# NORTHSHORE UTILITY DISTRICT

KING COUNTY

WASHINGTON



## WASTEWATER SYSTEM PLAN AMENDMENT TOTEM LAKE CAPACITY ANALYSIS AND IMPROVEMENTS

G&O #20166.24 DECEMBER 2016



### NORTHSHORE UTILITY DISTRICT KING COUNTY WASHINGTON



### WASTEWATER SYSTEM PLAN AMENDMENT TOTEM LAKE CAPACITY ANALYSIS AND IMPROVEMENTS



G&O #20166.24 DECEMBER 2016



### **TABLE OF CONTENTS**

Purpose	1
PLANNING INFORMATION	1
Kirkland Subbasin	3
Future Development and Buildout	3
Modeled Scenarios	3
Sewer Analysis	3
Sewer Flow	4
CAPITAL IMPROVEMENT PROJECTS	5
Totem Lake Trunk Cured-In-Place Pipe (CIPP) Capacity Improvement	5
NE 124 <sup>th</sup> Street 12-Inch Bypass Main	6
Upsize Existing Totem Lake Trunk Line Segment	6
Eastside Collector Trunk	6
Additional Ongoing O&M	7
Model Results	7
SUMMARY OF RECOMMENDATIONS	11

#### LIST OF TABLES

#### No. **Table**

1

#### New Developments and Anticipated Units in Totem Lake ......2 2 3 Eastside Collector Pipe Capacity Summary for 20-Year Partial Buildout 4 5

### **LIST OF FIGURES**

#### No. **Figure**

Totem Lake Revised Zoning Designation	2
Totem Lake Redevelopable Parcels	2
Totem Lake Trunk Pipe Capacity	4
Proposed Capital Improvements.	6
Eastside Collector Diversion	6
	Totem Lake Revised Zoning Designation Totem Lake Redevelopable Parcels Totem Lake Trunk Pipe Capacity Proposed Capital Improvements Eastside Collector Diversion

### **APPENDICES**

Appendix A – Figure 3-6 (Zoning) from 2009 Plan
Appendix B – Projected Additional Equivalent Multi-Family Housing Units for the
Totem Lake Urban Neighborhood
Appendix C – Cost Estimates

#### Page

#### Page

#### PURPOSE

The Northshore Utility District serves a portion of the City of Kirkland, including the Totem Lake Area, which has been designated by the City as an urban neighborhood. In 2015, the City of Kirkland adopted zoning revisions in specific urban neighborhoods, including Totem Lake, that allow for significantly denser development.

The Northshore Utility District provides water and sewer service to the areas impacted by the zoning revisions adopted in the Totem Lake area. The District has determined that the additional density allowed by the City will create capacity deficiencies in its sanitary sewer system.

This report, which will serve as an amendment to the District's existing Wastewater System Plan (Plan) that was approved in 2009, analyzes and catalogs the impacts to the sanitary sewer system in the Totem Lake area, and identifies capital improvements required to mitigate the impacts.

#### PLANNING INFORMATION

In 2015, the City of Kirkland revised the zoning in some of its urban centers, including Totem Lake, to allow for mixed-use development in areas that were previously designated as commercial, industrial, or office. This change allows for significantly denser development to occur. The revised zoning from the 2015 action taken by the City is shown in Figure 1. The original zoning within the area is shown on Figure 3-6 from the 2009 Plan, included in Appendix A for reference.

Figure 2 includes the Totem Lake neighborhood boundary and the District's service boundary in the Totem Lake area.

The expected growth in the area was calculated by Kirkland for each parcel in terms of residential and employment square footage. For the Totem Lake development, the majority of the growth will be multi-family units (MFUs) because of the mixed-use zoning designation. One MFU is estimated to produce approximately 60 percent of the flow of a single-family residence. For this amendment, all units are assumed to be MFUs, and the residential and employment values from Kirkland are converted to equivalent MFUs.

The 2009 Plan established an average sewer usage of 71 gallons per capita per day (gpcd) and an average of 2.5 people per unit to estimate residential sewer demands throughout the District. As the District includes mostly single-family residences, the usage rate was scaled down by 60 percent to determine the number of equivalent MFUs within the Totem Lake neighborhood. Currently, approximately 9,460 MFUs contribute sewer flow to the Totem Lake trunk line, as calculated from 2005 sewer flows.

Kirkland's development analysis estimates four employees per 1,000 square feet of office area, 1.7 employees per 1,000 square feet of industrial area, and two employees per 1,000 square feet of commercial area. Sewer loading is estimated at 40 gallons per day (gpd) per employee. Each employee, therefore, contributes the equivalent of 0.135 MFU of sewage to the system. The number of equivalent MFUs based on employment was added to the residential equivalent MFUs to determine the total number of equivalent MFUs within the basin.

From Kirkland's projections, it is anticipated that up to 4,656 new equivalent MFUs will be developed in Totem Lake within the District's service area due to the rezoning. These units are projected as part of the City's "base" redevelopment scenario. The City also developed an "alternative" redevelopment scenario, which projects up to 14,770 new equivalent MFUs within the District's service area in Totem Lake.

The redevelopable parcels identified by Kirkland in the base redevelopment scenario that are within the District's service area are shown on Figure 2.

