active	450 Kelsey Creek
44	290	430.66	61	Active	450 Kelsey Creek
50	296	498.92	88	Active	520 Lake Hills
58	159	285.82	55	Active	300 Eastgate
59	298	413.29	50	Active	440 Eastgate
60	284	410.82	55	Active	440 Eastgate
61	86	247.41	70	Active	270 Sammamish
65	208	254.12	20	Active	270 Sammamish
66	270	406.05	59	Active	440 Eastgate
67	308	365.65	25	Active	380 Lake Hills
68	112	245.74	58	Active	270 Sammamish
69	308	365.65	25	Active	380 Lake Hills
70	271	411.66	61	Active	435 Lake Hills
71	194	0	26	Active	270 Sammamish
72	144	254.68	48	Active	270 Sammamish
73	288	380.23	40	Active	400 Redmond
80	310	422.99	49	Active	435 Lake Hills
81	288	424.05	59	Active	435 Lake Hills
82	286	382.85	42	Active	435 Lake Hills
86	78	290.14	92	Active	300 Richards Valley
93	284	433.88	65	Active	450 Kelsey Creek
94	334	442.38	47	Active	450 Kelsey Creek
95	303	399.85	42	Active	400 Eastgate
98	286	373.62	38	Active	380 College Hill
101	305	392.62	38	Active	400 Eastgate
114	181	254.79	32	Active	270 Sammamish
130	210	373.72	71	Active	370 Eastgate
136	316	431.29	50	Active	440 College Hill
137	351	489.35	60	Active	520 Lake Hills
139	200	0	38	Active	330 Redmond
140	197	296.15	43	Active	330 Redmond
141	277	371.54	41	Active	400 Redmond
154	230	366.05	59	Active	380 College Hill
158	159	285.82	55	Active	300 Richards Valley
20011a	315	519.76	88.8	Active	TESSL
20012	315	0	88.8	Active	520 Lake Hills

**FCVs**

Label	Elevation (ft)	Flow Setting (Initial) (gpm)	Status (Initial)
FCV-3	416.04	2,000.00	Closed
FCV-4	406.46	2,000.00	Closed
FCV-5	427.54	2,500.00	Closed
FCV-6	395.96	2,000.00	Active
FCV-7	391.55	2,300.00	Inactive
FCV-NE 8th Inlet	319.19	3,500.00	Closed

City of Bellevue

EOA-WOA Transmission Main Evaluation

Preliminary Study Level Cost Estimate

Description	Base Unit Price*	Construction + Indirect Unit Price
24" Water Main (per LF)	\$390	\$726
16" Water Main (per LF)	\$330	\$615
12" Water Main (per LF)	\$290	\$540
PRV Station (each)	\$105,000	\$195,572

\* Assumes grind and overlay of streets.

Alternative A					
Item	Description	Units	Quantity	Unit Price	Total Price
<b>Construction Costs (2013 \$\$)</b>					
1	16-inch Water Main in NE 40th St and PP670 Zone	LF	10,700	\$ 330	\$ 3,531,000
2	LH520/PP670 BPS: 5,500 gpm	LS	1	\$ 1,100,000	\$ 1,100,000
3	PP670/PP550 PRV	EA	1	\$ 105,000	\$ 105,000
4	PP550/BV400 PRV	EA	1	\$ 105,000	\$ 105,000
<b>Construction Cost Subtotal</b>					<b>\$ 4,841,000</b>
Washington State Sales Tax (9.5 percent)					\$ 460,000
Construction Cost Contingency (20 percent)					\$ 1,061,000
<b>Construction Cost Total</b>					<b>\$ 6,362,000</b>
<b>Indirect Costs (2013 \$\$)</b>					
Indirect Costs (35 percent of construction costs and includes construction survey, predesign engineering, design engineering, construction engineering and administration, permitting and inspections)					\$ 2,227,000
<b>Indirect Cost Total</b>					<b>\$ 2,227,000</b>
Project Cost Subtotal					\$ 8,589,000
Project Contingency (5 percent)					\$ 430,000
<b>Project Cost Including Construction and Indirect Costs</b>					<b>\$ 9,019,000</b>

Alternative B					
Item	Description	Units	Quantity	Unit Price	Total Price
<b>Construction Costs (2013 \$\$)</b>					
1	16-inch Water Main in NE 8th St	LF	7,800	\$ 330	\$ 2,574,000
2	LH520/KC450 PRV	EA	1	\$ 105,000	\$ 105,000
3	KC450/BV400 PRV	EA	1	\$ 105,000	\$ 105,000
<b>Construction Cost Subtotal</b>					<b>\$ 2,784,000</b>
Washington State Sales Tax (9.5 percent)					\$ 265,000
Construction Cost Contingency (20 percent)					\$ 610,000
<b>Construction Cost Total</b>					<b>\$ 3,659,000</b>
<b>Indirect Costs (2013 \$\$)</b>					
Indirect Costs (35 percent of construction costs and includes construction survey, predesign engineering, design engineering, construction engineering and administration, permitting and inspections)					\$ 1,281,000
<b>Indirect Cost Total</b>					<b>\$ 1,281,000</b>
Project Cost Subtotal					\$ 4,940,000
Project Contingency (5 percent)					\$ 247,000
<b>Project Cost Including Construction and Indirect Costs</b>					<b>\$ 5,187,000</b>

