MUKILTEO WATER & WASTEWATER DISTRICT

SNOHOMISH COUNTY **WASHINGTON**

WASTEWATER COMPREHENSIVE PLAN AMENDMENT 1

G&O #17424
DECEMBER 2017

Gray & Osborne, Inc.
CONSULTING ENGINEERS

MUKILTEO WATER & WASTEWATER DISTRICT

SNOHOMISH COUNTY **WASHINGTON**

WASTEWATER COMPREHENSIVE PLAN AMENDMENT 1

ERIC B. DELFEL
STATE OF WASHINGTON
40195
REGISTERED
PROFESSIONAL ENGINEER
12/11/17

G&O #17424
DECEMBER 2017

Gray & Osborne, Inc.
CONSULTING ENGINEERS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

Wastewater Comprehensive Plan Amendment 1 amends the Mukilteo Water & Wastewater District Wastewater Comprehensive Plan, approved in November 2011. The Wastewater Comprehensive Plan has had selected portions amended. Amendment 1 updates the service area population forecasts, inventories of lift stations and wastewater treatment plant facilities, and also updates the capital improvement plan and associated rates and general facility charges. The Plan is prepared to conform to the requirements of the Revised Code of Washington (RCW) 90.48, RCW 57.16, and the Washington Administrative Code (WAC) 173-240-050.

A planning level State Environmental Policy Act (SEPA) checklist is provided in Appendix A.

REVISIONS TO CHAPTER 1

The District is currently governed by a three-member Board of Commissioners. The current District Commissioners are:

Mr. Mike R. Johnson
Mr. Thomas McGrath
Mr. Thomas H Rainville

The General Manager is appointed by the Board of Commissioners and is responsible for the day-to-day operations of the District. The General Manager is Mr. Jim Voetberg.

REVISIONS TO CHAPTER 2

The revisions to Chapter 2 update the service area population forecasts. The service areas have been updated and the updates from the City of Everett Comprehensive plan have been incorporated. In addition, the forecasts more closely follow the method and format used in the Water System Plan using the updated wastewater service areas.

SERVICE AREA POPULATION FORECAST

The population of the District is estimated using data from Puget Sound Regional Council (PSRC) 2015 macroeconomic forecast. The forecast data is presented for regions known as Forecast Analysis Zones (FAZs). The District's service area overlaps four of the FAZs, as shown on Figure 2-6. The FAZ data provided by PSRC includes forecasts of populations for residents and employees inside each FAZ. Population forecasts within the FAZs are provided for 2010, 2017, 2023, 2030, and 2037.

Residential and employee populations for the District are based on GIS analysis of the four FAZs that contain the District's service area. Residential populations are estimated using the percentage of residential zoned land within the District's service area to total residential zoned land within the FAZ. The boundaries for FAZs 8000 and 7526 extend beyond the shoreline to include some of Puget Sound. These FAZ boundaries were trimmed to match the shoreline so that the percentage of land within the study area could be compared to the total FAZ area over land. This assumes that no residential or employment growth will occur beyond the shoreline in the waters of Puget Sound. The percentages for land use zoning inside the service area were also used to estimate employment. The residential population of the current westside service area is estimated to have been 15,054 in 2010. The employee population within the current service area is estimated to have been 8,713 in 2010 which does not include Paine Field. The PSRC provides population and employment projections for 2010, 2025, 2030, 2035, and 2040. These numbers are used as a baseline for the projections. Between these projected years, the population growth rates were interpolated to project individual years in the District's 20-year planning period.

Table 2-2 lists the FAZ identification number and the service area's residential population within each FAZ. Table 2-3 lists the service area's employee population within each FAZ.

TABLE 2-2

Residential Population Forecasts within the District Westside Service Area(1)

FAZ(2)	2010	2017	2023	2030	2037
7526	8,259	8,507	8,719	8,724	8,734
7537	1,637	1,696	1,747	1,873	2,050
8000	5,158	5,545	5,877	6,095	6,395
Total	**15,054**	**15,748**	**16,343**	**16,691**	**17,179**

(1) The Westside Service Area only includes areas within the District boundary that contribute wastewater to the WWTF.

(2) Data based on PSRC 2015 Macroeconomic Forecast.

PUGET SOUND

MUKILTEO BLVD

5TH ST

MUKILTEO SPEEDWAY

EVERGREEN WAY

84TH ST SW

SR 526

SR 526

AIRPORT RD

Paine Field Airport

MUKILTEO SPEEDWAY

AIRPORT RD

EVERGREEN WAY

ALDERWOOD WATER & WASTEWATER DISTRICT

N

0 1,200 2,400 4,800 Feet

SCALE 1" = 2400'

LEGEND:

- Study Area
- Mukilteo Water & Wastewater District
- Annex. Area (Alderwood Annex.)
- Paine Field Airport
- Parcels
- Everett City Limits
- Mukilteo City Limits

NOTE: Amended 2017

MUKILTEO WATER & WASTEWATER DISTRICT

WASTEWATER COMPREHENSIVE
PLAN AMENDMENT
FIGURE 2-1
POLITICAL JURISDICTIONS

Gray & Osborne, Inc.
CONSULTING ENGINEERS

M:\MUKILTEO\17424 Wastewater Comp Plan Update\GIS\POLITICAL.mxd

TABLE 2-3

Employee Population Forecasts within the District Westside Service Area[(1)]

FAZ[(2)]	2010	2017	2023	2030	2037
7526	3,583	3,918	4,205	4,181	4,977
8000	5,130	5,838	6,445	6,562	6,700
Total	**8,713**	**9,756**	**10,649**	**10,743**	**11,677**

(1) The Westside Service Area only includes areas within the District boundary that contribute wastewater to the WWTF. Paine Field employees are not included in the forecast as the wastewater flow quantities from Paine Field are based on contracted amounts.

(2) Data based on PSRC 2015 Macroeconomic Forecast.

POPULATION PROJECTION

The historical and projected population and employment are shown in Table 2-4 and Table 2-5, respectively. PSRC data was used to estimate the population within the District during these years. Based on these estimates, linear interpolation was used to calculate population and employment in years between the PSRC estimates.

TABLE 2-4

Historical Population

Year	Population[(1)]	
	Residential	Employee
2010	15,054	8,713
2011	15,153	8,862
2012	15,252	9,011
2013	15,352	9,160
2014	15,451	9,309
2015	15,550	9,458
2016	15,649	9,607

(1) Based on PSRC data within the Westside Service Area.

TABLE 2-5

Projected Population

Year	Population[(1)]	
	Residential	Employee
2017	15,748	9,756
2018	15,847	9,905
2019	15,946	10,053
2020	16,046	10,202
2021	16,145	10,351
2022	16,244	10,500
2023	16,343	10,649
2024	16,393	10,663
2025	16,442	10,676
2026	16,492	10,689
2027	16,542	10,703
2028	16,592	10,716
2029	16,641	10,730
2030	16,691	10,743
2031	16,761	10,877
2032	16,830	11,010
2033	16,900	11,143
2034	16,970	11,277
2035	17,039	11,410
2036	17,109	11,543
2037	17,179	11,677

(1) Based on PSRC forecast data within the Westside Service Area. Paine Field employees are not included in the forecast as the wastewater flow quantities from Paine Field are based on contracted amounts

DISTRICT POPULATION HOLDING CAPACITY

The population holding capacity for the District is the projected ultimate population based on future land use zoning. Future land use in the District service area is taken from the Puget Sound Regional Council (PSRC) 2015 macroeconomic forecast for the area served by the District within Mukilteo city limits, and the *2015 City of Everett Comprehensive Plan Update* for the area served by the District within Everett city limits.

Table 2-6 illustrates the calculation for population holding capacity. Within the City of Mukilteo, buildout population is assumed to be the year 2040 projected population from the PSRC forecast. Using the PSRC year 2040 population projections, the District has a

buildout population of 22,470 in the wastewater service area including the Westside and Eastside Service Areas. The southern area of the City of Mukilteo is served by Alderwood Water & Wastewater District and is not included in this projection.

For the City of Everett, zoning, area, and maximum density are shown for each classification to calculate the maximum number of dwelling units. For the Everett portion of the District's service area, the maximum capacity is a population of 31,523.

TABLE 2-6

Residential Population Holding Capacity

Source	Zoning	Maximum Density			Maximum Capacity
		(acres)	(DU/acre)[1]	(CAP/DU)[2]	(Persons)
PSRC FAZ Year 2040 Projection	All	4,536	--	--	22,470
City of Everett Comprehensive Plan	C-1	2.9	3.39	2	20
	E-1	62.9	1.22	2.9	223
	E-1MU	71.5	48	2.9	9948
	R-1	118.7	6.07	2.9	2090
	R-1A	6.3	11.12	2.9	202
	R-2	278.1	8	2.9	6452
	R-3	129.8	30	2.0	7786
	R-3L	101.4	20	2.0	4054
	R-S	52.5	4.91	2.9	748
Total		**5,360**			**53,993**

(1) DU stands for Dwelling Unit, based on Everett Comprehensive Plan target densities.
(2) Based on Everett Comprehensive Plan target population densities.

REVISIONS TO CHAPTER 4

The revisions to Chapter 4 update the wastewater treatment and conveyance system design criteria.

SUMMARY OF WASTEWATER FLOW DESIGN CRITERIA FOR BIG GULCH WWTP

The wastewater flow design criteria is summarized for the Big Gulch WWTP service area in Table 4-7. The projected residential and employee populations are from Chapter 2. The flows from Paine Field agreement are also included. The allowable monthly flow under the agreement is 250,000 gpd. This agreement does not state the basis of flow (e.g., maximum day, maximum month, or average annual). However, it is assumed to be a maximum month basis since billing has historically occurred on a monthly basis. The

District must include this allowance in its future projections. As shown in Table 4-7, an annual average flow of 250,000 gpd is included for Paine Field both for 2020 and 2030.

TABLE 4-7

Summary of Big Gulch WWTP Wastewater Design Criteria

Design Criteria	2010	2020	2030	2037
Residential Population	15,054	16,392	16,691	17,179
Residential Per Capita Flow (gpcd)	60	60	60	
Average Residential Flow (gpc)	903,242	983,508	1,001,460	1,030,728
Employee Population	8,713	11,151	10,743	11,677
Employee Per Capita Flow (gpcd)	22	22	22	22
Average Employee Flow (gpd)	191,689	245,316	236,352	256,891
Paine Field Average Flow	92,178	250,000	250,000	250,000
Average Annual Domestic Flow (gpd)	1,187,109	1,478,824	1,487,812	1,537,618
Average Annual I/I (gpd): Table 4-6	530,000	530,000	530,000	530,000
Average Annual Wastewater Flow (gpd)	1,717,109	2,008,824	2,017,812	2,067,619
Maximum Month Average Flow (gpd)	2,232,242	2,611,471	2,623,156	2,687,905
Maximum Day Flow (gpd)	4,636,195	5,423,825	5,448,093	5,582,572
Peak Hour Flow (gpd)	6,009,882	7,030,884	7,062,343	7,236,668
Peak Hour Flow (gpm)	4,174	4,883	4,904	5,025

Peaking Factors:

Maximum Month-to-Average Annual Flow: 1.3
Maximum Daily-to-Average Annual Flow: 2.7
Peak Hour-to-Average Annual Flow: 3.5

SUMMARY OF CITY OF EASTSIDE STUDY AREA WASTEWATER FLOW DESIGN CRITERIA

The wastewater flow design criteria for the Eastside Study Area is summarized in Table 4-11. The table contains calculated values for the total flow generated in and conveyed to the Eastside of the District based on developed land area and PSRC population projections.

TABLE 4-11

Summary of Eastside Study Area Wastewater Design Criteria

Design Criteria	2017	2025	2035	2040
Residential Population	8,512	8,756	9,705	10,293
Residential Per Capita Flow (gpcd)	60	60	60	60
Average Residential Flow (gpd)	510,703	525,387	582,304	617,582
Employee Population	4,629	5,457	6,120	6,889
Employee Per Capita Flow (gped)	22	22	22	22
Average Commercial Flow (gpd)	101,841	120,053	134,635	151,562
Total Average Flow (gpd)	612,544	645,440	716,939	769,144
Peaking Factor(1)	1.55	1.55	1.55	1.55
Peak Domestic Flow (gpd)	949,443	1,00,432	1,111,256	1,192,173
Sewered Area(2)	1,145	1,145	1,145	1,145
Infiltration and Inflow (gpad)	1,000	1,000	1,000	1,000
Infiltration and Inflow (gpd)	1,145,400	1,145,400	1,145,400	1,145,400
Snohomish County Solid Waste Transfer Station Flow (gpm)(3)	20	20	20	20
Peak Wet Weather Flow(4) (gpm)	1,475	1,510	1,587	1,643

(1) Peaking factor based on area-weighted average of Figures 4-1, 4-2, 4-3, and 4-4.
(2) Based on GIS analysis of Eastside Study Area.
(3) Served by agreement with a limitation of 20 gpm or 28,800 gpd.
(4) Peak Wet Weather Flow is sum of Peak Domestic Flow, Infiltration and Inflow, and Snohomish County Solid Waste Transfer Station Flow.

Because the District has an agreement with Everett based on flows from the District, and the District will continue to convey flow from residences and commercial areas outside the District boundaries, it is important to estimate flows within the District Boundary. Table 4-12 provides estimated sewer flow projections for areas within the Eastside District boundary.

TABLE 4-12

Summary of Eastside In-District Wastewater Design Criteria

Design Criteria	2017	2025	2035	2040
Residential Population	5,853	6,152	6,788	7,196
Residential Per Capita Flow (gpcd)	60	60	60	60
Average Residential Flow (gpd)	351,190	369,129	407,271	431,733
Employee Population	3,059	3,579	4,021	4,503
Employee Per Capita Flow (gped)	22	22	22	22
Average Commercial Flow (gpd)	67,297	78,747	88,473	99,072
Total Average Domestic Flow (gpd)	418,487	447,876	495,744	530,805
Peaking Factor(1)	1.55	1.55	1.55	1.55
Peak Domestic Flow	648,655	694,208	768,403	822,748
Sewered Area(2)	1,145	1,145	1,145	1,145
Infiltration and Inflow (gpad)	1,000	1,000	1,000	1,000
Infiltration and Inflow (gpd)	1,145,400	1,145,400	1,145,400	1,145,400
Snohomish County Solid Waste Transfer Station Flow (gpm)(3)	20	20	20	20
Peak Wet Weather Flow(4) (gpm)	1,266	1,298	1,349	1,387

(1) Peaking factor based on area-weighted average of Figures 4-1, 4-2, 4-3, and 4-4.
(2) Based on GIS analysis of Eastside Study Area.
(3) Served by agreement with a limitation of 20 gpm or 28,800 gpd.
(4) Peak Wet Weather Flow is sum of Peak Domestic Flow, Infiltration and Inflow, and Snohomish County Solid Waste Transfer Station Flow.

WASTEWATER LOADING DESIGN CRITERIA

The District operates the Big Gulch WWTP, and current and future loading criteria are a requirement for planning for treatment facilities. For other areas of the service area, the District operates and maintains pumping and collection system facilities. Loading criteria, therefore, are not developed for those areas.

PROJECTED BOD AND TSS LOADING

For future BOD_5 and TSS loadings the 2037 population of 17,179 is used.

PAINE FIELD LOADING (WHOLESALE)

Through its agreement with the District which was executed in June 2013, the Paine Field maximum month loading is 600 pounds per day BOD_5 and 750 pounds per day TSS to the District's system, with an average daily flow of 250,000 gallons per day and a maximum daily flow of 500,000 gallons per day. Paine Field is billed monthly based on the previous month's flows.

Table 4-15 presents existing BOD_5 and TSS loadings for average annual and maximum monthly conditions and projections for the years 2020 and 2037.

JAPANESE GULCH AGREEMENT AREA

The District had previously maintained an interlocal agreement with the City of Everett to provide sewer service to an area in Everett that bordered the northwest boundary of the District. This area has subsequently been zone as open space and will no longer require sewer service, so it has been eliminated from the capacity evaluation.

TABLE 4-15

Big Gulch Wastewater Treatment Plant
Existing and Future BOD and TSS Loadings

Component	Future Loading Factors	Existing					2020					2037				
		Units	Avg. Annual BOD_5 (lbs/day)	Max. Monthly BOD_5 (lbs/day)	Avg. Annual TSS (lbs/day)	Max. Monthly TSS (lbs/day)	Units	Avg. Annual BOD_5 (lbs/day)	Max. Monthly BOD_5 (lbs/day)	Avg. Annual TSS (lbs/day)	Max. Monthly TSS (lbs/day)	Units	Avg. Annual BOD_5 (lbs/day)	Max. Monthly BOD_5 (lbs/day)	Avg. Annual TSS (lbs/day)	Max. Monthly TSS (lbs/day)
District	0.2 lbs/day BOD_5. 0.26 lbs/day TSS. 1.3 Max. Monthly Peaking Factor.	15,054 pop.	3,011	3,914	3,914	5,088	16,392 pop.	3,278	4,262	4,262	5,540	17,179 pop.	3,436	4,466	4,466	5,806
Paine Field[(1)]	By Agreement.	--	192	250	192	250	--	600	600	750	750	--	600	600	750	750
Total			**3,203**	**4,164**	**4,106**	**5,338**	**16,392**	**3,878**	**4,862**	**5,012**	**6,290**	**17,179**	**4,036**	**5,066**	**5,216**	**6,556**

REVISIONS TO CHAPTER 5

The revisions to Chapter 5 update the inventory of sewage lift stations and force mains to reflect recent capital projects.

