

City of Arlington

Final 2017 Amendment to the 2015

Comprehensive Wastewater Plan





A General Sewer Plan

Prepared by:

City of Arlington

With assistance from:

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and

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October 2015

Amended October 2017

Cover photos:

Foreground photo shows the WRF Headworks with three Huber 3 mm corkscrew fine screens. Background photo shows the Kubota Flat Plate membrane cartridges in a drawn-down bay in the membrane bioreactor (MBR). Nominal pore size is 0.04 mm, with an effective pore size of 0.02 mm.

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DATE 2. 8. 2018

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11-2-2017
Date

City of Arlington
City Council

Barbara Tolbert, Mayor

11-2-2017
Date

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City of Arlington Certification

Chapters 1, 2, 3, 5, and 8 of this 2017 Amendment to the 2015 Comprehensive Wastewater Plan were prepared by City of Arlington staff under the direction of the following registered professional engineer. Chapters 4, 6 and 7 were prepared for the City by registered professional engineers with RH2 Engineering. Chapter 10 was prepared by FCS Group under the direction of the engineer below.

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RH2 Engineering Certification

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Reviser's Note Regarding The 2017 Amendment

The City of Arlington 2015 Comprehensive Wastewater Plan (CWP) planned for the expansion of the City's Urban Growth Area (UGA) and associated sewer collection systems west of I-5. This effort reflected the City's intent to develop west of the freeway in order to accommodate its 2035 population targets established under the Growth Management Act (GMA). The City acted on this intent in the 2014 filing of a petition with Snohomish County for the westward expansion of its UGA.

Planning for the expansion of the wastewater collection system also assured consistency of the CWP with the City's 2015 GMA Comprehensive Plan. Snohomish County's Planning and Development Services reviewed the City's 2015 Plan, but could not find it consistent with the County's own 2015 GMA Comprehensive Plan, which did not include the City's proposed UGA expansion. Later, in 2016, the City withdrew its petition and began revision of its GMA Comprehensive Plan in order to plan for an alternative population placement that was consistent with Snohomish County's plan. For purposes of consistency among all plans, this 2017 Amendment to the 2015 CWP also drops expansion of the distribution system west of I-5, and evaluates the re-allocation of additional population across the City, and its effect on sewer collections and wastewater treatment capacities to meet the additional demand.

These planning modifications resulted in minor revisions to most chapters in this amended CWP, and these are documented in this publication using underlined insertions and strikeout deletions to quickly and clearly show the effects of the amendment.

Although many portions of Chapter 3 (Land Use) have not changed, there are enough revisions that complete re-printing of the chapter is appropriate. Where changes may be significant, the amended text describes the change. Tables and figures which have substantial changes are also completely replaced, and the word "amended" follows the table and figure numbers in parentheses.

The primary changes to Chapter 10 (Financial Plan) are the replacements of Tables 10-4 and 10-5. Small, individual revisions are shown using underlined insertions and strikeout deletions as in most of the rest of the document.

The only appendix containing modifications is Appendix G (SEPA). Agency review comments and responses will be included in Appendix J in the final CWP.

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Executive Summary

ES.1 PURPOSE OF THE PLAN



The City of Arlington's (City) wastewater collections, reclamation (treatment), disposal, and reuse systems form a complex and sophisticated infrastructure. The wastewater utility matches qualified staff to the operational and maintenance (O&M) requirements of these systems, implements a capital improvement program (CIP) to schedule replacements of necessary components to keep the systems working optimally, and assures compliance with all federal and state laws and permit conditions. The primary purpose of the City's Comprehensive Wastewater Plan (CWP) is to serve as the nexus for:

- Preparing the wastewater system and personnel to meet the City's future growth,
- Evaluating current service levels
- Evaluating current O&M activities,
- Setting CIP goals and priorities to match City Comprehensive Plan,
- Reviewing compliance with City policies and state/federal regulations, and
- Evaluating Wastewater Utility funding requirements.

This comprehensive evaluation identifies existing conditions, assesses repair and replacement needs to serve existing customers, forecasts the demands of anticipated growth, develops improvements and solutions, and identifies schedules and funding mechanisms for implementing them. Done well, this CWP will help assure a resilient and sustainable means for transforming the human waste stream in Arlington into a clean, high quality resource, thereby protecting human and environmental health. This CWP also complies with Washington State Department of Ecology (Ecology) regulations under Washington Administrative Code (WAC) 173-240-050, which requires preparation of General Sewer Plans.

ES.2 CHANGES SINCE THE LAST COMPREHENSIVE WASTEWATER SYSTEM PLAN

The City's last CWP was completed in 2008. The following changes have occurred since the last update that affect wastewater system planning for the City.

- Upgrade and expansion of treatment facilities from a Sequential Batch Reactor with capacity of 1.0 MGD to a Membrane Bioreactor with Biological Nutrient Removal with capacity for 2.67 MGD. The Water Reclamation Facility (WRF) is easily expanded to accommodate 4.0 MGD simply by adding additional membrane units.
- Modifications to pumps and other equipment affecting capacities at 12 Lift Stations.
- Installation of telemetry system at all lift stations.
- Extension of the NPDES permit to 2019, and issuance of a Reclaimed Water permit allowing for discharge and reuse of reclaimed water in a constructed wetland adjacent to the WRF and the Stillaguamish River.
- Development of a constructed wetland (Old Town Wetland) which will serve as an adaptive management measure for temperature and copper and other metals if loading increases or river water quality declines.
- Construction of a reclaimed water lines from the new Water Reclamation Facility to the Old Town Wetland, and in a segment of 67th Avenue near the Cemetery.
- Extension of Sewer Collection system to SE areas of the City of Arlington.
- Replacement of undersized sewer (15") on the 67th Interceptor with larger pipe (24").
- Assessment of existing sewer collection system in Old Town Arlington area.
- Installation of new sewer for development in the Arlington Airport Business Park.

ES.3 SUMMARY OF KEY ELEMENTS

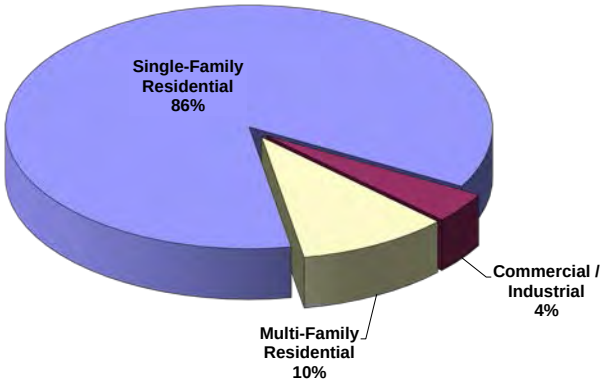
This CWP contains: a description of the existing wastewater system and service area; a forecast of future wastewater collection and treatment demands; policies and design criteria for wastewater system operation and improvements; wastewater system hydraulic analyses; the operations and maintenance program; staffing requirements; a schedule of improvements; and a financial plan to accomplish the improvements. A summary of the key issues related to these elements is provided in the following sections.

ES.3.1 Customers within the Wastewater Service Area

The City provides wastewater service to approximately 16,116 residents through 4,650 residential connections within its wastewater service area boundary, which is the City's Urban Growth Area (UGA). In addition, the City collects wastewater via side sewers from 520 commercial and

industrial facilities. An estimated 1,100 parcels with septic systems within the City will be required to connect to the collections network whenever their drain fields should fail.

2014 Sewer Service Connections by Customer Class



ES.3.2 Infrastructure

The Wastewater Department manages assets with a replacement value of approximately $132 million allocated as follows:

Facility	Value (2015)
Water Reclamation Facility	$ 75,000,000
Biosolids Compost facility	$ 7,500,000
Lift Stations	$ 8,850,000
Collection System	$ 40,500,000
Total	**$ 131,850,000**

Components within the Water Reclamation Facility (WRF) includes a headworks, biological nutrient removal (BNR), membrane bioreactor (MBR), ultraviolet radiation disinfection, a sludge digester, and solids handling. The WRF produces effluent of either Class B or Class A Reclaimed Water quality. Upgrades during the 20 year planning cycle are limited to additional MBR cartridges in existing filter bays in the WRF as necessary to increase plant capacity to accommodate growth.

The Biosolids Composting Facility (BCF) takes some of the digested and dewatered biosolids and produces Class A Exceptional Quality compost. No upgrades are proposed for the BCF in the 20 year horizon.

Twelve lift stations currently operate throughout the service area to route collected wastewater through the sewer collection system. Six of the lift stations will require capacity improvements, while two (LS-02 and LS-11) will likely require total replacement. Two additional stations will need to be constructed to accommodate growth west of I-5 and in the Island Crossing area.

The sewer utility maintains approximately 72 miles of force main and gravity sewer pipe. The sewer pipe is composed of various pipe material including PVC (79%), concrete (11%), and ductile iron (9%). The most common sewer pipe diameter is 8-inches (72%).

All existing pipe is considered young and within its design life, including: 0-10 years (41 percent of total length); 20-30 years (38 percent); and 50-60 years (21 percent). By 2035, total main length is estimated to be 78.6 miles. Replacement of 7,700 feet of the oldest pipe will result in 15 percent aged 70 to 80 years. All remaining pipe will be less than 50 years old.

ES.3.3 Historic and Forecast Demand

Annual average day flow rates into the WRF over the last six years (2009 to 2015) range from 1.07 to 1.21 MGD, with an average flow of 1.1 MGD. Maximum month flows ranged from 1.34 to 1.66 MGD, with an average flow of 1.51 MGD and a peaking factor of about 1.35. Maximum day flows ranged from 1.73 to 2.47 MGD, with an average of 2.15 MGD and a peaking factor of about 1.92. Inflow and infiltration are considered non-excessive per EPA standards.

Average day influent is forecast to increase relative to 2013 levels by 0.55 MGD to 1.66 MGD in 2024, an increase of 50%. Maximum month flows in 2024 will be 2.32 MGD, an increase of 0.83 MGD, or 56%.

Average day influent is forecast to increase relative to 2013 levels by 1.16 MGD to 2.27 MGD in 2035, an increase of 105%. Maximum month flows in 2035 will be 3.17 MGD, an increase of 1.68 MGD, or 113%. The NPDES permit allows a maximum month influent of 2.67 MGD into the WRF, so expansion of the MBR (additional cartridges in existing bays) will be required during the second planning decade.

ES.3.4 Staffing for Operations and Maintenance

The City's Wastewater Department staff are well-qualified, technically trained personnel equipped to operate and maintain the existing infrastructure. City staff regularly participates in safety and training programs to keep abreast of the latest changes in the wastewater industry and to ensure a smooth and safe operation of the collection, treatment, re-use, and composting systems. The current staff of nine (one supervisor and eight field crew), is one shy of the 10 estimated at the time of the WRF upgrade to fully staff all functions of the utility. With hydraulic and waste loading

below forecast and 2.25 management personnel in Public Works Administration, however, the City is capable of adequately operating the wastewater system, complying with the minimum Ecology requirements, and accomplishing the preventive maintenance tasks at the desired frequency. The City will add staff in the future, as necessary and as allowed by budget, to meet the increasing requirements of system operation and maintenance, due to customer growth and increased regulatory requirements.

ES.3.5 Wastewater System Evaluation

Wastewater flows were modeled through 12 lift stations and 14 drainage basins using SewerCAD version 8i. Flow increases for 2024 and 2035 scenarios occur primarily due to growth in ~~six~~ five focus areas:

- Island Crossing (LS #11, 14);
- ~~UGA expansion west of I-5 and the I-5 rest areas (LS #6, 14, 15);~~
- Airport Business Park (LS # 5, 3);
- Manufacturing Industrial Center (LS #12, 4, 3);
- Hilltop at SR 9 and SR 531(Gleneagle and Primary Interceptor gravity mains); and
- Central Arlington (Kent Prairie) mixed use developments (LS #2, Primary Interceptor).

The flow capacity of individual pipe segments and pipe networks were evaluated against the ratio of flow depth (d) to pipe diameter (D) at peak hour flow scenarios. Pipes with (d/D) >0.8 are deemed to be at capacity and recommended for upgrade.

- Under existing conditions, portions of the primary interceptor (trunk line) along 67th Avenue NE (4,520 feet) and West Avenue (760 feet) are at or near capacity. The City is monitoring the primary interceptor to confirm flow levels before selecting pipe segments and schedule for upgrade.
- By 2024, another 10,345 feet of pipes are considered deficient in their capacity to convey wastewater flows. Most of this distance is in the Primary Interceptor, approximately 3,000 feet are eight-inch mains in Gleneagle's arterials.
- By 2035, yet another 3,075 feet of pipes in Gleneagle will be under capacity and in need of an upgrade.

Lift station capacities are based on estimated peak hour capacity with one pump in operation.

- Model results suggest lift stations 2, 4, 5, and 7 are currently at or near capacity during peak hour events. Lift station 4 exceeds capacity during storm events. The City is monitoring these lift stations to validate priority and scheduling of improvements

- Prior to 2024, LS #6 is targeted to be rerouted away from LS #5, reducing loading to that lift station and others downstream. By 2021, ~~2024, two~~ one new lift stations (LS-14~~ and LS-15~~) will need to be constructed to support flows from Island Crossing~~, the WSDOT rest area and other areas west of I-5~~. No lift stations are forecast to have capacity deficiencies at this time.
- Lift stations 8, 11, and 12 may require upgrades to accommodate projected flows by 2035.

As mentioned previously, targeted upgrades for the WRF are limited to the installation of additional membranes in existing filtration bays between 2024 and 2035

ES.4 PROPOSED WASTEWATER SYSTEM IMPROVEMENTS AND FINANCING PLAN

This CWP identifies a capital improvement program (CIP) with annual expenditures over the first decade (2024), and lump sum expenditures over the second decade (2035). The 20-year CIP total is ~~$20.043~~ $18.8 million in 2015 dollars. With costs escalated to the year of planned spending at an annual rate of 3.0 percent, the 20-year total is ~~$25.822~~ $23.5 million. Most of CIP projects are preliminarily scheduled for the first decade, with a total of ~~$17.443~~ $15.2 million to be spent by 2024. Only ~~$2.60~~ $3.6 million in projects are slated to occur in the second decade. The actual implementation of these improvements will be predicated on growth.

A financial strategy to fully fund the CIP and operating expenses and service existing and new debt is also presented. The plan relies primarily on cash funding from rates and connection charges. Connection revenue of about $175,000 per year after 2015 from 40 connections per year is assumed. Annual rate increases of 2.0 percent are proposed after 2018, this expected to be at or near the rate of inflation. Under this scenario, the operating fund ends each year with a minimum of 45 days of O&M expenses. Capital projects are fully financed with cash over the 20-year CIP without the need for additional debt. ~~, except for years 8, 9, and 10 (ending 2025), when approximately $7.0 million in new revenue bond debt will need to be issued. This new debt issued at that time will bring total debt to approximately $9.1 million.~~

A study is underway at the time of this writing to evaluate costs of service and rates by customer class. Preliminary indications suggest decreases in both rates and connection charges are feasible prior to the implementation of the financing plan described herein. Chapter 9 of this CWP may be amended in the foreseeable future depending on the final recommendations of the rate study.

1 Introduction

1.1 WASTEWATER UTILITY OWNERSHIP AND MANAGEMENT

The City of Arlington (City) is a municipal corporation that owns, operates, and maintains a public wastewater utility under NPDES Permit WA0022560. The utility is managed by the Wastewater Department, in the City's Public Works' Utilities Division. The utility serves the City and its Urban Growth Area (UGA) with the exception of a portion of the Smokey Point neighborhood within the southwest corner of the City.



1.2 OVERVIEW OF EXISTING SYSTEM

The City's existing incorporated area and UGA creates a Wastewater Service Area totaling approximately 6,048 acres (9.45 square miles). This excludes the portion of Arlington's Smokey Point neighborhood whose wastewater service is provided separately by the City of Marysville.

In 2014, approximately 16,121 Arlington citizens received sewer service through 4,297 residential customer connections. An additional 394 connections served commercial, industrial, and institutional customers.

The City's wastewater utility consists of one supervisor and eight treatment, collections, and compost staff. A single treatment facility currently reclaims 1.1 million gallons per day (MGD) (capacity of 2.67 MGD expandable to 4 MGD) of municipal wastewater influent. Membrane filtration, biological nutrient removal, and ultraviolet disinfection processes produce effluent of Class A or B reclaimed water quality. Collections staff maintain 12 pump stations and approximately 68 miles of gravity collection and force main pipes. Biosolids are either composted with wood waste at a dedicated facility to create Class A compost, or land applied in Eastern Washington. A summary of wastewater utility data is provided in **Table 1-1**.

Table 1-1. 2014 Wastewater Utility Data

Description	Data
Population (Wastewater Service Area)	16,121
Wastewater Service Area (acre)	6,048
Total Connections	4,691
Average Gallons Per Capita Per Day (gpcd)	66
Average Daily Flow (MGD)	1.07
Number of Pump Stations	12
Total Length of Sewer Main (miles)	67.4
Total Dry Tons Biosolids Produced, 2014	278
Total Dry Tons Biosolids Composted, 2014	87

1.3 AUTHORIZATION AND PURPOSE (AMENDED)

In February 2014, the City initiated an update to its Comprehensive Wastewater Plan (Plan, CWP). RH2 Engineering (RH2) was retained in March 2014 to provide modeling and analytical support. FCS Group was also retained to provide financial planning assistance for the utility, including financial analyses for this CWP and conducting a utility rate study. The City previously prepared Comprehensive Sewer System Plans in October 1995 and September 2008. The purpose of this updated Plan is to:

- Comply with all requirements of a General Sewer Plan (GSP) under WAC 173-240-050.
- Quantify existing and projected sewerage volumes and flow rates.
- Determine the overall reliability and vulnerability of existing sewer lift (pump) stations.
- Analyze whether the treatment and operational objectives of the wastewater reclamation facility and biosolids composting facility are achieved.
- Evaluate whether the existing wastewater collections and treatment systems are sufficient to meet minimum requirements mandated by the Department of Ecology (DOE) and the City's own policies and design criteria.
- Identify capital and operational improvements that will resolve existing system deficiencies and accommodate future needs of the City of Arlington and its Wastewater Utility.
- Prepare a schedule of improvements that meets the goals of the City's financial program.

In addition, this amended CWP serves, by adoption, as a critical element of the 2015 Update to the City of Arlington's *GMA Comprehensive Plan, as amended in 2017*. Consistency between the plans, and the 2015 Update to Snohomish County's Plan, has been assured during their concurrent preparation. Arlington is forecast to accommodate a total of 24,937 citizens and at least 12,224 jobs by 2035. As stated in its ~~2015~~ *GMA Comprehensive Plan* ~~update~~, the City is taking a proactive role in attracting developments to meet the needs of its citizens, prioritizing alternative uses of land and public resources, and identifying in explicit terms the impact proposed developments will have on the community. ~~Six~~ Five focus area are identified in Arlington's ~~2015~~ *GMA Comprehensive Plan*, as amended, as being the most suitable for future residential, industrial and retail growth; these same focus areas were evaluated in this CWP to assure adequate wastewater infrastructure to assure a high level of service to existing customers, and to facilitate the growth of new customers. See chapter 3 for additional Land Use discussion.

1.4 SUMMARY OF PLAN CONTENTS

A brief summary of the content of the chapters in the Plan is as follows.

- **Chapter 1** introduces the reader to the City's Wastewater Utility, the objectives of the Plan, and the Plan organization.
- **Chapter 2** presents the Wastewater Service Area and describes the existing wastewater utility.
- **Chapter 3** presents related plans, land use and population characteristics.
- **Chapter 4** identifies existing wastewater flow rates and projects future rates.
- **Chapter 5** presents the City's operational policies and design criteria.
- **Chapter 6** discusses the sewer system analyses and existing system deficiencies.
- **Chapter 7** presents proposed wastewater utility improvements, their estimated costs and an implementation schedule.
- **Chapter 8** discusses the Wastewater Utility's operations and maintenance program.
- **Chapter 9** summarizes the financial status of the Wastewater Utility and presents a plan for funding wastewater improvements.

1.5 LIST OF ABBREVIATIONS

The abbreviations listed in **Table 1-2** are used throughout this Plan.

Table 1-2. Abbreviations

Abbreviation	Description
AAF	Average Annual Flow
ac	acres
BNR	Biological Nutrient Removal
BOD	Biochemical Oxygen Demand
CIP	Capital Improvement Program
City	City of Arlington
COD	Chemical Oxygen Demand
DOE	Department of Ecology
DOH	Department of Health
EPA	Environmental Protection Agency
ERU	Equivalent Residential Unit
fps	feet per second
GMA	Growth Management Act
gpm	gallons per minute
hp	horsepower
I/I	Infiltration and Inflow
MBR	Membrane Bioreactor
MDF	Maximum Day Flow
MMF	Maximum Month Flow
MG	Million Gallons
mgcd	million gallons per capita per day
MGD	Million gallons per Day
mg/L	Milligrams per Liter
mi^2	square miles
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety & Health Administration
PHF	Peak Hour Flow
RW	Reclaimed Water
SBR	Sequencing Batch Reactor
TDH	Total Dynamic Head
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UGA	Urban Growth Area
WAC	Washington Administrative Code

2 Wastewater System Description

2.1 INTRODUCTION



This chapter defines the City of Arlington's (City) wastewater service area, and provides an overview of the wastewater utility with its component sewer collections, wastewater treatment, and disposal and reuse systems as they exist in 2015. It estimates septic systems within the service area and identifies adjacent water and sewer systems. The existing wastewater system described herein is analyzed and evaluated for performance under current conditions, as well for projected demands in about 10 and 20 years (2024 and 2035). The results of these analyses are presented in **Chapter 6.**

2.2 WASTEWATER SERVICE AREA

2.2.1 Wastewater Service Area Definition (amended)

The Wastewater Service Area is generally the area within city limits and any adjacent urban growth area (UGA). The City is located in northwestern Snohomish County, Washington, at the confluence of the North Fork and South Fork of the Stillaguamish River. The City's corporate boundary encompasses an area of approximately 6.216 acres (9.71 square miles), as shown in **Figure 2-1,** Wastewater Service Area. The existing urban growth area (UGA) on the periphery of the City, identifying the area in which the City can grow by annexation, totals an additional 388 acres (0.61 mi^2). Since the previous Comprehensive Wastewater Plan (CWP), the City has annexed Island Crossing, the Country Charm Conservation Area, and smaller parcels in the southeast corner of the City near the intersection SR 9 and SR 531. ~~For much of the City~~ Except for the 388 acres of UGA outside city limits, the city limits are ~~currently~~ coincidental with the UGA. ~~The City is currently proposing changes to its UGA as described below.~~

2.2.2 Expansion Area West of I-5 (Amended)

The City filed a petition in 2014 to expand the UGA to include 236 acres west of I-5, but withdrew the petition in 2016. Under the City's *2017 Amendment of the GMA Comprehensive Plan* and this 2017 amendment of the 2015 CWP, there is no modification of any kind to the existing UGA. ~~The~~

~~City of Arlington's water (not wastewater) service area extends north from the City of Marysville to the Stillaguamish River, and west of the existing City limits at I-5 to the BNSF railroad tracks. An agreement between the Cities of Arlington and Marysville places the boundary between the two Cities for future UGA expansion approximately along 184th Street. The City of Arlington (City) has petitioned Snohomish County for Urban Growth Area (UGA) expansion into approximately 190 acres bounded by I-5 to the east, 184th Street to the south, 23rd Avenue on the west, and 200th Street on the north. This area lies entirely within the Rural Urban Transition Area (RUTA) established by Snohomish County. The petition is currently before the Snohomish County Council, and a decision is expected in 2016.~~

~~With these authorities and pending decision in place, the City of Arlington (City) is beginning planning its delivery of water and sewer service to an area that is absent of any utility infrastructure. Long-term planning will cover the approximately 900 acres of the water service area bounded by 184th and 200th Streets, and I-5 and the railroad. This Comprehensive Wastewater Plan will focus on the anticipated 190 acre UGA fronting along I-5.~~

2.2.3 Wastewater Infrastructure and the Service Area Boundary (amended)

The City's existing wastewater service area boundary generally follows the 6,604 acres (10.3 mi^2) of the City's UGA as shown in **Figure 2-1**. The ~~largest~~ one exception (about ~~555~~ 488 acres) is in the southwest corner of the City where the portion of the Smokey Point neighborhood south of 180th Street and west of 43rd Avenue is served both water and sewer by the City of Marysville. Altogether, the Wastewater Service Area contains about ~~6,049~~ 6,115 acres.

Just because an area is "served" does not mean that an existing or proposed structure can readily connect to a sewer main. The City's existing wastewater collection system generally extends from just south of 172nd Street NE, north to the South Fork and mainstem of the Stillaguamish River, east to the intersection of 212th Street NE and 87th Avenue NE, and west to I-5 at Island Crossing, as shown in **Figure 2-2**, Existing Sewer System. Existing parcels in the UGA that do not yet contain wastewater collections infrastructure include the following neighborhoods: Kunze Tracts (88th Dr.); Meadowbrook (89th Ave.); The Eagles (84th Ave.); Pioneer Park (62nd Dr.); Camelot Terrace (204th Pl.); and Prospect Point, Sau Turn, Cedar Village, and adjacent areas (Cemetery Rd., 196th Pl.. near 45th Dr. Sewer main has just recently been installed to begin serving the Star, Thompson, and Hilltop areas.

2.2.4 Wastewater Source Characterization

The service area primarily contains customers who generate sewage typical of domestic uses or low strength. As shown later in **Chart 4-1**, 96 percent of customer connections are residential, and four percent are commercial and industrial customers. Most of the commercial and industrial customers are very similar to residential customers in terms of effluent strength. For example, several, large industrial facilities in the City are not individually monitored due to mainly domestic and low production strengths, including: Alpha Technologies; Cuz Concrete; Powder Fab; Ecoating Solutions; Round Gold (recently moved); and Superior Powder Fabrication (new).

Three Significant Industrial Users (SIUs) are currently metered and monitored under the Wastewater Department's Pretreatment Program. These include, from the largest to smallest discharger: Ace Acme Septic; Snohomish County Solid Waste Transfer Station; and the

Snohomish County Decant Facility. Data from 2010 indicate these three facilities discharge less than 5 MG annually, or about one percent of the total annual influent to the WRF. Perhaps the discharger of the greatest volume and strength of effluent in recent history was US Marine/Bayliner Boats, who discontinued operations in the City between 2008 and 2010.

2.3 HISTORY

Arlington was incorporated in 1903. Construction of the sewer system began in 1913. Throughout the years, the system was extended to serve the greater downtown area with a combined sanitary sewer/storm sewer system. This system collected the City's wastewater and channeled it through a 36-inch-diameter trunk line to a discharge location on the banks of the Stillaguamish River, near the current wastewater reclamation facility location. All of the City's raw sewage was discharged into the river untreated until 1959.

Much of the downtown area sewer system that remains today consists of this legacy infrastructure. Between 1957 and 1959, a separate storm drain system was constructed in areas served by the old combined sewers. Roof drains and some other sources of inflow may remain connected to the sewer in that area. The remaining sewer collection system is relatively new, with the majority of the construction occurring within the last 20 years.

The City's first wastewater treatment plant, featuring primary treatment for the removal of settled solids and surface scums, was completed in 1959. Effluent discharged to the river through the same combined storm and sewer outfall as before. In 1974, the plant was upgraded to secondary treatment for the degradation of organic matter. A new wastewater outfall located just east of the old location was constructed and is still used today. This plant was one of the first secondary treatment facilities in the State of Washington. In 1998, the City upgraded its plant to a sequencing batch reactor (SBR) facility for improved secondary treatment. Again, the SBR technology selected was at the time considered cutting edge.

Sudden growth in the City subsequent to the 1998 expansion caused the wastewater treatment plant to approach capacity by 2004. This required the City to enhance the existing treatment process and begin planning for an expansion to the treatment plant. At the same time, a biosolids composting facility was added to reduce sludge disposal costs and provide beneficial reuse through production of Class B quality compost.

As part of the State's clean-up efforts for the Stillaguamish River, increasingly stringent discharge limits were placed on the treatment plant's discharge, requiring an increase in treatment technology to produce cleaner effluent. Beginning 2008, with completion in 2011, the treatment plant was upgraded and expanded for improved removal of conventional contaminants through membrane biofiltration (using membrane bioreactors [MBR]), and additional treatment for the removal of phosphorus and nitrogen using advanced biological nutrient removal. With this upgrade, the facility can produce effluent of Class A reclaimed water quality. Instead of a wastewater treatment

plant (WWTP), it is referred to as a water reclamation facility (WRF). With pre-designed expansion for capacity increases, the WRF is intended to serve the City well beyond 2025.

2.4 GEOLOGY AND SOILS

The City is located in northwestern Snohomish County, Washington, at the confluence of the North Fork and South Fork of the Stillaguamish River. At least three landforms converge here that affect how the City manages its water resources: the Marysville Trough, Getchell Plateau, and Stillaguamish River Floodplain. The Marysville Trough and Getchell Plateau were formed during the last glacial epoch—the Vashon—ending approximately 13,000 years ago. The Stillaguamish floodplain formed as the river cut through these formations since that time.

The Marysville Trough consists of terraces and areas of low relief extending from Old Town, south and southwest through the airport and Smokey Point areas, continuing south to the Snohomish River. The landform is underlain by outwash—gravels and sand deposited by meltwater as the glacier advanced and then receded. The outwash is from 100-to-200 feet deep and provides good infiltration, except where a groundwater divide is very shallow along SR 531 (172nd St), or where wetlands have developed. Approximately 55 percent of the wastewater service area is located on soils developed in glacial outwash, such as the Everett gravelly sandy loam.

The Getchell Plateau rises from Old Town southeast along Burn Road, extending toward Lake Stevens and Snohomish. The Brekhus-Beach area and the Crown Ridge, Arlington Terrace, and Gleneagle neighborhoods are situated on this ridge. The landform is underlain by glacial till—unsorted, gray silt, sand, and gravel deposited directly beneath the advancing glacier and compacted to form a very dense "hardpan". Typically around 70 feet thick, the silt content and density of the till impedes the vertical flow of water, resulting in greater water runoff and locally high water tables during the wet season. Glacial till is absent in the Marysville Trough and Stillaguamish floodplain, having been eroded away. Approximately 29 percent of the wastewater service area is located on soils underlain by glacial till, such as the Tokul gravelly loam.

The Stillaguamish River Floodplain is underlain by post-glacial alluvium consisting of sand and gravel with cobbles and boulders. Its largest extent begins at the confluence and continues downstream to the west, and includes portions of the Portage Creek and March Creek tributaries. It is typically between 0 and 30 feet thick in the area, but does reach 100 feet below the surface of the Stillaguamish valley. The City's Haller well field located at the confluence, and the Old Town Wetland west of the WRF and SR 9 is situated in this alluvium. The Island Crossing neighborhood is also located on the floodplain. Approximately 13 percent of the wastewater service area is located on soils developed in alluvium, such as the Norma loam and Puget silty clay loam.

2.5 TOPOGRAPHY

The topography of the City's wastewater service area is highly variable. The lowest areas within the service area are located on the Stillaguamish River Floodplain near Interstate 5 at Island

Crossing where the elevation is approximately 40 feet. Much of the wastewater service area is within the Marysville Trough. Elevations range from 120 feet west of the Arlington Airport to 115 feet in downtown Arlington. The highest areas served are in the southeastern portion of the service area on the Getchell Plateau. Elevations near the intersection of 91st Avenue NE and NE 172nd Street reach approximately 480 feet. Slopes are steepest at the transitions between the three major landforms, where elevation changes of 80 to 100 feet at slopes of about 100 percent are not uncommon.

2.6 CLIMATE

The City of Arlington experiences a marine climate typical of the Puget Sound region. Summers are relatively dry and cool, while winters are mild, cloudy and rainy. The average temperature in summer is 62˚F, and the average temperature in winter is 40˚F, with temperatures occasionally falling below freezing (Barrett Consulting Group 1995).

Average annual precipitation in Arlington is approximately 46 inches, as measured at the Arlington Water Department near the confluence of the North and South Forks of the Stillaguamish River. Annual precipitation across the wastewater service area ranges from 42 inches (west of I-5 and south of SR 531) to about 49 inches to the east-southeast on the Getchell Plateau. October through April are the wettest months. The prevailing winds are from the south or southwest during the wetter months and from the northwest or west during the drier months.

Fall and winter weather is generally wetter than normal during La Nina conditions when tropical moisture originating in the South Pacific Ocean is delivered via the "Pineapple Express" to the Pacific Northwest (Taylor 1998). At the same time, the polar jet stream passes through the Bering Strait before heading toward the Pacific Northwest. These phenomena generate the larger storm events influencing Wastewater Service Area. The risk of flooding is greatest when warm, heavy rains fall on accumulated snow after larger snowstorms. The large floods of 1996, 1997, and 2009 were rain-on-snow events generated during La Nina conditions.

2.7 WATER RESOURCES

2.7.1 Watersheds

The City straddles the divide between two river basins, the Stillaguamish and the Snohomish, which are regionally recognized as Water Resource Inventory Areas (WRIAs) 5 and 7, respectively. Approximately 58% of the land in the wastewater service area drains to the Stillaguamish River, either directly to the mainstem or the South Fork Stillaguamish, or via Portage Creek. The remaining 42% of the service area drains to the Snohomish River estuary at Ebey Slough via the Middle Fork Quilceda Creek.

2.7.2 Water Quality

The larger rivers form the northern (Stillaguamish) and eastern (South Fork Stillaguamish) boundaries of the wastewater service area and are significant considerations in the management of

the Wastewater Utility. Most or all segments of these rivers are identified (listed under CWA 303d) as impaired for fecal coliform, dissolved oxygen, and temperature. Clean-up plans developed under two Stillaguamish Total Maximum Daily Load studies (TMDLs) are enforced through the NPDES wastewater discharge permit for the WRF, and the NPDES Phase II stormwater general permit for Arlington and other cities. On the south end of the wastewater service area, the Middle Fork Quilceda Creek is impaired for fecal coliform and is subject to the Lower Snohomish Tributaries TMDL.

Various studies have suggested that some of the problems with depressed dissolved oxygen levels in the mainstem Stillaguamish and the lower Snohomish River tributaries are related to a nutrient-driven mechanism. High nutrient loads from point and nonpoint source pollution drive the excessive growth of algae and other organisms, which may produce oxygen during daylight hours, but then continue to respire and consume large amount of oxygen during night-time hours. This continuous day-night cycling can plunge dissolved oxygen levels below water quality standards. However, during modeling of river dissolved oxygen concentrations for the Stillaguamish TMDL, Ecology was unable to adequately model the river using known point and nonpoint influences, including BOD loading from the City's WWTP. The Washington State Department of Ecology (Ecology) hypothesized that nutrient loading from the City's WWTP and other unknown sources were causing the DO depressions, but did not have adequate information with which to develop wasteload allocations for phosphorus and nitrogen for the WWTP. A supplemental TMDL study implemented in 2012 sought to improve upon the understanding of which processes were causing the DO impairment. However, during that effort, no excursions of dissolved oxygen outside of surface water quality standards were observed. No reports have been drafted and released as of this writing, but Ecology staff has suggested river water quality has improved. During this time frame, the City evaluated and implemented the best available technology for achieving nutrient reductions during the wastewater reclamation process.

Accordingly, the TMDLs affecting the City also address nutrient sources in most nonpoint source runoff. These sources are often associated with fecal coliform sources, including sediments, animal wastes, failing septic systems, and fertilizers.

In a separate study, Read (2006) evaluated trends in Stillaguamish basin water quality (bacteria, temperature, dissolved oxygen, and sediment) using data from multiple sources. Some data at some locations were collected as early as 1959, but most were collected between 1994 and 2006. Many of the river and stream stations analyzed, including those near Arlington, showed improvements for all parameters, including some statistically significant changes. However, despite improving or maintained conditions, fecal coliform bacteria in the mainstem and South Fork Stillaguamish Rivers and in Portage Creek still do not meet water quality standards. In addition, trends in water temperature and sediment in the South Fork near Arlington were shown to be degrading. Results are summarized in Table 2-1. For the mainstem Stillaguamish downstream of the WRF the trends are generally favorable. For water temperature in the South

Fork entering the reach with the WRF outfall, temperature trends are worsening, and may require adaptive management measures be implemented by the City.