City of Bellevue

EOA-WOA Transmission Main Evaluation

Preliminary Study Level Cost Estimate

Alternative C					
Item	Description	Units	Quantity	Unit Price	Total Price
<b>Construction Costs (2013 \$\$)</b>					
1	16-inch Water Main in Bel-Red Rd from Bel-Red Inlet to TESSL*	LF	2,800	\$ -	\$ -
2	16-inch Water Main in Bel-Red Rd from TESSL to LH520 Zone	LF	2,800	\$ 330	\$ 924,000
3	16-inch Water Main in 148th Ave NE and 156th Ave NE	LF	4,500	\$ 330	\$ 1,485,000
4	LH520/BV400 PRV	EA	1	\$ 105,000	\$ 105,000
<b>Construction Cost Subtotal</b>					<b>\$ 2,514,000</b>
Washington State Sales Tax (9.5 percent)					\$ 239,000
Construction Cost Contingency (20 percent)					\$ 551,000
<b>Construction Cost Total</b>					<b>\$ 3,304,000</b>
<b>Indirect Costs (2013 \$\$)</b>					
Indirect Costs (35 percent of construction costs and includes construction survey, predesign engineering, design engineering, construction engineering and administration, permitting and inspections)					\$ 1,157,000
<b>Indirect Cost Total</b>					<b>\$ 1,157,000</b>
Project Cost Subtotal					\$ 4,461,000
Project Contingency (5 percent)					\$ 224,000
<b>Project Cost Including Construction and Indirect Costs</b>					<b>\$ 4,685,000</b>

\* Cost allocated in CIP #W-104

Alternative D					
Item	Description	Units	Quantity	Unit Price	Total Price
<b>Construction Costs (2013 \$\$)</b>					
1	16-inch Water Main in SE 8th and Lake Hills Conn to TESSL*	LF	9,400	\$ -	\$ -
2	16-inch Water Main in Lake Hills Conn from TESSL to LH520	LF	2,600	\$ 330	\$ 858,000
3	24-inch Water Main in LH520 Zone: Parksite to SE 28th Inlet	LF	7,500	\$ 390	\$ 2,925,000
4	LH520/BV400 PRV	EA	1	\$ 105,000	\$ 105,000
<b>Construction Cost Subtotal</b>					<b>\$ 3,888,000</b>
Washington State Sales Tax (9.5 percent)					\$ 370,000
Construction Cost Contingency (20 percent)					\$ 852,000
<b>Construction Cost Total</b>					<b>\$ 5,110,000</b>
<b>Indirect Costs (2013 \$\$)</b>					
Indirect Costs (35 percent of construction costs and includes construction survey, predesign engineering, design engineering, construction engineering and administration, permitting and inspections)					\$ 1,789,000
<b>Indirect Cost Total</b>					<b>\$ 1,789,000</b>
Project Cost Subtotal					\$ 6,899,000
Project Contingency (5 percent)					\$ 345,000
<b>Project Cost Including Construction and Indirect Costs</b>					<b>\$ 7,244,000</b>

\* Cost allocated in CIP #W-104

*City of Bellevue*

EOA-WOA Transmission Main Evaluation

**Preliminary Study Level Cost Estimate**

<b>Alternative E</b>					
<b>Item</b>	<b>Description</b>	<b>Units</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Total Price</b>
<b>Construction Costs (2013 \$\$)</b>					
1	16-inch Water Main in NE 8th St	LF	2,600	\$ 330	\$ 858,000
2	12-inch Water Main in SE 7th St	LF	400	\$ 290	\$ 116,000
3	12-inch Water Main in 140th Ave NE	LF	1,200	\$ 330	\$ 396,000
4	Upgrade Existing PRV Stations	EA	2	\$ 35,000	\$ 70,000
<b>Construction Cost Subtotal</b>					<b>\$ 1,440,000</b>
Washington State Sales Tax (9.5 percent)					\$ 137,000
Construction Cost Contingency (20 percent)					\$ 316,000
<b>Construction Cost Total</b>					<b>\$ 1,893,000</b>
<b>Indirect Costs (2013 \$\$)</b>					
Indirect Costs (35 percent of construction costs and includes construction survey, predesign engineering, design engineering, construction engineering and administration, permitting and inspections)					\$ 663,000
<b>Indirect Cost Total</b>					<b>\$ 663,000</b>
Project Cost Subtotal					\$ 2,556,000
Project Contingency (5 percent)					\$ 128,000
<b>Project Cost Including Construction and Indirect Costs</b>					<b>\$ 2,684,000</b>