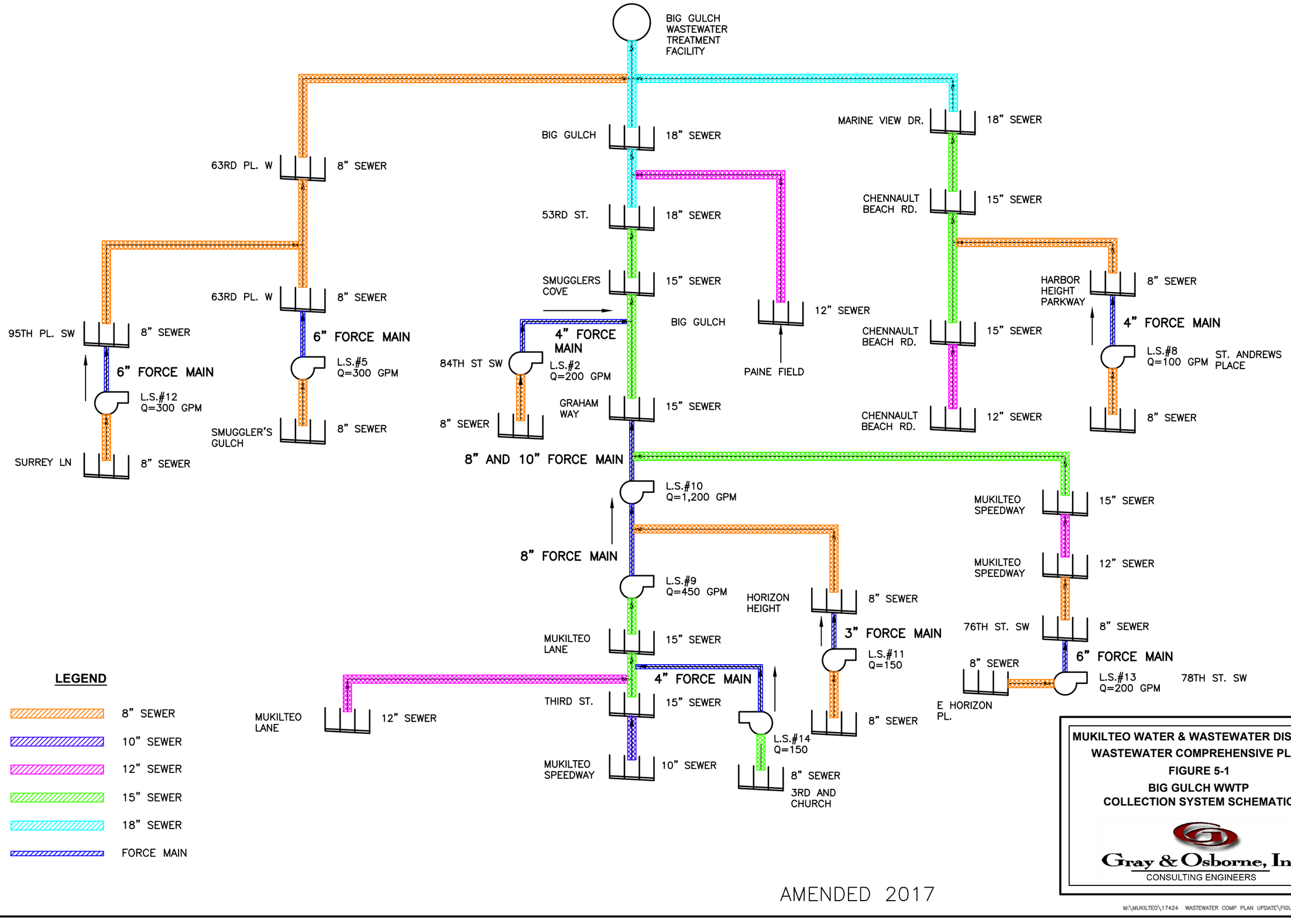
SEWAGE LIFT STATIONS

An inventory of the District's sewage lift stations is presented in Table 5-1. The areas served by each lift station are shown in Figure 5-3. Upgrades to 112th Street Lift Station, Holly Drive Lift Station, and S-7 Lift Station are included, as well as Lift Station No. 10 which is currently under construction. Lift Station No. 4 was abandoned in 2017 through construction of a gravity main.

TABLE 5-1

Inventory of Sewage Lift Stations

ID	Year On Line	Station Type	Pump Manufacturer /Model	No. of Pumps/ Capacity (gpm)		TDH (ft)	Motor (hp)	Standby Power	Telemetry	Other
Lift Station No. 2	1970	Wet Well/Dry Well	Cornell/4NN-38-6	2	200	49	7.5	Yes	Yes	Flow Meter
Lift Station No. 5	1970	Wet Well/Dry Well	Cornell/4NHTLHVM40-4	2	300	198	40	Yes	Yes	Flow Meter
Lift Station No. 8	1993	Wet Well/Dry Well	Cornell/4414T-VC18	4	100	370	30 (two)	Yes	Yes	Flow Meter
Lift Station No. 9	1992	Wet Well/Dry Well	Cornell/441472HVM-304	4	450	221	30 (two)	Yes	Yes	Flow Meter Chemical Addition
Lift Station No. 10	2018	Wet Well/Dry Well	Cornell/4NHTB	4	1,200	198	100	Yes	Yes	Flow Meter
Lift Station No. 11	2004	Submersible	Cornell/4NNT	2	99	99	10	No	Yes	--
Lift Station No. 12	2002	Submersible	Hydromatic/24PX	2	300	59	7.5	Yes	Yes	Flow Meter
Lift Station No. 13	2002	Wet Well/Dry Well	Cornell/4NHTA-VC18DB	2	200	110	20	Yes	Yes	Flow Meter
Lift Station No. 14	2008	Submersible	Wemco/3 x 3 x 11 CLCESR	2	150	97	20	No	Yes	Flow Meter
112th Street Lift Station	2013	Submersible	Flygt/3153.091-1658	3	400	95	20	Yes	Yes	Flow Meter
Holly Drive Lift Station	2017	Submersible	Flygt/NP3171.095-433	2	1,246	73	40	Yes	Yes	Flow Meter
S-7 Lift Station	2013	Submersible	Flygt/3153.091-462	3	450	92	29	Yes	Yes	Flow Meter

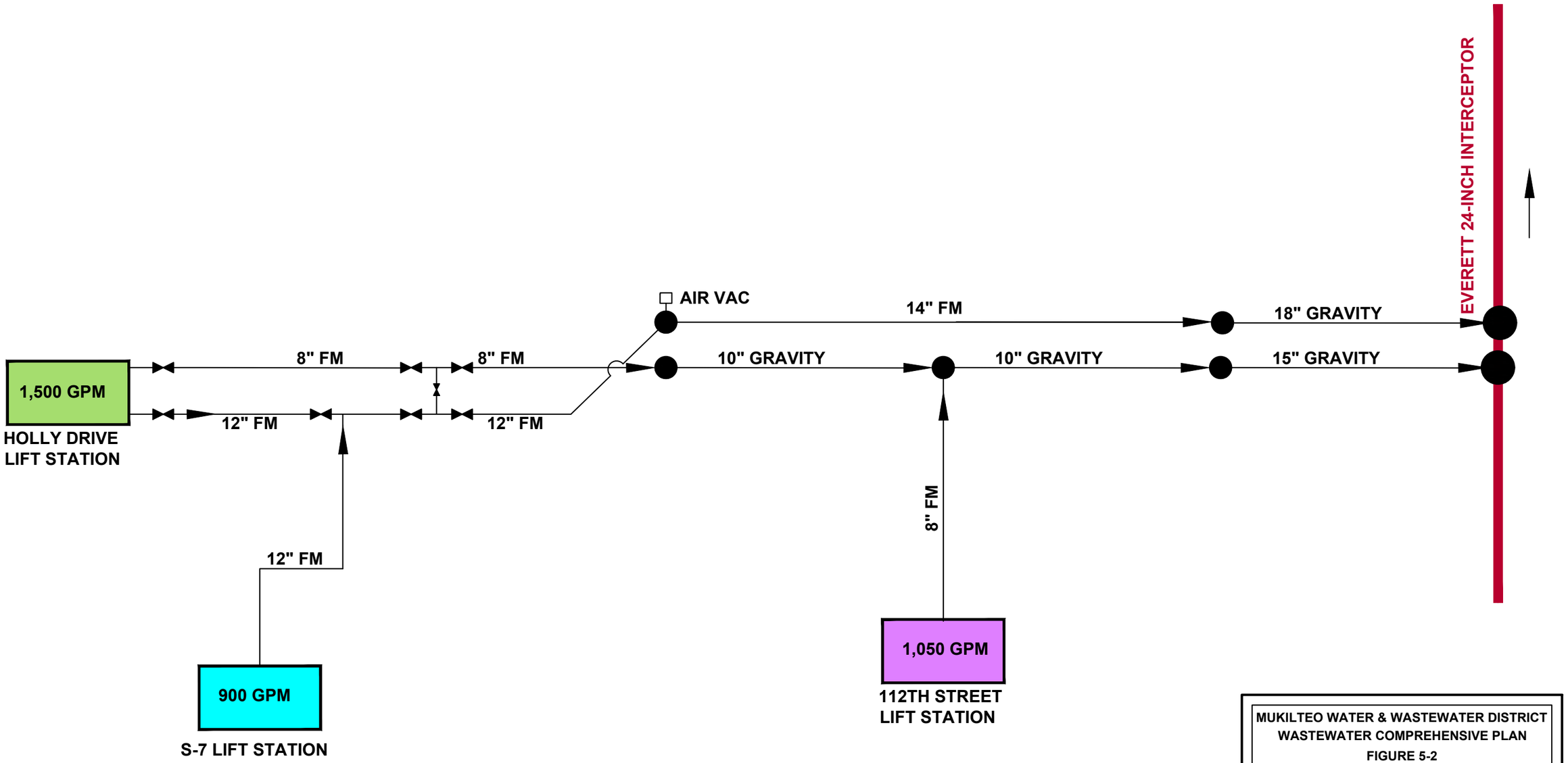


AMENDED 2017

MUKILTEO WATER & WASTEWATER DISTRICT
WASTEWATER COMPREHENSIVE PLAN
FIGURE 5-1
BIG GULCH WWTP
COLLECTION SYSTEM SCHEMATIC

Gray & Osborne, Inc.
CONSULTING ENGINEERS

M:\MUKILTEO\17424 WASTEWATER COMP PLAN UPDATE\FIGURES\FIG5-1.DWG



MUKILTEO WATER & WASTEWATER DISTRICT
WASTEWATER COMPREHENSIVE PLAN
FIGURE 5-2
LIFT STATION AND FORCE MAIN SCHEMATIC

Gray & Osborne, Inc.
CONSULTING ENGINEERS

AMENDED 2017

M:\MUKILTEO\17424 WASTEWATER COMP PLAN UPDATE\FIGURES\FIG5-2.DWG

PUGET SOUND

MUKILTEO BLVD

5TH ST

MUKILTEO SPEEDWAY

LS 9

LS 14

LS 10

LS 11

LS 13

LS 2

84TH ST SW

SR 526

SR 526

EVERGREEN WAY

AIRPORT RD

LS 5

LS 12

Big Gulch WWTP

WTP

LS 8

MUKILTEO SPEEDWAY

AIRPORT RD

EVERGREEN WAY

Holly Drive LS

112th St. LS

S-7 LS

N

0 1,200 2,400 4,800 Feet

SCALE 1" = 2400'

LEGEND:

- Mukilteo Water & Wastewater District
- Mukilteo City Limits
- Lift Station
- WTP Big Gulch WWTP
- Study Area
- Parcels
- Holly Drive LS
- LS 2
- LS 5
- 112th St. LS
- S-7 LS
- LS 8
- LS 9
- LS 10
- LS 11
- LS 12
- LS 13
- LS 14

NOTE:
1. AMENDED 2017
2. UNCOLORED AREAS SERVED BY GRAVITY

MUKILTEO WATER & WASTEWATER DISTRICT

WASTEWATER COMPREHENSIVE PLAN AMENDMENT
FIGURE 5-3
LIFT STATION SERVICE AREAS

Gray & Osborne, Inc.
CONSULTING ENGINEERS

M:\MUKILTEO\17424 Wastewater Comp Plan Update\GIS\LS_SERV_AREA.mxd

FORCE MAINS

The length, diameter, and material of each force main is shown in Table 5-2. The District has slightly over 7 miles of force main piping.

TABLE 5-2

Inventory of Force Main

Pump Station	Length (lf)	Diameter (inches)	Material
2	460	6	HDPE
5	765	6	CI
8	5,035	4	PVC
9	3,565	8	PVC
10	2,400 5,570	8 10	DI DI
11	1,184	3	PVC
12	626	6	DI
13	2,026	6	DI
14	581 140	4 4	DI HDPE
112th Street Lift Station	2,995	8	DI
Holly Drive Lift Station	3,368 3,665 3,401	8 12(1) 14(2)	DI
S-7 Lift Station	5,231 3,401	12(1) 14(2)	DI
Total	**44,413**		

(1) Includes approximately 1,551 lineal feet of 12-inch force main common to Holly Drive and S-7 Lift Stations.

(2) The 14-inch force main is common to both Holly Drive and S-7 Lift Stations.

The District added/replaced 2,914 LF of DI force main serving Lift Station 10 and 460 LF of HDPE force main serving Lift Station 2 in 2016. The District decommissioned 331 LF of force main when Lift Station No. 4 was abandoned.

REVISIONS TO CHAPTER 7

The amendments to Chapter 7 include updates to the inventory of wastewater treatment facilities to reflect recent capital projects and an evaluation of WWTF capacity compared to the flow and loading rates projected in Chapter 4 for 2037. In addition, the list of recommended capital projects has been updated.

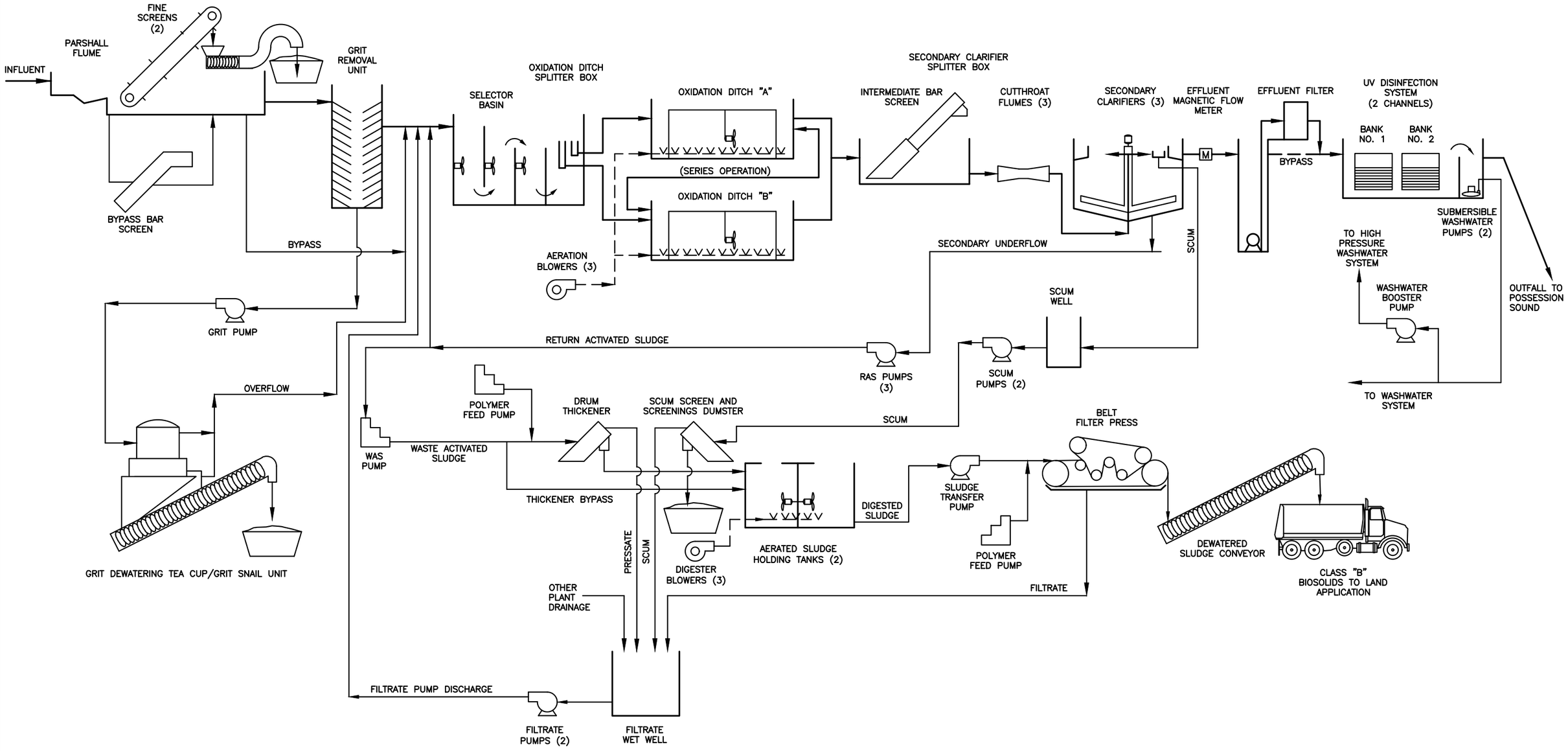
EXISTING DESIGN DATA

Design data for the existing liquid treatment equipment are listed in Table 7-2, including installation dates for major processes and equipment items. Figure 7-3 provides an amended process flow diagram for the WWTF that includes recent upgrade projects.