Table 2-1. Trend analysis of water quality in the Stillaguamish Watershed from 1959 through 2006[a,b]

Stream Name	Bacteria	Temperature	Oxygen	Sediment
Mainstem Stillaguamish—Arlington	None*	Improving	Improving	Improving
South Fork Stillaguamish—Arlington	Improving*	Worsening	None	Worsening
Portage Creek	Improving*	Improving	None	Improving

[a] Table is an abbreviated version of Table 3 in Svrjcek and Lawrence (2007)

[b] Recent analysis of water quality data (Read 2006) indicate whether the trends for the parameters and water courses shown are improving, staying the same (no trend, or none), or worsening. A dark gray box indicates the trend is statistically significant ($p<0.05$). An asterisk indicates bacterial pollution remains a problem (does not meet WQS).

Copper and lead appeared on the 1998 303d list as exceeding state water quality criteria in the Stillaguamish River near Arlington, and lead was on the list for Portage Creek as well. These exceedances were deemed to not require TMDL development, due to suspicions about the reliability of the data.

Similarly, Quilceda Creek also appears on the Section 303(d) list as requiring TMDL development for lead, copper, zinc, and dissolved oxygen. However, Johnson, et. al. (2001) indicated that these metals are not present in concentrations approaching the water quality criteria in Quilceda Creek. Previous listings were due to measuring total recoverable metals, which are not comparable to the water quality standards. Ecology does not anticipate developing a TMDL for these metals unless new information indicates the need.

Further water quality data collection could result in a requirement to develop a metals TMDL for these water bodies. Metals are commonly found in stormwater runoff, and development of a metals TMDL in the future would require the issue to be addressed in a future Comprehensive Wastewater Plan update.

2.7.3 Fisheries

Fish are known to inhabit all rivers and streams within or adjacent to the Wastewater Service Area. These include both anadromous fish—those ocean-going fish who spend a portion of their life-cycle in fresh water streams, and resident fish—those fish that spend their entire life in fresh water

streams. Accordingly, nearly all life stages of fish and their subsequent habitat requirements are present in area streams year round.

Three species that inhabit area streams are federally listed as threatened under the Endangered Species Act. These are addressed individually below.

Puget Sound Chinook salmon were listed in 1999 with recent populations at about 7% of historic levels. In the Stillaguamish basin, most Chinook spawn in the mainstem river, the forks, and the larger tributaries, and rear throughout the river system. After hatching, most juvenile Chinook spend one to five months rearing in freshwater before migrating to the estuary, but, under current degraded habitat conditions only, 1-2% will rear in freshwater for a full year (SIRC 2005). Two distinct populations are recognized in the Stillaguamish basin. The North Fork Stillaguamish Chinook is the stronger population, with an average number of 1,080 fish returning in the summer to spawn (SIRC 2005). The South Fork/mainstem Stillaguamish Chinook begin arriving in mid-September with a current average population of only 246 fish (SIRC 2005). In the immediate vicinity of the City, Chinook salmon typically do not utilize Portage and Eagle Creek systems, except for temporal rearing use at their confluence with the rivers, or as flood refuge during inundation of the Stillaguamish floodplain. In the Snohomish basin, the Quilceda watershed generally provides low levels of Chinook salmon use as far upstream as Middle Fork Quilceda Creek, and they do not utilize Edgecomb Creek. Ebey Slough, however, provides extensive Chinook rearing habitat for out-migrants.

Listed in 1998, bull trout need cold water to survive, so they are seldom found in waters where temperatures exceed 59-64 °F (USFWS 2008). These fish may exhibit three different life histories—resident (non-migrating), adfluvial (migrating to rivers and larger streams), and anadromous (migrating to the ocean). In the Stillaguamish basin, four local populations of bull trout, including North Fork and South Fork Stillaguamish, are known to be anadromous (SIRC 2005). Resident populations also occur. Bull trout are opportunistic foragers, and the USFWS considers the entire distribution area for Coho salmon to be potential foraging habitat for bull trout. Hence, mimicking the distribution of Coho salmon, bull trout are presumed to occupy the rivers and all small streams in the vicinity of Arlington. Similarly, in the Snohomish basin, bull trout have not been confirmed, but are suspected to inhabit Edgecomb Creek and other tributaries and reaches of Quilceda Creek. Ebey Slough is also presumably a high traffic area for bull trout when they out-migrate during the warm summer and early fall months. Immature adults will overwinter at the head of Ebey Slough (Shared Strategy 2007).

Puget Sound steelhead trout were listed in 2007. In the Snohomish basin, the Quilceda watershed generally provides low levels of steelhead trout use as far upstream as Middle Fork Quilceda Creek, but they are not known to utilize Edgecomb Creek. The Stillaguamish River also hosts several populations of steelhead, but their essential habitats in the basins managed by Arlington have not yet been mapped.

2.8 WASTEWATER COLLECTION FACILITIES

2.8.1 Sewer Drainage Basins

The City's existing wastewater service area is comprised of 14 sewer drainage basins, as shown in **Figure 2-3**, Wastewater Collections Drainage Basins. The portion of the City's southwest UGA served by the City of Marysville is also shown in this figure.

2.8.2 Collection Piping

The City has approximately 67.4 miles of sewer piping, including collection sewers, interceptors and force mains. There are approximately 7.8 miles of force main throughout the system. A majority of the system is 8-inch-diameter gravity main, totaling nearly 49 miles. **Table 2-2**, Sewer Piping Inventory summarizes the pipe by diameter. Pipe size and location are illustrated in **Figure 2-2**.

Table 2-2. Sewer Main Inventory

Diameter (in)	Total Main Length (mi)			% of Entire System
	Force	Gravity	Total	
4	0.05	0	0.05	0.1%
6	5.34	0.21	5.56	8.2%
8	2.43	46.4	48.83	72.4%
10	0	4.74	4.74	7.0%
12	0	3.7	3.7	5.5%
15	0	1.86	1.86	2.8%
16	0	0.36	0.36	0.5%
18	0	0.28	0.28	0.4%
24	0	1.56	1.56	2.3%
36	0	0.46	0.46	0.7%
Totals	7.83	59.57	67.41	100.0%

2.8.3 Lift Stations

The City currently owns, operates, and maintains 12 wastewater lift stations numbered 1 through 13 and excluding 10. The characteristics of each lift station are summarized in **Table 2-3**, Lift Station Characteristics. A description of the telemetry system, pump control logic, lift stations, and the potential for sewage overflows or bypass at lift stations follows. Additional details on each lift station are provided in **Appendix A**.

Table 2-3. Lift Station Characteristics

Lift Station	Year Designed	Pump Station				Pumps			Wet Well		Standby Power Supply	Potential for Bypass to Waters of the State
		Manufacturer	Model	Serial No.	Force Main Dia. (in)	HP	TDH (ft)	Capacity (gpm)	Diameter (ft)	Depth (ft)		
01	2009	Davis EMU	----	----	4	10	unknown	200 200	unknown	----	WRF Generator	None
02	1989	Smith & Loveless, Inc.	Duo-Duct	06-0103-C	8	15 15	33 33	500 500	8	21±	On-site Generator	Negligible
03	1987	Smith & Loveless, Inc.	Duo-Duct	06-0101-C	3	7.5 7.5	46 46	200 200	6	15.5±	On-site Generator	None
04	1990	Smith & Loveless, Inc.	Duo-Duct	06-0105-C	8	15 15	60 60	400 400	12	21±	On-site Generator	None
05	1990	Smith & Loveless, Inc.	Duo-Duct	06-0107-C	8	15 15	30.5 30.5	450 450	12	24±	On-site Generator	None
06	1992	Smith & Loveless, Inc.	Duo-Duct	06-0108-T	8	15 15	50.7 50.7	500 500	12	26±	On-site Generator	None
07	1995	Smith & Loveless, Inc.	Duo-Duct	06-0110-Z	6	10 10	74 74	176 176	12	26±	On-site Generator	Negligible
08	1996	Smith & Loveless, Inc.	Duo-Duct	06-0112-C	6	10 10	76 76	225 225	12	18±	On-site Generator	Negligible
09	1997	Smith & Loveless, Inc.	Duo-Duct	06-0114-C	6	10 10	79 79	225 225	12	21±	On-site Generator	Very Small
11	1978	Barnes	Submersible	----	6	20 20	98 98	115 115	6	22±	Portable Generator*	Very Small
12	2001	Smith & Loveless, Inc.	Duo-Duct	06-0118	6	5 5	33 33	250 250	12	27±	On-site Generator	Negligible
13	1994	Myers	Submersible	----	2	3	----	100 100	6	11.5±	Portable Generator*	Negligible

* See text for other handling alternatives to power for these lift stations

Telemetry and Supervisory Control

Successful operation of any municipal wastewater system requires gathering and using accurate sewer system information. A telemetry and supervisory control system gathers information and can efficiently control a system by automatically optimizing facility operations. A telemetry and supervisory control system also provides instant alarm notification to operations personnel in the event of equipment failure, operation problem, flood, fire or other emergency situations.

The City's telemetry and supervisory control system (SCADA) initially controlled lift station operations through phone lines connecting floats in each wet well to the control logic of the SCADA system located at the wastewater treatment plant. SCADA would then turn pumps on and off to operate each lift station within a range of wet well levels.

Telemetry and communications were improved with an upgrade to Mission Communications in 2009. Remote telemetry units at each of lift station have the capability to monitor 2 analog and 8 digital inputs. A transducer system senses the real time wet well level, high wet well level, low wet well level, communication, power failure, generator failure, pump status, pump starts, flow, pump runtime, in service mode, and water in drywell. The units utilize cellular type communication with a web based interface to continuously monitor and communicate this information to the SCADA system. At high and low set points unique to each lift station, SCADA has the ability to start and stop pumps, respectively, as needed. Each lift station can also be accessed and controlled remotely from any web server. The two original floats remain in place in each wet well to provide backup pump control and alarm sensing in the event of a failure of the Mission Communications system.

Lift Station No. 1 - Northwest Corner of Sewer Treatment Plant

Lift Station No. 1, located at the northwest corner of the wastewater treatment plant, was constructed in 1998. This small submersible type pump station serves the treatment plant site, stormwater runoff from the site, associated public works' offices, and a few properties located in the far northern region of the City. This station was upgraded in 2010 along with the Wastewater Treatment Upgrade. The station was retrofitted with new controls and new pumps now capable of 200 GPM and still maintains the existing 4" force main. The emergency generator providing backup power to the WRF also serves Lift Station No. 1.

Lift Station No. 2 - LID 20/204th Street

Lift Station No. 2, located on 204th Street near 71st Avenue NE, was constructed in 1989 for Local Improvement District (LID) 20. It is a wet well/dry well Smith and Loveless Duo-Duct package pump station. It is equipped with two 15 horsepower pumps, each with a capacity of 500 gpm at 33 feet of total dynamic head. A recent impeller upgrade using Smith & Loveless Xpellers reduced clogging of the pumps and also resulted in the nine percent increase in capacity from 460 gpm. The wet well is 8 feet in diameter and approximately 21 feet deep. As described previously, a transducer system senses the wet well fluid level, and two floats in the wet well provide backup

pump control and alarm sensing. The lift station has an 8-inch force main and is equipped with an emergency generator.

Lift Station No. 3 – Snohomish County Transfer Station

Lift Station No. 3 is located at the North County Recycling and Transfer station on 63rd Avenue NE. The wet well/dry well Smith and Loveless Duo-Duct package pump station was constructed in 1987. It has two 7.5 horsepower pumps, each with a capacity of 200 gpm at 46 feet of total dynamic head. A recent impeller upgrade using Smith & Loveless Xpellers reduced clogging of the pumps without affecting pump capacity. The wet well is 6 feet in diameter and approximately 16 feet deep. As described previously, a transducer system senses the wet well fluid level, and two floats in the wet well provide backup pump control and alarm sensing. The lift station has a 3-inch force main and is equipped with an emergency generator. A technical evaluation of Lift Station No. 3 was conducted in 2007 by MSA. A detailed memorandum dated April 2007 is archived in Wastewater Department files.

Lift Station No. 4 - AAMP

Lift Station No. 4 is located on 59th Avenue NE near Arlington Advanced Manufacturing Park (AAMP). The station was constructed in 1990. It is a wet well/dry well Smith and Loveless Duo-Duct package pump station with two 15 horsepower pumps. Each pump has a capacity of 400 gpm at a total dynamic head of 37 feet. A recent impeller upgrade using Smith & Loveless Xpellers reduced clogging of the pumps, but also resulted in a five percent decrease in capacity from 420 gpm. (The issue is being addressed with the manufacturer as of this writing.) The lift station has an 8-inch-diameter force main. The wet well is 12 feet in diameter and is approximately 21 feet deep. As described previously, a transducer system provides for sensing of wet well fluid level, and two floats in the wet well provide for backup pump control and alarm sensing. The lift station is equipped with an emergency generator for backup power supply.

Lift Station No. 5 - Westside Airport

Lift Station No. 5 is located near the Westside Airport at approximately 51st Avenue NE and 172nd Street NE. The wet well/dry well Smith and Loveless Duo-Duct package pump station was constructed in 1990. The lift station is equipped with two 15 horsepower pumps, each with a capacity of 450 gpm at 30.5 feet of total dynamic head. A recent impeller upgrade using Smith & Loveless Xpellers reduced clogging of the pumps without affecting pump capacity. The wet well has a diameter of 12 feet, and a depth of approximately 24 feet. As described previously, a transducer system senses the wet well fluid level, and two floats in the wet well provide backup pump control and alarm sensing. The lift station has an 8-inch force main and an emergency generator.

Lift Station No. 6 - I-5 Rest Stop/WSDOT

Lift Station No. 6 is located on Smokey Point Boulevard near the I-5 rest stop. The lift station was constructed in 1992. It is a wet well/dry well Smith and Loveless Duo-Duct package pump station

with two 15 horsepower pumps. Each pump has a capacity of 500 gpm at 50.7 feet of total dynamic head. A recent impeller upgrade using Smith & Loveless Xpellers reduced clogging of the pumps without affecting pump capacity. The wet well has a diameter of 12 feet and a depth of approximately 26 feet. As described previously, a transducer system senses the wet well fluid level, and two floats in the wet well provide backup pump control and alarm sensing. The lift station pumps to an 8-inch diameter force main. The facility is fenced and equipped with an emergency generator.

Lift Station No. 7 – High Clover Park

Lift Station No. 7 is located in High Clover Park at 198th Avenue NE and 47th Avenue NE. The wet well/dry well Smith and Loveless Duo-Duct package pump station was constructed in 1995. It has two 10 horsepower pumps, each with a capacity of 176 gpm at 74 feet of total dynamic head. A recent impeller upgrade using Smith & Loveless Xpellers reduced clogging of the pumps without affecting pump capacity. The wet well is 12 feet in diameter and approximately 26 feet deep. As described previously, a transducer system senses the wet well fluid level, and two floats in the wet well provide backup pump control and alarm sensing. The lift station has a 6-inch force main. The facility is fenced and equipped with an emergency generator.

Lift Station No. 8 - Highland View

Lift Station No. 8, located near the intersection of 67th Avenue NE and Highland View Drive was constructed in 1996. It is a wet well/dry well Smith and Loveless Duo-Duct package pump station. The station is equipped with two 10 horsepower pumps, each with a capacity of 225 gpm at 76 feet of total dynamic head. A recent impeller upgrade using Smith & Loveless Xpellers reduced clogging of the pumps without affecting pump capacity. The wet well is 12 feet in diameter and is approximately 18 feet deep. As described previously, a transducer system provides for sensing of wet well fluid level, and two floats in the wet well provide for backup pump control and alarm sensing. The lift station pumps to a 6-inch diameter force main. The site is fenced and the station is equipped with an emergency generator.

Lift Station No. 9 - River Crest

Lift Station No. 9, located north of the River Crest subdivision and just south of SR 530, was constructed in 1997. The wet well/dry well Smith and Loveless Duo-Duct package pump station has two 10 horsepower pumps. Each pump has a capacity of 225 gpm and a total dynamic head of 79 feet. A recent impeller upgrade using Smith & Loveless Xpellers reduced clogging of the pumps without affecting pump capacity. The wet well is 12 feet in diameter and 21 feet deep. As described previously, a transducer system provides for sensing of wet well fluid level, and two floats in the wet well provide for backup pump control and alarm sensing. The River Crest Lift Station discharges to a 6-inch force main. The site is fenced and the station is equipped with an emergency generator for backup power supply.

Lift Station No. 10 – Cedar Stump

Lift Station No. 10, located near Cedar Stump, was abandoned December 6, 2001.

Lift Station No. 11 - Island Crossing

Lift Station No. 11, located at Island Crossing, was purchased from the City of Marysville sewer system. It was originally constructed in 1978 and the pumps were replaced in 2000. It is a submersible type (wet well only) pump station with two 20 horsepower Barnes pumps. Each pump has a capacity of 115 gpm at 98 feet of total dynamic head. Capacity has declined from 120 gpm in recent years due to age. The wet well is 6 feet in diameter and is approximately 22 feet deep. A transducer system provides for sensing of the wet well fluid level. The Island Crossing Lift Station pumps to 6-inch and 8-inch force mains. The site is not fenced, nor is it equipped with an emergency generator. A technical evaluation of Lift Station No. 11 was conducted in 2007 by MSA. A detailed memorandum dated April 2007 is archived in Wastewater Department files.

The facility does not have backup power onsite. When a power outage is observed or detected through the SCADA system, staff check all facilities and record the existing level of the fluid in the wet-well. This level dictates the amount of time Wastewater staff has and the approach they should take to relieve the load on the lift station. The preferred alternative is to use the City's vactor truck to remove the fluid from the wet well and discharge it at the Water Reclamation Facility at intervals of no less than 24 hours. The other alternative is to mobilize a trailer mounted generator at the site in the case of a prolonged outage. The Arlington Fire Department does have two trailer mounted portable generators that the Wastewater Department can utilize during these periods. The lift station is equipped to easily accommodate the portable generator, and it can operate normally with the generator in place.

Lift Station No. 12 - Crown Park

Lift Station No. 12 is located near Crown Park on 59th Avenue NE south of 172nd Street NE. It is a wet well/dry well Smith and Loveless Duo-Duct package pump station. The station has two 5 horsepower pumps, each with a capacity of 250 gpm at 33 feet of total dynamic head. The facility is fenced and equipped with an emergency generator. The wet well has a depth of approximately 27 feet. As described previously, a transducer system provides for sensing of wet well fluid level, and two floats in the wet well provide backup pump control and alarm sensing. The lift station discharges to an 8-inch force main.

Lift Station No. 13 - Yarmuth S/P

Lift Station No. 13 is a submersible type lift station, equipped with two grinder pumps with a capacity of 100 gpm that pump to a 2-inch force main. This small lift station, located south of the intersection of 215th Street NE and 87th Avenue NE, serves six residences. Formerly a private sewer system, the City took over management of this lift station and a new electrical panel was installed in 2006. A float system consisting of a High, Lag, Lead, Off, and Low senses the fluid level in the wet well and controls operations.

This facility has no backup power on site. For extended outages, the City has three alternatives to assure successful interim operations. The simplest (and the one used the only time an extended outage required it) is the use of the utility's trash pump to pump the LS reservoir's contents to the adjacent manhole on a gravity line located only about 6 feet away. Two other alternatives are the use of either a portable generator or the vactor truck.

Risk of Bypasses and Overflows Discharging to Waters of the State

Wastewater and Stormwater staff have thoroughly inventoried their respective collection and discharge systems. The City's efforts to create separate sewer systems began in the 1950s, and apparently have been quite successful, as no points meeting definitions of combined sewer overflows are known to exist. Therefore, the risk of overflows or bypasses via overwhelmed pipes and points of physical connection to unintended water sources and outfalls is negligible.

During periods of heavy flow, lift station wet wells are designed to provide adequate storage given the drainage area, diameter and length of force main, and pump characteristics. The lift stations have redundancy in wet well monitoring and in communications with SCADA through the Missions Communications transducers, float switches, and cellular lines. Each lift station is equipped with two pumps even though it is fully functional with one, thus providing redundancy in pump operations as well. Therefore, the risk of overflows or bypasses resulting from mechanical failures is also negligible.

Every lift station is also equipped to handle power outages. As described above and as shown in **Table 2-3**, each lift station has a standby generator that is maintained for emergencies. One exception is Station 11, which is equipped for use with portable generators available from the Fire Department, or which may be maintained using a vactor and transport method. The only other exception is Station 13, which is perfectly situated for use with a portable generator, trash pump, or vactor truck. Therefore, the risk of overflows or bypasses resulting from electrical failures is also negligible.

In summary, the City has multiple practices or "barriers" in place, making it highly unlikely for sewage to flow or overflow and reach waters of the State. The only plausible scenario would be one where operator error resulted in the inadvertent setting of a wet well level or other operating criterion, causing the overflow of sewage to the street or surrounding land, and then the subsequent flow to low-lying stormwater infrastructure. In this rare situation, staff are equipped to notify the State and rapidly implement containment, clean-up, and monitoring procedures. **Table 2-3** demonstrates the relative range of risks for untreated sewage from lift stations to reach waters of the State based on the above considerations and the proximity of lift stations to either surface waters or stormwater facilities. Because Lift Stations 9 and 11 are situated on the Stillaguamish floodplain, they are assumed to possess the greatest risk—though very small—of a sewage overflow of reaching waters of the State.

2.9 WASTEWATER TREATMENT AND DISPOSAL FACILITIES

2.9.1 Water Reclamation Facility

The City's first wastewater treatment plant was constructed in 1959 on the same site occupied today. It featured primary treatment using a clarifier for the removal of settled solids and surface scums from sewage collected via a then-new, separate collection system. Effluent discharged to the Stillaguamish River through the same combined storm and sewer outfall on its south bank that had been in use for decades.

In 1974, the WWTP was upgraded from primary treatment facility to one of the first secondary treatment facilities in Washington State. A new outfall was added as well. The plant consisted of the influent structure, one oxidation ditch with a single return-activated-sludge (RAS) pump, one secondary clarifier, a sludge holding tank, a chlorine tank and a laboratory, and had a capacity of 1 million gallons per day (MGD). The effluent was discharged through the new outfall into the thalweg of the Stillaguamish River, and the lime-stabilized liquid sludge was hauled away to City-owned property at the Arlington Airport for application onto grass fields surrounding the airport runways.

In 1998, the treatment facility was upgraded to a then state-of-the-art Sequencing Batch Reactor (SBR) with a capacity of 2 MGD. The City upgraded the aeration capacity of the WWTP and made some solids handling improvements in 2004.

Beginning 2008, with completion in 2011, the treatment plant was expanded and upgraded to meet TMDL clean-up objectives for the Stillaguamish River. Upgrades included improved removal of conventional contaminants using membrane biofiltration, and tertiary treatment for the removal of phosphorus and nitrogen using biological nutrient removal. With these upgrades, the facility can produce effluent of Class B reclaimed water quality. Instead of a wastewater treatment plant (WWTP), it is now referred to as a water reclamation facility (WRF) to communicate this distinction. With pre-designed expansion for capacity increases, the WRF is intended to serve the City with a capacity of 2.67 MGD well beyond 2025. It is expandable to 4 MGD with the addition of membrane cartridges in pre-constructed, vacant filtration bays.

2.9.2 Disposal Facilities

Stillaguamish River Outfall

Effluent of reclaimed water quality is discharged from the WRF to a single-port outfall in the Stillaguamish River at River Mile 17.7. The discharge is into the mainstem of the Stillaguamish River approximately 500 feet below the confluence of the North and South Forks (and 400 feet downstream of the City's Haller Well Field on the south bank of the river). The final 209-foot section of the outfall is a 24-inch diameter ductile iron pipe constructed in 1991 to replace a prior 16-inch outfall damaged from high river flows the previous winter. Two hundred eleven (211) feet of 16-inch diameter pipe remains between the newer 24- inch outfall section in the river and a manhole at the top of the south bank of the river (MH #3). This 16-inch segment is schedule to be

upgraded to 24 inches when influent flows average 1.7 MGD. The single port diffuser is the 12-inch diameter end of a 24-inch x 12-inch reducer discharging horizontally at the river bottom. The outlet port is approximately 45 feet south of the thalweg of the river at low flows. The outfall was in good condition during August 2006 field studies in preparation for the WRF upgrade. No visible leaks were found in the submerged portion of the outfall pipe during a dye study for the outfall mixing zone.

Old Town Wetland

In 2011, the City completed construction of a 9.8 acre wetland site designed to treat stormwater from 284 acres of Old Town (downtown) Arlington prior to its discharge to the Stillaguamish River. With the March 2014 NPDES permit renewal, the City also obtained a permit for the reuse of reclaimed water in the Old Town Wetland. The reclaimed water can help maintain wetland vegetation and functions through the dry summer months. It will also provide a slower release of water to the river after percolation to and storage in riparian groundwater.

The wetland was also designed with wastewater benefits in mind, however. Static temperature models (in the 2007 WRF engineering report) suggest that future reclaimed water production rates may be too great and too warm, resulting in increases in river temperature that are not consistent with surface water quality standards established in WAC 173-201A. Routing reclaimed water through the constructed wetland was identified as an adaptive management measure where temperature reductions may be achieved through vegetative shading and blending with groundwater. Reclaimed water use in the wetland—now—provides opportunity to grow the vegetation that would provide the shading, and evaluate the effectiveness of the concept prior to the potential for exceedance of the water quality standard for temperature.

Biosolids Composting Facility

Sludge from the WWTP is trucked to the BCF, amended with a carbon source (e.g., wood chips, hog fuel), and arranged in aerated static piles. Over time, biological activity naturally decomposes the sludge at elevated temperatures, creating stabilized biosolids that can be used beneficially for land application as compost. The BCF produces Class A Exceptional Quality biosolids.

The BCF began operation on a city-owned 2.8 acre site in 2004. Soon after beginning operation, it received an odor complaint from neighbors of the facility. It temporarily suspended hauling biosolids for a couple days, but received clearance from the Puget Sound Clean Air Agency that it could continue production. The City modified a sludge thickening process in January 2006 which prevented septic conditions, and reduced odors. The 2011 WRF upgrade also changed solids handling to aerobic digestion resulting in higher quality sludge and further reducing odors. Since the initial complaint, the City has received no odor complaints related to the BCF.

The BCF was designed to process 15.5 cubic yards (CY) of biosolids per day. Although the annual average loading to the BCF is about 10 CY of biosolids per day, the loading occasionally exceeds the current capacity of 15.5 CY per day. At one point the City considered marketing the compost

for homeowner and commercial use, but the City's own demand has grown such that virtually all compost produced is reserved for City projects. Examples of beneficial uses for the compost include soil amendment in parks, ball fields, rain gardens, the cemetery, and other construction and landscaping projects.

Expansion and upgrade of the BCF was considered at the same time as the expansion and upgrade to the WRF. Additional storage areas for raw materials, compost piles, and finished compost, and mixing equipment and odor control were considered. Hauling and land application in eastern Washington were shown to be more cost-effective than upgrade and expansion, however, and the decision was made to continue BCF operations at their existing levels.

Off-site Land Application

According to recent Annual Biosolids Reports submitted to Ecology, the WRF produced 278 dry tons of biosolids in 2014 of which approximately 87 dry tons (31%) were composted at the BCF and approximately 191 dry tons (69%) were land applied as Class A biosolids on Ecology-approved agricultural lands near Snohomish, WA. Land application has also occurred near Wilbur and Vantage, WA in recent years. Land application sites are monitored to assure nutrients meet agronomic rates and do not result in accumulations that may migrate and contaminate ground and surface waters.

2.10 ONSITE SEPTIC SYSTEMS

It is not known that the City has ever maintained a record of parcels within its Wastewater Service Area which were served by onsite septic systems (OSS). Septic-related information can provide valuable insight with regard to expansion of the wastewater collection system and risks to the environment, water supply, and public health.

In May 2014, the City obtained a copy of an OSS database developed by the Snohomish Health District (SHD) and maintained by Snohomish County Surface Water Management (SWM). The database is known by the acronym DAVE-- Drainfield Awareness and Vital Education—after the Ecology grant enabling its initial development. DAVE was only briefly reviewed for this preliminary assessment. Data fields which are immediately used in an initial evaluation included: Location (Parcel_ID); SHD Review Status (EhSystemSt); Owner Type (UseCode); and Age (YrHouseB and YrInstal). At the time of this review, DAVE contained 83,649 records for all of Snohomish County.

DAVE was used as a lookup table in GIS using Location to select 1,301 records within the City of Arlington's existing city limits. SHD had conducted reviews of 643 records (49.6%), including about 70 to 78% of those installed in the 1960s and 1970s, and determined just 11 records no longer had an OSS. Applying this rate to all Arlington records, DAVE contains approximately 1,279 records of active OSS within city limits. A summary of DAVE records is contained in **Table 2-4**.

Residential sewage disposal is served by nearly 1,100 (85%) of all OSS in the City. Approximately 179 (14%) OSS serve commercial purposes (see **Table 2-4**).

The age of OSS within the City is fairly well distributed, with 10% to 25% of all OSS drainfields built or re-built in each of the five previous decades. Approximately 46% of septic systems were installed in the 1990s and 2000s, when rapid growth in and near the City and its UGA outpaced the construction of wastewater infrastructure (**Table 2-4**).

Table 2-4. Septic Drainfield Age and Ownership within Arlington City Limits[a,b]

Decade in which Septic Drainfield was Installed	Count by Owner Type			Total		Records Validated	
	Residential	Commercial	Other	Count	Percent	Count	Percent of Row Total
1890-1959	35	6	1	42	3%	4	10%
1960-1969	139	8	1	148	12%	116	78%
1970-1979	256	18	3	277	22%	194	70%
1980-1989	169	52	8	229	18%	120	52%
1990-1999	266	47	4	317	25%	136	43%
2000-2009	215	47	1	263	21%	70	27%
2010-2015	2	1	0	3	0%	3	100%
Total Count	1,082	179	18	1,279	100%	643	50%
Total Percent	85%	14%	1%	100%	-	50%	-

[a] Snohomish Health District DAVE Database queried and evaluated by City of Arlington May 2014

[b] Database maintained and expanded by Snohomish County Surface Water Mgt.

The City partnered with SHD, SWM, and Ecology in 2010 to survey streams within the Portage Creek watershed in and adjacent to the City. The primary objective was to identify sources of bacterial contamination in the streams, including failing septic systems on streamside properties under jurisdiction of either the City or Snohomish County. Two separate surveys targeted wet season and dry season sources. The surveys detected no significant bacterial contamination, and no failing septic systems or other contaminant sources (e.g., stormwater, pet waste). That effort suggests that environmental and public health concerns from OSS need not drive expansion of wastewater collection systems into currently unserved areas of the City.

2.11 ADJACENT WATER AND SEWER SYSTEMS

The only other nearby sewer service system is the City of Marysville (Marysville). Marysville provides water and sewer service to a southwest portion of the City of Arlington (the Smokey Point neighborhood south of 180th Street and west of 43rd Avenue) and south of the Arlington

Airport (south of 172nd Street and west of 51st Avenue (**Figure 2-1**). The Marysville sewer service area encompasses approximately 21.3 square miles. Marysville's Sewer Comprehensive Plan was most recently updated in November 2011 and is available via their web page.

2.11.1 Water Systems Influencing Sewer Return Flows to the WRF

The Department of Health's Sentry Internet database was consulted in April 2014 to identify and describe Group A Community water systems in the vicinity of the City's Wastewater Utility. Water Facilities Inventory (WFI) forms were reviewed for basic operating information. Two larger, expanding Group A water systems produce water which returns via the sewer collections system to the WRF. In addition, there are two other expanding Group A systems in the area, and eight smaller, non-expanding Group A water systems. All of these water systems are shown in **Figure 2-4**. Each system is briefly summarized from their WFI form below.

The City of Arlington (Water System ID 02950K)

The City's existing water distribution system generally extends south to about 172nd Street NE, north to the South Fork of the Stillaguamish River, east to the intersection of 172nd Street NE and Burn Road, and west to Interstate 5. One exception is Arlington's Smokey Point neighborhood south of 180th Street, north of 166th Street, east of Interstate 5, and west of approximately 43rd and 51st Avenues. This area of Arlington is provided both water and sewer by the City of Marysville. As of 2014, the City has approximately 5,444 water service connections. The City serves a population of 16,245 persons in 4,835 dwelling units. There are 609 additional industrial, commercial, and industrial (ICI) and other connections.

Water supply to the City is provided through three sources. The Haller well field consists of three groundwater wells (and one reserve well) that are under the influence of surface water. A rapid filtration treatment plant has been recognized for producing some of the highest quality, filtered, disinfected potable water in the State for more than 12 years. This source produced 92% of the City's potable supply in 2013. The Airport well field produced 2% of the City's supply from a single, untreated groundwater well with chlorine disinfection. The remaining 6% of the municipal potable water supply is water purchased wholesale from the Snohomish County PUD. Water storage is provided by two reservoirs that have a total capacity of 4 million gallons (MG). In addition, the City's water system has 4 pressure zones with 8 pressure reducing stations, 1 booster pump station and more than 89 miles of water main. The City's water service area is shown in **Figure 2-4**.

Snohomish County PUD No. 1 – Lake Stevens (Water System ID 80907)

The Snohomish County PUD No. 1's (PUD) Lake Stevens water system (aka as PUD's Integrated System) abuts the City's eastern service area boundary, with most of its adjacent infrastructure near the southeastern corner of the service area. The PUD's WFI indicates approximately 17,739 water service connections. It serves a population of 43,695 in 17,324 dwelling units. The WFI indicates 415 additional industrial, commercial, and industrial (ICI) and other connections.

However, a recent transfer of the Sunnyside neighborhood from PUD to the City of Marysville is understood to have reduced PUD's active water customers by about 20%.

The PUD receives most of its water from approximately eight interties with the City of Everett. However, it has recently begun increasing the amount of water it produces from two wells near Lake Stevens at up to 2,400 gpm. The City of Arlington receives water from the PUD via a wholesale water supply line. In 2013, about 6% of the City's supply was a blend of Sultan River water and groundwater served by PUD.

2.11.2 Other Large, Expanding Group A Community Water Systems

The City of Marysville

Marysville's water system is located south of the City's service area boundary. Marysville's WFI indicates approximately 20,683 water service connections. It serves a population of 62,115 in 19,395 dwelling units. The WFI indicates 1,288 additional industrial, commercial, and industrial (ICI) and other connections. However, a recent transfer of the Sunnyside neighborhood from PUD to the City of Marysville is understood to have resulted in a significant increase in the number of Marysville's residential water customers.

Water is supplied to the system from Edward Springs, three groundwater wells near the springs, two other groundwater wells, a Ranney well in the Stillaguamish River, and an intertie with the City of Everett. A filtration plant for the Ranney well, located within Arlington city limits, serves only City of Marysville customers. Although interties between the two cities formerly existed, no interties currently exist. The only exception is Arlington water purveyed to a single service in an isolated portion of the Marysville service area).

Marysville has a large service area that extends well beyond its city limits. As described previously, Marysville serves water to Arlington's Smokey Point neighborhood. Marysville provides sewer service to those same customers, so no wastewater generated from Marysville water reaches Arlington's WRF.

Seven Lakes Water Association (Water System ID 77660)

Seven Lakes Water Association operates a water system in the lakes region of the lower Stillaguamish basin, west of the railroad which marks the western margin of Arlington's water service area. Seven Lake's WFI indicates approximately 2,223 water service connections. It serves a permanent population of 5,557 in 2,215 dwelling units. The WFI indicates three additional industrial, commercial, and industrial (ICI) connections. It also serves five recreational camps and RV parks where transient populations range from 1,905 in January to 8,075 in July and August.

Water sources include three deep wells (depths exceeding 150 to more than 330 feet) and one shallow well. Other reserve wells and an intertie with Marysville are maintained for emergency purposes. All services in this area are understood to utilize onsite septic systems for waste disposal.

2.11.3 Other Non-expanding Group A Community Water Systems

Arlington Terrace (Water System ID 27241A)

Arlington Terrace is a small water system located at about 192nd Street between 67th Avenue and SR 9, entirely within the City of Arlington's limits and water service area. The system serves about 104 people using 28 of 29 approved service connections. Two groundwater wells provide water to the Arlington Terrace system. The topography makes it difficult for the City to provide this neighborhood with water and sewer service. It is understood that all parcels utilize onsite septic systems for waste disposal.

McPherson Hills (Water System ID 529307)

The McPherson Hills private water system is located southeast of the Arlington Airport just outside of city limits but within the City's water service area. The system uses all of its 11 approved service connections to provide water to 30 people. One deep groundwater well provides the sole water source. All parcels utilize onsite septic systems for waste disposal.

Stilli Ridge Estates (Water System ID 187072)

Stilli Ridge Estates is a private water system located east of the City along Tviet Road. It is within the City's water service area. The system supplies 72 persons on 30 of 44 approved service connections with two shallow groundwater wells. One well is approximately 30 feet deep and produces 22 gpm, and the second well is approximately 40 feet deep and produces 31 gpm. All parcels utilize onsite septic systems for waste disposal.