Category	Item	Description	Weight Factor	3.5 MG WOA Storage	Transmission Main Alternative A	Transmission Main Alternative B	Transmission Main Alternative C	Transmission Main Alternative D	Transmission Main Alternative E
Economic	Initial Capital Cost	Initial Capital Cost	4	\$5,524,000	\$9,019,000	\$5,187,000	\$4,685,000	\$7,244,000	\$2,893,000
Economic	Energy Consumption After Construction	Long term electricity bill	1	It is assumed that the proposed reservoir will be designed with an overflow elevation of 400 feet and only minimal power will be needed at the facility for lighting, SCADA, etc.	Increase due to need to pump water to the BPSO to be ultimately conveyed to BVAO Zone.	Proposed facilities will not require power.	Proposed facilities will not require power.	Proposed facilities will not require power.	Proposed facilities will not require power.
Economic	Long Term O&M Needs	Effort required to maintain infrastructure	3	A new storage facility will require daily monitoring and frequent maintenance.	A new BPS will require daily monitoring and frequent maintenance. New PRVs and transmission main will require occasional maintenance.	New PRVs and transmission main will require occasional maintenance.	New PRVs and transmission main will require occasional maintenance.	New PRVs and transmission main will require occasional maintenance.	New transmission main will require occasional maintenance.
Economic	Potential Renewal and Replacement Savings	Added value for R&R program	2	It is assumed that the selected site will provide the opportunity for the City to exercise the reservoir in order to replace an existing aging facility. Cost savings may be realized for the future renewal and replacement of the existing aging facility by coordinating these projects.	The oldest known section of water main along the proposed alignment was installed in 1966 and is likely nearing the end of its life expectancy. Portions of the existing alignment are constructed of AC. Cost savings may be realized for the future renewal and replacement of the existing water main by coordinating these projects.	The oldest known section of water main along the proposed alignment was installed in 1965 and is likely nearing the end of its life expectancy. Portions of the existing alignment are constructed of AC. Cost savings may be realized for the future renewal and replacement of the existing water main by coordinating these projects.	The oldest known section of water main along the proposed alignment was installed in 1961 and is likely nearing the end of its life expectancy. Portions of the existing alignment are constructed of AC. Cost savings may be realized for the future renewal and replacement of the existing water main by coordinating these projects.	The oldest known section of water main along the proposed alignment was installed in 1970 and is likely nearing the end of its life expectancy. Portions of the existing alignment are constructed of AC. Cost savings may be realized for the future renewal and replacement of the existing water main by coordinating these projects.	The oldest known section of water main along the proposed alignment was installed in 1957 and is likely nearing the end of its life expectancy. Cost savings may be realized for the future renewal and replacement of the existing water main by coordinating these projects.
Economic	Impact on Creation of 560 Zone	Any effects related to increasing Lake Hills pressure	3	No impact on creation of 560 Zone anticipated.	No impact on creation of 560 Zone anticipated.	No impact on creation of 560 Zone anticipated.	Several of the 560 Zone alternatives include a portion of this alignment. Cost savings may be realized with coordination of these projects.	No impact on creation of 560 Zone anticipated.	No impact on creation of 560 Zone anticipated.
Economic	Traffic Impacts During Construction	Opportunity cost of traffic delay	2	Depending on site, traffic impacts during construction will be minimal compared to transmission main alternatives, which will be installed within existing right-of-ways.	Traffic in residential areas will be impacted during the construction of the transmission main and other alternative improvements.	Traffic within a main arterial and business district will be impacted during the construction of the transmission main and other alternative improvements.	Traffic within a main arterial and business district will be impacted during the construction of the transmission main and other alternative improvements.	Traffic within a main arterial will be impacted during the construction of the transmission main and other alternative improvements.	Traffic within a short section of a main arterial and business district will be impacted during the construction of the transmission main and other alternative improvements.
Economic	System Water Quality	Effects on DBP, chlorine residual and taste & odor; O&M effort required to maintain WQ	2	Water turnover rate will decrease, however it will depend heavily on the selected site.	No change. Transmission main will only operate in existing reservoirs. No impact on normal turnover in existing reservoirs.	No change. Transmission main will only operate in existing reservoirs. No impact on normal turnover in existing reservoirs.	No change. Transmission main will only operate in existing reservoirs. No impact on normal turnover in existing reservoirs.	No change. Transmission main will only operate in existing reservoirs. No impact on normal turnover in existing reservoirs.	No change. Transmission main will only operate in existing reservoirs. No impact on normal turnover in existing reservoirs.

Category	Item	Description	Weight Factor	3.5 MG WOA Storage	Transmission Main Alternative A	Transmission Main Alternative B	Transmission Main Alternative C	Transmission Main Alternative D	Transmission Main Alternative E
Economic	Construction and Permitting Schedule	Storage is made available to WOA before deadline (no lapse in minimum compliance)	4	-2	-1	1	1	-1	1
Economic	System Transmission Redundancy	Flexibility in Ability to Move Storage/Supply	2	0	2	2	2	2	2
Economic	Environmental Impacts*	Environmental Impacts	2	-1	-1	-1	-1	-1	-1
Social	Available Fire Flow - WOA	Life, safety and insurance rate ramifications	4	0	0	0	0	0	0
Social	Available Fire Flow - EOA	Life, safety and insurance rate ramifications	4	0	0	0	0	0	0
Social	Impact to Neighboring Utilities	Effect on O&M and supply redundancy of Redmond, CCUD, Kirkland, SPU, Issaquah, etc.	1	1	-1	-1	-1	-1	-1
Social	Long Term Neighborhood Impacts	Site access for O&M and other vehicles. Occasional noise for O&M tasks. Access to PRV station may be within or adjacent to ROW and may require temporary interruptions for occasional access to vault for O&M activities.	4	-2	-1	-1	-1	-1	-1