Table 1 includes the estimated number of additional units that may be constructed in Totem Lake in the District's service area due to the rezoning within the next 10 years. The 10-year horizon will be used for planning. Table 1 also includes projections for partial buildout in the 20-year horizon and full buildout. Appendix B includes the determination of additional employment and multi-family units per parcel within the District's Totem Lake service area. A map developed by Kirkland is also included, showing the location of each parcel identified in the base redevelopment scenario.

#### **TABLE 1**

	Development	Number of Additional Equivalent Multi-Family Units
Base	Kirkland Rezoning (multiple developments)	3,597
Redevelopment	The Village at Totem Lake	1,059
Scenario	Subtotal	4,656
Additional Redevelopment Planned at this Time	Lennar Development	336
10-year Base Redevelopment Scenario Subtotal (Modeled)		4,992
Kirkland Subbasin	Wolff Development	550
10-year Additional Developments Scenario Total (Modeled)		5,542
Additional Partial Buildout Potential	Kirkland Rezoning (multiple developments)	7,373
20-year Partial Buildout Scenario Total (Modeled)		12,915
Full Buildout Total	15,656	

#### New Developments and Anticipated Units in Totem Lake

2





#### KIRKLAND SUBBASIN

In the Kirkland subbasin, shown on Figures 1 and 2 as an orange hatched area, 550 new units are currently planned as of the writing of this amendment in addition to the units planned in the City's redevelopment scenarios. These units were included in the capacity modeling analysis but are outside of the District's service area. These units are included in an area of Kirkland that is served by the District under a wholesale agreement. These 550 new units were added to the 4,992 units in the 10-year Base Redevelopment scenario, resulting in 5,542 new units modeled for the 10-year Additional Developments Scenario.

#### FUTURE DEVELOPMENT AND BUILDOUT

The 20-year Partial Buildout Scenario represents an estimate of the potential development in the area, past the base development scenario. This scenario assumes approximately 80 percent of the units projected under full buildout are constructed in the 20-year horizon. This equates to a total of 12,915 additional equivalent multi-family units. For planning purposes, the Partial Buildout Scenario is anticipated to be built in the next 20 years.

The Full Buildout Scenario includes approximately 2,700 additional units. This scenario was not modeled as conversations with the City have indicated that the anticipated 20-year level of development will not reach the full buildout level. The extent and rate of development in the Totem Lake area should be reassessed as future improvements for the District's system are planned and designed to determine whether the full buildout development may occur.

#### MODELED SCENARIOS

The 10-year Base Development Scenario, 10-year Additional Developments Scenario, and 20-year Partial Buildout Scenario were modeled to determine the effects of the various levels of development that are anticipated over the planning period.

### SEWER ANALYSIS

In order to evaluate the impact of the expected growth in the Totem Lake area, Gray & Osborne developed a sewer model for the District's existing sewer infrastructure within the area. The model focused on the Totem Lake Trunk line, which is aligned under I-405 and connects to the King County Sewer system west of Juanita High School as shown in Figure 2. The hydraulic modeling software used for this analysis was the InfoSewer application in ArcMap 10.1. The District's GIS mapping was used to confirm the elevations of components in the sewer system.

The District developed a hydraulic model of the sanitary sewer system as part of the 2009 Wastewater Comprehensive Plan. The network and catchment information developed for that Plan was used in the Totem Lake Trunk line analysis.

The District placed multiple flow monitoring devices in the Totem Lake area in 2015 and 2016. The monitoring data were compared to the modeling results and was used to refine the modeling assumptions.

#### SEWER FLOW

Sewer flow data from 2005 was used to estimate the average daily flows for the District's sewer customers in the majority of the basins analyzed, where more recent data were unavailable. Peak inflow and infiltration (I&I) from each basin, both existing and proposed, was based on a daily peak I&I rate of 1,100 gallons per acre per day (gpad), which was the rate used in the development of the District's 2006 Wastewater Comprehensive Plan. The diurnal curve developed in the 2009 Wastewater System Plan was used to scale sewer base flows on an hourly basis, with the highest flows occuring mid-morning and the lowest flows occurring just after midnight. I&I flows were assumed to remain constant throughout the day and were not peaked. King County has recently reevaluated its I&I rate recommendations, increasing the rate to 2,000 gpad for new pipes. The District intends to revisit its I&I assumptions in the next 5 years through flow monitoring and will revise the modeling presented in this amendment, if necessary, based on future analysis.

Water consumption data from 2013 and 2015 were used to estimate additional loading from customers in Kirkland subbasin. Sewer flow was assumed to be 90 percent of the average daily water use.

The flows included in the modeling analysis are approximately 15 percent greater than the calculated flows for the future development; therefore, the model represents a conservative analysis of the potential future loading to the District's sewer system.

Table 2 includes the additional peak hour flows anticipated under each modeled scenario. These flows would contribute to the Totem Lake Trunk if alternative diversions are not constructed. Figure 3 shows the trunk sections that are over capacity under existing flow conditions.



#### TABLE 2

#### Modeled Peak Hour Flows (gpm)

		<b>Peak Hour Flow</b>
	Scenario	(gpm)
Existing Flo	DWS	2,582
Additional	Base Redevelopment – 10-year	1,369
Flow	Additional Redevelopment – 10-year (Kirkland Subbasin)	197
FIOWS	Partial Buildout – 20-year	1,850
Total		5,998

#### CAPITAL IMPROVEMENT PROJECTS

The following Capital Improvement Projects were developed during the revised sewer capacity analysis. The detailed cost breakdowns of each project are included in Appendix C. Figures 4 and 5 include the locations of the proposed CIPs.