TABLE 7-2

Existing WWTF Design Data Liquid Treatment

Parameter	Design Data *(Installation Date)*
Influent Flow Measurement	***(2012)***
Type	12-Inch Parshall Flume
Influent Fine Screening	***(2002; 2012)***
Quantity of Screen	2
Type of Screen	Mechanical Perforated Plate Screen
Screen Perforation Size	5 mm (3/16")
Design Peak Flow, Each	7.5 mgd
Head Loss at Peak Flow (dirty screen)	6"
Screenings Handling, per Screen	Washer/Screw Compactor Unit
Grit Removal System	***(2012)***
Grit Vortex Unit	
Quantity	1
Dimensions	9’ Diameter; 12’ Square Tank
Quantity of Stacked Tray	7
Rated Capacity, peak	7.5 mgd
Grit Pump	
Quantity	1
Type	Dry-pit Recessed Impeller Centrifugal
Capacity	150 gpm @ 24' TDH
Motor Size	15 hp
Grit Concentrator (Slurry Cup)	
Quantity	1
Size	24-Inch diameter
Capacity	150-250 gpm
Grit Dewatering (Grit Snail)	
Quantity	1
Capacity	1 cubic yard/hour
Drive Motor Size	1/3 hp



MUKILTEO WATER & WASTEWATER DISTRICT
WASTEWATER COMPREHENSIVE PLAN
FIGURE 7-3
EXISTING WWTF PROCESS FLOW DIAGRAM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

AMENDED 2017

M:\MUKILTEO\17424 WASTEWATER COMP PLAN UPDATE\FIGURES\FIG7-3.DWG

TABLE 7-2 (continued)

Existing WWTF Design Data Liquid Treatment

Parameter	Design Data *(Installation Date)*
Selector Tanks	***(2012)***
Type of Selector	Anoxic/Anaerobic, Three-stage
Total Volume	104,000 gallons
Selector No.1 Volume	25,600 gallons
Selector No.2 Volume	25,600 gallons
Selector No.3 Volume	52,800 gallons
Tank Water Depth	13.83’
Mixing Type	Submersible Mixers
Mix Quantity	3 (1 per compartment)
Mixer Motor Size, Each	2.5 hp
Oxidation Ditch “A”	***(1970)***
Volume	640,000 gallons
Sidewater Depth	12.33'
Aeration Diffusers	***(2008)***
Type	Fine-bubble
Form	9" Diam. Membrane Disc
Quantity	750
Submersible Mixers	***(2010)***
Quantity	2
Motor Size	6 hp
Oxidation Ditch “B”	***(1991)***
Volume	1,070,000 gallons
Sidewater Depth	12.33'
Aeration Diffusers	***(2009)***
Type	Fine-bubble
Form	9" Diam. Membrane Disc
Quantity	900
Submersible Mixers	***(2009)***
Quantity	2
Motor Size	6 hp

TABLE 7-2 (continued)

Existing WWTF Design Data Liquid Treatment

Parameter	Design Data *(Installation Date)*
Aeration Blowers	***(2008/2009)***
Standard Oxygen Requirement (SOR)	14,250 lb O_2/d
Quantity of Blowers	3 (2 duty, 1 standby)
Type	High-speed Turbo Single-stage Centrifugal Blowers
Capacity, each	1,300 scfm @ 6.1 psig
Motor Size, each	50 hp
Drive Type	Integrated VFD
Intermediate Bar Screen	***(2016)***
Type of Screen	Self-cleaning Mechanical Bar Screen
Bar Spacing	1/2"
Secondary Clarifier 1	***(1970) (mechanism – 1998)***
Type	Circular, Center Feed and Rim Withdrawal
Diameter	58'
Surface Area	2,642 ft^2
Sidewater Depth	9'
Secondary Clarifier 2	***(1984; 2017 rehabilitation)***
Type	Circular, Center Feed and Rim Withdrawal
Diameter	54'
Surface Area	2,290 ft^2
Sidewater Depth	9'
Secondary Clarifier 3	***(1991) (mechanism thermoplastic coated in 2000)***
Type	Circular, Center Feed and Rim Withdrawal
Diameter	54'
Surface Area	2,290 ft^2
Sidewater Depth	13'
Scum Pumps	***(1991)***
Quantity of Pumps	2
Type of Pumps	Dry-pit Centrifugal
Capacity, each	160 gpm @ 23' TDH
Motor Size	3 hp
RAS Pumps	***(1991) (rebuilt in 1999)***
Quantity of Pumps	3
Type of Pumps	Dry-pit Centrifugal
Capacity, each	920 gpm @ 82' TDH
Motor Size	30 hp

TABLE 7-2 (continued)

Existing WWTF Design Data Liquid Treatment

Parameter	Design Data *(Installation Date)*
WAS Pump	***(2007)***
Type	Rotary Lobe
Quantity	1
Capacity	120 gpm @ 17.1 psi
Motor Size	5 hp
Drive Type	VFD
Effluent Flow Measurement	***(2001)***
Type	16" Magnetic Flow Meter
Effluent Filter	***(2011)***
Filter Feed Pumps	
Type	Submersible Centrifugal
Quantity	2
Capacity, ea.	1,750 gpm @ 17’ TDH
Motor Size, ea.	10 hp
Drive Type	VFD
Effluent Filter	
Quantity	1 – 10-disk unit
Type	Fabric Disk
Total filter Area	538 ft^2
Average Capacity	2.0 mgd
Max. Design Capacity	5.0 mgd
Filter Drive Motor Size, ea.	0.75 hp
Backwash Pumps	
Quantity	2
Motor Size, ea.	2.0 hp
Ultraviolet Disinfection System	***(2001)***
Quantity of Channels	2
Type of Lamp	Low-pressure, High-intensity
Maximum Hydraulic Capacity	8.7 mgd
Head Loss at Hydraulic Capacity	2.9"
Disinfection Capacity	8.7 mgd
Disinfection Capacity, 1 bank out of service	6.5 mgd
Design UV Dose (at 8.7 mgd)	35 mJ/cm^2
Design UV Transmittance	60%
Quantity of UV Lamp Banks	4
Quantity of UV Lamps per Bank	24
Quantity of UV Lamps, total	96

TABLE 7-2 (continued)

Existing WWTF Design Data Liquid Treatment

Filtrate Pumps	***(1991)***
Quantity of Pumps	2
Type of Pumps	Dry-pit Screw Centrifugal
Capacity, each	250 gpm @ 15' head
Motor Size	7.5 hp
Wash Water Pumps	***(2013)***
Quantity of Pumps	2
Type of Pumps	Submersible Multi-Stage
Capacity, each	150 gpm @ 95 psi
Motor Size	15 hp
Standby Generator	***(2001)***
Type	Diesel Engine
Quantity	1
Capacity	350 kW

WASTEWATER TREATMENT FACILITY EVALUATION

The following sections evaluate the capacity requirements of major WWTF components at the 2020 and 2037 projected flows and loadings. The loading rates, where applicable, are compared to accepted design criteria, such as published in the Washington State Department of Ecology *Criteria for Sewage Works Design* (2008) (known as the "Orange Book"), WEF *Manual of Practice No. 8* (MOP 8, 2010) and Metcalf & Eddy *Wastewater Engineering* (4th Edition, 2003).

Table 7-3 presents a comparison of the NPDES-permitted influent flow and loading capacity with the projected flow and loading rates that were developed in Chapter 4.

TABLE 7-3

Big Gulch WWTF Influent Capacity:
Comparison of NPDES Permit, Current and Projected

	NPDES Permit Capacity[(1)]	2020 Projection	2037 Projection
Average Annual Flow (mgd)	—	2.01	2.07
Maximum Month Flow (mgd)	2.61	2.61	2.69
Peak Day Flow (mgd)	—	5.42	5.58
Peak Hour Flow (mgd)	7.51[(2)]	7.03	7.24
Average Annual BOD_5 Loading (lb/d)	—	3,878	4,036
Maximum Month BOD_5 Loading (lb/d)	5,210	4,862	5,066
Average Annual TSS Loading (lb/d)	—	5,012	5,216
Maximum Month TSS Loading (lb/d)	6,489	6,290	6,556

(1) Condition S.4.A of District's NPDES permit.
(2) From the Phase II Construction Record Drawings (1993)

Table 7-4 presents a comparison of unit process design criteria with current and projected flows and loadings. The following text provides a more detailed analysis of each component and the applicable criteria.

TABLE 7-4

Comparison of Component Design Capacity/Criteria and Projected Conditions

Component (Parameter)	Recommended Capacity/Criteria	Reference[1]	2020 Operating Condition	2037 Operating Condition
			(Criteria Met?)	(Criteria Met?)
Mechanical Fine Screen (Capacity)	7.5 mgd peak hour	Manufacturer	7.03 mgd	7.24 mgd
			(yes)	(yes)
Bypass Screen (Capacity)	7.5 mgd peak hour	Manufacturer	7.03 mgd	7.24 mgd
			(yes)	(yes)
Grit Removal System	7.5 mgd peak hour	Manufacturer	7.03 mgd	7.24 mgd
			(yes)	(yes)
Biological Selectors (Number of Stages)	3 stages	M&E, 2003	3	3
			(yes)	(yes)
Biological Selector (Detention Time at Max. Mo. Flow)	30–45 min. design	Ecology, 2008	56 min	55 min
	20–60 min. design	M&E, 2003	(yes)	(yes)
Biological Selector (1^{st} stage F/M Ratio)[2]	3–8 lb BOD/lb MLSS	M&E, 2003	6.4	6.4
	3 lb BOD/lb MLSS	WEF, 2010	(yes)	(yes)
	10–15 lb BOD/lb MLSS	Ecology, 2008		
Oxidation Ditch (Detention Time)	8–36 hours @ max. month flow	WEF, 2010	15.7	15.3
			(yes)	(yes)
Oxidation Ditch (BOD_5 Loading)	5–30 lb/1,000 ft^3/d	WEF, 2010	19	20
			(yes)	(yes)
Oxidation Ditch (Solids Retention Time – SRT)[2]	10–30 days	WEF, 2010	14	14
			(yes)	(yes)
Oxidation Ditch (Aeration Capacity – Standard Oxygen Requirement)	14,250 lb O_2/d	Blower mfgr./ design calculations	17,583 lb O_2/d	18,428 lb O_2/d
			(no)	(no)
Secondary Clarifiers (Overflow Rate – Avg. @ Equal Flow Split)	400–700 gpd/ft^2	M&E, 2003; WEF, 2010; Randall, 1992	361	372
			(yes)	(yes)
Secondary Clarifiers (Overflow Rate – Peak @ Equal Flow Split)	1,000–1,600 gpd/ft^2 (peak day)	M&E, 2003; WEF, 2010; Randall, 1992	750	773
	<1,200 gpd/ft^2 (peak day)	Ecology, 2008	(yes)	(yes)

TABLE 7-4 – (continued)

Comparison of Component Design Capacity/Criteria and Projected Conditions

Component (Parameter)	Recommended Capacity/Criteria	Reference[1]	2020 Operating Condition	2037 Operating Condition
			(Criteria Met?)	(Criteria Met?)
Secondary Clarifiers (Solids Loading Rate – Avg. @ Equal Flow Split)[2,3]	0.8–1.2 lb/ft^2/hr (max. mo.)	M&E, 2003	0.69 (yes)	0.76 (yes)
Secondary Clarifiers (Solids Loading Rate – Peak @ Equal Flow Split)[2,3]	1.6 lb/ft^2/hr (peak day)	M&E, 2003	1.41 (yes)	1.50 (yes)
UV Disinfection System (Hydraulic Capacity)	8.7 mgd (peak hour)	Manufacturer	7.03 mgd (yes)	7.24 mgd (yes)
UV Disinfection System (Disinfection Capacity)	6.5 mgd (peak day, with one bank out of service)	Manufacturer	5.42 mgd (yes)	5.58 mgd (yes)

(1) See the list of references at the end of the Chapter.
(2) Based on an MLSS concentration of 3,130 mg/L in 2020 and of 3,260 mg/L in 2037 (14-day SRT).
(3) Based on a RAS recycle ratio of 75 percent in 2020 and 81 percent in 2037 at maximum month, and max RAS pump capacity at peak day.

HEADWORKS

Influent Metering and Sampling

A 12-inch Parshall flume was installed in 2012, adjacent to and upstream of the mechanical fine screens, and meters the influent flow. An ultrasonic level sensor monitors the flow rate and provides data to the SCADA system. Previously, the WWTF relied on the effluent magnetic flow meter for flow measurement. The new 12-inch Parshall flume has a capacity range of 0.2 mgd to 10.4 mgd, which is sufficient for the design peak hour flow of 7.5 mgd.

The influent composite sampler, with a peristaltic pump, is relocated to draw samples from the channel between the influent fine screens and the grit removal system, which is upstream of the addition point for in-plant recycle streams. Sampler accuracy has been verified in side-by-side testing with a portable composite sampler.

Influent Screening

The headworks include a primary mechanical fine screen system installed in 2002 and rebuilt in 2012, (a 5-mm perforated-plate mechanical fine screen and a screening washer/compacter unit), and a similar redundant unit by the same manufacturer installed in the 2012 headworks project (5-mm perforated-plate mechanical fine screen and a screening washer/compacter unit). Each screening channel is equipped with slides gates upstream and downstream of the fine screens. A backup manual bar screen is also provided in a bypass channel.

Ecology's Orange Book requires that influent screening be provided for the peak hour flow rate, and that a bypass screen be available with capacity for the peak hour flow. The hydraulic profile calculations demonstrate that each of the existing mechanical fine screens, and the bypass bar screen in the bypass channel, each have the capacity for the design peak hour flow of 7.5 mgd while maintaining sufficient freeboard.

Grit Removal System

A new grit removal system was installed in 2012 to improve grit removal performance. The stacked-tray vortex grit chamber (Head-Cell) is a proprietary technology developed by Hydro International over the past 10 years. Wastewater is distributed and tangentially fed to a series of stacked conical LDPE trays. Grit settles onto a boundary layer in each tray and rapidly slides towards the central hopper opening. The stacked trays provide a large surface area and short settling distances between trays. This technology combines vortex grit removal principles with plate settler principles for effective grit removal. Stacked-tray vortex grit chambers can be more effective over the full range of flow rates than gravity channels. The influent to the chamber velocity may can range between 2.0 and 3.0 fps for acceptable performance. In addition to being reliable and simple to operate,

Stacked-tray vortex grit chambers demonstrated significant removal of fine grit (106 microns), which conventional grit removal technologies are not capable of removing.

One 9-foot diameter Head-Cell unit with seven stacked trays was installed in a concrete tank where the decommissioned screw lift pumps had previously been located. Grit slurry is pumped from the bottom of the chamber hopper by a dry-well grit pump to the Hydro International Slurry Cup unit, which is a high performance version of a hydrocyclone. Concentrated grit is then classified in the Grit Snail, a high-performance version of a grit classifier. Classified grit is stored in a dumpster for off-site removal.

The grit system is designed for a peak hour hydraulic capacity of 7.5 mgd with a maximum head loss of 12 inches. The grit chamber is designed to remove 95 percent of grit particles greater than 106 micron. The grit dewatering unit is designed to have capacity to remove up to 1 cubic yard/hour of dewatered grit (32 tons/day at 1.35 ton/cubic yard), which is significantly higher than the estimated peak week grit loading of 2 tons/day. For facilities with less than 2 mgd average day flow, such as the Big Gulch WWTF, the Orange Book states that one grit removal chamber may be installed if a method to bypass the chamber for maintenance be provided. The headworks facility contains a grit chamber bypass channel. The grit chamber can be drained using the grit pump.

Selector Tank

A deeper selector basin was constructed in 2012. The selector basin has three stages in series, each provided with a direct-drive submersible mixer to keep the mixed liquor in suspension. RAS is recycled to the first or second stage of the selector, which provides a source of nitrates. The total basin volume is 104,000 gallons. The first stage provides a high food-to microorganism (F/M) ratio of 6.4 lb $CBOD_5$/lb MLSS/d (MLSS is mixed liquor suspended solids) under anoxic conditions. The F/M ratios in the second and third stages are successively lower as the influent CBOD (food) is rapidly consumed. High F/M and anoxic or anaerobic conditions are known to promote the establishment of well settling non-filamentous bacteria in the mixed liquor. Flow splitting to each oxidation ditch is provided by a weir trough with an adjustable stop gate (flow split to each oxidation ditch is determined by the relative length of weir on each side of the gate location). Each outlet channel is equipped with a slide gate for isolation of flow to either ditch. The updated selector basin meets the design criteria for staging, F/M ratio and detention time from various references at the design 2037 flow and loading rates.

During low flow and warm weather conditions, the nitrates may be consumed and the selector tanks may become anaerobic. Some level of biological phosphorus removal may also be achieved when the selector is anaerobic, although if the detention time is too long, odors could occur. During these conditions, the third selector stage may be bypassed and drained using a portable trash pump.

Oxidation Ditch

The oxidation ditch was been evaluated at the projected 2037 flow and loading rates using a spreadsheet program (Appendix I). The oxidation ditches were modeled with an assumed two anoxic phases per day, each lasting for 3 hours. Table 7-9 provides the operational design criteria from the spreadsheet evaluation at current and projected conditions.

TABLE 7-9

Activated Sludge Evaluation Results – Operation Characteristics

Criteria	Total HRT (hr)	Total SRT (d)	MLSS[(1)] (mg/L)	SOR[(2)] (lb O_2/d)	Peak Air Rqmt. (scfm)
2004–2009 Average Dry Weather Flow and Loading (summer conditions)	27	21	2,550	17,870	3,260
2004–2009 Average Wet Weather Flow and Loading (winter conditions)	21	16	2,520	12,990	2,370
2020 Maximum Month Flow and BOD_5	15.7	14	3,130	17,583	3,210
2037 Maximum Month Flow and BOD_5	15.3	14	3,260	18,428	3,360

(1) MLSS calculated as: [WAS mass flow (lb/d)] * SRT (d)/[Tank volume (mil. gal.) * 8.34].
(2) SOR = Standard oxygen requirement, including a 30 percent diurnal peaking factor.

The activated sludge evaluation determined that the existing activated sludge system has capacity for the projected 2037 flow and loading rates. With a 14-day SRT and an MLSS concentration of 3,260 mg/L, the system will be capable of complete BOD oxidation and nitrification and of significant denitrification (nitrogen removal). However, the standard oxygen requirement (SOR) and airflow requirement exceed the capacity of the existing diffused aeration system (14,250 lb O_2/d and 2,600 scfm, respectively). It is recommended that the three aeration blowers be replaced with higher capacity units, particularly since the manufacturer has informed the District that service and replacement parts for the blowers are being discontinued.