Category	Item	Description	Weight Factor	3.5 MG WOA Storage	Transmission Main Alternative A	Transmission Main Alternative B	Transmission Main Alternative C	Transmission Main Alternative D	Transmission Main Alternative E
Social	Reliability (reduces pumped storage)	Manages risk of failure when needed most	4	It is assumed that the proposed reservoir will be designed with an overflow elevation of at least 100 ft above the WOA, which is more reliable than pumped storage.	Additional risk is assumed with emergency storage needing to be pumped and supplied from facilities that carry a potential for failure of the mechanical equipment.	This transmission main alternative relies on pumped storage from the EOA, which is more reliable than pumped storage.	This transmission main alternative relies on pumped storage from the EOA, which is more reliable than pumped storage.	This transmission main alternative relies on pumped storage from the EOA, which is more reliable than pumped storage.	This transmission main alternative relies on pumped storage from the EOA, which is more reliable than pumped storage.
Social	Traffic Impacts During Construction	Opportunity cost of traffic delays	2	Traffic impacts during construction will vary depending on the final site selected.	Traffic in residential areas will be impacted during construction of the transmission main and other alternative improvements.	Traffic within a main arterial and business district will be impacted during the construction of the transmission main and other alternative improvements.	Traffic within a main arterial and business district will be impacted during the construction of the transmission main and other alternative improvements.	Traffic within a main arterial will be impacted during the construction of the transmission main and other alternative improvements.	Traffic within a short section of a main arterial and business district will be impacted during the construction of the transmission main and other alternative improvements.
Social	Construction and Permitting Schedule	Storage is made available to WOA before deadline (no lapse in minimum compliance)	3	Depending on selected site, state parks or other agencies may require coordination.	The transmission main and BPS are located in residential areas that may not require as much time to mitigate utility, ROW and traffic impacts during design and construction. Minor coordination with SPU for TESSL crossing will be necessary.	It is assumed that this corridor is congested with utilities and that significant traffic impact mitigation may extend design and construction schedule. Coordination with SPU for TESSL crossing will be necessary.	It is assumed that this corridor is congested with utilities and that significant traffic impact mitigation may extend design and construction schedule. Coordination with SPU for TESSL crossing will be necessary.	It is assumed that this corridor is congested with utilities and that significant traffic impact mitigation may extend design and construction schedule. Coordination with SPU for TESSL crossing will be necessary.	Although it is assumed that this corridor is congested with utilities and that traffic impact mitigation will be necessary, this alignment is significantly shorter than other alternatives. Minor coordination with SPU for TESSL crossing will be necessary.
Social	System Water Quality	Effects on DBP, chlorine residual and taste & odor; O&M effort required to maintain WQ	4	Water turnover rates will decrease, however it will depend heavily on the selected site.	No change. Transmission main will only operate during emergency conditions and will not impact the normal turnover in existing reservoirs.	No change. Transmission main will only operate during emergency conditions and will not impact the normal turnover in existing reservoirs.	No change. Transmission main will only operate during emergency conditions and will not impact the normal turnover in existing reservoirs.	No change. Transmission main will only operate during emergency conditions and will not impact the normal turnover in existing reservoirs.	No change. Transmission main will only operate during emergency conditions and will not impact the normal turnover in existing reservoirs.
Social	Short Term Neighborhood Impacts	Localized quality of life during construction	2	Construction activities will create noise, dust, vibration, odor and access interruptions within the vicinity of selected site.	Construction activities will create noise, dust, vibration, odor and access interruptions within residential areas along alignment.	Alignment is in major arterial. Construction activities will create noise, dust, vibration, odor and access interruptions within commercial areas along alignment.	Alignment is in major arterial. Construction activities will create noise, dust, vibration, odor and access interruptions within commercial areas along alignment.	Alignment is in major arterial. Construction activities will create noise, dust, vibration, odor and access interruptions within residential and commercial areas along alignment.	Alignment is in major arterial. Construction activities will create noise, dust, vibration, odor and access interruptions within residential and commercial areas along alignment.
Social	System Storage Redundancy	Total Storage Available; Flexibility to take tanks in/out of service	5	Increases redundancy in the amount of total storage available to the system.	Does not increase total storage available to the system.	Does not increase total storage available to the system.	Does not increase total storage available to the system.	Does not increase total storage available to the system.	Does not increase total storage available to the system.
Social	System Transmission Redundancy	Flexibility in Ability to Move Storage/Supply	4	Does not provide additional flexibility in the way storage and supply can be conveyed from one operating area to another.	Provides redundancy in supply to the WOA and flexibility in the means available to move storage and supply from the EOA to the WOA.	Provides redundancy in supply to the WOA and flexibility in the means available to move storage and supply from the EOA to the WOA.	Provides redundancy in supply to the WOA and flexibility in the means available to move storage and supply from the EOA to the WOA.	Provides redundancy in supply to the WOA and flexibility in the means available to move storage and supply from the EOA to the WOA.	Provides redundancy in supply to the WOA and flexibility in the means available to move storage and supply from the EOA to the WOA.

Category	Item	Description	Weight Factor	3.5 MG WOA Storage	Transmission Main Alternative A	Transmission Main Alternative B	Transmission Main Alternative C	Transmission Main Alternative D	Transmission Main Alternative E
Social	Environmental Impacts*	Environmental Impacts	3	Environmental impacts are relative to the site selected which has not been done. For that reason, an average weight and rating has been assigned with the understanding that should the final ranking be close and this be in the top two, refinement would be necessary.	Portions of the proposed alignment cross a creek in a Chinook distribution area and would require mitigation.	The proposed alignment crosses a creek in a Chinook distribution area and 100 year floodplain and would require mitigation.	Portions of the proposed alignment cross a creek in a Chinook distribution area and 100 year floodplain or are located in an erosion hazard area and would require mitigation.	Portions of the proposed alignment cross a creek in a Chinook distribution area and 100 year floodplain or are located in an erosion hazard area and would require mitigation.	The proposed alignment crosses a creek in a Chinook distribution area and 100 year floodplain and would require mitigation.
Environmental	Environmental Impacts*	Environmental Impacts	4	Environmental impacts are relative to the site selected which has not been done. For that reason, an average weight and rating has been assigned with the understanding that should the final ranking be close and this be in the top two, refinement would be necessary.	Portions of the proposed alignment cross a creek in a Chinook distribution area and would require mitigation.	The proposed alignment crosses a creek in a Chinook distribution area and 100 year floodplain and would require mitigation.	Portions of the proposed alignment cross a creek in a Chinook distribution area and 100 year floodplain or are located in an erosion hazard area and would require mitigation.	Portions of the proposed alignment cross a creek in a Chinook distribution area and 100 year floodplain or are located in an erosion hazard area and would require mitigation.	The proposed alignment crosses a creek in a Chinook distribution area and 100 year floodplain and would require mitigation.
Environmental	Energy Consumption After Construction	Long-term electricity bill	1	It is assumed that the proposed reservoir will be designed with an operation of 400 feet and only minimal power will be needed at the facility for lighting, SCADA, etc.	Increases due to need to pump water to the P9670 to be ultimately conveyed to BV400 Zone.	Proposed facilities will not require power.	Proposed facilities will not require power.	Proposed facilities will not require power.	Proposed facilities will not require power.
				-42	-39	0	-13	-22	18

\* A cursory review of environmental impacts was performed based on sensitive areas currently mapped by King County. Further investigation and analysis is recommended if the City elects to consider these alternatives further.