New Start Landowners Association (Water System ID 22380M)

Formerly the Top of the Hill Water Association, New Start is a private water system located southeast of the Arlington Airport just outside of city limits but within the City's water service area. It is immediately adjacent to the McPherson Hills system. New Start supplies water to 90 people on 26 of 52 approved service connections with one deep groundwater well and a shallow emergency well. All parcels utilize onsite septic systems for waste disposal.

Meadowbrook Homeowner's Association (Water System ID 03449C)

Meadowbrook Homeowner's Association is a private water system located immediately east of the City along Tviet Road. It is within the City's water service area. The system supplies 35 persons using all 15 approved service connections with one deep groundwater well. There are no current plans for interties between this system and the City's water system. All parcels utilize onsite septic systems for waste disposal.

Eagle Ridge Water Association (Water System ID 24731H)

The Eagle Ridge Water Association is a private water system located north of the Stillaguamish River mid-way between I-5 and SR 9. It is outside of the City's water service area. Two shallow groundwater wells supply water to 250 people on 137 of 146 approved service connections. All parcels utilize onsite septic systems for waste disposal.

Silvana Water Association (Water System ID 79050)

The Silvana Water Association is located adjacent to the northwest corner of the Arlington water service area. A spring provides its sole water source to 150 residents on 44 unapproved connections, and eight ICI connections. It also provides service to a transient population of about 78 persons from May through October. All parcels are understood to utilize onsite septic systems for waste disposal.

Sudden View (Water System ID 12451F)

The Sudden View water system is a private water system which abuts (is outside of) the very southeast corner of the City's water service area. The water system purchases water from PUD and maintains two groundwater wells for emergency supply. It serves 60 people on 21 of 48 approved connections. All parcels utilize onsite septic systems for waste disposal.

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CITY OF ARLINGTON

COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 2-1
SEWER SERVICE AREA

Legend

- City Limits
- UGA Boundary

Sewer Service Area Boundary

- City of Arlington
- City of Marysville

Future Water Service Area

- City of Arlington
- City of Marysville

Existing Sewer Facilities

- Water Reclamation Facility
- Lift Station
- Force Main
- Gravity Main

1 INCH = 1,250 FEET

0 1,250 2,500

DRAWING IS NOT TO SCALE
IF BAR IS NOT 2" LONG

REVISION DATE: MAY 18, 2017

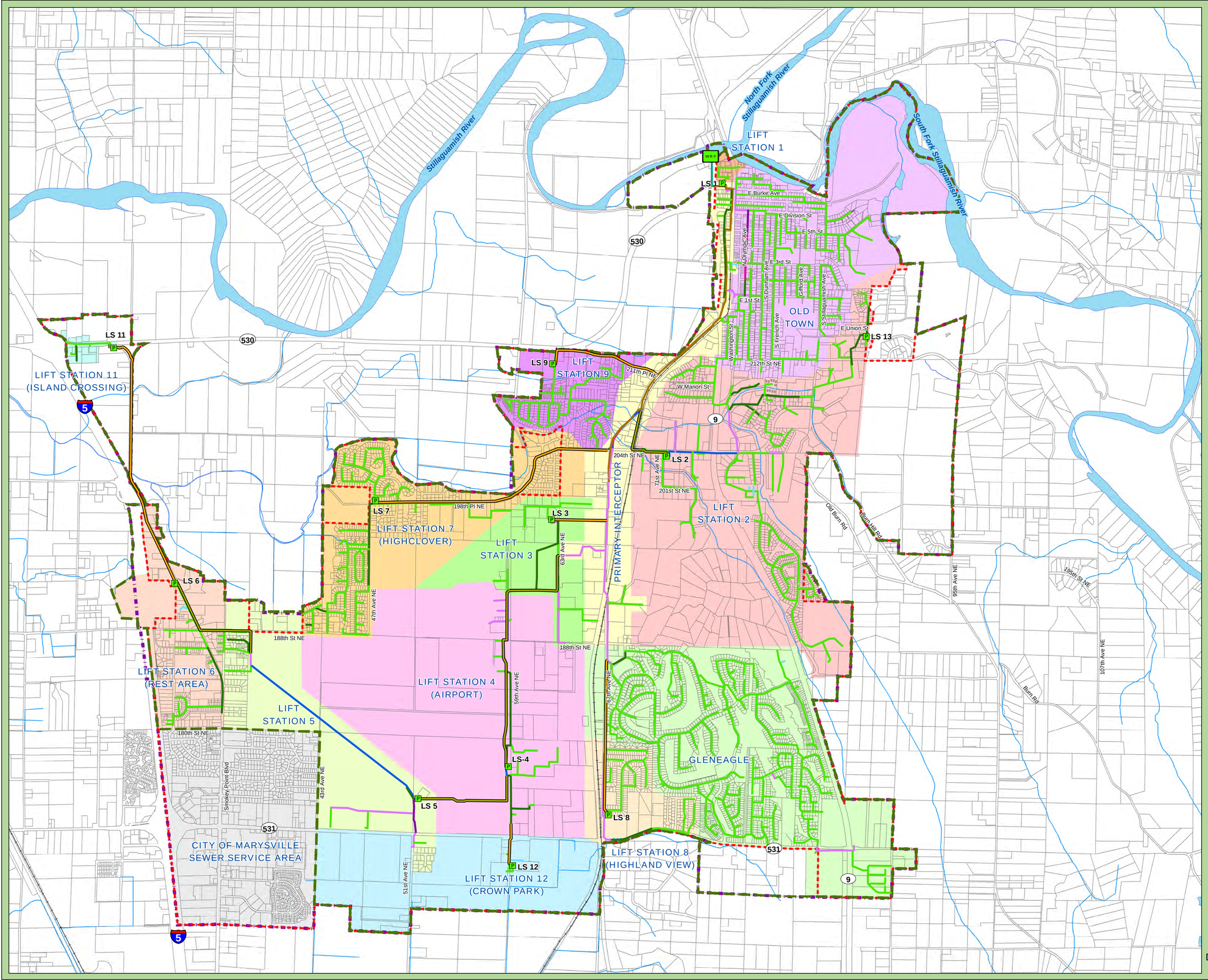
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BY: ACALDERON

RH2 ENGINEERS PLANNERS SCIENTISTS

CITY OF ARLINGTON

COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 2-2
EXISTING SEWER SYSTEM



Legend

- City Limits
- UGA Boundary
- Sewer Service Area Boundary

Existing Sewer Facilities

- Water Reclamation Facility
- Lift Station

Force Main Diameter

- 2-inch
- 4-inch
- 6-inch
- 8-inch

Gravity Main Diameter

- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 15-inch
- 16-inch
- 18-inch
- 24-inch
- 36-inch

Sewer Drainage Basins

- Primary Interceptor
- Old Town
- Gleneagle
- Lift Station 1
- Lift Station 2
- Lift Station 3
- Lift Station 4 (Airport)
- Lift Station 5
- Lift Station 6 (Rest Area)
- Lift Station 7 (Highclover)
- Lift Station 8 (Highland View)
- Lift Station 9
- Lift Station 11 (Island Crossing)
- Lift Station 12 (Crown Park)
- City of Marysville Sewer Service Area

1 INCH = 1,250 FEET

0 1,250 2,500

DRAWING IS NOT TO SCALE
IF BAR IS NOT 2" LONG

REVISION DATE: MAY 18, 2017

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BY: ACALDERON

CITY OF ARLINGTON

COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 2-3
SEWER DRAINAGE BASINS

Legend

City Limits

UGA Boundary

Sewer Service Area Boundary

Existing Sewer Facilities

Water Reclamation Facility

Lift Station

Force Main

Gravity Main

ADF: ###,###
PHF: ###

ADF - AVERAGE DAILY FLOW (gpd)

PHF -PEAK HOUR FLOW (gph)

Sewer Drainage Basins

Primary Interceptor

Old Town

Gleneagle

Lift Station 1

Lift Station 2

Lift Station 3

Lift Station 4 (Airport)

Lift Station 5

Lift Station 6 (Rest Area)

Lift Station 7 (Highclover)

Lift Station 8 (Highland View)

Lift Station 9

Lift Station 11 (Island Crossing)

Lift Station 12 (Crown Park)

City of Marysville Sewer Service Area

1 INCH = 1,250 FEET

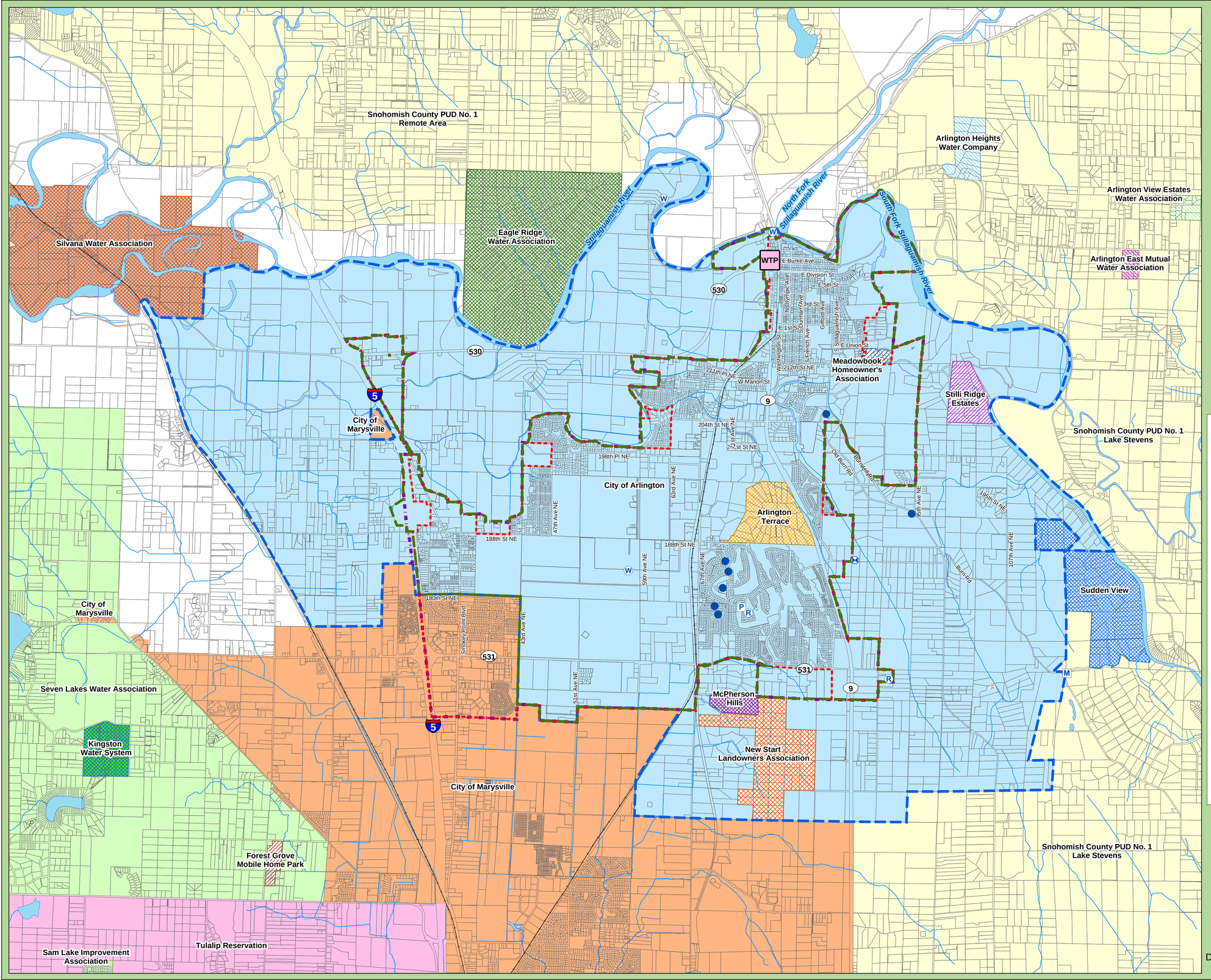
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REVISION DATE: JUN 13, 2017

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CITY OF ARLINGTON
COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 2-4
SERVICE AREA AND ADJACENT WATER SYSTEMS

Legend

- Arlington City Limits
- Arlington UGA Boundary
- Arlington Sewer Service Area

Water Facilities

- WTP — Water Treatment Plant
- W — Well
- M — Meter
- R — Reservoir
- P — Pump Station
- PRV
- FCV

Water Service Areas

- Arlington Future Water Service Area
- City of Marysville Water Service Area

Water Service Areas (cont.)

- Arlington East Mutual Water Association
- Arlington Heights Water Company
- Arlington Terrace
- Arlington View Estates Water Association
- Eagle Ridge Water Association
- Forest Grove Mobile Home Park
- Kingston Water System
- McPherson Hills
- Meadowbrook Homeowner's Association
- New Start Landowners Association
- No Public Water Service
- Sam Lake Improvement Association
- Seven Lakes Water Association
- Silvana Water Association
- Snohomish County PUD
- Stilli Ridge Estates
- Sudden View
- Tulalip Reservation

1 INCH = 2,000 FEET

0 2,000 4,000

DRAWING IS NOT TO SCALE
IF BAR IS NOT 2" LONG

REVISION DATE: MAY 17, 2017

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BY: ACALDERON

3 Land Use and Population

REVISER'S NOTE:

This chapter, first published in the October 2015 CWP, was revised in July 2017 to reflect the City of Arlington's decision not to expand west of I-5 at this time. Amendment is also necessary to maintain consistency with the City's GMA Comprehensive Plan, which is also being amended in 2017 to reflect this change. Population growth previously targeted for a proposed UGA expansion area west of I-5 has been reallocated throughout much of the City.

Many chapters in this amended CWP have been revised using underlined insertions and strikeout deletions to quickly and clearly show the effects of the amendment. However, although many portions of Chapter 3 have not changed, there are enough revisions that complete re-printing of the chapter is appropriate. Where changes may be significant, the amended text describes the change. Tables and figures which have substantial changes are also completely replaced, and the word "amended" follows the table and figure numbers in parentheses.

3.1 INTRODUCTION (AMENDED)



The City of Arlington (City) *GMA Comprehensive Plan*, first completed in 1995 and updated in 2005, was updated once again in 2015. The 2015 plan is being amended and is scheduled for adoption by the City Council in summer 2017. The plan was developed to meet the requirements of the State of Washington Growth Management Act (GMA). The GMA requires, among other things, consistency between land use and utility plans and their implementation.

This Comprehensive Wastewater Plan (CWP) update was developed in 2015 concurrent with the citywide comprehensive

planning process. It is likewise being amended concurrent with the City plan in 2017. This chapter demonstrates the compatibility of this CWP with the City's *GMA Comprehensive Plan* and with other plans, identifies the designated land uses within the existing and future service area, and identifies population projections within the City's planning area.

3.2 COMPATIBILITY WITH OTHER PLANS

3.2.1 Introduction (Amended)

To ensure that the CWP is consistent with the land use policies that guide it and other related plans, the following planning documents were examined.

- Growth Management Act (GMA)
- City of Arlington 2015 *GMA Comprehensive Plan, as amended in 2017*
- Snohomish County General Policy Plan
- North Snohomish County Coordinated Water System Plan (2010)

3.2.2 Growth Management Act (Amended)

The State of Washington Growth Management Act, as amended, defines four goals relevant to this CWP.

1. Growth and services should be in urban areas.
2. There should be consistency between land use and utility plans and their implementation.
3. There should be concurrency of growth with public facilities and services.
4. Critical areas should be designated and protected.

Urban Growth Area

The GMA requires that Snohomish County (County) and the City cooperate in designating an Urban Growth Area (UGA). As part of the development of their individual 2005 *GMA Comprehensive Plan* updates, the City and the County designated an UGA that would accommodate the City's projected population growth and provide resource conservation. The County then completed its 2015 Comprehensive Plan Update, maintaining the City's UGA without modification. (The City filed a petition in 2014 to expand the UGA west of I-5, but withdrew the petition in 2016.) The City limits and the UGA are shown in **Figure 3-1**. Population growth is allocated across the entire wastewater service area.

Consistency

The GMA requires planning consistency from two perspectives. First, it requires consistency of plans among jurisdictions. This means that plans and policies of the City and the County must be consistent (RCW 36.70A.100). Second, the GMA requires the implementation of the CWP be consistent with the City's *Comprehensive Plan* (RCW 36.70A.120). While this CWP and the

City's *2015 Comprehensive Plan* were in development, Snohomish County was also updating its *Comprehensive Plan*. Both were completed and adopted in June 2015. The City's *GMA Comprehensive Plan* is being amended concurrent with this CWP amendment. In all instances, the City's Planning staff and its Public Works staff worked with their counterparts in Snohomish County Planning and Development Services (PDS) to assure they are aware of the City's service levels, capital development needs, and planning proposals. In addition, the Public Works Department coordinated with the City's Community and Economic Development Department to assure this CWP utilized the same growth projections, the same focus areas for residential and commercial/industrial growth, and other assumptions as were used in the City's *2015 GMA Comprehensive Plan, as amended*.

Concurrency

Concurrency means that adequate public facilities and services must be provided at the time growth occurs, which is defined as being within a six-year time frame. For example, growth should not occur where schools, roads and other public facilities are overloaded. Concurrency ensures that public dollars are used efficiently and that quality of life is preserved. To achieve this objective, the GMA directs growth to areas already served or readily served by public facilities and services (RCW 36.70A.110). It also requires that when public facilities and services cannot be maintained at an acceptable level of service, the new development should be prohibited (RCW 36.70A.100).

Critical Areas

The GMA requires that critical areas be designated and protected. Critical areas include fish and wildlife habitat, flood zones, aquifer recharge areas, streams, creeks, rivers, lakes, wetlands and other surface water, and geologic hazard areas such as steep slopes and liquefaction zones. Designated critical areas within the City's UGA and wastewater service area are shown in **Figure 3-2. Appendix G** contains a SEPA checklist that addresses other environmental concerns.

3.2.3 City of Arlington Comprehensive Plan (Amended)

The Land Use Element of the City of Arlington's 2015 *GMA Comprehensive Plan, as amended in 2017,* is the City's vision of how growth and development should occur over a 20-year horizon. It articulates many of the same goals and concerns of the GMA. Like the GMA, the Land Use Element seeks to accommodate growth while preserving the City's character and protecting the environmentally sensitive areas. It seeks to promote a strong local economy and vital commercial, industrial and airport industrial districts by focusing on economic development within them and establishing development guidelines. The Utilities Element ensures that new development will be adequately serviced without compromising existing levels of service, similar to the principal of concurrency as defined in the GMA.

While the Land Use Element goals and policies set forth general standards for locating land uses, the *GMA Comprehensive Plan's* Land Use Map indicates geographically where certain types of

uses may be appropriate. The Land Use Map is a blueprint for development of an area, whereas the zoning code is the regulatory means for implementing it. The zoning designations used in the 2015 updates of both the City's *GMA Comprehensive Plan* and the CWP were identical, and the same consistency is maintained in the 2017 amendments to these plans. With few exceptions, the land use classifications identified in 2015 have not changed in the 2017 amendments. The biggest difference is the inclusion of a Mixed Use Overlay, which encourages higher density residential developments in juxtaposition with various commercial uses to promote a walkable community. The City's 2017 zoning designations are shown in **Figure 3-1**, Land Use.

3.2.4 Snohomish County General Policy Plan (Amended)

Snohomish County Council (Council) adopted the *Snohomish County General Policy Plan* (Policy Plan) on June 28, 1995. The Policy Plan was effective on July 10, 1995. Since this time, the Policy Plan has been amended numerous times to incorporate UGA, Capital Facility Plan and land use changes with the last amendment occurring on December 21, 2013. The Policy Plan designates towns and incorporated cities, including Arlington, as subareas and acknowledges these areas as having individual comprehensive plans. Together with these subareas, the County determines adequate growth areas for each subarea. The County's Policy Plan also guides development in rural, unincorporated Snohomish County.

Similar to the City's *GMA Comprehensive Plan*, *as amended*, the County's Policy Plan contains land use goals that "form the basis of the County's land use strategy and:

- provides for a supply and distribution of land use types to accommodate the majority of county population and employment growth within urban growth area;
- reduces development pressures and patterns of sprawl within rural areas;
- conserves agricultural, forest and mineral resource lands of long-term commercial significance; and
- preserves and protects open space, scenic and cultural resources."

3.3 LAND USE (AMENDED)

The City limits currently encompass an area of approximately 6,216 acres. The City's UGA encompasses an additional 387 acres outside of the current City limits. As described in Chapter 2, approximately 488 acres of southwest Arlington receive wastewater service from the City of Marysville. The existing wastewater service area therefore contains approximately 6,115 total acres (**Table 3-1**). Since no UGA expansion is anticipated in the foreseeable future, the future wastewater service area in this GSP remains the same as the existing service area. The Zoning Map, **Figure 3-1**, displays the zoning that guides—for the purposes of this CWP—development within the City, UGA, and Expanded UGA.

Land use designations in the wastewater service area are summarized in **Table 3-1**. Approximately 2,706 acres (44 percent) is designated for residential use. Of the remaining area, commercial, industrial, and all other uses occupy approximately 846 acres (14 percent), 1,108 acres (18 percent), and 1,454 acres (24 percent) of land, respectively.

A significant change to the 2015 CWP made by this amendment includes the maintenance of the UGA boundary maintained by Snohomish County in its 2015 Comprehensive Plan. To highlight this difference, the Expanded UGA column in **Table 3-1** demonstrates explicitly that there will be no UGA expansion under this plan.

Table 3-1. Current and Future Land Use Zoning Allocations in the Wastewater Service Area (Amended)

Land Use Type	Area (Acres)					
	City	Less Smokey Point [1]	Plus Existing UGA	Existing Wastewater Service Area	Expanded UGA West of I-5[2]	Future Wastewater Service Area
Airport	737	0	0	737	0	737
Business Park	155	0	11	166	0	166
Commercial	1,088	276	34	846	0	846
Industrial	1,108	0	0	1,108	0	1,108
Medical	20	0	0	20	0	20
Public	450	0	81	531	0	531
Residential	2,657	212	261	2,707	0	2,707
Total	6,216	488	387	6,115	0	6,115

[1] Served by City of Marysville

[2] The 2017 amendment to the 2015 update of the WCP removes UGA expansion west of I-5.

3.4 POPULATION

3.4.1 Household Trends

The City is a residential community comprised of a full range of housing types. In 2013, the Office of Financial Management (OFM) estimated that two-thirds of 7,053 housing units (4,695) within the City limits were single family detached homes. Approximately one-fourth of the residences (1,773) had two or more units. The remaining 585 units (8 percent) were in mobile homes and special housing.

According to the U.S. Census Bureau, the average household size in the City was 2.70 persons per household in 2010, down slightly from 2.72 in 2000, but still above 2.51 in 1990. The average household size in all of Snohomish County was 2.65 persons per household in 2000, dropping slightly to 2.62 in 2010. The 2005 *Comprehensive Plan* anticipated that the average household size for Arlington would decrease to approximately 2.50 persons per household by the year 2020. The average number of people per household in 2000 was 2.82 for owner-occupied housing units and 2.54 for renter-occupied units. The densities by housing type and the anticipated future trending could not be located in the 2010 census data at the time of this writing. For the purposes of this CWP, all dwelling units were assumed to house 2.70 persons.

3.4.2 Existing and Future Population (Amended)

The County has experienced rapid population growth and extensive physical developments since 1990. The County's population increased by more than 25 percent in the 1990s, and remained high at 17.7 percent from 2000 to 2010. It increased another 2.4 percent by 2013, totaling 730,500 people.

Including annexations, the City's population increased by approximately 82 percent during the 1990s, and another 62.5 percent from 2000 to 2010. It increased another 3.9 percent by 2016, totaling 18,620 people. **Table 3-2** illustrates the City's historical population growth since 1990.

Future population growth is established by county and regional planners under the direction of GMA. Snohomish County established a target population in the year 2035 of 24,937 for the City of Arlington and its UGA. As a basis for projecting water demand and wastewater loading, the City assumed linear annual residential growth of 313 persons per year (or 4.76 percent per year) in order to increase by an additional 6,577 persons, from 18,360 in 2014 to 24,937 in 2035 (21 years). **Table 3-2** illustrates the City's historical population growth since 1990, and projected future growth within the City limits and the wastewater service area.

The actual population served within the wastewater service area differs from the population that resides within the City limits. The City's existing and future population is modified by adding and subtracting various other population values to the annual series of City population described above. The City's Smokey Point and Country Manor neighborhoods obtain wastewater service for their combined 861 lots directly from the City of Marysville. Other facilities in the City (primarily residences) have their waste treated via onsite septic systems, such as the 38 lots in Arlington Terrace. The populations of these areas, as estimated by City planning staff[1], are subtracted from the City population values. The City also provides wastewater service to a limited number of

[1] Smokey Point and Country Manor estimated as 861 lots times a density of 2.6 persons per household, or 2,239 total persons. Arlington Terrace estimated as 37 occupied lots times a density of 2.7 persons per household, or 100 total persons. Both estimates are assumed to reflect built-out conditions under existing land use classifications, and therefore do not increase into the future.

customers outside the City limits but within its UGA, such as the 35 residences under Snohomish County jurisdiction in The Eagles neighborhood. The populations of these services, as estimated by City planning staff [2], are added to the City population values. The actual population served by the wastewater system in 2014 was 16,116. The population served in 2035 is projected to be 22,693, as shown in **Table 3-2**. Note that the population served by the wastewater utility apparently decreases from 2013 to 2014 because of a modification of (increase in) the estimated number of Arlington citizens residing in the Smokey Point area that is served by the City of Marysville. The estimate increased the assumed built-out population of the Smokey Point and Country Manor neighborhoods by 606 persons, from 1,633 to 2,239.

Continued

[2] Service population in The Eagles is estimated for existing conditions as 35 served parcels times 2.7/HH, or 95 total persons. As there are no remaining vacant parcels in The Eagles, this estimate is understood to reflect built-out conditions, and therefore do not increase into the future.

Table 3-2. City Population Trends and Projections (Amended)

Year	Population	
	City Limits	Wastewater System
Historical		
1990	4,037	3,977
1991	4,397	4,330
1992	4,614	4,545
1993	4,863	4,792
1994	5,167	5,094
1995	5,692	5,617
1996	6,019	5,942
1997	6,514	6,435
1998	7,188	7,107
1999	8,054	7,971
2000	11,927	11,842
2001	12,912	12,825
2002	13,676	12,185
2003	14,431	12,852
2004	14,838	13,219
2005	15,173	13,523
2006	15,693	13,964
2007	17,094	15,457
2008	17,527	15,889
2009	17,711	16,073
2010	17,926	16,288
2011	17,930	16,292
2012	17,970	16,332
2013	18,270	16,632
2014	**18,360**	**16,116**
2015	18,490	16,246
2016	18,620	16,376
Projected (from 2014 base year)		
2020 (+6 years)	20,239	17,995
2024 (+10 years)	21,492	19,247
2034 (+20 years)	24,624	22,379
2035 (+21 years)	24,937	22,693

3.5 POPULATION PLACEMENT (AMENDED)

Infill within the city is estimated to assume 40 percent of total residential growth. In addition, commercial and industrial growth associated with increased employment will create land use changes with the potential for significant effects on the City's wastewater system. Therefore, five general areas within the wastewater service area, where concentrated growth and its associated impacts to the wastewater system are expected, have been defined to facilitate discussion. The five areas are shown in **Figure 3-3** and characterized in **Table 3-3**. Descriptions of the five areas follow.

Table 3-3. Growth Center Attributes and Assumptions (Amended)

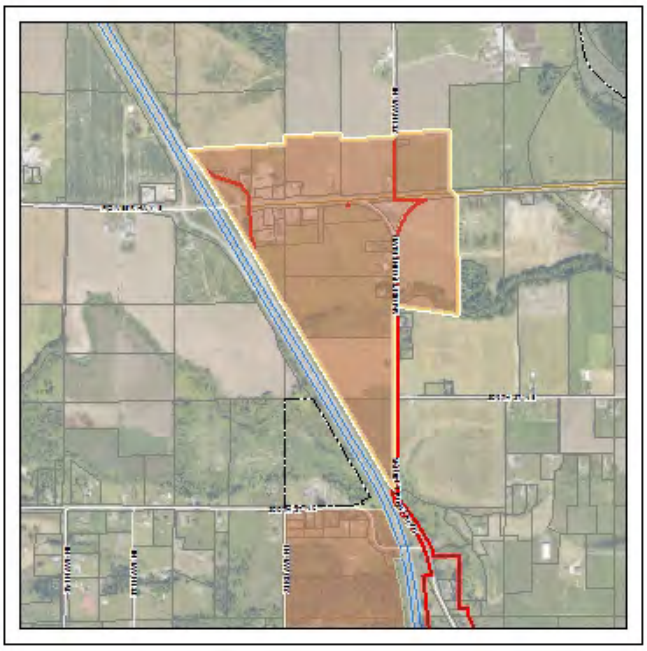
Focus Area	Area	Zoning Type[1]			Occupancy by Zoning		
		Residential	Commercial	Industrial	Residential[1]	Commercial[2]	Industrial[2]
	(acres)	(Percent)			(Persons)	(Facility Area, sq. ft.)	(Facility Area, sq. ft.)
Island Crossing	157	0%	100%	0%	0	2,735,568	0
AP Business Park	188	0%	95%	0%	0	3,118,896	0
MIC--South of 172nd	348	0%	57%	43%	0	3,484,800	3,223,440
SR9/SR531	227	65%	33%	0%	1,897	1,306,800	0
Central Industrial	343	8%	24%	68%	1,216	1,428,768	5,096,520

[1] City of Arlington data

[2] AWWA Commercial and Institutional End uses of Water indicate 40% and 50% of parcel areas are developed for water consumption in commercial and industrial facilities, respectively

Continued

Island Crossing



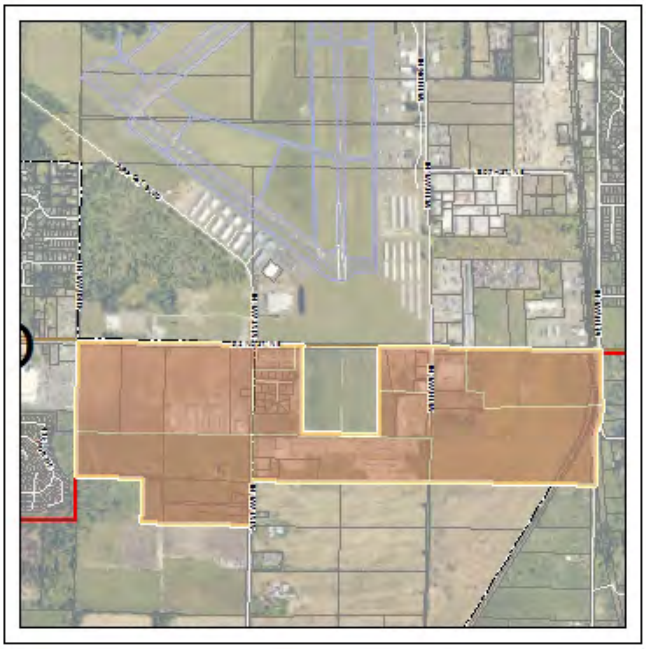
The Island Crossing focus area is situated at the northwest corner of the City, immediately east of I-5 and entirely on the Stillaguamish River floodplain. It contains 157 acres of city and county land that is primarily in commercial and agricultural use. Current zoning anticipates that land use in 2035 will be 100 percent commercial. For planning purposes, this CWP update assumes 40 percent of the total area—about 2.7 million square feet—contributes to wastewater loading. Capital projects within this focus area are assumed to occur in the second decade of the 20-year planning horizon.

The county land included in this growth center (located east of Smokey Point Boulevard) is entirely within the City's water service area and is owned in part by the Stillaguamish Tribe. The Tribe has approached the City regarding utility service to these parcels, and although development approval is outside of the City's jurisdiction, the City assumes it will develop within the foreseeable future. These parcels are outside of the City's UGA, however, and the City will need to enter into a special use agreement with the Tribe in order to provide wastewater service.

Airport Business Park

The Airport Business Park includes parcels formally zoned as a business park southwest of the airport, and north of 172nd Street (SR 531) and west of Airport Blvd. It also contains additional commercially-zoned parcels further north along Airport Blvd toward 188th St. Nearly the entire area is zoned for commercial and light industrial use. About 5 percent is zoned for open space within the Airport Flightline. It is estimated that the area will contain about 3.1 million sq. ft. of facilities contributing to wastewater loading in 2035. Capital projects within this focus area are assumed to occur in the first decade of the 20-year planning horizon.





Manufacturing Industrial Center (MIC)

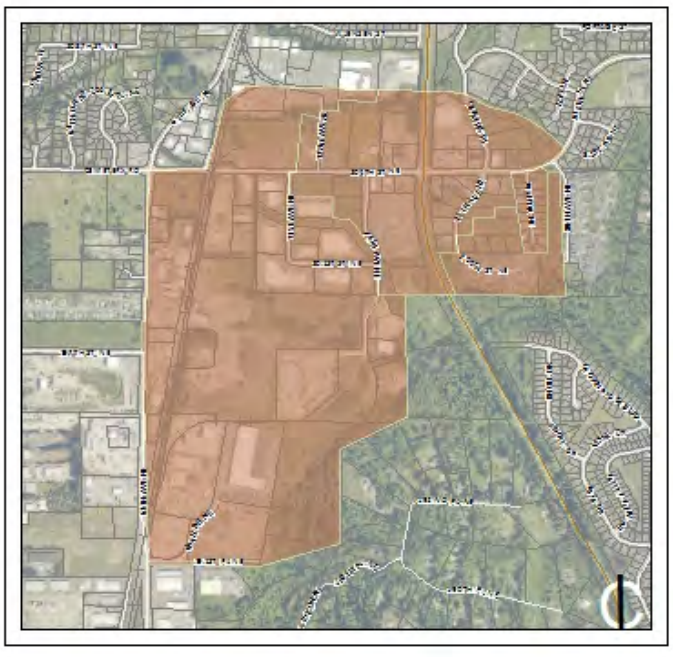
Arlington City Council and Community & Economic Development goals for the City include emphasis on the development of a Manufacturing and Industrial Center (MIC) with the City of Marysville. In its working with PSRC and Snohomish County, the City is seeking full recognition of the Arlington-Marysville MIC by pertinent jurisdictions as a regional employment center for family-wage jobs. The MIC would develop primarily on areas zoned as General and Light Industrial across the airport.

The MIC area needing intensive development of City utilities is situated south of 172nd St. Here the MIC would contain about 57 percent commercial area, and 43 percent industrial area. For planning purposes, this CWP update assumes 40 percent of the commercial area contributes to wastewater loading, or about 3.5 million square feet. Another 3.2 million square feet of industrial facilities would develop and discharge wastewater to the City. Capital projects within this focus area are assumed to occur in the second decade of the 20-year planning horizon.

Hilltop (Vicinity of the SR9/SR531 Roundabout)



In addition to infill in existing lots across the City, one of two centers for greater residential development is on 227 acres within existing City limits—the vicinity of the intersection of SR 9 and 172nd Street (SR 531). Nearly two-thirds of this area is zoned for residential use at high and suburban densities. This area is also slated for mixed use with about one-third of the area zoned for General and Highway Commercial land use with a mixed use overlay. In addition to providing housing for up to 2,000 persons, the area may accommodate up to 1.3 million square feet of commercial retail facilities. Capital projects within this focus area are assumed to occur in the first decade of the 20-year planning horizon.



Central Industrial Area in the Vicinity of Arlington Valley Road

This growth center is located in and adjacent to the existing central industrial area currently housed in Jensen Business Park. It also includes the former Northwest Hardwoods site and other parcels east of 67th Avenue which are accessed from 191st Street NE. The area is anticipated to grow with access provided by construction of the Arlington Valley Rd. Capital projects within this focus area are assumed to occur in the first decade of the 20-year planning horizon.

The area is zoned to accommodate more than two-thirds industrial land use in 2035, along with about one-quarter in commercial use, and another eight percent in residential land use. Commercial areas in Kent Prairie will also integrate limited residential development through the mixed use overlay. These developments will increase wastewater loading through

residential domestic use, industrial facilities totaling 5.1 million square feet, and another 1.4 million square feet in commercial facilities.