# TOTEM LAKE TRUNK CURED-IN-PLACE PIPE (CIPP) CAPACITY IMPROVEMENT

The Totem Lake Trunk is over capacity in sections, even under existing flow conditions. Additional flows from the potential future Totem Lake developments will cause further stress and increase surcharging<sup>1</sup> throughout the trunk. CIPP rehabilitation of the trunk would improve the pipe's interior smoothness, increasing capacity within the trunk line while slightly decreasing the pipe diameter. The District has employed CIPP technology in other sewer mains in the past as a method of increasing capacity with minimal system downtime and disturbance.

The trunk line proposed to undergo CIPP rehabilitation extends west approximately from the east side of I-405, along Totem Lake Boulevard NE (identified as pipe 6322 in the model) at the upstream end to the King County Metro Connection near 100<sup>th</sup> Avenue NE and NE 129<sup>th</sup> Place as shown on Figure 4. This section includes 3,519 feet of 18-inch-diameter sewer main and 2,117 feet of 21-inch-diameter sewer main. Approximately 1,257 feet of 21-inch-diameter sewer main along the trunk in the vicinity of Juanita High School was rehabilitated with CIPP in the past year and as such will not be included in this project.

It is anticipated that this project would be completed in phases, and that the entire trunk line will not be improved all at once. The CIPP rehabilitation would occur in portions of the trunk downstream of the newly developed areas as each development occurs.

5

<sup>&</sup>lt;sup>1</sup> Surcharging in a pipe occurs when the entrance and exit of the pipe are submerged and the pipe is flowing full and under pressure.

Northshore Utility District

The estimated cost associated with this project is \$1,530,000.

#### NE 124<sup>TH</sup> STREET 12-INCH BYPASS MAIN

In order to accommodate increased flows from a proposed development to be located at 11725 NE 118<sup>th</sup> Street in Kirkland, a new bypass will be installed on NE 124<sup>th</sup> Street. The bypass will reroute flows from the new and existing sewer connections located south of NE 124<sup>th</sup> Street at 113<sup>th</sup> Avenue NE to the Totem Lake Trunk line further downstream, near Juanita High School, to alleviate some of the loading on the upstream portions of the trunk. The bypass includes approximately 1,300 feet of 12-inch-diameter sewer main directed west along NE 124<sup>th</sup> Street and north, behind the properties on 107<sup>th</sup> Place NE, from the District's existing system at the intersection of 113<sup>th</sup> Avenue NE and NE 124<sup>th</sup> Street to the Totem Lake Trunk line east of Juanita High School.

Approximately 220 feet of existing 8-inch-diameter sewer main would be abandoned during this project.

The estimated cost associated with this project is \$672,000.

#### UPSIZE EXISTING TOTEM LAKE TRUNK LINE SEGMENT

A small section of the Totem Lake Trunk line is over capacity primarily due to its slight slope. The existing 21-inch-diameter pipe located to the east of Juanita High School (identified as pipe 6196 in the model and on Figure 3) is 430 feet long and has already been lined using CIPP, making it ineligible for capacity improvement under CIP 1, above. This project will include the removal of the existing 21-inch-diameter pipe and the installation of a new 30-inch-diameter pipe. Temporary bypass of the sewer system will be necessary for the construction of this project.

The estimated cost associated with this project is \$485,000.

#### EASTSIDE COLLECTOR TRUNK

As a long-term capacity improvement, sewer flows may be diverted from the sewer basins upstream (east) of the Totem Lake Trunk line in order to alleviate some of the loading on the main. A number of sewer basins to the east of the Totem Lake area that currently contribute sewer flows to the Totem Lake Trunk line could be diverted to flow east to the King County York lift station, located at the intersection of NE 124<sup>th</sup> Street and Willows Road in Kirkland. The total peak hour flows diverted away from the Totem Lake Trunk to the York lift station are estimated to be approximately 2,230 gpm at the 20-year horizon. Improvements to the York Lift Station are anticipated to occur in 2021, according to King County.

This project would require the construction of an 18-inch-diameter and 24-inch-diameter main aligned along the former BNSF Railway corridor that is now owned by the City of





Kirkland. Additional 12-inch-diameter and 8-inch-diameter mains would collect and convey flows from the existing basins to the new trunk line, as shown in Figure 5.

This project will require intensive coordination with King County to determine the impact of diverting additional flows from the District's system to the County's system and to resolve the logistics of constructing a connection to the County's lift station.

The estimated cost associated with this project is \$5,866,000.

#### ADDITIONAL ONGOING O&M

The trunk line would also benefit from additional and ongoing maintenance, such as flushing and jetting the trunk line below the highway. In the future, as flows are diverted away and the trunk conveys flows below its designed capacity the trunk line will require additional maintenance to clear debris. This alternative was not included in modeling.

The estimated cost associated with this effort is \$417,000.

### **MODEL RESULTS**

The sewer model was run under a number of different flow scenarios. First, the existing system was modeled with existing and future flows to establish a baseline of the impacts of each stage of future development. The capital improvements detailed above were then modeled and compared to the baseline scenario in order to determine the potential to manage projected future flows with the proposed improvements.