The oxidation ditch system with the projected 2037 flow and loading rates also meets the general design criteria in terms of HRT, SRT and volumetric BOD_5 loading, per Table 7-4.

Secondary Clarifiers

Clarifier 2, originally constructed in 1984, is currently undergoing its 2017 rehabilitation. The refurbished clarifier will maintain the same dimensions, a diameter of 54 feet and a sidewater depth of 9 feet, but will change to a center feed and peripheral withdrawal configuration. These changes will increase the clarifier's capacity and ability to deal with

peak flow. Clarifier No. 3, constructed in 1991, has a diameter of 54 feet and a sidewater depth of 13 feet, in a center feed and rim withdrawal configuration (the mechanism was thermoplastic coated in 2000 to extend the service life).

Hydraulic Overflow Rate

At projected year 2020 and 2037 flow rates, the clarifiers have sufficient capacity at the maximum recommended overflow rates listed in Table 7-10. Ecology Class II Reliability requirements state that the facility must be capable of treating 50 percent of the design flow with the highest capacity clarifier out of service (Clarifier 3). Per Table 7-10, Clarifier Nos. 1 and 2 have capacity to treat 72 percent of the projected 2037 design flow at the peak day. Therefore, the reliability requirement is met. The mixed liquor flow can be split evenly between the three clarifiers.

TABLE 7-10

Maximum Recommended Capacity of Secondary Clarifiers

	Clarifier Depth (ft)	Recommended Average Overflow Rate (gpd/ft^2) (1)	Recommended Peak Overflow Rate (gpd/ft^2) (2)	Max. Month Capacity (mgd)	Peak Day Capacity (mgd)
Clarifier No. 1	9	405	810	1.07	2.14
Clarifier No. 2	9	405	810	0.93	1.86
Clarifier No. 3	13	650	1,300	1.49	2.98
Total Capacity				3.49	6.97
Total with Highest Capacity Unit Out of Service				2.00	4.00
Total with Highest Capacity Unit Out of Service (% of projected 2037 flow)				74%	72%

(1) Used to estimate capacity at maximum month flow.
(2) Used to estimate capacity at peak day flow.

Solids Loading Rate

The average solids loading rate recommended by Metcalf & Eddy for secondary clarifiers is 0.8 to 1.2 $lb/ft^2/hr$ (see Table 7-4). The peak solids loading rate recommended by Metcalf & Eddy is 1.6 $lb/ft^2/hr$. The solids loading rates for each clarifier at the projected 2037 maximum month and peak day conditions are shown in Table 7-12. With the rehabilitation of Clarifier No. 2, the mixed liquor flow can be evenly split between the three clarifiers, and the existing clarifiers have sufficient solids loading capacity at the maximum month and peak day conditions.

TABLE 7-12

Recommended 2037 Solids Loading Rates for Secondary Clarifiers

	Flow Split (%)	Max. Month Solids Loading Rate ($lb/hr/ft^2$)(1)	Peak Day Solids Loading Rate ($lb/hr/ft^2$)(2)
Clarifier 1	33	0.7	1.4
Clarifier 2	33	0.8	1.6
Clarifier 3	33	0.8	1.6

(1) At MLSS of 3,260 mg/L and 81 percent recycle rate.
(2) At MLSS of 3,260 mg/L and recycle rate of 3.97 mgd.

WASHWATER SYSTEM PUMPS

Due to high washwater demand, the two submersible washwater pumps downstream of UV disinfection were replaced in 2013 with larger-capacity and higher pressure 15-hp pumps. The washwater booster pump was decommissioned as the new submersible washwater pumps produced enough pressure for all uses.

EFFLUENT OUTFALL

WWTF final effluent is discharged into Puget Sound at a point slightly north of the facility site through a 24-inch High Density Polyethylene (HDPE) outfall. The outfall is 655 feet long and was replaced in 2013, replacing the original CMP outfall. The hydraulic analysis showed that the new outfall is capable of handling the design peak hour flow rate of 7.51 mgd. At the 100-year high tide of 8.5 feet (NGVD 1929 datum) the water surface elevation downstream of the UV system weirs (elevation 18.27 feet) would be 13.44 feet with a new 24-inch HDPE outfall. No effluent pumping is required for the projected peak hour flow for 2037.

The fact sheet to the District's 2013 NPDES permit contains documentation of mixing zone and dilution analyses for the outfall. The analyses determined that the effluent does not have a reasonable potential to exceed water quality standards in Puget Sound at the edges of the mixing zone. Therefore, the District does not have any water quality based effluent limits in their discharge permit.

WWTF PLANNED IMPROVEMENTS

Table 7-17 provides a list of the recommended capital improvement projects for the liquid treatment processes and the recommended year for each project. WWTF Equipment generally has an expected service life of 20 to 25 years, and equipment replacement projects are scheduled in Table 7-17 based on equipment installation dates.

TABLE 7-17

WWTF Liquid Treatment Recommended Capital Improvement Projects

Description	Year	Project Type
Headworks Gate Actuators	2018	Improve performance
K-Turbo Blower No. 1 Replacement	2018	Maintenance
K-Turbo Blower No. 2 Replacement	2018	Maintenance
K-Turbo Blower No. 3 Replacement	2018	Maintenance
Headworks Screen No. 1 Rebuild	2020	Improve performance, Maintenance
Headworks Screen No. 2 Rebuild	2021	Improve performance, Maintenance
Oxidation Ditch "B" NH_3/NO_3 Probe Replacement	2021	Maintenance
Oxidation Ditch "A" NH_3/NO_3 Probe Replacement	2022	Maintenance
UV System Upgrades	2022	Maintenance
WWTF SCADA Upgrades	2023	Optional item, Improve operations
Clarifier No. 3 Mechanism Replacement	2024	Improve performance, Maintenance
Effluent Filter Feed Pump No. 1 Replacement	2024	Maintenance
Effluent Filter Feed Pump No. 2 Replacement	2025	Maintenance
Effluent Flow Meter and Sampler Replacement	2025	Maintenance
Clarifier Mechanism No. 1 Replacement	2026	Maintenance
Oxidation Ditch "A" Mixers Replacement	2026	Maintenance
Headworks Screen No. 1 Replacement	2027	Maintenance
Oxidation Ditch "B" Mixers Replacement	2027	Maintenance
Effluent Filter Replacement	2029	Maintenance
Oxidation Ditch Fine Bubble Diffuser Replacement	2029	Maintenance
Grit Removal System Equipment Replacement	2032	Maintenance
Oxidation Ditch Selector Zone Mixers Replacement	2032	Maintenance
Wash Water Pump Replacement	2033	Improve performance, Maintenance

REFERENCES

1. *Mukilteo Water & Wastewater District: Wastewater Facility Plan*, Gray & Osborne, Inc., November 2012

REVISIONS TO CHAPTER 8

Chapter 8 has been modified to incorporate the aeration blower upgrades and update the future capital improvements.

Table 8-1 provides the design data for the sludge treatment system.

TABLE 8-1

Big Gulch WWTF Existing Design Data Sludge Treatment System

Parameter	Design Data *(Installation Date)*
Aeration Diffusers	***2006***
Type	Fine-bubble
Form	9" diameter Membrane Disc
Quantity, total	336
Aeration Blowers 1 and 2	***2006 (sheaves upsized in 2009)***
Quantity	2
Type of Blower	Positive Displacement
Blower Capacity, each	624 scfm @ 9.8 psi
Motor Size, each	50 hp
Aeration Blower 3	***2011***
Quantity	1
Type of Blower	Positive Displacement
Blower Capacity, each	1,147 scfm @ 8.8 psi
Motor Size, each	75 hp

Table 8-19 provides a list of the recommended capital improvement project for the solids treatment system and the recommended year for each project. WWTF equipment generally has an expected service life of 20 to 25 years, and equipment replacement projects are scheduled in Table 8-19 based on equipment installation dates.

TABLE 8-19

WWTF Solids Treatment System Recommended Capital Improvement Projects

Description	Year	Type
New Sludge Dewatering System	2019-2021	Maintenance
AHT Diffuser Replacement	2026	Maintenance
WAS Pump Replacement	2028	Maintenance
Class B Aerobic Digestion System Expansion	2030-2033	Increase capacity, meet Ecology standards
AHT Blower Replacement	2031	Maintenance
Digester Motor Operated Valve Replacement	2031	Maintenance

REVISIONS TO CHAPTER 9

Chapter 9 has been amended to reflect the current SCADA system and organizational chart.

SCADA SYSTEM

The existing Supervisory Control and Data Acquisition (SCADA) system is presented in Figure 9-2. The existing system is a product of the 2007 merger between the Mukilteo Water System and the former Olympus Terrace Sewer District. Currently, there are two parallel SCADA systems in operation.

One integrator, Stead and Baggerly (S&B) has designed and maintains the District's water system and collections system SCADA system. The master control is located at the District office but can also be remotely accessed by District staff. This system currently uses Siemen's programmable logic controllers (PLCs), integrated with WINCC control software. The WINCC software offers a graphical user interface that provides operators with the ability to interpret and interact with data presented in user-friendly display screens. Display screens have been modified and created to suit the needs of the District's operators.

The wastewater treatment facility SCADA system has been designed and maintained by Technical Systems, Inc. (TSI). The master control is located at the Big Gulch WWTF, and the SCADA system is based on Wonderware and Allen Bradley PLCs. Similar to WINCC software, Wonderware provides a graphical user interface.

REVISIONS TO CHAPTER 10

The amendments to Chapter 10 update the revised Capital Improvement Program.

Proposed system improvements are defined as lift station improvements (LS), force main improvements (FM), gravity system improvements (GV), wastewater treatment facility improvements (WWTF), or general improvements (G). General improvements include studies, reports, improvements to the District Headquarters Operation Facility, and the District's share in Everett's Wastewater Pollution Control Facility (WPCF).

PROPOSED 6-YEAR SYSTEM IMPROVEMENTS (2018 TO 2023)

Each project cost includes construction, a contingency, state sales tax, and design and project management and is presented in 2017 cost without inflation (CCI=10698.72). The projects listed are in the 6-year system improvement planning window from 2018 to 2023.

GENERAL IMPROVEMENTS

General improvements (G-X) include studies, reports, and improvements to the District Headquarters Operation Facility as well as participation in City of Mukilteo projects.

G-1: Wastewater Comprehensive Plan Amendment (2018)

This project provides an amendment to the existing Wastewater Comprehensive Plan covering the capital improvements plan for the 20-year planning horizon.

Estimated Project Cost: $2,000

G-2: Reservoir Nos. 2/5 Storage Building (2018)

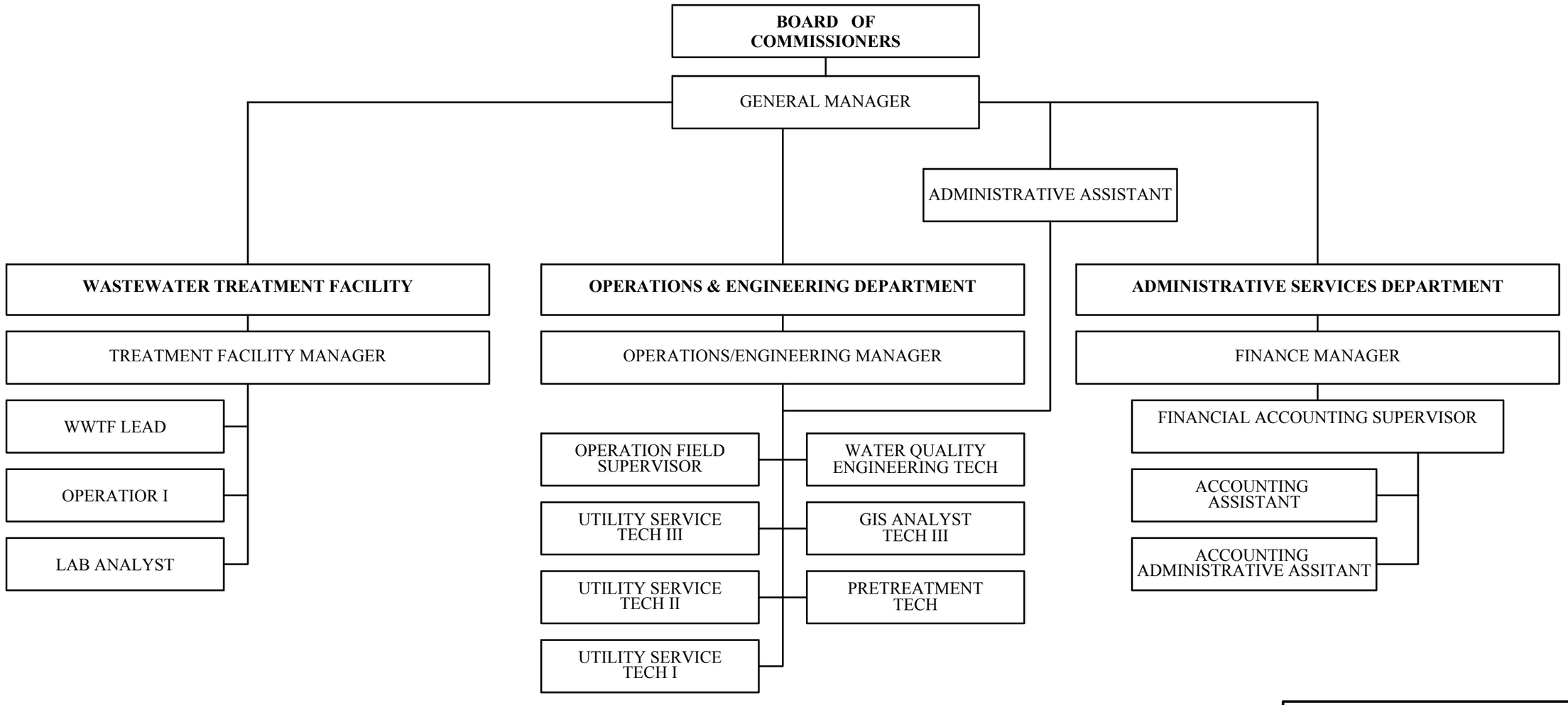
This project covers a new storage building at Reservoir Nos. 2 and 5 that will be shared by both the water and wastewater utilities.

Estimated Project Cost (Wastewater System Share): $185,500

G-3: Telemetry (2018-2023)

This is an annual program to upgrade the telemetry systems for the water system and collection system.

Estimated Project Cost (Wastewater System Share): $73,400

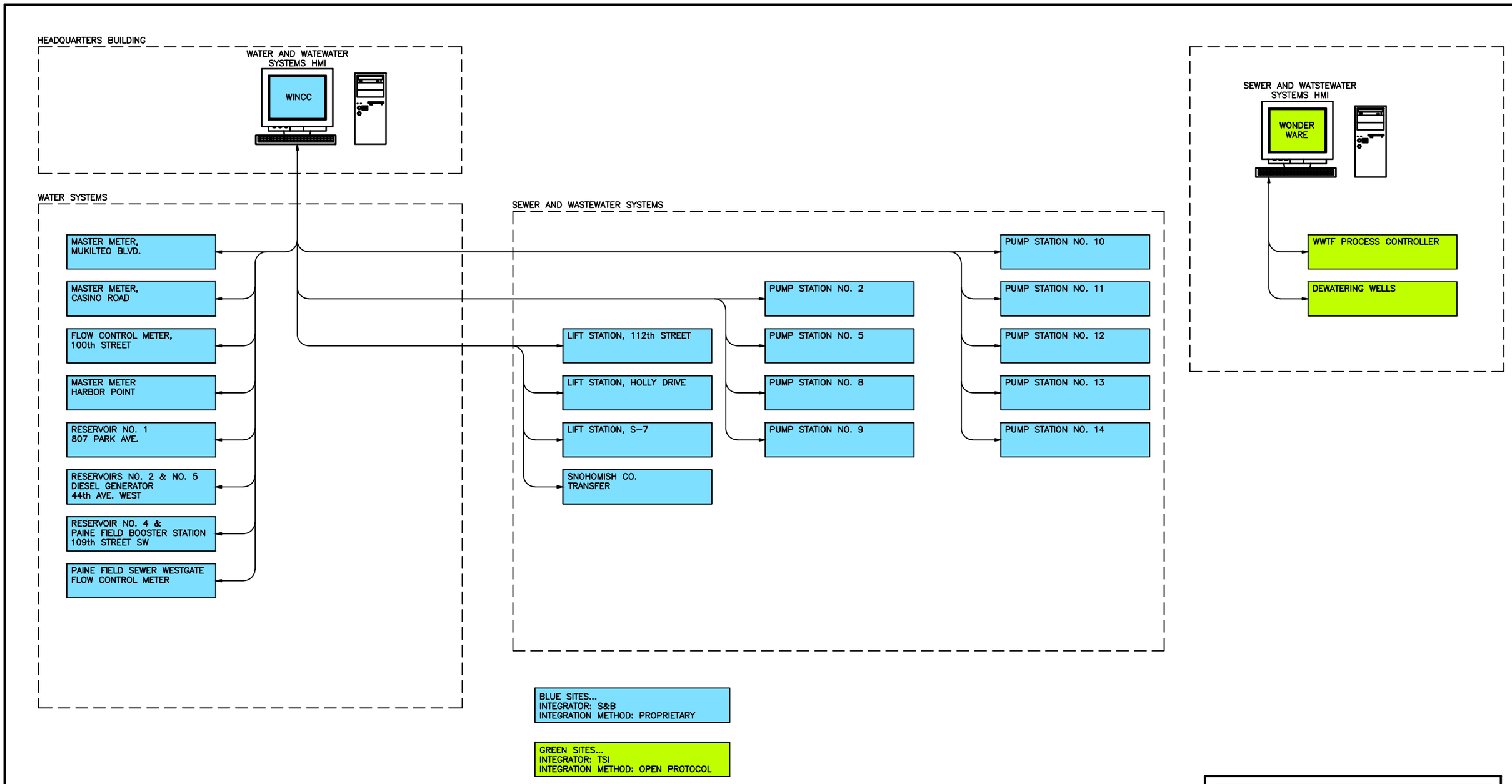


MUKILTEO WATER & WASTEWATER DISTRICT
WASTEWATER COMPREHENSIVE PLAN
FIGURE 9-1
DISTRICT STAFF ORGANIZATION CHART

Gray & Osborne, Inc.
CONSULTING ENGINEERS

AMENDED 2017

M:\MUKILTEO\17424 WASTEWATER COMP PLAN UPDATE\FIGURES\ORGCHART.DWG



MUKILTEO WATER & WASTEWATER DISTRICT
WASTEWATER COMPREHENSIVE PLAN
FIGURE 9-2
SCADA SYSTEM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

AMENDED 2017

M:\MUKILTEO\17424 WASTEWATER COMP PLAN UPDATE\FIGURES\SCADA MAP.DWG

G-4: LED Lighting in Shop and Admin Building (2018)

This project will upgrade the existing lighting in the District's shop and admin building.

