Conceptual Projects to Meet Identified Capacity Needs

Conveyance System Improvement Program

Local Agency Review Draft

August 2016

Note: This draft is being circulated for local agency review and comment through September 16, 2016. It presents conceptual projects needed to meet projected capacity needs in the separated portion of the regional wastewater conveyance system through 2060. Project descriptions and planning-level cost estimates are presented for each conceptual project. The King County Wastewater Treatment Division (WTD) will be adding background information to the cost estimates during the local agency review and comment period. The background information will be included in the final report. Contact Steve Tolzman at 206.477.5459 or steve.tolzman@kingcounty.gov to request a meeting with WTD staff to discuss conceptual projects or to submit written comments.

King County

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Natural Resources and Parks
Wastewater Treatment Division

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Chapter 1

Process for Developing Recommended Conveyance Improvement Projects

The *Regional Needs Assessment* found that the capacities of 77 conveyance facilities in King County's separated sewer system are below or will fall below the 20-year peak flow design standard sometime in the 50-year planning period (2010–2060).[1] Over half of the facilities (40) do not currently meet the standard. This chapter discusses the processes used to develop conceptual conveyance system improvement (CSI) projects and lists recommended projects to address these system capacity needs. Chapter 2 describes the projects.

The Wastewater Treatment Division (WTD) considered the following capital project options for addressing capacity needs:

- Paralleling existing conveyance pipes with new pipes
- Upgrading pump stations
- Replacing undersized pipes or pump stations with larger ones
- Diverting flows to other conveyance facilities
- Building storage facilities that reduce peak flow volumes by storing wastewater during high flow periods until it can be safely conveyed by the downstream system

The process for developing a list of recommended projects was an iterative one in which early project lists were reviewed and revised to incorporate local information and cost-saving measures (Figure 1-1). Key activities, not necessarily in order, are listed below and described in the text that follows:

- Review the list of recommended projects in the 2007 CSI program update.
- Determine whether to recommend replacing or paralleling an existing pipe that has an identified capacity constraint.
- Size each project to convey the projected 20-year peak flow in 2060.
- Determine possible routes for new pipelines.
- Develop initial project cost estimates.
- Evaluate whether diversion or storage projects would provide cost-effective alternatives to parallel pipes.

[1] The *Regional Needs Assessment* can be found at http://www.kingcounty.gov/~/media/services/environment/wastewater/csi/docs/1505_Final_RNA_web.ashx?la=en.

- Revise project alternatives, as needed, to reflect information from local sewer agencies.
- Refine cost estimates.

The process used to develop projects depended on whether or not conveyance facilities with identified needs can convey a 20-year peak flow without surcharging and/or overflowing under current conditions (2010). Facilities that cannot currently convey the peak flow were assigned a level of service (LOS) of 20 or less; the remaining facilities were assigned an LOS of greater than 20.

For facilities with an LOS of greater than 20, two options were assumed:

- If the need was identified in the 2007 update, the conceptual project developed for the need in 2007 will be carried forward.
- If the need was not identified in the 2007 CSI update, the pipeline or pump station will be replaced or upgraded.

For facilities with an LOS of 20 or less, the condition, age, and composition of pipes were considered in order to decide whether to parallel or replace them. Replacement projects were developed for pipes greater than 50 years old and in poor condition. It was assumed that paralleling would occur in areas with relatively new pipes made of durable materials like reinforced concrete or metal, with enough room available, and with few pipes in the corridor.

The size for each new parallel or replacement pipe was then determined by projecting the 20-year peak flow in 2060 to be conveyed through the pipe. After the pipes were sized, possible pipeline routes were developed based on GIS data, aerial photographs, and elevations of existing conveyance facilities. Factors considered in developing routes included stream crossings, major street and culvert crossings, wetlands, public rights-of-way, topography, water bodies, and high water tables. Stream and wetland crossings were avoided if possible; major street crossing were minimized; and public rights-of-way were preferred to private properties.

Flow diversion and storage were evaluated if paralleling was infeasible or to determine if these options were more-cost effective than paralleling all or part of a the length of a pipeline where capacity is needed. Sometimes an iterative process was used to find the optimal combination of storage, diversion, and downstream paralleling costs.

- **Storage.** The downstream benefits of storage were analyzed using a hydraulic model to determine if building storage capacity rather than paralleling the pipe could provide needed capacity. A storage curve was developed to determine how much storage would be required. If the modeling indicated that storage was feasible and if the estimated cost of storage was less than increasing capacity in the downstream system, storage was assumed. Possible locations and types of storage facilities (such as box storage or underground pipe or tunnel storage) were identified. It is usually better if flow enters and exits a storage facility via gravity to avoid the need for pumps and associated electrical

and mechanical equipment, and large pipes are usually less expensive than boxes for underground storages.

- **Diversion.** Analysis of the feasibility of diversion took into consideration proximity to existing conveyance facilities, infrastructure and environmental constraints, and possible impacts to downstream facilities. If the analysis indicated that diversion was feasible and if the estimated cost of diversion was less than increasing capacity in the downstream system, storage was assumed.

Planning-level capital cost estimates for recommended projects were developed using the Tabula cost estimating tool. Tabula is a Web-based construction cost estimating program developed specifically for WTD. The program contains unit construction cost estimates and allied costs associated with designing and constructing the range of conveyance facilities needed across the regional system.[2] Operation and maintenance cost estimates included staffing and energy costs.

The list of proposed projects and cost estimates were modified based on input from local sewer agency representatives on local conditions, including topographic or permitting issues, and on plans for future road and utility projects that may provide the opportunity for coordination with CSI projects.

The feasibility of reducing infiltration and inflow (I/I) as a means to reduce, delay, or eliminate the need for a CSI project and the feasibility of including reclaimed water conveyance and access will be analyzed during early stages of each project.

An I/I analysis will be done as part of design flow criteria development and will be informed by the following:

- Assumptions developed by King County's Regional I/I Control Program, including high and low ranges of I/I reductions.
- Lessons learned from I/I program pilot and initial projects.

Possible outcomes of include a recommendation of whether I/I reduction should be considered as a project alternative during predesign and/or further evaluated through a sewer system evaluation survey.

[2] The Tabula program and user's guide can be accessed at http://dnr.metrokc.gov/wtd/csi/tabula/index.htm.

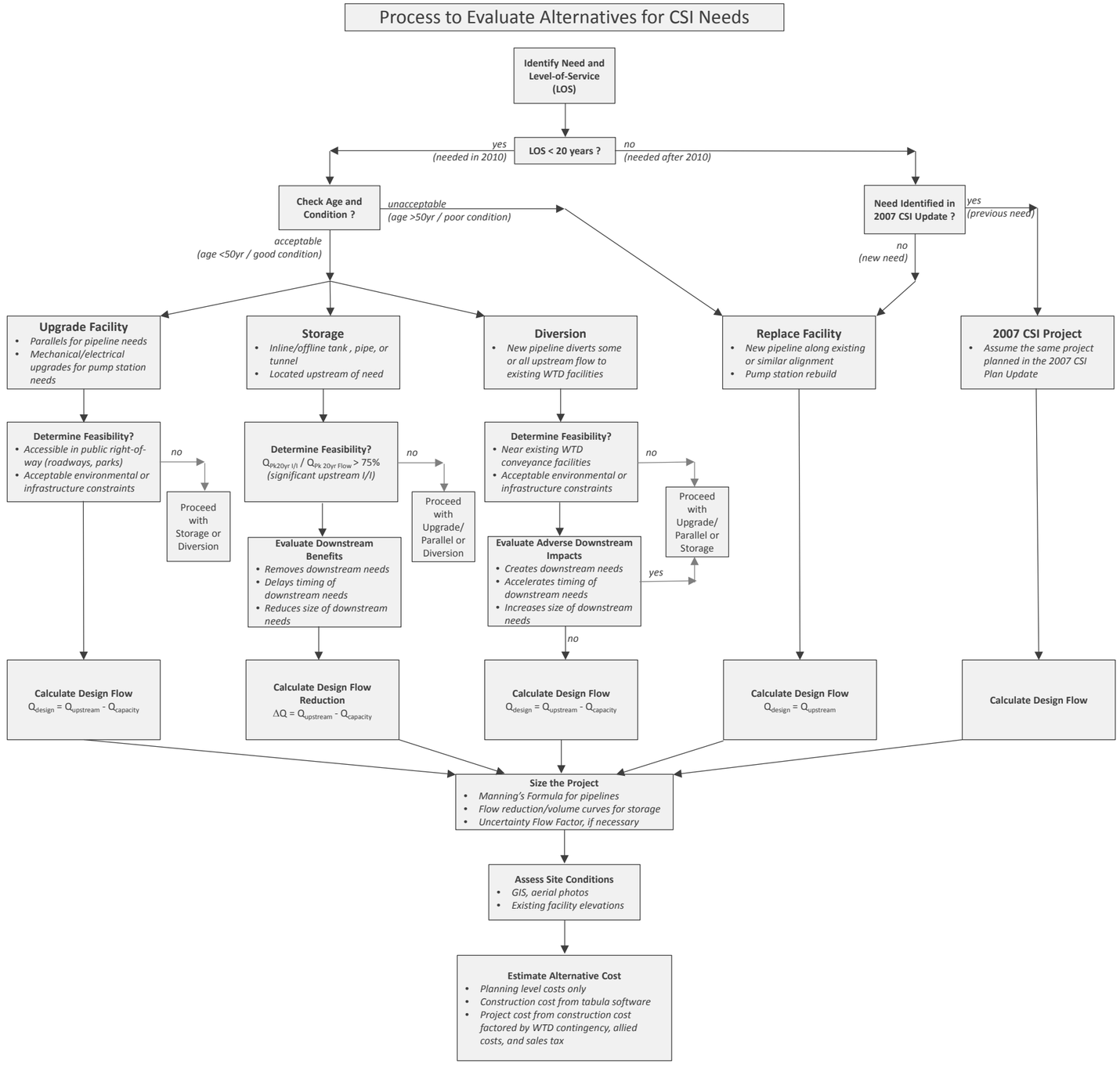


Figure -1-1. Process for Developing Recommended Conceptual Conveyance System Improvement Projects

Chapter 2

Recommended Conceptual Projects

Thirty-four conceptual CSI projects were developed to address the capacity needs of conveyance facilities in the separated sewer portion of the regional wastewater system. Ten conceptual projects are located in the Northeast Lake Washington Planning Area and six in the Hidden Lake Planning Area. The number of projects in other planning areas range from zero to four.

Table 2-1 lists the planning-level project and construction cost estimates for the conceptual projects. Figure 2-1 shows the locations of the projects in each of the planning areas, followed by descriptions of the conceptual projects.

Table 2-1. Estimated Project and Construction Costs for Conceptual Projects

Planning Area	Project Name	Estimated Total Project Cost (M 2016$)	Estimated Construction Cost (M 2016$)
North Lake Washington	North Creek Trunk Storage and Replacement (two phases)	77.3	26.6
	Swamp Creek Trunk Extension Replacement	15.3	4.9
Hidden Lake	Richmond Beach Pump Station Upgrade	29.8	10.5
	Richmond Beach Force Main Parallel	11.1	3.59
	Richmond Beach - Edmonds Interceptor Parallel	12.4	4.02
	Boeing Creek Trunk Replacement and Parallel	8.35	2.71
	Hidden Lake Pump Station Upgrade	8.96	2.91
	Hidden Lake Force Main Replacement	5.61	1.82
Northwest Lake Washington	Thornton Creek Trunk Replacement and Diversion	33.9	12
	North Lake City Trunk Replacement, Realignment, and Rehabilitation (two phases)	44.1	14.49
Northeast Lake Washington	Medina Trunk Replacement	12.2	3.95
	Medina Siphon Replacement	11.8	3.82
	Factoria Trunk Diversion	15.4	4.98
	Lake Hills Interceptor Replacement	62.1	21.9
	North Mercer Pump Station Upgrade	7.68	2.49
	Kirkland Pump Station Upgrade	10.8	3.49
	Medina Pump Station Upgrade	10.6	3.44
	Yarrow Bay Pump Station Replacement	16.3	5.35
	Sweyolocken Pump Station Upgrade	9.37	3.04
	Eastside Interceptor Section 8 Storage	101	35.5

Planning Area	Project Name	Estimated Total Project Cost (M 2016$)	Estimated Construction Cost (M 2016$)
North Lake Sammamish	No conceptual projects	-	-
Southeast Lake Washington	No conceptual projects	-	-
South Lake Sammamish	Sammamish Plateau Diversion	386	136
	Eastgate Trunk Replacement	7.06	2.29
	Issaquah Interceptor Section 2 Replacement	3.42	1.11
	Issaquah Creek Highlands Storage	6.22	2.02
South Lake Washington	Eastside Interceptor Section 1 Replacement	195	68.6
	Bryn Mawr Trunk Storage	20.5	6.73
	Cedar River Interceptor Section 2 Replacement	7.74	2.51
	Cedar River Interceptor Section 1 Replacement	15.9	5.24
North Green River	Tukwila Freeway Crossing Replacement	22.8	7.49
	Tukwila Interceptor Replacement	27.2	8.93
	South Renton Trunk Replacement	8.63	2.8
	Rainier Vista Interceptor South Replacement	3.73	1.21
	North Soos Creek Trunk Replacement	5.95	1.93
South Green River - Kent	Garrison Creek Interceptor Replacement, Realignment, and Diversion	49.2	17.4
	Auburn Interceptor Sections 1, 2, and 3 Replacement	255	89.6
	South 227th Interceptor Replacement	7.43	2.41
	West Hill Trunk Diversion	6.63	2.15
South Green River - Soos Creek	Black Diamond Pump Station Upgrade	1.37	0.42
	Black Diamond Trunk Storage and Replacement (2 Phases)	75.1	25.9
South Green River - Auburn	No conceptual projects	-	-

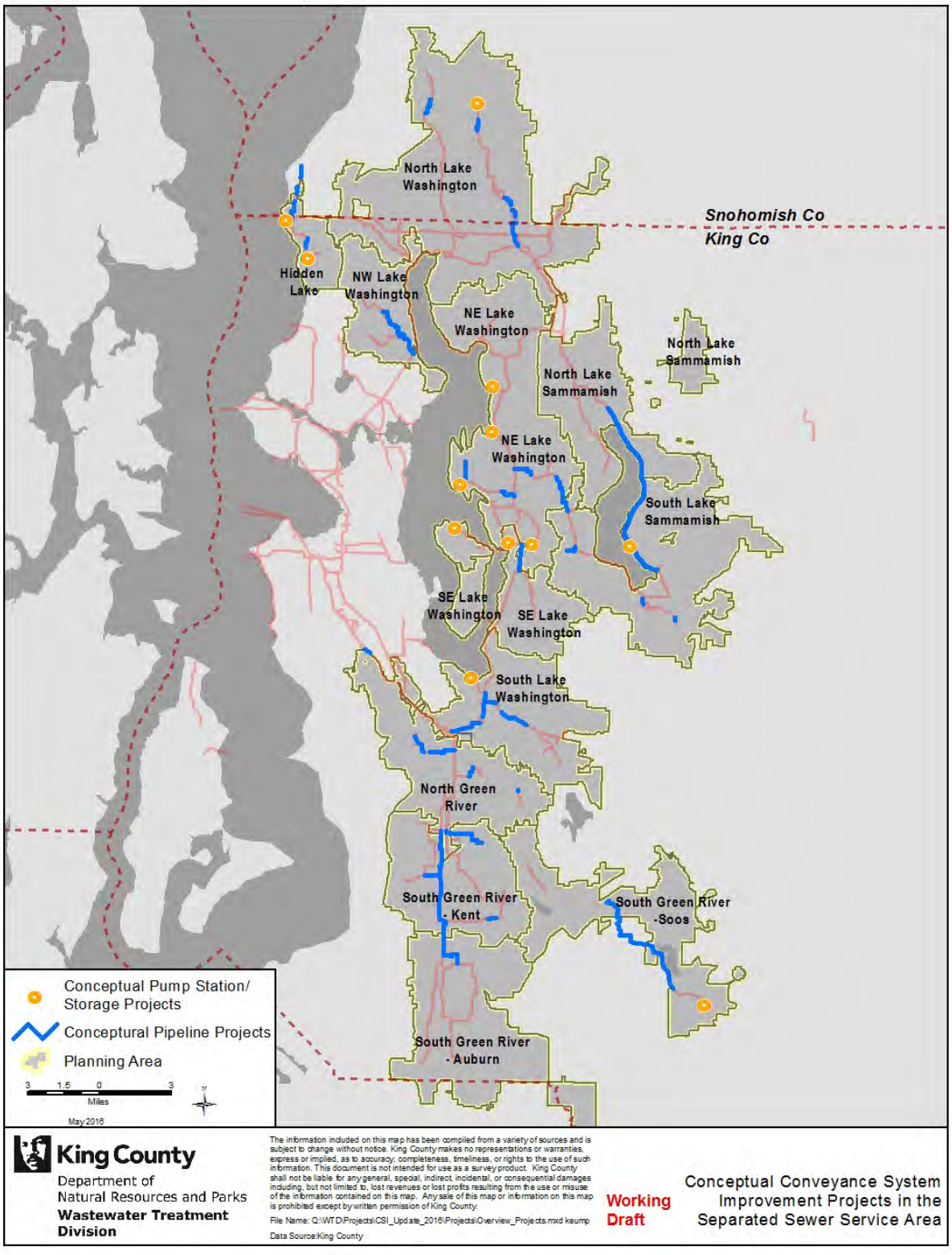


Figure 2-1. Locations of Conceptual Conveyance System Improvement Projects in the Separated Sewer Service Area

North Lake Washington Planning Area

Two conceptual projects were developed to address capacity needs in the North Lake Washington Planning Area:

- North Creek Trunk Storage and Replacement
- Swamp Creek Trunk Extension Replacement
- McAleer Creek Trunk Replacement
- Lake Ballinger Storage

Conceptual Project: North Creek Trunk Storage and Replacement

Capacity Needs Addressed

North Creek Trunk Extension–North
North Creek Trunk Extension–South

Location

Sewer Agency: Alderwood Water and Sewer District; Bothell Public Works
Jurisdiction: City of Bothell
Planning Area: North Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
WW*NCREEK_76-1.56(13)	56	44	4,033	24	1978	12.9	17.1	4.21	2032	> 20
WW*NCREEK_76-1.44(8)	44	36	2,462	24	1978	7.5	17.1	9.57	2010	18.1
WW*NCREEK_76-1.36(36)	36	204	8,903	24	1978	13.2	18.5	5.33	2027	> 20
Discontinuous pipe reaches not included in the conceptual project										
WW*NCREEK_14.203(2)	203	108	299	36	2014	23.9	28.1	4.25	2043	> 20
Discontinuous pipe reaches not included in the conceptual project										
WW*NCREEK_14.2(2)	2	25	261	30	2014	17.7	40.6	22.89	2010	6.9
WW*NCREEK_S3-89.25(8)	25	17	2,415	36	1991	25.7	41.7	15.99	2015	> 20
Discontinuous pipe reaches not included in the conceptual project										
WW*NCREEK_S3-89.14(7)	14	06	2,168	36	1991	24.9	41.7	16.77	2013	> 20
Discontinuous pipe reaches not included in the conceptual project										
WW*NCREEK.W85-16(18)	W85-16	BWDS	6,658	42	1985	28.2	46.1	17.90	2015	> 20
RE*NORTHCREEK.YORK(3)	YORK	BWDS	18,262	30	1991	31.7	33.6	1.83	2055	> 20

Project Description

Components and Construction Methods

The North Creek Trunk Storage and Replacement Project uses a phased approach to adding capacity to accommodate population growth over time and manage capital costs:

- Phase 1 provides a 1.2-MG storage vault at the upstream end of the trunk to reduce peak flow by 5.33 mgd. The storage vault site will be approximately 0.4 acre and will include effluent pumping, odor control, and access via 164th Street SE. Providing storage will defer conveyance improvement needs through 2030. In addition, Phase 1 storage will eliminate conveyance improvement needs through the 2060 planning horizon in four reaches with identified capacity needs including the North Creek (York) Force Main.
- Phase 2 provides additional downstream improvements beyond 2030, including replacement of 14,005 feet of the trunk downstream of the storage vault with 36- to 54-inch-diameter conveyance pipe.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: None

Concepts Evaluated

- **Paralleling (Phase 2).** The majority of the conveyance facilities identified for replacement in Phase 2 of this conceptual project (post 2030) were constructed prior to 1985. Inspections of the North Creek Trunk in 2005 (lower portion) and 2013 (upper portion) rated the condition of the entire system as a 4, showing serious signs of corrosion, sedimentation, root intrusion, or infiltration. Because of age and condition, paralleling was not evaluated.
- **Replacement (Phase 1).** To address all capacity needs identified in the North Creek Trunk for the 2060 planning horizon would require replacement of 27,200 feet of gravity conveyance with 36- to 54-inch-diameter pipe at an estimated construction cost of $25M. The storage alternative allows for deferring a significant portion of these costs beyond 2030 and also avoiding the potential environmental impacts of replacing the portions of the trunk in the North Creek riparian corridor.

Estimated Project Costs

Construction Costs

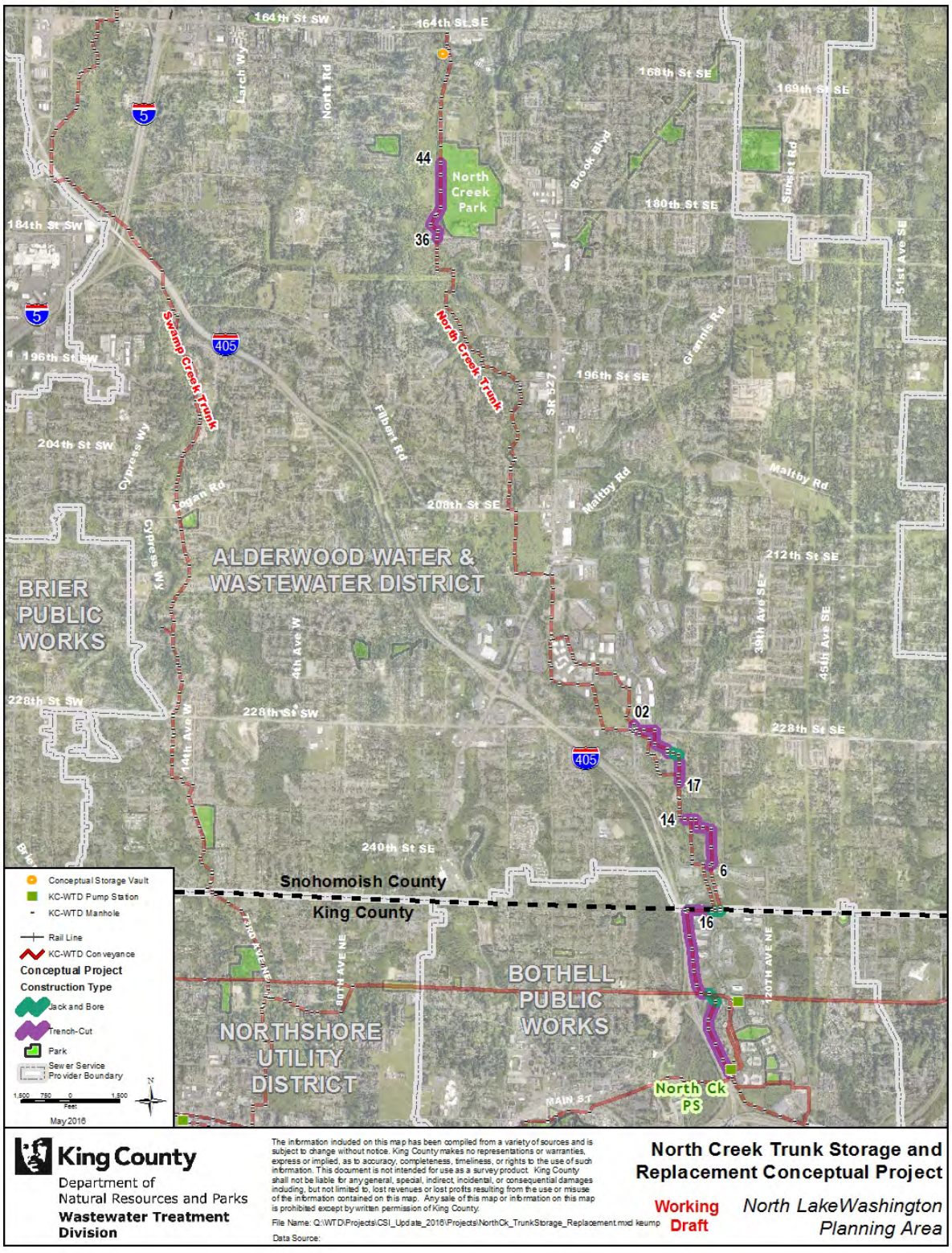
Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Phase 1							
WW*NCREEK_76-1.56(13)	56 to44	Vault storage with effluent pumping and odor control	Cast-in-place	N/A	N/A	1.2 MG	$8.3
		Land acquisition					$0.8
Phase 2							
WW*NCREEK_76-1.44(8)	44 to 36	Pipe replacement	Trench-cut	36	2,462	16 mgd	$1.9
Discontinuous pipe reaches no included in the conceptual project							
WW*NCREEK_14.2(2)	2 to 25	Pipe replacement	Trench-cut	48	261	45.4 mgd	$0.32
WW*NCREEK_S3-89.25(8)	25 to 20	Pipe replacement	Trench-cut	48	1,427	46.8 mgd	$1.4
	20 to 19	Pipe replacement	Jack and bore	48	169	46.8 mgd	$0.72
	19 to 17	Pipe replacement	Trench-cut	48	819	46.8 mgd	$0.71
Discontinuous pipe reaches no included in the conceptual project							
WW*NCREEK_S3-89.14(7)	14 to 07	Pipe replacement	Trench-cut	48	2,082	46.8 mgd	$2.1
	07 to 06	Pipe replacement	Jack and bore	48	86	46.8 mgd	$0.52
Discontinuous pipe reaches no included in the conceptual project							
WW*NCREEK.W85-16(18)	W85-16 to W85-15	Pipe replacement	Jack and bore	54	268	52.3 mgd	$1.1
	W85-15 to W85-06	Pipe replacement	Trench-cut	54	3,616	52.3 mgd	$4.7
	W85-06 to W85-05	Pipe replacement	Jack and bore	54	306	52.3 mgd	$1.2
	W85-05 to BWDS	Pipe replacement	Trench-cut	54	2,509	52.3 mgd	$3.3

Total Project Cost

The construction cost estimates for the North Creek Trunk Storage and Replacement Project are $9.1M ($2016) for Phase 1 and $17.5M for Phase 2. The project cost estimates are $27.7M ($2016) for Phase 1 and $49.6M (2016) for Phase 2 after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.

- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).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184th St SW
196th St SW
196th St SE
204th St SW
208th St SE
212th St SE
228th St SW
228th St SE
240th St SE
North Creek Park
North Creek Trunk
Swamp Creek Trunk
ALDERWOOD WATER & WASTEWATER DISTRICT
BRIER PUBLIC WORKS
BOTHELL PUBLIC WORKS
NORTHSHORE UTILITY DISTRICT
Snohomish County
King County
North Ck PS
44
36
02
17
14
6
16
Conceptual Storage Vault
KC-WTD Pump Station
KC-WTD Manhole
Rail Line
KC-WTD Conveyance
Conceptual Project Construction Type
Jack and Bore
Trench-Cut
Park
Sewer Service Provider Boundary
May 2016
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Data Source:
North Creek Trunk Storage and Replacement Conceptual Project
Working Draft
North LakeWashington Planning Area

Conceptual Project: Swamp Creek Trunk Extension Replacement

Capacity Needs Addressed

Swamp Creek Trunk Extension

Location

Sewer Agency: Alderwood Water and Sewer District
Jurisdiction: Unincorporated Snohomish County
Planning Area: North Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
WW*SWAMP_S1-79.38(2)	38	35	688	36	1983	14.2	25.7	11.5	2013	> 20
WW*SWAMP_S1-79.34(12)	34	22	2,540	36	1983	14.4	29.1	14.7	2010	7.4

Project Description

Components and Construction Methods

The Swamp Creek Trunk Extension Replacement Project includes replacement of 3,228 feet of existing 36-inch-diameter pipe with 54-inch-diameter pipe. Most of the project is trench-cut construction with one 80-foot section of jack-and-bore construction.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: None

Concepts Evaluated

- **Paralleling.** Paralleling the existing pipe was evaluated using projected 2060 peak flow data. Paralleling the pipe with a 42- to 48-inch diameter pipe could save an estimated 17 percent when compared to replacing it with a 54-inch diameter pipe. However, the system was constructed in 1983 and inspection information from 2004 indicated a condition rating of 3, showing moderate signs of corrosion, sedimentation, root intrusion, or infiltration. For these reasons, paralleling was not considered any further.

Estimated Project Costs

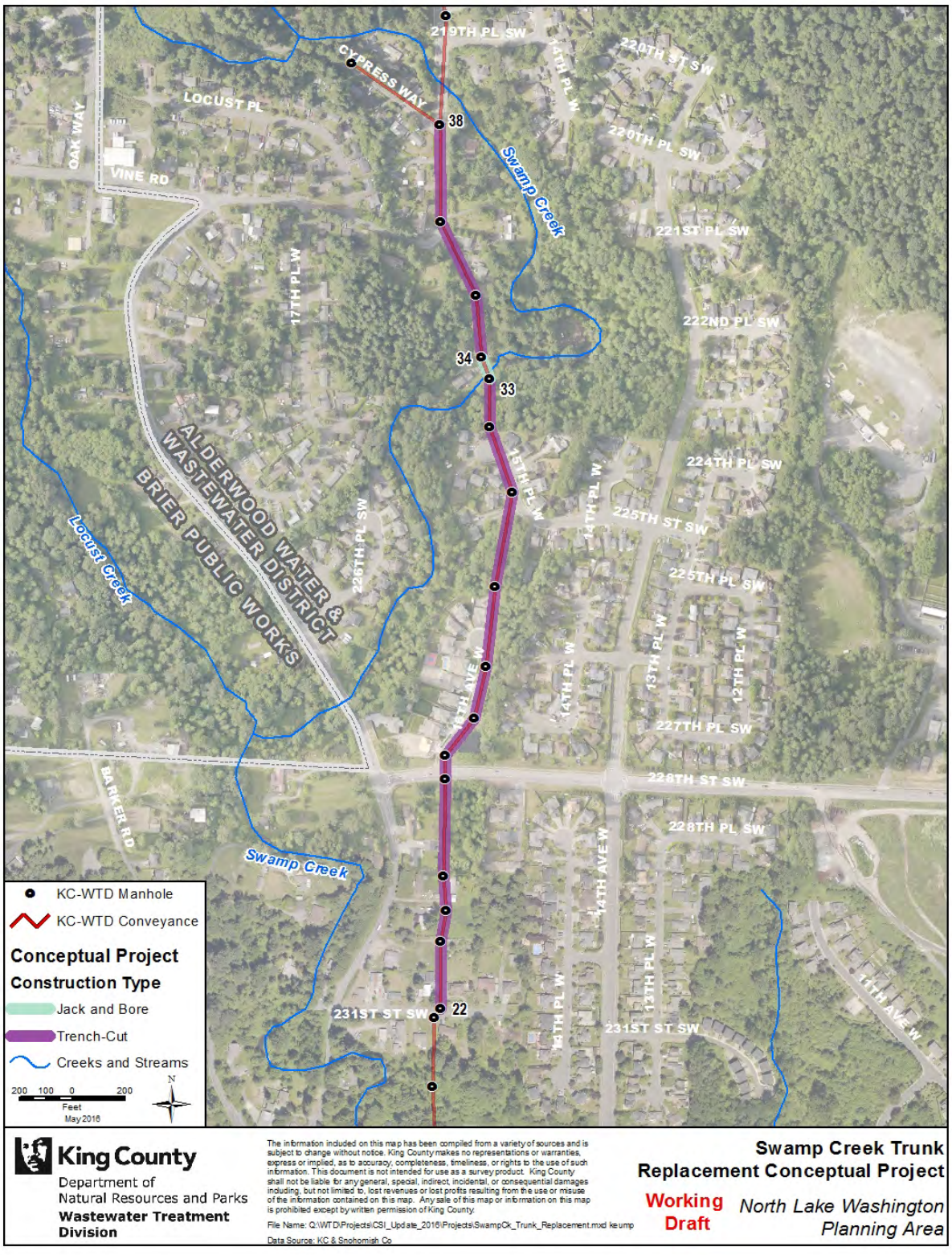
Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
WW*SWAMP_S1-79.38(2)	38 to 35	Pipe replacement	Trench-cut	54	688	32.1 mgd	$1.0
WW*SWAMP_S1-79.34(12)	34 to 33	Pipe replacement	Jack and bore	54	80	32.1 mgd	$0.54
	33 to 31	Pipe replacement	Trench-cut	54	431	32.1 mgd	0.59
	31 to 22	Pipe replacement	Trench-cut	54	2,029	36.4 mgd	$2.8

Total Project Cost

The construction cost estimate is $4.97M ($2016) for the Swamp Creek Trunk Extension Replacement Project. The project cost estimate is $15.3M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


219TH PL SW
CYPRESS WAY
LOCUST PL
OAK WAY
VINE RD
38
Swamp Creek
14TH PL W
220TH ST SW
220TH PL SW
221ST PL SW
17TH PL W
222ND PL SW
34
33
ALDERWOOD WATER & WASTEWATER DISTRICT
BRIER PUBLIC WORKS
Locust Creek
226TH PL SW
13TH PL W
14TH PL W
224TH PL SW
225TH ST SW
225TH PL SW
13TH PL W
12TH PL W
14TH PL W
14TH AVE W
227TH PL SW
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228TH PL SW
BARKER RD
Swamp Creek
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231ST ST SW
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KC-WTD Manhole
KC-WTD Conveyance
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Construction Type
Jack and Bore
Trench-Cut
Creeks and Streams
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Department of
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Wastewater Treatment
Division
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Data Source: KC & Snohomish Co
Swamp Creek Trunk
Replacement Conceptual Project
Working
Draft
North Lake Washington
Planning Area

Conceptual Project: McAleer Creek Trunk Replacement

Capacity Needs Addressed

McAleer Trunk

Location

Sewer Agency: Lake Forest Park Public Works
Jurisdiction: City of Lake Forest Park
Planning Area: North Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
WW*MCALEER.W502-12(7)	W502-12	W502-05	1,838	24	1966	17.63	28.42	10.80	2010	12.5

Project Description

Components and Construction Methods

The McAleer Creek Trunk Replacement Project replaces 1,838 feet of the McAleer Creek Trunk with 30-inch-diameter pipeline. Construction is assumed to be trench-cut. The conceptual alignment follows the existing WTD conveyance route from manhole W502-12 to manhole W502-05. The upstream implementation of the Lake Ballinger Storage Project would delay the need for the McAleer Creek Trunk Replacement Project until 2038.

Upstream and Downstream Considerations

Upstream Projects: Lake Ballinger Storage

Downstream Projects: None

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address the downstream pipe reach need in the McAleer Creek Trunk. The peak flow reduction-to-volume relationship developed for the Lake Ballinger Storage Project determined that the additional required volume of storage would be 2.1 MG. However, the estimated additional construction cost of $11.7M ($2016) exceeds the cost for the diversion alternative. Storage was not considered further for a conceptual project.
- **Paralleling.** Paralleling was evaluated by the age and condition of the pipe reach needs. The McAleer Creek Trunk was constructed in 1966. In a 2007 assessment, WTD Facility Inspections found no signs of corrosion, sedimentation, root intrusion, or infiltration. Because the trunk will be more than 50 years old in 201), replacement is recommended. Paralleling was not considered further for a conceptual project.

- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole W502-12 to address the downstream pipe reach need in the McAleer Creek Trunk. However, no feasible diversion route to Kenmore Interceptor Section 2 could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
WW*MCALEER.W502-12(7)	W502-12 to W502-05	Pipe replacement	Trench-cut	30	1,838	27.9 mgd	$1.2

Total Project Cost

The construction cost estimate is $1.25M ($2016) for the McAleer Creek Trunk Replacement Project. The project cost estimate is $3.85M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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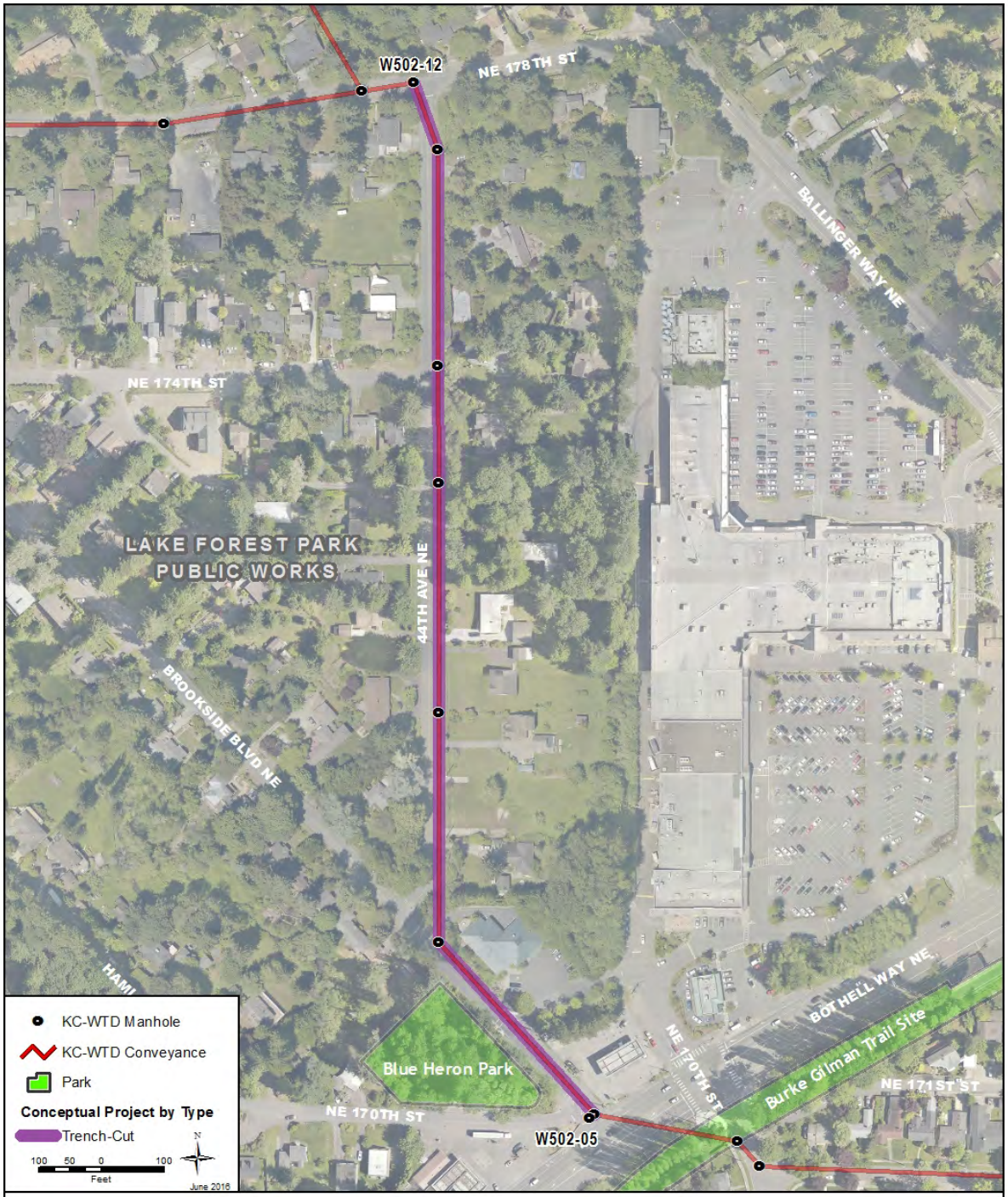
W502-12
NE 178TH ST
BALLINGER WAY NE
NE 174TH ST
LAKE FOREST PARK
PUBLIC WORKS
44TH AVE NE
BROOKSIDE BLVD NE
HAMI
BOTHELL WAY NE
Blue Heron Park
NE 170TH ST
W502-05
Burke Gilman Trail Site
NE 171ST ST
KC-WTD Manhole
KC-WTD Conveyance
Park
Conceptual Project by Type
Trench-Cut
100 50 0 100
Feet
June 2016
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\McAleerTrunk_Replacement.mxd keump
Data Source: King County/Snohomish Co
McAleer Creek Trunk
Conceptual Replacement Project
Working
Draft
North Lake Washington
Planning Area

Conceptual Project: Lake Ballinger Storage

Capacity Needs Addressed

Lake Ballinger Pump Station

Location

Sewer Agency: Ronald Wastewater District
Jurisdiction: City of Edmonds
Planning Area: North Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
Lake Ballinger Pump Station	BALLINGR	0	50	0	1993	16.80	23.72	6.92	2010	3.1
WW*BALLINGR.30(9)	30	21	1,592	30	1991	12.00	17.73	5.73	2020	> 20
WW*MCALEER.W502-29(11)	W502-29	W502-20	3,273	21	1966	14.69	20.11	5.42	2028	> 20
WW*MCALEER.W502-20(8)	W502-20	W502-12	2,844	24	1966	15.77	20.11	4.34	2034	> 20
WW*MCALEER.W502-12(7)	W502-12	W502-05	1,838	24	1966	17.63	28.42	10.80	2010	12.5
WW*MCALEER.W502-01(1)	W502-01	W11-35	551	27	1966	25.61	29.31	3.71	2042	> 20
WW*KENMR.W11-39(45)	W11-39	W11-00	24,514	48	1964	26.00	53.33	27.33	2010	1.5
Matthews Park Pump Station	MATTHEWS	N/A	N/A	N/A	1967	123.10	151.10	28.00	2026	> 20

Project Description

Components and Construction Methods

The Lake Ballinger Storage Project stores up to 9.2 mgd of 2060 20-year peak flow within a 4.5 MG offline underground storage tank. This project, in combination with the Kenmore Interceptor Diversion conceptual project, limits the downstream flow to the 26-mgd capacity of the Kenmore Interceptor Section 2 Lakeline in Lake Washington. An overflow weir upstream of Lake Ballinger Pump Station would fill the storage during large flow events. Pumping would empty the storage after large flow events. The conceptual site is located upstream of Lake Ballinger Pump Station on undeveloped private property. A property acquisition cost of $0.559 M ($2016) is included in the project cost based on a 43,000-sf project footprint and a 2015 Taxable Land Value of $13/sf.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: McAleer Trunk Replacement

Concepts Evaluated

- **Replacement or upgrade (pump station).** Replacement or upgrade of the Lake Ballinger Pump Station was evaluated by the age and condition of the pump station and the projected flow in excess of capacity. The station was constructed in 1993. The 2060 projected flow is 6.92 mgd more than the existing capacity of 16.8 mgd. Upgrading was preferred over replacement because the station will be less than 50 years in 2016 and the capacity increase is less than 50 percent of existing capacity.

- **Paralleling or replacement (pipe reaches).** Pipe reach paralleling or replacement was evaluated by the age and condition of the pipe reaches.
    - The Lake Ballinger Interceptor was constructed in 1991. In a 2011 assessment, WTD Facility Inspections found minor signs of corrosion, sedimentation, root intrusion, or infiltration. Because the interceptor will be less than 50 years old in 2016 and is in fairly good condition, paralleling would be recommended.
    - The McAleer Creek Trunk was constructed in 1966. In a 2007 assessment, WTD Facility Inspections found no signs of corrosion, sedimentation, root intrusion, or infiltration. Because the trunk will be less than 50 years old in 2016 and is in good condition, paralleling would be recommended.
    - The Kenmore Interceptor Section 2 was constructed in 1964. In a 2011 assessment, contractors found minor exposed aggregate on the top of the pipe and at the manholes. Because the interceptor will be more than 50 years old in 2016 and is in poor condition, replacement would be recommended. However, construction in Lake Washington would be prohibitive in terms of constructability and expense. Further, King County Council directives prohibit pipeline construction in Lake Washington. For these reasons, only storage combined with the Kenmore Interceptor Diversion conceptual project can address the capacity need in Kenmore Interceptor Section 2. Storage would also address the capacity needs at the Lake Ballinger and Matthews Park pump stations and in the Lake Ballinger Interceptor and McAleer Creek Trunk, with the exception of pipe reach WW*MCALEER.W502-12(7). Pump station upgrades and pipe reach paralleling were not considered further for conceptual projects.
- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream of the Lake Ballinger Pump Station to address downstream pipe reach capacity needs in the Lake Ballinger Interceptor and McAleer Creek Trunk and to reduce the pipe reach need in the Kenmore Interceptor Section 2. However, no feasible diversion routes to Matthews Park Pump Station could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Lake Ballinger Storage	N/A	Storage	Cast-in-place	N/A	N/A	4.5 MG	$26

Total Project Cost

The construction cost estimate is $26.2M ($2016) for the Lake Ballinger Storage Project. The project cost estimate is $74.9M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility

studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.

- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


OLYMPIC VIEW WATER & SEWER DISTRICT
EDMONDS PUBLIC WORKS
84th Ave W
238th St SW
99
76th Ave W
Lakeview Dr
Lake Ballinger
MOUNTLAKE TERRACE UTILITIES
EDMONDS PUBLIC WORKS
Lake Ballinger Wy
RONALD WASTEWATER DISTRICT
NE 205TH ST
244th St SE
Lake Ballinger Pump Station
AURORA AVE N
N 203RD ST
N 201 ST ST
BURKE AVE N
MERIDIAN AVE N
BAGLEY DR N
N 199TH ST
WALLINGFORD AVE N
ASHWORTH AVE N
N 196TH PL
N 195TH ST
N 194TH ST
6TH PL NE
6TH AVE NE
7TH AVE NE
KC-WTD Manhole
KC-WTD Pump Station
KC-WTD Conveyance
Rail Line
Park
Sewer Service Provider Boundary
Lake Ballinger Storage
500 250 0 500
Feet
N
June 2016
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\LkBallinger_Storage.mxd keump
Data Source: King County/Snohomish Co
Working Draft
Lake Ballinger Conceptual Storage Project
North Lake Washington Planning Area

Hidden Lake Planning Area

Six conceptual projects were developed to address capacity needs in the Hidden Lake Planning Area:

- Richmond Beach Pump Station Upgrade
- Richmond Beach Force Main Parallel
- Richmond Beach–Edmonds Interceptor Parallel
- Boeing Creek Trunk Replacement and Parallel
- Hidden Lake Pump Station Upgrade
- Hidden Lake Force Main Replacement

Conceptual Project: Richmond Beach Pump Station Upgrade

Capacity Needs Addressed

Richmond Beach Pump Station

Location

Sewer Agency: Ronald Wastewater District
Jurisdiction: City of Shoreline
Planning Area: Hidden Lake

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Total Dynamic Head (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
Richmond Beach Pump Station	RBPS	N/A	370	N/A	1993	10	20.77	10.77	2010	1.3

Project Description

Components and Construction Methods

The Richmond Beach Pump Station Upgrade Project adds 10.8 mgd of capacity to WTD's Richmond Beach Pump Station. The existing station was constructed in 1993, and aging equipment is due for replacement. It is assumed that the project will include a new structure with wet well, pumps, and electrical/instrumentation. The proposed site for the upgrade is the existing pump station.

Upstream and Downstream Considerations

Upstream Projects: Boeing Creek Trunk Replacement and Parallel; Hidden Lake Pump Station Upgrade; Hidden Lake Force Main Replacement

Downstream Projects: Richmond Beach Force Main Parallel; Richmond Beach–Edmonds Interceptor Parallel

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to store enough of the peak 20-year flow in 2060 to address downstream pump station and pipe reach needs for the Richmond Beach Pump Station, Richmond Beach Force Main, and Richmond Beach–Edmonds Interceptor. A peak flow reduction-to-volume relationship developed at upstream manhole BCT-05 determined that the required volume would be 20 MG. However, the estimated construction cost of $106M ($2016) would exceed the cost for upgrading. Storage was not considered further for a conceptual project.
- **Replacement.** Replacement was evaluated by the age and condition of the pump station and the projected flow in excess of capacity. The Richmond Beach Pump Station was built in 1993. The projected flow is 10.8 mgd more than the existing capacity of 10 mgd. Because the station

will be less than 50 years old in 2016, replacement was not considered further for a conceptual project.

- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream of the pump station to address downstream pump station and pipe reach needs for the Richmond Beach Pump Station, Richmond Beach Force Main, and Richmond Beach–Edmonds Interceptor. However, no diversion routes to the Lake Ballinger Pump Station could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Richmond Beach Pump Station	N/A	Pump station upgrade	N/A	N/A	N/A	10.8 mgd	$12.9

Total Project Cost

The construction cost estimate is $12.9M ($2016) for the Richmond Beach Pump Station Upgrade Project. The project cost estimate is $36.6M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
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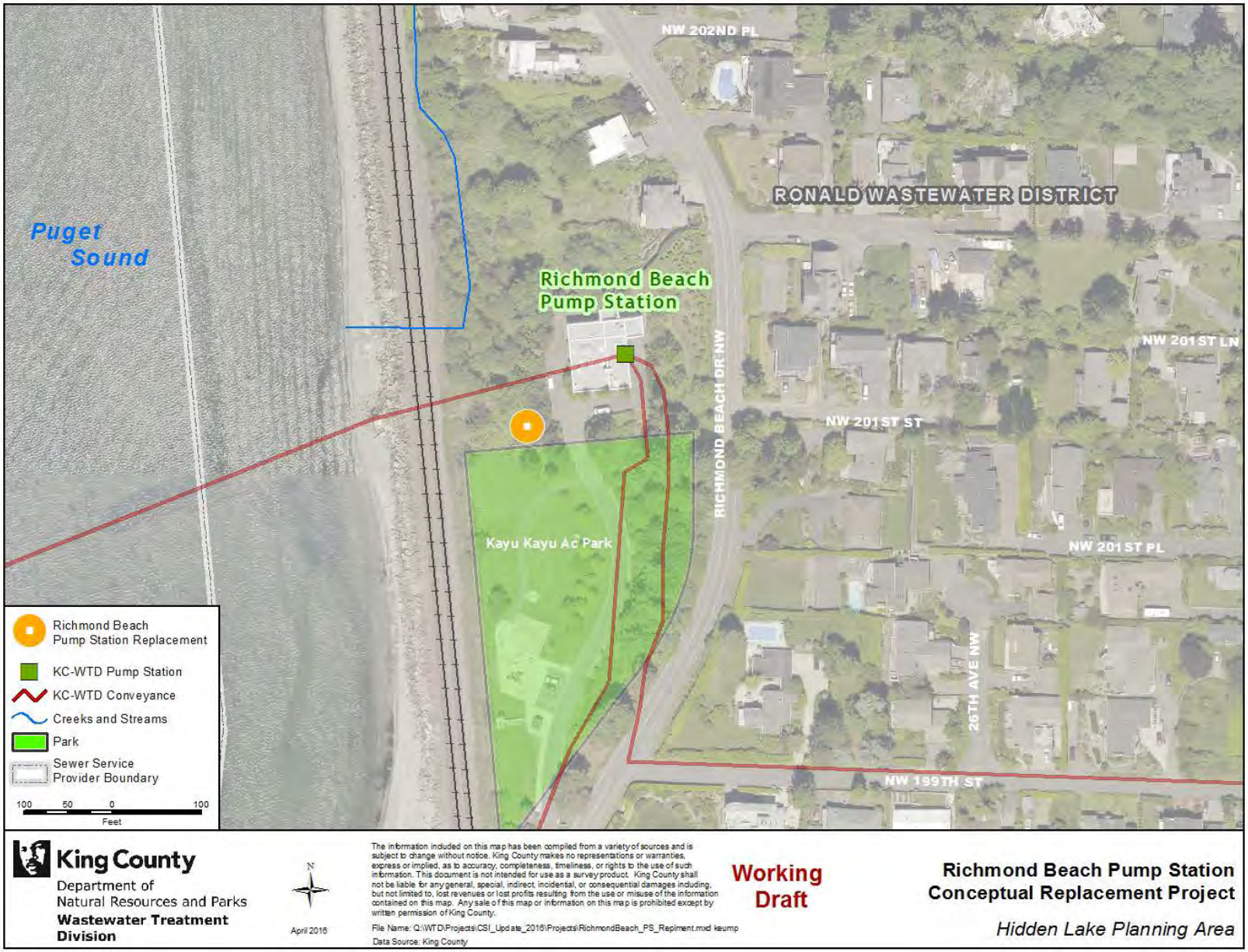
Puget Sound
NW 202ND PL
RONALD WASTEWATER DISTRICT
Richmond Beach Pump Station
RICHMOND BEACH DR NW
NW 201ST LN
NW 201ST ST
Kayu Kayu Ac Park
NW 201ST PL
26TH AVE NW
NW 199TH ST
Richmond Beach Pump Station Replacement
KC-WTD Pump Station
KC-WTD Conveyance
Creeks and Streams
Park
Sewer Service Provider Boundary
100 50 0 100
Feet
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
April 2016
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\RichmondBeach_PS_Replment.mxd keump
Data Source: King County
Working Draft
Richmond Beach Pump Station
Conceptual Replacement Project
Hidden Lake Planning Area

Conceptual Project: Richmond Beach Force Main Parallel

Capacity Needs Addressed

Richmond Beach Pump Station

Location

Sewer Agency: Ronald Wastewater District; Olympic View Water and Sewer District
Jurisdiction: City of Shoreline
Planning Area: Hidden Lake

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
BW*RICHMOND.RBPS(1)FM	RBPS	32A	5,598	20	1991	14.10	20.77	6.67	2010	8.7

Project Description

Components and Construction Methods

The Richmond Beach Force Main Parallel Project parallels all 5,598 feet of the existing Beach Force Main with a 24-inch-diameter pipeline. Construction is assumed to be trench-cut and includes one creek crossing culvert. The conceptual alignment follows the existing WTD conveyance route from the Richmond Beach Pump Station to Force Main Discharge Structure 32A. A parallel is proposed because the existing force main is in good condition and dual pipes will provide benefits such as the ability to manage variable wastewater flows and perform maintenance on idle force mains.

Upstream and Downstream Considerations

Upstream Projects: Boeing Creek Trunk Replacement and Parallel; Hidden Lake Pump Station Upgrade; Hidden Lake Force Main Replacement; Richmond Beach Pump Station Upgrade; Richmond Beach Force Main Parallel

Downstream Projects: Richmond Beach−Edmonds Interceptor Parallel

Concepts Evaluated

- **Storage.** Storage was considered but not proposed for the upstream Richmond Beach Pump Station conceptual project. Accordingly, storage for the Richmond Beach Force Main was not considered further for a conceptual project.
- **Replacement.** Replacement was evaluated by the age and condition of the pipe reach needs. The Richmond Beach Force Main was constructed in 1991. WTD Facility Inspections could not assess the condition because of pressurized operations. The force main will be less than 50 years old in 2016, and therefore replacement was not considered further for a conceptual project.

- **Diversion.** Diversion was considered but not proposed for the upstream Richmond Beach Pump Station conceptual project. Accordingly, diversion for the Richmond Beach Force Main was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
BW*RICHMOND.RBPS(1)FM	RBPS to 32A	Force main parallel	Trench-cut	24	5,598	13.9 mgd	$3.6

Total Project Cost

The construction cost estimate is $3.59M ($2016) for the Richmond Beach Force Main Parallel Project. The project cost estimate is $11.1M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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WOODWAY
236TH PL SW
112TH PL W
111TH PL W
32
238TH ST SW
114TH AVE W
239TH PL W
240TH ST SW
241ST ST SW
POINT WELLS RD
116TH AVE W
TIMBERLANE RD
OLYMPIC VIEW WATER & SEWER DISTRICT
RONALD WASTEWATER DISTRICT
NW 201ST ST
25TH AVE NW
24TH AVE NW
23RD AVE NW
23ST PL NW
21ST AVE NW
20TH AVE NW
19TH AVE NW
Richmond Beach Pump Station
NW 199TH ST
NW 198TH ST
NW 197TH ST
27TH AVE NW
Richmond Beach Community Park
KC-WTD Manhole
KC-WTD Pump Station
KC-WTD Conveyance
Creeks and Streams
Rail Line
Conceptual Project
Construction Type
Trench-Cut
Park
Sewer Service Provider Boundary
260 130 0 260
Feet
May 2016
N
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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Data Source: King County & Snohomish Co
Richmond Beach Force Main
Conceptual Parallel Project
Working Draft
Hidden Lake Planning Area

Conceptual Project: Richmond Beach–Edmonds Interceptor Parallel

Capacity Needs Addressed

Richmond Beach-Edmonds Interceptor

Location

Sewer Agency: Olympic View Water and Sewer District; Edmonds Public Works
Jurisdiction: City of Edmonds
Planning Area: Hidden Lake

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
BW*RICHMOND.32A(4)	32A	29	1,429	24	1991	10.99	22.42	11.43	2010	1.5
BW*RICHMOND.23(4)	23	19	1,699	30	1991	10.84	22.42	11.58	2010	1.4
BW*RICHMOND.10A(7)	10A	04	1,869	24	1991	18.30	22.42	4.12	2019	> 20
BW*RICHMOND.04(3)	04	01	803	30	1991	21.01	22.42	1.41	2046	> 20

Project Description

Components and Construction Methods

The Richmond Beach−Edmonds Interceptor Parallel Project parallels 5,800 feet of the existing Richmond Beach−Edmonds Interceptor with 18-inch to 36-inch-diameter pipeline. Construction is assumed to be trench-cut. The conceptual alignment follows the existing WTD conveyance route intermittently from manholes 32A to 01. Phased construction is recommended because pipe reaches BW*RICHMOND.32A(4) and BW*RICHMOND.23(4) are required by 2010, BW*RICHMOND.10A(7) is required by 2019, and BW*RICHMOND.04(3) is required by 2046. A parallel is proposed because the existing interceptor is in good condition and having dual pipes will provide benefits such as ability to manage variable wastewater flows and conduct maintenance on idle pipes.

Upstream and Downstream Considerations

Upstream Projects: Boeing Creek Trunk Replacement and Parallel; Hidden Lake Pump Station Upgrade; Hidden Lake Force Main Replacement; Richmond Beach Pump Station Upgrade; Richmond Beach Force Main Parallel

Downstream Projects: None

Concepts Evaluated

- **Storage.** Storage was considered but not proposed for the upstream Richmond Beach Pump Station conceptual project. Accordingly, storage for the Richmond Beach−Edmonds Interceptor was not considered further for a conceptual project.
- **Replacement.** Replacement was evaluated by the age and condition of the pipe reach needs. The Richmond Beach−Edmonds Interceptor was constructed in 1991. In 2009, WTD Facility

Inspections found only minor signs of corrosion, sediment accumulation, root intrusion, or infiltration). Both age and condition therefore do not warrant replacement, and replacement was not considered further for a conceptual project

- **Diversion.** Diversion was considered but not proposed for the upstream Richmond Beach Pump Station conceptual project. Accordingly, diversion for the Richmond Beach-Edmonds Interceptor was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
BW*RICHMOND.32A(4)	32A to 29	Pipeline parallel	Trench-cut	30	1,429	17.0 mgd	$0.91
BW*RICHMOND.23(4)	23 to 19	Pipeline parallel	Trench-cut	36	1,699	17.2 mgd	$1.8
BW*RICHMOND.10A(7)	10A to 04	Pipeline parallel	Trench-cut	18	1,869	9.73 mgd	$0.81
BW*RICHMOND.04(3)	04 to 01	Pipeline parallel	Trench-cut	21	803	7.02 mgd	$0.46

Total Project Cost

The construction cost estimate is $4.02M ($2016) for the Richmond Beach−Edmonds Interceptor Replacement Project. The project cost estimate is $12.4M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
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Puget Sound
EDMONDS PUBLIC WORKS
OLYMPIC VIEW WATER & SEWER DISTRICT
01
10A
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23
29
32
KC-WTD Manhole
KC-WTD Conveyance
Creeks and Streams
Rail Line
Conceptual Project
Construction Type
Trench-Cut
Sewer Service Provider Boundary
500 250 0 500
Feet
May 2016
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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Data Source: King County & Snohomish Co
Richmond Beach-Edmonds Interceptor
Conceptual Parallel Project
Working Draft
Hidden Lake Planning Area

Conceptual Project: Boeing Creek Trunk Replacement and Parallel

Capacity Needs Addressed

Boeing Creek Trunk

Location

Sewer Agency: Ronald Wastewater District
Jurisdiction: City of Shoreline
Planning Area: Hidden Lake

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
BW*BOEING.BCS-01(9)	BCS-01	HIDDENLK	1,692	15	1963	6.11	7.41	1.30	2010	3.7
BW*BOEING.BOO-38(1)	BOO-38	BCT-64	275	15	1963	9.37	10.38	1.00	2025	> 20
BW*BOEING.BCT-46(2)	BCT-46	BCT-45	2,007	16	1963	5.54	10.26	4.72	2010	3.3
BW*BOEING.BCT-07(6)	BCT-07	BCT-01	903	30	2008	18.92	20.77	1.85	2038	> 20

Project Description

Components and Construction Methods

The Boeing Creek Trunk Replacement and Parallel Project replaces 3,974 feet of the Boeing Creek Trunk with 12- to 21-inch-diameter pipe and parallels 903 feet of the Boeing Creek Trunk with 21-inch-diameter pipe. Construction is assumed to be trench-cut. The conceptual alignment follows the existing WTD conveyance route intermittently from manholes BCS-01 to BCT-01.

Upstream and Downstream Considerations[3]

Upstream Projects: None

Downstream Projects: Richmond Beach Pump Station Upgrade; Richmond Beach Force Main Parallel; Richmond Beach−Edmonds Interceptor Parallel

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address downstream capacity needs in the Boeing Creek Interceptor, Boeing Creek Force Main, and Hidden Lake Pump Station. A peak flow reduction-to-volume recurrence relationship developed at upstream manhole BOO-39 determined a required volume of 2.6 MG. This volume is in addition to the existing 0.5-MG Boeing Creek Storage facility. However, the estimated total construction cost of $15.0M ($2016)

[3] This project includes improvements both upstream and downstream of the Hidden Lake Pump Station Upgrade and the Hidden Lake Force Main Replacement conceptual projects.

would exceed the pump station upgrade and pipe reach replacement and parallel alternatives. Storage was not considered further for a conceptual project.

- **Paralleling/Replacement.** Paralleling or replacement was evaluated by the age and condition of the pipe reach needs. The Boeing Creek Trunk was constructed in 1963 and partially replaced in 2008. In a 2009 assessment, WTD Facility Inspections found only minor signs of corrosion, sedimentation, root intrusion, or infiltration. Paralleling was not recommended for pipe reaches BW*BOEING.BCS-01(9), BW*BOEING.BOO-38(1), BW*BOEING.BCT-46(2) because they will be more than 50 years old in 2016. Replacement was not recommended for pipe reach BW*BOEING.BCT-07(6) because it will be less than 50 years old in 2016.
- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole BCS-01 to address downstream capacity needs in the Boeing Creek Interceptor, Boeing Creek Force Main, and the Hidden Lake Pump Station. However, no feasible diversion routes to Lake Ballinger Pump Station could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
BW*BOEING.BCS-01(9)	BCS-01 to HIDDENLK	Pipeline replacement	Trench-cut	21	1,692	9.26 mgd	$0.93
BW*BOEING.BOO-38(1)	BOO-38 to BCT-64	Pipeline replacement	Trench-cut	18	275	13.0 mgd	$0.13
BW*BOEING.BCT-46(2)	BCT-46 to BCT-45	Siphon replacement	Trench-cut	12/21	2,007	13.9 mgd	$1.11
	Culvert Creek Crossing	Culvert replacement	Trench cut	36	50	N/A	$0.10
BW*BOEING.BCT-07(6)	BCT-07 to BCT-01	Pipeline parallel	Trench-cut	21	903	7.04 mgd	$0.43

Total Project Cost

The construction cost estimate is $2.71M ($2016) for the Boeing Creek Trunk Replacement and Parallel Project. The project cost estimate is $8.35M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent.

(AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


Boeing Creek Pump Station
BCT-07
Richmond Beach Community Park
Ronald Wastewater District
Strandberg Preserve
Richmond Beach Saltwater Park
BCT-45
BCT-47
Innis Arden Reserve Open Space
BCT-64
BCS-01
BOO-38
BOO-39
Hidden Lake Pump Station
NW 201ST ST
NW 199TH ST
NW 200TH ST
NW 198TH ST
NW 197TH ST
NW 196TH ST
NW 195TH ST
NW 193RD ST
NW 191ST ST
NW 179TH PL
NW 177TH ST
NW 175TH ST
20TH AVE NW
19TH AVE NW
25TH AVE NW
21ST AVE NW
17TH AVE NW
15TH AVE NW
10TH AVE NW
17TH PL NW
RICHMOND BEACH RD NW
RIDGEFIELD RD NW
KC-WTD Manhole
KC-WTD Pump Station
KC-WTD Conveyance
Creeks and Streams
Conceptual Project Construction Type
Trench-Cut
Rail Line
Park
430 215 0 430
Feet
May 2016
N
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\BoeingCk_TrunkReplParallel.mxd keump
Data Source:
Boeing Creek Trunk Replacement and Parallel Project
Working Draft
Hidden Lake Planning Area

Conceptual Project: Hidden Lake Pump Station Upgrade

Capacity Needs Addressed

Hidden Lake Pump Station

Location

Sewer Agency: Ronald Wastewater District
Jurisdiction: City of Shoreline
Planning Area: Hidden Lake

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Total Dynamic Head (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
Hidden Lake Pump Station	HIDDENLK	N/A	90	N/A	2009	6.80	10.38	3.58	2010	6.2

Project Description

Components and Construction Methods

The Hidden Lake Pump Station Upgrade Project adds 6.2 mgd of capacity to the Hidden Lake Pump Station. The upgrade consists of an expansion of the existing pump station. Construction is assumed to include a new structure with wet well, pumps, and electrical/instrumentation. The proposed site for the upgrade adjoins the existing Hidden Lake Pump Station.

Upstream and Downstream Considerations

Upstream Projects: Boeing Creek Trunk Replacement and Parallel

Downstream Projects: Hidden Lake Force Main Replacement; Boeing Creek Trunk Replacement and Parallel; Richmond Beach Pump Station Upgrade; Richmond Beach Force Main Parallel; Richmond Beach−Edmonds Interceptor Parallel

Concepts Evaluated

- **Storage.** Storage was considered but not proposed for the upstream Boeing Creek Trunk conceptual alternative. Accordingly, storage for the Hidden Lake Pump Station was not considered further for a conceptual project.
- **Replacement.** Replacement was evaluated by the age and condition of the pump station and the projected flow in excess of capacity. The Hidden Lake Pump Station was rebuilt in 2009. The projected flow is 3.58 mgd more than the existing capacity of 6.8 mgd. Because the station will be less than 50 years in 2016 and the capacity increase is less than 50 percent of existing capacity, replacement was not considered further for a conceptual project.

- **Diversion.** Diversion was considered but not proposed for the upstream Boeing Creek Trunk conceptual alternative. Accordingly, diversion for the Hidden Lake Pump Station was not considered further for a conceptual project.

Estimated Project Costs

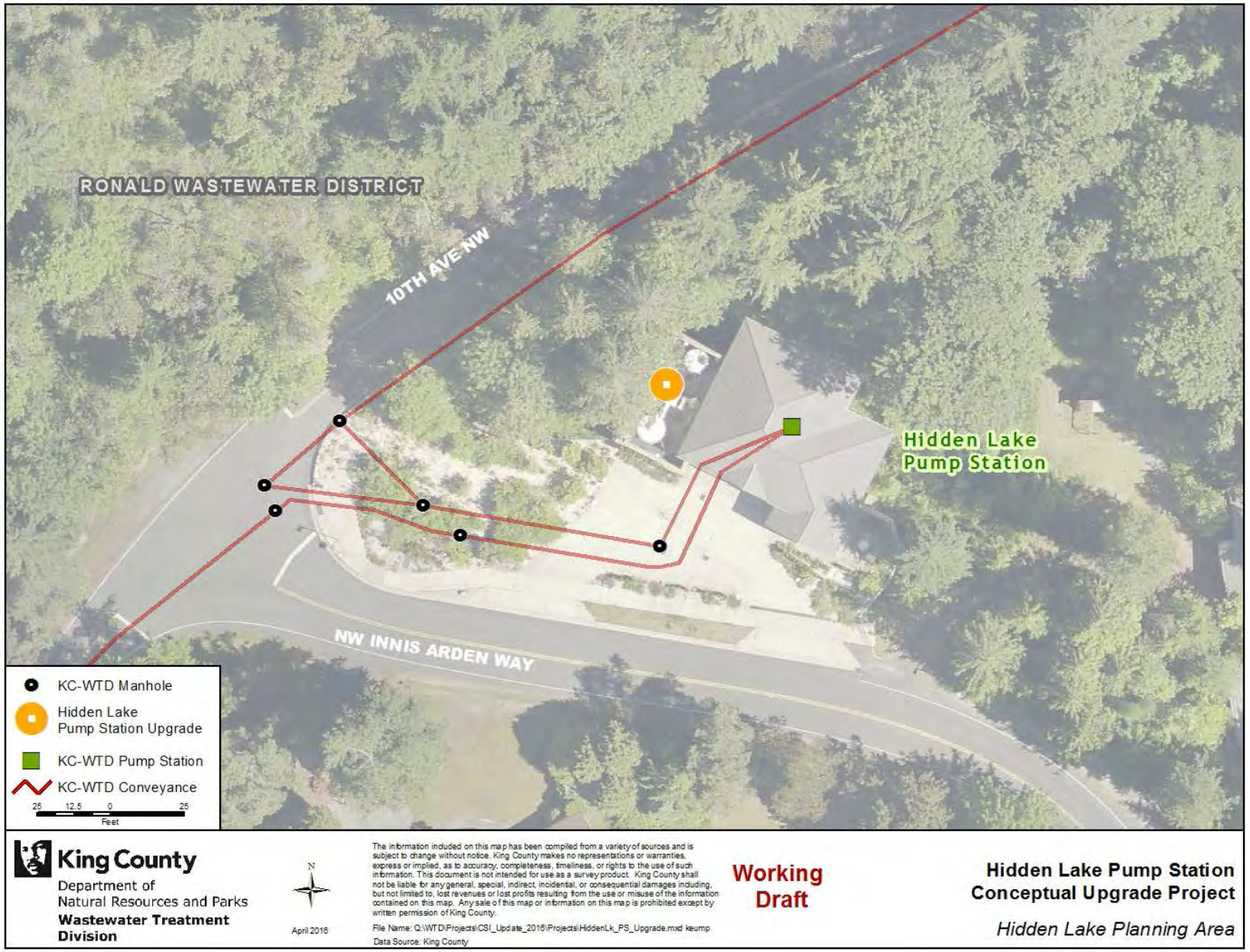
Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Hidden Lake Pump Station	HIDDENLK	Pump station expansion	N/A	N/A	N/A	6.2 mgd	$2.9

Total Project Cost

The construction cost estimate is $2.91M ($2016) for the Hidden Lake Pump Station Upgrade Project. The project cost estimate is $8.96M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


RONALD WASTEWATER DISTRICT
10TH AVE NW
NW INNIS ARDEN WAY
Hidden Lake
Pump Station
KC-WTD Manhole
Hidden Lake
Pump Station Upgrade
KC-WTD Pump Station
KC-WTD Conveyance
25 12.5 0 25
Feet
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
N
April 2016
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\HiddenLk_PS_Upgrade.mxd keump
Data Source: King County
Working
Draft
Hidden Lake Pump Station
Conceptual Upgrade Project
Hidden Lake Planning Area

Conceptual Project: Hidden Lake Force Main Replacement

Capacity Needs Addressed

Hidden Lake Force Main

Location

Sewer Agency: Ronald Wastewater District
Jurisdiction: City of Shoreline
Planning Area: Hidden Lake

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
BW*BOEING.HIDDENLK(1)FM	HIDDENLK	BOO-38	2,375	10	1962	6.91	10.38	3.46	2010	6.7

Project Description

Components and Construction Methods

The Hidden Lake Force Main Replacement Project replaces the 2,375 feet of the Boeing Creek Force Main with 12-inch and 24-inch-diameter parallel pipelines. Construction is assumed to be trench-cut. The conceptual alignment follows the existing WTD conveyance route from the Hidden Lake Pump Station to force main discharge structure BOO-38.

Upstream and Downstream Considerations

Upstream Projects: Boeing Creek Trunk Replacement and Parallel; Hidden Lake Pump Station Upgrade

Downstream Projects: Boeing Creek Trunk Replacement and Parallel; Richmond Beach Pump Station Upgrade; Richmond Beach Force Main Parallel; Richmond Beach−Edmonds Interceptor Parallel

Concepts Evaluated

- **Storage.** Storage was considered but not proposed for the upstream Boeing Creek Trunk conceptual project. Accordingly, storage for the Hidden Lake Force Main was not considered further for a conceptual project.
- **Paralleling.** Paralleling was evaluated by the age and condition of the pipe reach needs. The Hidden Lake Force Main was constructed in 1962. WTD Facility Inspections could not assess its condition because of pressurized operations. Because the force main will be more than 50 years old in 2016, paralleling was not considered further for a conceptual project.