The model and flow data indicate that the existing Totem Lake Trunk line serving the region is at capacity in some areas and near capacity in others. The existing infrastructure is not able to provide the desired level of service for the anticipated growth. Figure 3 shows the pipes within the trunk that are currently over capacity, or that will be over capacity with future development if improvements are not implemented.

The projected future flows were modeled in phases – the first flows added are from the estimated 4,992 units included in the 10-year Base Redevelopment scenario; next, flows projected for the remaining 550 units included in the 10-year Additional Redevelopment scenario for the Kirkland Subbasin were added; finally, the Partial Buildout scenario for the 20-year horizon added flows from an additional 7,373 units.

Table 3 includes the percent capacity of each pipe modeled along the trunk line under the Existing and 20-year Partial Buildout Scenario. As seen in the second column, the Totem Lake Trunk line is already overcapacity under existing flows. Figures 2, 3, and 4 include the pipe ID numbers as listed in Table 3, for reference.

Each successive addition of flows causes further stress on the already overcapacity Totem Lake Trunk line. The 124<sup>th</sup> Street bypass and trunk CIPP improvements mitigate the

7

impacts of the new developments, but are unable to solve the capacity issues entirely. The location and extent of these CIPs is shown on Figure 4. The Eastside Collector is proposed to reroute some of the sewer flows upstream of Totem Lake to King County's York lift station to the east, alleviating the load on the Totem Lake Trunk line. The proposed alignment can be seen on Figure 5.

A number of the District's sewer basins could be captured by this bypass trunk. As demonstrated, the current and projected flows tributary to the Totem Lake Trunk cause surcharging throughout the trunk. The Eastside Collector would be able to reduce peak flows to the Totem Lake Trunk by over 1,500 gpm.

The modeling for the evaluation of the Eastside Collector was developed assuming that the Totem Lake Trunk line CIPP project is completed and the NE 124<sup>th</sup> Street 12-inch bypass main project is constructed.

TABLE 3	5
---------	---

#### Pipe Capacity Summary – Percent Full Under Each Scenario

	Pine		Redevelopment Scenario: 20-Year Partial Buildout
	ID	Existing Flows and Pipes	124 <sup>th</sup> Bypass, Full CIPP, Eastside Collector
	413	12%	0%
	412	53%	2%
	411	54%	2%
	409	50%	2%
	408	98%	3%
	6324	85%	3%
	6323	82%	3%
e	6322	46%	44%
ŗ.	6321 <sup>1</sup>	100%	100%
lk I	6320	70%	67%
un.	6211	31%	30%
L	6210	80%	83%
ıke	6207	84%	110%
Ľ	6206	84%	110%
em	6205	94%	123%
lot	6203	76%	99%
	6202	59%	70%
	6201	72%	85%
	6200	98%	117%
	6199	44%	62%
	6198	66%	94%
	6197	74%	104%
	6196	112%	91%
	6195	59%	89%

Northshore Utility District Wastewater System Plan Amendment Totem Lake Capacity Analysis and Improvements

#### TABLE 3 – (continued)

#### Pipe Capacity Summary – Percent Full Under Each Scenario

	Pine		Redevelopment Scenario: 20-year Partial Buildout	
	ID	<b>Existing Flows and Pipes</b>	124 <sup>th</sup> Bypass, Full CIPP, Eastside Collector	
	6146	112%	135%	
ne	6147	113%	136%	
Li	6150	113%	136%	
nk	6151	113%	136%	
<u>ru</u>	6152	113%	136%	
e T	6153	11%	13%	
,ak	6123	117%	141%	
nI	6111	53%	63%	
ten	6112	48%	57%	
$\mathbf{T}_{0}$	6113	30%	36%	
	6116	24%	28%	
	51042		6%	
	51040		17%	
	51032		18%	
	51030		18%	
	51028		18%	
	51026		34%	
$\mathbf{r}^{(2)}$	51024		34%	
cto	51022		34%	
lle	51020		34%	
Co	51018		34%	
de	51016		34%	
stsi	51014		23%	
Ea	51012		60%	
	51010		60%	
	51008		62%	
	51006		62%	
	51004		62%	
	51002		62%	
	51000		9%	

(1) Pipe 6231 is currently installed at a negative slope.

(2) The Eastside Collector was not modeled in the existing scenario.

Under the 20-year Partial Buildout Scenario shown in Table 3, which includes a total of approximately 13,000 new multi-family units, the Eastside Collector is at approximately 60 percent capacity if it is composed of 12-, 18-, and 24-inch pipes. Also under this scenario, the Totem Lake Trunk is seen to be over capacity, even with all of the proposed improvements and the Eastside Collector Diversion.

In the future, the District plans to divert flows from approximately 3,000 new units in the Totem Lake Mall area (shown on Figure 5) to the Eastside Collector by gravity flow, further reducing the load on the Totem Lake Trunk. By rerouting these additional flows, the burden on the overcapacity sections of the Totem Lake Trunk is alleviated. However, the 24-inch Eastside Collector would reach capacity under the 20-year Partial Buildout Scenario with the additional flow diversion. Table 4 includes a comparison of the capacity of the Eastside Collector with 24-inch pipes versus 36-inch pipes.

The Eastside Collector project has been identified as the most feasible and effective longterm solution to address future capacity problems in the Totem Lake area. The District plans to revisit this capacity analysis at the time of the Eastside Collector design to verify the appropriate design capacity for the trunk, considering the level of development that occurs over the next several years.