Action  
 Discussion  
 Information

October 17, 2013

**To:** Environmental Services Commission  
**From:** Doug Lane, Water & Sewer Systems Senior Engineer  
**Subject:** Wastewater System Plan Update  
Executive Summary

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#### Action Required at this Time

Staff will present an executive summary of the draft *Wastewater System Plan*. Hard copies of the draft Plan update will be provided to the Commission for review. No action by the Commission is required at this meeting.

SEPA review of the Plan, and review by adjacent jurisdictions, regional and state agencies will take place over the next month. Staff will host a public open house about the Plan prior to the ESC meeting on November 21. A summary of comments collected to date will be presented in November, and Commission comments about the Plan will be requested at that time.

#### Background

Bellevue's *Comprehensive Wastewater Plan* was adopted by Council in 2002. A draft update to the Plan, now known as the *Wastewater System Plan*, has been prepared for review.

In June the Plan *recommendations* were presented to the Commission. Previously, proposed changes to wastewater *policies* and the *system planning criteria* were also discussed with the Commission. The draft Plan being delivered at the October ESC is the culmination of this effort.

Major elements of this system plan update include:

- Review of wastewater utility general policies;
- Review of system planning criteria;
- Revised service area population forecasts;
- Capacity evaluation of the parts of the wastewater system that were assumed from Coal Creek Utility District in 2003;
- Re-evaluation of system capacity in downtown Bellevue;
- Analysis of basin-wide flow monitoring and infiltration & inflow investigations;
- Updated programmatic and capital investment recommendations for a 20-year planning horizon; and
- Updated descriptions of wastewater system operational practices.

#### Key Points

The draft Plan is consistent with recent presentations to the Commission—there should be no surprises. Staff will highlight a few key findings for the executive summary:

- **Lake Line Evaluation & Replacement.** There are 18.7 miles of lake lines in the service area, 3.6 miles of which are asbestos cement (AC) material installed in the late-1950's.

Significant structural deterioration of AC pipe has been observed in Meydenbauer Bay. In addition, overflows due to sedimentation have occurred in some flat pipes. Sedimentation can be mitigated by jetting and cleaning the pipes, but these AC pipes can no longer be jetted due to the risk of further structural damage.

Replacement of the lake lines is expected to be technically challenging, environmentally sensitive, and relatively expensive. Replacement will need to be site specific; no single solution will work at all locations. Stakeholder input will be critical.

CIP Program S-58 budgets approximately \$1.85 million to replace approximately 1,300-feet of lake line in Meydenbauer Bay in 2013 and 2014, and \$113,000 annually is budgeted beyond that for ongoing condition assessment. Planned R&R funding includes the projected costs for lake line replacement. The remaining lakeline replacement will need to be scheduled in the CIP.

- **Inflow & Infiltration.** I&I is higher than previously realized in many areas, and is causing capacity problems and increasing the potential risk of overflows. The Plan recommends I&I investigations in portions of 8 basins (~ \$600,000 estimated total), and flow monitoring in 6 locations (~\$120,000) to provide targeted I&I mitigation prior to capital investment. If I&I mitigation is not successful, capacity improvements will be required.
- **Proposed Replacement of AC Force Mains.** The Plan recommends establishing a new asset management program to inspect and prioritize replacement of AC force mains. AC force mains have a higher risk of failure compared with other materials as a result of hydrogen sulfide damage, and have a higher consequence of failure because they're pressurized.

Two locations would have particularly significant consequences if they failed, due to the volume of sewage conveyed and their location in easements through private property and/or localized geography (slopes or proximity to lakes). These locations are downstream of Lake Hills PS #12 and Lake Hills PS #6. The rough estimated costs are \$316k to replace 800-ft force main at PS #6, and \$1.2M to replace 3,000-ft of force main at PS #12.

In addition to discussing these issues, staff will present a brief overview of anticipated growth and development, and a summary the outcomes of review of sewer system policies.

#### Next Steps

Over the next few months, staff will collect and respond to comments received from the public, other agencies, and from the SEPA review process. Once incorporated, the Final Draft Plan will be presented to the ESC. Staff will request that the ESC recommend Council adoption of the Plan. The Plan must ultimately be adopted by City and County Councils, and approved by the WA Department of Ecology.

#### Attachments:

- 1) Powerpoint presentation "WWSP Exec Summary ESC 17 Oct 2013.pptx"

# 2013 Wastewater System Plan Update

## Executive Summary

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## Review

### Key Findings for Discussion:

- Lake Line Evaluation & Replacement
- I&I Worse than thought
- Proposed Replacement of AC Force Mains
- Brief overview of growth & development, policies

### Wastewater Plan requirements not discussed today (but in the Plan):

- Inventory of Assets
- Hydraulic Analysis
- O&M Practices
- Financing
- Ongoing, annual CIP programs
- More...