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CITY OF ARLINGTON

COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 3-1 (AMENDED*)
LAND USE

Legend

- City Limits
- UGA Boundary
- Sewer Service Area Boundary

City of Arlington Land Use

- SR = Suburban Residential
- RLMD = Low to Moderate Density Residential
- RMD = Moderate Density Residential
- RHD = High Density Residential
- OTRD = Old Town Residential District
- NC = Neighborhood Commercial
- OTBD - 1 = Old Town Business District 1
- OTBD - 2 = Old Town Business District 2
- OTBD - 3 = Old Town Business District 3
- GC = General Commercial
- HC = Highway Commercial
- BP = Business Park
- LI = Light Industrial
- GI = General Industrial
- P/SP = Public/Semi-Public
- MS = Medical Services
- AF = Aviation Flightline

- Contract Rezone
- MPN - Master Planned Neighborhood
- Commercial Corridor Overlay
- Horizontal Mixed Use Overlay

** The 2015 Wastewater Comprehensive Plan was amended in June 2017 to assure consistency with 2017 amendments to the City of Arlington's General Comprehensive Plan. Primary revisions include the City's decision to not expand its UGA west of I-5 at this time, and its approach to redistributing that population throughout the remainder of the City and its existing UGA.*

1 INCH = 1,250 FEET

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DRAWING IS NOT TO SCALE
IF BAR IS NOT 2" LONG

REVISION DATE: MAY 18, 2017

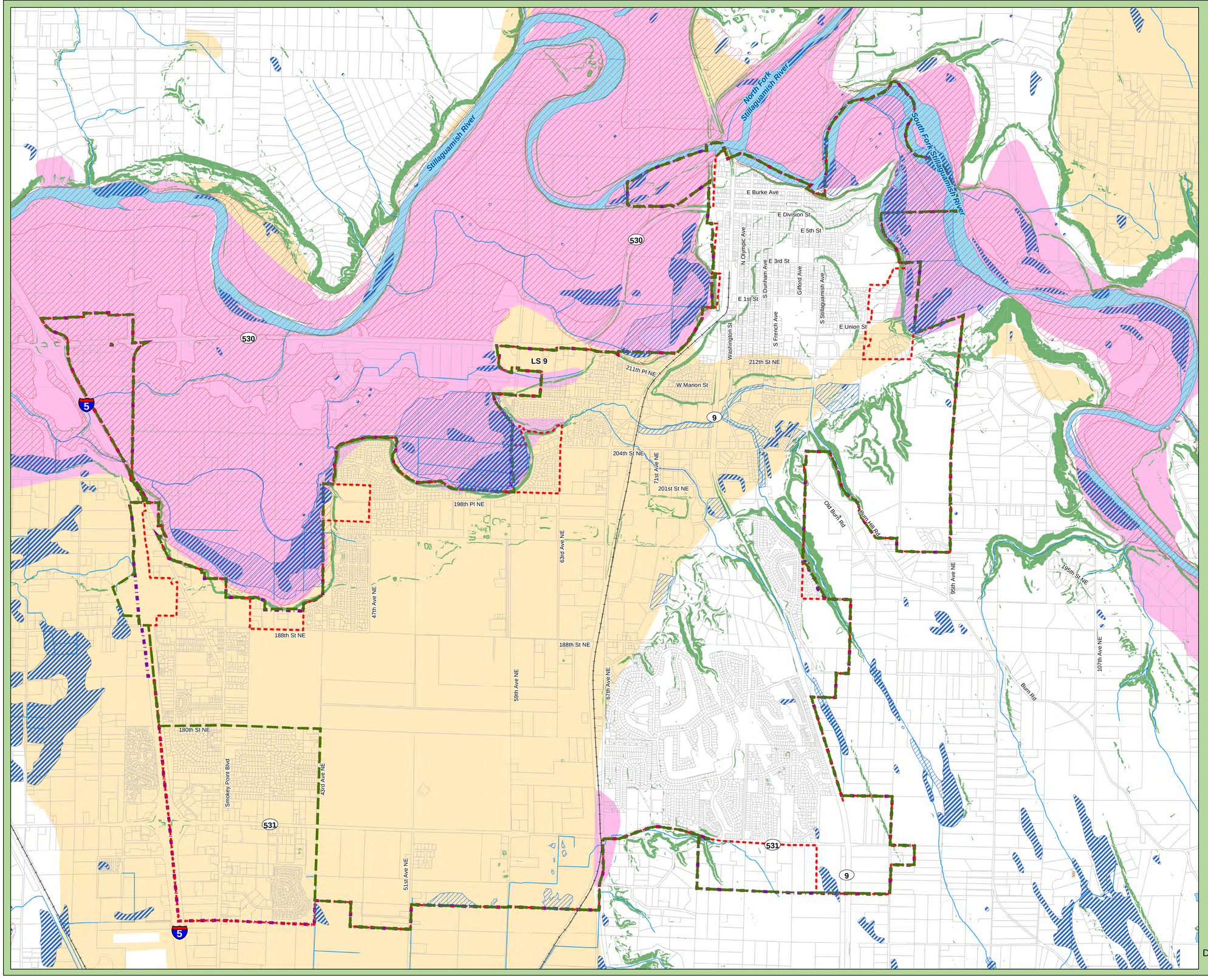
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BY: ACALDERON

RH2 ENGINEERS PLANNERS SCIENTISTS

CITY OF ARLINGTON

COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 3-2
CRITICAL AREAS



Legend

- City Limits
- UGA Boundary
- Sewer Service Area Boundary
- Wetlands (City Mapped)
- Wetlands (USFW)
- High Liquifaction Hazard
- Moderate Liquifaction Hazard
- FEMA Flood Hazard Area
- Steep Slopes (Greater than 33% Slope)

1 INCH = 1,250 FEET

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RH2 ENGINEERS PLANNERS SCIENTISTS

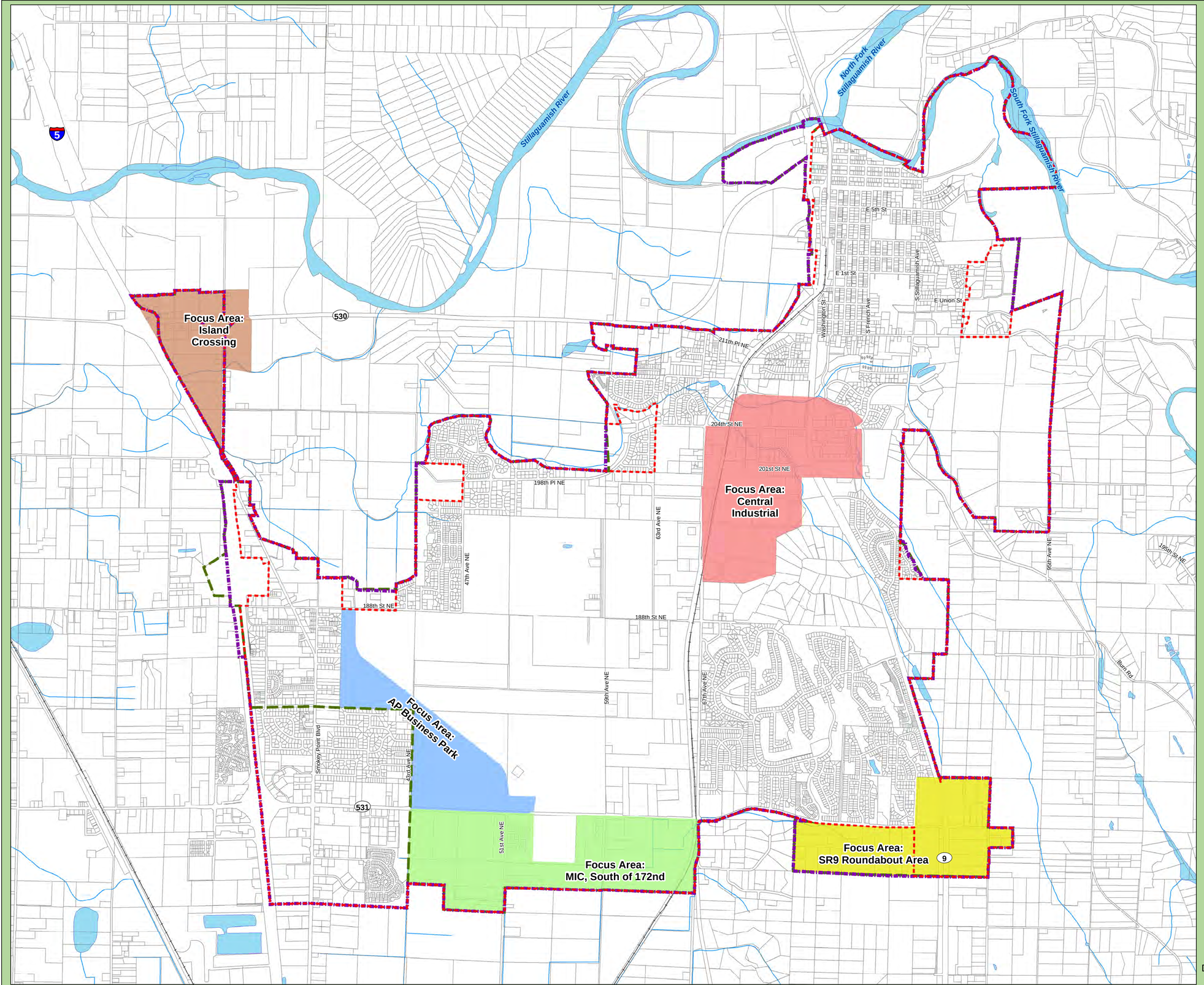
REVISION DATE: AUG 10, 2015

ARL-SSP-FIG-3-2

CITY OF ARLINGTON

COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 3-3 (AMENDED*) CAPITAL IMPROVEMENT PROJECT FOCUS AREAS



Legend

- City Limits
- UGA Boundary
- Sewer Service Area Boundary

Focus Areas

- Central Industrial
- AP Business Park
- Island Crossing
- SR9 Roundabout Area
- MIC, South of 172nd

** The 2015 Wastewater Comprehensive Plan was amended in June 2017 to assure consistency with 2017 amendments to the City of Arlington's General Comprehensive Plan. Primary revisions include the City's decision to not expand its UGA west of I-5 at this time, and its approach to redistributing that population throughout the remainder of the City and its existing UGA.*

1 INCH = 1,250 FEET

0 1,250 2,500

DRAWING IS NOT TO SCALE
IF BAR IS NOT 2" LONG

REVISION DATE: MAY 18, 2017

BY: ACALDERON

\\ARLINGTON\CITY\GIS\DATA\RH2_SEWER\AUGUST2015\MAPS\MAPS\ARL-SSP-FIG-3-3.MXD

4 Flow Analysis

4.1 INTRODUCTION



A detailed analysis of flow and loading in a sewer system is crucial to the planning efforts of a sewer service provider. When analyzing a sewer system, the first step is to identify current flow and load values to determine if the existing system can effectively provide adequate service to its customers under the most crucial conditions. A future sewer system analysis identifies projected flow and load to determine where the system will need to be improved in order to satisfy future growth and continue to meet federal and state laws.

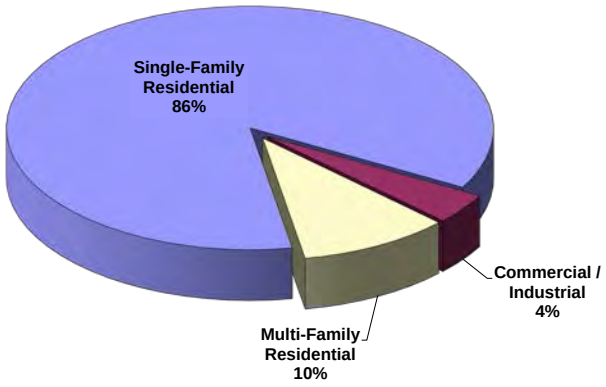
Flow and load values in a sewer system are used to determine the size of gravity collection piping, lift station facilities, force main piping, and size and type of treatment facilities needed. Several different flow scenarios were analyzed and are addressed in this chapter, including average day flow, peak day flow, peak hour flow, and projected future flows. The loading information and analysis for the City of Arlington's (City) Water Reclamation Facility (WRF) is addressed in "City of Arlington, Washington Wastewater Treatment Plant Evaluation" (Kennedy/Jenks Consultants 2007).

4.2 CURRENT POPULATION AND SERVICE CONNECTIONS

The 2014 city population is estimated at 18,360 people, and the 2014 population served by the wastewater system is estimated at 16,116 people. As of December 2014, there were approximately 5,170 sewer service connections throughout the City's sewer system. Of those connections, 4,440

were single-family residential services, 210 were multi-family residential services, and 520 were commercial/industrial. The 210 multi-family residential connections serve approximately 1,431 multi-family units. **Chart 4-1** shows the December 2014 system connections broken down by customer class.

Chart 4-1. 2014 Sewer Service Connections by Customer Class



4.3 EXISTING WASTEWATER FLOW RATES (AMENDED)

The City's sewer collection system can be broken down into 14 distinct sewer drainage basins, as shown in **Figure 2-3**. For the most part, the City's existing collection system flow rates were estimated using 2013 lift station flow records and WRF flow data. 2014 lift station flow data was not used since a full year was not available. The 2013 lift station flow rates are shown in **Table 4-1**. The flow rate for Lift Station 6 is estimated from 2014 flow data because there was a leak in the Lift Station 6 sewer drainage basin that was partially collected and returned through Lift Station 6 in 2013, which caused the flow measured through Lift Station 6 to be greater than the flow measured through Lift Station 5 in 2013. The 2009 to 2014 WRF flow data is shown in **Table 4-2**. Additional lift station information is provided in **Appendix A**.

It is important to note that Lift Station 4 includes flow from Lift Stations 5, 6, 11, and 12; Lift Station 5 includes flow from Lift Stations 6 and 11; and Lift Station 6 includes flow from Lift Station 11. As such, the actual flow from each sewer drainage basin is not directly represented by the recorded lift station flow rate. The estimated existing flow rate for the sewer drainage basins served by Lift Stations 4, 5, and 6 were calculated by subtracting the flow from the upstream lift station.

Pumping information for the Lift Station 1 sewer drainage basin is not available; therefore, the pumping information from the previous Comprehensive Sewer System Plan (Plan) was used for the Lift Station 1 sewer drainage basin. Pumping information for the Lift Station 6 sewer drainage

basin (Rest Area) is not complete for 2013; therefore, the pumping information for 2014 was utilized for the Lift Station 6 sewer drainage basin. Lift Station 13 is a small facility serving a few homes and is included within the Lift Station 2 sewer drainage basin.

There are three remaining sewer drainage basins for which there is limited specific flow information: Old Town, Gleneagle, and the Primary Interceptor. A few weeks' worth of flow data was collected in 2000 and additional flow data was collected from 2007 through ~~2014~~ 2016 at several locations in the City's sewer system, including some in the Primary Interceptor. This information was reviewed and used to the extent possible in this evaluation. It is recommended that the City continue to obtain additional flow data from these sewer drainage basins in order to accurately evaluate future capacity issues and plan for appropriate improvements.

For the purposes of this Plan, total flow from these three sewer drainage basins has been estimated by subtracting the total recorded lift station flows from the recorded WRF flows. This remaining flow was then allocated to each of the three sewer drainage basins based on the estimated size of the service area, age of pipes, site conditions, historical operation, and judgment. Based on this analysis and discussion of flow rates with the City, Old Town was allocated approximately 63 percent of the remaining flow, Gleneagle was allocated approximately 33 percent of the remaining flow, and the Primary Interceptor was allocated the remaining ~~approximately~~ 5 percent. This is very similar to the previous Plan, which allocated approximately 65 percent of the remaining flow to Old Town, approximately 30 percent of the remaining flow to Gleneagle, and the remaining approximately 5 percent to the Primary Interceptor. The recent development near the intersection of SR531 and SR9 may account for the slight shift in flow from Old Town to Gleneagle.

The resulting average daily flow and estimated peak hour flows for the various sewer drainage basins are illustrated in **Figure 2-3**.

Table 4-1. Existing Average Day Flow Rates at Lift Stations

Lift Station	2013 Existing Average Day Flow (GPD)
LS-1[1]	7,100
LS-2	219,390
LS-3	17,170
LS-4	179,985
LS-5	156,585
LS-6[2]	92,040
LS-7	69,090
LS-8	49,160
LS-9	38,770
LS-11	14,670
LS-12	10,860
LS-13	1,400

Notes:
-Average day flows shown in this table are rounded and approximate.
1 - Historical flow data for LS-1 is not available; the average day flow from the previous General Sewer Plan is presented.
2 - 2014 flow data for LS-6 is presented since the 2013 flow data for LS-6 is not complete.

Table 4-2. Existing Average Day Flow Rates at the Water Reclamation Facility

Year	Average Day Flow (GPD)
2009[1]	1,213,056
2010	1,068,001
2011[2]	1,109,340
2012	1,195,760
2013	1,108,791
2014	1,115,778

Notes:
1 - The influent flow for January 8, 2009, of 3.021 MG was omitted because it exceeds the capacity of the influent flow meter at the WRF and appears to be atypical of the maximum day flows observed at the WRF.
2 - There are 9 days of data in 2011 that are missing for the influent flow at the WRF.

4.4 INFILTRATION AND INFLOW

A sanitary sewer system must be able to carry the domestic wastewater generated by utility customers and the extraneous infiltration/inflow (I/I) that is a part of every sewer collection system. Groundwater that seeps into sewer pipes through holes, cracks, joint failures, and faulty connections on a seasonal or even year-round basis is referred to as infiltration. Stormwater and other water sources with direction connections and rapid response discharges to sanitary sewers on an ephemeral basis is called inflow. Common examples of inflow include roof drain downspouts, foundation drains, storm drain cross-connections, and holes in manhole covers.

The United States Environmental Protection Agency (EPA) published a report in May 1985, *Infiltration/Inflow, I/I Analysis and Project Certification,* that developed guidelines to help determine what amount of I/I is considered to be "excessive" and what amount can be cost-effectively removed. The report established I/I flow rates that were considered normal or acceptable, based on surveys and statistical evaluations of data from hundreds of cities across the nation.

4.4.1 Inflow

The EPA report gives guidelines for determining whether inflow can be classified as non-excessive. Inflow is considered to be non-excessive if the average daily flow during periods of heavy rainfall or spring thaw (i.e. any event that creates surface ponding and surface runoff) does not exceed 275 gallons per capita per day (gpcd). The peak recorded flow day in the last several years (2009 through 2014) of record for the City was 3.02 MGD (million gallons per day), which occurred on January 8, 2009. This day was recorded as having 0.4 inches of precipitation. However, this day was also preceded by several days with heavier precipitation and near-freezing temperatures, so some snow melt may have occurred on this day. This peak inflow event equates to a 188 gpcd flow rate, which is well below the EPA maximum of 275 gpcd. Therefore, the amount of inflow would be considered non-excessive and may be difficult to cost-effectively remove. The influent flow for January 8, 2009, was omitted from the other analyses presented in this Plan because it exceeds the capacity of the influent flow meter at the WRF and appears to be atypical of the maximum day flows observed at the WRF.

The second peak recorded flow day in the last several years of record for the City was 2.47 MGD on November 23, 2011. This day was recorded as having 0.6 inches of precipitation. However, this day was also preceded by several days with heavier precipitation, including the previous day which had the heaviest precipitation from 2009 through 2014 in the amount of 3.0 inches, and near-freezing temperatures, so some snow melt may have occurred on this day. This peak inflow event equates to a 152 gpcd flow rate.

The third peak recorded flow day in the last several years of record for the City was 2.41 MGD on January 7, 2009. This day was recorded as having 1.2 inches of precipitation. In addition, this day was also preceded by several days of precipitation and near-freezing temperatures, so some snow

melt may have occurred on this day. This peak inflow event equates to a 150 gpcd flow rate. The inflow evaluation data is included in **Appendix E**. All of these high inflow days are below the EPA maximum of 275 gpcd and are considered non-excessive.

4.4.2 Infiltration

The determination of non-excessive infiltration was based on the national average for dry-weather flow of 120 gpcd. In order for the amount of infiltration to be considered non-excessive, the average daily flow must be less than 120 gpcd (i.e. a 7 to 14-day average measured during periods of seasonal high groundwater). Although it can be difficult to determine how much of the flow is due to I/I, peak inflow will generally occur immediately during or just after a significant rain event, while peak infiltration will occur during the high groundwater period that follows prolonged precipitation events. In addition, it is difficult to find a 7 to 14-day period without rain in the winter in the Pacific Northwest. Therefore, periods were chosen that include negligible or small amounts of rain. The peak week in the last several years (2009 through 2014) of record for the City, occurring after heavy rains, was the week of January 11, 2009. This yielded an average flow rate of 1.88 MGD, which equates to 117 gpcd, which is within the EPA maximum of 120 gpcd. Therefore, the amount of infiltration would be considered non-excessive and difficult to cost-effectively remove.The second peak week in the last several years of record for the City, occurring after heavy rains, was the week of April 6, 2011, yielding an average flow rate of 1.77 MGD, which equates to 109 gpcd. The third peak week in the last several years of record for the City, occurring after heavy rains, was the week of January 31, 2013, yielding an average flow rate of 1.73 MGD, which equates to 104 gpcd. The infiltration evaluation data is included in **Appendix E**. All of these high infiltration days are below the EPA maximum of 120 gpcd and are considered non-excessive.

4.4.3 Further Investigation/Remedial Work

The City performed an I/I study in 1974, and another in 1991. Copies of these studies are in the Wastewater Department archives. Both studies revealed many sources of direct inflow into the system and identified some areas where the heaviest infiltration was thought to occur. The majority of the direct inflow was identified as primarily coming from roof drains connected to the sewer main along West Avenue, and along the alleyway between MacLeod and Olympic Avenue in the older downtown area of the City. Direct inflow was estimated at rates upwards of 250,000 gallons per day (gpd) during heavy rainfall periods.

The City has not completed any other I/I studies since the last one in 1991. However, City staff regularly monitor flows from neighborhood to neighborhood to detect sewer mains that may be approaching their capacity. Since 2013, the primary focus has been the various mains draining to Lift Station 2. Consistent with the guidelines defined in Chapter C-1 of the Washington State Department of Ecology's (Ecology) *Criteria for Sewage Works Design*, summer and winter flows are being compared to evaluate I/I in this basin. Recent anomalies in the data have prompted additional monitoring through 2016, including precipitation monitoring. A comprehensive

evaluation is anticipated to result in a report containing corrective measures, which may be implemented beginning in the future ~~2016~~.

Any I/I studies that are conducted in the future should follow the guidelines defined in Chapter C-1 of Ecology's *Criteria for Sewage Works Design*. In addition, the King County Department of Natural Resources has published a technical memorandum concerning I/I called *Regional Inflow and Infiltration Program*. This memorandum provides useful information which should be utilized to assist with ~~the I/I study currently being conducted and in~~ future I/I studies conducted on the sewer collection system.

4.5 PEAKING FACTORS

Once existing flow rates are measured and defined, projected flow rates can be developed. Projected flows are used to further analyze how well the existing system will perform in the future, and to determine improvements required to maintain or improve system function. In order to establish projected flow scenarios for a sewer system, peaking factors need to be determined for the existing system, which can then be applied to future flow rates. Peaking factors are the ratio of higher flows, such as maximum day flow, to the average annual flow. **Table 4-3** presents flow rates and peaking factors measured at the WRF.

Table 4-3. Summary of Existing Flows and Peaking Factors for the Water Reclamation Facility

Flow Scenario	Flow (MGD)	Peaking Factor (in terms of AAF)
2009 Average Annual Flow[1]	1.21	1.00
2009 Max Month Flow[1]	1.66	1.37
2009 Max Day Flow[1]	2.41	1.98
2010 Average Annual Flow	1.07	1.00
2010 Max Month Flow	1.34	1.25
2010 Max Day Flow	1.73	1.62
2011 Average Annual Flow	1.11	1.00
2011 Max Month Flow	1.55	1.40
2011 Max Day Flow	2.47	2.23
2012 Average Annual Flow	1.20	1.00
2012 Max Month Flow	1.59	1.33
2012 Max Day Flow	2.26	1.89
2013 Average Annual Flow	1.11	1.00
2013 Max Month Flow	1.49	1.35
2013 Max Day Flow	2.16	1.95
2014 Average Annual Flow	1.12	1.00
2014 Max Month Flow	1.42	1.27
2014 Max Day Flow	1.85	1.66

Note:
1 - The influent flow for January 8, 2009, of 3.021 MG was omitted because it exceeds the capacity of the influent flow meter at the WRF and appears to be atypical of the maximum day flows observed at the WRF.

As shown in **Table 4-3**, the average annual flow at the WRF has remained around 1.1 to 1.2 MGD over the last 6 years. The maximum month and maximum day peaking factors have also remained fairly consistent over the same time span.

Peaking factors for collection system pipes and lift stations are typically based on peak hour flow rates. Peaking factors in the collection system are often greater than those experienced at the WRF due to the smaller size of the sewer drainage basin feeding the particular collector or lift station.

The City is not able to retrieve direct measurements of peak hour flows into the WRF, so this value could not be obtained for comparison. Peak hour flow rates have been measured in the system at the lift stations; the peak hour flow peaking factor for the lift stations are presented later in this chapter in **Table 4-5**. The average of the peaking factors (peak hour flow to average annual flow) for the lift stations is approximately four. (This average excludes Lift Station 13, which only serves approximately four residences and is located on the outer boundaries of the sewer service area.)

The average is consistent with the peaking factor curves provided in Figure C1-1 in Ecology's *Criteria for Sewage Works Design*. For the purposes of this Plan, therefore, peak hour flow will be estimated using a peaking factor of four times the Average Annual Flow (AAF).

4.6 PROJECTED WASTEWATER FLOW RATES(AMENDED)

Future flow rates were calculated for the 2024 (10-year) and 2035 (21-year) planning horizons. Population projections, as shown in **Table 3-2** in **Chapter 3**, were used to calculate the projected flow rates. A population increase was established over the projected period, which was in turn applied to the estimated existing flow rate for each sewer drainage basin. Information regarding expected future development and areas where growth is projected was obtained from the City (**Figure 3-3**) and used to develop population and flow distributions for the 2024 and 2035 planning horizons.

The projected flows at the WRF and the flow distribution to the various sewer drainage basins were developed using the following assumptions.

- The existing flow rate for the current population will remain the same as in recent years. This assumes that existing users of the City's sewer system will continue to discharge wastewater at the same rate they currently do.
- Although the current average flow rate is approximately 70 gpcd, average day flow rates for the new growth portion of the future flow were projected based on 100 gpcd, in accordance with Ecology's sewer system design guidelines.
- The projected flows for sewer drainage basins where commercial and industrial development is expected were estimated assuming an average annual water demand rate of 26 gallons per square foot of building space per year, which is in accordance with the American Water Works Association's (AWWA) Commercial and Institutional End Users of Water design guidelines, 30 percent of the available land would be developed to building space, and 90 percent of the water demand would be conveyed into the City's sewer system. Development in these growth center areas is discussed further in **Chapter 3**.
- The estimated existing and projected peak hour influent flows for each of the lift stations were assessed by assuming that all upstream lift stations were pumping at firm capacity at the same time the peak hour flows occurred (**Table 4-5**). The firm capacity is the capacity of the lift station with the largest pump out of service.

Table 4-4 presents the existing and projected flow rates for the sewer drainage basins and WRF based on the population projections and the assumptions above. **Chapter 3** should be referenced for more information regarding both population and growth scenarios.

Table 4-4. Projected Sewer Drainage Basin Average Day and Peak Hour Flow Rates (Amended)

Sewer Drainage Basin	2013 Existing		Projected 2024		Projected 2035	
	ADF (GPD)	PHF (GPM)[1]	ADF (GPD)	PHF (GPM)[1]	ADF (GPD)	PHF (GPM)[1]
Primary Interceptor	26,405	75	53,463	150	85,186	240
Old Town (A & B)	330,080	915	345,690	958	361,630	1,005
Gleneagle	171,640	475	215,056	596	319,989	887
Lift Station 1	7,100	20	7,201	20	7,417	21
Lift Station 2	255,960	711	447,480	1,243	639,360	1,776
Lift Station 3	17,170	50	19,229	56	21,389	62
Lift Station 4 (Airport)	12,540	35	21,180	59	31,116	87
Lift Station 5	64,545	180	120,331	317	182,150	435
Lift Station 6 (Rest Area)	77,370	215	91,252	255	104,946	297
Lift Station 7 (Highclover)	69,090	190	77,240	212	84,786	234
Lift Station 8 (Highland View)	49,160	135	76,088	211	97,558	269
Lift Station 9	38,770	110	43,450	123	48,173	136
Lift Station 11 (Island Crossing)	14,670	40	49,187	139	81,256	242
Lift Station 12 (Crown Park)	10,860	30	88,505	246	176,878	491
Lift Station 14 (Smokey Point)	---	---	14,615	40	30,695	85
~~Lift Station 15 (UGA Expansion)~~	~~---~~	~~---~~	~~109,095~~	~~305~~	~~229,105~~	~~635~~
Treatment Plant (ADF)	**1.15 MGD**		**1.67 MGD**		**2.27 MGD**	
Treatment Plant (MMF)	**1.49 MGD**		**2.34 MGD**		**3.18 MGD**	

Notes:
-Average day flows and peak hour flows shown in this table are rounded off and approximate.
-Highlighted flow exceeds current wastewater treatment plant capacity.
1 - Peak hour flows for each sewer drainage basin were estimated based on the average day flow and a peaking factor of four.

The City's current National Pollutant Discharge Elimination System (NPDES) permit allows a maximum month average influent flow (MMF) of 2.67 MGD at the WRF. As shown in **Table 4-4**, the regulatory flow capacity of the WRF will be exceeded within the 21-year planning period. At 85 percent of the design MMF, planning will need to begin for the membrane upgrades at the WRF. The City's Capital Improvement Plan (CIP) includes the planning and construction of the membrane upgrades for the WRF. Capacity upgrades to the WRF will be necessary to handle future flows. The numbers presented in **Table 4-4** are projected estimates based on current flow information. The City should closely monitor influent flow on a yearly basis to verify population and flow trends.

Current pumping capacity and flow rate projections for the lift stations are provided in **Table 4-5**. The existing lift station capacities presented in **Table 4-5** are the capacities of each lift station with the largest pump out of service. The projections in **Tables 4-4** and **4-5** include the following projects that are anticipated to be completed by 2024:

- Upgrade the capacity of Lift Station 2. Improvements to increase the firm capacity to 1,100 gpm are anticipated to be complete in 2017. Provisions for the installation of a third pump in Lift Station 2 will be provided that will ultimately increase the firm capacity of the facility to 1,400 gpm.
- Construct Lift Station 14 (Smokey Point) ~~and Lift Station 15 (Urban Growth Area (UGA) Expansion). Lift Station 15 will be conveyed to Lift Station 14~~.
- Reroute wastewater flows from Lift Station 6 (Rest Area) and Lift Station 11 (Island Crossing) to Lift Station 14 (Smokey Point). Rerouting the flow from Lift Station 6 will alleviate the flows ~~on~~ to the Primary Interceptor.
- The wastewater from Lift Station 14 (Smokey Point) will be conveyed to Lift Station 7 (High Clover).

These improvements are discussed further in **Chapter 7**. No improvements are discussed in **Chapter 7** for re-routing wastewater flows from Lift Station 6 to Lift Station 14 because the City has indicated that the existing force main will be re-used. Lift Station 11 will be evaluated during the design of Lift Station 14.

Table 4-5. Projected Lift Station Average Day and Peak Hour Flow Rates (Amended)

Name	Existing Firm Capacity (GPM)[5,6]	2013 Existing				Projected 2024		Projected 2035	
		ADF (GPD)	Estimated PHF (GPM)[1]	Measured PHF (GPM)	Measured PHF Peaking Factor	ADF (GPD)	PHF (GPM)[1]	ADF (GPD)	PHF (GPM)[1]
LS-1[2]	200	7,100	20	20	4.06	7,201	20	7,417	21
LS-2[3]	1,100	219,390	705	445	2.92	447,480	**1,243**	639,360	**1,776**
LS-3	200	17,170	50	60	4.88	19,229	56	21,389	62
LS-4 (Airport)	400	179,985	**735**	**555**	4.43	230,015	**759**	390,143	**1,037**
LS-5	450	156,585	**680**	270	2.48	120,331	317	182,150	435
LS-6 (Rest Area)[4]	500	92,040	330	195	3.08	91,252	255	104,946	297
LS-7 (Highclover)	176	69,090	**190**	130	2.71	217,679	**962**	270,988	**984**
LS-8 (Highland View)	225	49,160	135	135	3.92	76,088	211	97,558	**269**
LS-9	225	38,770	110	90	3.26	43,450	123	48,173	136
LS-11 (Island Crossing)	115	14,670	40	55	5.53	49,187	**139**	81,256	**242**
LS-12 (Crown Park)	250	10,860	30	55	7.31	88,505	246	176,878	**491**
LS-13	100	1,400	5	15	14.29	1,400	5	1,400	5
LS-14 (Smokey Point)	---	---	---	---	---	140,438	750	186,202	750
~~LS-15 (UGA Expansion)~~	~~---~~	~~---~~	~~---~~	~~---~~	~~---~~	~~109,095~~	~~305~~	~~229,105~~	~~635~~

Notes:
-Average day flows and peak hour flows shown in this table are rounded-off and approximate.
-Highlighted flows exceeds current pump capacity.
1 - Peak hour flows for each lift station were estimated based on the average day flow and a peaking factor of four.
2 - No historical flow data is available for LS-1 so the average day flow and peak hour flow from the previous Plan was utilized for LS-1.
3 - Lift Station 2 capacity expansion is planned for 2017, with the existing 500 gpm capacity proposed to be increased to 1,100 gpm within 2017. The 2017 improvements include the capacity with 2 pumps installed, and the improvements will allow provisions for a 3rd pump to be installed in the future, further increasing the firm capacity to 1,400 gpm.
4 - 2014 flow data for LS-6 was utilized since the 2013 flow data for LS-6 is not complete.
5 - The existing firm capacities are the capacities of each lift station with the largest pump out of service.
6 - The firm capacity of Lift Station 2 is 500 gpm as of the writing of this chapter in June 2017, but improvements to improve the facility's capacity are underway and will be completed in 2017. The firm capacity following these 2017 improvements is shown in this table.

Some of the peak hour flow data points from each of the lift stations were omitted from these analyses because they appear to be atypical of the peak hour flows observed at the respective lift station. The lift station flow data used for these analyses is presented in **Appendix D**.

The following assumptions were made for the estimated 2013 existing peak hour flow analysis.

- The incoming flow for Lift Station 2 is based on the following:
    - Estimated 2013 existing peak hour flow from the Lift Station 2 sewage drainage basin, excluding the peak hour flow from the area served by Lift Station 13, and
    - Existing capacity of 100 gallons per minute (gpm) for Lift Station 13.
- The incoming flow for Lift Station 4 (Airport) is based on the following:
    - Estimated 2013 existing peak hour flow from the Lift Station 4 sewage drainage basin,
    - Existing capacity of 450 gpm for Lift Station 5, and
    - Existing capacity of 250 gpm for Lift Station 12.
- The incoming flow for Lift Station 5 is based on the following:
    - Estimated 2013 existing peak hour flow from the Lift Station 5 sewage drainage basin, and
    - Existing capacity of 500 gpm for Lift Station 6.
- The incoming flow for Lift Station 6 (Rest Area) is based on the following:
    - Estimated 2013 existing peak hour flow from the Lift Station 6 sewage drainage basin, and
    - Existing capacity of 115 gpm for Lift Station 11.

The following assumptions were made for the 2024 peak hour flow analysis.

- The incoming flow for Lift Station 2 is based on the following:
    - Projected 2024 peak hour flow from the Lift Station 2 sewage drainage basin, excluding the peak hour flow from the area served by Lift Station 13, and
    - Existing capacity of 100 gpm for Lift Station 13.
- The incoming flow for Lift Station 4 (Airport) is based on the following:
    - Projected 2024 peak hour flow from the Lift Station 4 sewage drainage basin,
    - Existing capacity of 450 gpm for Lift Station 5, and
    - Existing capacity of 250 gpm for Lift Station 12.
- The incoming flow for Lift Station 7 (High Clover) is based on the following:

- Projected 2024 peak hour flow from the Lift Station 7 sewage drainage basin, and
- Estimated future capacity of 750 gpm ~~1,425 gpm~~ for Lift Station 14.

- The incoming flow for Lift Station 14 (Smokey Point) is based on the following:
  - Projected 2024 peak hour flow from the Lift Station 14 sewage drainage basin,
  - Existing capacity of 500 gpm for Lift Station 6, and
  - ~~Existing capacity of 115 gpm for Lift Station 11~~,
  - Estimated future capacity of 250 gpm for Lift Station 11.
  - ~~Estimated future capacity of 650 gpm for Lift Station 15.~~

The following assumptions were made for the 2035 peak hour flow analysis.