- **Diversion.** Diversion was considered but not proposed for the upstream Boeing Creek Trunk conceptual project. Accordingly, diversion for the Hidden Lake Force Main was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
BW*BOEING.HIDDENLK(1)FM	HIDDENLK to BOO-38	Pipeline replacement	Trench-cut	14/24	2,375	13.00 mgd	$1.8

Total Project Cost

The construction cost estimate is $1.82M ($2016) for the Hidden Lake Force Main Replacement Project. The project cost estimate is $5.61M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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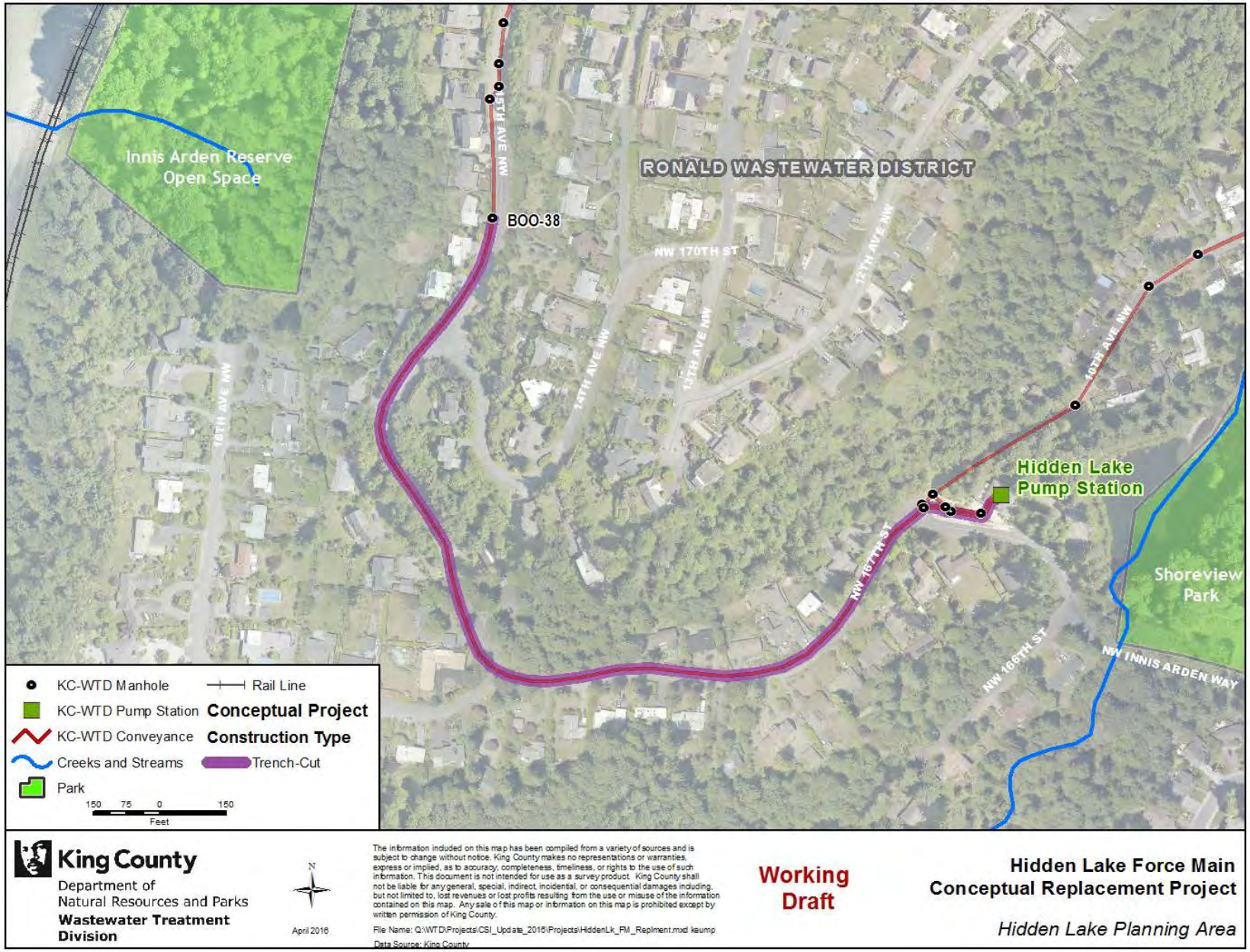
Innis Arden Reserve
Open Space
RONALD WASTEWATER DISTRICT
BOO-38
15TH AVE NW
NW 170TH ST
12TH AVE NW
14TH AVE NW
13TH AVE NW
16TH AVE NW
10TH AVE NW
Hidden Lake
Pump Station
NW 167TH ST
NW 166TH ST
Shoreview
Park
NW INNIS ARDEN WAY
KC-WTD Manhole
KC-WTD Pump Station
KC-WTD Conveyance
Creeks and Streams
Park
Rail Line
Conceptual Project
Construction Type
Trench-Cut
150 75 0 150
Feet
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
N
April 2016
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Draft
Hidden Lake Force Main
Conceptual Replacement Project
Hidden Lake Planning Area

Northwest Lake Washington Planning Area

Two conceptual projects were developed to address capacity needs in the Northwest Lake Washington Planning Area:

- Thornton Creek Trunk Replacement and Diversion
- North Lake City Trunk Replacement, Realignment, and Rehabilitation
- Kenmore Interceptor Diversion

Conceptual Project: Thornton Creek Trunk Replacement and Diversion

Capacity Needs Addressed

Thornton Creek Trunk

Location

Sewer Agency: Seattle Public Utilities
Jurisdiction: City of Seattle
Planning Area: Northwest Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
WW*THORNTON.NWW10-01(6)	NWW10-01	WO7-04	866	42	1965	54.58	81.85	27.27	2010	10.7
WW*THORNTON.WO7-04(4)	WO7-04	WO7-08	1,151	48	1965	33.60	81.85	48.25	2010	1.1
WW*THORNTON.WO7-08(1)	WO7-08	WO7-08A	340	48	1965	74.35	81.85	7.5	2043	> 20
WW*THORNTON.WO7-08A(2)	WO7-08A	WO7-11	744	42	1965	32.6	81.85	49.25	2010	1.0
WW*THORNTON.WO7-11(3)	WO7-11	WO7-14	1,425	42	1965	61.06	81.85	20.79	2012	> 20
WW*THORNTON.WO7-15(8)	WO7-15	WO7-23	1,225	48	1965	44.65	91.42	46.77	2010	2.1

Project Description

Components and Construction Methods

The Thornton Creek Trunk begins at the confluence of the North Lake City and West Lake City trunks. Conveyance needs have been identified for the entire trunk. The conceptual project includes diversion of flows from the North Lake City Trunk to the Thornton Creek Trunk through a new pipeline. The diversion includes 2,250 feet of 54-inch-diameter pipe. The upstream end of the new pipe connects to the North Lake City Trunk at NE 110th Street; the downstream end connects to the Thornton Creek Trunk in the athletic field north of NE 105th Street. The Thornton Creek Trunk will be replaced downstream from the point where the North Lake City Trunk diversion connects to the Thornton Creek Trunk. The existing 640-foot pipe segment from the North Lake City Trunk diversion location (manhole NWW10-02) to the current connection with the Thornton Creek Trunk will be taken out of service and abandoned in place.

By diverting inflows from the North Lake City Trunk, the upper portion of the existing Thornton Creek Trunk will have adequate conveyance capacity for the projected 2060 peak 20-year flows from the West Lake City Trunk. A new easement of approximately 960 lineal feet through a Seattle Public Schools property will be required.

Upstream and Downstream Considerations

Upstream Projects: North Lake City Trunk Replacement, Realignment, and Rehabilitation

Downstream Projects: None

Concepts Evaluated

- **Storage.** Storage was evaluated as an alternative to conveyance replacement. The comparative costs for providing an estimated required storage volume in excess of 20 MG precluded this alternative from further evaluation.
- **Paralleling.** The Thornton Creek Trunk was constructed in 1965; therefore, the paralleling alternative was not considered further for a conceptual project.
- **Replacement of the upstream end of the trunk.** Replacement of the upstream end of the existing trunk was considered, including trench-cut construction through Meadowbrook Pond Park, microtunneling under the park, and microtunneling under the residential areas adjacent to the park. Trench-cut construction through the park would result in significant impacts to the Thornton Creek riparian corridor, which would require extensive mitigation. A stream crossing outside of (downstream of) the park would also be required. Microtunneling at a safe and allowable elevation under the park or under the adjacent residential area would increase project costs significantly. Inspection information from 2012 rated the condition of the existing trunk as structurally sound yet showing signs of corrosion sedimentation, root intrusion, and infiltration. Replacement of the upstream portion of the trunk was not further considered in this conceptual plan.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
North Lake City diversion	NWW10-02 to W07-06	North Lake City diversion	Trench-cut	54	2250	71.7 mgd	$3.4
		Easement through school property	N/A	N/A	N/A	N/A	$0.87
WW*THORNTON.WO7-04(4)	W07-06 to W07-08	Pipe replacement	Trench-cut	60	521	103 mgd	$0.78
WW*THORNTON.WO7-08(1)	WO7-08 to WO7-08A	Pipe replacement	Trench-cut	60	340	103 mgd	$0.48
WW*THORNTON.WO7-08A(2)	WO7-08A to WO7-11	Pipe replacement	Trench-cut	60	744	103 mgd	$1.3
WW*THORNTON.WO7-11(3)	WO7-11 to WO7-14	Pipe replacement	Trench-cut	60	1425	103 mgd	$2.4
WW*THORNTON.WO7-15(8)	WO7-15 to WO7-23	Pipe replacement	Trench-cut	72	1225	114 mgd	$2.8
		City of Seattle street use fee	N/A	N/A	N/A	N/A	$0.30

Total Project Cost

The construction cost estimate is $12.33M ($2016) for the Thornton Creek Replacement and Diversion Project. The project cost estimate is $34.98M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility

studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.

- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
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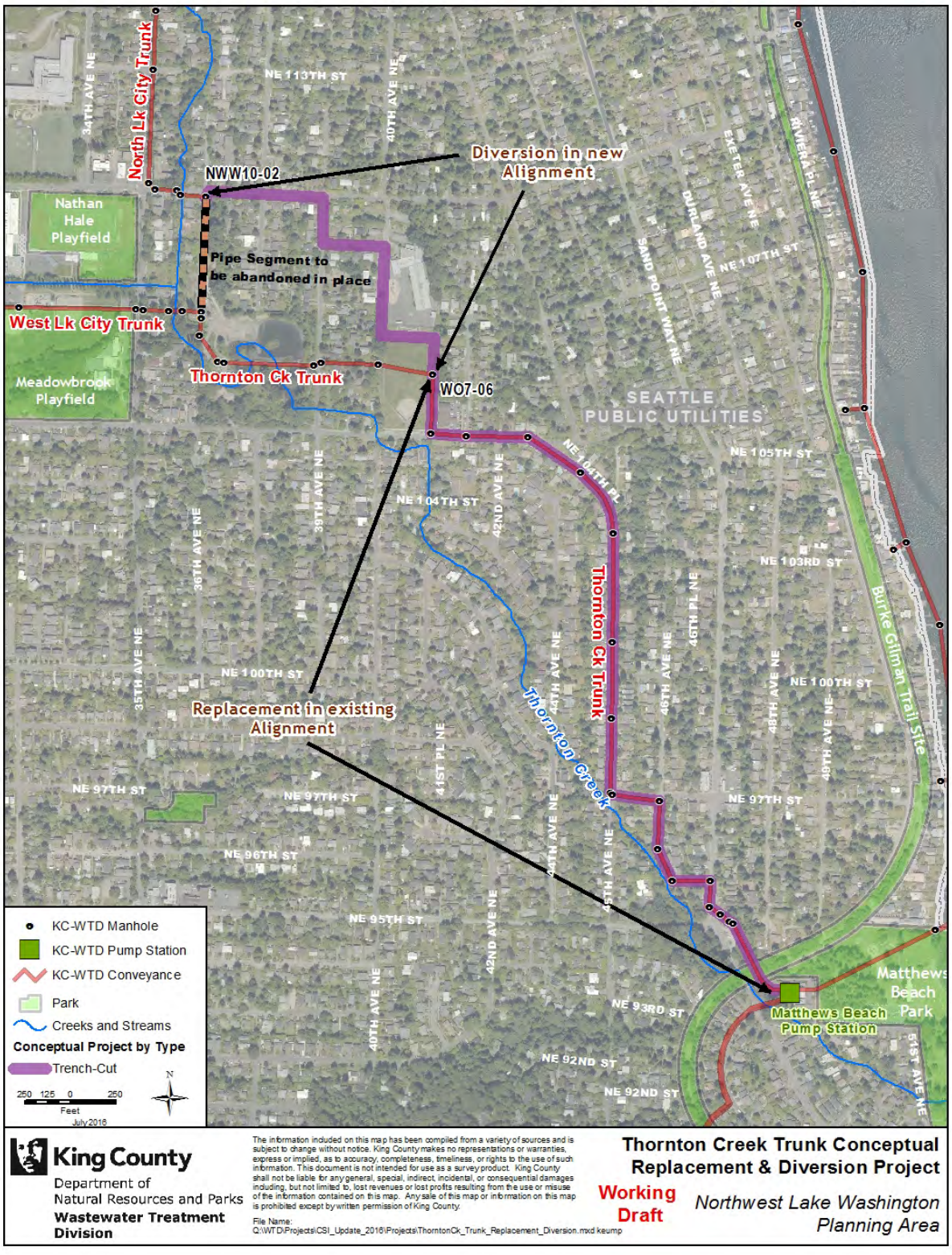
North Lk City Trunk
NWW10-02
Diversion in new Alignment
Nathan Hale Playfield
Pipe Segment to be abandoned in place
West Lk City Trunk
Meadowbrook Playfield
Thornton Ck Trunk
WO7-06
SEATTLE PUBLIC UTILITIES
Replacement in existing Alignment
Thornton Creek
Burke Gilman Trail Site
Matthews Beach Park
Matthews Beach Pump Station
NE 113TH ST
NE 107TH ST
NE 105TH ST
NE 104TH ST
NE 103RD ST
NE 100TH ST
NE 97TH ST
NE 96TH ST
NE 95TH ST
NE 93RD ST
NE 92ND ST
34TH AVE NE
35TH AVE NE
36TH AVE NE
39TH AVE NE
40TH AVE NE
41ST PL NE
42ND AVE NE
43RD AVE NE
44TH AVE NE
45TH AVE NE
46TH AVE NE
46TH PL NE
48TH AVE NE
49TH AVE NE
51ST AVE NE
RIVIERA PL NE
EXETER AVE NE
DURLAND AVE NE
SAND POINT WAY NE
KC-WTD Manhole
KC-WTD Pump Station
KC-WTD Conveyance
Park
Creeks and Streams
Conceptual Project by Type
Trench-Cut
250 125 0 250
Feet
July 2016
N
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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File Name:
Q:\WTD\Projects\CSI_Update_2016\Projects\ThorntonCk_Trunk_Replacement_Diversion.mxd keump
Thornton Creek Trunk Conceptual Replacement & Diversion Project
Working Draft
Northwest Lake Washington Planning Area

Conceptual Project: North Lake City Trunk Replacement, Realignment, and Rehabilitation

Capacity Needs Addressed

North Lake City Trunk

Location

Sewer Agency: Seattle Public Utilities
Jurisdiction: City of Seattle
Planning Area: Northwest Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
Phase 1										
WW*NLKCITY.NWW9-14(13)	NWW9-14	NWW9-01	3,823	30	1951	37.49	52.04	14.55	2010	17.8
WW*NLKCITY.NWW9-01(5)	NWW9-01	NWW10-01	985	30	1951	38.49	57.40	18.91	2010	12.1
Phase 2										
WW*NLKCITY.NWW9-26(12)	NWW9-26	NWW9-14	2,699	27	1951	28.11	30.81	2.71	2043	> 20

Project Description

Components and Construction Methods

The project will be completed in 2 phases. Phase 1 will address needs identified for 2010. Phase 2 will address needs identified beginning in 2043. Both Phases 1 and 2 include realignment and replacement elements.

- Phase 1 includes replacement of 210 feet of 36-inch-diameter pipe on the west side of Lake City Way and 90 feet of jack-and-bore under Lake City Way in the existing alignment. On the east side of Lake City Way, the project continues in a new alignment with 2,317 feet of 36-inch-diameter pipe connecting to the existing alignment at NE 115th Street. The portion of the system from this proposed connection point to the downstream end of the project at MH NWW10-02 is replaced within the existing alignment and includes 1,580 feet of 42-inch-diameter and 345 feet of 54-inch-diameter pipe. The section of pipe from MH NWW10-02 to NWW10-01 is abandoned in place. Phase 1 also includes 1,126 feet of 8-inch-diameter sliplining within the existing trunk to provide for existing local line connections in the Thornton Creek riparian corridor and facilitate continuous conveyance of the reduced flow. New conveyance constructed as part of the Thornton Creek Trunk Replacement and Diversion Project will convey all flows from the North Lake City Trunk beginning at MH NWW10-02.
- Phase 2 will begin at the NE 127th Street alignment. It includes 3,644 feet of 36-inch-diameter pipe that diverts flows from the existing trunk within the Thornton Creek riparian corridor and conveys them to the connection point with Phase 1 on the west side of Lake City Way. Phase 2 also includes 2,813 feet of 8-inch-diameter sliplining within the existing trunk in the riparian

corridor to provide for existing local line connections and facilitate continuous conveyance of the reduced flow.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Thornton Creek Trunk Replacement and Diversion

Concepts Evaluated

- **Storage.** Storage was evaluated as an alternative to conveyance replacement. The storage volume required to meet all conveyance needs would be more than 6 MG, with an estimated construction costs of approximately $35M. This North Lake City Trunk system was constructed in 1951 and inspection information from 2007 indicates a condition rating of 4, showing serious signs of corrosion, sedimentation, root intrusion, or infiltration. These factors eliminated storage from further evaluation.
- **Paralleling.** This system was constructed in 1951 and inspection information from 2007 indicates a condition rating of 4, showing serious signs of corrosion, sedimentation, root intrusion, or infiltration. Therefore, paralleling was not considered further.
- **Replacement of pipe within the riparian corridor.** A significant portion of the existing trunk is in the Thornton Creek riparian corridor. Replacing this portion using the existing alignment would result in significant impacts to the riparian corridor and, thus, eliminates this alternative from further evaluation.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Phase 1 2010 need							
WW*NLKCITY.NWW9-14(13)	NWW9-14 to NWW9-13	Pipe replacement	Trench-cut	36	145	38.5 mgd	$0.16
	NWW9-13 to jack and bore	Pipe replacement	Trench-cut	36	65	57.5 mgd	$0.09
	Jack and bore under Lake City Way	Pipe replacement	Jack and bore	36	90	57.5 mgd	$0.47
New Alignment	Jack and bore to New MH1	Pipe realignment	Trench-cut	36	215	57.5 mgd	$0.59
	New MH1 to NWW9-06	Pipe realignment	Trench-cut	36	1741	57.5 mgd	$2.8
	NWW9-06 to NWW9-04	Pipe replacement	Trench-cut	42	355	61.6 mgd	$0.36
	NWW9-04 to NWW9-01	Pipe replacement	Trench-cut	42	1225	65.1 mgd	$1.2
WW*NLKCITY.NWW9-01(5)	NWW9-01 to NWW10-02	Pipe replacement	Trench-cut	54	345	65.1 mgd	$0.46
	Slipline existing alignment in creek corridor for local connections	Pipe rehabilitation	Slipline	8	1126	Not calculated	$0.55
		City of Seattle street use fee	N/A	N/A	N/A	N/A	$0.30
Phase 2 2040 need							
WW*NLKCITY.NWW9-27(1)	New alignment to connection at NWW9-14	Pipe realignment	Trench-cut	36	3,644	36.7 mgd	$6.2
WW*NLKCITY.NWW9-26(12)	Slipline existing alignment for 8 local connections	Pipe rehabilitation	Slipline	8	2813	Not calculated	$1.6
		City of Seattle street use fee	N/A	N/A	N/A	N/A	$0.30

Total Project Cost

The construction cost estimates for the North Lake City Trunk Project are $6.98M ($2016) for Phase 1 and $8.10M for Phase 2. The project cost estimates are $21.23M ($2016) for Phase 1 and $24.63M (2016) for Phase 2 after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).

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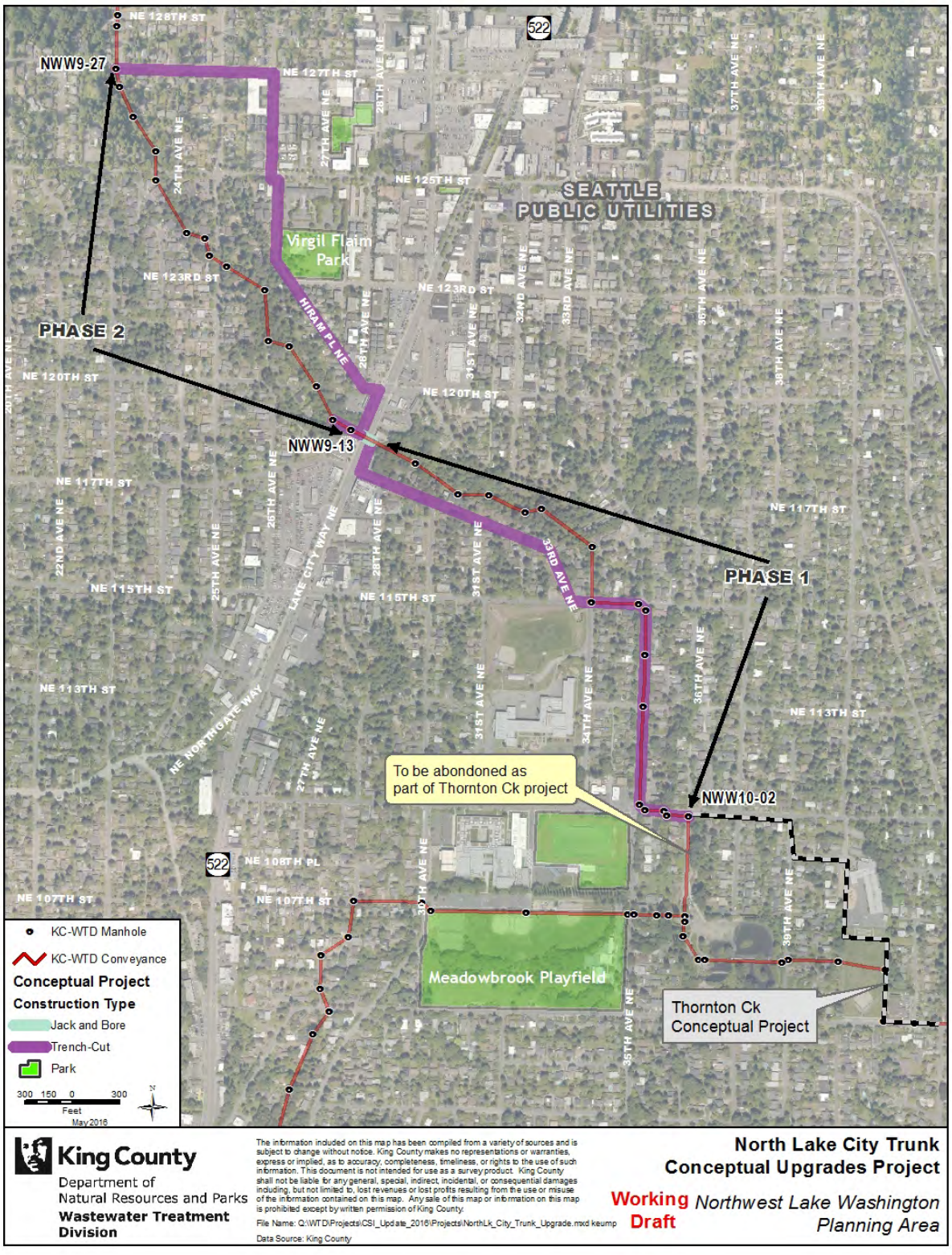
NWW9-27
PHASE 2
NWW9-13
PHASE 1
NWW10-02
To be abondoned as part of Thornton Ck project
Thornton Ck Conceptual Project
Virgil Flaim Park
Meadowbrook Playfield
SEATTLE PUBLIC UTILITIES
NE 128TH ST
NE 127TH ST
NE 125TH ST
NE 123RD ST
NE 120TH ST
NE 117TH ST
NE 115TH ST
NE 113TH ST
NE 108TH PL
NE 107TH ST
NE NORTHGATE WAY
HIRAM PL NE
LAKE CITY WAY NE
522
KC-WTD Manhole
KC-WTD Conveyance
Conceptual Project
Construction Type
Jack and Bore
Trench-Cut
Park
300 150 0 300
Feet
May 2016
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\NorthLk_City_Trunk_Upgrade.mxd keump
Data Source: King County
North Lake City Trunk
Conceptual Upgrades Project
Working Draft
Northwest Lake Washington Planning Area

Conceptual Project: Kenmore Interceptor Diversion

Capacity Needs Addressed

Lake Ballinger Pump Station
McAleer Trunk

Location

Sewer Agency: Northshore Utility District
Jurisdiction: City of Bothell
Planning Area: Northwest Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
WW*KENMR.W11-39(45)	W11-39	W11-00	24,514	48	1964	26.00	53.33	27.33	2010	1.5
Matthews Park Pump Station	MATTHEWS	N/A	N/A	N/A	1967	123.10	151.10	28.00	2026	> 20

Project Description

Components and Construction Methods

The Kenmore Interceptor Diversion Project diverts up to 18.1 mgd of 20-year peak flow by 2060 from the Kenmore Interceptor to the Swamp Creek Connector Interceptor. This project in combination with the Lake Ballinger Storage conceptual project limits the downstream flow to the 26-mgd capacity of Kenmore Interceptor Section 2 in Lake Washington. The Kenmore Interceptor Diversion Project consists of a pump station upgrade and parallel force mains.

- During high flow events, the gates at the Logboom Regulator Station close and flow backs up into Logboom Storage facility. Storage overflow and the inflow along Kenmore Interceptor Section 3 back up into the Kenmore Pump Station. The pump station then diverts flow through two new parallel force mains (one large diameter and one small diameter) that convey the flow to the Swamp Creek Connector for treatment at Brightwater Treatment Plant.
- After the flow events, the gates at the Logboom Regulator Station open to drain Logboom Storage facility and Kenmore Interceptor Section 3 into Kenmore Interceptor Section 2 for treatment at West Point Treatment Plant.

This diversion requires an upgrade to the Kenmore Pump Station to increase the total dynamic head from 24 feet to more than 53 feet. The upgrade consists of replacement pumps and mechanical, electrical, and instrumentation improvements. Pump station construction is assumed to be within the existing pump station, with no modifications to the structure or wet well. Force main construction is assumed to be trench-cut, with jack-and-bore crossings below NE Bothell Way and Swamp Creek. The conceptual alignment extends east and then north in the public right-of-way from the Kenmore Pump Station to manhole 99-80.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: None

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address the downstream pipe reach capacity needs in Kenmore Interceptor Section 2. The peak flow reduction-to-volume relationship developed for the upstream Logboom Storage facility determined that the additional volume to be unachievable. Storage was not considered further for a conceptual project.
- **Paralleling/replacement.** The Kenmore Interceptor Section 3 was constructed in 1964. In a 2011 assessment, contractors found minor exposed aggregate on the top of the pipe and at the manholes. Because the Kenmore Interceptor Section 3 will be more than 50 years old in 2016 is in poor condition, replacement would be recommended. However, in-lake construction would be prohibitive in terms of constructability and expense. Further, King County Council directives prohibit pipeline construction in Lake Washington. Paralleling or replacement was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

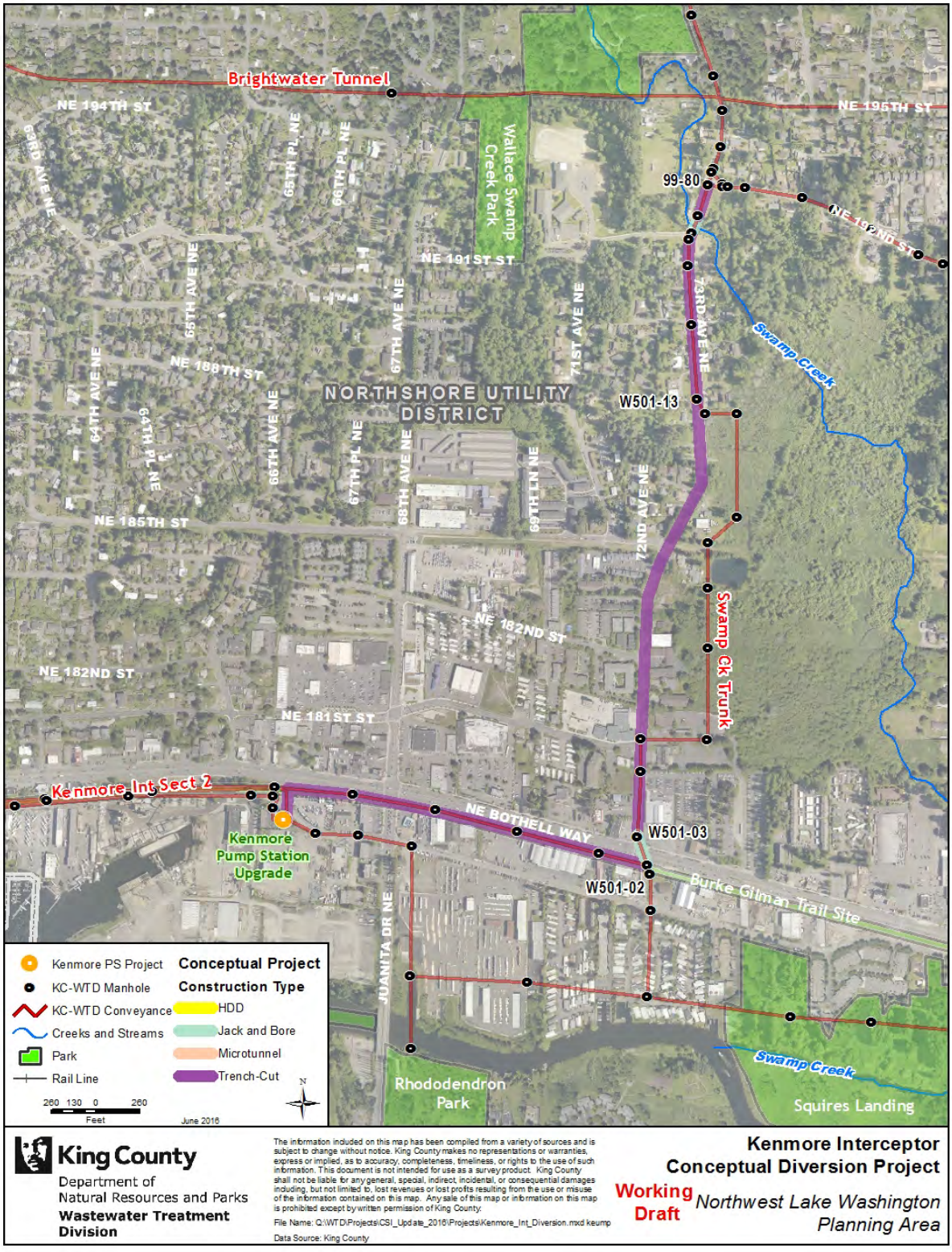
Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Kenmore Pump Station	N/A	Pump station upgrade	N/A	N/A	N/A	18.1 mgd	$6.4
Kenmore Pump Station Force Mains	KENMORE to 99-80	Two force mains	Trench-cut	30/12	6,380	22.6 mgd	$5.2
	W500-05 to W501-03	Intersection crossing	Jack and bore	42	200	22.6 mgd	$0.71
	99-17 to 99-18	Creek crossing	Jack and bore	42	150	22.6 mgd	$0.61

Total Project Cost

The construction cost estimate for the Kenmore Interceptor Diversion Project is $12.9M ($2016). The project cost estimate is $36.6M (2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.

- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


Brightwater Tunnel
NE 194TH ST
NE 195TH ST
65TH PL NE
66TH PL NE
Wallace Swamp Creek Park
99-80
NE 191ST ST
65TH AVE NE
67TH AVE NE
71ST AVE NE
73RD AVE NE
Swamp Creek
NE 188TH ST
NORTHSHORE UTILITY DISTRICT
W501-13
64TH AVE NE
64TH PL NE
66TH AVE NE
67TH PL NE
68TH AVE NE
69TH LN NE
72ND AVE NE
NE 185TH ST
NE 182ND ST
Swamp Ck Trunk
NE 181ST ST
Kenmore Int Sect 2
NE BOTHELL WAY
W501-03
Kenmore Pump Station Upgrade
W501-02
Burke Gilman Trail Site
JUANITA DR NE
Rhododendron Park
Squires Landing
Kenmore PS Project
KC-WTD Manhole
KC-WTD Conveyance
Creeks and Streams
Park
Rail Line
Conceptual Project
Construction Type
HDD
Jack and Bore
Microtunnel
Trench-Cut
260 130 0 260
Feet
June 2016
N
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\Kenmore_Int_Diversion.mxd keump
Data Source: King County
Kenmore Interceptor
Conceptual Diversion Project
Working Draft
Northwest Lake Washington Planning Area

Northeast Lake Washington Planning Area

Ten conceptual projects were developed to address capacity needs in the Northeast Lake Washington Planning Area:

- Medina Trunk Replacement
- Medina Siphon Replacement
- Factoria Trunk Diversion
- Lake Hills Interceptor Replacement
- North Mercer Pump Station Upgrade
- Kirkland Pump Station Upgrade
- Medina Pump Station Upgrade
- Yarrow Bay Pump Station Replacement
- Sweyolocken Pump Station Upgrade
- Eastside Interceptor Section 8 Storage

Conceptual Project: Medina Trunk Replacement

Capacity Needs Addressed

Medina Trunk

Location

Sewer Agency: Bellevue Utility Services
Jurisdiction: City of Medina
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*MEDINA.T-18(8)	T-18	T-11	3,427	21	1963	3.52	5.60	2.08	2010	8.5
RE*MEDINA.T-11(11)	T-11	T-02C	2,073	24	1963	5.21	8.69	3.49	2010	6.7
RE*MEDINA.T-02C(1)	T-02C	T-02B	34	12 (x 2)	1963	8.28	8.69	0.41	2051	> 20
RE*MEDINA.T-02B(3)	T-02B	Medina	169	24	1963	5.85	12.48	6.64	2010	> 20

Project Description

Components and Construction Methods

The Medina Trunk Replacement Project replaces all 5,703 feet of the Medina Trunk with 24-inch to 36-inch-diameter pipeline. Construction is assumed to be trench-cut. The conceptual alignment follows the existing WTD conveyance route from manhole T-18 to the Medina Pump Station.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Medina Pump Station Upgrade; Medina Siphon Replacement; Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address downstream pipe reach needs in the Medina Trunk, Medina Pump Station, and Medina Siphon. Peak flow reduction-to-volume relationships were developed at upstream manholes T-18 and T-09 and the Medina Pump Station in series. It was determined that these volumes of storage would be 0.4 MG, 0.71 MG, and 0.36 MG, respectively. However, the estimated total construction cost of $11.9M ($2016) exceeds the cost for the replacement alternative. Storage was not considered further for a conceptual project.
- **Paralleling.** Paralleling was evaluated by the age and condition of the pipe reach needs. The Medina Trunk was constructed in 1963. In a 2011 assessment, WTD Facility Inspections found moderate signs of corrosion, sedimentation, root intrusion, or infiltration. Paralleling was not considered further for a conceptual project because of age (more than 50 years old in 2016) and condition.

- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole T-18 to address downstream pipe reach needs in the Medina Trunk, Medina Pump Station, and Medina Siphon. However, no feasible diversion route to the Eastside Interceptor Section 13 could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*MEDINA.T-18(8)	T-18 to T-11	Pipe replacement	Trench-cut	30	3,427	7.00 mgd	$2.1
RE*MEDINA.T-11(11)	T-11 to T-02C	Pipe replacement	Trench-cut	36	2,073	10.9 mgd	$1.7
RE*MEDINA.T-02C(1)	T-02C to T02B	Pipe replacement	Trench-cut	27	34	9.31 mgd	$0.03
RE*MEDINA.T-02B(3)	T-02B to MEDINA	Pipe replacement	Trench-cut	36	169	15.6 mgd	$0.1

Total Project Cost

The construction cost estimate is $3.95M ($2016) for the Medina Trunk Replacement Project. The project cost estimate is $12.2M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
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- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


T-18
T-01
Medina Pump Station
Medina Park
Overlake Golf and Country Club
NE 22ND ST
NE 21ST PL
NE 21ST ST
NE 20TH ST
NE 19TH PL
NE 19TH ST
NE 17TH ST
NE 16TH ST
NE 15TH ST
NE 14TH ST
NE 13TH ST
NE 12TH ST
NE 11TH ST
NE 10TH ST
NE 9TH ST
NE 7TH ST
77TH AVE NE
79TH AVE NE
80TH AVE NE
80TH PL NE
82ND AVE NE
83RD AVE NE
84TH AVE NE
85TH AVE NE
86TH AVE NE
87TH AVE NE
88TH AVE NE
88TH PL NE
89TH AVE NE
89TH PL NE
90TH AVE NE
90TH PL NE
91ST AVE NE
91ST PL NE
LAKE WASHINGTON BLVD NE
KC-WTD Manhole
KC-WTD Pump Station
Creeks and Streams
KC-WTD Conveyance
Conceptual Project Construction Type
Trench-Cut
250 125 0 250
Feet
March 2016
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\Medina_TrunkReplacement.mxd keump
Data Source:
Medina Trunk Replacement
Northeast LakeWashington Planning Area

Conceptual Project: Medina Siphon Replacement

Capacity Needs Addressed

Medina Siphon

Location

Sewer Agency: Bellevue Utility Services
Jurisdiction: City of Medina
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*MEDINA.SIS(2)	SIS	RO2-41A	3,669	16	1988	5.24	10.05	4.80	2010	7.6

Project Description

Components and Construction Methods

The Medina Siphon Replacement Project replaces all 3,669 feet of the Medina Siphon with 12-inch and 24-inch-diameter parallel pipeline. Construction is assumed to be trench-cut with jack-and-bore below I-405. The conceptual alignment generally follows the existing WTD conveyance route from Siphon Inlet Structure SIS to Siphon Discharge Structure RO2-41A.