Estimated Project Cost (Wastewater System Share): $3,700

G-5: Vehicle Replacement (2018-2023)

This is an annual program to replace vehicles for both utilities.

Estimated Project Cost (Wastewater System Share): $177,000

G-6: Wastewater Rate Study (2018)

A sewer rate study will be performed to update the District's rates and general facility charges.

Estimated Project Cost (Total Cost): $55,000

G-7: Copier Replacement (2019)

This is a replacement program to replace the District's copier shared by both utilities in 2019.

Estimated Project Cost (Wastewater System Share): $6,900

G-8: Server Replacement (2018)

This project will replace the District's computer network server in 2018.

Estimated Project Cost (Wastewater System Share): $14,500

G-9: Website Rebuild (2018)

This project will update the District's website in 2018.

Estimated Project Cost (Wastewater System Share): $12,800

G-10: City of Mukilteo Participation Agreement (2018)

This project will consist of the District's share of City of Mukilteo projects.

Estimated Project Cost: $15,000

GRAVITY SYSTEM IMPROVEMENTS

Proposed gravity system improvements are designated as GV-X.

GV-1: Small Project Replacement – Design and Construction (2018–2023)

This is an annual program that covers the District's smaller projects to replace infrastructure; primarily gravity sewer system point repairs.

Estimated Project Cost (Total Cost): $1,665,600

GV-2: LS No. 4 to No. 12 Bore Construction and Construction Management (2018)

This project covers the 2018 construction and construction management costs for the LS No. 4 to LS No. 12 Bore project.

Estimated Project Cost: $200,000

LIFT STATION IMPROVEMENTS

Proposed lift station improvements are designated as LS-X.

LS-1: Lift Station No. 10 Construction and Construction Management (2018)

The existing force main serving Lift Station No. 10 is a combination of 8- and 10-inch pipes. With the upgrade of Lift Station No. 10 to 1,413 gpm, the 8-inch force main will be undersized. The existing 8-inch force main will be replaced by 10-inch force main and extended to 88th Street. The extension will also correct an existing pipeline deficiency (e.g., 15 inches) located north of 88th Street since flow will be rerouted.

This project will also upgrade lift station capacity and relocate it to a site north of the existing location. The new site will be outside of the highway right-of-way and include a structure for a generator and electrical gear.

Estimated Project Cost: $2,700,000

LS-2: Lift Station No. 9 Upgrades Design, Construction (2019-2021)

By 2020, this lift station will have been in operation for nearly 30 years. In addition, the estimated capacity will be upgraded from 450 gpm to 786 gpm for buildout flows. This project consists of design and construction.

Estimated Project Cost (Total Cost): $3,525,000

LS-3: S-7 Lift Station Control System Upgrade (2019)

This project will perform upgrades to the S-7 Lift Station control system.

Estimated Project Cost: $50,000

LS-4: Lift Station No. 5 Upgrades Design and Construction (2021-2023)

This project includes the design and construction of upgrades to Lift Station No. 5.

Estimated Project Cost (Total Cost): $1,300,00

FORCE MAIN IMPROVEMENTS

Proposed force main improvements are designated as FM-X.

FM-1: Lift Station No. 9 Force Main Upgrade Design and Construction (2018–2019)

This project includes the design and construction of upgrades to the Lift Station No. 9 force main.

Estimated Project Cost (Total Cost): $1,425,000

FM-2: Lift Station No. 5 Force Main Upgrade Design and Construction (2020–2021)

This project includes the design and construction of upgrades to the Lift Station No. 5 force main.

Estimated Project Cost (Total Cost): $380,000

FM-3: Lift Station No. 8 Force Main and Gravity Pipe Upgrade Design and Construction (2022–2023)

This project includes the design and construction of upgrades to the Lift Station No. 8 force main and gravity piping.

Estimated Project Cost (Total Cost): $825,000

WATER POLLUTION CONTROL FACILITY IMPROVEMENTS

The proposed projects include the District's share of the City of Everett Water Pollution Control Facility (WPCF) projects. The proposed WPCF projects are designated as WPCF-X.

WPCF-1: City of Everett WPCF Expansion (2018–2023)

This multi-year project covers the District's share of the WPCF expansion.

Estimated Project Cost (Total): $1,532,000

WASTEWATER TREATMENT FACILITY IMPROVEMENTS

Proposed wastewater treatment facility (WWTF) improvements are designated as WWTF-X.

WWTF-1: Clarifier No. 1 Floor Rehab (2021)

This project will rehabilitate the floor of Clarifier No. 1.

Estimate Project Cost: $20,000

WWTF-2: Headworks No. 1 Screen Rebuild (2020)

The existing screen was installed as part of the 2002 construction project and is scheduled to be rebuilt.

Estimated Project Cost: $47,500

WWTF-3: Headworks No. 2 Screen Rebuild (2021)

The existing screen was installed as part of the 2002 construction project and is scheduled to be rebuilt.

Estimated Project Cost: $48,000

WWTF-4: Lab/Administration Building Replacement (2018-2019)

The project to replace the existing Lab/Administration Building includes design and construction.

Estimated Project Cost: $1,100,000

WWTF-5: Solids Screw Press (2019)

This project includes procurement of a new solids screw press to replace existing aging equipment.

Estimated Project Cost: $300,000

WWTF-6: Solids Handling Design and Construction (2020-2021)

This project will design and construct solids handling improvements. The existing sludge dewatering belt filter press and associated equipment were installed in 1994 and are scheduled for replacement after approximately 25 years.

Estimated Project Cost: $550,000

WWTF-7: Headworks Gate Actuators (2018)

This project is to install motor-operated valve actuators to enable automatic operation of the headworks gates.

Estimated Project Cost: $15,000

WWTF-8: Filtrate Pump No. 1 Replacement (2021)

This project replaces Filtrate Pump No. 1.

Estimated Project Cost: $17,000

WWTF-9: Filtrate Pump No. 2 Replacement (2018)

This project replaces Filtrate Pump No. 2.

Estimated Project Cost: $17,000

WWTF-10: Scum Pump No. 1 Replacement (2019)

This project will replace Scum Pump No. 1.

Estimated Project Cost: $17,000

WWTF-11: Scum Pump No. 2 Replacement (2021)

This project will replace Scum Pump No. 2.

Estimated Project Cost: $17,000

WWTF-12: "A & B" Ditch NH3/NO3 Probe Replacement (2021-2022)

This project will replace the NH3/NO3 probe in the WWTF "A & B" oxidation ditches.

Estimated Project Cost: $20,000

WWTF-13: Aerated Sludge Holding Tank Blower Drives (2021)

This project will replace variable frequency drives for Blower Nos. 1 and 2 in the aerated holding tank.

Estimated Project Cost: $15,000

WWTF-14: Clarifier No. 3 Rehabilitation Design (2023)

The mechanism for Clarifier No. 3 was installed in 1990. In addition, replacing the cutthroat flumes will remove a hydraulic capacity limitation within the WWTF. Painting of the canopy area associated with the clarifier is included with this project.

Estimated Project Cost: $35,000

WWTF-15: Aerated Sludge Holding Tank Mixer Replacement (2022)

This project will replace the aerated holding tank Mixer Nos. 1 and 2.

Estimated Project Cost: $28,000

WWTF-16: UV System Upgrades (2022)

The equipment was installed in 2001 and is scheduled for a replacement or upgrade in 2022.

Estimated Project Cost: $800,000

WWTF-17: Grit Pump Replacement (2023)

This project will replace the grit pump.

Estimated Project Cost: $18,000

WWTF-18: SCADA System Upgrades (2023)

The SCADA system is scheduled to be upgraded in 2023.

Estimated Project Cost: $100,000

WWTF-19: K-Turbo Blower Replacement (2018)

This project replaces the three K-Turbo blowers at the WWTF. The manufacturer has warned the District that this model of blower will no longer be supported.

Estimated Project Cost (Total Cost): $250,000

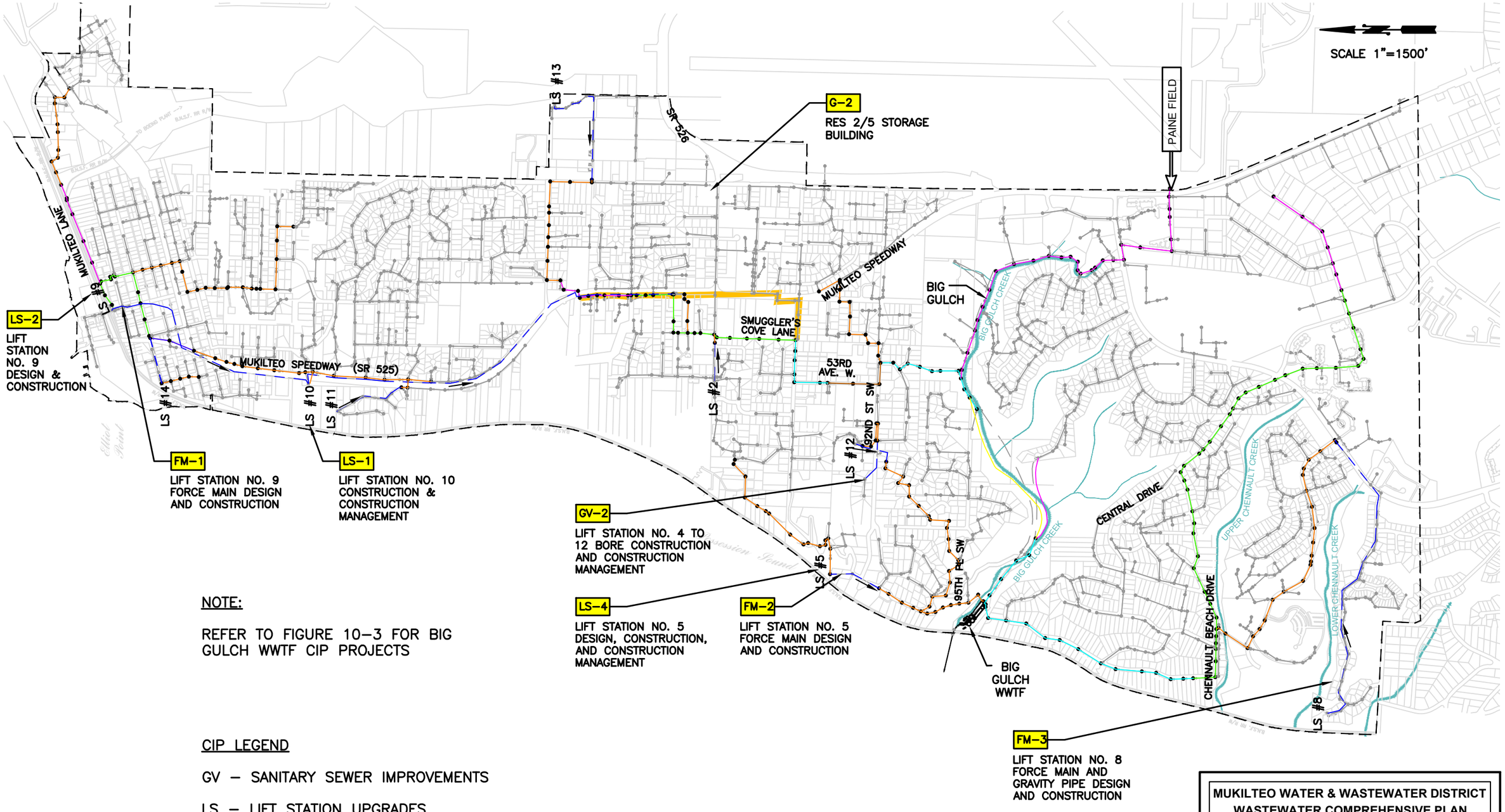
CAPITAL IMPROVEMENTS PLAN SCHEDULE

Table 10-1 provides a summary of each capital improvement project and the proposed schedule for implementation for 2018-2023. Several projects span multiple years. The District can reschedule its capital improvement projects as needed to accommodate unanticipated projects in the future. Figures 10-1, 10-2, and 10-3 show the locations for the 2018-2023 CIP projects, and Figure 10-4 presents the time line for a 6-year CIP.

TABLE 10-1

6-Year Capital Improvement Project Summary (2018–2023)[(1)]

Project No.	Project Title	Cost					
		2018	2019	2020	2021	2022	2023
G-1	Wastewater Comprehensive Plan Amendment	$2,000					
G-2	Res 2/5 Storage Building	$185,500					
G-3	Telemetry	$11,200	$11,800	$12,100	$12,500	$12,800	$13,000
G-4	LED Lighting in Shop and Admin Building	$3,700					
G-5	Vehicle Replacement	$19,100	$19,500	$39,700	$20,300	$60,800	$17,600
G-6	Wastewater Rate Study	$55,000					
G-7	Copier Replacement		$6,900				
G-8	Server Replacement	$14,500					
G-9	Website Rebuild	$12,800					
G-10	City of Mukilteo Participation Agreement	$15,000					
GV-1	Small Project Replacement – Design and Construction	$257,500	$265,200	$273,200	$281,400	$289,800	$298,500
GV-2	Lift Station No. 4 to No. 12 Bore – Construction and CM	$200,000					
LS-1	Lift Station No. 10 Construction and CM	$2,700,000					
LS-2	Lift Station No. 9 Upgrade – Design		$275,000				
LS-2	Lift Station No. 9 Upgrade – Construction			$2,000,000	$1,250,000		
LS-3	S-7 Lift Station Control Upgrade		$50,000				
LS-4	Lift Station No. 5 Upgrade – Design				$100,000		
LS-4	Lift Station No. 5 Upgrade – Construction					$800,000	$400,000
FM-1	Lift Station No. 9 Force Main – Design	$100,000					
FM-1	Lift Station No. 9 Force Main – Construction – Phase 1	$125,000					
FM-1	Lift Station No. 9 Force Main – Construction – Phase 2		1,200,000				
FM-2	Lift Station No. 5 Force Main – Design			$30,000			
FM-2	Lift Station No. 5 Force Main – Construction				$350,000		
FM-3	Lift Station No. 8 Force Main/Gravity Design					$75,000	
FM-3	Lift Station No. 8 Force Main/Gravity Construction						$750,000
WPCF-1	City of Everett WPCF Projects	$220,000	$80,000	$80,000	$536,000	$536,000	$80,000
WWTF-1	Clarifier No. 1 Floor Rehab				$20,000		



NOTE:

REFER TO FIGURE 10–3 FOR BIG GULCH WWTF CIP PROJECTS

CIP LEGEND

GV – SANITARY SEWER IMPROVEMENTS

LS – LIFT STATION UPGRADES

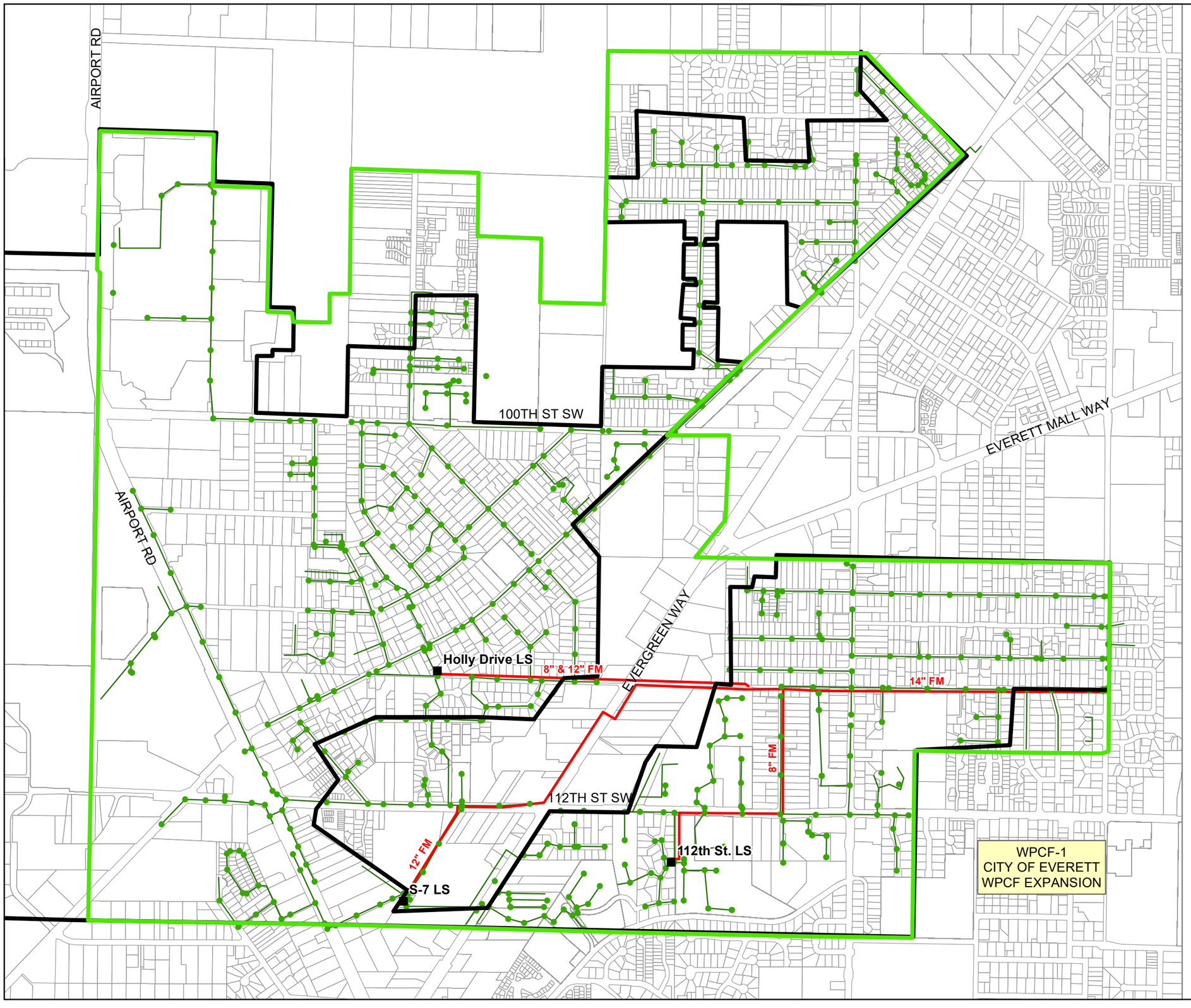
G – GENERAL IMPROVEMENTS

AMENDED 2017

MUKILTEO WATER & WASTEWATER DISTRICT
WASTEWATER COMPREHENSIVE PLAN
FIGURE 10-1
WESTSIDE SERVICE AREA COLLECTION SYSTEM AND LIFT STATION CIP PROJECTS: 2018-2023