- The incoming flow for Lift Station 2 is based on the following:
  - Projected 2035 peak hour flow from the Lift Station 2 sewage drainage basin, excluding the peak hour flow from the area served by Lift Station 13, and
  - Existing capacity of 100 gpm for Lift Station 13.
- The incoming flow for Lift Station 4 (Airport) is based on the following:
  - Projected 2035 peak hour flow from the Lift Station 4 sewage drainage basin,
  - Existing capacity of 450 gpm for Lift Station 5, and
  - Estimated future capacity of 500 gpm ~~475 gpm~~ for Lift Station 12.
- The incoming flow for Lift Station 7 (High Clover) is based on the following:
  - Projected 2035 peak hour flow from the Lift Station 7 sewage drainage basin, and
  - Estimated future capacity of 750 gpm ~~1,425 gpm~~ for Lift Station 14.
- The incoming flow for Lift Station 14 (Smokey Point) is based on the following:
  - Projected 2035 peak hour flow from the Lift Station 14 sewage drainage basin,
  - Existing capacity of 500 gpm for Lift Station 6, and
  - Estimated future capacity of 250 gpm ~~175 gpm~~ for Lift Station 11.~~, and~~
  - ~~Estimated future capacity of 650 gpm for Lift Station 15.~~

As indicated in **Table 4-5**, the following lift stations are estimated to be at or near capacity based on the existing 2013 analyses:

- Lift Station 4 (Airport)

The following lift stations are estimated to be at or near capacity prior to 2024 based on the future system analyses, as shown in **Table 4-5**:

- Lift Station 2
- Lift Station 7 (High Clover)
- Lift Station 11 (Island Crossing)

The following lift stations are estimated to be at or near capacity prior to 2035 based on the future system analyses, as shown in **Table 4-5**:

- Lift Station 8 (Highland View)
- Lift Station 12 (Crown Park)

Capacity upgrades to Lift Stations 2, 4, 7, 8, 11, and 12 will be necessary to handle projected flowrates. The future capacity of these lift stations were based on 2035 peak hour flows. These improvements are discussed further in **Chapter 7**. Capacity upgrades for Lift Station 2 are being constructed the summer of 2017.

~~As indicated in **Table 4-5**, Lift Station 4 (Airport) is estimated to be at or near capacity at this time and Lift Station 2 is estimated to be near capacity at this time. Lift Stations 7 (High Clover) and 12 (Crown Park) will be at capacity prior to 2024 and Lift Station 12 (Crown Park) 11 (Island Crossing) will be at capacity prior to 2035, as shown in **Table 4-5**. Capacity upgrades to Lift Stations 2, 4, 7, 11, and 12 will be necessary to handle future flows. The future capacity of these lift stations were based on 2035 peak hour flows. These improvements are discussed further in **Chapter 7**.~~

4.7 SUMMARY (AMENDED)

Table 4-6 includes a summary of the population and flow information presented in this chapter.

The City's current NPDES Permit allows a MMF of 2.67 MGD at the WRF. The WRF will reach capacity based on flow within the 21-year planning period. Assuming linear growth in the MMF, influent will reach permitted flow ~~during~~ in approximately 2028. The City is required to begin planning for membrane upgrades at 85 percent of design MMF, or about 2.27 MMF. Linear growth model assumes planning would begin in about 2023.

The projected flows presented in **Table 4-6** were estimated using current flow rates and the assumptions stated above. ~~assuming a future average annual influent flow rate per capita of 100 gpcd, which is in accordance with Ecology's sewer system design guidelines. In addition, the projected flows for sewer drainage basins where commercial and industrial development is expected were estimated assuming an average annual water demand rate of 26 gallons per square foot of building space per year, which is in accordance with the AWWA's Commercial and Institutional End Users of Water design guidelines, 30 percent of the available land would be developed to building space, and 90 percent of the water demand would be conveyed into the City's sewer system. Based on the flow analysis and using Ecology's recommended guidelines,~~ The WRF will reach capacity based on flow. The WRF has the capability to be expanded for

additional capacity, which is discussed further in the "City of Arlington, Washington Wastewater Treatment Plant Evaluation" report prepared by Kennedy/Jenks Consultants. The planning and construction of the membrane upgrades at the WRF are included in **Chapter 7** and the City's CIP.

The City's average annual influent flow rate per capita has been below 100 gpcd since at least 2009. Future sewer flow rates for commercial and industrial developments are difficult to estimate without specific information about the proposed developments. If the average annual gallons per capita day remains below Ecology's recommended guideline of 100 gpcd, it is likely that the WRF will not reach capacity in the 21-year planning period based on flow. Therefore, the City should closely monitor influent flow on a yearly basis to see if the average annual influent flow rate per capita continues to remain lower than the guidelines presented in Ecology's Orange Book.

Table 4-6. Flow Analysis Summary (Amended)

Description	2013 Existing	2024 Projected	2035 Projected
Population Data			
Service Area Population	16,632	18,800	21,800
Increase from Base Year 2013		2,168	5,168
Flow Basis Data (gal/day/capita)			
Residential Average Day Flow Per Capita	---	74	78
Commercial and Industrial Average Day Flow Per Capita	---	12	22
Total Average Day Flow Per Capita	67	86	100
Water Reclamation Facility Flow (MGD)			
Average Annual WRF Flow	1.11	1.67	2.27
Max Month WRF Flow	1.49	2.34	3.18

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5 Policies and Design Criteria

5.1 INTRODUCTION



The City of Arlington (City) operates and plans wastewater service for the City and associated wastewater service area residents and businesses according to the design criteria, laws and policies that originate from the United States Environmental Protection Agency (EPA) and the Washington State Department of Ecology (DOE).

These laws, design criteria and policies guide the City's operation and maintenance of the wastewater utility on a daily basis, and it's planning for growth and improvements. The overall objective is to ensure that the City provides high quality sewer service at a fair and reasonable cost to its customers. They also set the standards the City must meet to ensure that the sewer system is adequate to meet existing and future flows. The system's ability to handle these flows is detailed in **Chapter 6**, and the recommended improvements are identified in **Chapter 7**.

The Arlington City Council cannot adopt regulations and policies that are less stringent or in conflict with those established by the U.S. and State governments. The City's policies take the form of ordinances, memoranda and operational procedures, many of which are summarized in this chapter.

The policies associated with the following categories are presented in this chapter.

- Regulations
- Customer Service
- Collection Systems
- Lift Stations
- Treatment
- Operational
- Reclaimed Water Reuse
- Financial
- Organizational

5.2 REGULATIONS

5.2.1 National Pollutant Discharge Elimination System Permit and Reclaimed Water Permit

The State of Washington regulates the federal effluent limitations with the National Pollutant Discharge Elimination System (NPDES) program. Wastewater discharge into the waters of the state shall have an NPDES permit from the Department of Ecology. The City of Arlington's permit allows 2.67 MGD for the average flow during the maximum month. The permit also contains influent and effluent quality standards, collection system requirements, pretreatment requirements, and system maintenance requirements.

Beginning with the permit effective March 1, 2014, reclaimed water is permitted for reuse according to the specific conditions included within the NPDES permit. These "R" conditions require treatment to Class A reclaimed water standards, and treatment and operational and maintenance procedures which assure reliability and redundancy for public health protection. This initial permit limits reuse to the irrigation of the City's constructed treatment wetland, located just west of the WRF across SR 9, for the maintenance of wetland functions.

A copy of the NPDES and Reclaimed Water permits is included in **Appendix I**.

5.2.2 Other Regulations and Required Permits

The City also holds permits and is regulated by the Puget Sound Clean Air Agency (Registration No. 11058), State of Washington Department of Natural Resources Aquatic Lands Outfall Easement (No. 51-070281) and the General Permit for Biosolids Management (issued 2015).

5.3 CUSTOMER SERVICE POLICIES

5.3.1 Sewer Service and Connection

- The City will strive to provide sewer service to the properties within the City's wastewater service area, provided all policies related to service can be met.
- All proposed developments within the City's wastewater service area shall connect directly to the City's sewer system, unless deemed unfeasible by the City at the time of the request.
- Sewer system extensions required to provide sewer service to proposed developments shall be approved by the Department of Public Works and must conform to the City's adopted design criteria and construction standards and specifications, as shown in the City's most current Design and Construction Standards and Specifications. All costs of the extension shall be borne by the developer or applicant. The sanitary sewer section (Section 3) from the City's draft 2015 Design and Construction Standards and Specifications is included in **Appendix H**.
- Sewer service can be extended outside of the City limits and within the UGA only if the project is in compliance with the City's utility regulations, standards and policies.
- Sewer service cannot be extended outside of the City's UGA, except for certain exceptions identified in City Code.
- Sewer extensions shall be given based on system capacity using the following priorities.
    1. Extensions shall first be given to applicants within the City limits.
    2. Second priority shall be given to those applicants within the UGA.
    3. Extensions may be given higher priority where existing environmental problems make extension necessary.
- For sewer service applications within the City limits, the City will review the availability for wastewater service at the time of land use permitting, site development permit review and building permit. During the land use permitting process, the City will determine if sewer collection and treatment capacity is available for the site and will issue its determination in a certificate of wastewater service availability. During the site development permit review, the City will address the sizing and location of the sewer extension. The formal sewer service application begins at the time of building permit when service sizing is evaluated.
- For sewer service applications outside of the City limits, the applicant must first obtain a wastewater utility service agreement from the City. The City will review the agreement and determine the availability of sewer
- Sewer collection system, lift station and treatment plant capacity will be considered when providing sewer availability to applicants.

- In the absence of a connection, wastewater service availability at a site shall expire at the time that the associated permit expires (i.e. land use, site development or building permit).
- Time extensions in regards to sewer availability shall be granted in accordance with the associated permit requirements. When extensions are denied, the disputes are handled through the rules guiding the associated permit process. Disputes can be brought to the City Council for discussion.

5.3.2 Septic Systems

- Existing single-family homes with septic systems in good working condition, per the Snohomish County Health Department, may continue to be used. All septic systems in the City shall be monitored per WAC 246-272A-0270 and the Snohomish County Health Department's regulations. The City will provide periodic reminders to property owners regarding their responsibilities for onsite sewage disposal.
- Property owners within city limits with a failing septic system, as documented by the Snohomish County Health Department, shall connect to the sewer system, consistent with AMC 20.60.120. The presence of an available reserve drain field area is not adequate reason for an exemption from this requirement.
- Septic systems are not typically allowed for new developments. Exceptions may be granted: 1) where connection to the sewer within 500 feet is not available, 2) to single-family residences, 3) on 5-acre platted lots, 4) when located outside of recognized aquifer protection areas (in the City's *GMA Comprehensive Plan*). See AMC 20.60.120 for further reference.

5.3.3 Annexations

- Areas annexed will be served by the City of Arlington sewer utility at the customer's expense, unless accepted by City Council, and must meet the City of Arlington sewer standards.
- Provision of sewer service will be provided per the adopted utility policy. The City of Arlington will follow State guidelines in the assumption of facilities in annexation areas.

5.4 COLLECTION SYSTEM POLICIES AND DESIGN CRITERIA

5.4.1 Sanitary Sewer Design Criteria

- All sewer lines within the City shall be designed in accordance with good engineering practice by a professional engineer with the minimum design criteria presented in the *Criteria for Sewerage Works Design*, prepared by the State of Washington Department of Ecology (DOE), December 1998, or as superseded by subsequent updates. Chapter C1 of this document includes standards and guidelines for design considerations (minimum pipe sizes, pipe slopes and wastewater velocities), maintenance considerations, estimating wastewater flow rates, manhole locations, leak testing and separation from other

underground utilities. These criteria have been established to ensure that the sanitary sewers convey the sewage and protect the public health and environment. The sewer lines shall also conform to the latest regulatory requirements relating to design.

- Sewers shall be designed and constructed in accordance with the City of Arlington's most current Design and Construction Standards and Specifications.

5.4.2 Gravity Sewer Design Criteria

- Gravity sewers are sized to provide capacity for peak, wet-weather flows. The smallest diameter sewer allowed is 8 inches.
- All sewers will be laid on a grade to produce a mean velocity of at least 2 feet per second when flowing half-full.
- Manholes shall be at least 48 inches in diameter and will be spaced at intervals not to exceed 400 feet.
- Manholes shall also be located at changes in grade, flow direction, and sewer pipe size.

5.4.3 Design Flow Rates

- Sanitary sewer system flows are composed of residential, institutional, business, commercial, and industrial wastewater, along with infiltration and stormwater inflow. Sanitary sewer systems must be capable of conveying the ultimate peak flows of these wastewater sources.
- No overflows will be permitted.

5.4.4 Gravity Pipe Material and Roughness

- Allowable gravity sewer pipe material shall include ductile iron, high density polyethylene (HDPE) or polyvinyl chloride (PVC). For normal depth, PVC is generally preferable. All materials shall be in accordance with the City of Arlington's most current Design and Construction Standards and Specifications.
- The Manning equation is used to design and analyze wastewater flow characteristics of the sanitary sewers. The Manning roughness coefficient "n" varies depending on the pipe material. However, an "n" value of 0.013 shall be used for design regardless of material used.

5.4.5 Separation between Sanitary Sewer and Other Utilities

- A minimum horizontal separation of 5 feet between sanitary sewer and other utilities shall be maintained (edge to edge).
- Wherever possible, a horizontal separation of 10 feet is required between sewer and water lines (edge to edge).

- The guidelines provided in DOE's *Criteria for Sewage Works Design* should be followed for difficult spacing or other situations.

5.4.6 Design Period

- The design period is the length of time that a given facility will provide safe, adequate and reliable service. The design period selected is based on the economic life of a given facility, which is determined by the structural integrity of the facility, the rate of degradation, the replacement cost, the cost of increasing the capacity of the facility and the projected population growth rate serviced by the facility.
- Collection and interceptor sewers are designed for the peak development of a contributing area.
- The life expectancy for new sanitary sewers, using current design practices, is in excess of 50 years.

5.4.7 Force Main Design Criteria

- All force mains within the City shall be designed in accordance with good engineering practice by a professional engineer with the minimum design criteria presented in the *Criteria for Sewerage Works Design*, prepared by the State of Washington Department of Ecology, December 1998, or as superseded by subsequent updates. Chapter C2 of this document contains design considerations for force mains.
- Force mains shall not be less than 4 inches in diameter.
- A minimum scouring velocity of 2 feet per second should be maintained. Velocities should not exceed 8 feet per second.
- All force mains should be constructed of ductile iron. Alternative materials, if any, will be specified in the City's *Engineering Standards* (**Appendix H**)

5.4.8 Side Sewer Design Criteria

- City jurisdiction and responsibility for side sewers ends at the right-of-way boundary. On the homeowners' side, sewers are governed by the City's adopted versions of the International Plumbing Code and the Uniform Building Code.
- Side sewers shall provide single service. Each individual single family, duplex and triplex unit shall have its own side sewer. Four-plex and larger multi-family buildings, as well as other non-residential buildings shall have one side sewer per building.
- Side sewers shall be installed in accordance with the City of Arlington's most current Design and Construction Standards and Specifications.

5.5 LIFT STATION POLICIES AND DESIGN CRITERIA

- Lift stations shall be designed in accordance with the City of Arlington's most current Design and Construction Standards and Specifications.
- Lift stations shall be designed for peak design flow with the largest pump out of service.
- Lift stations should be designed for a 20-year design life.
- All existing and future lift stations will be modified/constructed to comply with the following minimum standards.
    1. All structures will be non-combustible, where practical.
    2. All buildings will have adequate heating, cooling, ventilation, insulation, lighting and work spaces necessary for on-site operation and repair.
    3. Sites will be fenced to reduce vandalism and City liability.
    4. Each station will be equipped with a flow meter and all necessary instrumentation to assist personnel in operating and troubleshooting the facility.
    5. Emergency power capability will be provided at all lift stations.
- Pumps will be operated automatically, with flexibility in pump start/stop settings.
- Stations will be operated with the provision for at least two methods of control to minimize system vulnerability.

5.6 TREATMENT POLICIES

5.6.1 Treatment Facilities

Consistent with the selection of membrane filtration and biological nutrient removal treatment technologies in the 2006-2011 upgrade to a water reclamation facility, the City's future treatment decisions will consider and prefer approaches which:

- Require a smaller footprint (providing greater expansion opportunities in the future),
- Require fewer unit processes (less demand on operations staff),
- Have more consistent performance (less fluctuation in effluent quality),
- Produce higher quality effluent, which will reduce disinfection requirements and may yield some removal of constituents that could be regulated in the future,
- Are considered "best available technology" for cost-effective treatment of municipal wastewater, and
- Demonstrate the City's ongoing commitment as a good steward of the environment.

- The City will initiate planning for expansion and upgrade of treatment facilities when influent rates reach 80% of the design capacity, or as required by state law.

5.6.2 Environmental Responsibility

- The wastewater utility will implement procedures, and modifications to procedures, when it is demonstrated that such procedures, as part of an integrated watershed management plan involving other utilities and land uses in the Stillaguamish and Quilceda basins, would result in net environmental benefits at a reasonable cost to the utility.
- The wastewater utility will manage its operations and discharges with consideration for parameters known to cause, or which potentially could cause, impairments to water quality in the Stillaguamish River. As of this plan, parameters of primary concern include: water temperature, phosphorus and other nutrients, and copper and zinc.
- The wastewater utility will maintain lists of viable alternatives for adaptive management planning in the event that changes in effluent or receiving water quality require the consideration or implementation of such procedures.

5.7 OPERATIONAL POLICIES

5.7.1 Maintenance

- With regard to all wastewater utility infrastructure, equipment, and operational procedures, the utility will work proactively, not reactively, to maintaining its assets. Assets will not be simply built and operated, but managed for the following objectives: extending asset life; optimizing maintenance and renewal schedules; developing accurate long-term funding strategies; and sustaining long term performance.
- Detailed asset inventories and maintenance scheduling will be maintained in an asset management program. The wastewater utility currently employs Cartegraph for this purpose.
- Equipment breakdown is given highest maintenance priority, and repairs should be made as soon as possible.
- Equipment should be replaced when it becomes obsolete.
- Worn parts should be repaired, replaced or rebuilt before they represent a high failure probability.
- Equipment that is out of service should be returned to service as soon as possible.
- A preventive maintenance schedule shall be established for all facilities, equipment and processes.
- Spare parts shall be stocked for all equipment items whose failure will impact the ability to meet other policy standards.

- Tools shall be obtained and maintained to repair all items whose failure will impact the ability to meet other policy standards.
- Dry, heated shop space shall be available to all maintenance personnel to maintain facilities.
- All maintenance personnel shall be trained in the procedures and techniques necessary to efficiently perform their job descriptions.
- Work orders, maintenance records, labor and expense tracking, and summary reports will be maintained on each facility and item of equipment using Public Works' asset management program (Cartegraph).

5.7.2 Temporary and Emergency Services

- Compliance construction standards (not quality standards) may be deferred for temporary sewer service.
- Compliance with Construction Standards may be deferred for emergency wastewater service.
- Once an emergency has been identified by City staff and the threat to public health and the environment has been abated, City Staff will notify the Department of Ecology and City Administrator about the emergency; the cause, the remedy, and plans to prevent it from reoccurring.

5.7.3 Reliability

- The City shall ensure that the wastewater utility is constructed, operated and maintained to protect against failures of power supply, treatment process, equipment or structure with appropriate backup facilities.

5.8 RECLAIMED WATER REUSE POLICIES

- The City considers the newly available production of reclaimed water to be a resource with potential economic and environmental benefits. The potential for distribution and/or reuse of reclaimed water shall be a consideration in all utilities, road, and land use projects.
- Reclaimed water may have a significant role in the City's integrated water resources management program.
- The City will advocate for the development of rules and regulations at the state level which will recognize the City's right to consumptive and non-consumptive use of reclaimed water it produces.
- The City will develop and implement a Reclaimed Water Reuse marketing plan to guide the development of a reclaimed water market.

- The City will develop rate structures for potable water, reclaimed water, and wastewater services that encourage consideration of reclaimed water reuse. Preliminarily, reclaimed water rates should consider recovering approximately 80% of the cost to distribute it, and 20% should be borne by potable water and wastewater rates with the understanding that these are costs that would otherwise be borne by utilities for expansion of their treatment and pipe infrastructure.

5.9 ORGANIZATIONAL POLICIES

5.9.1 Structure (Amended)

- The Public Works Director or his/her designee is responsible for overall sewer utility financial planning and management.
- The ~~Wastewater Utility Supervisor~~ Utilities Manager is responsible for the day-to-day operations of the wastewater systems, including pretreatment, collections, treatment, composting, disposal, and reuse, as well as system operation and maintenance, personnel staffing and management, and reporting requirements.
- The wastewater utility is responsible for adequate system operation and maintenance.
- Planning, design, operations and maintenance, and construction will be accomplished or overseen by the Public Works Department.

5.9.2 Staffing

- The wastewater utility staffing levels are established by the City Council based on the financial resources of the City and needs of the wastewater utility.
- Personnel certification and training will comply with State established standards.

5.9.3 Relationship with Other Departments

- The Finance Department works in conjunction with the Utilities Division Staff Accountant. The Staff Accountant and Public Works Director or designee coordinate all sewer-related financing requirements. The Finance Department is responsible for customer billing and payment collection, and the Utility Division collects connection fees and oversees project cost accounting.
- The Human Resources Department is responsible for employee records, union labor negotiations and salary schedules.
- The Fire Department is responsible for emergency responses to hazardous events at wastewater utility facilities.
- The Police Department and/or Sewer Department are responsible for enforcing violations of the City's wastewater ordinances.

- The Water Department is responsible for shutting off water service if a customer does not pay their wastewater bill.
- The Wastewater Department will participate in the implementation of the Water Department's Water Use Efficiency and Cross-Connection Control Programs.

5.10 FINANCIAL POLICIES

General financial policies are summarized in this section, detailed information regarding these and other wastewater utility financial policies is included in **Chapter 9**.

5.10.1 General (Amended)

- The City will set rates that comply with State regulations.
- Rates and additional charges established for the City should:
    1. Be cost-based rates that recover historical, current and future costs associated with the City's wastewater utility and its services;
    2. Be equitable charges to recover costs from wastewater customers commensurate with the service demands, including the total volume of water used, peak rates of use, and other factors;
    3. Be an adequate and stable source of funds to cover the current and future annual cash needs of the wastewater utility; and
    4. Not subsidize the operation of other City departments.
- The City's existing customers will pay the direct and indirect costs of operating and maintaining the wastewater facilities through user rates. In addition, the user rates will include debt service incurred to finance the capital assets of the utility.
- New customers seeking to connect to the sewer system will be required to pay a connection charge for an equitable share of the cost of the system's current and planned infrastructure. This revenue will be used to finance the CIP, in conjunction with rate revenue.
- New and existing customers will be charged for extra services through a separate ancillary charge based on the cost to provide the service. The charges should be reviewed regularly and updated based on the cost of providing the service. In between cost studies, charges may be increased annually based on increases in the Consumer Price Index for the City area. Revenue from ancillary charges will be used to finance annual operations and maintenance.
- The City will maintain information systems that provide sufficient financial and statistical information to ensure conformance with rate-setting policies and objectives.
- The user charges must be sufficient to provide cash for the expenses of operating and maintaining the utility. To ensure the fiscal and physical integrity of the utility, an amount

should be set aside each year for capital expenditures from rates. That is, an amount should be set aside to cover some portion of the depreciation of the physical plant. The amount may be transferred from the operating fund to the capital fund for general or specific purposes.

- ~~Rate Stabilization Fund - For this Financial Plan, a rate stabilization reserve will be set to phase in up to 5% of rate revenue by the end of the 10-year forecast.~~
- System Reinvestment Funding - It is recommended to annually fund from rates an amount equal to annual depreciation expense net of annual debt principal payments. However, due to the current debt load for the Wastewater Utility, no incremental funding for system reinvestment is forecasted during the 10-year time period. As debt service is paid down, system reinvestment funding is projected to begin in year 2029.
- Debt Management – The Wastewater Utility will strive to manage debt consistent with industry best practice, that is to maintain a debt to fixed asset ratio of no more than 60% debt to 40% fixed assets (current ratio for the Wastewater Utility is 32% debt to 68% fixed assets).
- Operational Reserve - The City's current policy is to maintain a minimum balance in the operating account equal to 3 months of operating reserves (90 days), plus sufficient funds for all necessary bond and loan reserves; industry practice is to maintain an operating reserve range of 30 to 45 days of O&M expenses. The City will adjust its policy to maintain a reserve equivalent to 60 days of O&M expenses for the short term, plus sufficient funds for all necessary bond and loan reserves. This policy can be adjusted in the future if other recommendations~~, such as the Rate Stabilization Account,~~ provide financial stability in the Sewer O&M fund.
- ~~Bond Reserve – It is typical industry practice, and often required by lenders and underwriters, for utilities to establish a restricted cash reserve equivalent to one year's debt service payment (principal and interest) for each bond issue or loan. The Wastewater Utility has such a fund for its one outstanding revenue bond due to mature in 2017. Additional reserve monies are held in the fund as a requirement for the utility's two Department of Ecology State Revolving Fund loans.~~
- Capital Contingency Reserve – A Capital Contingency Reserve will be maintained to cover unanticipated emergencies and capital cost overruns. The current practice is to maintain a $1,000,000.00 reserve which is about 1.7% of current fixed assets, this is consistent with industry standards of maintaining a capital reserve balance equal to 1% to 2% of the original cost of plant in service.
- The City's fees and charges should be calculated for the wastewater service area as a whole. Rates will be the same regardless of service location for existing customers. Rates charged in annexed areas will be evaluated on an individual basis.

5.10.2 Connection Charges

The owners of properties that have not been assessed, charged or have not borne an equitable share of the cost of the sewer collection and sewer treatment facilities shall pay one or more of the following connection charges prior to connection to a sewer main. Additional details regarding connection charges can be found in Chapter 9.

1. Latecomers Fees: Latecomers Fees are negotiated with developers and property owners for the reimbursement of a pro rata portion of the original costs of sewer system extensions and facilities and is documented in a Recovery Contract.
2. Connection Charge: The connection charge shall be assessed against any property connecting to the sewer system. This charge is for the major facilities that deliver the sewage to a treatment facility and for the facilities to treat and dispose of the sewage. This charge is for reimbursement of customers who have paid for the facilities described and for building capacity to accommodate growth.
3. Developer Extension Charges: These charges are for the administration, review and inspection of a developer extension project.
4. Developer Funded Improvements: These are costs incurred by a developer to upgrade and increase capacity in the sewer system to accommodate the increase in flow from the proposed development.

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6 Wastewater Collection Evaluation

6.1 *INTRODUCTION*



The City of Arlington (City) will require improvements to its collection system to accommodate in-City growth, collection system expansions, and to repair damaged and deteriorating facilities. This chapter presents the evaluation of the City's existing sewer collection system. Individual sewer system components were analyzed to determine their ability to meet policies and design criteria under both existing and future flow conditions. The policies and design criteria are presented in **Chapter 5**, and the sewer system flow analysis is presented in **Chapter 4**. A description of the existing sewer system facilities and current operation is presented in **Chapter 2**.

6.2 *DRAINAGE BASINS*

The City's collection system can be broken into 14 sewer drainage basins, as shown in **Figure 2-3**. Three of the drainage basins are able to gravity flow to the treatment plant. The remaining basins gravity flow to lift stations, where they are pumped into gravity sewer interceptors, which in turn flow by gravity to the treatment plant.

6.3 *HYDRAULIC MODEL DESCRIPTION*

6.3.1 Background

A computer-based hydraulic model of the existing sewer system was created using version 8i (SELECT series 3) of the SewerCAD program, developed by Bentley Systems, Inc. The entire sewer collection system, including gravity mains, force mains, and sewer lift stations was modeled. The hydraulic model was updated since the previous Comprehensive Sewer System Plan (Plan) using information provided by the City, including construction as-built drawings and geographic information system (GIS) data. Pipe location, length, diameter, and material were input based on as-built drawings and various system maps acquired from the City. Manhole invert and rim elevation data was used, when available, and the remaining elevation data was extracted from

Snohomish County topographic and United States Geological Survey (USGS) data when other information was not available.

6.3.2 Model Limitations

Due to the lack of diameter, material, or invert elevation information in some areas, the results of the modeling should be further investigated through field surveys or similar methods in the vicinity of the proposed improvements prior to design and construction. If it is found that the input information differs significantly from actual conditions, then the model should be updated accordingly and rerun to confirm the original results.

The modeling was performed using a steady-state analysis, which shows all flows reaching all downstream points simultaneously. This is conservative and not truly representative of conditions that occur since it takes some time for wastewater to travel downstream through the sewer system. Steady-state modeling is a good planning-level tool to conduct capacity analyses and sizing of pipes in planning-level documents like sewer system plans.

6.3.3 Flow Data

Existing and proposed flow rates for the basins and lift stations were developed in **Chapter 4**. Average day flow and peak hour flow, based on a peaking factor of four, were developed for each basin in **Table 4-4** and for the lift stations in **Table 4-5**. This information was used in the modeling scenarios.

6.3.4 Facilities

The hydraulic model of the existing system contains all active existing system facilities. Available information for each lift station, such as pump capacity, total dynamic head (TDH), horsepower, wet well diameter, wet well depth, and force main diameter is included in the model. For simplicity, the pump stations are modeled as constant-discharge pumps so that they produce a constant discharge regardless of TDH conditions.

6.4 *HYDRAULIC ANALYSIS RESULTS*

~~Hydraulic analyses were performed assuming a peaking factor of average day flow to peak hour flow of four~~ In the evaluation, the criteria for listing a sewer pipe as deficient is that the peak hour flow exceeds 80 percent of the pipe flow capacity in terms of depth to diameter (d/D). The results of the hydraulic analyses are presented in **Appendix B**, in a Google Earth KMZ file.

Hydraulic analyses were performed based on the existing flow rates, as well as future flow rates for the 2024 (10-year) and 2035 (20-year) projections. **Figure 7-1** highlights current system deficiencies. **Figure 7-2** provides capacity deficiencies for projected 2024 conditions. **Figure 7-3** provides capacity deficiencies for the population projection for 2035.

6.4.1 Pipe Capacity Analysis

Existing System

Based on discussions with the system operators, there are a few deficiencies along the primary interceptor which occur during storm events. Based on the analysis of the existing system, it appears that a significant portion of the lower primary interceptor is currently at or near capacity. The primary interceptor is a current pipe segment of interest in the City's ongoing flow monitoring program. It is recommended that monitoring continue to determine what the actual peak flows are in the system and whether the primary interceptor is at capacity. Flow monitoring is included in the City's capital improvement program (CIP).

In addition, the hydraulic modeling indicated that there may be some pipe segments that are near or at capacity along West Avenue between E 1st Street to E 3rd Street. This City has elected to conduct flow monitoring along West Avenue before scheduling this improvement (CIP P3 in **Chapter 7**). This information is presented in **Table 6-1**, along with the linear feet (LF) of pipe that has been identified.

Table 6-1. Existing Collection System Deficiencies

Sewage Drainage Basin	Location	Existing Diameter of Main (in.)	Proposed Diameter of Main (in.)	Length of Main (LF)
Primary Interceptor	67th Avenue NE	12	15	1,710
		12	24	2,810
	West Avenue	24	36	605
		24	42	155

Population 2024

Based on the analysis of the system using projected flow rates for 2024, a significant portion of the upper end of the primary interceptor and several pipe sections in the Gleneagle sewage drainage basin will need to be upsized. This information, in addition to other areas that need to be upsized, are presented in **Table 6-2**.

Most of the flow increases will occur due to the six growth center areas (discussed in **Chapter 3**). A considerable amount of collection pipe will be required in the following sewage drainage basins to accommodate this growth: Island Crossing (LS-11), Rest Area (LS-6), ~~Urban Growth Area (UGA) Expansion (west of I-5 and the Rest Area sewage drainage basin)~~, Lift Station 12 (Crown Park), Gleneagle (south of SR531 and east of SR9), and Lift Station 2. The City has elected to conduct flow monitoring of the primary interceptor deficiencies prior to scheduling improvements (CIP P3 in **Chapter 7**) except for the 1,605 LF of pipe south of 197th Street NE (CIP P5 in **Chapter 7**).

These improvements are shown in **Figure 7-2**. The pipe size upgrades for the 2024 flow projections are scheduled based on capacity of the existing pipes being reached at the 2024 flow rate. However, the proposed size of the pipe is based on the ultimate flow projection for 2035. All of the growth and related improvements for 2024 are necessary to accommodate flow from expected future developments.

Table 6-2. 2024 Collection System Deficiencies (Amended)

Sewage Drainage Basin	Location	Existing Diameter of Main (in.)	Proposed Diameter of Main (in.)	Length of Main (LF)
Gleneagle	Wedgewood Park	8	12	500
	W Country Club Drive	8	12	2,300
	Cedarbough Loop	8	12	205
Primary Interceptor	South of 197th Street NE	12	15	1,605
	67th Avenue NE	8	15	80
		24	30	4,060
		24	36	285
	67th Avenue NE and 204th Street NE	12	15	60
		10	15	60
	West Avenue	24	30	560
	Railroad Street	24	30	280
Lift Station 4 (Airport)	Near 59th Avenue	10	12	120
Lift Station 7 (Highclover)	Cemetery Road and 47th Avenue NE	10	15	110
		8	15	100

Population 2035

Based on the analysis of the system using projected flow rates for 2035 and assuming the 2024 improvements were completed, there are additional pipe sections in the Gleneagle sewage drainage basin (see **Table 6-3**) that will need to be reconstructed to accommodate projected flows from the SR9/SR531 Roundabout growth center area (**Chapter 3**).

Table 6-3. 2035 Collection System Deficiencies

Sewage Drainage Basin	Location	Existing Diameter of Main (in.)	Proposed Diameter of Main (in.)	Length of Main (LF)
Gleneagle	Gleneagle Boulevard	8	12	1,260
	Woodlands Way	8	12	1,815

The majority of the growth and related improvements for 2035 are necessary to accommodate flow from expected future developments. The additional improvements for 2035 are shown in **Figure 7-3**.

6.4.2 Lift Station Capacity Analysis

Existing System

Based on discussions with the system operators, Lift Station 2 has capacity deficiencies during peak flow events. Based on the analysis of the existing system, it appears likely that Lift Stations 2, 4, 5, and 7 (**Table 6-4**) are currently at or near capacity during peak hour events. Review of lift station telemetry data does show that Lift Station 4 exceeds its firm capacity (capacity of the lift station with the largest pump out of service) ~~(n-1 pump in operation)~~ during storm events. Capacity analyses are ~~is~~ based on the estimated peak hour flow with the largest pump out of service at each lift station ~~n-1 pumps in operation~~. The City's lift stations are, and will continue to be, monitored to determine if current inflow during peak events is approaching or exceeding the current pumping capacity.

As part of the 2024 improvements, the discharge for Lift Station 6 will be rerouted away from Lift Station 5 sewage drainage basin and this will significantly reduce the flow to Lift Station 5. The City has indicated that the existing force main for Lift Station 11 will be re-used and therefore, the project to re-route Lift Stations 6 and 11 discharges are not included on the capital improvement plan. Lift station 5 is not planned for an upgrade. In addition, City staff have not observed capacity issues with this lift station during peak hour flow events.

Population 2024

Based on the analysis of the system using projected flow rates, a third pump may be needed to be installed in Lift Station 2 to meet the 2024 projected flows, and Lift Station 11 may need to be upgraded for 2024 projected flows as part of the 2024 improvements (**Table 6-4**). ~~no additional lift station will have capacity deficiencies.~~ It is recommended that the capacity of Lift Station 11 be evaluated with the construction of Lift Station 14 in 2024. It may be possible to divert a portion of the flow away from Lift Station 11 to Lift Station 14 such that Lift Station 11 is not at capacity in 2024 or 2035.

~~Two new lift stations will need to be constructed: Lift Stations 14 and 15, and they will be~~ Lift Station 14 is also proposed to be constructed as part of the 2024 improvements, located in the northwestern portion of the City's sewer service area (**Figure 7-2**). In addition, the effluent from Lift Station 6 (Rest Area sewage drainage basin) is currently pumped to the Lift Station 5 sewage drainage basin. Lift Station 5 pumps to Lift Station 4 which discharges into the primary interceptor just south of 197th Street NE. The discharge from Lift Station 6 is planned to be rerouted to the proposed Lift Station 14 which will reduce flows to Lift Stations 5 and 4 from the Rest Area sewage drainage basin (Lift Station 6). The discharge from the proposed Lift Station 14 will be conveyed to Lift Station 7. Lift Station 7 discharges to the primary interceptor at 204th Street NE.