Upstream and Downstream Considerations

Upstream Projects: Medina Trunk Replacement; Medina Pump Station Upgrade

Downstream Projects: Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was considered but not proposed for the upstream Medina Trunk conceptual project. Accordingly, storage for the Medina Siphon was not considered further for a conceptual project.
- **Paralleling** Paralleling was evaluated by the age and condition of the pipe reach needs. The Medina Siphon was constructed in 1988. WTD Facility Inspections could not assess the condition because of pressurized operations. Although paralleling the siphon with a third barrel is feasible, both existing barrels could be replaced in the same trench for an additional $0.55M construction cost. Paralleling was not considered further for a conceptual project.
- **Diversion.** Diversion was considered but not proposed for the upstream Medina Trunk conceptual project. Accordingly, diversion for the Medina Siphon was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*MEDINA.SIS(2)	SIS to RO2-41A	Siphon replacement	Trench-cut	12/24	3,346	15.6 mgd	$2.7
		I-405 crossing	Jack and bore	48	300	15.6 mgd	$1.0
		Creek crossing	Culvert	48	50	N/A	$0.052
		Creek crossing	Culvert	48	50	N/A	$0.052

Total Project Cost

The construction cost estimate is $3.82M ($2016) for the Media Siphon Replacement Project. The project cost estimate is $11.8M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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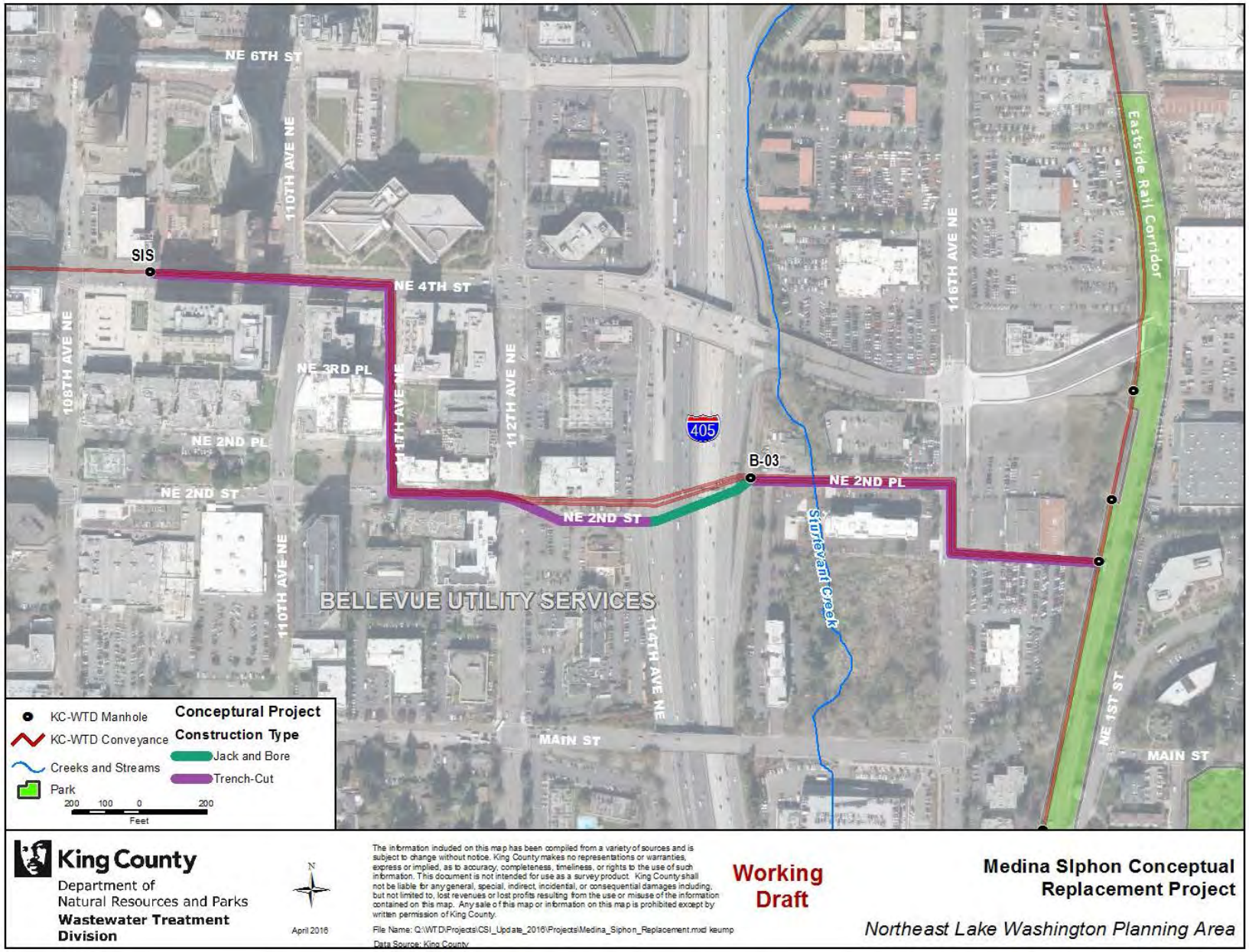
NE 6TH ST
110TH AVE NE
SIS
NE 4TH ST
108TH AVE NE
NE 3RD PL
111TH AVE NE
112TH AVE NE
116TH AVE NE
Eastside Rail Corridor
405
B-03
NE 2ND PL
NE 2ND ST
Sturtevant Creek
BELLEVUE UTILITY SERVICES
114TH AVE NE
MAIN ST
NE 1ST ST
KC-WTD Manhole
KC-WTD Conveyance
Creeks and Streams
Park
Conceptural Project
Construction Type
Jack and Bore
Trench-Cut
200 100 0 200
Feet
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
N
April 2016
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\Medina_Siphon_Replacement.mxd keump
Data Source: King County
Working
Draft
Medina SIphon Conceptual
Replacement Project
Northeast Lake Washington Planning Area

Conceptual Project: Factoria Trunk Diversion

Capacity Needs Addressed

Factoria Trunk

Location

Sewer Agency: Bellevue Utility Services
Jurisdiction: City of Factoria
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*FACTOR.RO6-25(8)	RO6-25	RO6-20	2,446	18	1964	3.50	5.83	2.33	2010	6.1
RE*FACTOR.RO6-19(7)	RO6-19	RO6-14	1,784	21	1964	4.85	8.28	3.43	2010	5.2
RE*FACTOR.RO6-14(13)	RO6-14	RO6-05	3,697	21	1964	6.55	8.28	1.73	2028	> 20
RE*FACTOR.RO6-05(7)	RO6-05	RO6-00	2,832	30	1964	7.88	11.02	3.15	2015	> 20
Wilburton Pump Station	WILBURTON	N/A	110	0	1965	10.20	11.02	0.82	2049	> 20

Project Description

Components and Construction Methods

The Factoria Trunk Diversion Project diverts up to 4.94 mgd of peak 20-year flow by 2060 from upstream Factoria Trunk to the Eastside Interceptor (ESI) Section 8. The project consists of a low-head 6.2-mgd pump station and an 18-inch-diameter force main. The pump station would operate only during large flow events to divert upstream flow from the Factoria Trunk to the ESI. Construction is assumed to be trenchless using horizontal directional drilling. The conceptual alignment extends 2,500 feet west below SE 32nd Street and I-405 from manholes RO6-25 to RO2-29A. The proposed site for the new pump station is in the public right-of-way owned by City of Bellevue Utilities. Property acquisition costs were not included in the project cost estimate.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address downstream pipe reach and pump station needs in the Factoria Trunk and Wilburton Pump Station. A peak flow reduction-to-volume recurrence relationship developed at upstream manhole RO6-25 determined the volume to be 3.2 MG. However, the estimated storage construction cost of $19.0M ($2016)

would exceed the cost for the diversion alternative. Storage was not considered further for a conceptual project.

- **Paralleling/Replacement.** Paralleling or replacement was evaluated by the age and condition of the pipe reach needs. The Factoria Trunk was constructed in 1964. In a 2012 assessment, WTD Facility Inspections found moderate signs of corrosion, sedimentation, root intrusion, or infiltration. Because of both age (more than 50 years in 2016) and condition, replacement would be preferred to paralleling. However, the estimated replacement construction cost would exceed the cost of the diversion alternative. Paralleling or replacement was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
New pump station	RO6-25	New pump station	N/A	N/A	N/A	6.18 mgd	$3.2
New pressure pipeline	RO6-25 to RO2-29A	New pressure pipeline	Horizontal directional drilling	18	2,500	6.18 mgd	$2.4

Total Project Cost

The construction cost estimate is $5.58M ($2016) for the Factoria Trunk Diversion Project. The project cost estimate is $16.9M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
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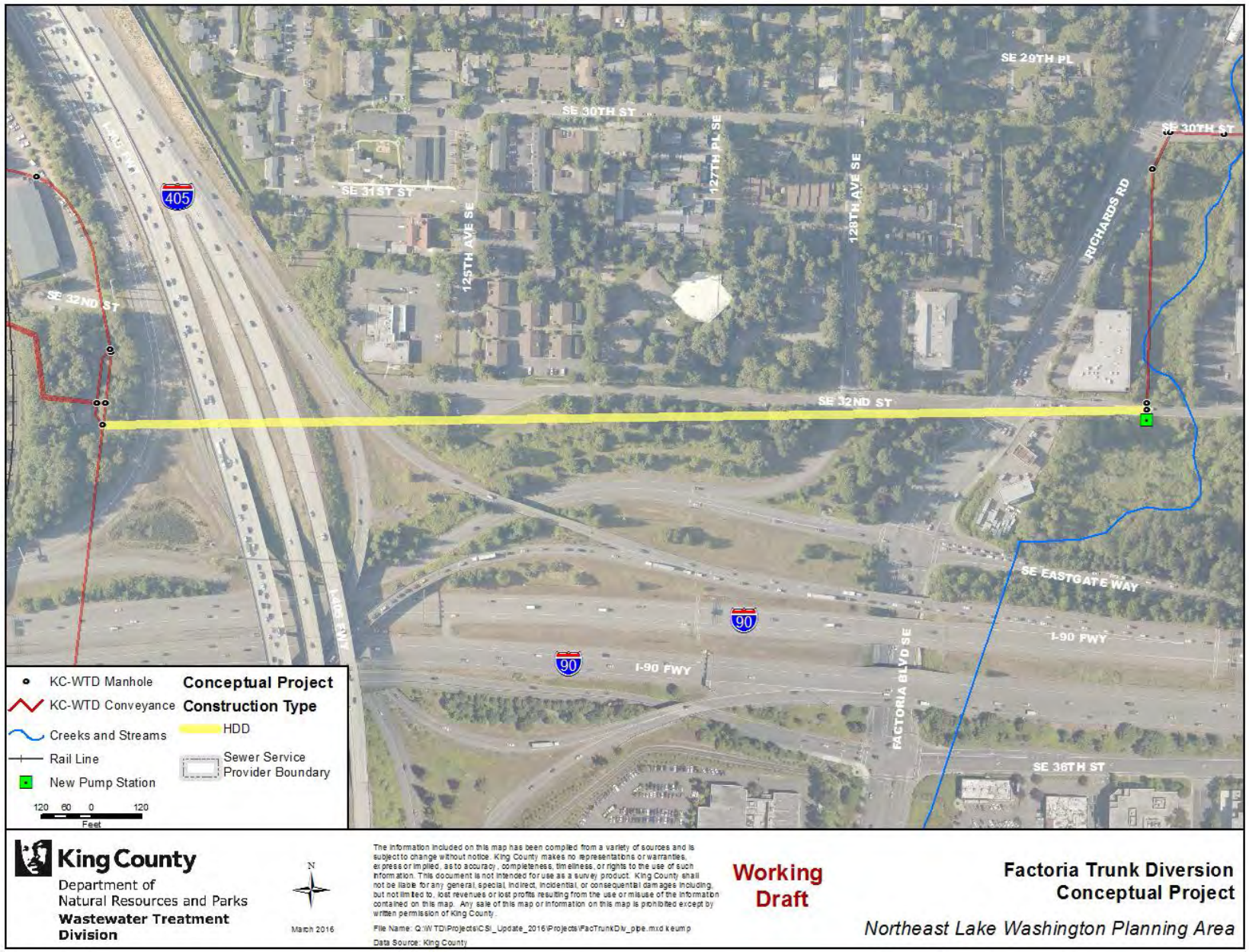
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127TH PL SE
128TH AVE SE
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SE EASTGATE WAY
FACTORIA BLVD SE
SE 36TH ST
KC-WTD Manhole
KC-WTD Conveyance
Creeks and Streams
Rail Line
New Pump Station
Conceptual Project
Construction Type
HDD
Sewer Service Provider Boundary
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King County
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Wastewater Treatment
Division
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March 2016
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\FacTrunkDiv_pipe.mxd keump
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Working Draft
Factoria Trunk Diversion
Conceptual Project
Northeast Lake Washington Planning Area

Conceptual Project: Lake Hills Interceptor Replacement

Capacity Needs Addressed

Lake Hills Interceptor

Location

Sewer Agency: Bellevue Utility Services
Jurisdiction: City of Bellevue
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*LKHILLS.RO3-49(24)	RO3-49	RO3-25	9,191	48	1965	39.11	51.95	12.84	2023	> 20
RE*LKHILLS.RO3-09(9)	RO3-09	RO2-49	4,620	54	1965	55.26	59.83	4.57	2049	> 20

Project Description

Components and Construction Methods

The Lake Hills Interceptor Replacement Project replaces 13,811 feet of the Lake Hills Interceptor with 60-inch to 72-inch-diameter pipeline. Construction is assumed to be trench-cut, with jack-and-bore creek and railroad crossings. The conceptual alignment for pipe reach RE*LKHILLS.RO3-49(24) generally follows the existing WTD conveyance route from manholes RO3-49 to RO3-25. However, a partial re-alignment is proposed along 148th Avenue SE to avoid a wetlands crossing. The conceptual alignment for pipe reach RE*LKHILLS.RO3-09(9) follows the existing conveyance route from manholes RO3-09 to RO2-49. Staged construction is recommended because additional capacity in pipe reaches RE*LKHILLS.RO3-49(24) and RE*LKHILLS.RO3-09(9) is required by 2023 and 2049, respectively.

The proposed conceptual project assumes that the North Lake Sammamish Flow Diversion Project, Sammamish Plateau Diversion Conceptual Project, Issaquah Creek Storage Conceptual Project, and Sunset/Heathfield Pump Station Replacement and Force Main Upgrade Project have been fully implemented.

Upstream and Downstream Considerations

Upstream Projects: Issaquah Interceptor Section 2 Replacement; Issaquah Creek Highlands Storage; Eastgate Trunk Replacement

Downstream Projects: Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address downstream pipe reach needs in the Lake Hills Interceptor. A peak flow reduction-to-volume recurrence relationship developed at upstream manhole RO3-49 determined the volume to be 4.3 MG. However, the estimated storage construction cost of $25.1M ($2016) would exceed the cost of the replacement alternative. Storage was not considered further for a conceptual project.
- **Paralleling.** Paralleling was evaluated by the age and condition of the pipe reach needs. The Lake Hills Interceptor was constructed in 1965. In a 2016 assessment, WTD Facility Inspections found minor to moderate signs of corrosion, sedimentation, root intrusion, or infiltration. Because of the age interceptor (more than 50 years in 2016), paralleling was not considered further for a conceptual project.
- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole RO3-49 to address downstream pipe reach needs in the Lake Hills Interceptor. However, no feasible diversion route to the Eastside Interceptor could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*LKHILLS.RO3-49(24)	RO3-49 to RO3-25	Pipeline replacement	Trench-cut	60	9,191	64.9 mgd	$12
	RO3-31	Pipeline replacement	Jack and bore	60	50	64.9 mgd	$0.56
	RO3-40	Pipeline replacement	Jack and bore	60	50	64.9 mgd	$0.56
RE*LKHILLS.RO3-09(9)	RO3-09 to RO2-49	Pipeline replacement	Trench-cut	72	4,260	74.8 mgd	$8.2
	RO3-03	Culvert creek crossing	Trench-cut	36	50	n/a	$0.045
	RO3-01	Railroad crossing	Jack and bore	72	100	74.8 mgd	$0.62

Total Project Cost

The construction cost estimate is $21.9M ($2016) for the Lake Hills Interceptor Replacement Project. The project cost estimate is $62.1M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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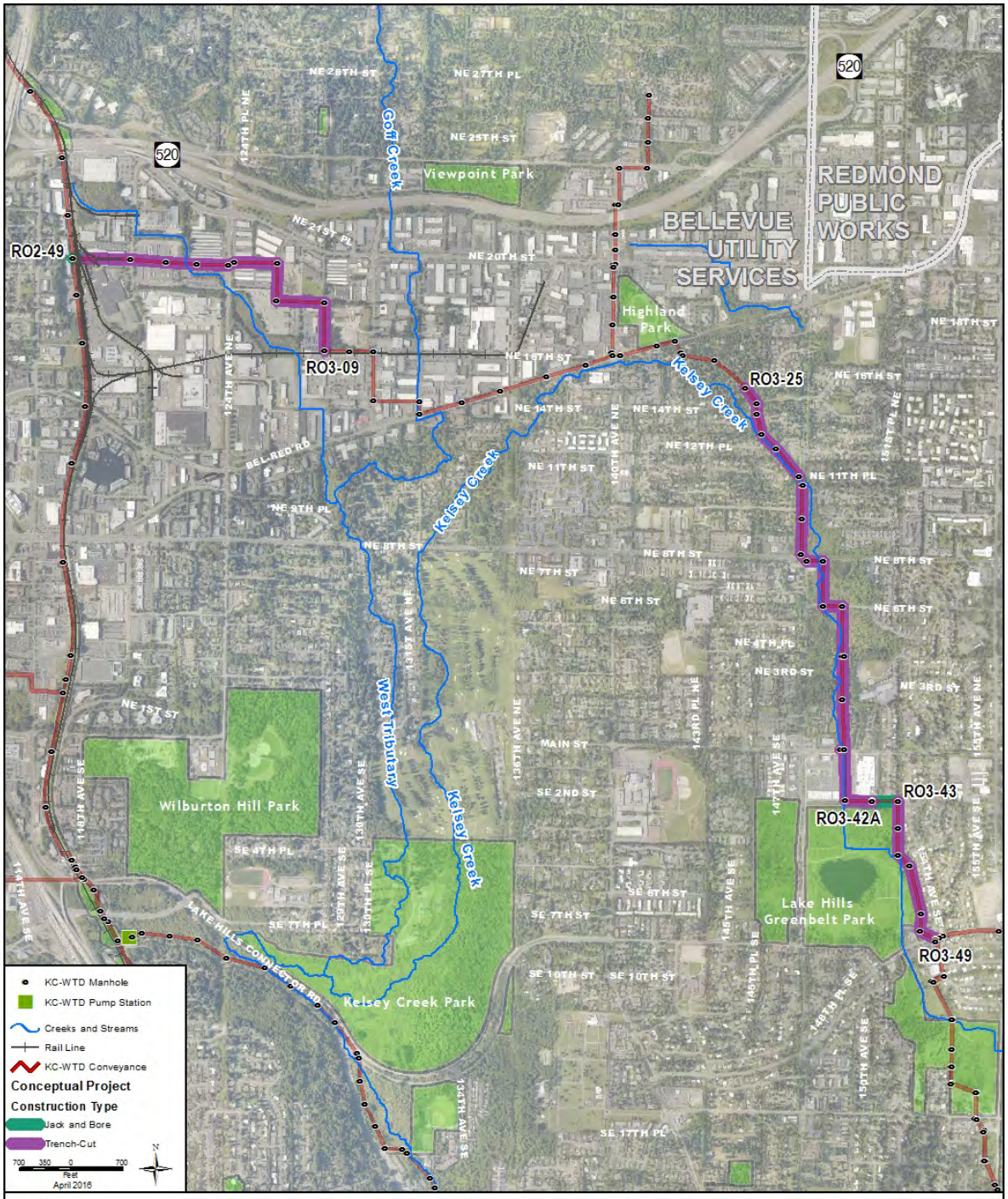

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Data Source:

Lake Hills Interceptor Replacement Conceptual Project

Working Draft

Northeast LakeWashington Planning Area

Conceptual Project: North Mercer Pump Station Upgrade

Capacity Needs Addressed

North Mercer Pump Station

Location

Sewer Agency: Mercer Island Maintenance
Jurisdiction: City of Mercer Island
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Total Dynamic Head (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
North Mercer Pump Station	NMERCER	N/A	140	N/A	1970	7.50	10.53	3.03	2010	16.5

Project Description

Components and Construction Methods

The North Mercer Pump Station Upgrade Project adds 3.03 mgd of capacity to the North Mercer Pump Station. The upgrade consists of replacement pumps and mechanical, electrical, and instrumentation improvements. Construction is assumed to be inside the existing pump station, with no modifications to the existing structure or wet well.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Sweyolocken Pump Station Upgrade; Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was not evaluated to address downstream pump station and pipe reach capacity needs in the North Mercer Island Pump Station, North Mercer Interceptor, Enatai Interceptor, and Sweyolocken Pump Station. The planned North Mercer and Enatai Interceptor Upgrade Project addresses these needs. Storage therefore was not considered further for a conceptual project.
- **Replacement.** Replacement was evaluated by the age and condition of the North Mercer Pump Station and the projected flow in excess of capacity. The pump station was constructed in 1970. The projected flow is 3.03 mgd more than the existing capacity of 7.5 mgd. Because the station will be less than 50 years in 2016 and the capacity increase is less than 50 percent of exisiting capacity, replacement was not considered further for a conceptual project.

- **Diversion.** Diversion was not evaluated to address downstream pump station and pipe reach capacity needs in the North Mercer Island Pump Station, North Mercer Interceptor, Enatai Interceptor, and Sweyolocken Pump Station. The planned North Mercer and Enatai Interceptor Upgrade Project addresses these needs and assumes that the projected flows from the North Mercer Pump Station will be pumped and not reduced from a diversion alternative. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
North Mercer Pump Station	NMERCER	Pump station upgrade	N/A	N/A	N/A	3.03 mgd	$5.18

Total Project Cost

The construction cost estimate is $5.18M ($2016) for the North Mercer Pump Station Upgrade Project. The project cost estimate is $15.8M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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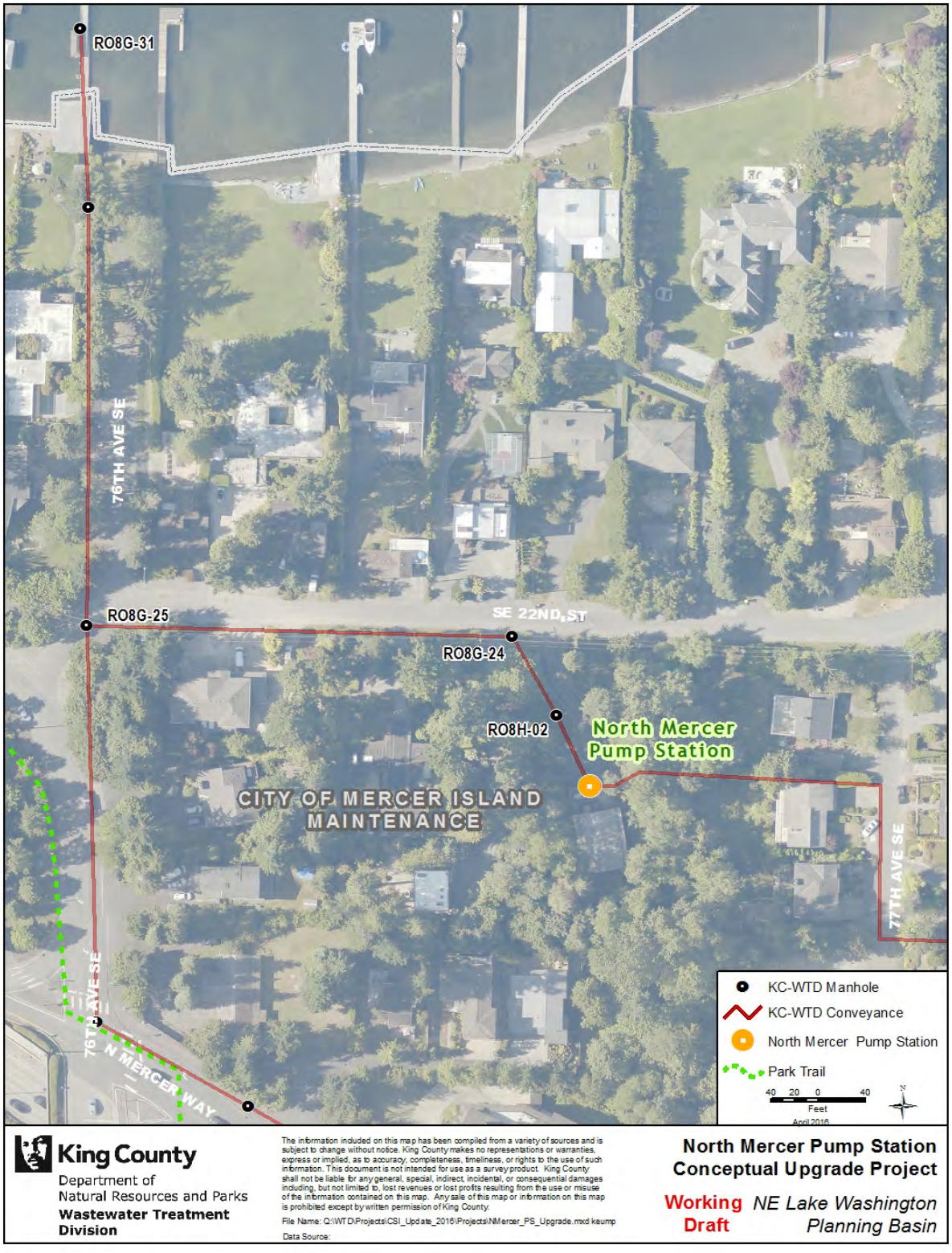
RO8G-31
76TH AVE SE
RO8G-25
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North Mercer
Pump Station
CITY OF MERCER ISLAND
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KC-WTD Manhole
KC-WTD Conveyance
North Mercer Pump Station
Park Trail
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April 2016
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
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Data Source:
North Mercer Pump Station
Conceptual Upgrade Project
Working
Draft
NE Lake Washington
Planning Basin

Conceptual Project: Yarrow Bay Pump Station Replacement

Capacity Needs Addressed

Yarrow Bay Pump Station

Location

Sewer Agency: Kirkland Public Works
Jurisdiction: City of Kirkland
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
Yarrow Bay Pump Station	YARROW BAY	N/A	165	0	1966	4.80	8.05	3.25	2010	7.8

Project Description

Components and Construction Methods

The Yarrow Bay Pump Station Replacement Project replaces the existing Yarrow Bay Pump Station with a new 10.1-mgd pump station. The conceptual site is located within the footprint of the existing structure. This conceptual project may be altered pending results of a current pump station assessment. The assessment could result in replacement of pumps in the station and, possibly, the associated force main, which may address the capacity need and or timing of the project.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address the pump station needs in the Yarrow Bay Pump Station. A peak flow reduction-to-volume recurrence relationship at the pump station determined the required volume to be 0.44 MG. The estimated storage construction cost of $4.16M ($2016) is comparable to the replacement alternative. However, an acquisition cost for 4,900 square feet of land was not included in the storage estimate. This acquisition cost would be significant for waterfront property in Kirkland. Storage was not considered further for a conceptual project.
- **Upgrading.** Upgrading was evaluated by the age and condition of the Yarrow Bay Pump Station and the projected flow in excess of capacity. The pump station was constructed in 1966. The projected flow is 3.25 mgd more than the existing capacity of 4.80 mgd. Because of both age (50

years in 2016) and the capacity increase (more than 50 percent of capacity), upgrading was not considered further for a conceptual project.

- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted upstream to address the downstream pump station need in the Yarrow Bay Pump Station. However, no feasible diversion routes to the Eastside Interceptor Section 14 could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Yarrow Bay Pump Station	YARROWBAY	Pump station replacement	N/A	N/A	N/A	10.1 mgd	$5.3

Total Project Cost

The construction cost estimate is$5.35M ($2016) for the Yarrow Bay Pump Station Replacement Project. The project cost estimate is $16.3M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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LAKE WASHINGTON BLVD NE
KIRKLAND PUBLIC WORKS
OF-01
OF-02
OF-03
KC-WTD Manhole
KC-WTD Conveyance
Yarrow Bay Pump Station
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Wastewater Treatment
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Data Source:
Yarrow Bay Pump Station
Conceptual Replacement Project
Working Draft
NE Lake Washington Planning Basin

Conceptual Project: Sweyolocken Pump Station Upgrade

Capacity Needs Addressed

Sweyolocken Pump Station

Location

Sewer Agency: Bellevue Utility Services
Jurisdiction: City of Bellevue
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Total Dynamic Head (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
Sweyolocken Pump Station	SWEYOLOCK	N/A	86	N/A	2002	21.20	24.92	3.72	2033	> 20

Project Description

Components and Construction Methods

The Sweyolocken Pump Station Upgrade Project adds 3.72 mgd of capacity to the Sweyolocken Pump Station. The upgrade consists of replacement pumps and mechanical, electrical, and instrumentation improvements. Construction is assumed to be inside the existing pump station, with no modifications to the existing structure or wet well.

Upstream and Downstream Considerations

Upstream Projects: North Mercer Pump Station Upgrade

Downstream Projects: Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was not evaluated to address the pump station need in the Sweyolocken Pump Station. The construction cost estimate for storage would exceed the cost for the upgrade alternative. Storage was not considered further for a conceptual project.
- **Replacement.** Replacement was evaluated by the age and condition of the Sweyolocken Pump Station and the projected flow in excess of capacity. The pump station was replaced in 2002. The projected flow is 3.72 mgd more than the existing capacity of 21.2 mgd. Because the pump station will be less than 50 years old in 2033 and the capacity increase is less than 50 percent of existing capacity, replacement was not considered further for a conceptual project.
- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted upstream to address the downstream pump station need in the Sweyolocken Pump

Station. However, no feasible diversion routes to the Eastside Interceptor Sections 9 or 8 could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Sweyolocken Pump Station	SWEYOLOCK	Pump station upgrade	N/A	N/A	N/A	3.72 mgd	$8.83

Total Project Cost

The construction cost estimate is $8.83M ($2016) for the Sweyolocken Pump Station Upgrade Project. The project cost estimate is $26.9M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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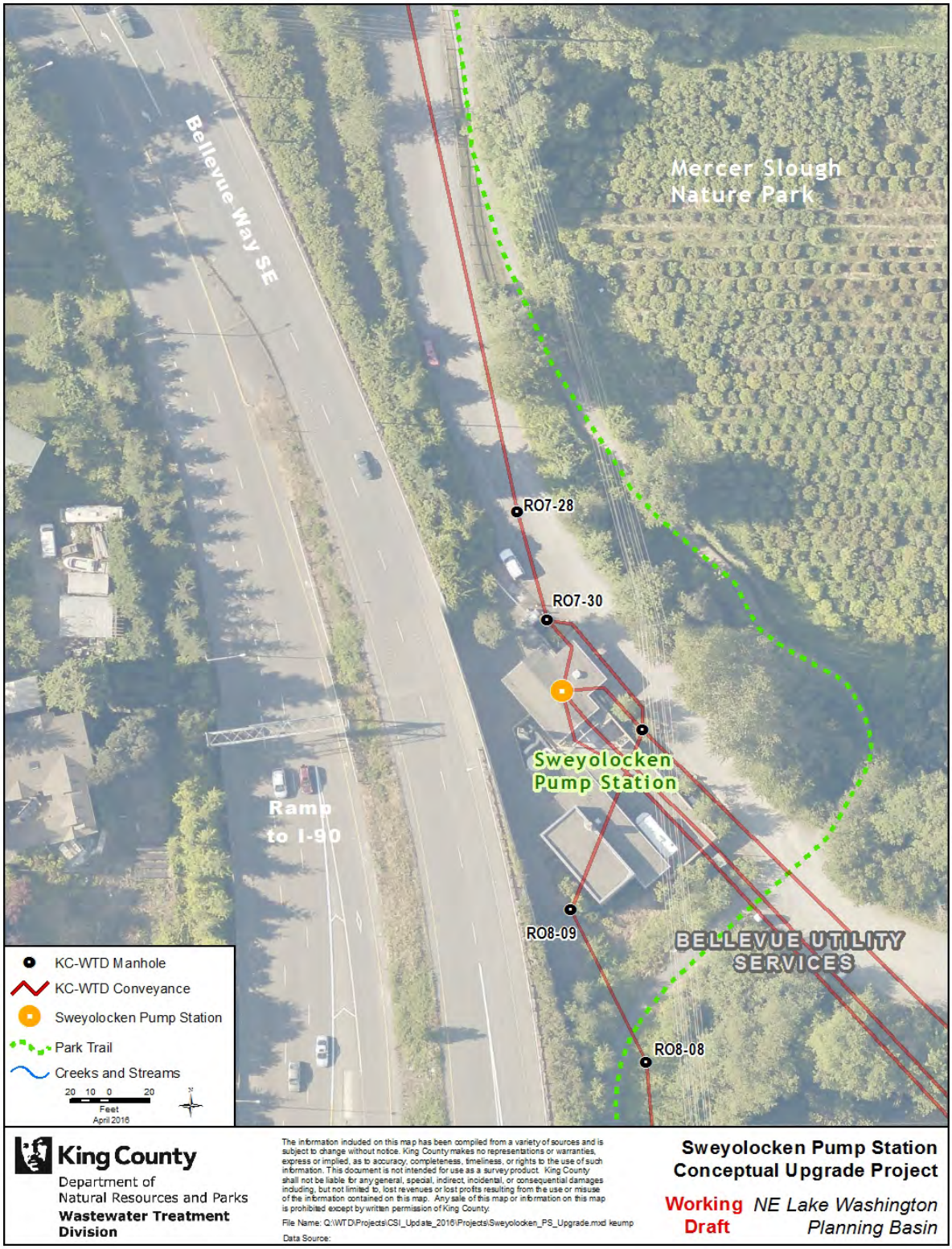
Bellevue Way SE
Mercer Slough
Nature Park
RO7-28
RO7-30
Sweyolocken
Pump Station
Ramp
to I-90
RO8-09
BELLEVUE UTILITY
SERVICES
RO8-08
KC-WTD Manhole
KC-WTD Conveyance
Sweyolocken Pump Station
Park Trail
Creeks and Streams
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April 2016
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Department of
Natural Resources and Parks
Wastewater Treatment
Division
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Data Source:
Sweyolocken Pump Station
Conceptual Upgrade Project
Working
Draft
NE Lake Washington
Planning Basin

Conceptual Project: Kirkland Pump Station Upgrade

Capacity Needs Addressed

Kirkland Pump Station

Location

Sewer Agency: Kirkland Public Works
Jurisdiction: City of Kirkland
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
Kirkland Pump Station	KIRKLAND	N/A	189	0	2014	9.40	12.15	2.75	2019	> 20

Project Description

Components and Construction Methods

The Kirkland Pump Station Upgrade Project adds 2.75 mgd of capacity to the Kirkland Pump Station. The upgrade consists of replacement pumps and mechanical, electrical, and instrumentation improvements. Construction is assumed to be inside the existing pump station, with no modifications to the existing structure or wet well.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address the pump station needs in the Kirkland Pump Station. A peak flow reduction-to-volume recurrence relationship at the pump station determined the required storage volume to be 0.35 MG. However, the estimated storage construction cost of $3.59M ($2016) would exceed the cost of the upgrade alternative. Storage was not considered further for a conceptual project.
- **Replacement.** Replacement was evaluated by the age and condition of the Kirkland Pump Station and the projected flow in excess of capacity. The pump station was rebuilt in 2014. The projected flow is 2.75 mgd more than the existing capacity of 9.40 mgd. Because the station will be less than 50 years old in 2016 and the capacity increase is less than 50 percent of existing capacity, replacement was not considered further for a conceptual project.
- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted upstream to address the pump station need in the Kirkland Pump Station. However, no

feasible diversion routes to the Juanita Interceptor or the Eastside Interceptor Section 14 could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

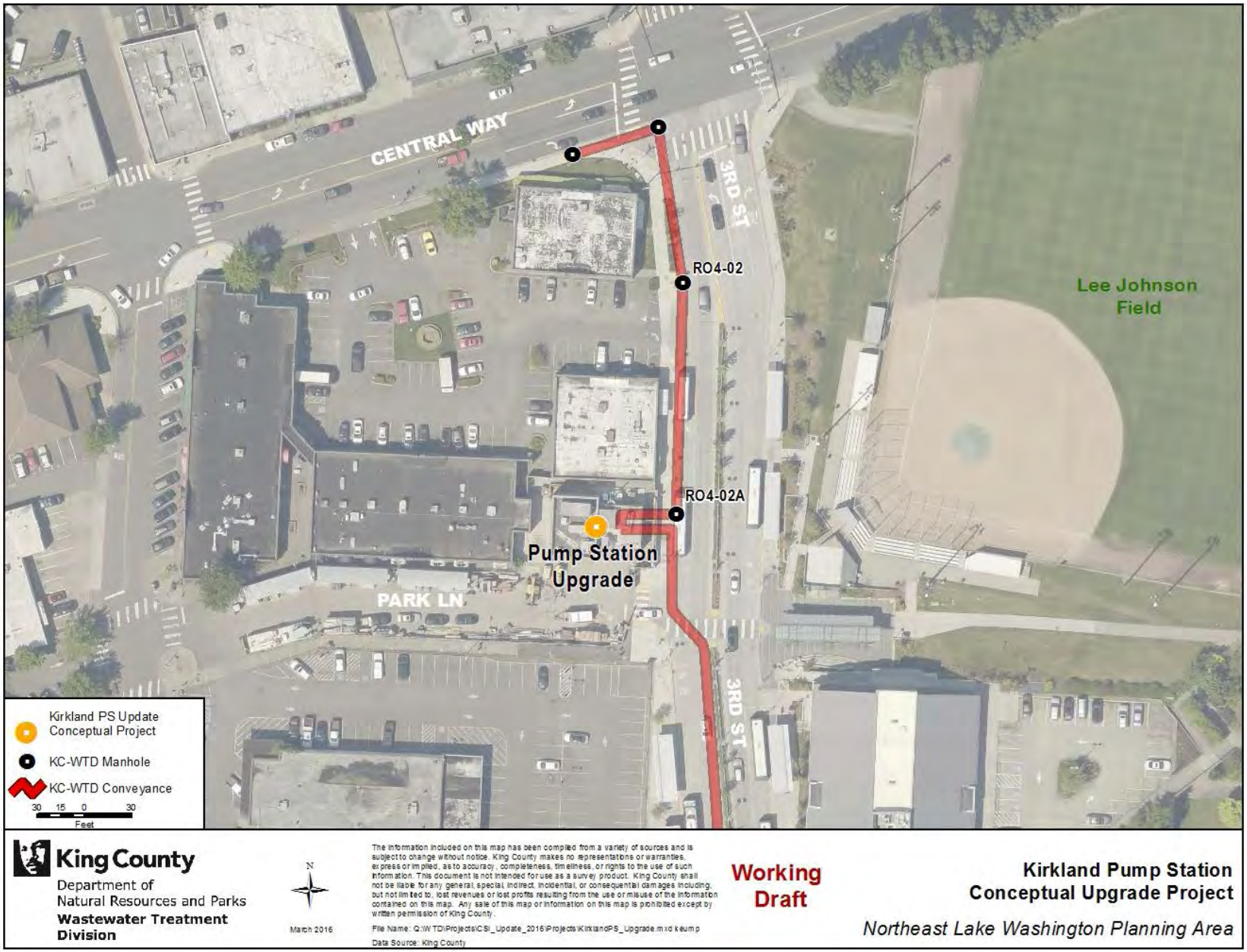
Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Kirkland Pump Station Upgrade	KIRKLAND	Pump station upgrade	N/A	N/A	N/A	2.75 mgd	$6.61

Total Project Cost

The construction cost estimate is $6.61M ($2016) for the Kirkland Pump Station Upgrade Project. The project cost estimate is $20.1M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


CENTRAL WAY
3RD ST
RO4-02
Lee Johnson Field
RO4-02A
Pump Station Upgrade
PARK LN
3RD ST
Kirkland PS Update Conceptual Project
KC-WTD Manhole
KC-WTD Conveyance
30 15 0 30
Feet
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
March 2016
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\KirklandPS_Upgrade.mxd keump
Data Source: King County
Working Draft
Kirkland Pump Station
Conceptual Upgrade Project
Northeast Lake Washington Planning Area

Conceptual Project: Medina Pump Station Upgrade

Capacity Needs Addressed

Medina Pump Station

Location

Sewer Agency: Bellevue Utility Services
Jurisdiction: City of Medina
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
Medina Pump Station	MEDINA	N/A	180	0	1987	10.50	12.48	1.98	2030	> 20

Project Description

Components and Construction Methods

The Medina Pump Station Upgrade Project adds 1.98 mgd of capacity to the Medina Pump Station. The upgrade consists of replacement pumps and mechanical, electrical, and instrumentation improvements. Construction is assumed to be inside the existing pump station, with no modifications to the existing structure or wet well.