Gray & Osborne, Inc.
CONSULTING ENGINEERS

M:\MUKILTEO\17424 WASTEWATER COMP PLAN UPDATE\FIGURES\FIG10-1.DWG



N

0 500 1,000 2,000 Feet

SCALE 1" = 1000'

NOTE:
AMENDED 2017

LEGEND:

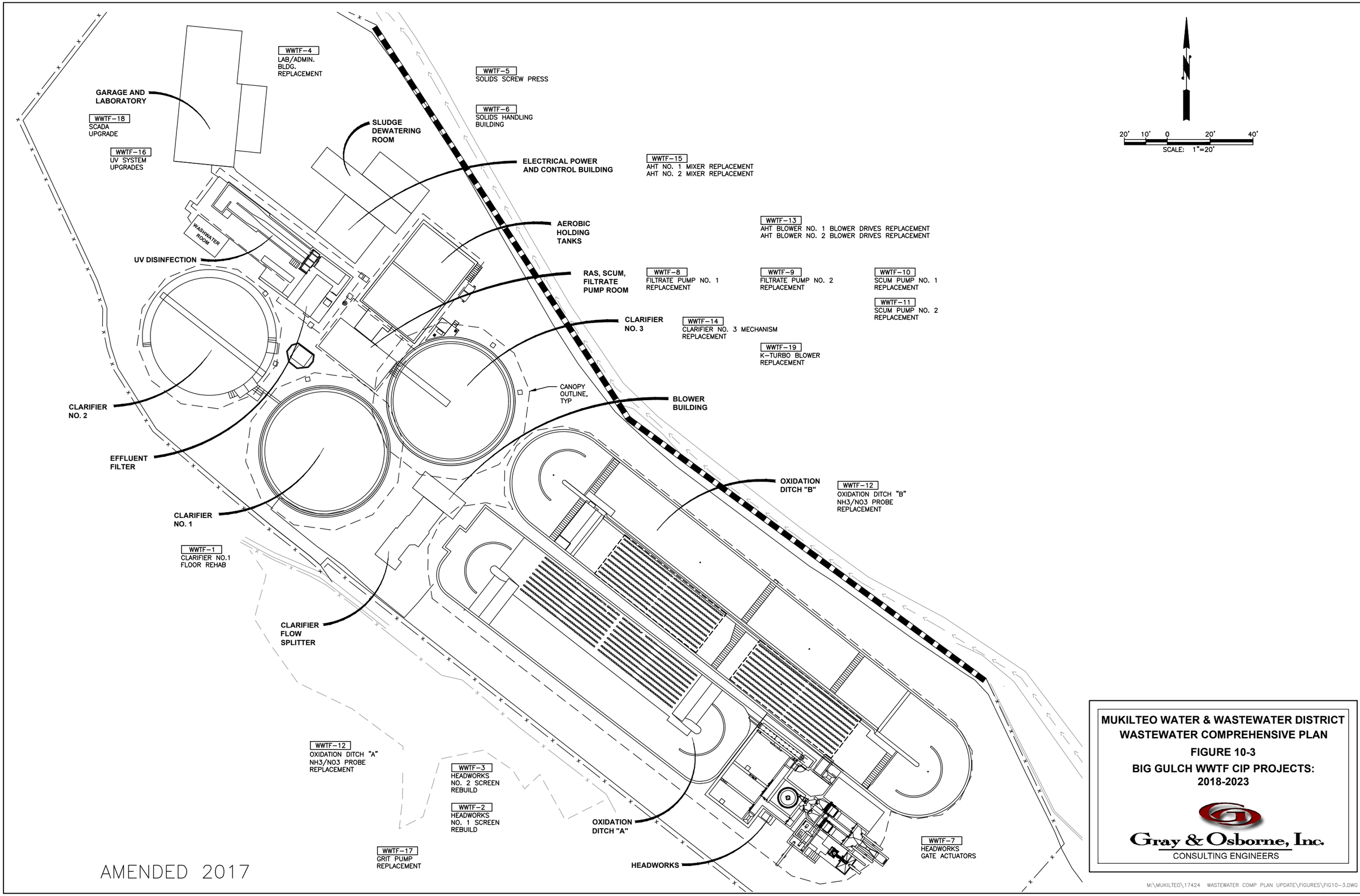
- Manhole
- Lift Station
- Sewer Main
- Force Main
- Study Area
- Mukilteo Water & Wastewater District
- Parcels

MUKILTEO WATER & WASTEWATER DISTRICT

WASTEWATER COMPREHENSIVE
PLAN AMENDMENT
FIGURE 10-2
EASTSIDE COLLECTION SYSTEM AND LIFT
STATION CIP PROJECTS: 2018-2023

Gray & Osborne, Inc.
CONSULTING ENGINEERS

M:\MUKILTEO\17424 Wastewater Comp Plan Update\GIS\CIP.mxd

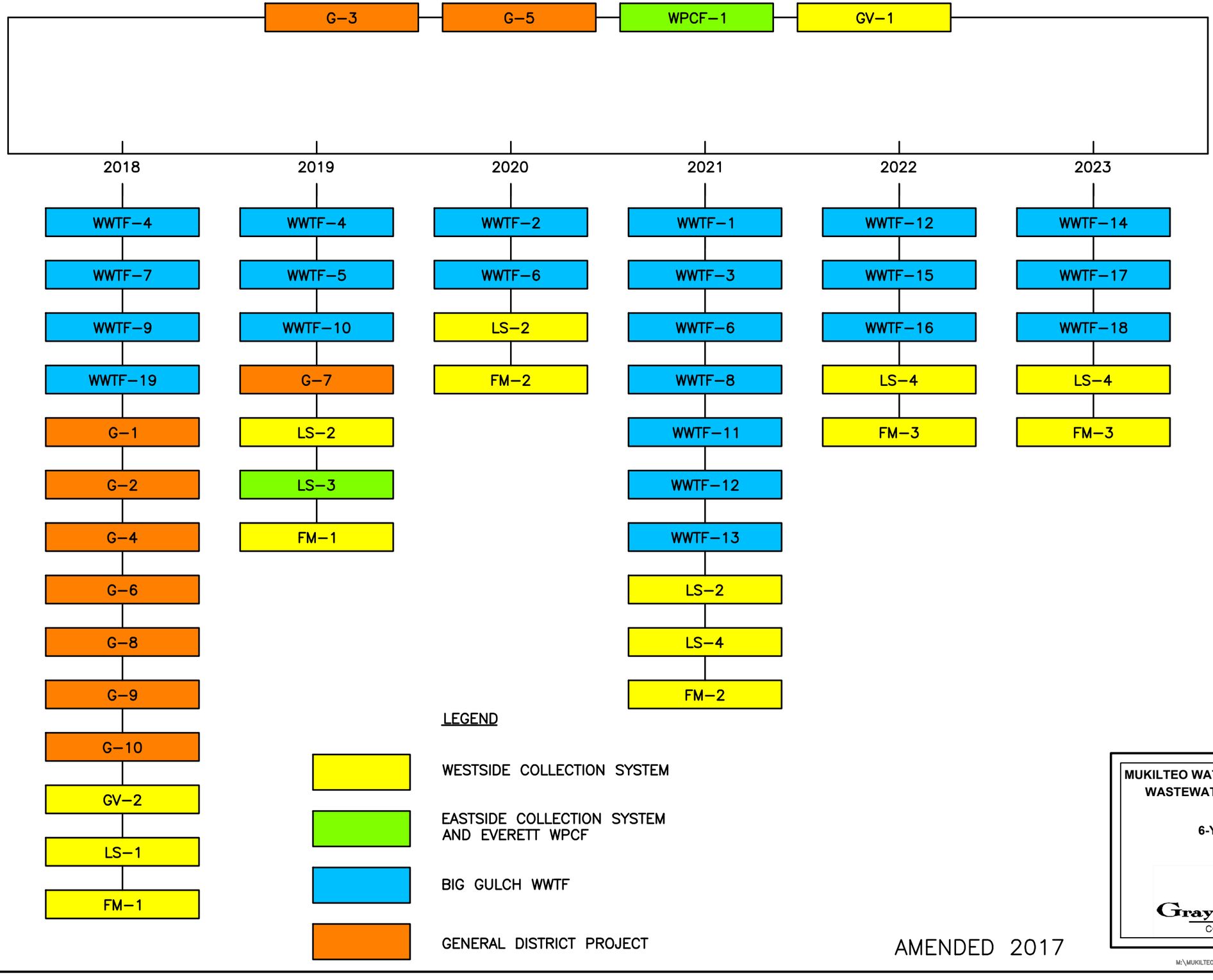


AMENDED 2017

MUKILTEO WATER & WASTEWATER DISTRICT
WASTEWATER COMPREHENSIVE PLAN
FIGURE 10-3
BIG GULCH WWTF CIP PROJECTS: 2018-2023

Gray & Osborne, Inc.
CONSULTING ENGINEERS

M:\MUKILTEO\17424 WASTEWATER COMP PLAN UPDATE\FIGURES\FIG10-3.DWG



AMENDED 2017

MUKILTEO WATER & WASTEWATER DISTRICT
WASTEWATER COMPREHENSIVE PLAN
FIGURE 10-4
6-YEAR CIP TIMELINE

Gray & Osborne, Inc.
CONSULTING ENGINEERS

M:\MUKILTEO\17424 WASTEWATER COMP PLAN UPDATE\FIGURES\FIG10–4.DWG

TABLE 10-1 – (continued)

6-Year Capital Improvement Project Summary (2018–2023)[(1)]

Project No.	Project Title	Cost					
		2018	2019	2020	2021	2022	2023
WWTF-2	WWTF Headworks No. 1 Screen Rebuild			$47,500			
WWTF-3	WWTF Headworks No. 2 Screen Rebuild				$48,000		
WWTF-4	WWTF Lab./Admin Bldg. Replacement – Design	$100,000					
WWTF-4	WWTF Lab./Admin Bldg. Replacement – Construction		$1,000,000				
WWTF-5	WWTF Solids Screw Press		$300,000				
WWTF-6	WWTF Solids Handling Building Modification – Design			$50,000			
WWTF-6	WWTF Solids Handling Building – Construction				$500,000		
WWTF-7	WWTF Headworks Gate Actuators	$15,000					
WWTF-8	WWTF Filtrate No. 1 Pump Replacement				$17,000		
WWTF-9	WWTF Filtrate No. 2 Pump Replacement	$17,000					
WWTF-10	WWTF Scum No. 1 Pump Replacement		$17,000				
WWTF-11	WWTF Scum No. 2 Pump Replacement				$17,000		
WWTF-12	WWTF “A” Ditch NH3/NO3 Probe Replacement					$10,000	
WWTF-12	WWTF “B” Ditch NH3/NO3 Probe Replacement				$10,000		
WWTF-13	WWTF AHT Blower No. 1 VFD Replacement				$7,500		
WWTF-13	WWTF AHT Blower No. 2 VFD Replacement				$7,500		
WWTF-14	WWTF Replace Clarifier No. 3 Mechanism – Design						$35,000
WWTF-15	WWTF AHT No. 1 Mixer Replacement					$14,000	
WWTF-15	WWTF AHT No. 2 Mixer Replacement					$14,000	
WWTF-16	WWTF UV System Upgrades					$800,000	
WWTF-17	WWTF Grit Pump Replacement						$18,000
WWTF-18	WWTF SCADA Upgrade						$100,000
WWTF-19	WWTF Nos. 1, 2, and 3 K-Turbo Replacement	$250,000					
Totals		4,303,300	3,225,400	2,532,500	$3,177,200	2,612,400	1,712,100

(1) All project costs in 2017 dollars (CCI =10698.72).

SUMMARY OF CAPITAL IMPROVEMENTS FROM 2024 TO 2028

Table 10-2 is a summary of the capital improvements for 2024 through 2028. This summary covers the projects not included in the 6-year CIP summary for the remainder of projects within the 10-year period to provide a basis for evaluating the District's general facility charge (GFC).

TABLE 10-2

Summary of Capital Improvements (2024-2028)

Project No.	Project Title	Cost				
		2024	2025	2026	2027	2028
G-3	Telemetry	$13,400	$13,800	$14,200	$14,600	$15,100
G-5	Vehicle Replacement	$21,500	$51,000	$52,500	$54,000	$55,600
G-6	Wastewater Rate Study	$50,000				
G-7	Copier	$6,000				
G-8	Server Replacement		$20,000			
G-11	Vacon Replacement			$800,000		
GV-1	Sewer Line Replacement Design/Construction	$307,500	$316,700	$326,200	$336,000	$346,000
WPCF-1	City of Everett WPCF Projects	$800,000	$800,000	$400,000	$75,000	$75,000
WWTF-14	WWTF Replace Clarifier No. 3 Mechanism – Construction	$350,000				
WWTF-20	WWTF "A" Ditch Mixer Replacement			$35,000		
WWTF-21	WWTF "B" Ditch Mixer Replacement				$35,000	
WWTF-22	WWTF WAS Pump Replacement					$12,000
WWTF-23	WWTF Replace Clarifier No. 1 Mechanism			$750,000		
WWTF-24	WWTF Eff. Filter Feed Pump No. 1 Replacement	$20,000				
Total		**$1,568,400**	**$1,201,500**	**$2,377,900**	**$514,600**	**$503,700**

REVISIONS TO CHAPTER 11

Chapter 11 has been updated to reflect current rates and general facility charges.

SEWER RATES

The District covers two service areas for wastewater service. One is the Westside Service Area and the other is the Eastside Service Area. Tables 11-1 and 11-2 present the monthly sewer rates for the respective areas. Table 11-1 shows customer classifications for single-family, multi-family, and commercial; Table 11-2 has only two classifications,

single-family and all other buildings. The Westside commercial customers may be assessed a surcharge based on wastewater strength. Westside and Eastside rates are scheduled to be combined into a single rate in 2021.

TABLE 11-1

Westside Wastewater Service Rates

Customer Classification	Effective 1-1-17		Effective 1-1-18	
	2-Month Base Rate	Volume Charge ($/k gal)	2-Month Base Rate	Volume Charge ($/k gal)
Single-Family Residence(1)	$130.48	N/A	$132.70	N/A
Multi-Family Residence(2)	$91.72	N/A	$92.72	N/A
Commercial Class I(3)				
5/8 x 3/4-Inch Meter	$77.08	$7.10	$76.92	$7.32
1-Inch Meter	$192.66	$7.10	$192.28	$7.32
1-1/2-Inch Meter	$385.36	$7.10	$384.58	$7.32
2-Inch Meter	$616.56	$7.10	$615.30	$7.32
3-Inch Meter	$1,233.56	$7.10	$1,231.04	$7.32
4-Inch Meter	$1,926.74	$7.10	$1,922.82	$7.32
Strength Class Volume Charge				
Class II(4)	N/A	$3.47	N/A	$3.58
Class III(4)	N/A	$8.34	N/A	$8.59
Class IV(5)	N/A	$0.83	N/A	$0.86
Commercial (Contract)	$26,752.10	$4.34	$27,554.68	$4.47
Strength Classes				
	BOD_5		**Units**	
Strength Class I	0 to 300 mg/L BOD_5		200 mg/L BOD_5	
Strength Class II	301 to 900 mg/L BOD_5		400 mg/L BOD_5	
Strength Class III	901 to 1,500 mg/L BOD_5		1,000 mg/L BOD_5	
Strength Class IV(5)	Over 1,500 mg/L BOD_5		To be Determined	

(1) Single-Family Residential – A residential unit served by a separate water meter.

(2) Multi-Family Residence – Duplex, apartments, condominium, townhouses, mobile home parks served by a single water meter.

(3) Commercial-Industrial Class I shall mean a non-residential non-food processing/preparation customers including but not limited to retail stores, offices, service stations, schools, churches, governmental facilities, parks, manufacturing businesses, hotels and motels, all of which have a daily average BOD strength of 300 mg/L or less.