Population 2035

Lift Stations 8~~, 11,~~ and 12 may need to be upgraded for 2035 projected flows as part of the 2035 improvements (**Table 6-4**). ~~The capacity of Lift Station 11 will need to be evaluated further with~~

~~the construction of Lift Stations 14 and 15 in 2024. It may be possible to divert a portion of the flow away from Lift Station 11 to Lift Station 14 so that Lift Station 11 is not at capacity by 2035. This will need to be evaluated in the future during the design of Lift Station 14.~~

Table 6-4. Projected Lift Station Peak Hour Flow Rates (Amended)

Name	Number of Pumps	Existing Capacity (GPM)	Existing Firm Capacity (GPM)[2]	2013		Projected 2024		Projected 2035	
				Estimated PHF (GPM)	% of Firm Capacity[1]	Estimated PHF (GPM)	% of Firm Capacity[1]	Estimated PHF (GPM)	% of Firm Capacity[1]
LS-2[3]	2	1,100 1,100	1,100	705	64%	1,243	**113%**	1,776	**161%**
LS-4 (Airport)	2	400 400	400	735	**184%**	759	**190%**	1,037	**259%**
LS-5	2	450 450	450	680	**151%**	317	71%	435	97%
LS-7 (Highclover)	2	176 176	176	190	**108%**	962	**546%**	984	**559%**
LS-8 (Highland View)	2	225 225	225	135	60%	211	94%	269	**119%**
LS-11 (Island Crossing)	2	115 115	115	40	35%	139	**121%**	242	**211%**
LS-12 (Crown Park)	2	250 250	250	30	12%	246	98%	491	**196%**
LS-14 (Smokey Point)	2	NA	NA	NA	NA	750	NA	750	NA
~~LS-15 (UGA Expansion)~~	~~2~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~305~~	~~NA~~	~~635~~	~~NA~~

Notes:
1 - The percentages for firm capacity that exceed the capacity of the lift station are highlighted red.
2 - The existing firm capacities are the capacities of each lift station with the largest pump out of service.
3 - The firm capacity of Lift Station 2 is 500 gpm as of the writing of this chapter in June 2017, but improvements to improve the facility's capacity are underway and will be completed in 2017. The firm capacity following these 2017 improvements is shown in this table.

7 Wastewater System Improvements

7.1 INTRODUCTION

This chapter presents proposed improvements to the City of Arlington's (City) sewer system that are necessary to resolve existing system deficiencies and plan for the projected growth of sewer customers. The sewer system improvements were identified from an evaluation of the results of the system analyses presented in **Chapter 6**. The existing and projected flow values are presented in **Chapter 4**. The sewer system improvements were sized to meet both the existing and future demand conditions of the system.



A capital improvement program (CIP) project number has been assigned to each improvement. Project numbers were assigned to the improvements as shown in **Figures 7-1** (Existing System Analysis), **7-2** (2024 Projected System Analysis), and **7-3** (2035 Projected System Analysis). The improvements are organized and presented in this chapter according to the following primary categories:

- Existing System Analysis:
  - Pipeline Improvements (P)
  - Facility Improvements (F)
  - Miscellaneous Improvements (M)
- 2024 Projected System Analysis (10-Year):
  - Pipeline Improvements (P)
  - Facility Improvements (F)
  - Miscellaneous Improvements (M)
- 2035 Projected System Analysis (21-Year):

- Pipeline Improvements (P)
- Facility Improvements (F)
- Miscellaneous Improvements (M)

The remainder of this chapter presents the basis for the cost estimates, a brief description of each group of improvements, the criteria for prioritizing, and the implementation schedule. **Table 7-1** also shows the distribution of projects that have been identified for implementation over the next ten years and those that are slated to occur in 2026 and beyond.

For planning purposes, the improvement projects described herein are based on one alternative route or conventional concept for providing the necessary improvement. Other methods of achieving the same result, such as obtaining flow capacity increases by adding one large gravity main versus using multiple gravity pipes, force main/gravity main combinations, or multiple force mains, should be considered during predesign to ensure the best and lowest cost alternative design is selected. Further evaluation should be performed when more information is available regarding when and where new developments will occur in the future.

7.2 ESTIMATING COSTS OF IMPROVEMENTS

Project costs for the proposed improvements were estimated, based on costs of similar, recently-constructed sewer projects in the City and around the Puget Sound area, and are presented in 2014 dollars and do not include future escalation. The costs were developed from a combination of recent bids on construction projects, vendor quotes, cost curves, scale-up and scale-down factors, and size and cost comparisons with similar projects. These project costs are developed for guidance in project evaluation from information available at the time of preparation. No costs are included for extraordinary circumstances, such as potential discovery and remediation of contaminated materials or actions that may be required to address the existence of cultural artifacts.

The unit costs for each pipe size are based on estimates of all construction-related improvements, such as materials and labor for installation, services, manholes, connections to the existing system, trench restoration, asphalt surface restoration, and other work for a complete installation. The unit costs also include a contingency and sales tax. Additional costs were added to some improvements to cover anticipated increased costs related to the project location and degree of difficulty.

The cost estimates include the estimated construction cost of the improvement and indirect costs estimated at 35 percent of the construction cost for engineering preliminary design, final design, construction management services, permitting, and legal and administrative services.

Cost estimates for projects in the CIP are considered to be Class 5 estimates, based on standards established by the American Association of Cost Engineers (AACE). Class 5 estimates are described as generally being prepared with very limited information and subsequently have wide accuracy ranges. The typical accuracy range for this cost estimate class is from -20 percent to -50 percent

on the low side and from +30 percent to +100 percent on the high side. Class 5 estimates are prepared for any number of strategic business planning purposes, including but not limited to, market studies, assessment of initial viability, evaluation of alternate schemes, project screening, project location studies, evaluation of resource needs and budgeting, long-range capital planning, etc. Supporting documentation for all lift station capital improvement items is included in **Appendix H**.

The final cost of the projects will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, and other variable factors. As a result, the final project costs will likely vary from those presented. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

7.3 DESCRIPTION OF IMPROVEMENTS

This section provides a general description of each group of improvements and an overview of the deficiencies they will resolve. Most improvements will be necessary to serve currently undeveloped areas within city limits ~~and the expanded Urban Growth Area (UGA)~~. The major pipe and facility improvements that will be required when development occurs in those areas are considered to be developer-funded projects. Additional developer-funded projects include localized on-site sewer main improvements that are not associated with the existing overall sewer collection/interceptor system but will be necessary when the property served by the sewer system is redeveloped or expanded. The costs associated with all of these improvements shall be borne by the developers, rather than the existing sewer customers. The locations of improvements in the undeveloped areas are not shown as they will be designed in the future to fit the specific layout of the future developments.

Some projects—particularly those in existing developed areas—target replacement and/or improvement of existing, aging infrastructure. Where these projects clearly provide benefits to existing customers and prospective developers, funding requirements are pro-rated by the benefits provided to the City and to developers. In some areas, projects simply are infrastructure replacements with little or no upgrades to the services provided. In these instances, the entire project will be borne by the City.

7.3.1 Pipeline Improvements

P1: Flow Monitoring Study and Plans (Gleneagle Area)

Deficiency: Based on modeling results, portions of the Gleneagle sewage drainage basin may be at or near capacity as future development occurs within the City's sewer service area. Flow monitoring should be completed to verify existing flow rates at various points in the system in order to determine if any additional capacity is available. Actual infrastructure improvements associated with CIPs P2A and P2B will be dependent on the prior completion of this CIP.

Improvement: Install monitoring equipment in the sewer collection system at multiple locations to determine existing flow rates; use flow data to calibrate model for this basin and run the model to project future flows. If current or future peak flow capacity is at or exceeds 80 percent of the pipeline or pumping capacity, then plans for an expansion and/or upgrade should be implemented.

P2A: Gleneagle Improvements

Deficiency: Portions of the Gleneagle sewage drainage basin collection system will be near or at capacity with the development of SR9 Roundabout Capital Project Improvement Focus Area.

Improvement: Replace approximately 3,005 lineal feet (LF) of existing pipe with 12-inch diameter pipe, per City standards.

P2B: Gleneagle Improvements

Deficiency: Portions of the Gleneagle sewage drainage basin collection system will be near or at capacity with the development of SR9 Roundabout Capital Project Improvement Focus Area.

Improvement: Replace approximately 3,075 LF of existing pipe with 12-inch diameter pipe, per City standards.

P3: Flow Monitoring Study and Plans (Primary Interceptor and Inflow to Lift Stations)

Deficiency: Portions of the Primary Interceptor sewage drainage basin may be at or near capacity as future development occurs within the City's sewer service area. In addition, influent gravity sewer mains in the vicinity of the lift stations may be at or near capacity. Flow monitoring should be completed to verify existing flow rates at various points in the system in order to determine if any additional capacity is available. The hydraulic analysis found deficiencies in Primary Interceptor segments as summarized in **Table 7-1**. In addition, inflows to Lift Stations 2, 4, 5, and 7 may be near capacity now or with future development proposals and warrant additional monitoring.

Table 7-1. Modeled Deficiencies in the Existing Primary Interceptor

Sewage Drainage Basin	Location	Existing Diameter of Main (in.)	Proposed Diameter of Main (in.)	Length of Main (LF)
Primary Interceptor	West Avenue	24	36	605
		24	42	155
	67th Avenue NE	24	30	4,060
		24	36	285
	67th Avenue NE and 204th Street NE	12	15	60
		10	15	60
	West Avenue	24	30	560
	Railroad Street	24	30	280

Improvement: Install monitoring equipment in the sewer collection system at multiple locations to determine existing flow rates. If peak flow capacity is at or exceeds 80 percent of the pipeline or pumping capacity, then plans for an expansion and/or upgrade should be implemented.

P4: Primary Interceptor Improvements

Deficiency: Portions of the Primary Interceptor will be near or at capacity as future development occurs within the City's sewer service area.

Improvement: Replace approximately 1,710 LF of existing pipe with 15-inch diameter pipe and 2,810 LF of existing pipe with 24-inch diameter pipe, per City standards.

P5: Primary Interceptor Sewage Drainage Basin Improvements

Deficiency: Portions of the Primary Interceptor sewage drainage basin will be near or at capacity as future development occurs within the City's sewer service area.

Improvement: Replace approximately 560 LF of existing pipe with 15-inch diameter pipe, per City standards.

P6: Lift Station 4 Sewage Drainage Basin Improvements

Deficiency: Portions of the Lift Station 4 sewage drainage basin will be near or at capacity as future development occurs within the City's sewer service area.

Improvement: Replace approximately 120 LF of existing pipe with 12-inch diameter pipe, per City standards.

P7: Lift Station 7 Sewage Drainage Basin Improvements

Deficiency: Portions of the Lift Station 7 sewage drainage basin will be near or at capacity ~~as future development in the West I-5 Expansion Area and Island Crossing Capital Project Improvement Focus Areas.~~ <u>following the completion of the Lift Station 14 improvements.</u>

Improvement: Replace approximately 220 LF of existing pipe with 15-inch diameter pipe, per City standards.

~~**P8: West of I-5 Collection System**~~

~~**Deficiency:** This area was recently included in the City's sewer service area and the area will need to be connected to the municipal sewer system.~~

~~**Improvement:** Extend the gravity sewer to serve the West of I-5 Capital Project Improvement Focus Area, per City standards.~~

P9: MIC, South of 172nd Improvement Focus Area Collection System

Deficiency: This area was recently included in the City's sewer service area and the area will need to be connected to the municipal sewer system.

Improvement: Extend the gravity sewer to serve the Manufacturing Industrial Center (MIC), South of 172nd Capital Project Improvement Focus Area, per City standards.

7.3.2 Facility Improvements

F1: Lift Station 2 Improvements

Deficiency: Pumping and force main capacity will be exceeded as future development occurs within the City's sewer service area.

Improvement: Construct a new submersible pump station with a variable frequency drive (VFD) with a ~~1,400~~ 1,400 gallons per minute (gpm) capacity and 2,300 LF of force main, per City standards. With a new parallel force main, capacity will be increased to 1,800 gpm utilizing the triplex lift station in construction in 2017.

F2: Lift Station 4 Improvements

Deficiency: Pumping capacity will be exceeded as future development occurs within the City's sewer service area.

Interim Improvement: Replacement of the impellers and motor, a relatively small investment in 2020, will buy another 5 years before the lift station is permanently replaced (**Table 7-2**).

Permanent Improvement: Construct a new submersible pump station on a VFD with a 1,100 gpm capacity, per City standards.

F3: Lift Station 7 Improvements

Deficiency: Pumping and force main capacity will be exceeded as future development occurs within the City's sewer service area.

Interim Improvement: Replacement of the pumps and motors, a comparatively small investment in 2023, will buy another 3 years before the lift station is permanently upgraded and replaced (**Table 7-2**).

Permanent Improvement: Construct a new submersible pump station on a VFD with a ~~1,700~~ 1,000 gpm capacity and 7,700 LF of force main, per City standards.

F4: Lift Station 8 Improvements

Deficiency: Pumping capacity will be exceeded as future development occurs within the City's sewer service area.

Improvement: Replacement of the pumps and motors with a capacity of 300 gpm.

F5: Lift Station 11 Improvements

Deficiency: Pumping capacity will be exceeded as future development occurs within the City's sewer service area.

Improvement: Construct a new submersible pump station on a VFD with a ~~200~~ 250 gpm capacity, per City standards.

F6: Lift Station 12 Improvements

Deficiency: Pumping capacity will be exceeded as future development occurs within the City's sewer service area.

Improvement: Replacement of the pumps and motors with a capacity of 500 gpm.

F7: Lift Station 14 Construction

Deficiency: The Island Crossing Capital Project Improvement Focus Area was recently added to the City's sewer service area and a pump station will be required for the areas that cannot be served by gravity sewer.

Improvement: Construct a new submersible pump station on a VFD with a ~~1,450~~ 750 gpm capacity and 9,000 LF of force main, per City standards.

~~**F8: Lift Station 15 Construction**~~

~~**Deficiency:** The West of I-5 Capital Project Improvement Focus Area was recently added to the City's sewer service area and a pump station will be required for the areas that cannot be served by gravity sewer.~~

~~**Improvement:** Construct a new submersible pump station on a VFD with a 650 gpm capacity and 2,000 LF of force main, per City standards.~~

F9: Lift Station 3 Rehabilitation

Deficiency: The existing electrical system, controls, pumps, and wet well are nearly 20 years old and in poor condition.

Improvement: Replace lift station structures and equipment, as required, to bring the lift station to City standards.

F10: Membrane Upgrade for WRF

Deficiency: The existing membrane units will need to be replaced, per the manufacturer's recommendations.

Improvement: Replace membrane units, as needed.

7.3.3 Miscellaneous Improvements

The following miscellaneous improvements are for future planning efforts.

M1: 2024 Sewer Plan Update

Deficiency: The City's Comprehensive Sewer System Plan (Plan) should be updated every ten years.

Improvement: The City will update its Plan every ten years. In addition, the City will perform a check of the Plan at the five-year mark and adjust the projections and improvements, as necessary.

M2: 2035 Sewer Plan Update

Deficiency: The City's Plan should be updated every ten years.

Improvement: The City will update its Plan every ten years. In addition, the City will perform a check of the Plan at the five-year mark and adjust the projections and improvements, as necessary.

7.4 PRIORITIZING IMPROVEMENTS

The existing system improvements were prioritized by the City based on the perceived need for the improvement to be completed prior to projects with fewer deficiencies or less risk of damage due to failure of the system. For planning purposes, a general schedule has been established for the projects; however, the estimated schedule will need to be modified as development occurs.

7.5 SCHEDULE OF IMPROVEMENTS

The results of prioritizing the improvements were used to assist in establishing an implementation schedule that can be used by the City for preparing its ten-year CIP. The implementation schedule for the proposed improvements is shown in **Table 7-2**. The City will identify and schedule the repair/replacement projects during the annual budget process. This provides the City with the flexibility to coordinate these projects with road or other projects within the same area.

7.5.1 Future Project Cost Adjustments

All cost estimates shown in the tables are presented in year ~~2014~~ 2015 dollars. Therefore, it is recommended that future costs be adjusted to account for the effects of inflation and changing construction market conditions at the actual time of project implementation. Future costs can be estimated using the Engineering News Record Construction Cost Index for the Seattle area or by applying an estimated rate of inflation that reflects the current and anticipated future market conditions.

The CIP presented in **Table 7-2** is based on the information currently available. As the City implements the recommendations, the cost and timing of projects may be revised. The ~~two~~ element~~s~~

~~that are~~ most likely to affect the costs and schedule of projects in the CIP table is an update of facility condition assessments, particularly of the lift stations. ~~are:~~

- ~~Condition assessment, particularly of the lift stations, and~~
- ~~Collection system flow monitoring.~~

~~Once these activities are completed or under way, the City can reassess the priority and timing of the projects in the CIP.~~

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Table 7-2. Proposed Improvements Implementation Schedule (Amended)

No.	Description	Type	Finance Source	Estimated 2015 Cost	Schedule of Improvements Planned Year of Project and Estimated Cost 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030	2031-2035
Pipeline Improvements																
~~P1~~	~~Flow Monitoring Study and Plans (Gleneagle Area)~~	~~Increase Capacity~~	~~City Funded~~	~~$40K~~	~~$20K~~	~~$20K~~										
P2A	Gleneagle Improvements (Replace Existing 8-inch Pipe along Wedgewood Park, W Country Club Drive, and Cedarbough Loop)	Increase Capacity	City Funded	$811K				$243K	$284K	$284K						
P2B	Gleneagle Improvements (Replace Existing 8-inch Pipe along Gleneagle Boulevard and Woodlands Way)	Increase Capacity	City Funded	$306K												$306K
P3	Flow Monitoring Study and Plans (Primary Interceptor and Inflow to Lift Stations)	Increase Capacity	City Funded	$80K	$40K	$40K										
P4	Primary Interceptor Improvements (Replace Existing 12-inch Pipe along 67th Avenue NE)	Increase Capacity	City Funded	$1,567K			$470K	$548K	$548K							
P5	Primary Interceptor Sewer Drainage Basin Improvements (Replace Existing 12-inch Pipe South of 197th Street NE)	Increase Capacity	City Funded	$440K							$440K					
P6	Lift Station 4 Sewer Drainage Basin Improvements (Replace Existing 10-inch Pipe near 59th Avenue)	Increase Capacity	City Funded	$32K				$10K	$22K							
P7	Lift Station 7 Sewer Drainage Basin Improvements (Replace Existing 8-inch and 10-inch Pipe along Cemetery Road and 47th Avenue NE)	Increase Capacity	City Funded	$58K						$17K	$20K	$20K				
~~P8~~	~~West of I-5 Collection System~~	~~Expansion~~	~~City Funded~~	~~$2,228K~~								~~$668K~~	~~$780K~~	~~$780K~~		
P9	MIC, South of 172nd Improvement Focus Area Collection System	Expansion	City Funded	$3,240K								$972K	$1,134K	$1,134K		
Total Pipeline Improvements				**$6,534K**	**$40K**	**$40K**	**$470K**	**$801K**	**$855K**	**$301K**	**$460K**	**$992K**	**$1,134K**	**$1,134K**	**$0K**	**$306K**
Facility Improvements																
F1[1]	Lift Station 2 Improvements	Increase Capacity	City Funded	$1,733K		$1,085K										$648K
F2	Lift Station 4 Improvements	Increase Capacity	City Funded	$825K					$75K					$750K		
F3	Lift Station 7 Improvements	Increase Capacity	City Funded and Developer Funded	$2,400K								$200K			$2,200K	
F4	Lift Station 8 Improvements	Increase Capacity	City Funded and Developer Funded	$100K												$100K
F5	Lift Station 11 Improvements	Replacement/Expansion	City Funded and Developer Funded	$600K						$600K						
F6	Lift Station 12 Improvements	Increase Capacity	City Funded and Developer Funded	$200K											$200K	
F7	Lift Station 14 Construction	Expansion	City Funded and Developer Funded	$3,750K				$1,125K	$1,313K	$1,313K						
~~F8~~	~~Lift Station 15 Construction~~	~~Expansion~~	~~City Funded and Developer Funded~~	~~$1,621K~~									~~$567K~~	~~$1,054K~~		
F9	Lift Station 3 Rehabilitation	Increase Capacity	City Funded and Developer Funded	$50K			$25K	$25K								
F10	Membrane Upgrades for WRF	Increase Capacity	City Funded and Developer Funded	$2,000K										$2,000K		
Total Facility Improvements				**$11,658K**	**$0K**	**$1,085K**	**$25K**	**$1,150K**	**$1,388K**	**$1,913K**	**$0K**	**$200K**	**$0K**	**$2,750K**	**$2,400K**	**$748K**
Miscellaneous Improvements																
M1	2024 Sewer Plan Update		City Funded	$225K	$75K								$150K			
M2	2035 Sewer Plan Update		City Funded	$150K												$150K
Total Miscellaneous Improvements				**$375K**	**$75K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$150K**	**$0K**	**$0K**	**$150K**
Total Estimated Project Costs				**$18,567K**	**$115K**	**$1,125K**	**$495K**	**$1,951K**	**$2,242K**	**$2,214K**	**$460K**	**$1,192K**	**$1,284K**	**$3,884K**	**$2,400K**	**$1,204K**

(1) Lift Station 2 costs were revised in 2017, and are presented in 2017 dollars.

~~CIP NO. =~~ Project completed since previous WSP

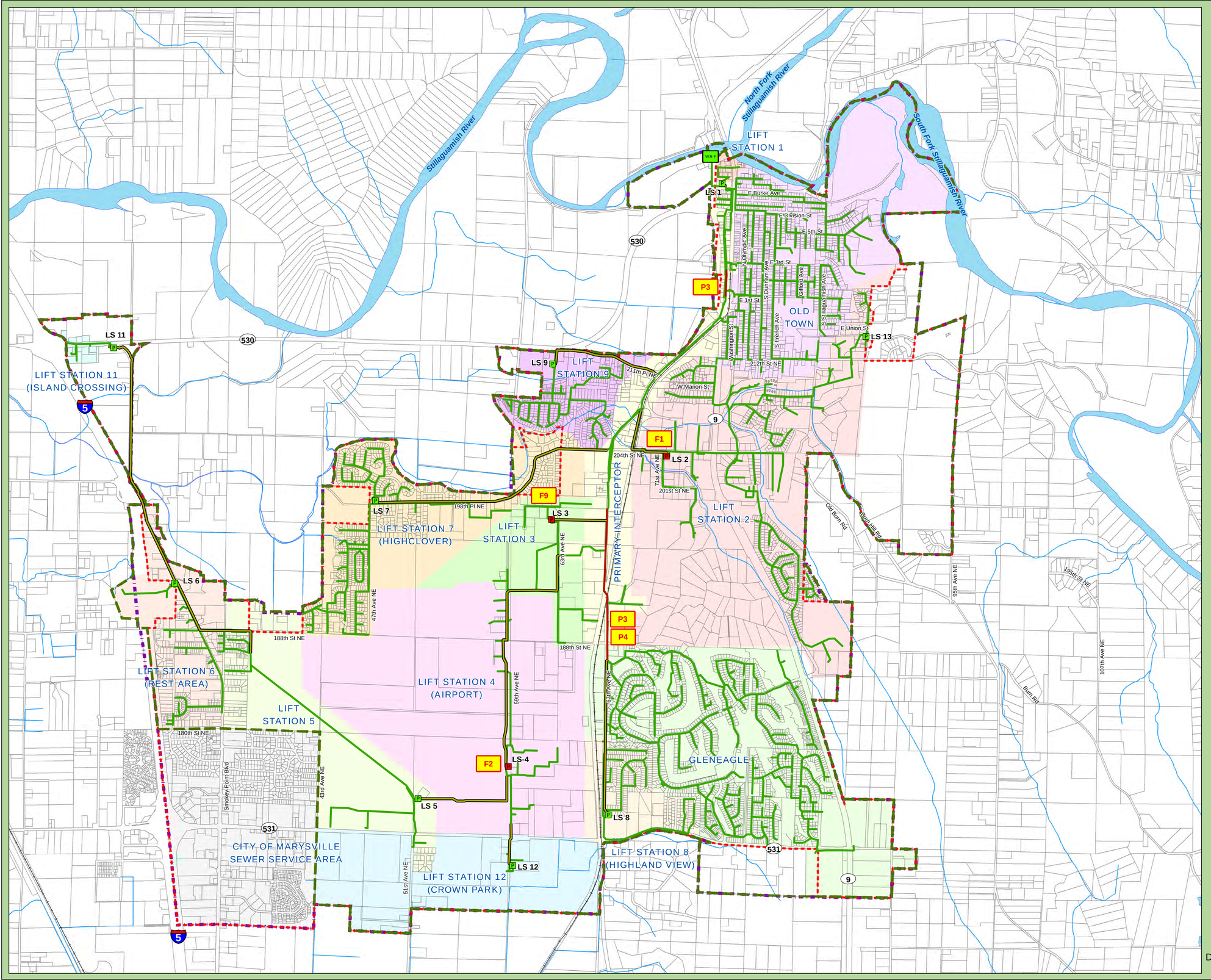
~~CIP NO. =~~ Project removed since previous WSP

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CITY OF ARLINGTON

COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 7-1
EXISTING SYSTEM ANALYSIS



Legend

- City Limits
- UGA Boundary
- Sewer Service Area Boundary
- ### / ### — Average Day Flow (ADF) [gpd] / Peak Hour Flow (PHF) [gpm]
- XX## — Proposed Sewer System Improvement

Existing Sewer Facilities

- WRF — Water Reclamation Facility
- P — Lift Station
- Force Main
- Gravity Main

Existing System Deficiencies

- P — Lift Station
- Gravity Main

Sewer Drainage Basins

- Primary Interceptor
- Old Town
- Gleneagle
- Lift Station 1
- Lift Station 2
- Lift Station 3
- Lift Station 4 (Airport)
- Lift Station 5
- Lift Station 6 (Rest Area)
- Lift Station 7 (Highclover)
- Lift Station 8 (Highland View)
- Lift Station 9
- Lift Station 11 (Island Crossing)
- Lift Station 12 (Crown Park)
- City of Marysville Sewer Service Area

1 INCH = 1,250 FEET

0 1,250 2,500

DRAWING IS NOT TO SCALE
IF BAR IS NOT 2" LONG

REVISION DATE: AUG 10, 2015

ARL-SSP-FIG-7-1

CITY OF ARLINGTON

COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 7-2
2024 PROJECTED SYSTEM ANALYSIS (AMENDED)

Legend

- City Limits
- UGA Boundary
- Sewer Service Area Boundary
- ### / ### — Average Day Flow (ADF) [gpd] / Peak Hour Flow (PHF) [gpm]
- XX## — Proposed Sewer System Improvement

Existing Sewer Facilities

- WRF — Water Reclamation Facility
- P — Lift Station
- Force Main
- Gravity Main

2024 System Deficiencies

- P — Lift Station
- Force Main
- Gravity Main

Sewer Drainage Basins

- Primary Interceptor
- Old Town
- Gleneagle
- Lift Station 1
- Lift Station 2
- Lift Station 3
- Lift Station 4 (Airport)
- Lift Station 5
- Lift Station 6 (Rest Area)
- Lift Station 7 (Highclover)
- Lift Station 8 (Highland View)
- Lift Station 9
- Lift Station 11 (Island Crossing)
- Lift Station 12 (Crown Park)
- City of Marysville Sewer Service Area

1 INCH = 1,250 FEET

0 1,250 2,500

DRAWING IS NOT TO SCALE IF BAR IS NOT 2" LONG

RH2 ENGINEERS PLANNERS SCIENTISTS

REVISION DATE: MAY 30, 2017

\\RH2\DFS\RICHLAND\DATA\ARL\417-057\GIS\GSP\ARL-SSP-FIG-7-2A.MXD
BY: LREITER

CITY OF ARLINGTON

COMPREHENSIVE SEWER SYSTEM PLAN

FIGURE 7-3
2035 PROJECTED SYSTEM ANALYSIS (AMENDED)

Legend

- City Limits
- UGA Boundary
- Sewer Service Area Boundary
- ### / ### — Average Day Flow (ADF) [gpd] / Peak Hour Flow (PHF) [gpm]
- XX## — Proposed Sewer System Improvement

Existing Sewer Facilities

- WRF — Water Reclamation Facility
- P — Lift Station
- Force Main
- Gravity Main

2035 System Deficiencies

- P — Lift Station
- Force Main
- Gravity Main

Sewer Drainage Basins

- Primary Interceptor
- Old Town
- Gleneagle
- Lift Station 1
- Lift Station 2
- Lift Station 3
- Lift Station 4 (Airport)
- Lift Station 5
- Lift Station 6 (Rest Area)
- Lift Station 7 (Highclover)
- Lift Station 8 (Highland View)
- Lift Station 9
- Lift Station 11 (Island Crossing)
- Lift Station 12 (Crown Park)
- City of Marysville Sewer Service Area

1 INCH = 1,250 FEET

0 1,250 2,500

DRAWING IS NOT TO SCALE IF BAR IS NOT 2" LONG

RH2 ENGINEERS PLANNERS SCIENTISTS

REVISION DATE: JUN 6, 2017

\\RH2\DFS\RICHLAND\DATA\ARL\417-057\GIS\GSP\ARL-SSP-FIG-7-3.MXD

BY: LREITER

8 Operations and Maintenance

8.1 INTRODUCTION

The City of Arlington's (City) wastewater utility operations and maintenance program consists of the following six elements.

1. Normal Operations
2. Emergency Operations
3. Preventive Maintenance
4. Maintenance
5. Development Review
6. Construction Inspection



8.2 NORMAL OPERATIONS

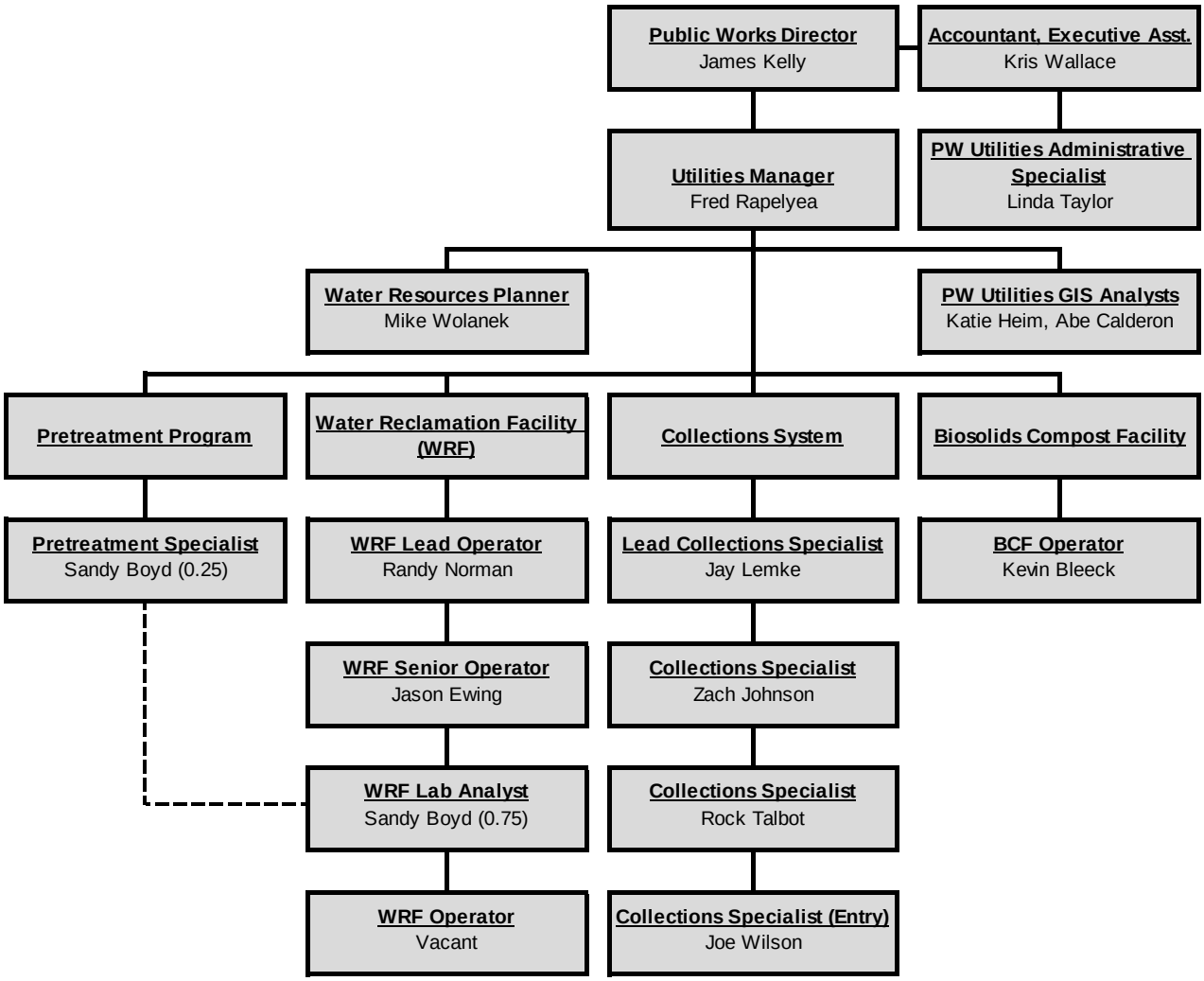
8.2.1 City Personnel (Amended)

The organizational structure of the wastewater utility is presented in **Chart 8-1**. The City of Arlington Utilities Division operates under the Public Works Department and its Director, Mr. James Kelly, P.E. The Utilities Division functions under the direction of the Utilities Manager, a previously vacant position ~~also served by the Public Works Director since approximately 2008~~ which was filled in 2017 by the ~~.~~ ~~The~~ Wastewater Department Supervisor, Mr. Fred Rapelyea. Mr. Rapelyea, who reports to the ~~Utility Manager~~ Public Works Director, ~~and~~ is now responsible for supervising the daily operations of ~~the wastewater utility~~ all City utilities—water, sewer, and stormwater. The Water Resources Planner, Mr. Mike Wolanek, assists with the regulatory requirements and planning and implementation of capital improvement projects, and special projects requiring coordination across water, wastewater, and stormwater utilities.

The Wastewater Department is staffed by several operation and maintenance personnel that function under the Wastewater Utility Supervisor (**Chart 8-1**). Tasks that are performed by the operations and maintenance staff include development review, inspection, testing, installation and repair of system facilities, routine operation and preventive maintenance, water quality sampling, regulatory compliance monitoring, recordkeeping, administrative tasks, general clerical work, and corrective or breakdown maintenance required in response to emergencies.

The City allocates funds annually for personnel training, certification and membership in professional organizations. The City believes that the time and money invested in training, certification and professional organizations are repaid many times in improved safety, skills, quality control and employees' job satisfaction.

Chart 8-1. Wastewater Department Organization (Amended)



8.2.2 Personnel Responsibilities (Amended)

The key responsibilities of the wastewater operations and maintenance staff are summarized below.

Utilities Manager (1) – Supervises, organizes, directs and performs activities related to the overall operation of the water, wastewater, and stormwater utilities. Organizes, directs and performs

activities related to the operation and maintenance of the City's sewage collection system, water reclamation facility (WRF), and biosolids compost facility.

Utilities Water Resources Planner (1) – Assists with the planning and implementation of capital improvement projects, and special projects requiring coordination across water, wastewater, and stormwater utilities. Responsible for regulatory compliance and communications under NPDES and other permits. Monitoring and management of reclaimed water and reuse programs. Organizes and oversees as-built records and filing system.

Utilities Administrative Specialist (1) – Coordinates development and building permit review comments and assures timely submittal of comments. Coordinates the business license review process for utilities. Tracks review processes. Also supports the general administrative duties for all utilities.

Public Works Executive Assistant and Staff Accountant (1) – Administrative support and general accounting duties for all utilities and other Public Works' divisions.

~~**Wastewater Utility Supervisor (1)** – Organizes, directs and performs activities related to the operation and maintenance of the City's sewage collection system, water reclamation facility (WRF), and biosolids compost facility.~~

Lead Wastewater Treatment Plant Operator (1) – Directs and performs skilled routine maintenance activities at the WRF.

Senior Wastewater Treatment Plant Operator (1) – Performs skilled routine maintenance activities at the WRF.

Wastewater Treatment Plant Operator (0) – Performs a variety of skilled tasks to efficiently operate and maintain the City's WRF, compost facility and related facilities.

Lab Analyst/Pre-treatment Specialist (1) – Evaluates samples and analyzes water quality data collected by WRF staff. Assures compliance with applicable State water quality limits, and directs all necessary routine tasks. Performs technical work to perform all regular and non-routine sewer pre-treatment operations, reviews, inspection and laboratory work. Required to be a fully licensed and trained Wastewater Treatment Plant Operator (WWTPO) at the WRF.

Bio-solids Compost Operator (1) – Performs a variety of skilled tasks to efficiently operate and maintain the City's Bio-solids Compost Facility (BCF) and related facilities. Tasks include monitoring, preventive maintenance, sample collection, reporting and compost distribution.