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## Lake Line Evaluation & Replacement

### Two Problems

- Failing asbestos cement (AC) pipe, ~3.6 miles
- Overflows due to sedimentation in flat pipes

**Structural failure of AC lake line piping expected within 10-15 years**



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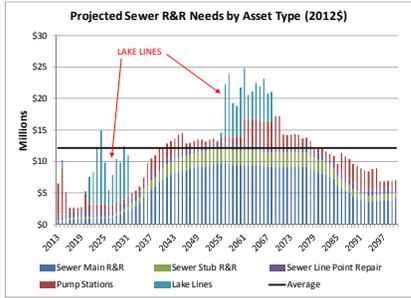
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### Infrastructure Renewal: Lakelines



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### Inflow & Infiltration

- I&I is higher than previously realized
- I&I is causing capacity problems
- Recommend I&I investigations in portions of 8 basins (~ \$600,000) and flow monitoring in 6 locations (~\$120,000)



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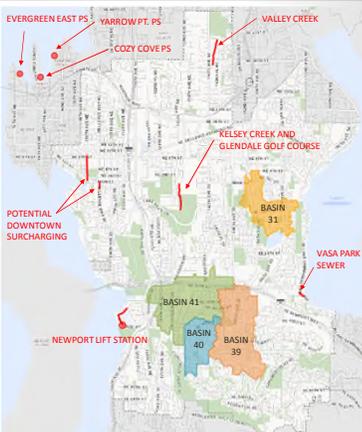
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### Existing Capacity Problems

Recommended sites for flow monitoring and targeted I&I investigation



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### AC Force Mains

- AC pipes are failing
- Pressurized force main pipes have higher criticality and consequence of failure
- Estimated \$1.5M for replacement of ~3,800-ft at Pump Stations #6 and #12



Legend:  
Force Mains (Purple)  
Other Sewer Pipes (Green)

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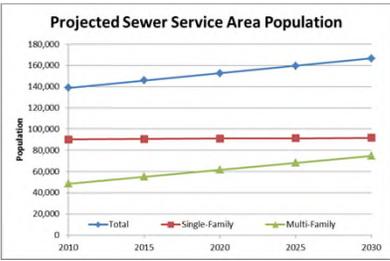
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### Growth & Development

- Population Expected to surpass 166,000 by 2030
- Downtown, Bel-Red re-zone, East Link Light Rail corridor, etc



Year	Total	Single-Family	Multi-Family
2010	140,000	90,000	40,000
2015	145,000	90,000	55,000
2020	150,000	90,000	60,000
2025	155,000	90,000	65,000
2030	166,000	90,000	76,000

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### Capacity Needed for Growth

Recommended sites for capacity expansion due to forecasted growth and development



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## Policies

The Wastewater System Plan (WWSP) facilitates growth and economic development consistent with:

- Bellevue Comprehensive Plan (Policies UT-4, ED-21...)
- Growth Management Act (GMA)

The Wastewater System Plan (WWSP) defines utility-specific policies:

- Existing utility policies were clarified, but no big changes
- Regional Policy: A new policy was added to guide Bellevue's role in influencing *regional* decision-making.

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## Wastewater System Plan

Questions?

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# MEMORANDUM

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**DATE:** October 8, 2013

**TO:** Environmental Services Commission

**From:** Pamela J. Maloney, Water Resources Planning Manager, Utilities  
425-452-4625 [pmaloney@bellevuewa.gov](mailto:pmaloney@bellevuewa.gov)

**SUBJECT:** Comprehensive Plan Update: Recommended Policy changes to the Utilities, Capital Facilities, and Environmental Elements of the City's Comprehensive Plan

In September the ESC reviewed staff-proposed changes to Comprehensive Plan policies that are particularly relevant to Utilities' business lines. The Commission requested some changes and additions, and asked that staff bring the summary back in October for a final look. The attached table reflects ESC-proposed modifications, as listed below:

- Spell out acronyms throughout the document.
- Under "General Utility System Policies", make it clear that proposed new asset management policies are referring to utility infrastructure assets.
- Add to the proposed changes for UT 25 to encourage coordination with schools about water quality education efforts.
- For the proposed new Aquatic Habitat policy, make it clear that the policy should not compel private property owners to improve stream habitat, although education to encourage them to do so is appropriate.
- For EN 36: Add the word "littoral" as well as "riparian" to capture the banks adjacent to lakes as well as streams.

If the Commission believes the table appropriately captures your intended policy changes, *staff requests the ESC pass a motion to forward the proposed changes to the Planning Commission for their consideration.* Staff will prepare a memo for the Chair's signature, and forward the document to the Planning Commission, via the Comprehensive Plan Update (CPU) Team lead Paul Inghram.

### Next Steps

The CPU team will consider stakeholder input, including ESC's, to develop proposed policy language and general updates to the non-policy portions of the Elements for review by the Planning Commission over the next several months. Proposed policy language (from the PC) will be provided to stakeholders, including the ESC, for review in 2014 prior to submittal to the City Council.

**2013 Comprehensive Plan Update**  
**ESC / Utilities Recommended Policy Changes**  
 As Presented for Approval by ESC on October 17, 2013

<b>Utilities Element</b>			
<b>Policy #</b>	<b>Existing Policy or New Topic</b>	<b>Proposed Change</b>	<b>Why?</b>
<b>General Utility System Policies UT-1 to UT-6</b>			
NEW	Asset Management – general	Add policy language in support of asset management of utility infrastructure assets. Stress cost effective management of systems over their lifetime, including planning for renewal and replacement, balancing risk, and maintaining levels of service. For city-managed utilities, add guidance to forecast future capital and operations/maintenance costs, so that customer rates can be established to fully fund ownership costs in an equitable manner across generations.	There are currently no policies about using an asset management approach for utility infrastructure in the Comp Plan. Proposal would add general language about support for comprehensive asset management approach as a best practice to serve utility customers.
NEW	Asset Management – risk	Add a policy requiring management of city-managed utility infrastructure assets in a manner to reduce the likelihood of public safety impacts, property and environmental damage, and business/social disruption due to asset failure.	There are currently no policies about asset management in the Comp Plan. Proposed language recognizes the risk management element of utility infrastructure asset management.
NEW	Support for Emerging Technology	Add policy language recognizing and supporting emerging technologies which support sustainability that are appropriate and viable. (Examples: smart buildings using water recycling, wastewater treatment techniques such as membrane treatment technologies) and stormwater management (Low Impact Development) techniques that allow them to lessen their demand to the utility grid, or even to be ‘off the grid’.  Add policy support for providing education about the benefits of these technologies, in particular Low Impact Development.	There is virtually no mention of emerging technologies in the Comp Plan now. Policy would affirm city should be supportive of credible proposals to manage water and wastewater use efficiently, and mitigate stormwater innovatively, on site.  NPDES Compliance
NEW	Utility System Plan Updates	Add policy direction for development and periodic updating of functional utility plans (aka Utility System Plans) that forecast system capacity and deficiency for at least a 20 year planning horizon.	Would provide policy support that long range planning is appropriate and necessary.
NEW	Utility System Plan Content	Add policy direction that functional system plans for water, wastewater and storm water should contain system management and operational policies, levels of service, and consider the impact of changing weather patterns.	Clarity. Alerts CP audience that system plans contain policies and level of service information specific to each utility, in addition to those broad policies stated in the CP.
NEW	Low Impact Development	Add policy support for “Considering LID principles to minimize impervious surfaces and native vegetation loss on all infrastructure improvement projects.”	NPDES Compliance