(4) Commercial-Industrial Class II and III shall mean a non-residential customer including restaurants, taverns, food processing/preparation businesses, breweries, ferry terminals and ferry waste, or other businesses which have a daily BOD strength between 301 mg/L and 1,500 mg/L.

(5) Commercial-Industrial Class IV shall mean a non-residential customer with a daily average BOD strength in excess of 1,500 mg/L. Wastewater surcharge rates for Strength Class IV are based on BOD_5 concentrations as opposed to predefined concentrations used in Classes I, II and III. Staff, based on a calculation for BOD_5 over 1,500 mg/L BOD_5, will determine actual volume rate.

(6) Commercial-Industrial Contract Customers shall mean a non-residential customer served by the District by contract.

TABLE 11-2

Eastside Wastewater Service Rates

Customer Classification	Effective 1-1-17		Effective 1-1-18	
	2-Month Base Rate	Volume Charge (after 10,000 gal)	2-Month Base Rate	Volume Charge (after 10,000 gal)
Single-Family Residence(1)	$106.14	N/A	$113.66	N/A
Multi-Family Residence(2)	$77.22	N/A	$79.02	N/A
Commercial Class I(3)				
5/8 x 3/4-Inch Meter	$77.72	$6.52	$77.40	$6.86
1-Inch Meter	$93.36	$6.52	$192.28	$6.86
1-1/2-Inch Meter	$107.24	$6.52	$147.34	$6.86
2-Inch Meter	$117.80	$6.52	$177.82	$6.86
3-Inch Meter	$135.34	$6.52	$234.68	$6.86
Strength Class Volume Charge				
Class II(4)	N/A	$3.47	N/A	$3.58
Class III(4)	N/A	$8.34	N/A	$8.59
Class IV(5)	N/A	$0.83	N/A	$0.86

(1) Single-Family Residential – A residential unit served by a separate water meter.

(2) Multi-Family Residence – Duplex, apartments, condominium, townhouses, mobile home parks served by a single water meter.

(3) Commercial-Industrial Class I shall mean a non-residential non-food processing/preparation customers including but not limited to retail stores, offices, service stations, schools, churches, governmental facilities, parks, manufacturing businesses, hotels and motels, all of which have a daily average BOD strength of 300 mg/L or less.

(4) Commercial-Industrial Class II and III shall mean a non-residential customer including restaurants, taverns, food processing/preparation businesses, breweries, ferry terminals and ferry waste, or other businesses which have a daily BOD strength between 301 mg/L and 1,500 mg/L.

(5) Commercial-Industrial Class IV shall mean a non-residential customer with a daily average BOD strength in excess of 1,500 mg/L. Wastewater surcharge rates for Strength Class IV are based on BOD_5 concentrations as opposed to predefined concentrations used in Classes I, II and III. Staff, based on a calculation for BOD_5 over 1,500 mg/L BOD_5, will determine actual volume rate.

(6) Commercial-Industrial Contract Customers shall mean a non-residential customer served by the District by contract.

GENERAL FACILITIES CHARGE

Tables 11-3 and 11-4, respectively, present the general facility charges for each service area.

TABLE 11-3

Westside Service Area General Facility Charges (Resolution No. 388-16)

Effective March 17, 2016		
Customer Classification	**GFC**	
Single-Family Residential	$5,252 per dwelling	
Multi-Family Residential	$5,252 for 1st unit $3,939 for each additional unit (provided however, total charge shall not be lower than corresponding commercial charge based on meter size)	
Hotels/Motels	$5,252 for 1st unit $2,626 for each additional unit (provided however, total charge shall not be lower than corresponding commercial charge based on meter size)	
Commercial	5/8" x 3/4" meter	$5,252
	1" meter	$13,130
	1-1/2" meter	$26,261
	2" meter	$42,019
	3" meter	$84,039
	4" meter	$131,311

TABLE 11-4

Eastside Service Area General Facilities Charge (Resolution No. 388-16)

Effective March 17, 2016		
Customer Classification	**GFC**	
Single-Family Residential	$4,435 per dwelling	
Multi-Family Residential	$4,435 for 1st unit $3,326 for each additional unit (provided however, total charge shall not be lower than corresponding commercial charge based on meter size)	
Hotels/Motels	$4,435 for 1st unit $2,297 for each additional unit (provided however, total charge shall not be lower than corresponding commercial charge based on meter size)	
Commercial	5/8" x 3/4" meter	$4,412
	1" meter	$11,085
	1-1/2" meter	$22,171
	2" meter	$35,472
	3" meter	$70,944
	4" meter	$110,851

APPENDIX E

SEPA CHECKLIST
(REVISED)

MUKILTEO WATER & WASTEWATER DISTRICT
SEPA ENVIRONMENTAL CHECKLIST

A. Background

1. Name of proposed project, if applicable:

Mukilteo Water & Wastewater District Wastewater Comprehensive Plan Amendment No. 1.

2. Name of applicant:

Mukilteo Water & Wastewater District

3. Address and phone number of applicant and contact person:

Jim Voetberg, General Manager
7824 Mukilteo Speedway, Mukilteo, WA 98275
(425) 355-3355

4. Date checklist prepared:

December 11, 2017

5. Agency requesting checklist:

Mukilteo Water & Wastewater District

6. Proposed timing or schedule (including phasing, if applicable):

The Amendment presents a schedule of sewer system and treatment facility improvements identified for construction for the period of 2018-2028.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

Recommendations for capital improvement projects are included in the amendment. Future plan updates or developments unknown to the District at this time may identify sewer system needs that are not identified in the present plan.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Projects funded and scheduled for construction will have individual SEPA review at the time of construction, as required.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

None known.

10. List any government approvals or permits that will be needed for your proposal, if known.

-Mukilteo Water & Wastewater District Board of Commissioners
-Snohomish County Health Department
-Washington State Department of Ecology
-Snohomish County
-City of Everett
-City of Mukilteo

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The Mukilteo Water and Wastewater District's Wastewater Comprehensive Plan Amendment 1 amends The Mukilteo Water and Wastewater District's Wastewater 2011 Comprehensive Plan, which was approved in November 2011. It is a planning document describing the location and type of facilities needed to provide wastewater service through 2037. It is used as a resource for public works staff; public officials and state regulatory agencies. The plan describes management, standards, policies, service area, geography, quality, infrastructure, operations, finance and other aspects of the District's wastewater management system.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The Mukilteo Water and Wastewater District's wastewater service area includes a portion of the City of Mukilteo, a portion of the City of Everett, Snohomish County Airport (Paine Field) and unincorporated areas of Snohomish County.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site:
Flat, rolling, hilly, steep slopes, mountainous, other: **The District encompasses a plateau that drops sharply to the Puget Sound's shoring. Several ravines cut into the plateau area.**

b. What is the steepest slope on the site (approximate percent slope)?

The ravines that cut into the plateau and the bluffs along the shoreline have slopes of 40-50% in the steepest area.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

The Soil Survey of Snohomish County Area, Washington (U.S. Department of Agriculture, 1987) maps the soils on the sites as Alderwood urban land complex. Consistent with the mapping designation, soils at the sites consists of Everett gravelly sandy loam, Alderwood gravelly sandy loam, and Alderwood-Everett gravelly sandy loam.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Steep slopes along the ravines in the western portion of the study area are subject to instability, particularly under seismic conditions and during periods of heavy precipitation .

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Individual SEPA reviews will be performed on each proposed project, as required.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Individual SEPA reviews will be performed on each proposed project, as required.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

This will be determined on a project specific basis.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Storm water best management practices will be employed for each project. An erosion control plan will be developed for each project.

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Individual SEPA reviews will be performed on each proposed project, as required.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Dust suppression measures and minimization of vehicle idling will be implemented construction projects.

3. **Water**

a. Surface Water:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

The western half of the District is confined by Puget Sound. Several deep gullies contain streams that drain to Puget Sound. Few areas within the District's boundary are classified as wetlands. Swamp Creek, Big Gulch Creek, and Japanese Gulch flow through the service area.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

This will be determined on a project specific basis.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

None anticipated, this will be determined on a project specific basis.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No withdrawals or diversions are anticipated.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

This will be determined on a project specific basis.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No discharge of waste materials into surface waters will occur as a result of the Plan.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

Pipeline and other excavations may disturb groundwater, and geotechnical studies may be required to determine the depth to groundwater. This will be determined on a project specific basis.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Not applicable.

c. Water runoff (including storm water):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Construction BMP's for the control of erosion and sedimentation will be implemented during construction of projects identified in the Plan Amendment.

2) Could waste materials enter ground or surface waters? If so, generally describe.

This will be determined on a project specific basis.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

This will be determined on a project specific basis.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Construction specifications for proposed projects will require the implementation of measures to control or eliminate surface, ground, and runoff water impacts, as per regulations.

4. **Plants**

a. Check the types of vegetation found on the site:

_X__deciduous tree: alder, maple, aspen, other
_X__evergreen tree: fir, cedar, pine, other
_X__shrubs
_X__grass
____pasture
____crop or grain
____ Orchards, vineyards or other permanent crops.
_X_ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other

_X_water plants: water lily, eelgrass, milfoil, other
_X_other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

This will be determined on a project specific basis.

c. List threatened and endangered species known to be on or near the site.

None known.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

This will be determined on a project specific basis.

e. List all noxious weeds and invasive species known to be on or near the site.

None known.

5. **Animals**

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

This will be determined on a project specific basis.

b. List any threatened and endangered species known to be on or near the site.

The District is bordered by the Puget Sound, the murrelet and the bull trout (both threatened species) may be present The streaked horned lark and the yellow-billed cuckoo may be present in the project area. The yellow-billed cuckoo is generally found in intact riparian areas along larger rivers and is thought to have been extirpated from Washington since the 1930s. The streaked horned lark generally nests in open/cleared areas.

c. Is the site part of a migration route? If so, explain.

The District is located within the Pacific Flyway, a regional migratory bird route that includes much of Western Washington. Puget Sound, immediately west of the project area, is a migration route for Pacific salmon, Orca, and other marine mammals and many species of waterfowl.

d. Proposed measures to preserve or enhance wildlife, if any:

This will be determined on a project specific basis. Individual SEPA review will be performed on each project, as required.

e. List any invasive animal species known to be on or near the site.

Opossums, an introduced species may be present in Mukilteo.

6. **Energy and Natural Resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

This will be determined on a project specific basis. Individual SEPA review will be performed on each project, as required.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

This will be determined on a project specific basis.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

This will be determined on a project specific basis.

7. **Environmental Health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

None anticipated but will be determined on a project specific basis.

1) Describe any known or possible contamination at the site from present or past uses.

None anticipated.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

This will be determined on a project specific basis.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

This will be determined on a project specific basis.

4) Describe special emergency services that might be required.

None required.

5) Proposed measures to reduce or control environmental health hazards, if any:

Compliance with industrial safety standards in design, construction on operation of facilities.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Ambient noise is primarily from traffic and will not affect the projects proposed in the Amendment.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hour's noise would come from the site?

To be determined on a project specific basis.

3) Proposed measures to reduce or control noise impacts, if any:

Construction equipment will be limited to daylight hours. Mufflers and other soundproofing equipment on construction machinery will be properly operated and maintained.

8. **Land and Shoreline Use**

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

To be determined on a project specific basis.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or non-forest use?

No.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

No.

c. Describe any structures on the site.

To be determined on a project specific basis.

d. Will any structures be demolished? If so, what?

To be determined on a project specific basis.

e. What is the current zoning classification of the site?

To be determined on a project specific basis. The zoning classifications vary within

jurisdiction and location.

f. What is the current comprehensive plan designation of the site?

To be determined on a project specific basis. The zoning classifications vary with jurisdiction and location.

g. If applicable, what is the current shoreline master program designation of the site?

To be determined on a project specific basis.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

To be determined on a project specific basis.

i. Approximately how many people would reside or work in the completed project?

To be determined on a project specific basis.

j. Approximately how many people would the completed project displace?

To be determined on a project specific basis.

k. Proposed measures to avoid or reduce displacement impacts, if any:

To be determined on a project specific basis.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Proposed improvements will be consistent with City of Mukilteo, City of Everett and Snohomish County Ordinances covering land use planning.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

Not applicable.

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

To be determined on a project specific basis.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

To be determined on a project specific basis.

c. Proposed measures to reduce or control housing impacts, if any:

Not applicable.

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

To be determined on a project-specific basis.

b. What views in the immediate vicinity would be altered or obstructed?

To be determined on a project-specific basis.

c. Proposed measures to reduce or control aesthetic impacts, if any:

To be determined on a project-specific basis.

11. **Light and Glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Not applicable.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Not applicable.

c. What existing off-site sources of light or glare may affect your proposal?

Not applicable.

d. Proposed measures to reduce or control light and glare impacts, if any:

Not applicable.

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity?

- Walter E. Hall Golf Course
- Kasch Memorial Park
- Paine Field Gymnasium & Ball Field (YMCA)
- Mukilteo Little League Complex
- Mukilteo Lighthouse Park
- Big Gulch Trail System

b. Would the proposed project displace any existing recreational uses? If so, describe.

To be determined on a project-specific basis.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

To be determined on a project-specific basis.

13. **Historic and cultural preservation**

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.

To be determined on a project-specific basis.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

To be determined on a project-specific basis.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

To be determined on a project-specific basis.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

To be determined on a project-specific basis.

14. **Transportation**

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

To be determined on a project-specific basis.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

To be determined on a project-specific basis.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

To be determined on a project-specific basis.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

To be determined on a project-specific basis.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

This will be determined on a project-specific basis.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and non-passenger vehicles). What data or transportation models were used to make these estimates?

Not applicable.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

This will be determined on a project-specific basis.

h. Proposed measures to reduce or control transportation impacts, if any:

This will be determined on a project-specific basis.

15. **Public Services**

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

No.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable.

16. **Utilities**

a. Utilities currently available at the site:

Electricity, natural gas, water, refuse service, telephone, sanitary sewer

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

This will be determined on a project-specific basis.

C. Signature

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: Eric Delfel

Name of signee ERIC DELFEL

Position and Agency/Organization ENGINEER, GRAY & OSBORNE, INC.

Date Submitted: 12/12/2017

D. Supplemental sheet for non-project actions

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Mukilteo Water and Wastewater Districts ' Amendment 1 to the Wastewater Comprehensive Plan recommends capital improvements such as replacement of existing piping, upgrades to the District's wastewater treatment facilities and sewage lift stations. All proposed projects will be completed in compliance with all state and federal regulations and City and County ordinances. It is anticipated that these capital improvements will have no discharge to water, emissions to air, or production storage, or release of toxic or hazardous substances, and no production of noise.

Proposed measures to avoid or reduce such increases are:

This will be determined on a project-specific basis.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

The District will strive to minimize work performed in streams, lakes or marine waters, therefor no impacts are anticipated to fish or marine life. Any urban run of for erosion would be controlled at project-specific construction sites. The capital improvements recommended in the Amendment 1 to the Wastewater Comprehensive Plan will be implemented in an existing urban environment, thus producing no impacts to animals whose habitats typically reside in rural settings.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

For any construction projects, individual SEPA documents will be prepared for each project, as required. Impacts to plants, animals, fish or marine life will be determined on a project-specific basis. Any landscape rehabilitation plan associated with project-specific

construction will take into account the protection or replacement of important plant species.

3. How would the proposal be likely to deplete energy or natural resources?

Not applicable to this Amendment Impacts to energy resources and natural resources will be determined on a project specific basis.

Proposed measures to protect or conserve energy and natural resources are:

Not applicable. Measures to conserve energy and natural resources will be determined on a project specific basis

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

The siting of public facilities such as collection system piping, lift stations and force mains take into account environmentally sensitive areas during the planning and design phases. Therefore, environmentally sensitive areas can either be mitigated or avoided all together.

Proposed measures to protect such resources or to avoid or reduce impacts are:

This will be determined on a project-specific basis.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow encourage land or shoreline uses incompatible with existing plans?

Effects to land and shorelines will be determined on a project specific basis. Each proposed project will be completed in compliance with all state, county, city and federal regulations, including District resolutions.

Proposed measures to avoid or reduce shoreline and land use impacts are:

This will be determined on a project-specific basis.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

It is anticipated that the proposed projects will have minimal effects on transportation or public services and utilities. However, pipeline construction may have some temporary impacts to traffic flow, as sewer mains are typically installed within road right-of-ways.

Proposed measures to reduce or respond to such demand(s) are:

This will be determined on a project-specific basis.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

This will be determined on a project-specific basis.

WAC 197-11-970 Determination of nonsignificance (DNS).

DETERMINATION OF NONSIGNIFICANCE

Description of proposal:

The Mukilteo Water and Wastewater District's Wastewater Comprehensive Plan Amendment 1 amends The Mukilteo Water and Wastewater District's Wastewater 2011 Comprehensive Plan, which was approved in November 2011. It is a planning document describing the location and type of facilities needed to provide wastewater service through 2037. It is used as a resource for public works staff, public officials and state regulatory agencies. The plan describes management, standards, policies, service area, geography, quality, infrastructure, operations, finance and other aspects of the District's wastewater management system.

Proponent: ***Mukilteo Water and Wastewater District***

Location of proposal, including street address, if any*:*

The Mukilteo Water and Wastewater District's wastewater service area includes a portion of the City of Mukilteo, a portion of the City of Everett, Snohomish County Airport (Paine Field) and unincorporated areas of Snohomish County.

Lead agency*:* ***Mukilteo Water and Wastewater District***

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030 (2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

☐ There is no comment period for this DNS.

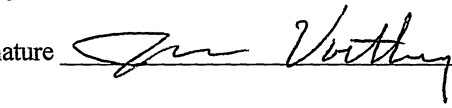
☐ This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS.