Lead Collection System Specialist (1) – Performs non-routine trouble shooting, maintenance, development review, inspection, installation and repair work for the sanitary sewer collection system, and directs all necessary routine tasks. This position is also required to be a fully licensed and trained WWTPO.

Senior Collection System Specialist (0) – Performs all necessary routine and non-routine activities in the installation, construction, maintenance, repair and testing of the sanitary sewer collection system. This position is also required to be a fully licensed and trained WWTPO.

Collection System Specialist (3) – Performs all necessary routine activities in the installation, construction, maintenance, repair and testing of the sanitary sewer collection system. This position is also required to be a fully licensed and trained WWTPO.

8.2.3 Available Equipment

The wastewater department has several types of equipment available for daily routine operation and maintenance of the utility. If additional equipment is required for specific projects, the City will rent or contract with a local contractor for the services needed. A stock of supplies in sufficient quantities for normal system operation and maintenance and short-term emergencies are stored at the WRF. A list of major equipment and chemicals used in the normal operation of the wastewater utility is shown in **Table 8-1,** Utilities Division Equipment List.

The following representatives typically provide the supplies and chemicals to the wastewater utility.

- Collections System supplies: H.D. Fowler, 6016 29th Drive NE, Marysville, WA 98288, (360) 651-2400
- Ferric Chloride, Calcium Hypochlorite: Univar Inc., 8201 S 212th, Kent, WA 98032-1925, (253) 872-5000
- Collections system supplies and vactor services: CUZ Concrete, 19604 67th Avenue NE, Arlington, WA 98223, (360) 435-5531
- Analytical supplies: Hach Company, PO Box 389, Loveland, CO 80539, (800) 227-4224
- Analytical supplies: Scientific Supply and Equipment, Inc., 926 Poplar Place S., Seattle, WA 98144, (206) 324-8550
- Membrane treatment process: Ovivo USA, LLC, 2404 Rutland Drive, Austin, TX 78758, 1-855-OVIVO-MBR

The wastewater department utilizes several different types of communications equipment to ensure a reliable and redundant means of internal communication. Some vehicles are equipped with mobile two-way radios that are capable of communicating with similar base radios at the water utility office. In addition, all Public Works employees are equipped with cell phones that have two-way radio capability. The phones provide the capability for personnel to communicate with other cities and Snohomish County as necessary.

Table 8-1. Wastewater Department Equipment List

Quantity	Description	Size/Special Features
	Equipment Inventory	
1	Dump Truck	10 Yard for Biosolids
1	CAT IT 14G Front Loader	Compost Facility
1	Vactor Truck	Shared by all utilities depts.
1	Forklift	Shared with Water Dept
2	Backhoe	Water and Street Depts
2	Snow Plows	Available via Street Dept
3	Pickup Truck	1/2 Ton
2	Pickup Truck	3/4 Ton
2	Flat Bed Trucks	
1	Van	
1	Utility Trailer	Enclosed
1	O'Brien Series 7040 Hydrojetter	
1	Portable Video Camera System	
1	Portable Pressure Washer	
1	Portable Steam Cleaner	
2	Emergency Generator	5 kW, with Water Dept
1	Emergency Generator	1 kW, with Water Dept
3	Portable Pumps	Water Dept
Varies	Miscellaneous Equipment	
	Chemical Inventory	
Varies	Sodium Hypochlorite	
Varies	Magnesium Hydroxide	
Varies	Polymer	Biosolids belt press
Varies	MARC Citrus Lift Station Maintainer	

8.2.4 Routine Operations

Routine operations involves the analysis, formulation and implementation of procedures to ensure the facilities are functioning efficiently and meeting demands of the system. The utility's maintenance procedures are good, with repairs being made promptly.

8.2.5 Continuity of Service

As a municipality, the City has the structure, stability, authority and responsibility to ensure that wastewater service will be continuous. For example, changes in the City Council or staff would not have a pronounced effect on the City's customers or quality of service.

8.2.6 Routine Sampling

The Washington State Department of Ecology has adopted federal regulations that specify minimum monitoring requirements for the wastewater utility. The sampling requirements typically depend on the type of treatment provided and site specific conditions. The sampling, testing and reporting requirements are contained in the NPDES and Reclaimed Water permits; copies are included in **Appendix I**.

8.2.7 Operations and Maintenance Records (Amended)

Facilities Operations and Maintenance Manuals

With the upgrade to the WRF, an operations and maintenance manual has been developed in html format and made available on the City's intranet and internet for staff members' reference. The O&M manual includes summarized procedures, graphics and reference tables, links to as-built drawings, and links to vendors' manuals. Paper copies of these materials are also kept on file at the WRF, compost facility, lift stations, and utilities office as appropriate. The utility intends to maintain its policies of requiring complete operation and maintenance manuals for all new equipment and facilities and making them available electronically.

Mapping and As-Built Drawing Records

Maintenance of infrastructure drawings is essential to maintenance crews, City planners, developers and anyone else needing to know the WRF, and how the sewer collections system is laid out throughout the City. The City's sewer collections system is fully mapped in digital format using the Esri ArcServer geodatabase management system. WRF as-builts are available in hardcopy in the wastewater utility office, and electronically from within the online O&M manual. The entire sewer collections system is electronically mapped in an ArcGIS geodatabase. This provides alignment and information on every component of the collections system (gravity sewers, force mains, manholes, lift stations, etc.). Older collections system as-builts are maintained in paper format and are stored in an organized file at the Public Works' Administration office. Staff are actively converting these documents for electronic access through the City's Engineering Library. Links to these documents are also provided through ArcGIS.

Operations and Maintenance Records

Maintenance of the WRF and the collection system is planned and scheduled using Public Works' asset management system (Cartegraph). Work orders are issued and associated with specific assets. Completed work orders track maintenance performed, supplies used, labor, and changes in scheduling. Examples of records are stored electronically in Cartegraph include:

- Pump motor tests
- Wastewater flow records
- Wastewater system maintenance

- Sewer collection notes
- Side sewer connections
- Sewer main cleaning/inspection

Laboratory analyses and reporting are maintained in a bench log, Access database, and in pdf files on the City's server. The inspections and reviews of new developments are maintained in the City's permit tracking database and at the wastewater utility offices. Tracking of customer

complaints is done through the City's web site (maintained by the Executive Department) and in departmental files.

8.2.8 Safety Procedures and Equipment

Safety is the concern and responsibility of all sewer operations and maintenance staff. To maintain the highest level of safety the City actively educates and trains employees as to safe working procedures; safety equipment and other resources are always available to employees. The wastewater utility has a dedicated Safety Coordinator who ensures that safety topics are discussed at the department's weekly meeting and that the shop safety locker is always adequately supplied. Quarterly safety coordination meetings are conducted between the utility manager, each utility supervisor, and each utility safety coordinator. The City is fully dedicated to providing a safe and secure work environment for each of its employees.

The following identifies procedures to be followed for operations and maintenance tasks that involve the most common potential work place hazards in the wastewater utility.

Use of Sodium Hypochlorite and Magnesium Hydroxide

Standard Procedure – Handle with care, provide adequate ventilation, and wear safety glasses and rubber gloves.

Working in Confined Spaces

Standard Procedure – Follow state requirements for confined space entry and the Public Works Department, Utilities Division's Confined Space Program.

Working around Heavy Equipment

Standard Procedure – Obtain proper training and follow all safety procedures. Use noise protection equipment and also follow standard Labor and Industries safety procedures.

Working in Traffic Areas

Standard Procedure – Wear proper clothing and provide adequate signage and flagging for work area, follow standard Washington State Department of Transportation and Labor and Industries safety procedures.

Working on or around Tall Structures

Standard Procedure – Follow proper safety harness procedures for working on tall structures and follow standard Labor and Industries safety procedures.

Working in or around Pump Stations

Standard Procedure – Obtain proper training and follow all safety procedures for working on pumps and electrical equipment. Use noise protection equipment.

Training and Supplies

Wastewater utility personnel are required to take training courses regarding the following topics: confined spaces; fall protection; competent persons; heavy equipment operation; CPR; first aid; traffic flagging; lockout-tagout; and blood-borne pathogens.

The City's facilities are equipped with confined space entry equipment, oxygen-gas meters and lockout-tagout equipment. Each City vehicle is equipped with first aid and blood-borne handling kits. The utility also owns flagging signs and equipment for safe handling of traffic.

The Public Works Department follows all appropriate OSHA and WISHA regulations in its day-to-day operations and complies with the following state requirements.

- WAC 296-62-145 to 14529 Part M – Entry into confined spaces.
- WAC 296-155-650 to 66411 Part N – Shoring of open ditches.
- WAC 296-155-429 – Lockout-tagout for work on energized or de-energized equipment or circuits.
- WAC 296-155 Part C1 – Fall restraint for access to pump stations, vaults and manholes.
- MUTCD – Traffic control for work in the public right-of-way.

8.3 EMERGENCY OPERATIONS

The City is well equipped to accommodate short-term system failures and abnormalities. The City's capabilities are as follows.

8.3.1 Emergency Equipment

The City is equipped with the necessary tools to deal with common emergencies. If a more serious emergency should develop, the City will hire a local contractor who has a stock of spare parts necessary to make repairs to alleviate the emergency condition.

8.3.2 Emergency Telephone

The wastewater department has a published "after hours" or emergency phone number that is available for the public to directly contact wastewater personnel. The police or other City departments can also reach staff via direct-connect phones or home contact numbers. Emergency

contact information, including cell phones, pagers and home phone numbers, is provided to each City department.

8.3.3 On-Call Personnel

The Wastewater Utility is actively monitored 24 hours per day, 365 days per year. The utility has an On-Call program to ensure monitoring during weekends, holidays, and non-work hours. The On-Call person is equipped with a portable computer from which he can control and monitor every function of the WRF and lift stations. The On-Call person also has an assigned service vehicle and is required to respond to a call within 45 minutes. A list of emergency telephone numbers is provided to each On-Call employee. New employees are not placed on-call until they are familiar with the systems and maintenance procedures and are properly certified as required.

8.3.4 Material Readiness

Some critical repair parts, tools and equipment are on-hand and kept in fully operational condition. As repair parts are used, they are re-ordered. Inventories are kept current and are adequate for most common emergencies that can reasonably be anticipated. The City has ready access to an inventory of repair parts, including parts required for the repair of each type and size of pipe within the service area. Additionally, the City has been provided with after-hours emergency contact phone numbers for key material suppliers, which gives the City 24-hour access to parts not kept in inventory.

8.4 PREVENTIVE MAINTENANCE

Maintenance schedules that meet or exceed the manufacturer's recommendations have been established for all critical components in the sewer system. The following schedule is used as a minimum for preventive maintenance, and the manufacturer's recommendations should be followed where conflict exists.

Sewer Collection System	
Frequency	***Task or Activity***
Annually or As Needed	Conduct leak survey primarily on force mains.
Every two-to-five years or As Needed	Inspect, clean and evaluate manholes and sewer pipe line condition.

Water Reclamation Facility	
Frequency	***Task or Activity***
Daily	Log and record run hours, motor starts, chemicals used, chemicals added, fuse indicators, flow and loading; visually inspect pumps/blowers; check pump/blower packing; check pump/blower oil levels; check all equipment for proper function and operation; check security.
Annually	Check all valves and screens; check control valve settings; re-grease pumps/blowers; change pump/blower oil.
As Needed	Maintain electrical and mechanical equipment; paint structures and piping; equipment calibration; indoor and outdoor facility maintenance and repairs.

Sewage Lift Stations	
Frequency	***Task or Activity***
Daily	Visual and audio inspection; check security; check pump motors for excessive heat and vibration.
Weekly	Observe and record motor current draw (three phases); log and record flow rates and pump motor hours; measure and record discharge pressure; check motor noise, temperature and vibration.
Annually	Change motor oil.
Annually	Take inventory of parts, pumps and motors.
As Needed	Calibrate flow meter; maintain electrical and mechanical equipment; paint structures and piping; routine maintenance of equipment.

Engine Generator Sets	
Frequency	***Task or Activity***
Monthly	Operate to achieve normal operating temperatures; observe output.
As Contracted	Routine maintenance in accordance with manufacturer's recommendations.
As Contracted	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on amount of use).
As Contracted	Perform tune-up; replace parts as necessary.

Telemetry and Control System	
Frequency	***Task or Activity***
Weekly	Backup program and data.
Monthly	Visually inspect cabinets and panels for damage, dust and debris.
Semi-Annually	Inspect inside of cabinets and panels for damage, dust and debris.
Semi-Annually	Vacuum clean all modules.
Semi-Annually	Test alarm indicator units.
Semi-Annually	Clean and flush all pressure sensitive devices.
Semi-Annually	Visually inspect all meters to coordinate remote stations.
Annually	Check master and remote telemetry units for proper operation; repair as necessary.

Tools and Equipment	
Frequency	***Task or Activity***
Rolling Stock	
Weekly	Check all fluid levels and brakes. Fluid levels and brakes are checked each time the equipment is used if less than weekly.
As Needed	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on type of use); preventive maintenance per manufacturer's recommendation.
Tools	
As Needed	Clean after each use; lubricate and maintain as necessary; inspect for damage and wear before each use; preventive maintenance performed per manufacturer's recommendation.

8.5 STAFFING

The preventive maintenance procedures, as well as normal and emergency operations of the wastewater utility, are described in the previous sections. The labor and supervision required to effectively implement the work of the maintenance and operations schedules form the basis for determining staffing levels.

The current staff includes management personnel, supervisory personnel, operators, maintenance workers and office personnel engaged in the activities necessary to see to the continuous safe operation and maintenance of a sewer system and sewer utility. There are currently nine full-time wastewater utility employees. An estimate of their time spent on assigned tasks and duties is shown in **Table 8-2**. An analysis completed with the upgrade and expansion of the WRF identified 10 employees would be necessary to fully staff all functions of the utility. The City anticipates adding another operator (WWTPO) at or before the next WRF membrane upgrade.

There is approximately the equivalent of 2.25 management personnel in Public Works Administration supporting the wastewater utility. The Public Works Director, Water Resources Planner, Utilities Administrative Specialist, Utilities Accountant, and utility billing staff support the City's water, wastewater, storm and refuse/recycling utilities; thus, only a portion of their time is available solely for the wastewater utility.

Table 8-2. Current Wastewater Department Staffing

Task/Duty Assignment	Full-time Employees
Distribution of Duties	
Supervisory	1
WRF Operations*	3.75
Collection system	3
Compost Facility	1
Pretreatment Program	0.25
Total Wastewater Department Staff	
Total FTE's	9

* Water Reclamation Facility

8.6 OPERATIONS AND MAINTENANCE IMPROVEMENTS

Since completion of the supervisory control improvements the wastewater department is continuing to enhance wastewater treatment and lift station operations. As the wastewater department collects more data, future optimization of controls and operation is planned. With the addition of an asset management program, a large effort has been placed into connecting the work performed directly to assets in the field. This process has allowed the wastewater department to better prioritize the work performed and the work that is needed. As this program continues we

will better understand the future needs of the system as a whole. We are continuing to add optimization parameters such as energy savings amongst the many others to better streamline operations and optimize processes.

8.7 CONSTRUCTION INSPECTION

The wastewater department staff performs inspections and project reviews for new construction. These inspections account for approximately 10% of the operations and maintenance time. Construction inspections are valuable tools to the verification of quality products provided to the City of Arlington and its citizens. They also serve as an invaluable tool for training new personnel and providing quality assurance for the management of the sewer collections system. We will continue to improve this the inspection process in collaboration with Community and Economic Development to further streamline development within the City of Arlington and better serve its citizens.

9 Financial Plan

9.1 INTRODUCTION

The objective of the financial plan is to identify the total cost of providing utility service and to provide a financial program that allows the utility to remain financially viable during execution of the identified Capital Improvement Program (CIP). This analysis considers the historical financial condition of the utility, the sufficiency of utility revenues to meet current and future financial and policy obligations, and the financial impact of executing the CIP identified in this Comprehensive Wastewater Plan (CWP). Furthermore, the plan provides a review of the utility's rate structure with respect to rate adequacy and customer affordability.



9.2 PAST FINANCIAL PERFORMANCE

This section includes a summary of historical financial performance for the utility (2010-2014), including a summary of Fund Resources and Uses and the schedule of outstanding debt.

9.2.1 Summary of Fund Resources and Uses

Sewer Utility Fund 401

Fund 401 serves as the Wastewater Utility operating account where operating revenues are deposited and operating expenses are paid. Operating revenues consist primarily of service charges (utility bills), and include taxes and fines as well as interfund transfers. Operating expenses include labor and materials for operations and maintenance of collections and treatment facilities, debt payments, transfers to capital funds, and more. During the historical time period, average annual revenues have increased by about $1.3 million, for an overall change of about 29%. Total expenditures (operating, debt service costs, and minor capital) have increased 67% over the same

period, or about $1.1 million, the majority of which represents additional debt service. **Table 9-1** presents the detail of annual revenues, expenditures, and ending cash for the time period 2010 to 2014.

Sewer Utility Fund 406

Fund 406 serves as the Wastewater Utility capital account where capital revenues are deposited and capital expenditures are paid. Examples of capital revenues include connection charges, grant and debt proceeds, and capital transfers from rates. Capital expenditures are investments in the utility through acquisition or upgrade of fixed, physical, non-consumable assets, such as buildings and equipment. During the historical time period, total revenues have varied widely from year to year, ranging from about $160,000 to $1 million, primarily due to the level of annual capital contributions. Similarly, total expenditures over that same period have varied from year to year based on the level of annual capital spending. **Table 9-2** presents the detail of annual revenues, expenditures, and ending cash for the time period 2010 to 2014.

9.2.2 Outstanding Debt Principal

Table 9-3 presents outstanding utility debt as of the end of 2014. The utility currently has six outstanding debt issues, as shown below, totaling $27.6 million.

9.3 AVAILABLE CAPITAL RESOURCES

Feasible long-term capital funding strategies must be defined to ensure that adequate resources are available to fund the CIP identified in this CWP. In addition to the City's internal resources such as accumulated cash reserves, capital revenues, and rate revenues designated for capital purposes, capital needs can be met from outside sources such as grants, low-interest loans, and bond financing. The following is a summary of potential internal and external resources that might be available for funding the CIP.

9.3.1 Internal Utility Resources

Internal utility resources appropriate for funding capital needs include accumulated cash in capital funds, transfers from operating revenues, and capital revenue such as connection charges or local facilities charges. These resources are discussed below.

Table 9-1. Summary of Historical Fund Resources and Uses Arising From Cash Transactions, Sewer Utility Fund 401

Sewer Utility Fund 401	2010	2011	2012	2013	2014
Beginning Net Cash and Investments					
Unspecified	$ -	$ -	$ -	$ -	**$ -**
Reserved	$ -	$ -	$ -	$ -	$ -
Unreserved [A]	$ 1,336,108	$ 1,086,978	$ 1,508,459	$ 1,367,577	$ 1,542,569
Total Beginning Cash Balance	**$ 1,336,108**	**$ 1,086,978**	**$ 1,508,459**	**$ 1,367,577**	**$ 1,542,569**
Revenues and Other Sources:					
Taxes [B]	$ 41,514	$ -	$ -	$ -	$ -
Intergovernmental Revenues	$ 51,574	$ -	$ -	$ -	$ -
Charges For Services	$ 4,237,302	$ 4,651,995	$ 5,195,065	$ 5,440,995	$ 5,549,725
Fines & Forfeitures	$ -	$ 4,117	$ 19,752	$ 35,505	$ 32,447
Miscellaneous Revenues	$ 15,523	$ 4,467	$ 16,438	$ 12,098	$ 30,424
Interfund Transfers	$ -	$ -	$ 48,814	$ -	$ -
Insurance Recoveries	$ -	$ -	$ 2,874	$ -	$ -
Total Revenues and Other Sources	**$ 4,345,913**	**$ 4,660,578**	**$ 5,282,943**	**$ 5,488,598**	**$ 5,612,597**
Total Resources	**$ 5,682,020**	**$ 5,747,556**	**$ 6,791,403**	**$ 6,856,175**	**$ 7,155,166**
Operating Expenditures:					
Sewer Utility	$ 2,478,568	$ 2,543,032	$ 2,635,165	$ 2,647,750	$ 2,629,064
Non Expenditures	$ -	$ -	$ -	$ -	$ 1,500
Total Operating Expenditures	**$ 2,478,568**	**$ 2,543,032**	**$ 2,635,165**	**$ 2,647,750**	**$ 2,630,564**
Debt Services	$ 1,349,303	$ 1,364,303	$ 2,186,443	$ 2,058,407	$ 2,096,123
Interest & Other Debt Svc Costs	$ 230,013	$ 228,478	$ 497,198	$ 604,962	$ 561,720
Capital Expenditures	$ 8,246	$ 1,583	$ 3,319	$ 787	$ -
Total Expenditures	**$ 1,587,563**	**$ 1,594,364**	**$ 2,686,961**	**$ 2,664,156**	**$ 2,657,844**
Other Financing Uses	$ 528,912	$ 101,700	$ 101,700	$ 1,700	$ 201,700
Total Uses	**$ 4,595,042**	**$ 4,239,097**	**$ 5,423,825**	**$ 5,313,606**	**$ 5,490,107**
Excess (Deficit) of Resources Over Uses	$ 1,086,978	$ 1,508,459	$ 1,367,577	$ 1,542,569	$ 1,665,059
Non-Revenues					
Non-Expenditures					
Ending Net Cash and Investments					
Unspecified					
Reserved					
Unreserved	$ 1,086,978	$ 1,508,459	$ 1,367,577	$ 1,542,569	$ 1,665,059
Total	**$ 1,086,978**	**$ 1,508,459**	**$ 1,367,577**	**$ 1,542,569**	**$ 1,665,059**

[A] The beginning fund balance in 2010 was backcalculated by assuming that the ending balance for 2010 is the beginning balance for 2011.

[B] In 2011, taxes began to be included in "Charges for Services"

Table 9-2. Summary of Historical Fund Resources and Uses Arising From Cash Transactions, Sewer Improvement Fund 406

Sewer Improvement Fund (406)	2010	2011	2012	2013	2014
Beginning Net Cash and Investments	2,692,216	2,834,584	2,898,731	3,400,111	3,570,011
Revenues:					
Miscellaneous Revenues	33,188	37,782	35,346	30,471	29,758
Capital Contributions	126,000	478,800	865,200	193,200	109,200
Non Revenues	1,175	3,376	4,026	7,040	1,676
Interfund Transfers	-	100,000	100,000	255,367	200,000
Total Revenues and Other Sources	**160,363**	**619,958**	**1,004,572**	**486,078**	**340,634**
Total Resources	**2,852,579**	**3,454,542**	**3,903,303**	**3,886,189**	**3,910,645**
Operating Expenditures:					
Sewer Utility	7,458	24,058	19,868	8,145	6,444
Non Expenditures	-	4,365	3,992	7,023	1,676
Total Operating Expenditures	**7,458**	**28,423**	**23,860**	**15,168**	**8,120**
Capital Expenditures	10,538	527,388	211,217	16,837	939,805
Total Expenditures	**17,996**	**555,811**	**235,077**	**32,005**	**947,924**
Other Financing Uses	-	-	268,114	284,173	-
Total Uses	**17,996**	**555,811**	**503,192**	**316,178**	**947,924**
Excess (Deficit) of Resources Over Uses	2,834,584	2,898,731	3,400,111	3,570,011	2,962,721
Nonrevenues					
Nonexpenditures					
Ending Net Cash and Investments	**2,834,584**	**2,898,731**	**3,400,111**	**3,570,011**	**2,962,721**

Table 9-3. Summary of Outstanding Debt

Debt Description	Principal Outstanding	Maturity Year
Revenue Bond: Water & Sewer Rev. Ref. Bonds 2007	$ 1,495,000	2017
PWTF Loan: City of Arlington WWTP Upgrade and Expansion	684,211	2027
PWTF Loan: Wwtp Improvements	4,722,562	2026
PWTF Loan: Wwtp Improvements	7,411,765	2028
Department of Ecology Loan: L1000024	5,068,284	2031
Department of Ecology Loan: L1000025	8,249,392	2031
Total	**$ 27,631,213**	

Utility Funds and Cash Reserves

Ongoing user charges (rates) paid by utility customers are operating revenues that are the primary funding source for all utility activities. While capital revenue cannot be used for operating or maintenance expenses, operating revenues can be used for capital investment. Rate revenue can pay for capital projects in two ways: either paying for debt service or directly paying for capital projects. Funding capital costs directly through rates avoids the interest expense associated with issuing new debt. Rate funded capital investment should be designed as a regular transfer from operating revenue each year; otherwise, trying to pay for capital projects with current-year operating revenue can lead to rate volatility. If regular transfers of operating revenue are made into the capital fund, then if capital spending is relatively low in any given year, cash reserves can be accumulated that will offset future capital project costs.

Capital Connection Charges

A connection charge, as provided for by RCW 35.92.025, refers to a one-time charge imposed on new customers as a condition of connection to the utility system. Connection charges are separate from meter installation fees or similar charges for the labor and materials used to make a physical connection. Instead connection charges are intended to recover a proportionate share of existing infrastructure and planned future capital investment that will serve new customers.

Equity is served by providing a vehicle for new customers to share the cost of infrastructure investment. Further, connection charge revenue provides a source of cash flow used to support utility capital needs. Revenue can only be used to fund utility capital projects or to pay debt service incurred to finance those projects; it cannot be used for operating or maintenance costs.

In the absence of a connection charge, growth-related capital costs would be borne in large part by existing customers. In addition, the net investment in the utility already collected from existing customers would be diluted by the addition of new customers, effectively subsidizing new customers with prior customers' payments.

The City currently charges all new utility customers a connection charge of $8,400 per equivalent residential unit, where one unit is equal to 300 gallons of water or sewage per day. A study is currently underway to review and update connection charges.

Local Facilities Charges

While a connection charge is the manner in which new customers pay their share of plant investment costs, local facilities charges is a funding mechanism that is used to pay the costs of local facilities that connect each property to the system's infrastructure. Local facilities funding is often overlooked in rate forecasting because it is funded up-front by either connecting customers, developers, or through an assessment to properties, but never from rates. Although these funding mechanisms do not provide a capital resource toward funding CIP costs, a discussion of these charges is included in this chapter because of their impact on new customers.

A number of mechanisms can be considered toward funding local facilities. One of the following scenarios typically occurs: (a) the utility charges a connection fee based on the cost of the local facilities (under the same authority as the connection charge); (b) a developer funds extension of the system to its development and turns those facilities over to the utility (contributed capital); or (c) a local assessment is set up called a Utility Local Improvement District (ULID/LID) or a Local Utility District (LUD) which collects tax revenue from benefited properties.

A local facilities charge (LFC) is a variation of the connection charge authorized through RCW 35.92.025. It is a city-imposed charge to recover the cost related to service extension to local properties. Often called a front-footage charge and imposed on the basis of footage of the main "fronting" a particular property, it is usually implemented as a reimbursement mechanism to a city for the cost of a local facility that directly serves a property. It is a form of connection charge and thus can accumulate up to 10 years of interest. It typically applies in instances where the city installs the facilities prior to the properties being developed.

A developer extension is a requirement that a developer install onsite and sometimes offsite improvements as a condition of extending service. These are in addition to the connection charge required and must be built to city standards. Part of the agreement between the city and the developer might include a late-comer agreement, resulting in a late-comer charge to other properties later served by the developer-funded extension.

A Latecomer charge is a variation of developer extensions whereby new customers connecting to a developer-installed improvement make a payment to the city based on their share of the developer's cost (RCW 35.91.920). The city passes this charge on to the developer who installed the facilities. Latecomer obligations are recorded on the title of affected properties. No interest is allowed, and the reimbursement agreement is in effect for a period of 20 years, unless a longer duration is approved by the city.

A LID/ULID is another mechanism for funding infrastructure that assesses benefited properties based on the special benefit received by the construction of specific facilities (RCW 35.43.042). Most often used for local facilities, some ULIDs also recover related general facilities costs. Substantial legal and procedural requirements can make this a relatively expensive process, and there are mechanisms by which a ULID can be rejected.

9.3.2 Government Programs & Resources

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining miscellaneous grant programs are lightly funded and heavily subscribed. Nonetheless, even the benefit of low-interest loans makes the effort of applying worthwhile. Grants and low-cost loans for Washington State

utilities are available from various Washington State Departments. Several grant and loan programs that the City might be eligible for are described in greater detail below.

Department of Commerce

A September 2014 document from the Department of Commerce summarizes various loan and grant programs available for utility projects. The document titled "Summary of Some Grant and Loan Programs for Drinking Water and Wastewater Projects" can be found at http://www.commerce.wa.gov/Documents/9-2-14_multi-program_funding_program_summary.pdf

A few of those programs are described below:

Community Development Block Grant (CDBG) General Purpose Grant

These grants are made available through a competitive application process to assist small cities, towns and counties in Washington State in carrying out significant community and economic development projects that principally benefit low and moderate income persons.

Eligible applicants are Washington State cities and towns with a population less than 50,000 and counties with a population less than 200,000 that are not participating in a CDBG Entitlement Urban County Consortium.

Eligible projects include public facilities such as water, wastewater, and streets.

Further details are available at:

- http://www.commerce.wa.gov/Programs/Infrastructure/CDBG-Program-Overview/Pages/default.aspx
- http://www.commerce.wa.gov/Documents/2015_CommerceResourceBook.pdf

Community Economic Revitalization Board (CERB)

CERB, a division of the Washington State Department of Commerce, primarily offers low cost loans; grants are made available only to the extent that a loan is not reasonably possible. The CERB targets public facility funding for economically disadvantaged communities, specifically for job creation and retention. Priority criteria include the unemployment rates, number of jobs created and/or retained, wage rates, projected private investment, and estimated state and local revenues generated by the project. According to their website, "CERB funds a variety of projects that create jobs including (but not limited to) domestic and industrial water, storm and sewer water projects, telecommunications and port facilities." Eligible applicants include cities, towns, port districts, special purpose districts, federally recognized Indian tribes and municipal corporations.

Program	Funding Limitations
Committed Private Sector Partner Construction	• $2 million per project loan award limit • Up to $300,000 or 50% of total award, **whichever is less**, may be grant funds. • 20% cash match required (minimum, percent of total project cost)
Prospective Development Construction	Available to rural communities only. • $2 million per project loan award limit • Up to $300,000 or 50% of total award, **whichever is less**, may be grant funds. • 50% cash match required (minimum, percent of total project cost)
Planning/Economic Feasibility Studies	• $50,000 grant per project award limit • 25% cash match required (minimum, percent of total project cost)

Funding details for the 2013 – 2015 Program are as follows per the Washington Commerce website: "$9 million was appropriated to CERB for the 2013-2015 Biennium. By state law, CERB must award 75% of this funding to projects in rural counties. The Board has also allocated $2,182,500 to be available for construction and planning grants on a first-come, first-served basis."

Further details are available at:

http://www.commerce.wa.gov/commissions/CommunityEconomicRevitalizationBoard/

http://www.commerce.wa.gov/Documents/2013-15_Policies.pdf

http://www.commerce.wa.gov/commissions/CommunityEconomicRevitalizationBoard/Pages/CERB-Traditional-Programs.aspx

Public Works Board (PWB) Financial Assistance

The Board's goal is community access to financial and technical resources that help sustain local infrastructure. Cities, towns, counties, and special purpose districts are eligible to receive financial assistance for qualifying projects. When funding is available, the following tools exist:

Construction Loan Program: http://www.pwb.wa.gov/financial-assistance/Construction/Pages/default.aspx

- Funding Cycle: Per the Board website, the Governor's proposed 2015-17 budget offers $69.7M for 19 projects.
- Program Description: Low-interest loans for local governments to finance public infrastructure construction and rehabilitation. Eligible projects must improve public health and safety, respond to environmental issues, promote economic development, or upgrade system performance.
- Terms: For non-distressed communities, a term of five years or less has an interest rate of 1.28% and a term from six to twenty years has an interest rate of 2.55%.

Pre-Construction Loan Program: http://www.pwb.wa.gov/financial-assistance/Pre-Construction/Pages/default.aspx

- Funding Cycle: No funding has been allocated to the Pre-construction loan program for the 2013-15 biennium but the program still exists and could be funded in a future biennium.
- Program Description: Local governments may apply for low interest loans to finance pre-construction activities to prepare a project for construction.
- Terms: Terms are limited to a five year repayment period (the loan term may be converted to 20-years once the project has secured construction funding) with a 1% interest rate.

Emergency Loan Program: http://www.pwb.wa.gov/financial-assistance/Emergency-Loan/Pages/default.aspx

- Funding Cycle: No funding has been allocated to the Emergency loan program for the 2013-15 biennium but the program still exists and could be funded in a future biennium.
- Program Description: The Emergency Loan Program provides funding to address public works emergencies, thereby helping provide immediate restoration of critical public works services and facilities.
- Terms: Funds are limited to $500,000 per jurisdiction per biennium, and come with a 20-year term (or the life of the project), and a 3% interest rate. No local match is required.

Energy and Water Efficiency Loan Program: http://www.pwb.wa.gov/financial-assistance/Energy-Water/Pages/default.aspx

- Funding Cycle: No funding has been allocated to the Energy and Water Efficiency (EWE) loan program for the 2013-15 biennium but the program still exists and could be funded in a future biennium.
- Program Description: The EWE program is designed to encourage energy, water, and efficiency upgrades to existing infrastructure by providing low-cost loans.
- Terms: The maximum loan amount is $1,000,000. The interest rate is dependent upon the term of the loan. Loans less than 5 years receive a 0.50% rate. Loans between 5 and 10 years receive a 1% interest rate. Loans between 11 and 20 years receive a 1.50% interest rate.

Further general resources are available at:

- http://www.pwb.wa.gov/financial-assistance/Pages/default.aspx
- http://www.pwb.wa.gov/Documents/FINAL-MASTER-GUIDELINES.pdf
- http://www.commerce.wa.gov/Documents/9-2-14_multi-program_funding_program_summary.pdf

Department of Ecology

Integrated Water Quality Funding Program

This year, Ecology received 227 applications requesting more than $352 million in assistance. Ecology is proposing grant and loan funding for 165 projects totaling approximately $229 million.

State Water Pollution Control Revolving Fund & Centennial Clean Water Program

- Design projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds planning and implementation of nonpoint source pollution control activities. Terms for State Fiscal Year 2016 include either 2.4% interest for 6-20 year term or 1.2% for 5 year term loans. Forgivable loan principal terms are available for distressed communities.
- Further general resources are available at:

  http://www.ecy.wa.gov/programs/wq/funding/cycles/FY2016/index.html

9.3.3 Public Debt Financing

Public debt financing options include General Obligation Bonds and Revenue Bonds.

General Obligation Bonds

General Obligation (G.O.) bonds are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, G.O. bonds have relatively low interest rates and few financial restrictions. However, the authority to issue G.O. bonds is restricted in terms of the amount and use of the funds, as defined by Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation.

RCW 39.36.020 states:

> *"(ii) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities, or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.*
>
> *(b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein."*

While bonding capacity can limit availability of G.O. bonds for utility purposes, these can sometimes play a valuable role in project financing. A rate savings may be realized through two avenues: the lower interest rate and related bond costs; and the extension of repayment obligation

to all tax-paying properties (not just developed properties) through the authorization of an ad valorem property tax levy.

Revenue Bonds

Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility. With this limited commitment, revenue bonds typically bear higher interest rates than G.O. bonds and also require security conditions related to the maintenance of dedicated reserves (a bond reserve) and financial performance (added bond debt service coverage). The city agrees to satisfy these requirements by resolution as a condition of bond sale.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except the practical limit of each utility's ability to generate sufficient revenue to repay the debt and provide coverage. In some cases, poor credit might make issuing bonds problematic.

9.3.4 Capital Resource Funding Summary

An ideal capital financing strategy would include the use of grants and low-cost loans when debt issuance is required. However, these resources are very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It is recommended that the City pursue these funding avenues but assume bond financing to meet needs for which the City's available cash resources are insufficient. G.O. Bonds may be useful for special circumstances, but since bonding capacity limits are most often reserved for non-utility purposes, revenue bonds are a more secure financing mechanism for utility needs. The capital financing strategy developed to fund the CIP identified in this CWP generally follows the funding priority below:

Available grant funds and/or developer contributions

Accumulated capital cash reserves from prior years

Interest earned on capital fund balances and other miscellaneous capital resources

Annual revenue from connection charges

Annual transfers of rate-funded capital or excess cash (above target balances) from the operating account

Revenue bond financing

9.4 FINANCIAL PLAN FRAMEWORK

9.4.1 Overview

The Wastewater Utility is a self-supporting enterprise fund responsible for funding all of its costs. It is not dependent upon general tax revenues or other General Fund resources. The primary source of funding for the utility is service charges. The City controls the level of service charges by ordinance and can adjust them as needed to meet financial objectives.