Upstream and Downstream Considerations

Upstream Projects: Medina Trunk Replacement

Downstream Projects: Medina Siphon Replacement; Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was considered but not proposed for the upstream Medina Trunk conceptual project. Accordingly, storage for the Medina Pump Station was not considered further for a conceptual project.
- **Replacement.** Replacement was evaluated by the age and condition of the pump station and the projected flow in excess of capacity. The Medina Pump Station was built in 1987. The projected flow is 1.98 mgd more than the existing capacity of 10.5 mgd. Because the station will be less than 50 years old in 2016 and the capacity increase is less than 50 percent of the existing capacity, replacement was not considered further for a conceptual project.
- **Diversion.** Diversion was considered but not proposed for the upstream Medina Trunk conceptual project. Accordingly, diversion for the Medina Pump Station was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Medina Pump Station	MEDINA	Pump station upgrade	N/A	N/A	N/A	1.98 mgd	$6.61

Total Project Cost

The construction cost estimate is $6.61M ($2016) for the Medina Pump Station Upgrade Project. The project cost estimate is $20.1M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
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NE 8TH ST
T-01
T-02
T-02B
82ND AVE NE
Medina
Pump Station
BELLEVUE UTILITY SERVICES
81ST AVE NE
KC-WTD Manhole
KC-WTD Conveyance
Medina Pump Station
40 20 0 40
Feet
April 2016
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
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Data Source:
Medina Pump Station
Conceptual Upgrade Project
Working Draft
NE Lake Washington
Planning Basin

Conceptual Project: Eastside Interceptor Section 8 Storage

Capacity Needs Addressed

Eastside Interceptor Section 4
Eastside Interceptor Sections 5, 6, and 7
Eastside Interceptor Section 8

Location

Sewer Agency: Bellevue Utility Service
Jurisdiction: City of Bellevue
Planning Area: Northeast Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*ESI8.RO2-30(2)	RO2-29A	RO2-29	5,658	90	1965	163.33	177.57	14.24	2047	> 20
RE* ESI5-7.RO2-29(1)	RO2-29	RO2-28	130	42	0	56.81	66.81	10.00	2051	> 20
RE*ESI5-7.RO2-28(1)	RO2-28	RO2-27	11,862	78	1965	178.22	197.49	19.27	2045	> 20
RE*ESI4.RO2-21(3)	RO2-21	RO2-18	1,916	96	1966	194.13	207.85	13.72	2050	> 20
RE*ESI3.RO2-18(1)	RO2-18	RO2-17	3,741	96	1965	179.36	208.53	29.17	2039	> 20
RE*ESI2.RO2-17(18)	RO2-17	RO1-32	9,033	96	1963	186.60	213.62	27.01	2041	> 20

Project Description

Components and Construction Methods

The Eastside Interceptor Section 8 Storage Project stores up to 30 mgd of 2060 20-year peak flow in a 6.5-MG 14-foot offline storage tunnel. The storage tunnel will be constructed by tunnel boring machine. An upstream regulating structure fills the storage during large flow events. A 6.5-mgd effluent pump empties the storage after large flow events. The conceptual alignment extends 5,645 feet from manholes RO2-29A to RO2-29 parallel to the existing WTD conveyance route. However, alternative alignments such as below 120th SE, 122nd SE, or Eastside Rail corridor, will be considered during planning to mitigate easements costs and to maintain horizontal separation from the Sunset Tunnel.

Upstream and Downstream Considerations

Upstream Projects: North Mercer Pump Station Upgrade; Sweyolocken Pump Station Upgrade; Kirkland Pump Station Upgrade; Yarrow Bay Pump Station Replacement; Issaquah Interceptor Section 2 Replacement; Issaquah Creek Highlands Storage; Eastgate Trunk Replacement; Lake Hills Interceptor Replacement; Factoria Trunk Diversion; Medina Trunk Replacement; Medina Pump Station Upgrade; Medina Siphon Replacement

Downstream Projects: Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Paralleling/Replacement.** The proposed storage addresses the pipe reach capacity need in the Eastside Interceptor Section 8 as well as pipe reach needs in downstream Eastside Interceptor Sections 5−7, 4, 3, and 2. It would also reduce the peak flows necessary to be conveyed through the Eastside Interceptor Section1 Replacement Project. In comparison, the cost of paralleling or replacing these pipe reaches would be prohibitive. For this reason, paralleling or replacement was not considered further for a conceptual project.
- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole RO2-30 to address downstream pipe reach needs in the Eastside Interceptor Sections 8, 5−7, 4, 3, 2, and 1. However, no feasible diversion route to the South Treatment Plant could be identified. Diversion was not considered further for a conceptual project

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*ESI8.RO2-29(1)	RO2-29A to RO2-29	Storage	Tunnel boring machine	168	5,645	6.5 MG	$35.7
	RO2-29A to RO2-29	Flow diversion regulator	N/A	N/A	N/A	N/A	$0.55

Total Project Cost

The construction cost estimate $36.2M ($2016) for the Eastside Interceptor Section 8 Storage Project. The project cost estimate is $103M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


Mercer Slough Nature Park
SE 30TH ST
Sweyolocken Pump Station
RO2-29A
SE 32ND ST
128TH AVE SE
90
Eastside Rail Corridor
120TH AVE SE
122ND AVE SE
SE 35TH ST
405
SE 38TH ST
SE 39TH ST
SE 40TH ST
SE 40TH LN
BELLEVUE UTILITY SERVICES
118TH AVE SE
SE 42ND ST
ORCAS KY
NEWPORT KY
SNAGLE KY
GLACIER KY
COLUMBIA KY
CASCADE KY
SE 41ST PL
FACTORIA BLVD SE
124TH AVE SE
SE 43RD ST
129TH PL SE
RO2-29
COAL CREEK PKWY SE
119TH AVE SE
Coal Creek Natural Area
KC-WTD Manhole
KC-WTD Pump Station
KC-WTD Conveyance
Rail Line
Conceptual Project
Construction Type
Tunnel
Park
Creeks and Streams
310 155 0 310
Feet
April 2016
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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Data Source: King County
Eastside Interceptor Section 8
Conceptual Storage Project
Working Draft
South Lake Washington Planning Basin

North Lake Sammamish Planning Area

No conceptual projects were developed for the North Lake Sammamish Planning area.

Southeast Lake Washington Planning Area

No conceptual projects were developed for the Southeast Lake Washington Planning area.

South Lake Sammamish Planning Area

Four conceptual projects were developed to address capacity needs in the South Lake Sammamish Planning area:

- Sammamish Plateau Diversion
- Eastgate Trunk Replacement
- Issaquah Interceptor Section 2 Replacement
- Issaquah Creek Highlands Storage

Conceptual Project: Sammamish Plateau Diversion

Capacity Needs Addressed

Issaquah Interceptor Section 1

Location

Sewer Agency: Sammamish Plateau Water and Sewer District; NE Sammamish Plateau Water and Sewer District
Jurisdiction: City of Sammamish
Planning Area: South Lake Sammamish

Existing Facilities and Capacity Needs

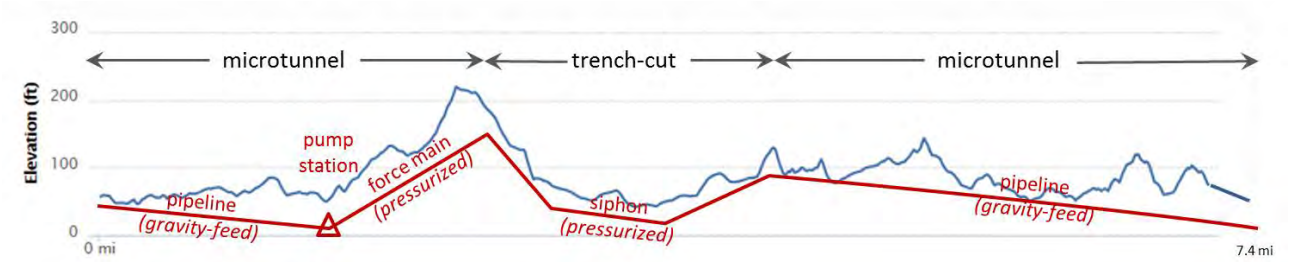
Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*SELKSAMM.R28-10(4)	R28-10	R28-03	8,217	20	2005	8.40	22.35	13.95	2030	> 20
RE*SELKSAMM.R28-03(2)	R28-03	R28-02	993	20	1995	16.80	31.61	14.81	2029	> 20
RE*SELKSAMM.R28-02(2)	R28-02	R17-36B	4,384	20	2005	8.40	23.21	14.81	2029	> 20
RE*ISSAQ1.R17-31(29)	R17-31	R17-02	14,004	48	1969	24.56	51.24	26.67	2017	> 20
RE*ISSAQ1.R17-02(2)	R17-02	SUNSET	185	48	1984	43.19	51.24	8.04	2047	> 20
Sunset Pump Station	1984SUNSET	0	150	0	1965	30.00	54.58	24.58	2022	11.0
RE*ISSAQ1.SUNSET(1)FM	SUNSET	HEATHFIEL	3,445	24	1982	20.31	34.27	13.97	2039	> 20
Heathfield Pump Station	HEATHFIEL	0	145	0	1965	30.00	54.58	24.58	2022	11.0
RE*ISSAQ1.HEATHFIEL(1)FM	HEATHFIEL	R11-67	1,685	24	1982	20.31	34.27	13.97	2039	> 20
RE*EGATE.R11-62B(2)	R11-62B	R11-60B	1,826	42	1984	31.74	58.21	26.47	2022	> 20
RE*EGATE.R11-60(4)	R11-60	R11-56	1,565	24	1964	22.10	45.40	23.30	2027	> 20
RE*EGATE.R11-56B(2)	R11-56B	R11-54B	1,238	42	1984	27.79	55.92	28.14	2020	> 20
RE*EGATE.R11-54B(8)	R11-54B	R11-46B	2,402	36	1984	33.80	55.92	22.13	2029	> 20
RE*EGATE.R11-46B(3)	R11-46B	R11-43B	1,405	42	1984	28.14	55.92	27.78	2020	> 20
RE*EGATE.R11-43B(1)	R11-43B	R11-42B	474	48	1984	30.75	55.92	25.17	2025	> 20
RE*EGATE.R11-42B(1)	R11-42B	RO3-49	20	48	1985	58.73	70.24	11.52	2045	> 20
RE*LKHILLS.RO3-25(5)	RO3-25	RO3-20	1,985	36	1965	70.25	82.62	12.37	2045	> 20
RE*LKHILLS.RO3-20(11)	RO3-20	RO3-09	4,999	48	1965	73.19	83.70	14.11	2044	> 20
RE*ESI10.RO2-39A(2)	RO2-39A	RO2-39	2,637	72	1962	146.45	179.83	33.38	2037	> 20

Project Description

Components and Construction Methods

The Sammamish Plateau Diversion Project diverts up to 26.5 mgd of 20-year peak flow in 2060 from the Southeast Lake Sammamish Interceptor to the Northeast Lake Sammamish Interceptor. The primary purpose of the this project is to limit the 20-year peak flow in 2060 to the existing 24.6 mgd capacity of the Issaquah Interceptor Section 1 Lakeline in Lake Sammamish. However, several downstream pipe reach capacity needs between the Sunset Pump Station and the South Treatment Plant are addressed by this project. The Sammamish Plateau Diversion Project consists of diversion pipelines, a pump station, a force main, and a siphon (see profile below). The diversion pipelines will operate by gravity-feed; the

force main and siphon will operate under pressure. Microtunneling is assumed for the gravity-feed pipelines and force main and trench-cut for the siphon. The siphon will include several trench-cut culvert crossings. The conceptual alignment extends 7.2 miles north below East Lake Sammamish Parkway SE to from manholes R28-09 to R19-64A.



It should be noted that relocating the conceptual alignment to the East Lake Sammamish Trail would significantly reduce construction costs, limit traffic disruption, and potentially eliminate the proposed pump station. However, railroad regulations and potential impacts to environmentally sensitive areas are expected to prevent use of the trail as a pipe alignment. More detailed examination during project predesign is recommended to confirm that the East Lake Sammamish Trail is not a viable alignment.

It is expected that the project will be completed in two phases. Phase 1 will install approximately 3.5 miles of pipe to reduce WTD capacity needs in facilities at the south end of Lake Sammamish and Sammamish Plateau Water and Sewer District capacity needs. Phase 2 will install approximately 3.5 miles of pipe to further reducing capacity needs in WTD facilities at the south end of Lake Sammamish.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: None

Concepts Evaluated

- **Storage**. Storage was evaluated by the volume required to address the downstream Issaquah Interceptor Section 1 Lakeline pipe reach need. A peak flow reduction-to-volume recurrence relationship developed at upstream manhole R17-31 determined that the required volume is unachievable. Series storage at two alternative locations was also evaluated. However, peak flow reduction-to-volume recurrence relationships developed at upstream manholes R17-37 and R17-36A determined the volume to be unachievable. Storage was not considered further for a conceptual project.
- **Storage/Diversion**. A combined storage and reduced diversion alternative was evaluated by the volume and construction cost to address the downstream Issaquah Interceptor Section 1 Lakeline capacity need. Up to 9.67 mgd of projected 20-year peak flow in 2060 was diverted from northern Sammamish Plateau Water and Sewer District to the Northeast Lake Sammamish Interceptor. The remaining 16.8 mgd of projected flow in excess of the lakeline capacity was addressed by storage. Two peak flow reduction-to-volume recurrence relationships developed at upstream manhole R17-37 and within Sammamish determined the required storage volumes

to be 18 MG and 10.1 MG, respectively. However, the estimated construction cost of $206M exceeds the cost of diversion-only alternative. Storage and diversion were not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Sammamish Plateau Diversion	R28-09 to R19-64A	Diversion pipeline	Microtunnel	48	7,760	33.1 mgd	$24
	R28-09 to R19-64A	New pump station	N/A	N/A	N/A	N/A	$26
	R28-09 to R19-64A	Diversion pipeline	Microtunnel	60	5,600	33.1 mgd	$24
	R28-09 to R19-64A	Diversion siphon	Trench-cut	12/36	9,050	33.1 mgd	$12
	R28-09 to R19-64A	Culvert creek crossing	Trench-cut	36	150	N/A	$0.29
	R28-09 to R19-64A	Culvert creek crossing	Trench-cut	36	150	N/A	$0.29
	R28-09 to R19-64A	Culvert creek crossing	Trench-cut	36	150	N/A	$0.29
	R28-09 to R19-64A	Culvert creek crossing	Trench-cut	36	150	N/A	$0.29
	R28-09 to R19-64A	Culvert creek crossing	Trench-cut	36	150	N/A	$0.29
	R28-09 to R19-64A	Diversion pipeline	Microtunnel	48	16,400	33.1 mgd	$50

Total Project Cost

The construction cost estimate is $137M ($2016) for the Sammamish Plateau Diversion Project. The project cost estimate is $390M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
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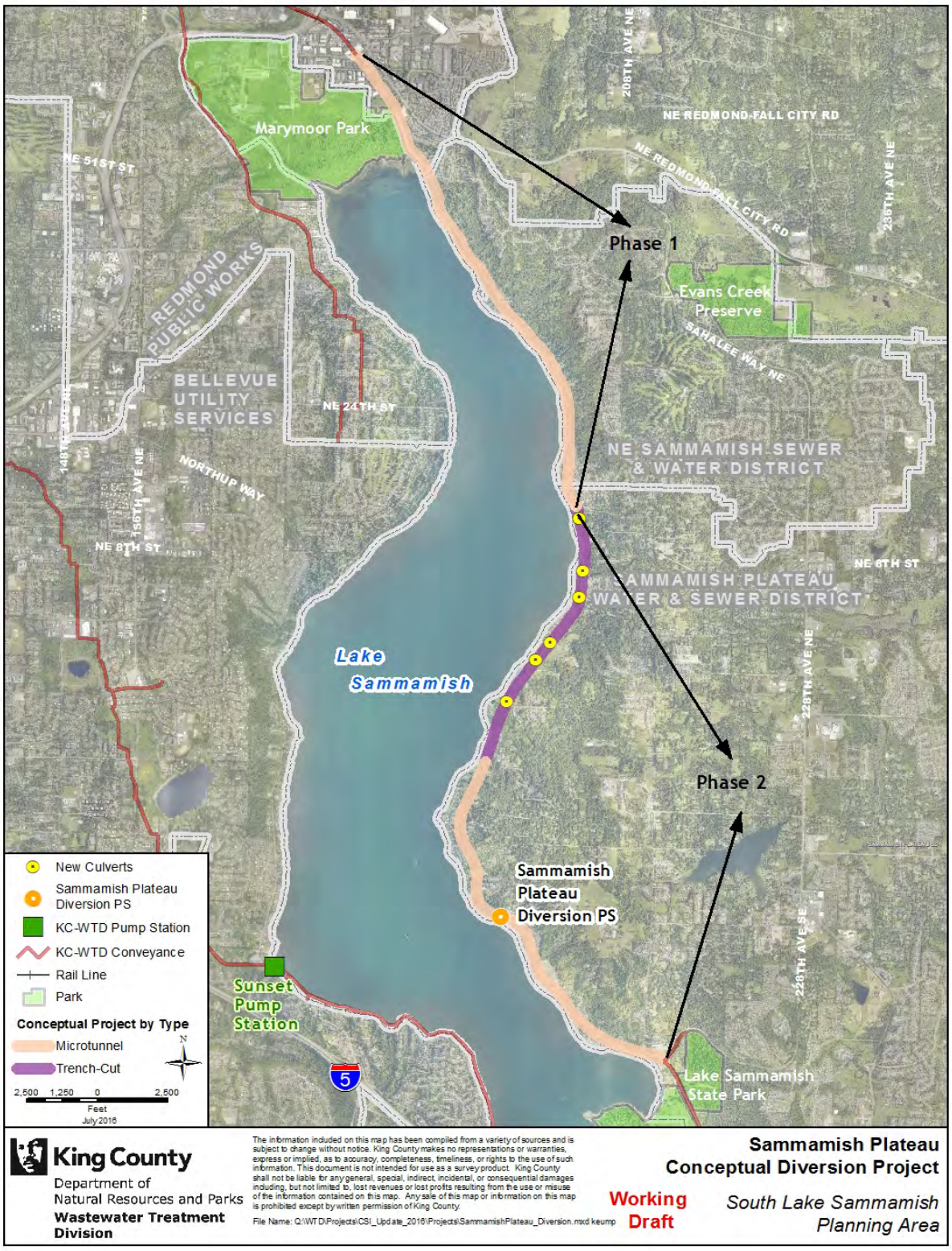
Marymoor Park
NE 51ST ST
REDMOND PUBLIC WORKS
BELLEVUE UTILITY SERVICES
NE 24TH ST
148TH AVE NE
156TH AVE NE
NORTHUP WAY
NE 8TH ST
208TH AVE NE
NE REDMOND-FALL CITY RD
236TH AVE NE
Phase 1
Evans Creek Preserve
SAHALEE WAY NE
NE SAMMAMISH SEWER & WATER DISTRICT
NE 6TH ST
SAMMAMISH PLATEAU WATER & SEWER DISTRICT
Lake Sammamish
228TH AVE NE
Phase 2
Sammamish Plateau Diversion PS
226TH AVE SE
Sunset Pump Station
5
Lake Sammamish State Park
New Culverts
Sammamish Plateau Diversion PS
KC-WTD Pump Station
KC-WTD Conveyance
Rail Line
Park
Conceptual Project by Type
Microtunnel
Trench-Cut
N
2,500 1,250 0 2,500
Feet
July 2016
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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Working Draft
Sammamish Plateau
Conceptual Diversion Project
South Lake Sammamish
Planning Area

Conceptual Project: Eastgate Trunk Replacement

Capacity Needs Addressed

Eastgate Trunk

Location

Sewer Agency: Bellevue Utility Services
Jurisdiction: City of Bellevue
Planning Area: South Lake Sammamish

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*EGATE.R11-71(4)	R11-71	R11-67	1,652	24	1964	6.37	8.07	1.70	2025	> 20
RE*EGATE.R11-66B(4)	R11-66B	R11-62B	950	36	1984	28.29	30.51	2.22	2051	> 20

Project Description

Components and Construction Methods

The Eastgate Trunk Replacement Project replaces 2,840 feet of the Eastgate Trunk with 30- to 42-inch-diameter pipeline. Construction is assumed to be trench-cut. The conceptual alignment generally follows existing WTD conveyance routes intermittently from manholes R11-71 to R11-62B. Staged construction is recommended because additional capacity in pipe reaches RE*EGATE.R11-71(4) and RE*EGATE.R11-66B(4) is not required until 2025 and 2051, respectively.

The proposed conceptual project assumes that the North Lake Sammamish Flow Diversion Project, Sammamish Plateau Diversion Conceptual Project, Issaquah Creek Storage Conceptual Project, and Sunset/Heathfield Pump Station Replacement and Force Main Upgrade Project have been fully implemented.

Upstream and Downstream Considerations

Upstream Projects: Issaquah Interceptor Section 2 Replacement; Issaquah Creek Highlands Storage

Downstream Projects: Lake Hills Interceptor Replacement; Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address downstream pipe reach needs in the Eastgate Trunk. A peak flow reduction-to-volume recurrence relationship developed at upstream manhole R11-71 determined the required volume to be 0.82 MG. However, the estimated construction cost of $5.32M ($2016) would exceed the cost for replacement. Storage was not considered further for a conceptual project.
- **Parallelling.** Paralleling or replacement was evaluated by the age and condition of the pipe reach needs. The Eastgate Trunk was constructed in 1964 and 1984. In 2005, WTD Facility

Inspections assessed the condition as a 5 (severe signs of corrosion, sedimentation, root intrusion, or infiltration). Because the trunk will be more than 50 years old in 2016 and is in poor condition, paralleling was not considered further for a conceptual project.

- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole R11-71 to address downstream pipe reach capacity needs in the Eastgate Trunk. However, no feasible diversion route to the Eastside Interceptor Section 9 could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*EGATE.R11-71(4)	R11-71 to R11-67	Pipeline replacement	Trench-cut	30	1,600	10.1 mgd	$1.2
RE*EGATE.R11-66B(4)	R11-66B to R11-62B	Pipeline replacement	Trench-cut	42	950	38.1 mgd	$1.0

Total Project Cost

The construction cost estimate is $2.29M ($2016) for the Eastgate Trunk Replacement Project. The project cost estimate is $7.06M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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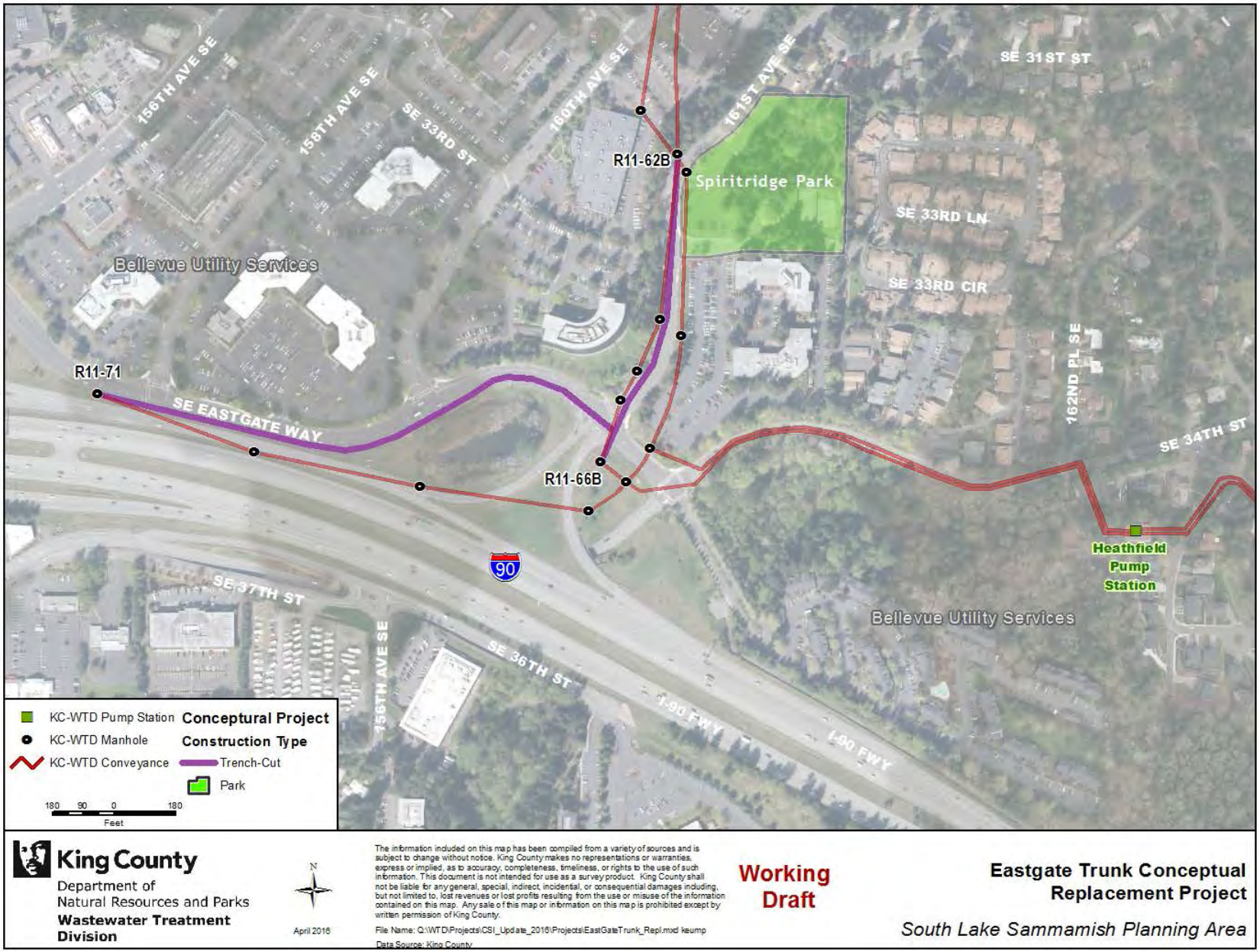
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


156TH AVE SE
158TH AVE SE
SE 33RD ST
160TH AVE SE
161ST AVE SE
SE 31ST ST
R11-62B
Spiritridge Park
SE 33RD LN
SE 33RD CIR
162ND PL SE
Bellevue Utility Services
R11-71
SE EASTGATE WAY
R11-66B
SE 34TH ST
Heathfield Pump Station
90
SE 37TH ST
156TH AVE SE
SE 36TH ST
I-90 FWY
Bellevue Utility Services
KC-WTD Pump Station
KC-WTD Manhole
KC-WTD Conveyance
Conceptural Project
Construction Type
Trench-Cut
Park
180 90 0 180
Feet
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
N
April 2016
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\EastGateTrunk_Repl.mxd keump
Data Source: King County
Working Draft
Eastgate Trunk Conceptual Replacement Project
South Lake Sammamish Planning Area

Conceptual Project: Issaquah Interceptor Section 2 Replacement

Capacity Needs Addressed

Issaquah Interceptor Section 2

Location

Sewer Agency: City of Issaquah Public Works
Jurisdiction: City of Issaquah
Planning Area: South Lake Sammamish

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*ISSAQ2.R17-40(3)	R17-40	R17-37	1,265	21	1968	7.30	7.85	0.55	2053	> 20

Project Description

Components and Construction Methods

The Issaquah Interceptor Section 2 Project is a pipe replacement project that provides for conveyance of the projected 2060 20-year peak flow. The project includes trench-cut construction to replace 1,265 feet of existing 21-inch-diameter pipe with 24-inch-diameter pipe.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Eastgate Trunk Replacement; Lake Hills Interceptor Replacement; Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Paralleling.** This system was constructed in 1968 and additional capacity will be needed by 2053 at which time the system will be 85 years old. Inspection information from 2008 indicates a conditions rating of 3, showing moderate signs of corrosion, sedimentation, root intrusion, or infiltration. The age and condition of the existing system precludes paralleling from further evaluation.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*ISSAQ2.R17-40(3)	R17-40 to R17-37	Pipe replacement	Trench-cut	24	1,265	9.8 mgd	$1.1

Total Project Cost

The construction cost estimate is $1.11M ($2016) for the Issaquah Interceptor Section 2 Replacement Project. The project cost estimate is $3.42M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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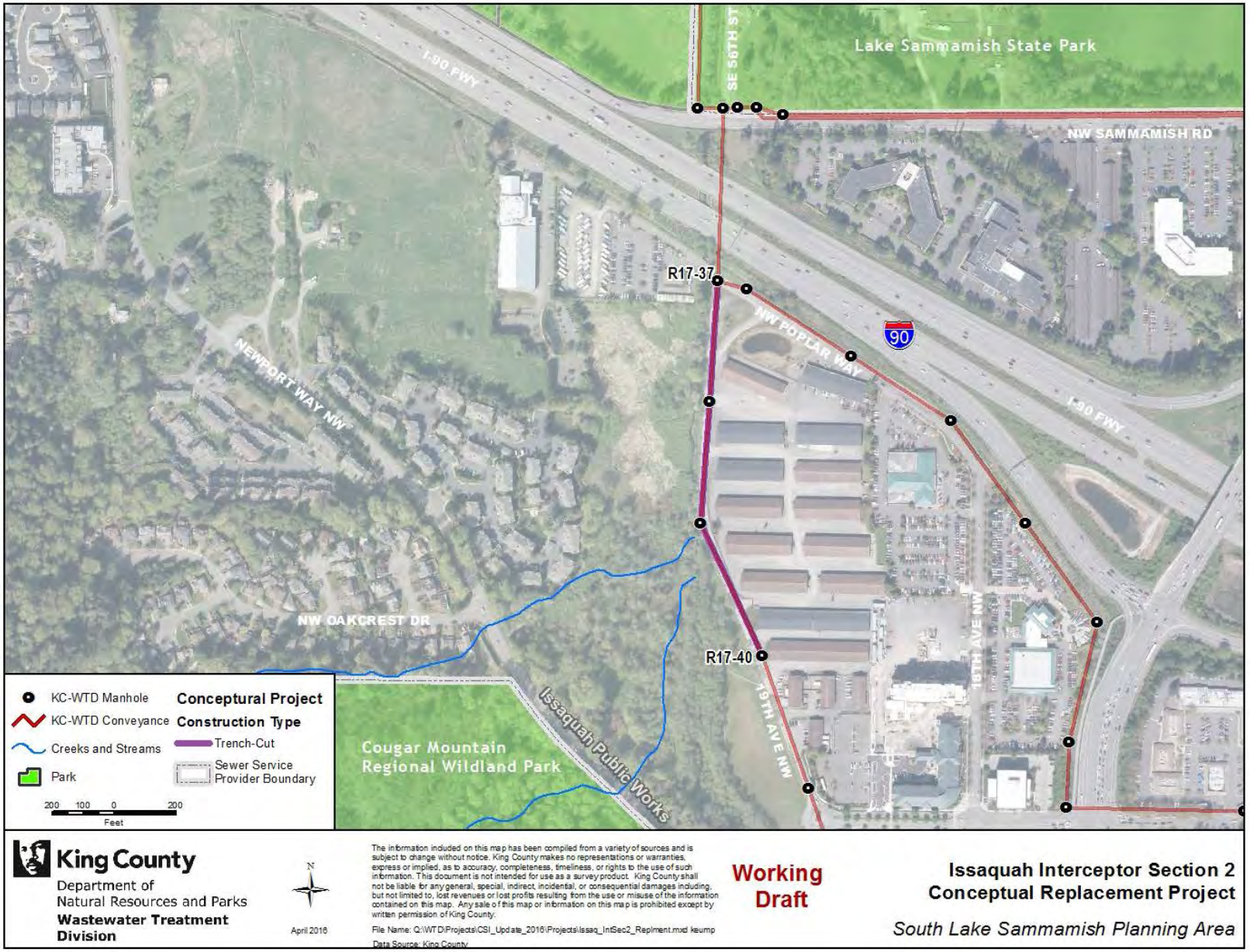
Lake Sammamish State Park
SE 56TH ST
I-90 FWY
NW SAMMAMISH RD
R17-37
NW POPLAR WAY
90
I-90 FWY
NEWPORT WAY NW
NW OAKCREST DR
R17-40
19TH AVE NW
Issaquah Public Works
Cougar Mountain
Regional Wildland Park
KC-WTD Manhole
KC-WTD Conveyance
Creeks and Streams
Park
Conceptual Project
Construction Type
Trench-Cut
Sewer Service
Provider Boundary
200 100 0 200
Feet
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
N
April 2016
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Data Source: King County
Working
Draft
Issaquah Interceptor Section 2
Conceptual Replacement Project
South Lake Sammamish Planning Area

Conceptual Project: Issaquah Creek Highlands Storage

Capacity Needs Addressed

Issaquah Creek Interceptor

Location

Sewer Agency: City of Issaquah Public Works
Jurisdiction: City of Issaquah
Planning Area: South Lake Sammamish

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*ISSCK.R17-54A(17)	R17-54A	R17-37	7,457	21	1981	5.75	6.97	1.22	2038	> 20

Project Description

Components and Construction Methods

The Issaquah Creek Highlands Storage Project is a 0.2-MG storage facility that will maintain downstream capacity in the Issaquah Creek Interceptor where the available capacity is projected to be exceeded. Located near the intersection of NW Holly Street and Front Street North in Issaquah, the project consists of 792 feet of 6.5-foot-diameter offline storage pipe, including an effluent pump station, odor controls, and backup power. The pipe will be installed using trench-cut construction and a jack-and-bore street crossing. Structures associated with operation and maintenance of this facility will be required at the upstream and downstream ends, and possibly above grade. The location of the project was proposed based on feedback from City of Issaquah Public Works. Additional sites may be considered during predesign.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Eastgate Trunk Replacement; Lake Hills Interceptor Replacement; Eastside Interceptor Section 8 Storage; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Replacement.** Replacement was evaluated using projected 2060 peak flow data. The comparative costs estimated for replacement ($6.9M) and the downstream benefits of building storage precluded this alternative from further evaluation.
- **Paralleling.** Paralleling the existing pipe was evaluated using projected 2060 peak flow data. The comparative costs estimated paralleling ($6.1M) and the downstream benefits of building storage precluded this alternative from further evaluation.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*ISSAQ2.R17-70(5)	R17-66A to R17-66	Off-line storage	Trench-cut	78	604	0.15 MG	$1.5
		Street crossing	Jack and bore	78	50	N/A	$0.56
		Effluent pump station	N/A	N/A	N/A	N/A	$0.26
		Odor control	N/A	N/A	N/A	N/A	$0.12
		Land acquisition	N/A	N/A	N/A	N/A	$0.35

Total Project Cost

The construction cost estimate is $2.79M ($2016) for the Issaquah Creek Highlands Storage Project. The project cost estimate is $8.60M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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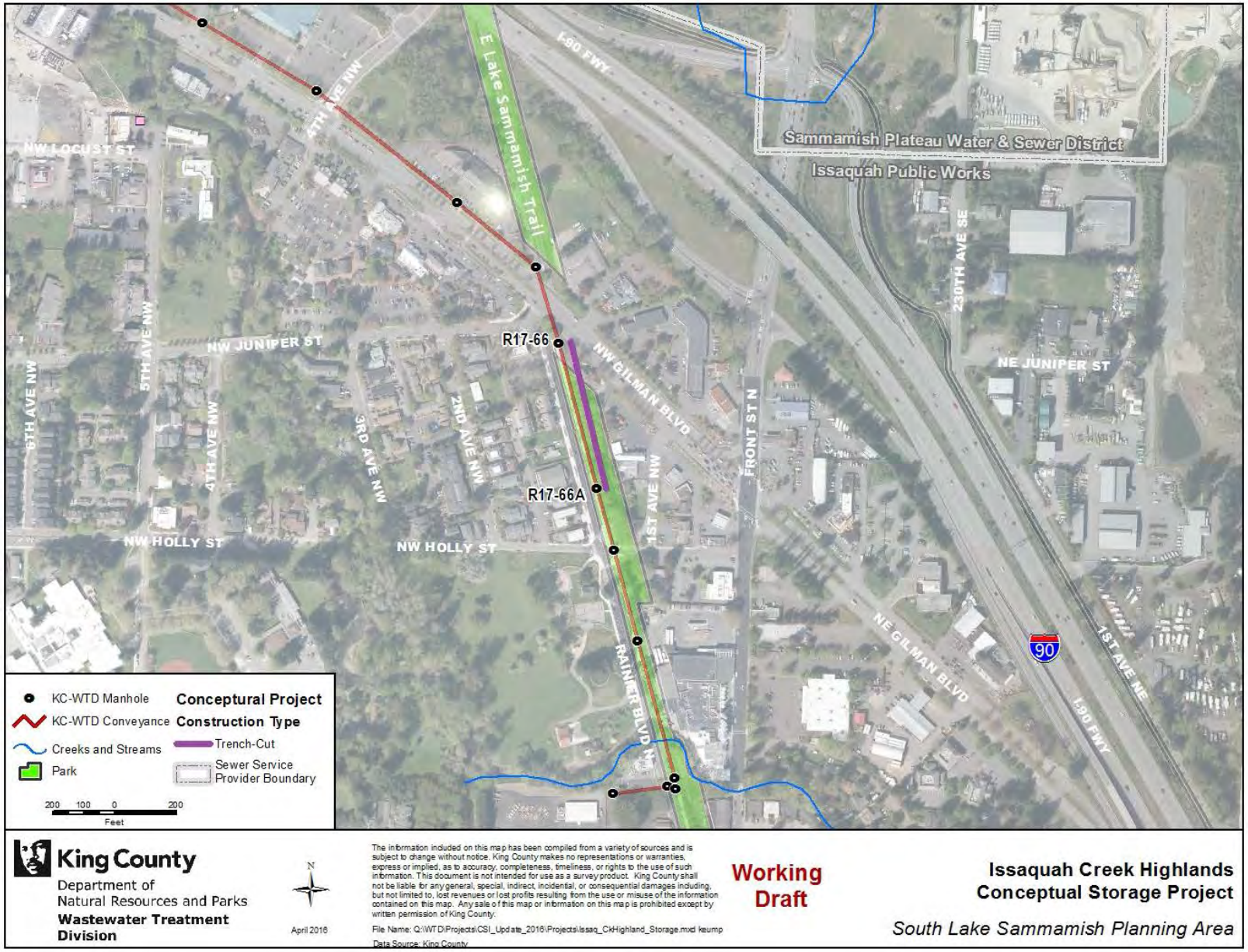
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I-90 FWY
Sammamish Plateau Water & Sewer District
Issaquah Public Works
230TH AVE SE
NW LOCUST ST
4TH AVE NW
5TH AVE NW
6TH AVE NW
NW JUNIPER ST
3RD AVE NW
2ND AVE NW
4TH AVE NW
R17-66
NW GILMAN BLVD
FRONT ST N
NE JUNIPER ST
R17-66A
1ST AVE NW
NW HOLLY ST
NW HOLLY ST
RAINIER BLVD N
NE GILMAN BLVD
90
1ST AVE NE
I-90 FWY
KC-WTD Manhole
KC-WTD Conveyance
Creeks and Streams
Park
Conceptual Project Construction Type
Trench-Cut
Sewer Service Provider Boundary
200 100 0 200
Feet
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
April 2016
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Data Source: King County
Working Draft
Issaquah Creek Highlands
Conceptual Storage Project
South Lake Sammamish Planning Area

South Lake Washington Planning Area

Four conceptual projects were developed to address capacity needs in the South Lake Sammamish Planning area:

- Eastside Interceptor Section 1 Replacement
- Bryn Mawr Trunk Storage
- Cedar River Interceptor Section 2 Replacement
- Cedar River Interceptor Section 1 Replacement

Conceptual Project: Eastside Interceptor Section 1 Replacement

Capacity Needs Addressed

Eastgate Interceptor Section 1

Location

Sewer Agency: Renton Public Works
Jurisdiction: City of Renton
Planning Area: South Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*ESI1.RO1-25A(10)	RO1-25A	RO1-15A	3,517	108	1963	190.00	217.27	27.27	2010	> 20
RE*ESI1.RO1-12A(14)	RO1-12A	RO1-01	7,027	108	1963	210.47	225.91	15.44	2017	> 20

Project Description

Components and Construction Methods

The Eastside Interceptor Section 1 Replacement Project replaces 12,533 feet of the Eastside Interceptor Section 1 with 120-inch to 144-inch-diameter pipeline. Construction is assumed to be trench-cut and includes a three-barrel microtunneled crossing below the Cedar River. The conceptual alignment follows the existing WTD conveyance route from manholes RO1-25A to RO1-01.