<b>Intergovernmental Relations and Coordination UT-7 to UT-10</b>			
UT 7	<i>Extend water and sewer utility service to unserved areas of the utility service area, including extensions into potential annexation areas, if the city's costs are reimbursed and provided that service will be extended only upon annexation to the city, or if extensions are consistent with local and regional land use and utility comprehensive plans.</i>	Add language to clarify that sub-area policy may modify utility extension requirements for specific geographic areas. (e.g. Bridle Trails BT-33 and Newcastle NC-61)	Clarity. Alerts reader that subarea policy may impact broad policy for specific geographic areas.
UT 8	<i>Recover all costs, including overhead costs, related to the extension of services, as well as the costs to maintain and operate these systems.</i>	Move this policy about cost recovery of extensions to the "General Utility System" section	Relocating policy to more logical place; No substantive change proposed.
NEW	Emergency Preparedness -- Coordination	Add policy endorsing coordinated emergency preparedness and response with local and regional utility partners. (Example: Washington Water and Wastewater Response Network {WAWARN})	Inter-agency coordination for emergency preparedness and response is critical to utility service delivery following an event, but Comp Plan is currently silent on this topic.
<b>Solid Waste Policies UT-14 to UT-21</b>			
NEW	Solid Waste Mission	Add a broad policy statement that fully captures the Solid Waste Utility mission to provide a convenient, efficient, environmentally-friendly and unobtrusive solid waste collection system.	There is currently no umbrella policy directing the City to implement a solid waste program.
<b>Sewer Utility Policies UT-20 to UT-21</b>			
NEW	Wastewater Utility Mission	Add a broad policy statement that captures the utility's wastewater mission: "Provide a reliable wastewater disposal system that ensures a public health and safety, and protects the environment."	There is currently no umbrella policy directing the city to implement a wastewater system.
<b>Storm and Surface Water Policies UT-22 to UT-25</b>			
UT 22	<i>Participate in regional watershed based efforts with the goals of achieving local watershed health and addressing Endangered Species Act issues, and strive to manage the city's storm and surface water system within a system wide, watershed based context.</i>	Separate this into two policies. 1) The first part of the sentence is a complete policy, with a period after "Endangered Species Act". Change second "watershed" term to "drainage basin".  2) Revise the second part of the sentence to read something like "Strive to manage the storm and surface water drainage system with a comprehensive and holistic approach."	Clarity: The two ideas are somewhat independent, so two policies would add clarity. Clarity: Change from 'Watershed' to "drainage basin" provides consistency with NPDES permit terminology, to avoid confusion.  Clarity. Dropping the word 'city's' would better convey that the storm system is comprised of both public and private elements. The changed words avoid confusion and conflict with the language of the NPDES permit.

UT 23	<i>Manage the storm and surface water system in Bellevue to maintain a hydrologic balance in order to prevent property damage, protect water quality, provide for the safety and enjoyment of citizens, and preserve and enhance habitat and sensitive areas.</i>	Update this umbrella policy to capture stormwater utility’s mission of “Provide a storm and surface water system that controls damage from storms, protects surface water quality, supports fish and wildlife habitat, and protects the environment.”	Clarity. Update language to be consistent with the storm and surface water utility mission.
UT 24	<i>Enforce surface water controls to protect surface water quality.</i>	Delete Policy	Policy was originally written for surface water protection from leaking underground storage tanks. Surface water quality is now broadly protected by local, state and federal regulations.
UT 25	<i>Educate the public on water quality issues.</i>	Update policy language to recognize need for water quality education specifically about low impact development, pollution prevention, aquatic habitat, and public engagement. Encourage coordination with schools as one option to further water quality education.	Brings policy up to date by adding specificity about which issues that affect WQ should be the focus of public education efforts.
<b>Water Utility Policies UT-26 to UT-31</b>			
UT 26	<i>Ensure a cost-effective water supply that meets the needs of the City of Bellevue</i>	Expand this policy to fully capture the water utility mission to “Provide a reliable supply of safe, secure, high quality drinking water that meets all the community’s water needs in an environmentally responsible manner.”	Revised umbrella policy would better align with water utility mission.
UT 27	<i>Provide a water supply that meets all federal drinking water quality standards.</i>	Revise policy to compel meeting all federal <u>and state</u> drinking water quality standards.	Recognizes that there are federal AND state drinking water quality standards.
<b>Non City Managed Utilities</b>			
NEW	Support for Emerging Technologies by non-city-managed utilities	Gap: Add policy language to support technology that could enhance the provision of municipal utility services, such as high capacity wireless internet that would support automated meter reading.	To add policy in support of new technologies that would benefit city-managed utility service delivery.
NEW	Priority to recovering power for the water/wastewater system	Gap: Add policy requiring that electrical utilities give priority to restoring power to utility lifeline services (water and sewer facilities), during power outages.	Supports restoration of utility lifelines following power outages, over other users.
UT 34	<i>Require effective and timely coordination of all public and private utility trenching activities.</i>	Expand this policy to require coordination beyond just trenching, such as for culvert replacements, and utility facility conflict resolution.	Policy support to leverage continued or enhanced coordination