#### **TABLE 4**

#### Eastside Collector Pipe Capacity Summary for 20-Year Partial Buildout Scenario – Pipe Size Analysis

		Percent Capacity		Percent Capacity
D	<b>.</b> .	with Additional		with Additional
Pipe	Proposed	Totem Lake Mall	Increased	Totem Lake Mall
ID	Pipe Size	Diversion	Pipe Size	Diversion
51042	12	6%	12	6%
51040	12	17%	12	17%
51032	18	74%	18	74%
51030	18	74%	18	74%
51028	18	74%	18	74%
51026	18	91%	24	42%
51024	18	91%	24	42%
51022	18	90%	24	42%
51020	18	91%	24	42%
51018	18	91%	24	42%
51016	18	91%	24	42%
51014	24	56%	24	56%
51012	24	93%	36	51%
51010	24	93%	36	51%
51008	24	95%	36	52%
51006	24	95%	36	52%
51004	24	96%	36	53%
51002	24	95%	36	52%
51000	24	14%	36	8%

Increasing the pipe size would allow the new trunk to have plenty of capacity for the 20-year scenario and beyond, but at a much greater cost.

#### SUMMARY OF RECOMMENDATIONS

A summary of the costs for each of the capital improvements projects detailed earlier in this amendment are presented in Table 5 below.

It is recommended that the Totem Lake Trunk CIPP project, the Totem Lake Trunk Segment Upsizing Project, and the NE 124<sup>th</sup> Street Bypass be constructed in the next three years in anticipation of new development in the area. These projects will increase capacity in the Totem Lake Trunk, which is already stressed by the existing flow load, and prepare the trunk for future increases in flow.

It is anticipated that the Eastside Collector Trunk will be completed in the 10- to 20-year planning horizon. The level of development in the Totem Lake area should be reassessed during design of the trunk to determine the appropriate pipe size.

The planned O&M efforts should be conducted on a continuous, as-needed basis to maintain the performance of the sewer system in the Totem Lake area.

#### TABLE 5

Project	Cost	Recommended Timeline for Implementation
Totem Lake Trunk CIPP Capacity Improvement	\$1,530,000	3-Year
NE 124 <sup>th</sup> Street 12-inch Bypass Main	\$672,000	3-Year
Upsize Existing Totem Lake Trunk Line Segment	\$485,000	3-Year
Eastside Collector Trunk	\$5,866,000	10- to 20-Year
Additional Ongoing O&M	\$417,000	
Total	\$8,970,000	

#### **Summary of Capital Improvement Projects**

## APPENDIX A

# FIGURE 3-6 (ZONING) FROM 2009 PLAN



### **APPENDIX B**

### PROJECTED ADDITIONAL EQUIVALENT MULTI-FAMILY HOUSING UNITS FOR THE TOTEM LAKE URBAN NEIGHBORHOOD

Northshore Utility District
Projected Additional Equivalent Multi-Family Housing Units for the Totem Lake Urban Neighborhood
From the City of Kirkland Base Analysis - NUD Service Boundary Only - Year 2035

Explaration of Projections Calculation: The following commercial, industrial, and office space projections, as well as the conversion factors for space to employees, are from the Kirkland analysis. The highlighted blue are existing parcels that are presently developed, the purple are vacant, the green is the Village at Totem Lake, and the yellow is known development that has transpired since the Kirkland Base Analysis was completed, which were not included in the Kirkland Base analysis. The parcels used are only those that are located within the Kirkland Totem Lake, and the yellow is known development that has transpired since the Kirkland Base Analysis was completed, which were not included in the Kirkland Base analysis. The parcels used are only those that are located within the Kirkland Totem Lake Urban Boundary and the District's sanitary sewer service boundary, including the area that is within the Kirkland Boundary that is proposed to be served by the District through an Interiocal Agreement.

C1515 11/1/2016 14:28 KAS

Summary Results - Projected Additional Equivalent Multi-Family Housing Units - 2035	
Basis of Projections	Additional MF Units
Kirkland Base Analysis 4,65	
Kirkland Base Analysis plus Additional Known	
Development not included in Kirkland Base 5,542	

Г

Conversion Factors - Building Use to Employees								
Bldg. Use	Employees per 1,000 feet							
Commercial 2								
Industrial	1.7							
Office	4							

Conversion Factor - Employees to Equivalent Multi-Family Housing Units									
Employee Waste Discharge	40	gpd/employee							
SF Resident Waste Discharge	71	gpd/SF Resident							
Persons per SF Residence	2.5	SF Resident/SF Residence							
MF Unit per SF Unit	0.6	MF Unit/SF Unit							
Equivalent MF Units per Employee	0.135	Eq MF Units/ Employee							