Upstream and Downstream Considerations

Upstream Projects: North Mercer Pump Station Upgrade; Sweyolocken Pump Station Upgrade; Kirkland Pump Station Upgrade; Yarrow Bay Pump Station Replacement; Issaquah Interceptor Section 2 Replacement; Issaquah Creek Highlands Storage; Eastgate Trunk Replacement; Lake Hills Interceptor Replacement; Factoria Trunk Diversion; Medina Trunk Replacement; Medina Pump Station Upgrade; Medina Siphon Replacement; Eastside Interceptor Section 8 Storage

Downstream Projects: None

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address downstream pipe reach needs in the Eastside Interceptor Section 1. However, this volume would be unachievable because of the significant upstream peak flow reduction from the proposed Eastside Interceptor Section 8 Storage Project. Storage was not considered further for a conceptual project.
- **Paralleling.** Paralleling was evaluated by the age and condition of the pipe reach needs. The Eastside Interceptor Section 1 was constructed in 1963. In a 2014 assessment, WTD Facility

Inspections found moderate signs of corrosion, sedimentation, root intrusion, or infiltration. Because the interceptor will be more than 50 years old in 2016 and is in moderate condition, replacement would be preferred to paralleling. Paralleling was not considered further for a conceptual project.

- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole RO1-32 to address downstream pipe reach needs in the Eastside Interceptor Section 1. However, no feasible diversion route to the South Treatment Plant could be identified. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*ESI1.RO1-25A(10)	RO1-25A to RO1-15A	Pipeline replacement	Trench-cut	144	3,517	309 mgd	$21
	Cedar River crossing	Pipeline replacement	Microtunnel	84	156 x 3	309 mgd	$3.8
RE*ESI1.RO1-12A(14)	RO1-12A to RO1-01	Pipeline replacement	Trench-cut	144	7,027	320 mgd	$43

Total Project Cost

The construction cost estimate is $68.6M ($2016) for the Eastside Interceptor Section 1 Replacement Project. The project cost estimate is $195M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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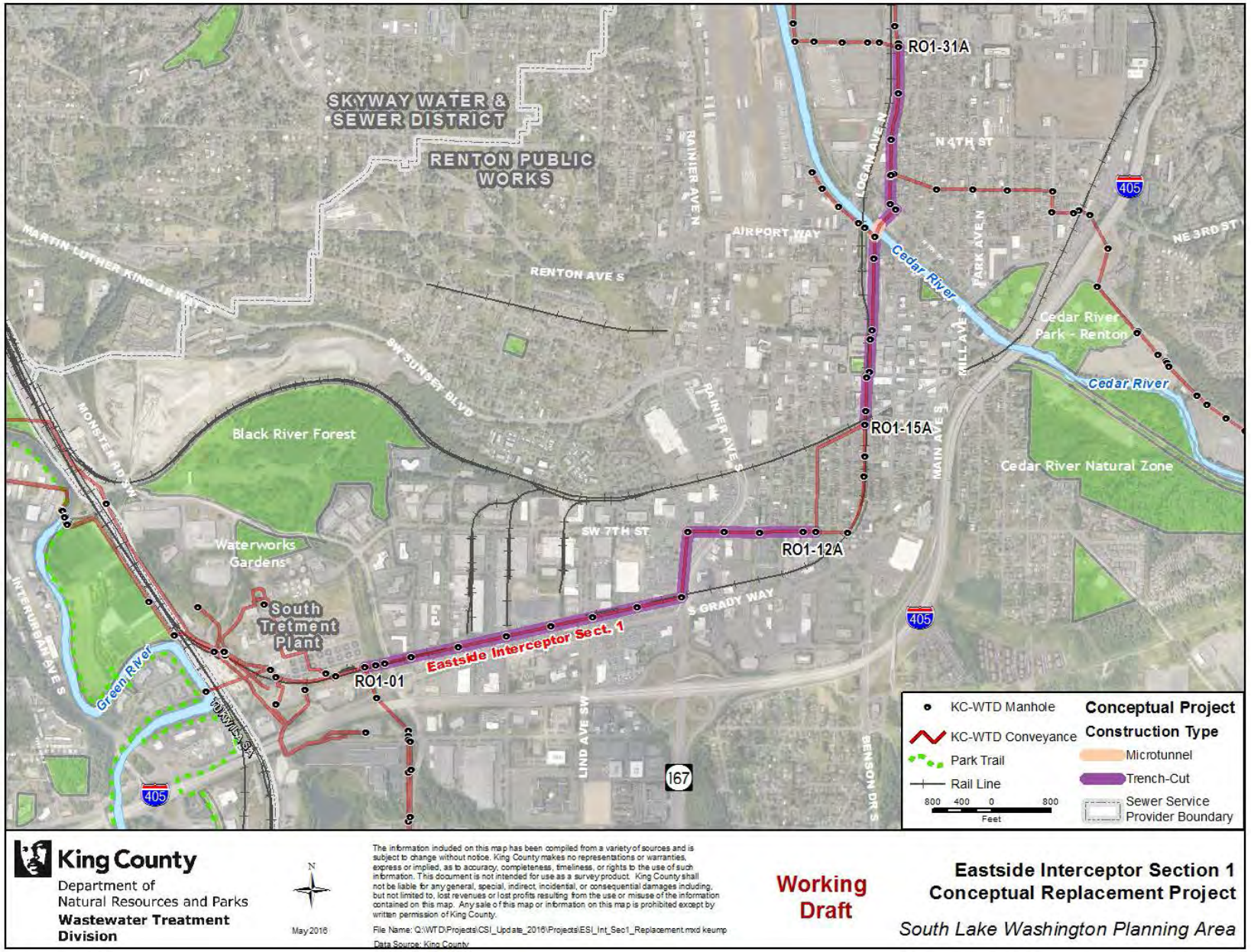
RO1-31A
SKYWAY WATER & SEWER DISTRICT
RENTON PUBLIC WORKS
RAINIER AVE N
LOGAN AVE N
N 4TH ST
405
AIRPORT WAY
PARK AVE N
NE 3RD ST
MARTIN LUTHER KING JR WAY S
RENTON AVE S
Cedar River
Cedar River Park - Renton
MILL AVE S
SW SUNSET BLVD
RAINIER AVE S
RO1-15A
MAIN AVE S
Cedar River Natural Zone
Black River Forest
MONSTER RD SW
SW 7TH ST
RO1-12A
Waterworks Gardens
South Tretment Plant
S GRADY WAY
Eastside Interceptor Sect. 1
RO1-01
Green River
INTERURBAN AVE S
LIND AVE SW
SR 167
SR 900
KC-WTD Manhole
KC-WTD Conveyance
Park Trail
Rail Line
800 400 0 800
Feet
Conceptual Project Construction Type
Microtunnel
Trench-Cut
Sewer Service Provider Boundary
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
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Data Source: King County
Working Draft
Eastside Interceptor Section 1
Conceptual Replacement Project
South Lake Washington Planning Area

Conceptual Project: Bryn Mawr Trunk Storage

Capacity Needs Addressed

Bryn Mawr Trunk

Location

Sewer Agency: Renton Public Works
Jurisdiction: City of Renton
Planning Area: South Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*BRYNMAWR.RO1-43A(2)	RO1-43A	RO1-41C	1,733	24	1998	12.73	14.51	1.79	2041	> 20
RE*BRYNMAWR.RO1-41A(10)	RO1-41A	RO1-31A	3,866	36	1998	13.03	18.02	4.99	2010	18.1

Project Description

Components and Construction Methods

The Bryn Mawr Trunk Storage Project stores up to 4.9 mgd of 2060 20-year peak flow in a 0.97-MG offline underground storage tank. A modification to the Bryn Mawr Siphon Inlet Structure and connecting pipeline fills the storage tank during large flow events. Pumping empties the storage after these events. The conceptual site is located downstream of manhole RO1-43A within the public right-of-way of Renton Municipal Airport. It is recommended that the storage tank be located more than 200 feet from the shoreline to avoid the need for a shoreline conditional use permit. Property acquisition costs were not included in the project cost estimate.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Paralleling/Replacement.** Paralleling or replacement was evaluated by the age and condition of the pipe reach capacity needs. The latest parallel of the Bryn Mawr Trunk was constructed in 1998. In a 2010 assessment, WTD Facility Inspections found minor signs of corrosion, sedimentation, root intrusion, or infiltration. Because the trunk will be less than 50 years old in 2016 and is in good condition, paralleling would be preferred to replacement. However, the estimated construction cost of $9.46M ($2016) for paralleling, including a Cedar River siphon crossing, exceeds the construction cost for storage. Storage also provides the benefit of reducing peak flow to the Eastside Interceptor Section 1. Paralleling or replacement was not considered further for a conceptual project.

- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole RO1-43B to address downstream pipe reach capacity needs in the Bryn Mawr Trunk. However, no feasible diversion route to the Eastside Interceptor Section 2 could be identified. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Bryn Mawr Storage Facility	N/A	Storage	Cast-in-place	N/A	N/A	0.97 MG	$6.3
Overflow pipeline	Ah	New pipeline	Trench-cut	36	500	9.50 mgd	$0.42

Total Project Cost

The construction cost estimate is $6.73M ($2016) for the Bryn Mawr Trunk Storage Project. The project cost estimate is $20.5M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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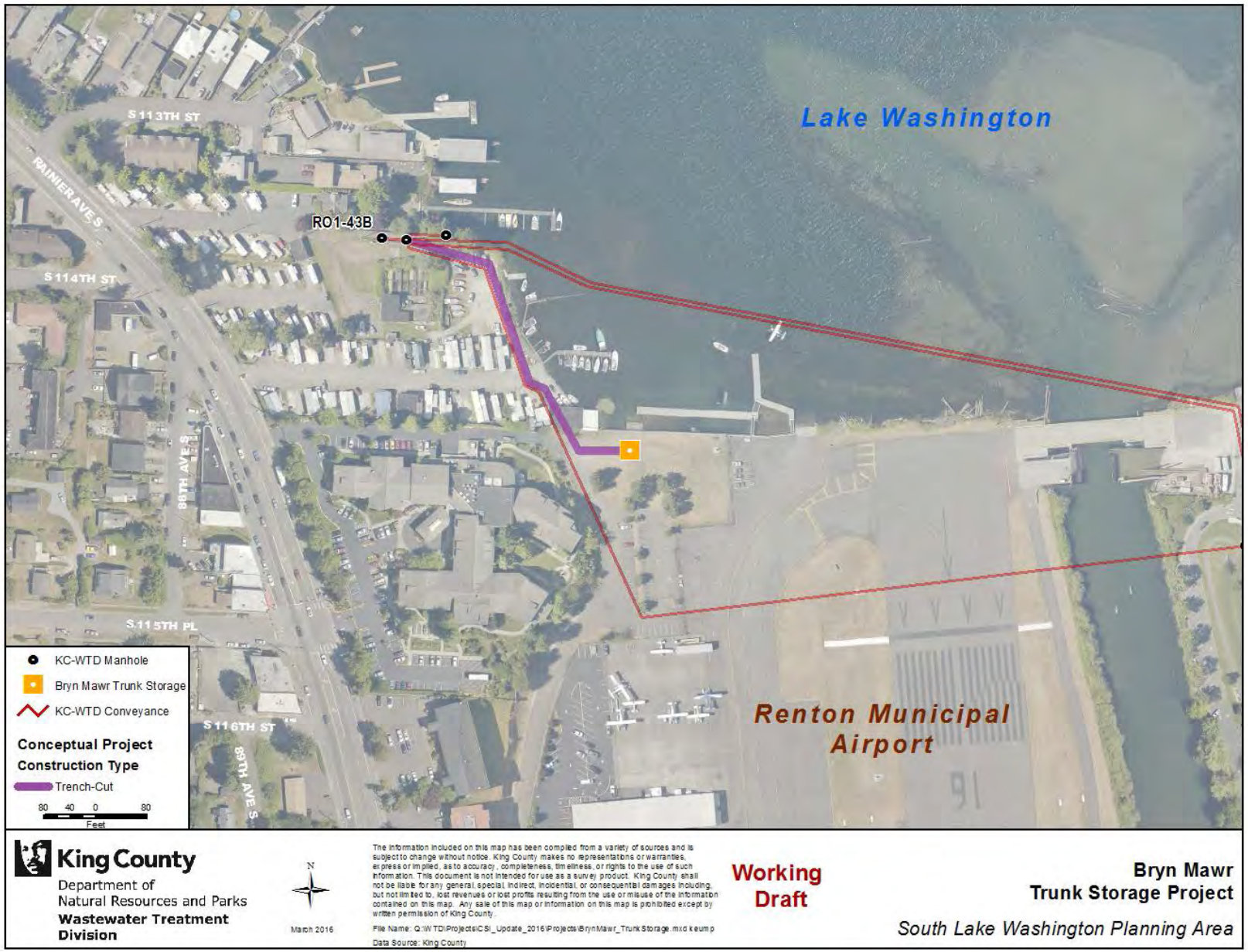
Lake Washington
RO1-43B
S 113TH ST
RAINIER AVE S
S 114TH ST
88TH AVE S
S 115TH PL
S 116TH ST
89TH AVE S
Renton Municipal Airport
KC-WTD Manhole
Bryn Mawr Trunk Storage
KC-WTD Conveyance
Conceptual Project Construction Type
Trench-Cut
80 40 0 80
Feet
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
March 2016
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\BrynMawr_TrunkStorage.mxd keump
Data Source: King County
Working Draft
Bryn Mawr Trunk Storage Project
South Lake Washington Planning Area

Conceptual Project: Cedar River Interceptor Section 2 Replacement

Capacity Needs Addressed

Cedar River Interceptor Section 2

Location

Sewer Agency: Renton Public Works
Jurisdiction: City of Renton
Planning Area: South Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*CEDAR2.R10-32(6)	R10-32	R10-26A	2,901	42	1963	29.07	30.97	1.90	2052	> 20
RE*CEDAR2.R10-26A(1)	R10-26A	R10-26	12	42	1963	29.08	41.46	12.38	2020	> 20

Project Description

Components and Construction Methods

The Cedar River Interceptor Section 2 Replacement Project replaces 2,913 feet of the Cedar River Interceptor Section 2 with 48-inch to 54-inch-diameter pipeline. Construction is assumed to be trench-cut. The conceptual alignment follows the existing WTD conveyance route from manholes R10-32 to R10-26. Staged construction is recommended because additional capacity in pipe reaches RE*CEDAR2.R10-32(6) and RE*CEDAR2.R10-26A(1) is not required until 2052 and 2020, respectively.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Cedar River Interceptor Section 1 Replacement; Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was not evaluated because of the uncertainty of the flow projections when most of the project is needed in 2052. Instead, the replacement alternative is recommended as a placeholder until storage feasibility can be reevaluated closer to this year. Storage was not considered further for a conceptual project.
- **Paralleling.** Paralleling was evaluated by the age and condition of the pipe reach needs. The Cedar River Interceptor Section 2 was constructed in 1963. In a 2009 assessment, WTD Facility Inspections found no serious signs of corrosion, sedimentation, root intrusion, or infiltration. Because the interceptor will be more than 50 years old in 2052 and 2020, replacement was assumed to be preferable to paralleling. Paralleling was not considered further for a conceptual project.

- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole R10-32 to address the downstream pipe reach capacity need in the Cedar River Interceptor Section 2 and Cedar River Interceptor Section 1. However, no feasible diversion routes to the Eastside Interceptor Section 1 could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*CEDAR2.R10-32(6)	R10-32 to R10-26A	Pipeline replacement	Trench-cut	48	2,901	38.7 mgd	$2.5
RE*CEDAR2.R10-26A(1)	R10-26A to R10-26	Pipeline replacement	Trench-cut	54	12	51.8 mgd	$0.031

Total Project Cost

The construction cost estimate is $2.51M ($2016) for the Cedar River Interceptor Section 2 Replacement Project. The project cost estimate is $7.74M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
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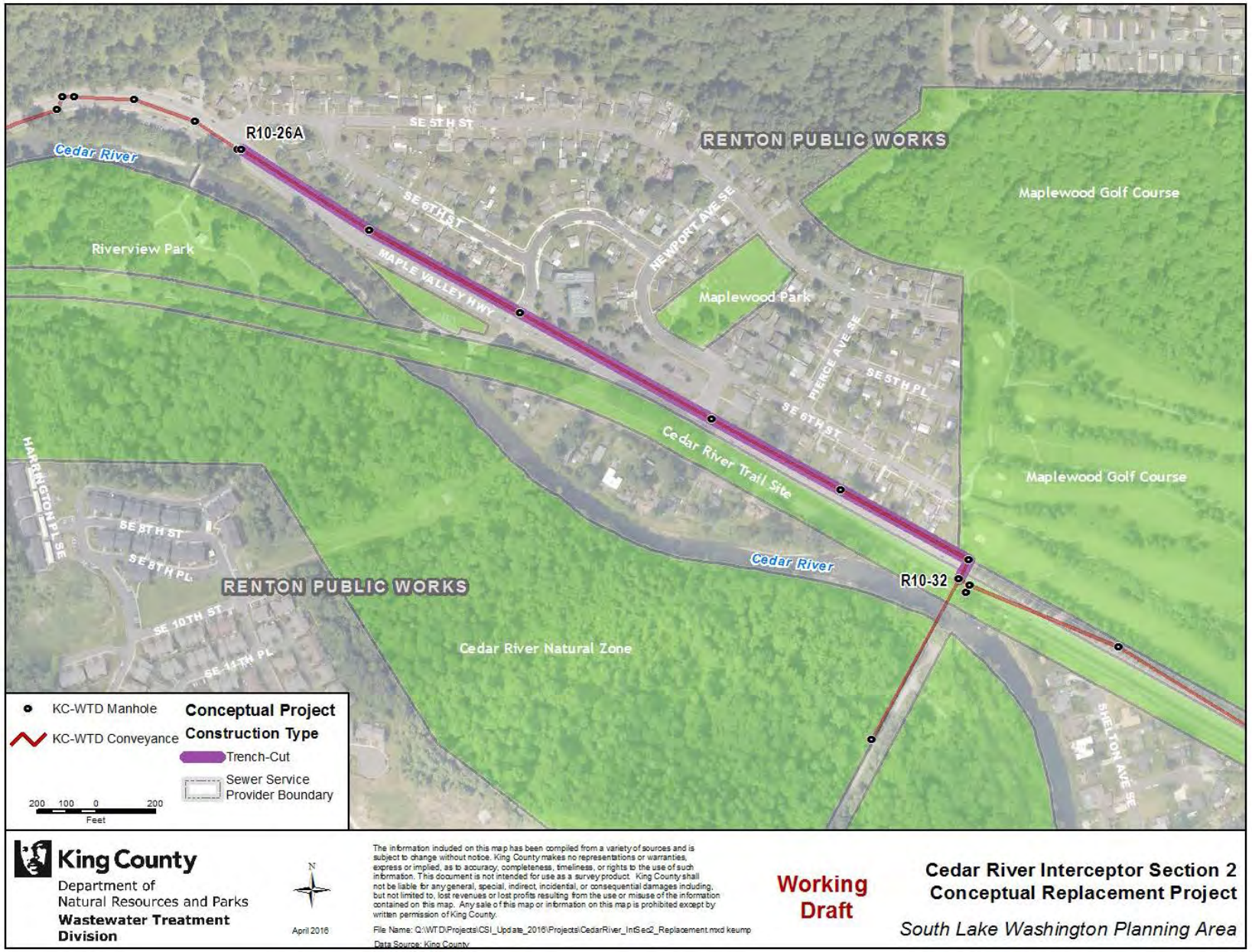
R10-26A
R10-32
Cedar River
SE 5TH ST
SE 6TH ST
MAPLE VALLEY HWY
NEWPORT AVE SE
PIERCE AVE SE
SE 5TH PL
RENTON PUBLIC WORKS
Maplewood Golf Course
Maplewood Park
Riverview Park
Cedar River Trail Site
HARRINGTON PL SE
SE 8TH ST
SE 8TH PL
SE 10TH ST
SE 14TH PL
Cedar River Natural Zone
SHELTON AVE SE
KC-WTD Manhole
KC-WTD Conveyance
Conceptual Project Construction Type
Trench-Cut
Sewer Service Provider Boundary
200 100 0 200
Feet
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
April 2016
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Data Source: King County
Working Draft
Cedar River Interceptor Section 2
Conceptual Replacement Project
South Lake Washington Planning Area

Conceptual Project: Cedar River Interceptor Section 1 Replacement

Capacity Needs Addressed

Cedar River Interceptor Section 1

Location

Sewer Agency: Renton Public Works
Jurisdiction: City of Renton
Planning Area: South Lake Washington

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*CEDAR1.R10-26(13)	R10-26	R10-14	3,313	42	1963	37.80	41.46	3.66	2049	> 20
RE*CEDAR1.R10-14(1)	R10-14	R10-13	30	18	1963	12.02	29.44	17.42	2010	> 20
RE*CEDAR1.R10-07A(6)	R10-07A	R10-01A	2,783	42	1994	34.61	43.56	8.95	2034	> 20

Project Description

Components and Construction Methods

The Cedar River Interceptor Section 1 Replacement Project replaces 3,343 feet of the Cedar River Interceptor Section 1 with 48-inch and 30-inch-diameter pipeline and parallels 2,783 feet of the Cedar River Interceptor Section 1 with a 36-inch-diameter pipeline. Construction is assumed to be trench-cut and includes a drainage culvert. The conceptual alignment follows the existing WTD conveyance route from manholes R10-26 to R10-13 and manholes R10-07A to R10-01A. Staged construction is recommended because additional capacity in pipe reaches RE*CEDAR1.R10-26(13) and RE*CEDAR1.R10-07A(6) is not required until 2049 and 2034, respectively.

Upstream and Downstream Considerations

Upstream Projects: Cedar River Interceptor Section 2 Replacement

Downstream Projects: Eastside Interceptor Section 1 Replacement

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address the downstream pipe reach needs in the Cedar River Interceptor Section 1. A peak flow reduction-to-volume recurrence relationship at upstream manhole R10-28 determined the required storage volume to be 1.81 MG. However, the estimated storage construction cost of $10.7M ($2016) would exceed the cost of replacement. Storage was not considered further for a conceptual project.
- **Paralleling/Replacement**. Paralleling or replacement was evaluated by the age and condition of the pipe reach capacity needs. Pipe reach RE*CEDAR1.R10-26(13) was constructed in 1963. Pipe reach RE*CEDAR1.R10-07A(6) was replaced in 1994. WTD Facility Inspections found no serious

signs of corrosion, sedimentation, root intrusion, or infiltration. For pipe reach RE*CEDAR1.R10-26(13), paralleling was not recommended because the pipe reach will be more than 50 years old in 2016. For pipe reach RE*CEDAR1.R10-07A(6), replacement is not recommended because it will be less than 50 years old in 2034.

- **Diversion.** Diversion was evaluated but not proposed as a conceptual project for upstream Cedar River Interceptor Section 2. Accordingly, diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*CEDAR1.R10-26(13)	R10-26 to R10-14	Pipeline replacement	Trench-cut	48	3,313	51.8 mgd	$3.1
	Creek crossing	Culvert replacement	Trench-cut	36	100	N/A	$0.073
RE*CEDAR1.R10-07A(6)	R10-07A to R10-01A	Pipeline parallel	Trench-cut	36	2,783	19.8 mgd	$2.1

Total Project Cost

The construction cost estimate $5.24M ($2016) for the Cedar River Interceptor Section 1 Replacement Project. The project cost estimate is $15.9M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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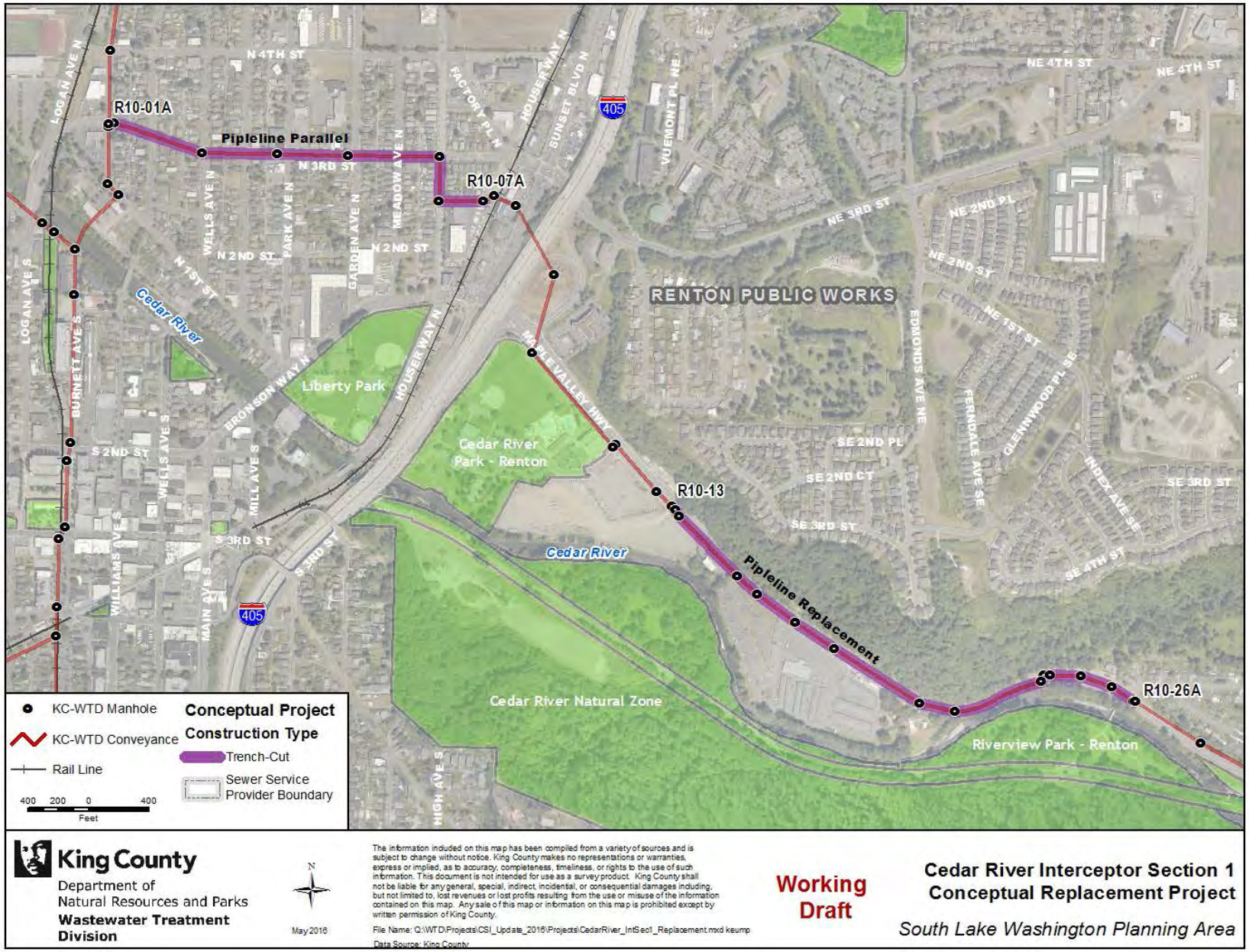
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


R10-01A
Pipeline Parallel
R10-07A
R10-13
Pipeline Replacement
R10-26A
RENTON PUBLIC WORKS
Liberty Park
Cedar River Park - Renton
Cedar River Natural Zone
Riverview Park - Renton
Cedar River
N 4TH ST
N 3RD ST
N 2ND ST
N 1ST ST
S 2ND ST
S 3RD ST
NE 4TH ST
NE 3RD ST
NE 2ND PL
NE 2ND ST
NE 1ST ST
SE 2ND PL
SE 2ND CT
SE 3RD ST
SE 4TH ST
LOGAN AVE N
LOGAN AVE S
BURNETT AVE S
WELLS AVE N
WELLS AVE S
PARK AVE N
GARDEN AVE N
MEADOW AVE N
FACTORY PL N
HOUSER WAY N
SUNSET BLVD N
VUEMONT PL NE
EDMONDS AVE NE
FERNDALE AVE SE
GLENNWOOD PL SE
INDEX AVE SE
BRONSON WAY N
MILL AVE S
MAIN AVE S
WILLIAMS AVE S
HIGH AVE S
MAPLE VALLEY HWY
405
KC-WTD Manhole
KC-WTD Conveyance
Rail Line
400 200 0 400
Feet
Conceptual Project
Construction Type
Trench-Cut
Sewer Service
Provider Boundary
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
N
May 2016
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Data Source: King County
Working
Draft
Cedar River Interceptor Section 1
Conceptual Replacement Project
South Lake Washington Planning Area

North Green River Planning Area

Five conceptual projects were developed to address capacity needs in the North Green River Planning Area:

- Tukwila Freeway Crossing Replacement
- Tukwila Interceptor Replacement
- South Renton Trunk Replacement
- Rainier Vista Interceptor South Replacement
- North Soos Creek Trunk Replacement

Conceptual Project: Tukwila Freeway Crossing Replacement

Capacity Needs Addressed

Tukwila Freeway Crossing

Location

Sewer Agency: Tukwila Public Works
Jurisdiction: City of Renton
Planning Area: North Green River

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*TFWXING.M-05(5)	M-05	M-01B	1,931	24	1963	7.77	10.30	2.53	2014	> 20
RE*TFWXING.M-01B(7)	M-01B	R18-34	2,455	24	1963	6.83	13.01	6.18	2010	1.1

Components and Construction Methods

The Tukwila Freeway Crossing Replacement Project replaces 4,386 feet of Tukwila Freeway Crossing with 30-inch to 48-inch-diameter pipeline. Construction is assumed to be trench-cut with microtunneling below I-5, Hwy 518, and associated access ramps. The conceptual alignment generally follows the existing WTD conveyance route from manholes M-05 to R18-34. However, realignment through the Southcenter Shopping Mall parking lot is recommended to avoid an earthwork freeway ramp.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Tukwila Interceptor Conceptual Replacement Project

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address downstream pipe reach capacity needs in the Tukwila Freeway Crossing and the Tukwila Interceptor. A peak flow reduction-to-volume relationship was developed at upstream manhole M-05. It was determined that the required storage volume was unachievable. Storage was not considered further for a conceptual project.
- **Paralleling.** Paralleling was evaluated by the age and condition of the pipe reach needs. The Tukwila Freeway Crossing was constructed in 1963. In a 2013 assessment, WTD Facility Inspections found moderate signs of corrosion, sedimentation, root intrusion, or infiltration. Because the pipeline will be more than 50 years in 2016 and is in moderate condition, paralleling was not considered further for a conceptual project.
- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole M-05 to address downstream pipe reach capacity needs in the

Tukwila Freeway Crossing and the Tukwila Interceptor. However, no feasible diversion routes to the South Interceptor or the South Treatment Plant could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*TFWXING.M-05(5)	M-05 to M-02	Pipeline replacement	Trench-Cut	21	782	12.9 mgd	$0.39
	M-02 to M-01B	Pipeline replacement	Microtunnel	30	1,149	12.9 mgd	$2.8
RE*TFWXING.M-01B(7)	M-01B to M-01	Pipeline replacement	Microtunnel	36	950	16.3 mgd	$2.8
	M-01 to R18-33	Pipeline replacement	Trench-Cut	36	1,800	16.3 mgd	$1.5[a]

[a] Does not include land acquisition costs.

Total Project Cost

The construction cost estimate is $7.49M ($2016) for the Tukwila Freeway Crossing Replacement Project. The project cost estimate is $22.8M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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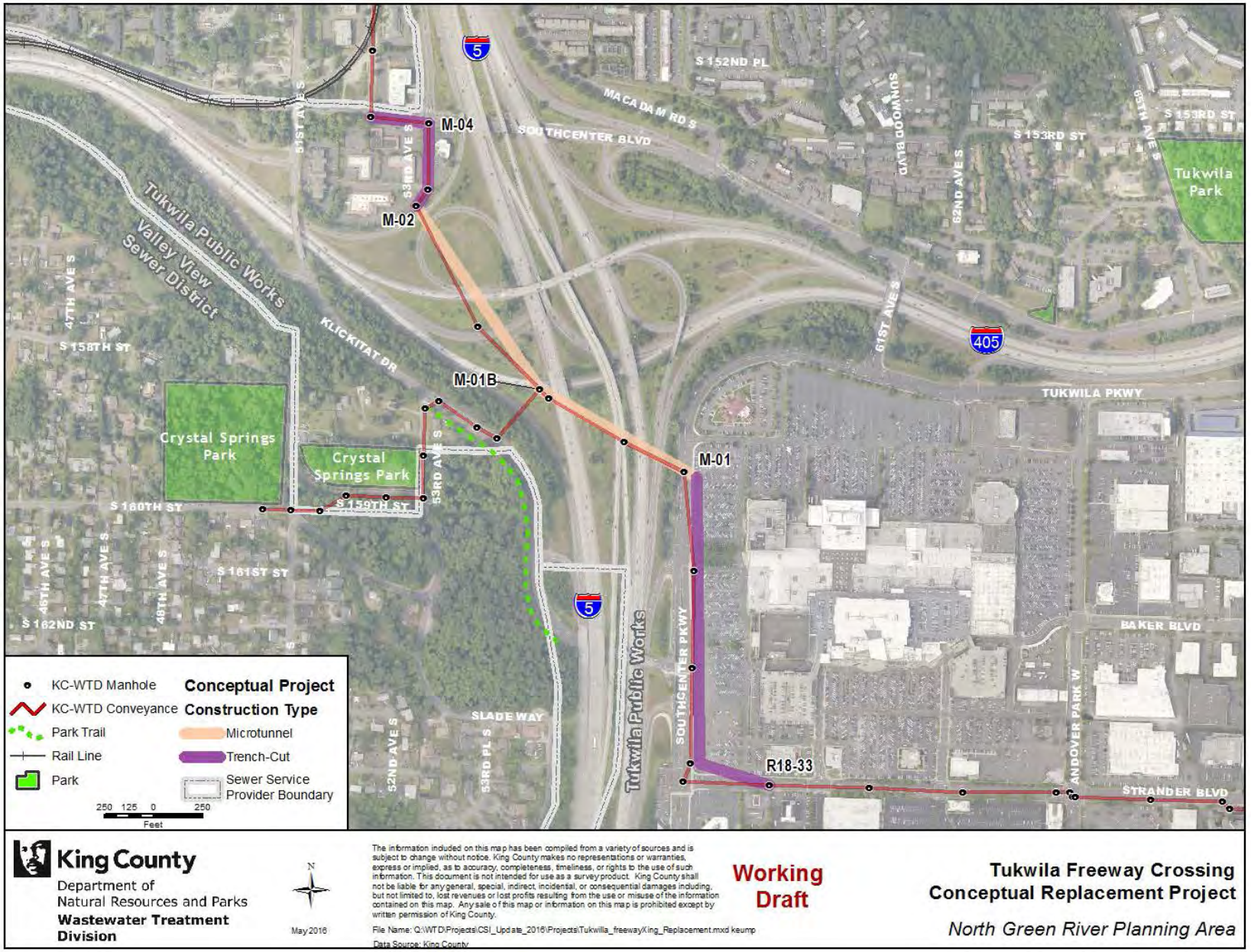
M-04
M-02
M-01B
M-01
R18-33
SOUTHCENTER BLVD
MACADAM RD S
S 152ND PL
SUNWOOD BLVD
S 153RD ST
Tukwila Park
Tukwila Public Works
Valley View Sewer District
KLICKITAT DR
S 158TH ST
Crystal Springs Park
S 160TH ST
S 161ST ST
S 162ND ST
TUKWILA PKWY
BAKER BLVD
SLADE WAY
STRANDER BLVD
ANDOVER PARK W
SOUTHCENTER PKWY
Tukwila Public Works
KC-WTD Manhole
KC-WTD Conveyance
Park Trail
Rail Line
Park
Conceptual Project Construction Type
Microtunnel
Trench-Cut
Sewer Service Provider Boundary
250 125 0 250
Feet
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
May 2016
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Data Source: King County
Working Draft
Tukwila Freeway Crossing
Conceptual Replacement Project
North Green River Planning Area

Conceptual Project: Tukwila Interceptor Replacement

Capacity Needs Addressed

Tukwila Interceptor

Location

Sewer Agency: Tukwila Public Works; Renton Public Works
Jurisdiction: City of Tukwila; City of Renton
Planning Area: North Green River

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*TUK.R18-28(9)	R18-29	R18-20B	2,464	36	1967	18.00	20.52	2.52	2041	> 20
RE*TUK.R18-20B(1)	R18-20B	R18-20A	200	24	1967	10.62	18.59	7.97	2010	> 20
RE*TUK.R18-20A(11)	R18-20A	R18-08	3,456	36	1967	12.93	20.52	7.58	2010	8.7

Components and Construction Methods

The Tukwila Interceptor Replacement Project replaces 6,120 feet of the Tukwila Interceptor with 24-inch to 48-inch-diameter pipeline. Construction is assumed to be trench-cut with microtunneling below the Green River and jack-and-bore below major street intersections and railway crossings. The conceptual alignment follows the existing WTD conveyance route from manholes R18-29 to R18-08. The project could be phased by postponing the upper 40 percent of the replacement until after 2040.