Capital Facilities Element			
Policy	Existing Policy or New Topic	Proposed Change	Why?
CF 1	<i>Ensure that necessary capital facilities are provided within a reasonable time of the occurrence of impacts resulting there from.</i>	Currently written awkwardly. For Utilities capital facilities (and possibly others), revise to indicate that Utility facilities should be in place, or have provision for providing extension (public and/or developer funding) to accommodate planned growth.	Clarity
CF 5	<i>Use adopted LOS, operating criteria, or performance standards to evaluate capital facility needs.</i>	Add language that points to Utility System Plans (functional plans) for Levels of Service(LOS) specific to each system	Alerts CP audience that system plans contain policies specific to each utility in addition to those shown in the CP.

Environment Element			
Policy	Existing Policy or New Topic	Proposed Change	Why?
<b>Environmental Stewardship Policies EN-1 to EN-31</b>			
EN 5	<i>Reduce waste, reuse and recycle materials, and dispose of all wastes in a safe and responsible manner</i>	Rewrite to target increased waste prevention, reuse, recycling, and the use of recycled-content materials and products. Promote the use of products and materials that require less resource to create and use and that are recyclable at the end of their useful lives. Keep the part about disposing of all wastes in a safe and responsible manner.	To make the policy more comprehensive by adding prevention and specifying support for recycled-content materials and products.
EN 27	<i>Implement the citywide use of low impact development techniques and green building practices that provide benefits to critical areas functions.</i>	Drop the last clause “that provide benefits to critical areas functions”.	The phrase inappropriately limits the application of LID techniques, inconsistent with NPDES permit.
NEW	Aquatic Habitat	Add a new policy directing that the City should be the steward of information relative to aquatic habitat on public <i>and</i> private property, and should develop a plan leading to overall habitat improvements throughout the City.	Would add flexibility to prioritize and implement projects wherever they will provide the most benefit, without obliging or mandating any defined level of public investment. Do not write in such a way that could compel private property owners to resolve such aquatic habitat problems, although education about voluntary resolution would be appropriate.
NEW	Space for Recyclables	Add a policy that requires developers to plan for adequate space for recycling a variety of materials (recyclables and organic materials to be source-separated and when collected for recycling)	Resolve an ongoing problem that has not been addressed through code modification.
NEW	Tree Canopy Preservation and Restoration	Add a policy that recognizes the value of trees to surface water, and that therefore encourages the preservation and restoration of tree canopy throughout the city, including in rights of way.	Trees provide cooling shade on stormwater runoff, reducing surface water temperatures. They also lessen the total volume of storm water that runs off, aligned with low impact development principles. Undeveloped property should preserve trees wherever possible; redeveloping property and city rights of way should add trees where possible.
<b>Water Resources Policies EN 32 to EN 43</b>			
GOALS	<i>Open surface water’s beneficial uses are, in order of priority:</i> <ul style="list-style-type: none"> <li>a. <i>Natural resources preservation;</i></li> <li>b. <i>Fish and wildlife habitat and water quality;</i></li> <li>c. <i>Storm water conveyance;</i></li> <li>d. <i>Recreation, culture and education; and</i></li> <li>e. <i>Aesthetics.</i></li> </ul>	Recommend removing prioritization.	Adds flexibility
EN 33	<i>Maintain surface water quality, defined as meeting federal and state standards and restore surface water that has become degraded, to the maximum extent practicable.</i>	Revise to acknowledge the non-point nature of pollution in surface water runoff, and to encourage the establishment of realistic goals consistent with state and federal requirements.	NPDES clarity. As written this policy implies that the city can maintain surface water quality that meets federal and state standards.

EN 36	<i>Retrofit public storm drainage systems and prioritize investments where there is a significant potential for restoring surface water quality important to preserving or enhancing aquatic life.</i>	Add “ littoral and riparian” after “aquatic”.	To more fully capture the in-water and land-living fish and wildlife dependent on healthy surface water quality of lakes and streams.
EN 38	<i>Restore and protect the biological health and diversity of the Lake Washington and Lake Sammamish watersheds in Bellevue’s jurisdiction.</i>	Change “watersheds” to “basins.”	Consistency: Current regional terminology now uses “watershed” to designate WRIAs, rather than referring to lake drainages as this policy did.
EN 39	<i>Restrict the runoff rate, volume, and quality to predevelopment levels for all new development and redevelopment.</i>	Delete this policy.	Stormwater runoff control is completely regulated by local and state prescriptive requirements, captured in Storm Code, Utility Engineering Standards, and other city development regulations.
<b>Earth Resources and Geologic Hazards Policies EN 44 to EN 58</b>			
EN 46	<i>Prepare geologic maps of the city, in conjunction with regional geologic mapping efforts.</i>	Replace “prepare” with “maintain”	Clarity. Would more accurately reflect ongoing need to keep current the geologic maps the city already has.
<b>Fish and Wildlife Habitat Conservation Areas Policies EN 59 to EN 77</b>			
EN 62	<i>Prohibit creating new fish passage barriers and remove existing artificial fish passage barriers in accordance with applicable state law regarding water crossing structures.</i>	Strike the last few words “regarding water crossing structures”.	Clarity. The term “water crossing structures” is confusing. The policy is complete without it.