					Subtotal				Subtotal Equivalent		
		Commercial	Subtotal Commercial	Industrial	Industrial	Office	Subtotal Office	Total	MF Units from	from	Total Additional
No.	Tax ID No.	Space, SF	Employees	Space, SF	Employees	Space, SF	Employees	Employees	Employees	Redevelopment	MF Units
1	2726059057	-4,280	-9	11,918	20	13,905	56	67	9	0	9
4	2826059032	11,231	22	0	0	154,554	618	641	87	82	169
6	2826059101	8,449	17	0	0	0	0	17	2	94	96
7	2826059153	3,685	7	0	0	0	0	7	1	63	64
8	2826059186	4,714	9	0	0	34,243	137	146	20	18	38
9	2826059187	8,049	16	0	0	67,784	271	287	39	36	75
10	2826059188	10,141	20	0	0	0	0	20	3	93	96
11	2826059223	4,013	8	0	0	0	0	8	1	53	54
12	2926059030	8,807	18	0	0	58,817	235	253	34	31	65
13	2926059171	6,813	14	0	0	0	0	14	2	76	78
14	2926059191	1,914	4	0	0	0	0	4	1	41	42
15	6928400031	4,572	9	0	0	21,037	84	93	13	0	13
16	6928400033	5,437	11	0	0	0	0	11	1	110	111
17	8663270010	-5,423	-11	0	0	0	0	-11	-1	395	394
18	2726059043	0	0	42,022	71	64,944	260	331	45	0	45
19	2726059051	0	0	19,643	33	36,917	148	181	24	0	24
20	2726059061	0	0	38,860	66	76,921	308	374	51	0	51
21	2726059080	10,425	21	-4,000	-7	0	0	14	2	95	97
22	2826059004	45,345	91	-10,376	-18	0	0	73	10	15	25
23	2826059062	30,299	61	-22,000	-37	0	0	23	3	278	281
24	2826059063	39,028	78	-40,479	-69	0	0	9	1	358	359
25	2826059105	0	0	4,554	8	24,409	98	105	14	0	14
26	2826059134	36,944	74	-16,038	-27	172,404	690	736	100	197	297
27	2826059173	7,753	16	-6,975	-12	0	0	4	0	71	71
28	2826059176	9,956	20	-9,600	-16	0	0	4	0	91	91
29	2826059177	6,347	13	-6,558	-11	0	0	2	0	58	58
35	3326059010	0	0	0	0	75,621	302	302	41	0	41
36	2826059181	44,486	89	0	0	0	0	89	12	565	577
37	2726059006	0	0	923	2	1,077	4	6	1	0	1
38	2726059007	0	0	27,866	47	32,510	130	177	24	0	24
39	3326059010	0	0	0	0	0	0	0	0	73	73
43	2826059098	7,219	14	0	0	0	0	14	2	66	68
44	2826059110	0	0	6,353	11	7,411	30	40	5	0	5
45	2826059249	9,709	19	0	0	0	0	19	3	89	92
A	Village at Totem Lake								209	850	1,059
B	Lennar									336	336
C	Litebridge Church					1	1	1	1	550	550



# **APPENDIX C**

# **COST ESTIMATES**

#### Northshore Utility District - Totem Lake Sewer System Capacity Expansion <u>Project Cost Estimate Summary</u>

9/12/2016 C1515 DPK

Item No.	Description	Estimated Project Cost
1	Sanitary Sewer Trunk - East Collector	\$5,866,160
2	Totem Lake Sewer Trunk - NE 124th St Bypass	\$671,876
3	Totem Lake Sewer Trunk - Juanita High School Segment Replacement	\$484,572
4	Totem Lake Sewer Trunk - Cured-in-Place-Pipe Rehabilitation	\$1,529,665
5	Totem Lake Sewer Trunk - Additional Operation & Maintenance Costs	\$417,264
	Total Estimated Project Cost	\$8,969,537

#### Northshore Utility District - Totem Lake Sewer System Capacity Expansion Sanitary Sewer Trunk - East Collector

9/12/2016 C1515

#### DPK

#### Project Cost Estimate

Item	Description	Units	Quantity	Unit Price	Quantity		Amount	
110.	Mobilization	19	1	\$ 300,000,00	1		\$	300 000 00
2	Trench Safety Systems		1	\$ 300,000.00	1		ψ \$	100,000.00
3	TESC		1	\$ 50,000,00	1	50,000,000	<u>Ψ</u> \$	50,000,00
4	24" D L Sewer Main	IF	2 355	\$ 215.00	2 355	215.00	\$	506 325 00
5	24" PVC Sewer Main	I F	1,375	\$ 190.00	1,375	190.00	\$	261 250 00
6	18" D L Sewer Main	I F	2 300	\$ 160.00	2,300	160.00	\$	368,000,00
7	18" PVC Sewer Main	I F	400	\$ 140.00	400	140.00	\$	56 000 00
8	12" D L Sewer Main	I F	180	\$ 120.00	180	120.00	\$	21 600 00
9	12" PVC Sewer Main	LF	945	\$ 110.00	945	110.00	\$	103,950.00
10	8" D.I. Sewer Main	LF	220	\$ 100.00	220	100.00	\$	22,000.00
11	8" PVC Sewer Main	LF	1.185	\$ 90.00	1.185	90.00	\$	106.650.00
12	6" PVC Side Sewer	LF	410	\$ 80.00	410	80.00	\$	32.800.00
13	36" Bored Steel Casing Pipe	LF	190	\$ 1.500.00	190	1.500.00	\$	285.000.00
14	6" Steel Pipe Piles	VF	7,500	\$ 30.00	7,500	30.00	\$	225,000.00
15	48" Shallow Sewer Manhole	EA	14	\$ 4,000.00	14	4,000.00	\$	56,000.00
16	48" Sewer Manhole	EA	28	\$ 5.000.00	28	5.000.00	\$	140.000.00
17	54" Drop Sewer Manhole	EA	8	\$ 6,500.00	8	6,500.00	\$	52,000.00
18	Sewer Manhole Extra Depth	VF	200	\$ 250.00	200	250.00	\$	50,000.00
19	Connection to Existing Sewer System	EA	27	\$ 3,000.00	27	3,000.00	\$	81,000.00
20	Abandon Existing Sewer Manhole	EA	14	\$ 2,000.00	14	2,000.00	\$	28,000.00
21	High Pressure Gas Pipeline Crossing	LS	1	\$ 15,000.00	1	15,000.00	\$	15,000.00
22	Imported Foundation Gravel	TN	2,000	\$ 25.00	2,000	25.00	\$	50,000.00
23	Imported Backfill Gravel	TN	15,000	\$ 18.00	15,000	18.00	\$	270,000.00
24	Crushed Rock	TN	11,500	\$ 20.00	11,500	20.00	\$	230,000.00
25	Asphalt Trench Patch	TN	550	\$ 125.00	550	125.00	\$	68,750.00
26	Asphalt Overlay	TN	650	\$ 175.00	650	175.00	\$	113,750.00
27	General Restoration	LS	1	\$ 75,000.00	1	75,000.00	\$	75,000.00