Upstream and Downstream Considerations

Upstream Projects: Tukwila Freeway Crossing Replacement

Downstream Projects: None

Concepts Evaluated

- **Storage** Storage was evaluated by the volume required to address downstream pipe reach capacity needs in the Tukwila Interceptor. A peak flow reduction-to-volume recurrence relationship developed at upstream manhole R18-28 determined the required volume to be unachievable. Storage was not considered further for a conceptual project.
- **Paralleling.** Paralleling was evaluated by the age and condition of the pipe reach needs. The Tukwila Interceptor was constructed in 1967. In a 2013 assessment, WTD Facility Inspections found moderate signs of corrosion, sedimentation, root intrusion, or infiltration. Because the interceptor will be more than 50 years old in 2016 and is in moderate condition, paralleling was not considered further for a conceptual project.
- **Diversion.** Diversion was evaluated by upstream flow and route. Sufficient flow could be diverted from upstream manhole R18-28 to address the downstream pipe reach capacity need

in the Tukwila Interceptor. However, no feasible diversion routes to the South Interceptor could be proposed. Diversion was not considered further for a conceptual project.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*TUK.R18-28(9)	R18-28 to R18-20B	Pipeline replacement	Trench-cut	42	2,464	25.6 mgd	$2.2
	Intersection Crossing	Pipeline replacement	Jack and bore	42	200	25.6 mgd	$0.65
RE*TUK.R18-20B(1)	R18-20B to R18-20A	Siphon replacement	Microtunnel	24/24	200	25.6 mgd	$1.8
RE*TUK.R18-20A(11)	R18-20A to R18-08	Pipeline replacement	Trench-cut	48	3,456	25.6 mgd	$3.3
	Railroad crossing	Jack and bore	Jack and bore	48	100	25.6 mgd	$0.43
	Railroad crossing	Pipeline replacement	Jack and bore	48	100	25.6 mgd	$0.43

Total Project Cost

The construction cost estimate is $8.93M ($2016) for the Tukwila Interceptor Replacement Project. The project cost estimate is $27.2M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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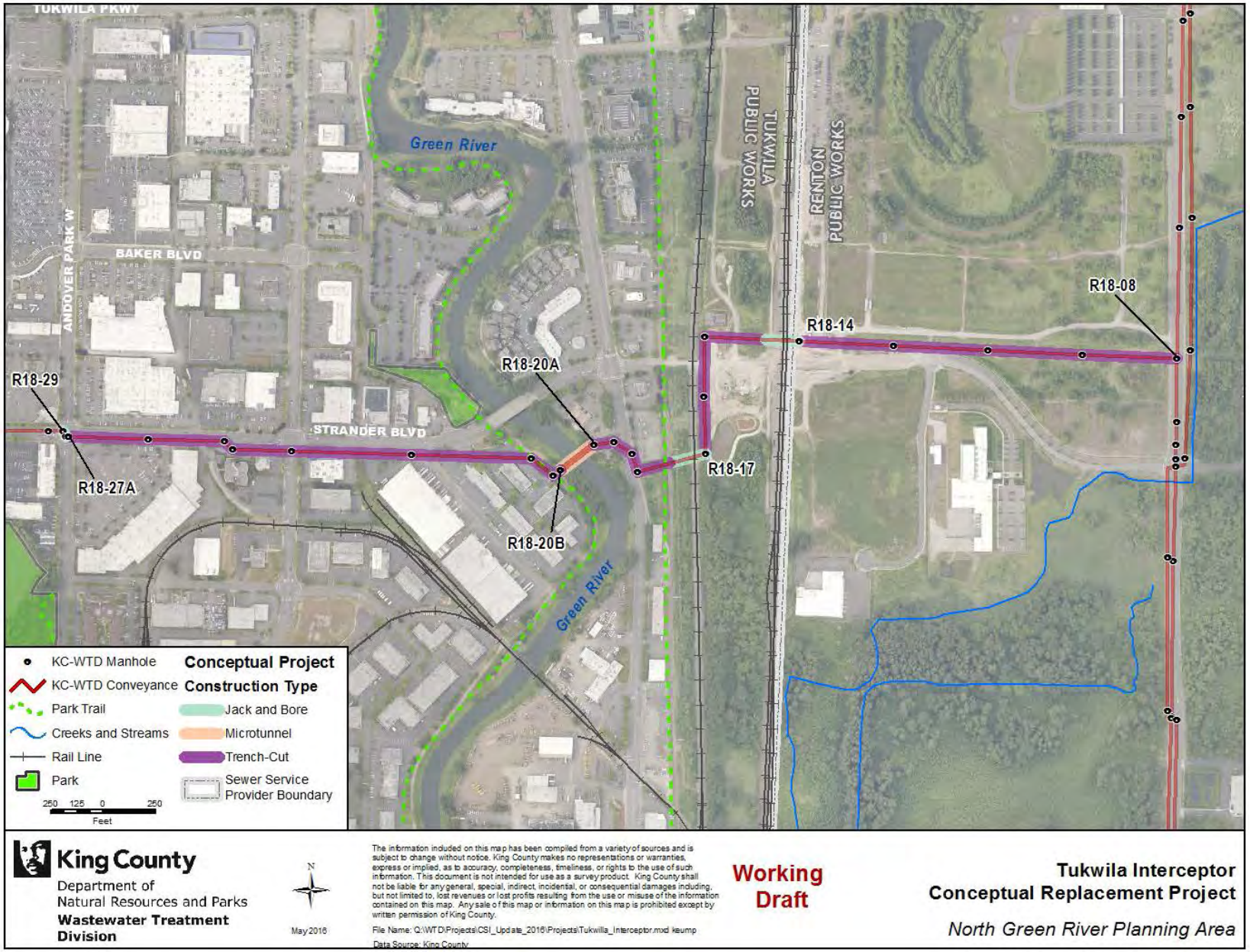
TUKWILA PKWY
Green River
ANDOVER PARK W
BAKER BLVD
TUKWILA PUBLIC WORKS
RENTON PUBLIC WORKS
R18-08
R18-14
R18-20A
R18-29
STRANDER BLVD
R18-27A
R18-17
R18-20B
Green River
KC-WTD Manhole
KC-WTD Conveyance
Park Trail
Creeks and Streams
Rail Line
Park
250 125 0 250
Feet
Conceptual Project Construction Type
Jack and Bore
Microtunnel
Trench-Cut
Sewer Service Provider Boundary
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
May 2016
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\Tukwilla_Interceptor.mxd keump
Data Source: King County
Working Draft
Tukwila Interceptor
Conceptual Replacement Project
North Green River Planning Area

Conceptual Project: South Renton Trunk Replacement

Capacity Needs Addressed

South Renton Trunk

Location

Sewer Agency: Renton Public Works
Jurisdiction: City of Renton
Planning Area: North Green River

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*SRENTON.R18-16(9)	R18-16	R18-07	2,387	27	1969	6.61	8.40	0.74	2047	> 20

Project Description

Components and Construction Methods

The South Renton Trunk Replacement Project includes trench-cut replacement of 2387 feet of the existing 27-inch-diameter pipe with 36-inch-diameter pipe.

Upstream and Downstream Considerations

Upstream Projects: North Soos Creek Trunk Replacement

Downstream Projects: None

Concepts Evaluated

- **Storage.** The South Renton Trunk system was constructed in 1969. Additional capacity is needed by 2047 at which point this trunk will be 78 years old. Inspection performed in 2012 indicated a condition rating of 3, showing moderate signs of corrosion, sedimentation, root intrusion, or infiltration in 2012. The age and condition of this trunk eliminated this alternative from further evaluation.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*SRENTON.R18-16(9)	R18-16 to R18-07	Pipe replacement	Trench-cut	36	2,387	10.5	$2.8

Total Project Cost

The construction cost estimate is $2.8M ($2016) for the South Renton Trunk Replacement Project. The project cost estimate is $8.63M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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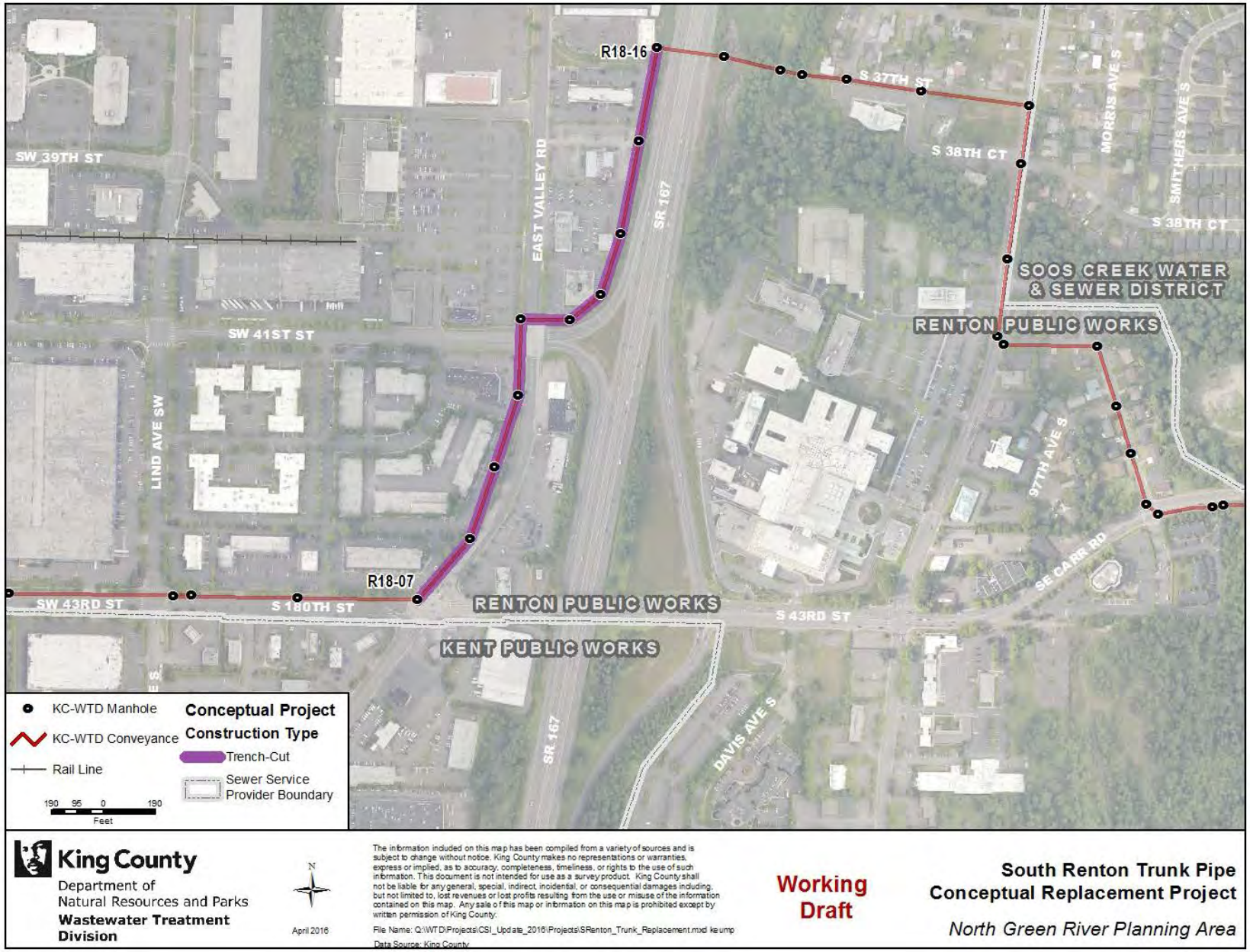
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


R18-16
R18-07
S 37TH ST
S 38TH CT
SOOS CREEK WATER & SEWER DISTRICT
RENTON PUBLIC WORKS
SW 39TH ST
SW 41ST ST
SW 43RD ST
S 180TH ST
EAST VALLEY RD
SR 167
LIND AVE SW
MORRIS AVE S
SMITHERS AVE S
97TH AVE S
SE CARR RD
S 43RD ST
KENT PUBLIC WORKS
DAVIS AVE S
KC-WTD Manhole
KC-WTD Conveyance
Rail Line
Conceptual Project Construction Type
Trench-Cut
Sewer Service Provider Boundary
190 95 0 190
Feet
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
April 2016
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Data Source: King County
Working Draft
South Renton Trunk Pipe
Conceptual Replacement Project
North Green River Planning Area

Conceptual Project: Rainier Vista Interceptor South Replacement

Capacity Needs Addressed

Rainier Vista Interceptor

Location

Sewer Agency: Valley View Sewer District
Jurisdiction: Unincorporated King County
Planning Area: North Green River

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
WE*RVISTA.W314-36A(6)	W314-34	W314-28	1,590	30	1975	9.91	11.18	1.27	2042	> 20

Project Description

Components and Construction Methods

The Rainier Vista Interceptor South Replacement Project includes replacement of 1,590 feet of existing 30-inch-diameter pipe with 36-inch-diameter pipe using trench-cut construction.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: None

Concepts Evaluated

- **Storage.** This Rainier Vista Interceptor South conveyance system was constructed in 1975. Additional capacity is needed by 2042, at which point the system will be 67 years old. Inspection indicated a condition rating of 4, showing serious signs of corrosion, sedimentation, root intrusion, or infiltration. System age and condition eliminated further evaluation of storage.
- **Paralleling.** This Rainier Vista Interceptor South conveyance system was constructed in 1975. Additional capacity is needed by 2042, at which point the system will be 67 years old. Inspection indicated a condition rating of 4, showing serious signs of corrosion, sedimentation, root intrusion, or infiltration. System age and condition eliminated further evaluation of paralleling.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
WE*RVISTA.W314-34(6)	W314-34 to W314-28	Pipe replacement	Trench-cut	36	1590	14.0 mgd	$1.2

Total Project Cost

The construction cost estimate is $1.21M ($2016) for the Rainier Vista Interceptor South Replacement Project. The project cost estimate is $3.73M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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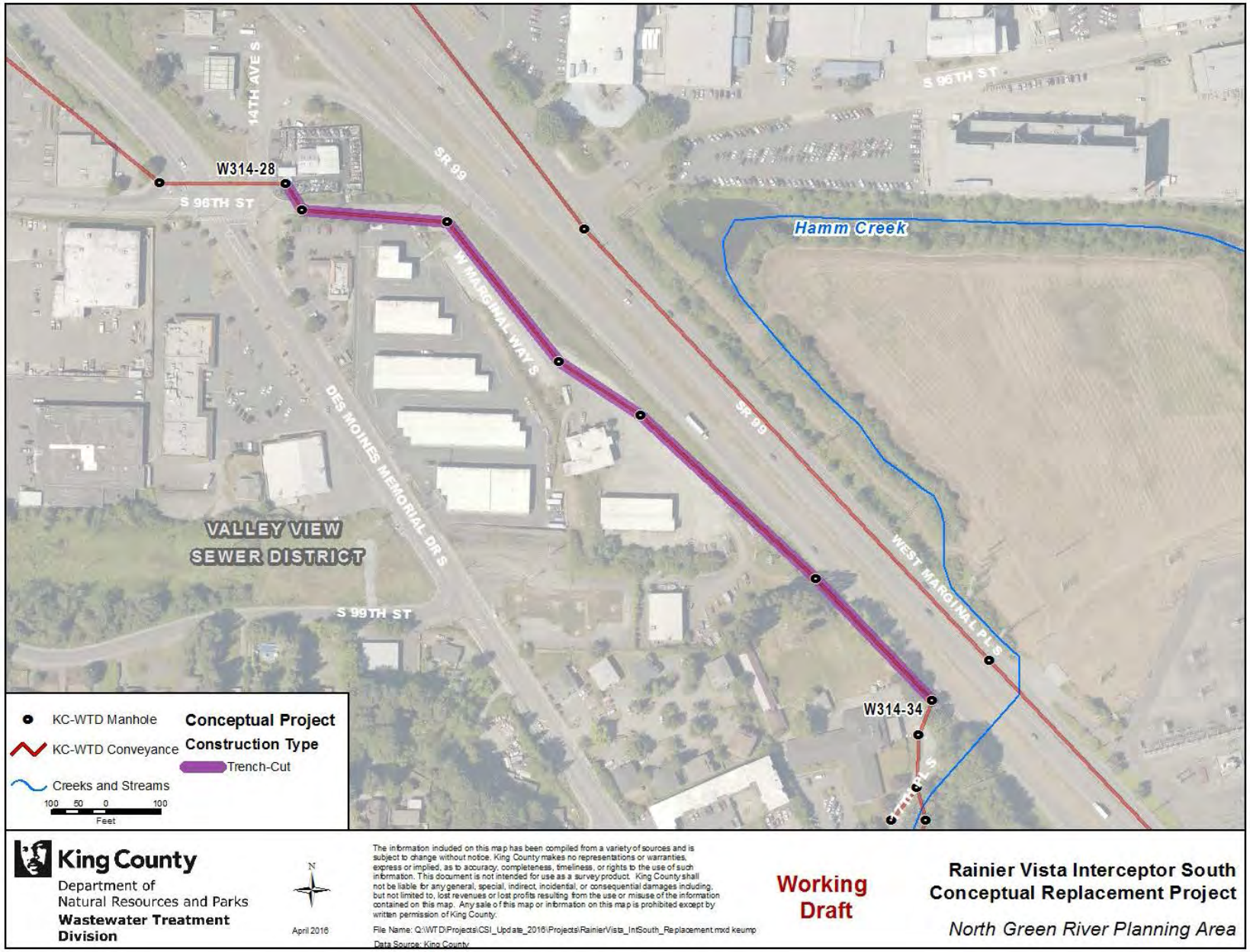
W314-28
S 96TH ST
14TH AVE S
SR 99
W MARGINAL WAY S
DES MOINES MEMORIAL DR S
VALLEY VIEW
SEWER DISTRICT
S 99TH ST
Hamm Creek
WEST MARGINAL PL S
W314-34
KC-WTD Manhole
KC-WTD Conveyance
Creeks and Streams
100 50 0 100
Feet
Conceptual Project
Construction Type
Trench-Cut
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
N
April 2016
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Data Source: King County
Working
Draft
Rainier Vista Interceptor South
Conceptual Replacement Project
North Green River Planning Area

Conceptual Project: North Soos Creek Trunk Replacement

Capacity Needs Addressed

North Soos Creek Trunk

Location

Sewer Agency: Soos Creek Water and Sewer District
Jurisdiction: City of Renton and City of Kent
Planning Area: North Green River

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*NSOOS.382(6)	382	388	3,302	21	1969	4.38	4.74	0.36	2051	> 20

Project Description

Components and Construction Methods

The North Soos Creek Trunk Replacement Project includes trench-cut installation of 3,302 feet of 24-inch-diameter conveyance pipe and 50 feet of Jack-and-bore installation under SE 192nd Street.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: South Renton Trunk Replacement

Concepts Evaluated

- **Storage** The existing trunk was constructed in 1969. Additional capacity is needed by 2051, at which time the system will be 82 years old. Inspection indicates a conditions rating of 3, showing moderate signs of corrosion, sedimentation, root intrusion, or infiltration in 2012. The age and condition of the trunk eliminated storage from further evaluation.
- **Paralleling.** The existing trunk was constructed in 1969. Additional capacity is needed by 2051, at which time the system will be 82 years old. Inspection indicates a conditions rating of 3, showing moderate signs of corrosion, sedimentation, root intrusion, or infiltration in 2012. The age and condition of the trunk eliminated paralleling from further evaluation.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*NSOOS.382(6)	382 to 388	Pipe replacement	Trench-cut	24	3,302	5.93 mgd	$1.9

Total Project Cost

The construction cost estimate is $1.93M ($2016) for the North Soos Creek Trunk Storage Project. The project cost estimate is $5.95M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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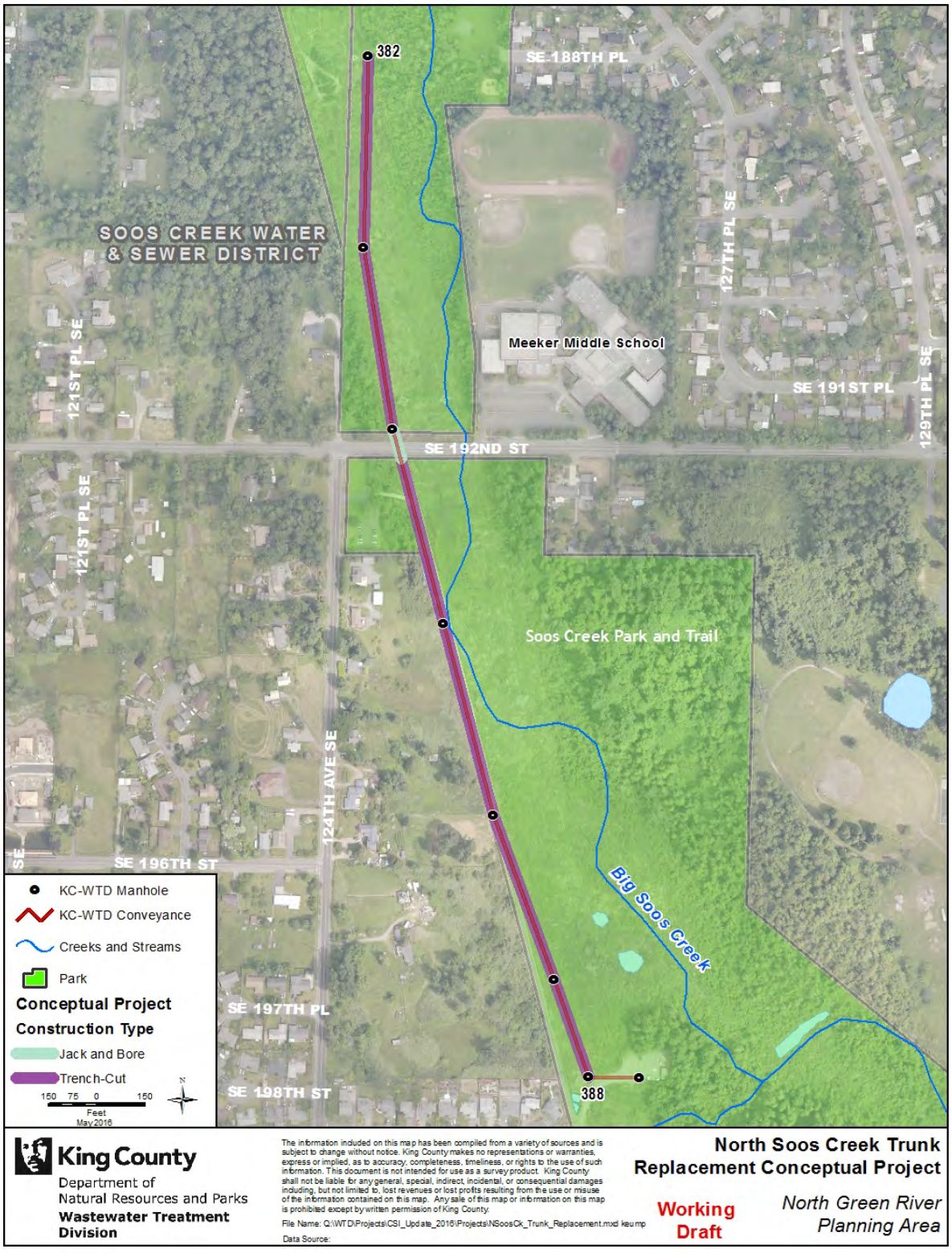
382
SE 188TH PL
SOOS CREEK WATER & SEWER DISTRICT
121ST PL SE
127TH PL SE
Meeker Middle School
SE 191ST PL
129TH PL SE
SE 192ND ST
121ST PL SE
Soos Creek Park and Trail
124TH AVE SE
SE 196TH ST
Big Soos Creek
SE 197TH PL
SE 198TH ST
388
KC-WTD Manhole
KC-WTD Conveyance
Creeks and Streams
Park
Conceptual Project
Construction Type
Jack and Bore
Trench-Cut
150 75 0 150
Feet
May 2016
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
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Data Source:
North Soos Creek Trunk
Replacement Conceptual Project
Working
Draft
North Green River
Planning Area

South Green River–Kent Planning Area

Four conceptual projects were developed to address capacity needs in the South Green River−Kent Planning Area:

- Garrison Creek Interceptor Replacement, Realignment, and Diversion
- Auburn Interceptor Sections 1,2, and 3 Replacement
- South 227th Interceptor Replacement
- West Hill Trunk Diversion

Conceptual Project: Garrison Creek Interceptor Replacement, Realignment, and Diversion

Capacity Needs Addressed

Garrison Creek Interceptor

Location

Sewer Agency: City of Kent Public Works
Jurisdiction: City of Kent
Planning Area: South Green River–Kent

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*GARISN.R18-30(5)	R18-30	R18-25	998	12	1969	7.36	8.95	1.60	2033	> 20
RE*GARISN.R18-25(2)	R18-25	R18-23	655	18	1969	4.83	8.95	4.13	2010	7.3
RE*GARISN.R18-23(2)	R18-23	R18-21	445	12	1969	7.64	8.95	1.32	2038	> 20
RE*GARISN.R18-21(2)	R18-21	R18-19	160	12	1969	9.80	8.95	0.00	>2060	> 20
RE*GARISN.R18-19(2)	R18-19	R18-17	559	15	1969	7.73	8.95	1.22	2040	> 20
RE*GARISN.R18-17(3)	R18-17	R18-13	791	18	1969	5.32	12.65	7.33	2010	4.3
RE*GARISN.R18-13(3)	R18-13	R18-11	517	24	1969	6.14	12.65	6.51	2010	6.7
RE*GARISN.R18-10(1)	R18-10	R18-09	260	18	1969	7.84	12.65	4.81	2010	16.5
RE*GARISN.R18-09(12)	R18-09	57I	2,675	24	1969	5.20	12.65	7.45	2010	4.1
ULID Contract 1 of 5 Trunk										
RE*ULID 1/5.57I(10)	57I	57	3,423	24	1969	6.33	12.65	6.32	2010	7.4
RE*ULID 1/5.57(5)	57	52	2,107	42	1969	13.06	21.44	8.38	2010	14.9

Project Description

Components and Construction Methods

The proposed conceptual project for the Garrison Creek Trunk affects the entire trunk and includes several elements: pipe replacement, realignment, and flow diversion. Total replacement pipe length is 5,479 feet. The realignment portion is from manhole R18-22 to R18-12A for total length of 1,921 feet. The diversion is from MH RE*GARISN.R18-02 on 84th Ave South just south of the South 218th Street alignment, continuing west, and connecting with the ULID 1 Contract 5 Trunk at manhole 53 for a total length of 3,236 feet. This diversion eliminates capacity needs in two reaches of the ULID 1 Contract 5 Trunk. Construction techniques will include trench-cut, microtunneling, and jack-and-bore.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: None

Concepts Evaluated

- **Storage.** The Garrison Creek Interceptor system was constructed in 1969. Inspection information from 2012 indicated a condition rating range from 2 (structurally sound yet showing signs of corrosion sedimentation, root intrusion, or infiltration) to 5 (showing severe signs of

corrosion, sedimentation, root intrusion, or infiltration). The age and condition eliminated storage from evaluation.

- **Paralleling.** The Garrison Creek Interceptor was constructed in 1969. Inspection information from 2012 indicated a condition rating range from 2 (structurally sound yet showing signs of corrosion sedimentation, root intrusion, or infiltration) to 5 (showing severe signs of corrosion, sedimentation, root intrusion, or infiltration). The age, condition, and location of portions of the interceptor in the Garrison Creek riparian corridor eliminated paralleling from evaluation.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*GARISN.R18-30(5)	R18-30 to R18-29	Pipe replacement	Trench-cut	27	110	11.1 mgd	$0.078
	R18-29 to R18-25	Pipe replacement	Trench-cut	15	887	11.1 mgd	$0.46
RE*GARISN.R18-25(2)	R18-25 to R18-23	Pipe replacement	Trench-cut	27	655	11.1 mgd	$0.44
RE*GARISN.R18-23(2)	R18-23 to R18-22	Pipe replacement	Trench-cut	15	235	11.1 mgd	$0.11
	Under stream	Pipe replacement	Microtunnel	18	450	11.1 mgd	$2.4
	Microtunnel to R18-12A	Pipe realignment	Trench-cut	18	1921	11.1 mgd	$4.1
RE*GARISN.R18-13(2)	R18-12A to R18-11	Pipe replacement	Trench-cut	36	415	15.8 mgd	$0.35
RE*GARISN.R18-10(1)	R18-10 to jack and bore	Pipe replacement	Trench-cut	36	40	15.8 mgd	$0.045
	Under SR 167	Pipe replacement	Jack and bore	36	185	15.8 mgd	$0.68
	Jack and bore to R18-09	Pipe replacement	Trench-cut	36	35	15.8 mgd	$0.04
RE*GARISN.R18-09(12)	R18-09 to jack and bore	Pipe replacement	Trench-cut	36	171	15.8 mgd	$0.15
	Under stream conveyance	Pipe replacement	Jack and bore	36	125	15.8 mgd	$0.45
	jack and bore to R18-08	Pipe replacement	Trench-cut	36	125	15.8 mgd	$0.11
	R18-08 to R18 -02	Pipe replacement	Trench-cut	36	1485	15.8 mgd	$1.5
	jack and bore under 84th St S	Pipe replacement	Trench-cut	36	125	15.8 mgd	$0.44
RE*GARISN.R18-09(12)	Diversion R18-02 to 53 (ULID 1/5)	Pipe diversion	Trench-cut	36	2836	15.8 mgd	$4.6
	Under railroad	Pipe diversion	Jack and Bore	36	200	15.8 mgd	$0.63
ULID 1/5 Trunk	53 to 52	Pipe replacement	Trench-cut	54	436	26.8 mgd	$0.82

Total Project Cost

The construction cost estimate is $17.4M ($2016) for the Garrison Creek Interceptor Project. The project cost estimate is $49.2M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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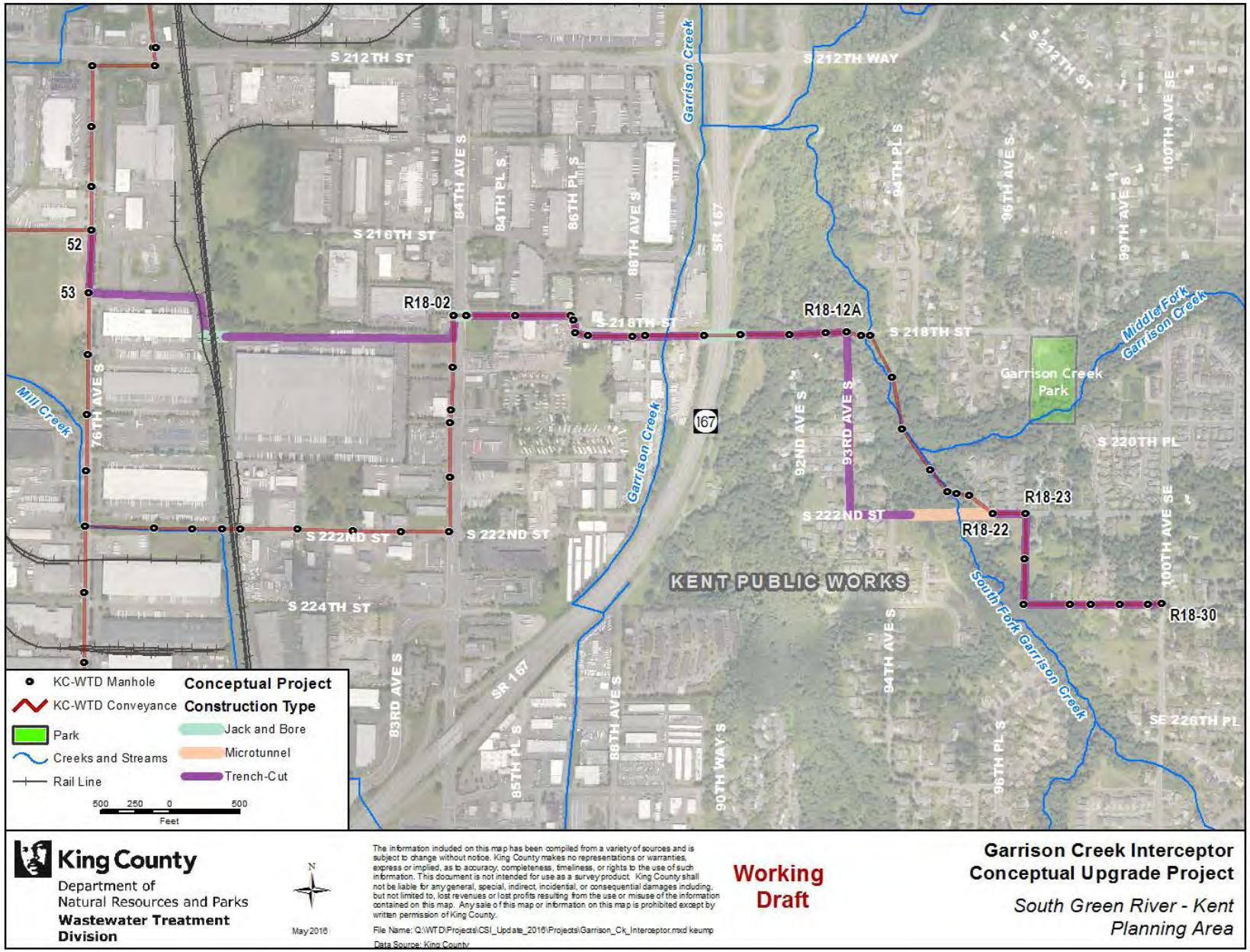
S 212TH ST
S 212TH WAY
S 216TH ST
S 218TH ST
S 220TH PL
S 222ND ST
S 224TH ST
SE 226TH PL
Garrison Creek
Middle Fork Garrison Creek
South Fork Garrison Creek
Mill Creek
SR 167
167
84TH AVE S
84TH PL S
86TH PL S
86TH AVE S
88TH AVE S
90TH WAY S
92ND AVE S
93RD AVE S
94TH AVE S
96TH AVE S
97TH PL S
99TH AVE S
100TH AVE SE
76TH AVE S
83RD AVE S
85TH PL S
96TH PL S
52
53
R18-02
R18-12A
R18-22
R18-23
R18-30
Garrison Creek Park
KENT PUBLIC WORKS
KC-WTD Manhole
KC-WTD Conveyance
Park
Creeks and Streams
Rail Line
Conceptual Project Construction Type
Jack and Bore
Microtunnel
Trench-Cut
500 250 0 500
Feet
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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Data Source: King County
Working Draft
Garrison Creek Interceptor
Conceptual Upgrade Project
South Green River - Kent Planning Area

Conceptual Project: West Hill Trunk Diversion

Capacity Needs Addressed

ULID #1 Contract #4 – Kent
ULID 250 – Kent ULID 250 – Kent

Location

Sewer Agency: Kent Public Works
Jurisdiction: City of Kent
Planning Area: South Green River–Kent

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*ULID 1/4.S-31(8)	S-31	S-23	3,297	24	1969	6.50	14.37	7.87	2010	1.3
RE*ULID 1/4.S-23(6)	S-23	S-17	1,463	30	1969	8.00	14.37	6.37	2010	4.4
RE*ULID 250.S-17(7)	S-10AA	S-17	2,640	30	1967	8.68	16.18	7.50	2010	3.5
RE*ULID 250.S-10AA(13)	S-10AA	N-02	5,248	36	1967	12.23	18.53	6.30	2010	15.5

Project Description

Components and Construction Methods

The West Hill Trunk Diversion Project diverts up to 9.86 mgd of 20-year peak flow by 2060 from the upstream West Hill Trunk to the Auburn Interceptor Section 2. The project consists of a flow diversion structure and a 30-inch-diameter diversion pipeline. Construction is assumed to be trench-cut. The conceptual alignment extends 3,340 feet east below West Meeker Street from manholes 02 to R18H-23.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Auburn Interceptor Sections 1, 2, and 3 Replacement

Concepts Evaluated

- **Storage.** Storage was evaluated by the volume required to address downstream pipe reach needs in ULID 1 Contract 4 and ULID Contract 250. A peak flow reduction-to-volume recurrence relationship developed at upstream manhole S-28 determined the required volume to be 2.5 MG. However, the estimated construction cost of $15M ($2016) for storage would exceed the diversion alternative. Storage was not considered further for a conceptual project.
- **Paralleling/Replacement.** Paralleling or replacement was evaluated by the age and condition of the pipe reach capacity needs. ULID 1 Contract 4 and ULID Contract 250 were constructed in 1969. In a 2012 assessment, WTD Facility Inspections found minor signs of corrosion, sedimentation, root intrusion, or infiltration. Because the reaches will be approximately 50 years old in 2016 and are in good condition, paralleling would be preferred to replacement. However, the estimated construction cost for 12,648 feet for paralleling would exceed the construction

cost for 3,340 feet for diversion. Paralleling and replacement were not considered further for a conceptual project.