✓ This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 14 days from the date below. Comments must be submitted by _____

Responsible official: ***Jim Voetberg***

Position/title: ***General Manager*** _____ *Phone:* ***425-355-3355***

Address: **7824 Mukilteo Speedway, Mukilteo, WA 98275**

Date. 12/11/17 Signature 

(OPTIONAL)

☐ You may appeal this determination to (name) _____
at (location) _____
no later than (date) _____
_____ by (method) .....

You should be prepared to make specific factual objections.
Contact _____to read or ask about the procedures for SEPA appeals.

☐ There is no agency appeal.

APPENDIX G

DEVELOPER EXTENSION STANDARDS
(REVISED)

APPENDIX I

HYDRAULIC PROFILE CALCULATIONS (REVISED)

Mukilteo Water and Wastewater District
2017 Wastewater Comp Plan Amendment

Activated Sludge Spreadsheet Model - Updated to Include Influent Characterization from GPS-X modeling

Parameter	Conditions				Equation/Source
	2004-09 ADWF	2004-09 AWWF	Projected 2020 Max. Month	Projected 2037 Max. Month	
Influent Characteristics					
Flowrate (mgd)	1.54	1.95	2.61	2.69	DMR data; includes 0.11 MGD filtrate
CBOD5 (lb/day)	2696	3002	4279	4458	DMR data; 88% of projected BOD loading
COD (lb/day)	8843	6604	9413	9808	[Infl CBOD5] * [Infl COD/CBOD5 ratio]
bCOD (lb/day)	8789	5554	7915	8247	[Infl CBOD5] * [Infl bCOD/CBOD5 ratio]
sCOD (lb/day)	1945	1453	2071	2158	[Infl COD] * [Infl sCOD/COD ratio]
sCBOD5 (lb/day)	593	660	941	981	[Infl CBOD] * [Infl sCBOD/CBOD ratio]
TSS (lb/day)	3757	4826	6290	6556	DMR data (2007-09 only); projections
VSS (lb/day)	3569	4585	5976	6228	[Infl TSS] * [Infl VSS/TSS ratio]
NH4-N (lb/day)	475	602	805	830	DMR data
TKN (lb/day)	699	885	1184	1221	[Infl NH4] / [Infl NH4/TKN ratio]
nbVSS (lb/day)	22	729	951	991	[Infl VSS] * { 1 - [Infl bCOD/CBOD ratio]*([Infl CBOD5] - [Infl sCBOD5])/([Infl COD] - [Infl sCOD]) }
iTSS (lb/day)	188	241	315	328	[Infl TSS] - [Infl VSS]
Kinetic and Stoichiometric Values					
Influent VSS/TSS ratio	0.95	0.95	0.95	0.95	2010 GPS-X calibration sampling
Influent COD/CBOD ratio	3.28	2.2	2.2	2.2	2010 GPS-X calibration sampling
Influent bCOD/CBOD ratio	3.26	1.85	1.85	1.85	Per GPS-X modeling
Influent sCBOD/CBOD ratio	0.22	0.22	0.22	0.22	Assume same as sCOD/COD ratio
Influent sCOD/COD ratio	0.22	0.22	0.22	0.22	Aug 2010 Calibration Period Average
Influent rbCOD/COD ratio	0.155	0.155	0.155	0.155	Aug 2010 Calibration Period Average
Influent NH4/TKN ratio	0.68	0.68	0.68	0.68	Aug 2010 Calibration Period Average
MLSS temperature T (°C)	20.1	13	13	13	DMR data
MLVSS/MLSS ratio	0.88	0.88	0.88	0.88	DMR data during Aug 2010 Calibration Period
Y (lb VSS/lb bCOD)	0.4	0.4	0.4	0.4	M&E
kd(20) (1/d)	0.12	0.12	0.12	0.12	M&E
kd(T) (1/d)	0.120	0.091	0.091	0.091	[kd(20)] * (1.04 ^ ([T]-20))
f-d	0.15	0.15	0.15	0.15	M&E
Yn (lb VSS/lb TKN)	0.12	0.12	0.12	0.12	M&E
Umax(20)	0.75	0.75	0.75	0.75	M&E

Mukilteo Water and Wastewater District
2017 Wastewater Comp Plan Amendment

Activated Sludge Spreadsheet Model - Updated to Include Influent Characterization from GPS-X modeling

Parameter	Conditions				Equation/Source
	2004-09 ADWF	2004-09 AWWF	Projected 2020 Max. Month	Projected 2037 Max. Month	
Umax(T)	0.755	0.461	0.461	0.461	[Umax(20)] * (1.072 ^ ([T]-20))
kdn(20) (1/d)	0.08	0.08	0.08	0.08	M&E
kdn(T) (1/d)	0.080	0.065	0.065	0.065	[kdn(20)] * (1.029 ^ ([T]-20))
MLSS NH4 (mg/L)	1	1	1	1	Assumed
MLSS DO (mg/L)	2	2	2	2	Assumed
KsNH4(20) (mg/L)	0.74	0.74	0.74	0.74	M&E
KsNH4(T) (mg/L)	0.744	0.516	0.516	0.516	[KsNH4(20)] * (1.053 ^ ([T]-20))
KsDO (mg/L)	0.5	0.5	0.5	0.5	M&E
Unet(T)	0.27	0.18	0.18	0.18	{Umax(T)*([NH4]/([NH4]+KsNH4(T)))*([DO]/([DO]+KsDO))}-kdn(T)
Physical Dimensions					
Selector Sx-1 Volume (MG)	0.026	0.026	0.026	0.026	Input
Selector Sx-2 Volume (MG)	0.026	0.026	0.026	0.026	Input
Selector Sx-3 Volume (MG)	0.051	0.051	0.051	0.051	Input
Oxidation Ditch 1 Volume (MG)	0.64	0.64	0.64	0.64	Input
Oxidation Ditch 2 Volume (MG)	1.07	1.07	1.07	1.07	Input
Avg. Clarifier Sludge Volume (MG)					
Total Volume (MG)	1.81	1.81	1.81	1.81	Input
Active volume ratio	1.0	1.0	1.0	1.0	Input (proportion of volume consumed by settled grit)
Total active volume (MG)	1.81	1.81	1.81	1.81	[Total volume] * [active volume ratio]
Aerated Phase Ratio	0.88	0.75	0.75	0.75	Input
Total active aerated Volume (MG)	1.59	1.36	1.36	1.36	[Total active volume] * [aerated phase ratio]
Total HRT (hr)	28	22	17	16	
Oxidation Ditch HRT (hr)	26.6	21.0	15.7	15.3	
BOD5 Loading (lbs/1000 ft3/day)			19	20	
Oxic Phase Design					
Min Aerobic SRT (calc) (d)	3.76	5.62	5.62	5.62	1 / [Unet(T)]
Min Aerobic SRT (safety) (d)	5.6	8.4	8.4	8.4	[SRT (calc)] * 1.5
Aerobic SRT (design) (d)	18.4	12.0	10.5	10.5	Input
Effl TKN (mg/L)	5	3	3	3	Aug 2010 Calibration Period Average
Effl sbCOD (mg/L)	24	12	12	12	Aug 2010 Calibration Period Average

Mukilteo Water and Wastewater District
2017 Wastewater Comp Plan Amendment

Activated Sludge Spreadsheet Model - Updated to Include Influent Characterization from GPS-X modeling

Parameter	Conditions				Equation/Source
	2004-09 ADWF	2004-09 AWWF	Projected 2020 Max. Month	Projected 2037 Max. Month	
Effl sbCOD S-o (lb/day)	308	195	261	269	[Effl sbCOD] * [Q] * 8.34)
WAS Org-N (lb/day)	97	84	126	132	Assume 0.068 N fraction of VSS (per GPS-X)
TKN-ox (lb/day) (calc'd)	537	752	993	1022	
TKN-ox (lb/day) (iter.)	537	752	993	1022	[Infl TKN] - ([Effl TKN] * [Q] * 8.34)
Grit removal ratio for iTSS	1	1	1	1	
Px (lb TSS/day)	**1838**	**2382**	**3378**	**3520**	
Px-bio (lb VSS/day)	1433	1242	1859	1937	$\frac{[Y]*([\text{Infl bCOD}]-[\text{Effl sbCOD}])}{(1+([k_{d(T)}]*[SRT]))*v}+\frac{[f_d]*[k_{d()}]*[Y]*([\text{Infl bCOD}]-[\text{Effl sbCOD}])*[\text{SRT}]}{(1+([k_{d(T)}]*[SRT]))*v}+\frac{[Y_n]*[TKN_{ox}]}{(1+([k_{dN(T)}]*[SRT]))*v}+[nbVSS]+[iTSS]$
Px-H-bio (lb VSS/day)	1407	1191	1789	1670	
WAS Conc (mg/L)	7100	7100	7100	7100	
Px (gal/day)	31040	40227	57047	59444	
Total SRT (design)	**21.0**	**16.0**	**14.0**	**14.0**	
Total Mass M (lb)	38546	38112	47292	49279	
MLSS (mg/L)	**2551**	**2522**	**3129**	**3261**	
Recycle ratio R	0.53	0.52	0.75	0.81	
MLVSS bio (mg/l)	1952	1261	1657	1547	
Px {A}	1201	1163	1777	1853	
Px {B}	398	191	255	266	
Px - N	30	57	80	83	
Px {nbVSS}	22	729	951	991	
Px {iTSS}	188	241	315	328	

Mukilteo Water and Wastewater District
2017 Wastewater Comp Plan Amendment

Activated Sludge Spreadsheet Model - Updated to Include Influent Characterization from GPS-X modeling

Parameter	Conditions				Equation/Source
	2004-09 ADWF	2004-09 AWWF	Projected 2020 Max. Month	Projected 2037 Max. Month	
Selector Design					
Total Selector F/M	1.2	1.4	1.6	1.6	
Selector Sx-1 F/M	5.0	5.6	6.4	6.4	
Model results per M&E figure					
NO3 in RAS (lb NO3/day)	20	72	111	141	<<Iterate RAS NO3 conc. With Anoxic Zone performance (Row 117)
F/Mbio (lb CBOD5/lb MLVSS bio/d)	1.6	2.8	3.0	3.4	
SDNRb (lb NO3-DEN/lb MLVSS b/d)	0.3	0.2	0.2	0.2	Per M&E Fig. 8-23; assumes rbCOD/COD = 0.2, Theta = 1.05
Potential NO3-DEN (lb NO3/day)	434	244	331	327	
Max NO3-DEN (lb NO3/day)	20	72	111	141	Min(NO3 available in RAS, Potential DEN based on SDNR)
Anoxic Phase Design					
Total Anoxic Volume (MG)	0.227	0.453	0.453	0.453	M&E Eq. 8-54 $\frac{0.175*[1-1.42Y+(\frac{1.42k_dY*SRT}{1+k_dSRT})]}{[\frac{Y}{1+k_dSRT}]*SRT}$
Method 1: Per M&E for Intermittent Anoxic/Aerobic Operation (Equation 8-54) (Not Used)					
Method 2: Model results per M&E figure					
F/Mbio (lb CBOD5/lb MLVSS bio/d)	0.73	0.63	0.68	0.76	
SDNRb (lb NO3-DEN/lb MLVSS b/d)	0.171	0.114	0.117	0.121	Per M&E Fig. 8-23; assumes rbCOD/COD = 0.1, Theta = 1.05
NO3-DEN (lb NO3/day)	630	542	734	706	
Effl NO3 (mg/L)	3.0	8.5	6.8	7.8	
RAS NO3 (mg/L)	3.0	8.5	6.8	7.8	
Net alk. Consumed (lb CaCO3/d)	1512	3177	4073	4271	
Net alk. Consumed (mg CaCO3/L)	118	195	187	190	
Effl TN (mg/L)	6	11	10	11	

Mukilteo Water and Wastewater District
2017 Wastewater Comp Plan Amendment

Activated Sludge Spreadsheet Model - Updated to Include Influent Characterization from GPS-X modeling

Oxygen Requirements

	Inf. Characteristics		Conditions				
			2004-09 ADWF	2004-09 AWWF	Projected 2020 Max. Month	Projected 2037 Max. Month	
1	Flow	mgd	*1.54*	*1.95*	*2.61*	*2.69*	
2	CBOD	lb/day	*2696*	*3002*	*4279*	*4458*	
3	TSS	lb/day	*3757*	*4826*	*6290*	*6556*	
4	VSS	lb/day	*3569*	*4585*	*5976*	*6228*	
5	NH4-N	lb/day	*475*	*602*	*805*	*830*	
6	TKN	lb/day	*699*	*885*	*1184*	*1221*	
	O2 Requirement Balance						
7	bCODin	lb/day	*8789*	*5554*	*7915*	*8247*	
8	bCODout	lb/day	*308*	*195*	*261*	*269*	
9	bCOD-R	lb/day	8481	5359	7654	7978	
10	WAS TSS	lb/day	*1838*	*2382*	*3378*	*3520*	
11	TKN ox	lb/day	*537*	*752*	*993*	*1022*	
12	Px-bio	lb VSS/day	1433	1242	1859	1937	
13	NO3-DEN	lb/day	650	614	845	848	
14	**AOR (O2 required)**	**lb/day**	***6912***	***5094***	***6895***	***7227***	
15	Peak AOR	lb/day	8985	6622	8964	9395	Include 30% peaking safety factor

Standard Oxygen Requirement

AOR = SOR * alpha((beta*CSW - CL)/CST)*1.024^(T-20)

16	alpha		0.60	0.60	0.60	0.60	O2 transfer in WW/O2 transfer in clean water
17	beta		0.96	0.96	0.96	0.96	O2 saturation in WW/O2 saturation in clean water
18	CSW	mg/L	8.95	10.53	10.53	10.53	Saturation of O2 at operating temperature and pressure
19	CL	mg/L	1.00	1.00	1.00	1.00	Desired Operating O2 concentration
20	CST	mg/L	9.08	9.08	9.08	9.08	Saturation of O2 at sea level at 20°C
21	T	°C	20.1	13	13	13	Winter minimum temperature
22	AOR/SOR Ratio		0.50	0.51	0.51	0.51	[16]*(([17]*[18]-[19])/[20])*1.024^([21]-20)
23	**SOR**	**lb/d**	**17868**	**12988**	**17583**	**18428**	standard oxygen requirement
24	SOR	lb/hr	744	541	733	768	standard oxygen requirement

Fine Bubble Diffuser Efficiency

25	Per-Foot Diffuser Efficiency	ft^{-1}	2.00%	2.00%	2.00%	2.00%	Sanitaire

Mukilteo Water and Wastewater District
2017 Wastewater Comp Plan Amendment

Activated Sludge Spreadsheet Model - Updated to Include Influent Characterization from GPS-X modeling

Oxygen Requirements

	Inf. Characteristics		Conditions				
			2004-09 ADWF	2004-09 AWWF	Projected 2020 Max. Month	Projected 2037 Max. Month	
26	Depth of Basin	ft	12	12	12	12	Side water depth
27	Depth of Submergence	ft	11	11	11	11	[26]-1
28	Fine Bubble Diffuser Efficiency		22%	22%	22%	22%	[25]*[27]
29	**Air Flow Required**	**scfm**	**3260**	**2370**	**3208**	**3362**	[23]*(1 scf/0.0173 lb O2)*(1 d/1440 min)/[28]
30	Quantity of blowers		2	2	2	2	
31	Air Flow Required per Blower	scfm	1630	1185	1604	1681	at standard temperature and pressure
	Inlet Volume of Atmospheric Air						Va=Vs*((Ps-(RHs*PVs))/(Pb-(RHa*PVa)))*(Ta/Ts)*(Pb/Pa)
32	Vs	scfm	1630	1185	1604	1681	Inlet flow of air at standard temperature and pressure
32	Ps	psi	14.7	14.7	14.7	14.7	standard pressure of air (=1.0 atm)
32	RHs		0.36	0.36	0.36	0.36	standard relative humidity
32	PVs	psi	0.26	0.26	0.26	0.26	vapor pressure of water @ std temperature and pressure
32	Pb	psi	14.3	14.3	14.3	14.3	design atmospheric pressure
32	RHa		0.80	0.80	0.80	0.80	design relative humidity
32	PVa	psi	0.95	0.95	0.95	0.95	vapor pressure of water at design temperature and pressure
32	Ta	°R	560	500	560	560	design temperature (=100°F)
32	Ts	°R	520	520	520	520	standard temperature (=60°F)
32	Pa	psi	14.1	14.1	14.1	14.1	design pressure at inlet
32	Va	icfm	1930	1250	1890	1990	Inlet flow of air at design conditions, from above equation
	Blower Discharge Pressure						
33	Diffuser submergence	ft	11	11	11	11	1' above bottom of aeration basins
34	static submergence pressure	psi	4.78	4.78	4.78	4.78	[117]/2.3
35	Equivalent length of 6" pipe	ft	100	100	100	100	approximate - pipe not designed yet
36	Unit Headloss in 6" pipe	psi/100ft	0.3	0.3	0.3	0.3	from friction loss chart
37	Friction headloss	psi	0.3	0.3	0.3	0.3	
38	Silencer headloss	psi	0.1	0.1	0.1	0.1	
39	Air filter pressure drop	psi	0.1	0.1	0.1	0.1	
40	Air diffuser headloss	psi	0.76	0.76	0.76	0.76	
41	Discharge Pressure	psi	6.10	6.10	6.10	6.10	rounded up to nearest 0.1 psi

Mukilteo Water and Wastewater District
2017 Wastewater Comp Plan Amendment

Activated Sludge Spreadsheet Model - Updated to Include Influent Characterization from GPS-X modeling

Oxygen Requirements

	Inf. Characteristics		Conditions			
			2004-09 ADWF	2004-09 AWWF	Projected 2020 Max. Month	Projected 2037 Max. Month
42	Max. blower capacity (Kturbo TB50-0.6S)	scfm	1300			
43	Qty. of blowers		3 (2 duty, 1 standby)			
44	Total aeration capacity	scfm	2600			
45	SOR at max. aeration cap.	lb/day	14250			
46	AOR at max. aeration cap.	lb/day	7267			