Subtotal \$ 3,668,075.00 Sales Tax, 9.5% \$ 348,467.13

Estimated Construction Cost \$ 4,016,542.13

#### **Estimated Project Cost**

S	Subtotal Construction Cost	\$ 3,668,075.00
15%	Construction Contingency	\$ 550,211.25
S	Subtotal Construction Cost	\$ 4,218,286.25
	9.5% Sales Tax	\$ 400,737.19
Total Est	timated Construction Cost	\$ 4,619,023.44
	15% Design & Mapping	\$ 692,853.52
5%	Permitting & Permit Fees	\$ 230,951.17
7% <u>C</u>	onstruction Administration	\$ 323,331.64
	Estimated Project Cost	\$ 5,866,159.77

#### Northshore Utility District - Totem Lake Sewer System Capacity Expansion <u>Totem Lake Sewer Trunk - NE 124th St Bypass</u> Project Cost Estimate

9/12/2016 C1515 DPK

Item No.	Description	Units	Quantity		Unit Price	Amount
1	Mobilization	LS	1	\$	50,000.00	\$ 50,000.00
2	Trench Safety Systems	LS	1	\$	25,000.00	\$ 25,000.00
3	12" PVC Sewer Pipe	LF	1,300	\$	125.00	\$ 162,500.00
4	48" Sewer Manhole	EA	4	\$	5,000.00	\$ 20,000.00
5	Connection to Existing Sewer System	EA	2	\$	3,000.00	\$ 6,000.00
6	Imported Foundation Gravel (if required)	TN	200	\$	25.00	\$ 5,000.00
7	Crushed Rock	TN	3,000	\$	20.00	\$ 60,000.00
8	Asphalt Paving	TN	600	\$	150.00	\$ 90,000.00
9	T.E.S.C.	LS	1	\$	10,000.00	\$ 10,000.00
10	General Restoration	LS	1	\$	25,000.00	\$ 25,000.00
					Subtotal	\$ 453,500.00
					Sales Tax, 9.5%	\$ 43,082.50
			Esti	mate	d Construction Cost	\$ 496,582.50

#### **Estimated Project Cost**

Estimated Project Cost	\$ 671,876.12
7% Construction Administration	\$ 38,236.85
4% Permitting & Permit Fees	\$ 21,849.63
12% Design & Mapping	\$ 65,548.89
Total Estimated Construction Cost	\$ 546,240.75
9.5% Sales Tax	\$ 47,390.75
Subtotal Construction Cost	\$ 498,850.00
10% Construction Contingency	\$ 45,350.00
Subtotal Construction Cost	\$ 453,500.00

#### Northshore Utility District - Totem Lake Sewer System Capacity Expansion <u>Totem Lake Sewer Trunk - Juanita High School Segment Replacement</u> Project Cost Estimate

9/12/2016 C1515 DPK

Item	Description	Units	Quantity	Unit Price		Amount				
1 1	Mobilization	IS	1	\$ 28,000,00	2 (	28 000 00				
2	Trench Safety Systems	LS	1	\$ 25,000.00	) \$	25,000.00				
3	30" PVC Sewer Line	LF	430	\$ 300.00	) \$	129,000.00				
4	Connection to Existing Sewer System	EA	2	\$ 5,000.00	) \$	10,000.00				
5	Imported Foundation Gravel (if required)	TN	200	\$ 50.00	) \$	10,000.00				
6	Imported Backfill Gravel	TN	1,000	\$ 25.00	) \$	25,000.00				
7	T.E.S.C.	LS	1	\$ 5,000.00	) \$	5,000.00				
8	General Restoration	LS	1	\$ 25,000.00	) \$	25,000.00				
9	Temporary Bypass Pumping	LS	1	\$ 25,000.00	) \$	25,000.00				
10	54-Inch Diam. Manhole	EA	2	\$ 7,700.00	) \$	15,400.00				
11	Sewer Manhole Extra Depth	VF	16	\$ 350.00	) \$	5,600.00				
-				Subtota	I \$	303,000.00				
				Sales Tax, 9.5%	\$	28,785.00				
			Estir	nated Construction Cos	t \$	331,785.00				
	Estimated Project Cost									