Estimated Project Costs

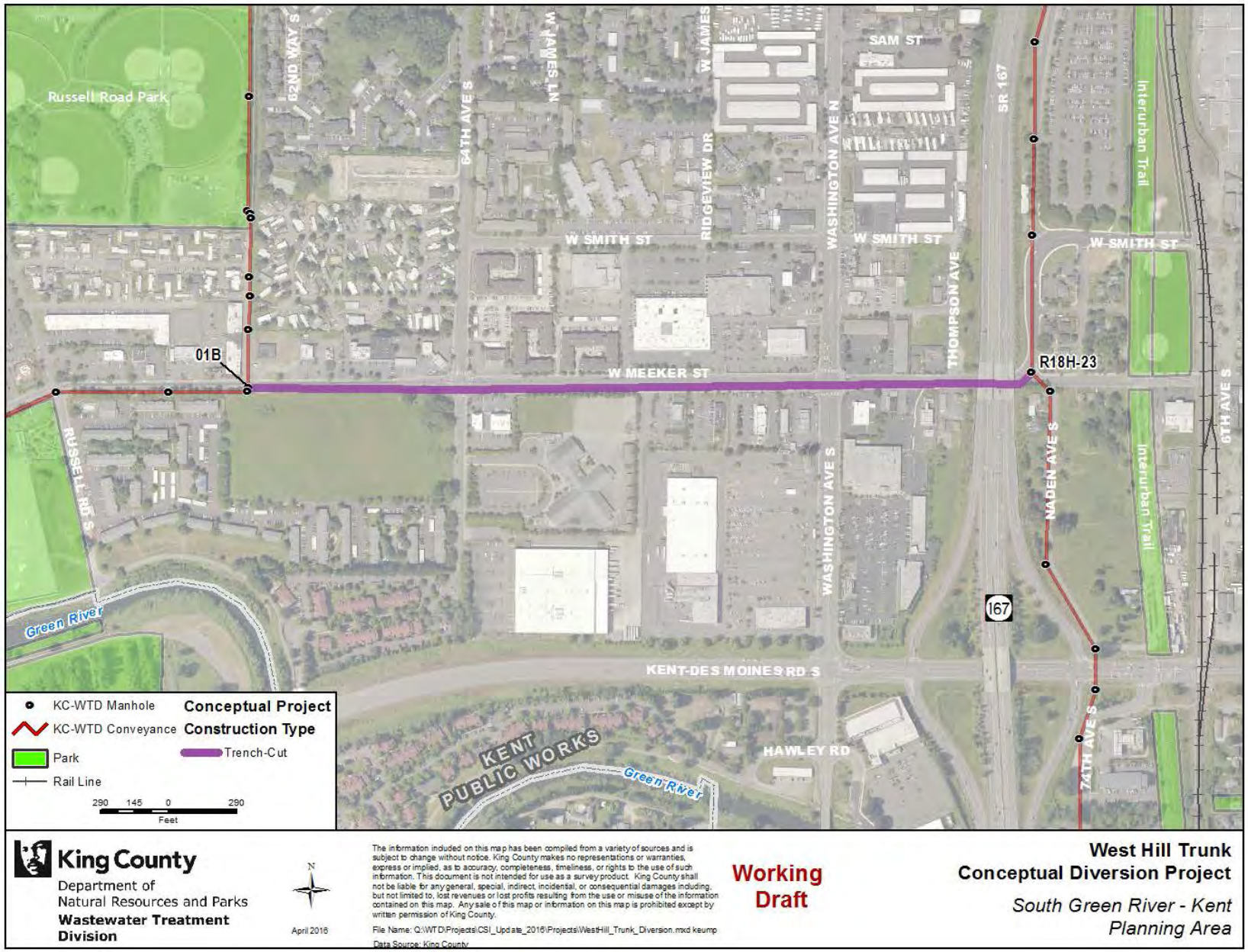
Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
West Hill Diversion	02 to R18H-23	New pipeline	Trench-cut	30	3,340	12.3 mgd	$2.1

Total Project Cost

The construction cost estimate is $2.15M ($2016) for the West Hill Trunk Diversion Project. The project cost estimate is $6.63M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


Russell Road Park
82ND WAY S
64TH AVE S
W JAMES LN
W JAMES
RIDGEVIEW DR
WASHINGTON AVE N
SAM ST
SR 167
Interurban Trail
W SMITH ST
THOMPSON AVE
01B
R18H-23
W MEEKER ST
RUSSELL RD S
WASHINGTON AVE S
NABEN AVE S
6TH AVE S
Green River
167
KENT-DES MOINES RD S
KENT PUBLIC WORKS
HAWLEY RD
74TH AVE S
KC-WTD Manhole
KC-WTD Conveyance
Park
Rail Line
Conceptual Project
Construction Type
Trench-Cut
290 145 0 290
Feet
King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division
N
April 2016
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Data Source: King County
Working Draft
West Hill Trunk
Conceptual Diversion Project
South Green River - Kent Planning Area

Conceptual Project: Auburn Interceptor Sections 1, 2 and 3 Replacement

Capacity Needs Addressed

Auburn Interceptor Section 1
Auburn Interceptor Section 2
Auburn Interceptor Section 3

Location

Sewer Agency: Kent Public Works
Jurisdiction: City of Kent
Planning Area: South Green River–Kent

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*AUBURN3.R99-01(5)	R99-01	R18H-42	2,591	72	1976	72.5	107.9	35.3	2030	> 20
RE*AUBURN2.R18H-42(7)	R18H-42	R18H-35	3,672	72	1976	82.6	107.9	25.2	2039	> 20
Siphon under Green River not included in the conceptual project										
RE*AUBURN2.R18H-34(12)	R18H-34	R18H-22	5,034	72	1976	82.9	108.8	26.0	2038	> 20
RE*AUBURN1.R18H-22(21)	R18H-22	R18H-01	10,025	72	1976	88.1	115.3	27.2	2038	> 20

Project Description

Components and Construction Methods

The Auburn Interceptor Sections 1,2,and 3 Replacement Project includes trench-cut replacement of 21,322 feet of the existing 72-inch-diameter pipe beginning near the downstream end of Section 3.The replacement pipe will range in size from 84 to 108 inches in diameter, with the majority being 96-inch-diameter pipe. The existing siphon under the Green River is not included in the project because it has adequate capacity beyond the projected 2060 peak flows.

Upstream and Downstream Considerations

Upstream Projects: Black Diamond Pump Station Upgrade; Black Diamond Trunk Storage and Replacement; South 227th Interceptor Replacement; West Hill Trunk Diversion

Downstream Projects: None

Concepts Evaluated

- **Storage.** Storage was evaluated using hydrographic output from the hydraulic model. The minimum storage required is 10 MG at an estimated cost of greater than $50M. The Auburn Interceptor Sections 1, 2, and 3 was built in 1976. Additional capacity is needed by 2030 at which point the system will be more than 50 years old. In addition, inspection in 2011 assigned a condition rating of 4, showing serious signs of corrosion, sedimentation, root intrusion, or infiltration. The comparative costs estimated to build storage volume sufficient to achieve the

required peak flow reduction and the age and condition of this conveyance precluded storage from further evaluation.

- **Paralleling.** Paralleling the existing pipe was evaluated using projected 2060 peak flow data. The construction cost for parallel conveyance was estimated at greater than $50M. The Auburn Interceptor Sections 1, 2, and 3 was built in 1976. Additional capacity is needed by 2030 at which point the system will be more than 50 years old. In addition, inspection in 2011 assigned a condition rating of 4, showing serious signs of corrosion, sedimentation, root intrusion, or infiltration. The age and comparative costs eliminated paralleling from further evaluation.

Estimated Project Costs

Construction Costs

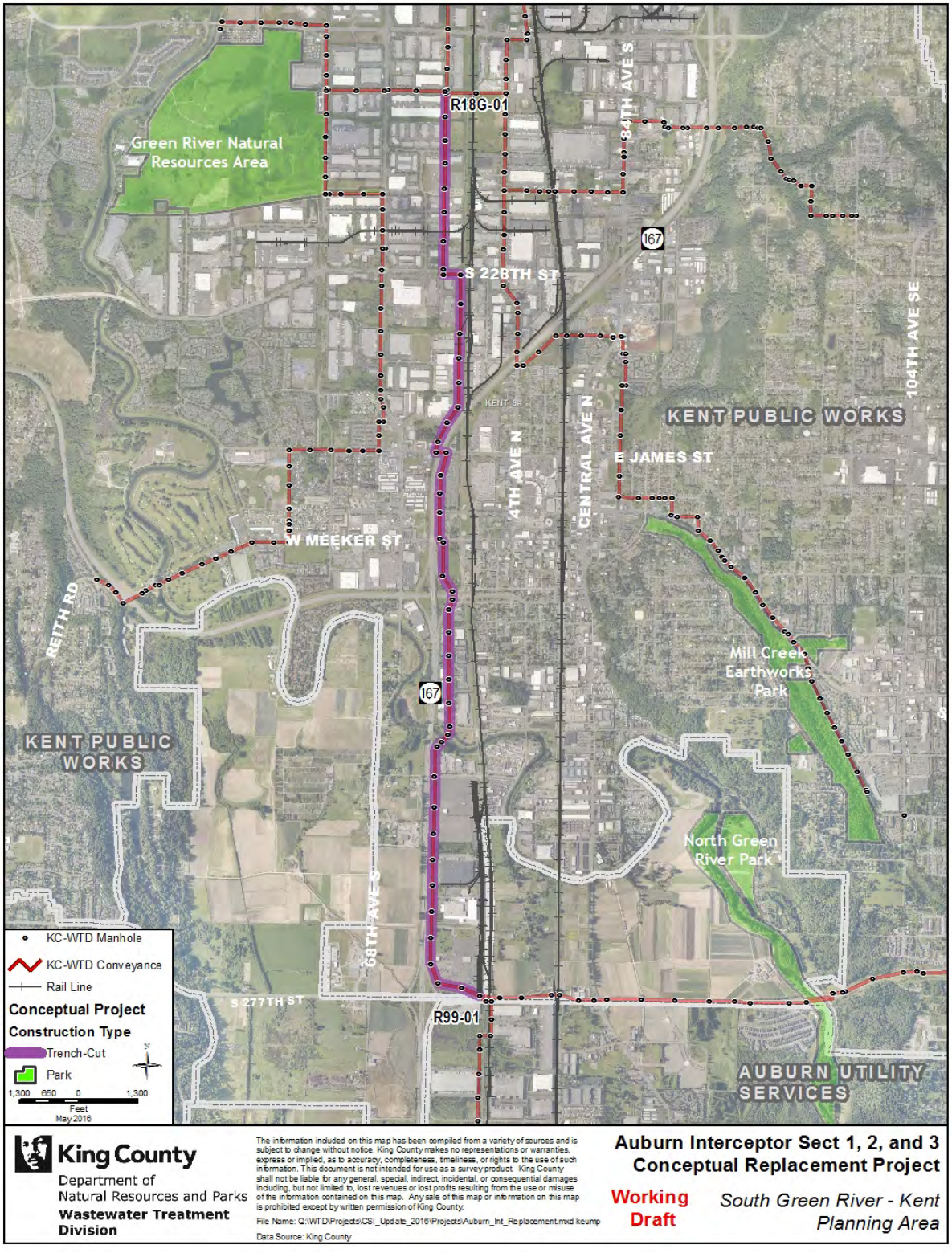
Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Section 3							
RE*AUBURN3.R99-01(5)	R99-01 to R18H-42	Pipe replacement	Trench-cut	96	2,591	134.8	$11
Section 2							
RE*AUBURN2.R18H-42(7)	R18H-42 to R18H-35	Pipe replacement	Trench-cut	96	3,672	134.8	$15
Siphon under Green River not included in the conceptual project							
RE*AUBURN2.R18H-34(12)	R18H-34 to R18H-33	Pipe replacement	Trench-cut	96	186	134.8	$0.85
	R18H-33 to R18H-27	Pipe replacement	Trench-cut	96	2,824	135.2	$12
	Under Kent Des Moines Rd. S.	Pipe replacement	Jack and bore	84	179	136.1	$1.2
	R18H-26 to R18H-23	Pipe replacement	Trench-cut	84	1,268	136.1	$4.5
	R18H-23 to R18H-22	Pipe replacement	Trench-cut	108	577	148.4	$3.2
Section 1							
RE*AUBURN1.R18H-22(21)	R18H-22 to R18H-19	Pipe replacement	Trench-cut	96	1,312	149.9	$5.6
	R18H-19 to R18H-12	Pipe replacement	Trench-cut	96	3,017	156.4	$12
	Under Railroad	Pipe replacement	Jack and bore	96	100	156.4	$0.87
	Railroad to R18H-05	Pipe replacement	Trench-cut	96	3,497	156.4	$14
	Substation	Pipe replacement	Trench-cut	96	370	156.4	$1.5
	Substation to R18H-01	Pipe replacement	Trench-cut	96	1,729	156.4	$7.1

Total Project Cost

The construction cost estimate is $89.6M ($2016) for the Auburn Interceptor Sections 1, 2, and 3 Replacement Project. The project cost estimate is $255M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.
- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.

- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


R18G-01
Green River Natural Resources Area
S 228TH ST
KENT PUBLIC WORKS
E JAMES ST
W MEEKER ST
REITH RD
Mill Creek Earthworks Park
North Green River Park
KENT PUBLIC WORKS
S 277TH ST
R99-01
AUBURN UTILITY SERVICES
104TH AVE SE
84TH AVE S
4TH AVE N
CENTRAL AVE N
68TH AVE S
167
KC-WTD Manhole
KC-WTD Conveyance
Rail Line
Conceptual Project
Construction Type
Trench-Cut
Park
1,300 650 0 1,300
Feet
May 2016
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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Data Source: King County
Auburn Interceptor Sect 1, 2, and 3
Conceptual Replacement Project
Working Draft
South Green River - Kent Planning Area

Conceptual Project: South 277th Interceptor Replacement

Capacity Needs Addressed

South 227th Interceptor

Location

Sewer Agency: Kent Public Works
Jurisdiction: City of Kent
Planning Area: South Green River–Kent

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*S277TH.R98-26(5)	R98-26	R98-21	2,659	30	1998	41.83	47.00	5.17	2050	> 20

Project Description

Components and Construction Methods

The South 277th Interceptor Replacement Project includes replacement of two pipe segments for a total of 1,707 feet of the pipe; 477 feet of 36-inch-diameter pipe will be replaced with 42-inch-diameter pipe and 1,230 feet of 42-inch-diameter pipe will be replaced with 48-inch-diameter pipe using trench-cut technology.

Upstream and Downstream Considerations

Upstream Projects: Black Diamond Pump Station Upgrade; Black Diamond Trunk Storage and Replacement

Downstream Projects: Auburn Interceptor Sections 1,2, and 3 Replacement

Concepts Evaluated

- **Paralleling.** Inspection in 2004 indicates a condition rating of 2, structurally sound yet showing signs of corrosion sedimentation, root intrusion, or infiltration. However, the South 227th Interceptor was constructed in 1998 and additional capacity is needed by 2050, at which time the system will be more than 50 years old. Therefore, paralleling was not further evaluated.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
RE*S277TH.R98-26(5)	R98-25 to R98-24	Pipe Replacement	Trench-Cut	42	477	58.8	$0.61
	R98-24 to R98-23	Pipe Replacement	Trench-Cut	48	1,230	58.8	$1.8

Total Project Cost

The construction cost estimate is $2.41M ($2016) for the South 277th Interceptor Replacement Project. The project cost estimate is $7.43M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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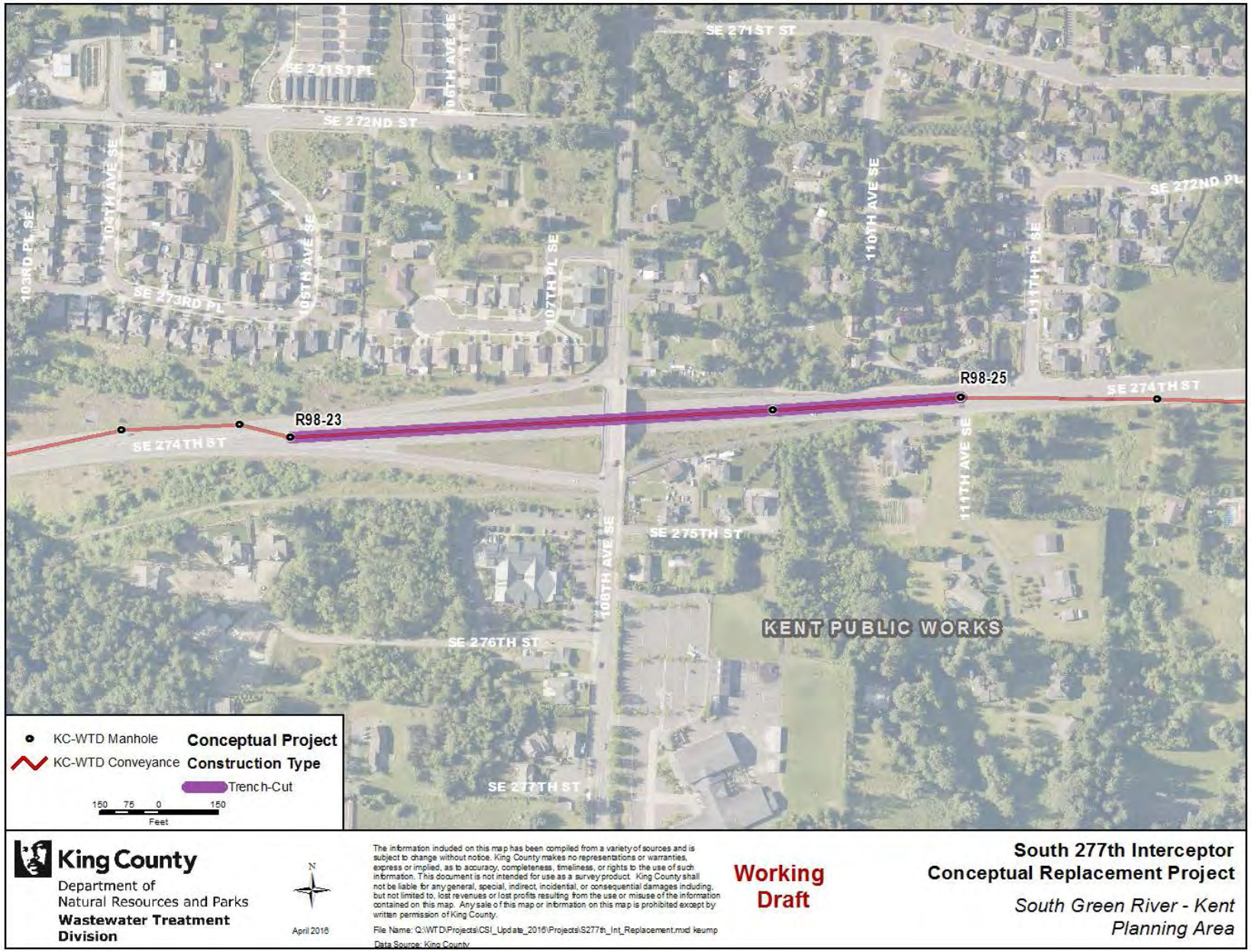
SE 271ST ST
SE 271ST PL
106TH AVE SE
SE 272ND ST
103RD PL SE
104TH AVE SE
SE 273RD PL
105TH AVE SE
107TH PL SE
110TH AVE SE
111TH PL SE
SE 272ND PL
R98-25
SE 274TH ST
R98-23
SE 274TH ST
111TH AVE SE
SE 275TH ST
108TH AVE SE
KENT PUBLIC WORKS
SE 276TH ST
SE 277TH ST
KC-WTD Manhole
KC-WTD Conveyance
Conceptual Project Construction Type
Trench-Cut
150 75 0 150
Feet
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
N
April 2016
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Data Source: King County
Working Draft
South 277th Interceptor
Conceptual Replacement Project
South Green River - Kent Planning Area

South Green River–Soos Creek Planning Area

Two conceptual projects were developed to address capacity needs in the South Green River–Soos Creek Planning Area:

- Black Diamond Pump Station Upgrade
- Black Diamond Trunk Storage and Replacement

Conceptual Project: Black Diamond Pump Station Upgrade

Capacity Needs Addressed

Black Diamond Pump Station

Location

Sewer Agency: Black Diamond Public Works; Soos Creek Water and Sewer District
Jurisdiction: Black Diamond, Covington, Maple Valley
Planning Area: South Green River–Soos Creek

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
Black Diamond Pump Station	N/A	N/A	N/A	N/A	1992	1.5	2.7	1.2	2010	2.7

Project Description

Components and Construction Methods

Additional pumping capacity is needed in the Black Diamond Pump Station service area. The assumption is that new development in the area will be served by a new pump station that will require a new connection to the downstream Black Diamond Trunk. However, flows to the existing pump station will increase as a result of infill within the current tributary area and increased peak infiltration and inflow.

Current pumping capacity at the Black Diamond pump station is 1.5 mgd. This conceptual project increases the pumping capacity at the existing pump station to the projected 2060 peak flow, which is estimated to be 2.7 mgd. It is assumed that the increase in capacity can be provided through electrical and mechanical upgrades to the existing pump station.

The force main has a capacity of 3.53 mgd and does not require improvements.

Upstream and Downstream Considerations

Upstream Projects: None

Downstream Projects: Black Diamond Trunk Storage and Replacement; South 227th Interceptor Replacement; Auburn Interceptor Sections 1, 2, and 3 Replacement

Concepts Evaluated

No concepts were evaluated.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction	Diameter	Length	Design	Construction

			Methodology	(in)	(ft)	Capacity	Estimate ($2016 x 1M)
Black Diamond Pump Station	N/A	Capacity upgrade	N/A	N/A	N/A	2.7 mgd	$0.42

Total Project Cost

The construction cost estimate for the Black Diamond Pump Station Upgrade Project is $0.42M ($2016). The project cost estimate is $1.37M ($2016) after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
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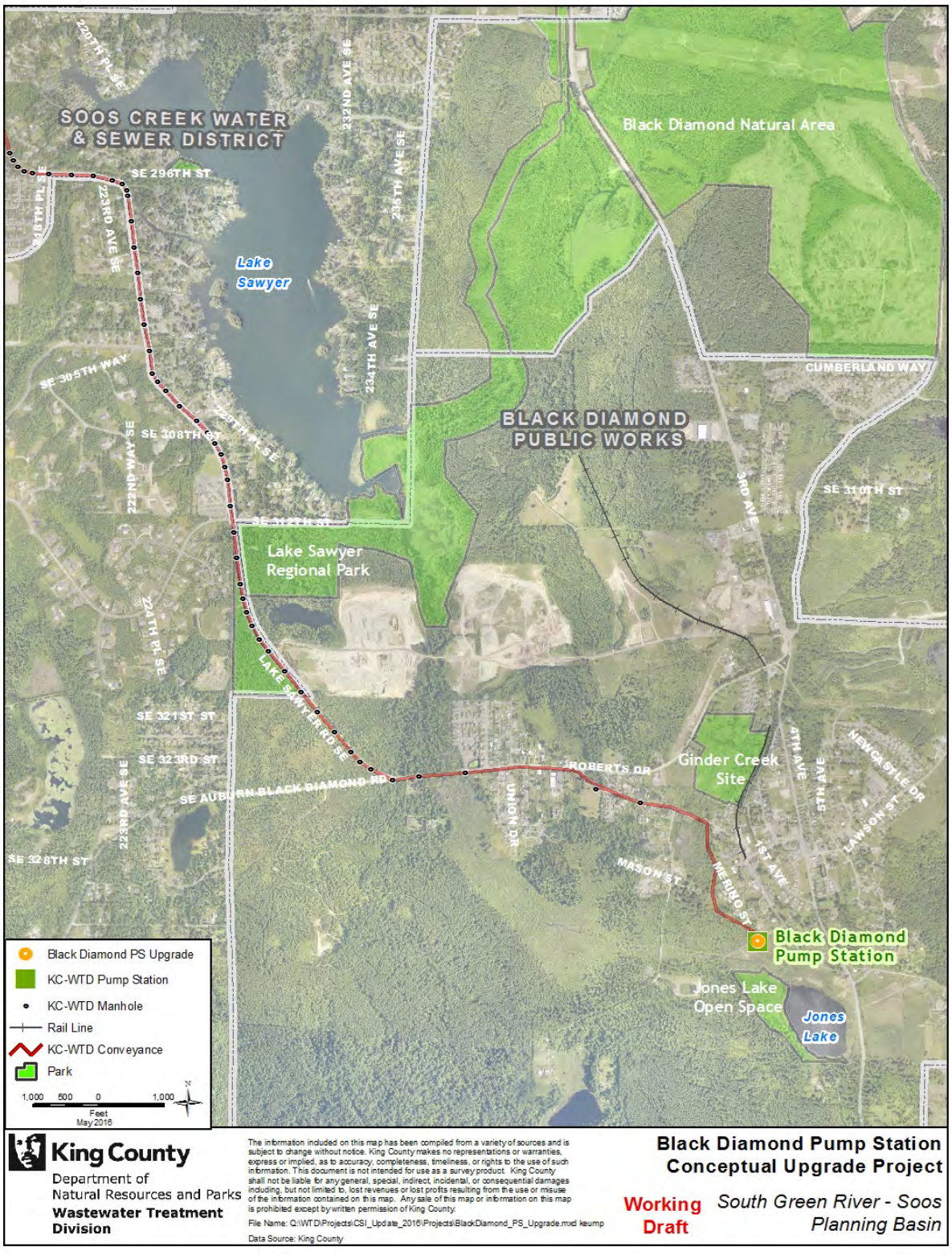
SOOS CREEK WATER & SEWER DISTRICT
Black Diamond Natural Area
Lake Sawyer
BLACK DIAMOND PUBLIC WORKS
Lake Sawyer Regional Park
Ginder Creek Site
Black Diamond Pump Station
Jones Lake Open Space
Jones Lake
SE 296TH ST
223RD AVE SE
232ND AVE SE
235TH AVE SE
224TH AVE SE
SE 305TH WAY
SE 308TH ST
222ND WAY SE
224TH PL SE
SE 321ST ST
SE 323RD ST
SE AUBURN BLACK DIAMOND RD
SE 328TH ST
ROBERTS DR
UNION DR
MASON ST
MERINO ST
1ST AVE
3RD AVE
4TH AVE
5TH AVE
LAWSON ST
NEWCASTLE DR
CUMBERLAND WAY
SE 310TH ST
Black Diamond PS Upgrade
KC-WTD Pump Station
KC-WTD Manhole
Rail Line
KC-WTD Conveyance
Park
1,000 500 0 1,000
Feet
May 2016
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\BlackDiamond_PS_Upgrade.mxd keump
Data Source: King County
Black Diamond Pump Station
Conceptual Upgrade Project
Working Draft
South Green River - Soos Creek Planning Basin

Conceptual Project: Black Diamond Trunk Storage and Replacement

Capacity Needs Addressed

Black Diamond Trunk

Location

Sewer Agency: Black Diamond Public Works; Soos Creek Water and Sewer District
Jurisdiction: Black Diamond, Covington, Maple Valley
Planning Area: South Green River–Soos Creek

Existing Facilities and Capacity Needs

Conveyance Facility	Upstream Manhole	Downstream Manhole	Length (ft)	Diameter (in)	Year Built	Capacity (mgd)	2060 20-yr Peak Flow (mgd)	2060 20-yr Peak Flow Exceeded (mgd)	Year Exceeded	2010 Level of Service (yr)
RE*BLKDIA.121(52)	121	69	18,488	15	1992	1.83	7.59	5.76	2010	14.6
RE*BLKDIA.69(16)	69	53	5,243	12	1992	1.67	7.59	5.92	2010	6.4
RE*BLKDIA.53(27)	53	26	6,368	12	1992	1.75	7.59	5.84	2010	9.7
RE*BLKDIA.26(3)	26	25	469	10	1992	3.14	5.79	2.65	2037	> 20
RE*BLKDIA.25(12)	25	13	3,146	15	1992	1.71	7.59	5.88	2010	7.9
RE*BLKDIA.13(7)	13	06	2,024	12	1992	2.43	7.59	5.16	2016	> 20
RE*BLKDIA.06(3)	06	03	814	15	1992	2.03	7.59	5.56	2011	> 20
RE*BLKDIA.03(2)	03	01	302	15	1992	3.22	7.59	4.37	2024	> 20

Project Description

Components and Construction Methods

The Black Diamond Trunk Storage and Replacement Project uses a phased approach to adding capacity in order to accommodate population growth over time and manage capital costs:

- Phase 1 replaces 4,563 feet of conveyance in the upper reaches of the trunk with 72-inch-diameter pipe to provide conveyance, storage, and peak flow capacity through 2030. This concept assumes that Phase 1 will be designed and constructed to convey a 20-year peak flow through the upper portion of the trunk and provide 0.95 MG of storage to reduce the downstream peak flow by 2.19 mgd and delay the need for downstream improvements. The slope of the 72-inch-diameter pipe will be gentler than the existing pipe to maximize effective storage in the pipe by lowering the invert at the upstream end. The invert at the downstream end of the storage pipe will match the invert of the downstream conveyance pipe to avoid the need for a pump station. Structures associated with operation and maintenance of this facility will be required at the upstream and downstream ends, and possibly above grade. It is expected that the scope of the Phase 1 will be reviewed during project implementation and a lower peak flow capacity may be selected, which would reduce the length of storage pipe constructed in Phase 1.
- Phase 2 downstream improvements beyond 2030 will include replacement of 26,417 feet of the trunk downstream of the storage with 15- to 27-inch-diameter conveyance pipe.

The project will be completed in coordination with the Soos Creek Water and Sewer District. The Black Diamond Trunk delivers wastewater to the district's system, which then conveys flows to WTD's Kent Cascade Relief Interceptor. WTD and the Soos Creek Water and Sewer District intend to continue to work together to manage flows. Improvements to the Black Diamond Trunk will be coordinated with improvements to the district's system.

Upstream and Downstream Considerations

Upstream Projects: Black Diamond Pump Station Upgrade

Downstream Projects: South 227th Interceptor Replacement; Auburn Interceptor Sections 1, 2, and 3 Replacement

Concepts Evaluated

- **Replacement (Phase 1).** Complete replacement of the Black Diamond Trunk would include replacement of 36,358 feet with 24- to 36-inch-diameter pipe. While initial complete replacement of the trunk may result in lower total projects costs, it would not allow for managing capital costs over time and delivering wastewater conveyance capacity as it is needed.

Estimated Project Costs

Construction Costs

Conveyance Facility	Segment (manholes)	Project Element	Construction Methodology	Diameter (in)	Length (ft)	Design Capacity	Construction Estimate ($2016 x 1M)
Phase 1							
RE*BLKDIA.121(52)	113 to 97	Inline storage pipe	Trench-cut	72	4,563	0.95 MG	$7.5
Phase 2							
RE*BLKDIA.121(52)	97 to 69	Pipe replacement	Trench-cut	24	8,051	7.3 mgd	$4.9
	85 to 84	Pipe replacement	Jack and bore	24	60	7.3 mgd	$0.33
RE*BLKDIA.69(16)	69 to 53	Pipe replacement	Trench-cut	21	5,243	7.3 mgd	$2.9
RE*BLKDIA.53(27)	53 to 26	Pipe replacement	Trench-cut	24	6,368	7.3 mgd	$5.8
RE*BLKDIA.26(3)	26 to 25	Parallel siphon 2 of 2; pipe replacement	Horizontal directional drilling	15	469	5.5 mgd	$0.33
RE*BLKDIA.25(12)	25 to 13	Pipe replacement	Trench-cut	27	3,146	7.3 mgd	$2.4
RE*BLKDIA.13(7)	13 to 6	Pipe replacement	Trench-cut	18	2,024	7.3 mgd	$1.1
RE*BLKDIA.06(3)	6 to 3	Pipe replacement	Trench-cut	27	814	7.3 mgd	$0.50
RE*BLKDIA.03(2)	3 to 1	Pipe replacement	Trench-cut	18	302	7.3 mgd	$0.16

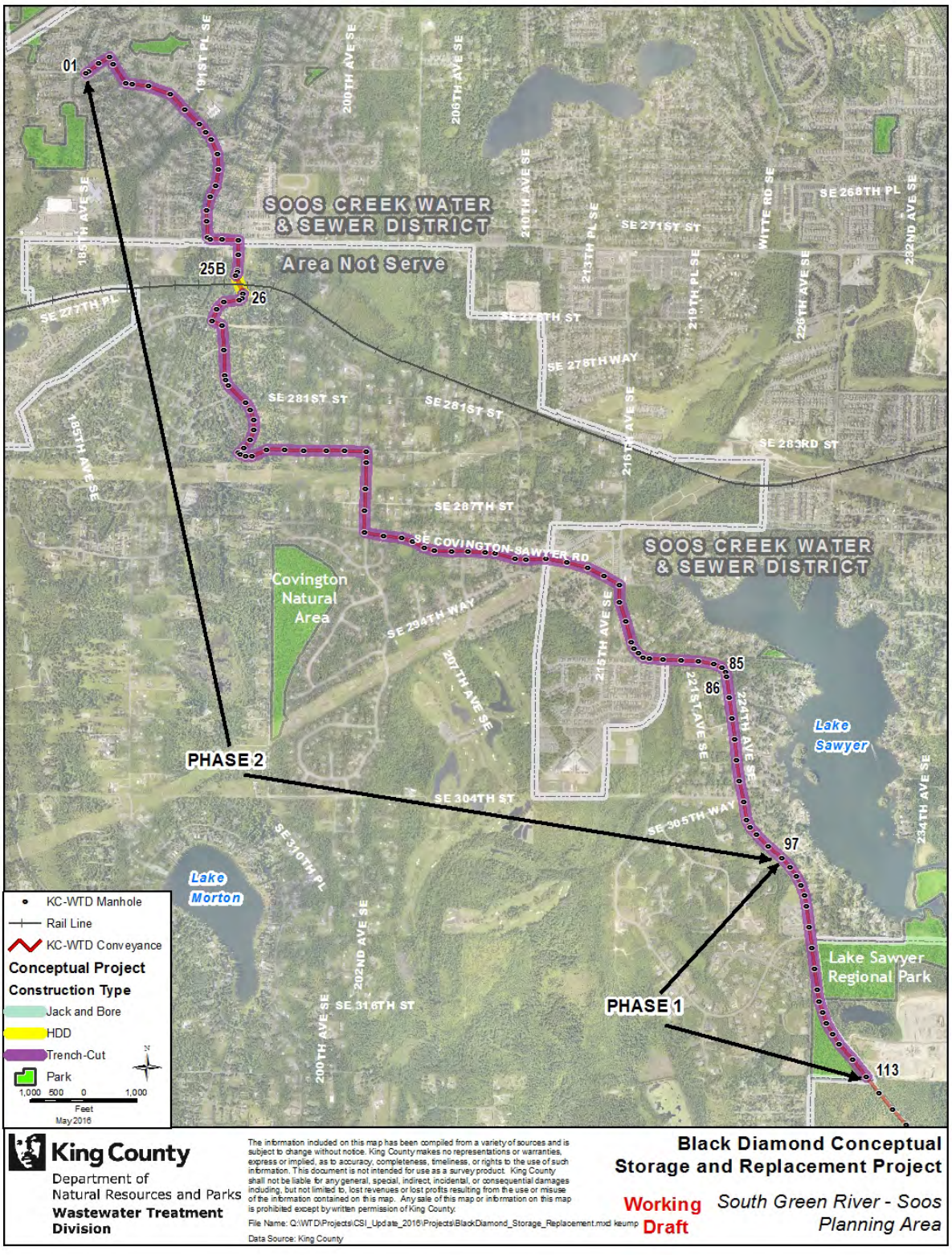
Total Project Cost

The construction cost estimates for the Black Diamond Trunk Project are $7.5M ($2016) for Phase 1 and $18.4M ($2016) for Phase 2. The project cost estimates are $22.8M ($2016) for Phase 1 and $52.3M ($2016) for Phase 2 after applying allied costs, project contingency, and construction cost and change order allowances. Cost estimating methodologies are as follows:

- The construction cost was estimated with Tabula conveyance system cost estimating software. Tabula is a parametric construction cost estimation tool used for conceptual or feasibility studies for projects at the 0 to 2 percent design level. Additional information on Tabula can be found at http://www.kingcounty.gov/services/environment/wastewater/csi/tabula.aspx.
- Allied costs (including design allowance, change order allowance, engineering, permitting, WTD staffing) were estimated based on a percentage of project construction costs in WTD's project

management database, PRISM. These allied cost percentages are based on a statistical analysis of different types and sizes of WTD's historical project costs over time.

- Overall project contingency (30 percent), construction cost allowances for indeterminate items (25 percent), and construction change order allowances (10 percent) are added in accordance with WTD estimating guidelines appropriate to this class of estimate.
- The estimate is an early AACE International Class 5 cost estimate based on 0–2 percent project design. Class 5 estimates are considered to have an accuracy range of -50% to +100 percent. (AACE RP No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries: http://www.aacei.org/toc/toc_18R-97.pdf).


01
25B
26
85
86
97
113
PHASE 1
PHASE 2
SOOS CREEK WATER & SEWER DISTRICT
Area Not Serve
SOOS CREEK WATER & SEWER DISTRICT
Covington Natural Area
Lake Morton
Lake Sawyer
Lake Sawyer Regional Park
SE 277TH PL
SE 281ST ST
SE 287TH ST
SE COVINGTON-SAWYER RD
SE 294TH WAY
SE 304TH ST
SE 305TH WAY
SE 316TH ST
SE 271ST ST
SE 278TH WAY
SE 283RD ST
SE 268TH PL
KC-WTD Manhole
Rail Line
KC-WTD Conveyance
Conceptual Project
Construction Type
Jack and Bore
HDD
Trench-Cut
Park
1,000 500 0 1,000
Feet
May 2016
King County
Department of Natural Resources and Parks
Wastewater Treatment Division
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File Name: Q:\WTD\Projects\CSI_Update_2016\Projects\BlackDiamond_Storage_Replacement.mxd keump
Data Source: King County
Black Diamond Conceptual Storage and Replacement Project
Working Draft
South Green River - Soos Creek Planning Area

South Green River–Auburn Planning Area

No conceptual projects were developed for the South Green River–Auburn Planning Area.