Estimated Project Cost Subtotal Construction Cost \$ 303,000.00 15% Construction Contingency \$ 45,450.00 Subtotal Construction Cost \$ 348,450.00 9.5% Sales Tax \$ 33,102.75 Total Estimated Construction Cost \$ 381,552.75 15% Design & Mapping \$ 57,232.91 5% Permitting & Permit Fees \$ 19,077.64 7% Construction Administration \$ 26,708.69 Estimated Project Cost \$ 484,571.99

#### Northshore Utility District - Totem Lake Sewer System Capacity Expansion Totem Lake Sewer Trunk - Cured-in-Place Pipe Rehabilitation Project Cost Estimate and Expansion Responsibility of Project Costs

9/12/2016 C1515 DPK

#### Schedule A

Item No.	Description	Units	Quantity	Unit Price	Amount
1	Mobilization/Demobilization	LS	1	\$ 40,000.00	\$ 40,000.00
2	18" Cured-in-Place Pipe	LF	2,661	\$ 150.00	\$ 399,150.00
3	Side Sewer Reinstatement	EA	5	\$ 300.00	\$ 1,500.00
4	Grouting of Side Sewer Connection	EA	5	\$ 400.00	\$ 2,000.00
5	Manhole Rehabilitation	EA	11	\$ 3,000.00	\$ 33,000.00
6	Temporary Erosion & Sediment Control	LS	1	\$ 2,500.00	\$ 2,500.00
7	General Restoration/Clean-Up	LS	1	\$ 10,000.00	\$ 10,000.00

### Schedule B

Subtotal - Estimated Construction Cost - Schedule A \$ 488,150.00 T

Item No.	Description	Units	Quantity	Unit Price	Amount
1	Mobilization/Demobilization	LS	1	\$ 40,000.00	\$ 40,000.00
2	21" Cured-in-Place Pipe	LF	2,177	\$ 200.00	\$ 435,400.00
3	18" Cured-in-Place Pipe	LF	858	\$ 250.00	\$ 214,500.00
4	Side Sewer Reinstatement	EA	11	\$ 300.00	\$ 3,300.00
5	Grouting of Side Sewer Connection	EA	11	\$ 400.00	\$ 4,400.00
6	Manhole Rehabilitation	EA	19	\$ 3,000.00	\$ 57,000.00
7	Temporary Erosion & Sediment Control	LS	1	\$ 5,000.00	\$ 5,000.00
8	General Restoration/Clean-Up	LS	1	\$ 15,000.00	\$ 15,000.00

#### Subtotal - Estimated Construction Cost - Schedule B \$ 774,600.00

#### Schedule C

Item	Description	Unite	Quantity	Lipit Prico	Amount
No.	Description	Units	Quantity	Onit Flice	Amount
1	Mobilization/Demobilization	LS	1	\$ 2,900.00	\$ 2,900.00
2	21" Cured-in-Place Pipe (Actual)	LF	1,257	\$ 120.00	\$ 150,840.00
3	Side Sewer Reinstatement	EA	2	\$ 85.00	\$ 170.00
4	Grouting of Side Sewer Connection	EA	2	\$ 350.00	\$ 700.00
5	Temporary Erosion & Sediment Control	LS	1	\$ 225.00	\$ 225.00
6	General Restoration/Clean-Up	LS	1	\$ 625.00	\$ 625.00
	\$ 155,460,00				

Subi	otal - Estimated Construction Cost - Schedule C	Ф	155,460.00
	Est	imat	ed Project Cost
	Sub Total, Construction Cost - Schedules A, B & C	\$	1,418,210.00
	10% Construction Contingency	\$	141,821.00
	Subtotal, Construction Cost	\$	1,560,031.00
	Sales Tax, 9.5%	\$	148,202.95
	Total Estimated Construction Cost	\$	1,708,233.95
	8% Design and Mapping	\$	124,802.48
	4% Permitting and Permit Fees	\$	62,401.24
	4% Construction Administration	\$	62,401.24
	Estimated Project Cost, Schedule	\$	1,957,838.91
	Expansion Responsibility for CIPP Project Cost	\$	1,529,664.88

Northshore Utility District - Totem Lake Sewer System Capacity Expansion		9/12/2016
Totem Lake Sewer Trunk - Additional Operation & Maintenance Costs		C1515
Cost Estimate		
Life Cycle Period, Years		30
Interest Rates - Recommended rates as of 2016		
Wage Inflation Rate & Interest Rate for Recurring Non-Labor O&M Cost Calculation		2.50%
Periodic Capital Costs - Not Recurring Annually		
For additional pipe & manhole rehabilitation due to excessive cleaning - year 30	\$	500,000
Operations and Maintenance Costs - Recurring Annual Labor		
3-Man Crew, 8-hrs, twice-yearly		48
Labor Hour Cost, Incl Benefits	\$	75
Annual Recurring Labor Cost	\$	3,600
Operations and Maintenance Costs - Recurring Annual Non-Labor		
Vactor Truck & Video Inspection, 8-hrs, twice-yearly		16
Non-Labor Hour Cost	\$	125
Annual Recurring Non-Labor Cost	\$	2,000
Net Present Value of Capital Investment, Year 30	\$	263,117
Net Present Value of Recurring Operations & Maintenance Labor	\$	105,366
Net Present Value of Recurring Operations & Maintenance Non-labor	\$	48,780
Life Cycle Net Present Value - Additional Opeation & Maintenance Costs	\$	417,264