The financial plan can give assurance of financial feasibility only if it considers the total cost of service – capital and operating. To meet this objective, the following analytical steps were taken:

Capital Funding Plan

The capital funding plan identifies total costs for the 20-year capital planning period, which is 2015 through 2035. The plan then shows how those costs can be paid for by some combination of existing reserves, current rate revenue, connection charges, debt financing and any special resources that may be readily available (e.g. grants, developer contributions, etc.). The capital funding plan impacts the financial forecast in two ways: debt financing results in annual debt service and potential debt service coverage requirements, and any rate revenue used for capital funding increases the rate revenue requirement.

Financial Forecast

The financial forecast, or revenue sufficiency analysis, forecasts the amount of annual rate revenue needed to be generated throughout the short-term planning horizon. To be consistent with the Water System Plan, the short-term planning period is defined as the 10-year period (2015-2025).

The analysis incorporates operating revenues, O&M expenses, debt service payments, rate-funded capital needs, and any other identified revenues or expenses related to utility operations. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates. In addition to annual operating costs, revenue needs are impacted by debt covenants (typically revenue bonds) and specific fiscal policies and financial goals of the utility. For this analysis, two revenue sufficiency tests have been developed to reflect the financial goals and constraints of the City: cash needs must be met, and debt coverage requirements must be realized. In order to operate successfully with respect to these goals, both tests of revenue sufficiency must be met.

Cash Test – The cash flow test identifies all known cash requirements for the utility in each year of the planning period. Typically these include O&M expenses, debt service payments, rate-funded system reinvestment funding or directly funded capital outlays, and any additions to specified reserve balances. The total annual cash needs of the utility are then compared to projected cash revenues using the current rate structure. Any projected revenue shortfalls are identified and the rate increases necessary to make up the shortfalls are established.

Coverage Test – The coverage test is based on a commitment made by the City when issuing revenue bonds and some other forms of long-term debt. For purposes of this analysis, revenue bond debt is assumed for any needed debt issuance. As a security condition of issuance, the City would be required per covenant to agree that the revenue bond debt would have a higher priority for payment (a senior lien) compared to most other expenditures; the only outlays with a higher lien are O&M expenses. Debt service coverage is expressed as a multiplier of the annual revenue bond debt service payment. For example, a 1.0 coverage factor would imply that no additional cushion is required. A 1.25 coverage factor means revenue must be sufficient to pay O&M expenses, annual revenue bond debt service payments, plus an additional 25 percent of annual

revenue bond debt service payments. The excess cash flow derived from the added coverage (if any) can be used for either rate-funded capital expenditures or to build reserves.

The City's current revenue bond debt covenants require a coverage factor of 1.20. Targeting a higher coverage factor can help the City achieve a better credit rating and provide lower interest rates for future debt issues. In addition to existing debt, a standard coverage requirement of 1.25 is applied to forecasted additional revenue bonding needs beginning in the latter part of the 10-year planning period.

In determining the annual revenue requirement, both the cash and coverage sufficiency tests must be met and the test with the greatest deficiency drives the level of needed rate increase in any given year.

Independent Growth Assumptions – The customer growth assumptions in the financial forecast are independent of the long-term population growth assumptions contained in other chapters of this CWP. The reason is that the meaning of the word "conservative" for the purpose of facilities planning is the opposite of "conservative" for the purpose of financial forecasting. In planning capital facilities, a conservative customer and demand forecast will tend to fall on the high side of the reasonable range, because underestimating demand could lead to a capacity shortfall, a more serious problem than would result from overestimated demand. For financial planning, the opposite is true: a conservative growth forecast will tend to fall on the low side of the reasonable range, because assuming too many customers could lead to a revenue shortfall and rate spike, a more serious problem than would result from assuming too few customers.

Financial Forecast Customer Growth Assumptions – To be consistent with average growth over the last five years, customer growth is forecasted at 40 connections, or ERUs, per year over the 20-year planning horizon (averaging 0.60 percent per year).

9.4.2 Fiscal Policies

The City maintains a fund structure and implements financial policies that target management of a financially viable and fiscally responsible wastewater utility. A brief summary of the key financial policies employed by the City, as well as those recommended and incorporated in the financial program are discussed below.

Reserve Policies

Utility reserves serve multiple functions: they can be used to address variability and timing of expenditures and receipts; occasional disruptions in activities, costs or revenues; utility debt obligations; and many other functions. The collective use of individual reserves helps to limit the City's exposure to revenue shortfalls, meet long-term capital obligations, and reduce the potential for bond coverage defaults.

Operating Reserve – An operating reserve is designed to provide a liquidity cushion; it protects a utility from the risk of short-term variation in the timing of revenue collection or payment of expenses. Like other types of reserves, operating reserves also serve another purpose: they help smooth rate increases over time. Target funding levels for an operating reserve are generally expressed as a certain number of days of operating and maintenance (O&M) expenses, with the minimum requirement varying with the expected revenue volatility. Industry practice for utility operating reserves ranges from 30 days (8%) to 120 days (33%) of O&M expenses, with the lower end more appropriate for utilities with stable revenue streams and the higher end of the range more appropriate for utilities with significant seasonal or consumption-based fluctuations.

The City's current policy is to maintain a minimum balance in the operating account equal to 3 months of operating reserves (90 days). While industry practice is to maintain a reserve range of 30 to 45 days of O&M expenses for wastewater utilities, the City will amend its current policy to maintain a reserve equivalent to 60 days of O&M expenses for the short term.

Rate Stabilization Reserve (Account) – A rate stabilization reserve is often required to be established per revenue bond covenants, although the amount of designated funding is not usually stipulated. The purpose of this type of reserve is to avoid unexpected rate increases, while ensuring that debt service payments can be made and coverage requirements will be met if revenue collections fall below normal levels. Per typical bond covenants, reserve amounts used in any given year are allowed to meet coverage requirements. There can be specific rules for the accounting of deposits and withdrawals into a rate stabilization reserve, so care must be taken when administering this reserve. The City may consider funding this reserve in the future if needed. It is recommended that the City confer with a bond advisor prior to funding this reserve.

Capital Contingency Reserve – A capital contingency reserve is the minimum fund balance in a capital fund, set aside for capital needs that are large, urgent, and unexpected. These needs could result from a sudden asset failure, or they could come from capital project cost overruns. There is more than one way to determine an appropriate level for this reserve. For instance, a utility could choose a certain percentage of the total cost of its assets, or it could base the minimum reserve on the cost of replacing a particular highly critical asset, or it could set the capital contingency as a percentage of average capital spending per year. The final target level should balance industry practice with the risk level of the City. The most common method is to set a minimum capital fund balance equal to 1% to 2% of the original cost of plant in service.

The City's current policy is to maintain a minimum balance in the Improvement Fund equal to $1 million (about 1.7% of current fixed assets). There are no changes recommended to this policy.

Restricted Bond Reserve – When issuing revenue bonds, and sometimes other debt instruments, underwriters require that the utility establish a restricted cash reserve, typically equal to one year's debt service payment (principal and interest) for each bond issue or loan. The reserve can be used to fund the last year's debt service payment for each issue. The Wastewater Utility has one

outstanding revenue bond due to mature in 2017. Additional reserve monies are held in the fund as a requirement for the utility's two Department of Ecology State Revolving Fund loans.

System Reinvestment Funding – System reinvestment funding promotes system integrity through reinvestment in the system. Target system reinvestment funding levels are commonly linked to annual depreciation expense as a measure of the decline in asset value associated with routine use of the system. Particularly for utilities that do not already have an explicit system reinvestment policy in place, implementing a funding level based on depreciation expense could significantly impact rates. A common alternative benchmark is annual depreciation expense net of debt principal payments on outstanding debt. This approach recognizes that customers are still paying for certain assets through the debt component of their rate, and intends to avoid simultaneously charging customers for an asset and its future replacement. The specific benchmark used to set system reinvestment funding targets is a matter of policy that must balance various objectives including managing rate impacts, keeping long-term costs down, and promoting "generational equity" (i.e. not excessively burdening current customers with paying for facilities that will serve a larger group of customers in the future).

The City does not have a policy in place for system reinvestment funding. It is recommended to establish a policy to annually fund from rates an amount equal to annual depreciation expense net of annual debt principal payments. Due to the current debt load for the Wastewater Utility, no incremental funding for system reinvestment is forecasted during the 10-year time period. As debt service is paid down, system reinvestment funding is projected to begin in year 2029.

Debt Management – It is prudent to consider policies related to debt management as part of broader utility financial policy structure. Debt management policies should be evaluated and formalized including the level of acceptable outstanding debt, debt repayment, bond coverage and total debt coverage targets.

Industry best practice is to maintain a debt to fixed asset ratio of no more than 60% debt to 40% fixed assets. The current ratio for the Wastewater Utility is 32% debt to 68% fixed assets. As debt is paid off over time at a faster pace than new debt is projected to be issued, this ratio improves to 16% debt to 85% fixed assets within 10 years and to 9% debt to 91% fixed assets within 20 years.

9.5 FINANCIAL PLAN RESULTS

9.5.1 Capital Improvement Program (Amended)

The CIP developed for this CWP identifies ~~$19.3~~ $15.2 million in project costs (~~$24.4~~ $17.9 million inflated) over the 10-year planning horizon (including study year 2015). This includes ~~$8.9~~ $4.0 million of developer funded projects and ~~$10.4~~ $11.2 million of utility funded projects. The 20-year period totals ~~$22.2~~ $18.8 million (~~$28.8~~ $23.5 million inflated). Costs are stated in 2015 dollars and are escalated to the year of planned spending at an annual rate of 3.0% per year.

Table 9-4 summarizes the expected capital expenditures. Approximately ~~87%~~ 81% (2015 dollars) of the capital costs are included in the 10-year planning period.

Table 9-4. 10-Year and 20-Year CIP (Amended)

Year	Total Annual Cost (2015 $)	Developer Funded (2015 $)	Utility Funded (2015 $)	Total Annual Cost (Inflated) [a]
Study Year 2015	$ 200,000	$ 0	$ 200,000	$ 200,000
2016	$ 115,000	$ 0	$ 115,000	$ 115,000
2017	$ 1,125,000	$ 0	$ 1,125,000	$ 1,158,750
2018	$ 495,000	$ 15,000	$ 480,000	$ 525,146
2019	$ 1,951,000	$ 690,000	$ 1,261,000	$ 2,131,910
2020	$ 2,242,000	$ 788,000	$ 1,454,000	$ 2,523,391
2021	$ 2,214,000	$ 1,148,000	$ 1,066,000	$ 2,566,633
2022	$ 460,000	$ 0	$ 460,000	$ 549,264
2023	$ 1,192,000	$ 120,000	$ 1,072,000	$ 1,466,010
2024	$ 1,284,000	$ 0	$ 1,284,000	$ 1,626,533
2025	$ 3,884,000	$ 1,200,000	$ 2,684,000	$ 5,067,739
10- Year Capital Total	**$ 15,162,000**	**$ 3,961,000**	**$ 11,201,000**	**$ 17,930,375**
2026-2035	$ 3,604,000	$ 1,802,000	$ 1,802,000	$ 5,614,915
20- Year CIP Total	**$ 18,766,000**	**$ 5,763,000**	**$ 13,003,000**	**$ 23,545,290**

[a] Inflated to year of implementation

9.5.2 Capital Funding Plan (Amended)

A capital funding plan is developed to identify the total resources available to pay for the CIP and determine if new debt financing is required.

The Wastewater Utility began 2015 with $1.4 million in the Operating Fund and $800,000 in the Improvement Fund. Funds in excess of the Operating Fund maximum target of 60 days of O&M expenses are planned to be transferred to the Improvement Fund. Since debt principal payments exceed depreciation expense in the 10-year period, rate-funded system reinvestment is not funded.

The cash resources described above are forecasted to fund 74% of the 10-year CIP and 69% of the 20-year CIP. Escalated developer funded projects total ~~$11.6~~ $3.9 million, or ~~47%~~ 26% of the 10-year CIP, and ~~$12.6~~ $5.8 million, or ~~44%~~ 31% of the 20-year CIP. ~~The remaining 6% of the 10-year CIP and 5% of the 20-year CIP are met through the issuance of revenue bonds.~~ The cash resources described above are forecasted to fully fund the 20-year CIP without the need for additional debt. **Table 9-5** presents the corresponding 20-year capital financing strategy.

Table 9-5. 20-Year Capital Funding Strategy (Amended)

Year	Capital Expenditures 2015 $	Capital Expenditures Escalated	Debt Financing	Developer Funding	Cash Funding	Total Financial Resources
2015	$ 200,000	200,000	$ -	$ -	$ 200,000	$ 200,000
2016	115,000	115,000	-	-	$ 115,000	$ 115,000
2017	1,125,000	1,158,750	-	-	$ 1,158,750	$ 1,158,750
2018	495,000	525,146	-	$ 15,000	$ 510,146	$ 525,146
2019	1,951,000	2,131,910	-	$ 690,000	$ 1,441,910	$ 2,131,910
2020	2,242,000	2,523,391	-	$ 788,000	$ 1,735,391	$ 2,523,391
2021	2,214,000	2,566,633	-	$ 1,148,000	$ 1,418,633	$ 2,566,633
2022	460,000	549,264	-	-	$ 549,264	$ 549,264
2023	1,192,000	1,466,010	-	$ 120,000	$ 1,346,010	$ 1,466,010
2024	1,284,000	1,626,533	-	-	$ 1,626,533	$ 1,626,533
2025	3,884,000	5,067,739	-	$ 1,200,000	$ 3,867,739	$ 5,067,739
10-Year	**$ 15,162,000**	**$ 17,930,375**	**$ -**	**$ 3,961,000**	**$ 13,969,375**	**$ 17,930,375**
2026-2035	3,604,000	5,614,915	-	$ 1,802,000	$ 3,812,915	$ 5,614,915
Total	**$ 18,766,000**	**$ 23,545,290**	**$ -**	**$ 5,763,000**	**$ 17,782,290**	**$ 23,545,290**

9.5.3 Financial Forecast

The financial forecast is developed from the 2015 budget documents along with other key factors and assumptions to develop a complete portrayal of the utility's annual financial obligations. The following is a list of the key revenue and expense factors and assumptions used to develop the financial forecast:

Revenue Assumptions

As previously discussed, rate revenues are assumed to grow at about 0.60% per year.

Miscellaneous revenues are forecasted to increase at the customer growth rate, for the most part. Miscellaneous revenues include late penalties, NSF fees, and charges for special services.

Connection charge revenue is budgeted at $168,000 for 2015. Based on the growth forecast, connection charge revenue is assumed at about $175,000 per year over the study period.

Interest earnings initially assume a rate of 0.15% applied to beginning of year cash balances based on existing Local Government Investment Pool rates. The interest rate phases up to 1.0% within five years.

Expenditure Assumptions

O&M expense projections are based on the 2015 budget and are forecasted to increase with general and labor cost inflation of 2.0% and benefit cost inflation of 7.0%.

Utility and state taxes are calculated based on forecasted revenues and prevailing tax rates.

The utility currently has six outstanding debt issues, including one revenue bond, three PWTF loans, and two Department of Ecology loans. Total existing debt service declines from $2.6 million to $2.1 million by the end of the 10-year period.

The capital financial strategy developed for this CWP forecasts the need to issue $1.6 million in new revenue bond debt, resulting in new debt service payments beginning at $132,000 in 2026, and continuing over the 20-year period. Bond terms are assumed at an interest rate of 4.5%, issuance cost of 1%, and a 20-year repayment period.

Any Operating Fund balance above the minimum requirement is assumed to be transferred to the Improvement Fund each year. The 2015 Operating Fund balance is expected to end the year at 60 days of O&M expenses, with the remainder transferred to the Improvement Fund. The Improvement Fund balance is expected to end the year at $1.4 million.

Although the financial plan is completed for a 20-year planning period, the rate strategy focuses on the shorter term horizon, 2015 through 2025. It is recommended that the City revisit the proposed rates annually to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table 9-6 summarizes the annual revenue requirement for 2015 through 2025 based on the forecast of revenues, expenditures, fund balances, fiscal policies, and capital funding.

Annual rate adjustments of 2.0% are projected for years 2018 through 2025 to cover projected O&M expenses and debt service, and achieve other stated financial policy objectives.

Table 9-6. 10-Year Financial Forecast

	Study Year	10 Year Forecast									
Revenue Requirement	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Revenues											
Rate Revenues Under Existing Rates	$ 5,546,108	$ 5,581,361	$ 5,621,339	$ 5,661,318	$ 5,701,297	$ 5,741,275	$ 5,781,254	$ 5,821,233	$ 5,861,211	$ 5,901,190	$ 5,941,168
Non-Rate Revenues	38,125	40,802	45,796	46,470	49,835	50,186	50,526	50,897	51,258	51,623	51,976
Total Revenues	**$ 5,584,234**	**$ 5,622,163**	**$ 5,667,135**	**$ 5,707,788**	**$ 5,751,132**	**$ 5,791,461**	**$ 5,831,779**	**$ 5,872,130**	**$ 5,912,469**	**$ 5,952,813**	**$ 5,993,145**
Expenses											
Cash Operating Expenses	$ 2,836,404	$ 2,895,984	$ 2,958,162	$ 3,022,185	$ 3,088,136	$ 3,156,104	$ 3,226,181	$ 3,298,466	$ 3,373,063	$ 3,450,084	$ 3,529,646
Existing Debt Service	2,647,912	2,500,034	2,052,625	2,047,747	2,042,869	2,037,991	2,033,113	2,028,235	2,023,357	2,018,479	2,013,601
New Debt Service	-	-	-	-	-	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-	-	-	-	-	-
Total Expenses	**$ 5,484,316**	**$ 5,396,018**	**$ 5,010,787**	**$ 5,069,932**	**$ 5,131,005**	**$ 5,194,095**	**$ 5,259,294**	**$ 5,326,701**	**$ 5,396,420**	**$ 5,468,563**	**$ 5,543,247**
Net Surplus (Deficiency)	**$ 99,917**	**$ 226,145**	**$ 656,348**	**$ 637,856**	**$ 620,126**	**$ 597,366**	**$ 572,486**	**$ 545,429**	**$ 516,049**	**$ 484,250**	**$ 449,898**
Additions to Meet Coverage	-	-	-	-	-	-	-	-	-	-	-
Total Surplus (Deficiency)	**$ 99,917**	**$ 226,145**	**$ 656,348**	**$ 637,856**	**$ 620,126**	**$ 597,366**	**$ 572,486**	**$ 545,429**	**$ 516,049**	**$ 484,250**	**$ 449,898**
Annual Rate Adjustment	0.00%	0.00%	0.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Cumulative Annual Rate Adjustment	0.00%	0.00%	0.00%	2.00%	4.04%	6.12%	8.24%	10.41%	12.62%	14.87%	17.17%
Rate Revenues After Rate Increase	$ 5,546,108	$ 5,581,361	$ 5,621,339	$ 5,774,544	$ 5,931,629	$ 6,092,687	$ 6,257,815	$ 6,427,111	$ 6,600,676	$ 6,778,612	$ 6,961,026
Additional Taxes from Rate Increase	$ -	$ -	$ -	$ 11,355	$ 23,100	$ 35,243	$ 47,794	$ 60,764	$ 74,161	$ 87,997	$ 102,281
Net Cash Flow After Rate Increase	**99,917**	**226,145**	**656,348**	**739,727**	**827,359**	**913,535**	**1,001,252**	**1,090,544**	**1,181,353**	**1,273,675**	**1,367,474**
Coverage After Rate Increases	**4.66**	**4.64**	**6.15**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**25.83**

Table 9-7 shows a summary of the projected ending balances for the Operating Fund, Improvement Fund, and Debt Reserve Fund through 2025.

The combined minimum target balance is based on 45 days of O&M expenses, plus $1 million for the Improvement Fund, plus one year's payment of revenue bonds and department of ecology loans in the Reserve Fund. Funds remain above the targets throughout the forecast.

Table 9-7. Ending Cash Balance Summary

	Study Year	10 Year Forecast									
Ending Fund Balances	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Sewer Utility Fund	$ 466,258	$ 474,751	$ 486,273	$ 496,798	$ 507,639	$ 517,394	$ 530,331	$ 542,214	$ 554,476	$ 565,587	$ 580,216
Sewer Improvement Fund	1,866,209	2,163,623	2,786,717	2,535,496	2,003,091	1,405,561	2,522,186	2,497,650	2,773,047	2,769,417	1,515,570
Sewer Bond Reserve	1,501,946	1,465,229	1,022,698	1,022,698	1,022,698	1,022,698	1,022,698	1,022,698	1,022,698	1,022,698	1,154,658
Total	**$3,834,413**	**$ 4,103,603**	**$ 4,295,688**	**$ 4,054,992**	**$ 3,533,428**	**$ 2,945,653**	**$ 4,075,215**	**$ 4,062,561**	**$ 4,350,221**	**$ 4,357,702**	**$ 3,250,443**
Combined Minimum Target Balance	*2,961,923*	*2,821,293*	*2,387,403*	*2,395,296*	*2,403,427*	*2,410,743*	*2,420,446*	*2,429,358*	*2,438,555*	*2,446,889*	*2,589,820*

9.6 CURRENT AND PROJECTED RATES

9.6.1 Current Rates

The current wastewater rate structure consists of a flat monthly charge for residential customers, and a fixed monthly charge for commercial customers, which includes up to 300 cubic feet of water usage and a volume charge per hundred cubic feet (ccf) of use above the allowance. There are also contract customers who are charged an individual flat rate based on winter water average, and industrial users who are charged a fixed monthly charge and a volume charge based on volume and strength. **Table 9-8** shows the existing rate schedule.

Table 9-8. Existing Schedule of Rates

2015 Sewer Rates	
Monthly Base Rate	
	Current
Residential	$ 70.15
Commercial (includes 3 ccf)	$ 70.15
Commercial Volume Charge (per ccf)	$ 7.25
Contract Customers	by contract
Industrial Users	
Industrial users < 250 mg/l	$ 429.00
Industrial users > 250 mg/l	$ 1,715.00
Industrial flow-based charge (per ccf)	$ 2.051
BOD charge (per pound BOD)	$ 0.645
TSS charge (per pound TSS)	$ 0.431

9.6.2 Projected Rates

Table 9-9 presents the proposed 10-year schedule of sewer rates, incorporating the proposed 2.0 percent annual rate increases, beginning in 2018. For purposes of the Financial Plan, the rate increases are applied uniformly to the existing rate structure. A study is underway to evaluate cost of service and rates by customer class.

Table 9-9. 10-Year Proposed Rates

Across the Board Projected Rate Increases

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Residential	$ 70.15	$ 70.15	$ 70.15	$ 71.55	$ 72.98	$ 74.44	$ 75.93	$ 77.45	$ 79.00	$ 80.58	$ 82.19
Commercial (includes 3 ccf)	$ 70.15	$ 70.15	$ 70.15	$ 71.55	$ 72.98	$ 74.44	$ 75.93	$ 77.45	$ 79.00	$ 80.58	$ 82.19
Commercial Volume Charge (per ccf)	$ 7.25	$ 7.25	$ 7.25	$ 7.40	$ 7.54	$ 7.69	$ 7.85	$ 8.00	$ 8.16	$ 8.33	$ 8.49
Contract Customers	by contract	by contract	by contract	by contract	by contract	by contract	by contract	by contract	by contract	by contract	by contract
Industrial Users											
Industrial users < 250 mg/l	$ 429.00	$ 429.00	$ 429.00	$ 437.58	$ 446.33	$ 455.26	$ 464.36	$ 473.65	$ 483.12	$ 492.79	$ 502.64
Industrial users > 250 mg/l	$ 1,715.00	$ 1,715.00	$ 1,715.00	$ 1,749.30	$ 1,784.29	$ 1,819.97	$ 1,856.37	$ 1,893.50	$ 1,931.37	$ 1,970.00	$ 2,009.40
Industrial flow-based charge (per ccf)	$ 2.051	$ 2.051	$ 2.051	$ 2.092	$ 2.134	$ 2.177	$ 2.220	$ 2.264	$ 2.310	$ 2.356	$ 2.403
BOD charge (per pound BOD)	$ 0.645	$ 0.645	$ 0.645	$ 0.658	$ 0.671	$ 0.684	$ 0.698	$ 0.712	$ 0.726	$ 0.741	$ 0.756
TSS charge (per pound TSS)	$ 0.431	$ 0.431	$ 0.431	$ 0.440	$ 0.448	$ 0.457	$ 0.467	$ 0.476	$ 0.485	$ 0.495	$ 0.505

Table 9-10 shows residential monthly bill comparisons for the proposed annual increases.

Table 9-10. 10-Year Monthly Bills

Residential	Current	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Monthly Bill	$ 70.15	$70.15	$ 70.15	$ 71.55	$ 72.98	$ 74.44	$ 75.93	$ 77.45	$ 79.00	$ 80.58	$ 82.19
% Increase		0.00%	0.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
$ Difference		$0.00	$ -	$ 1.40	$ 1.43	$ 1.46	$ 1.49	$ 1.52	$ 1.55	$ 1.58	$ 1.61

9.7 AFFORDABILITY

The Washington State Department of Health and the State Public Works Board have historically used an affordability index to prioritize low-cost loan awards. The typical threshold looks at whether a system's rates exceed 1.5% to 2.0% of the median household income for the demographic area. As a result, if monthly bills are less than 1.5% of the median household income for the demographic area, they are generally considered affordable.

According to a 2015 Alliance for Housing Affordability report, the median household income for the City of Arlington was $61,817. This figure is escalated for future years based on the assumed 2.0 percent labor cost inflation rate. **Table 9-11** presents the estimated residential sewer bill with the projected increases for the forecast period. The affordability mark (Monthly Bill *12 ÷ Median Income) averages 1.32% throughout the study period, indicating that rates are expected to remain affordable through 2025, remaining below the lower end of the threshold range.

Table 9-11.
Affordability Test

Year	Inflation	Median HH income	2.00% Monthly Threshold	Projected Monthly Bill	% of Median HH Income
2015		$ 61,817	$ 103.03	$ 70.15	1.36%
2016	2.00%	$ 63,053	$ 105.09	$ 70.15	1.34%
2017	2.00%	$ 64,314	$ 107.19	$ 70.15	1.31%
2018	2.00%	$ 65,601	$ 109.33	$ 71.55	1.31%
2019	2.00%	$ 66,913	$ 111.52	$ 72.98	1.31%
2020	2.00%	$ 68,251	$ 113.75	$ 74.44	1.31%
2021	2.00%	$ 69,616	$ 116.03	$ 75.93	1.31%
2022	2.00%	$ 71,008	$ 118.35	$ 77.45	1.31%
2023	2.00%	$ 72,428	$ 120.71	$ 79.00	1.31%
2024	2.00%	$ 73,877	$ 123.13	$ 80.58	1.31%
2025	2.00%	$ 75,355	$ 125.59	$ 82.19	1.31%

9.8 CONCLUSION

The analysis indicates that rate increases are necessary to fund ongoing operating and capital needs and to achieve stated policy objectives. Implementation of the proposed rate increases, beginning in 2018, should provide for continued financial viability while maintaining reasonably affordable rates.

Index to Appendices

Appendix	Subject
A	Lift Station Pump Characteristics and Operating Criteria
B	Hydraulic Model Results
C	Lift Station Capital Improvements
D	Current & Future Developed Flows
E	Inflow and Infiltration Data
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A Lift Station Pump Characteristics and Operating Criteria

A.1 SUMMARY DATA FOR LIFT STATIONS 2 THROUGH 12

A.2 INFORMATION RECEIVED AT START-UP OF EACH STATION

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LS-02	
Serial #	06-0101-C
Make	Smith & Loveless
Model	Duo-Duct

LS-02	2015	2025	2035
Force main Size	8"		
Suction pipe Size	6"		
Wet Well Diameter	8'		
Wet Well Depth	21'		
Basin Inflow (gpm)	605	935	1295
Upstream LS Inflow (gpm)	LS-13 = 100	LS-13 = 100	LS-13 = 100 LS-16 = 400
Total Inflow (gpm)	705	1035	1795
Total Head (ft)	33'		
Pump HP	15		
Pump RPM	1760		
Impeller Size	8"		
X-Peller (Y/N)	Y		
Pump Flow (gpm)	460		
Measured Flow			
Pump Efficiency			
Improvement (Y/N)	Y		
Improvement Cost	$0		
Improved Flow Rate	N/A		
Improved Efficiency	N/A		

1. Lift station data provided by manufacturer based on installed information, system analysis and data confirmation required before performing any improvements.

2. Pump ststion (wet well, pumps and pumping controls to be upgraded prior to 2025.

LS-03	
Serial #	06-0101-C
Make	Smith & Loveless
Model	Duo-Duct

LS Item	2015	2025	2035
Force main Size	6"	6"	6"
Suction pipe Size	4"	4"	4"
Wet Well Diameter	8'	8'	8'
Wet Well Depth	15' 6"	15' 6"	15' 6"
Basin Inflow	50	55	60
Upstream LS Inflow (gpm)	---	---	---
Total Inflow (gpm)	50	55	60
Total Head (ft)	46'	46'	46'
Pump HP	7.5	7.5	7.5
Pump RPM	1760	1760	1760
Impeller Size	7 3/8"	7 3/8"	7 3/8"
X-Peller (Y/N)	N	N	N
Pump Curve Flow (gpm)	200	200	200
Measured Flow			
Pump Efficiency			
Improvement (Y/N)	N	N	N
Improvement Cost	$0	$0	$0
Improved Flow Rate	N/A	N/A	N/A
Improved Efficiency	N/A	N/A	N/A

1. Lift station data provided by manufacturer based on installed information, system analysis and data confirmation required before performing any improvements.

LS-04	
Serial #	06-0105-C
Make	Smith & Loveless
Model	Duo-Duct

LS Item	2015	2025	2035
Force main Size	8"		
Suction pipe Size	6"		
Wet Well Diameter	12'		
Wet Well Depth	21'		
Basin Inflow	35	60	85
Upstream LS Inflow	LS-5 = 450 LS-12 = 250	LS-5 = 450 LS-12 = 250	LS-5 = 450 LS-12 = 475
Total Inflow (gpm)	735	760	1010
Total Head (ft)	37		
Pump HP	15		
Pump RPM	1760		
Impeller Size	7 7/8"		
X-Peller (Y/N)	Y		
Pump Curve Flow (gpm)	400		
Measured Flow			
Pump Efficiency			
Improvement (Y/N)	Y		
Improvement Cost			
Improved Flow Rate			
Improved Efficiency			

1. Lift station data provided by manufacturer based on installed information, system analysis and data confirmation required before performing any improvements.

2. Pump ststion (wet well, pumps and pumping controls to be upgraded prior to 2025.

LS-05	
Serial #	06-0108-T
Make	Smith & Loveless
Model	Duo-Duct

LS Item	2015	2025	2035
Force main Size	8"	8"	8"
Suction pipe Size	6"	6"	6"
Wet Well Diameter	12'	12'	12'
Wet Well Depth	24'	24'	24'
Basin Inflow (gpm)	180	295	420
Upstream LS Inflow (gpm)	LS-6 = 500	---	---
Total Inflow (gpm)	680	295	420
Total Head (ft)	30.5'	30.5'	30.5'
Pump Curve Flow	520	520	520
Pump HP	15	15	15
Pump RPM	1760	1760	1760
Impeller Size	8"	8"	8"
X-Peller (Y/N)	Y	Y	Y
Pump Curve Flow (gpm)	520	520	520
Measured Flow (gpm)			
Pump Efficiency			
Improvement (Y/N)	N	N	N
Improvement Cost	$0	$0	$0
Improved Flow Rate	N/A	N/A	N/A
Improved Efficiency	N/A	N/A	N/A

1. Lift station data provided by manufacturer based on installed information, system analysis and data confirmation required before performing any improvements.

LS-06	
Serial #	06-0108-T
Make	Smith & Loveless
Model	Duo-Duct

LS Item	2015	2025	2035
Force main Size	8"	8"	8"
Suction pipe Size	6"	6"	6"
Wet Well Diameter	12'	12'	12'
Wet Well Depth	26'	26'	26'
Basin Inflow	330	225	240
Upstream LS Inflow	0	0	0
Total Inflow (gpm)	330	225	240
Total Head (ft)	50.7'	50.7'	50.7'
Pump Curve Flow	500	500	500
Pump HP	15	15	15
Pump RPM	1760	1760	1760
Impeller Size	8 5/8"	8 5/8"	8 5/8"
X-Peller (Y/N)	Y	Y	Y
Pump Efficiency			
Improvement (Y/N)	N	N	N
Improvement Cost	$0	$0	$0
Improved Flow Rate	N/A	N/A	N/A
Improved Efficiency	N/A	N/A	N/A

1. Lift station data provided by manufacturer based on installed information, system analysis and data confirmation required before performing any improvements.

2. Current pump station configuration acceptable for 20-year planning horizon.

LS-07	
Serial #	06-0110-Z
Make	Smith & Loveless
Model	Duo-Duct

LS Item	2015	2025	2035
Force main Size	6"		
Suction pipe Size	6"		
Wet Well Diameter	12'		
Wet Well Depth	26'		
Basin Inflow	190	215	235
Upstream LS Inflow	---	1640	1660
Total Inflow (gpm)	190	1855	1895
Total Head (ft)	74'		
Pump Curve Flow	176		
Pump HP	10		
Pump RPM	1760		
Impeller Size	8 3/4"		
X-Peller (Y/N)	Y		
Pump Efficiency			
Improvement (Y/N)	N		
Improvement Cost	---		
Improved Flow Rate	N/A		
Improved Efficiency	N/A		

1. Lift station data provided by manufacturer based on installed information, system analysis and data confirmation required before performing any improvements.

2. Pump ststion (wet well, pumps and pumping controls to be upgraded prior to 2025.

LS-08	
Serial #	06-0112-C
Make	Smith & Loveless
Model	Duo-Duct

LS Item	2015	2025	2035
Force main Size	6"	6"	6"
Suction pipe Size	6"	6"	6"
Wet Well Diameter	12'	12'	12'
Wet Well Depth	18'	18'	18'
Basin Inflow	135	200	270
Upstream LS Inflow	---	---	---
Total Inflow (gpm)	135	200	270
Total Head (ft)	79	79	79
Pump Curve Flow	225	225	225
Pump HP	10	10	15
Pump RPM	1760	1760	1760
Impeller Size	9"	9"	9"
X-Peller (Y/N)	Y	Y	Y
Pump Efficiency			
Improvement (Y/N)	N	N	N
Improvement Cost	$0	$0	$25,000
Improved Flow Rate	N/A	N/A	N/A
Improved Efficiency	N/A	N/A	N/A

1. Lift station data provided by manufacturer based on installed information, system analysis and data confirmation required before performing any improvements.

2. Prior to 2035 add two 15-hp motors with X-peller pumps.

LS-09	
Serial #	06-0114-C
Make	Smith & Loveless
Model	Duo-Duct

LS Item	2015	2025	2035
Force main Size	6"	6"	6"
Suction pipe Size	6"	6"	6"
Wet Well Diameter	12'	12'	12'
Wet Well Depth	21'	21'	21'
Basin Inflow	110	110	115
Upstream LS Inflow	---	---	---
Total Inflow (gpm)	110	110	115
Total Head (ft)	79'	79'	79'
Pump Curve Flow	225	225	225
Pump HP	10	10	10
Pump RPM	1760	1760	1760
Impeller Size	9 1/8"	9 1/8"	9 1/8"
X-Peller (Y/N)	Y	Y	Y
Pump Efficiency			
Improvement (Y/N)	N	N	N
Improvement Cost	$0	$0	$0
Improved Flow Rate	N/A	N/A	N/A
Improved Efficiency	N/A	N/A	N/A

1. Lift station data provided by manufacturer based on installed information, system analysis and data confirmation required before performing any improvements.

2. Current pump station configuration acceptable for 20-year planning horizon.

LS-012	
Serial #	06-0118-V
Make	Smith & Loveless
Model	Duo-Duct

LS Item	2015	2025	2035
Force main Size	4"	8"	8"
Suction pipe Size	6"	6"	6"
Wet Well Diameter	12'	12'	12'
Wet Well Depth	27'	27'	27'
Basin Inflow	110	240	475
Upstream LS Inflow	---	---	---
Total Inflow (gpm)	110	240	475
Total Head (ft)	33'	33'	33'
Pump Curve Flow	250	250	500
Pump HP	5	5	15
Pump RPM	1760	1760	1760
Impeller Size	9 1/4"	9 1/4"	9 1/4"
X-Peller (Y/N)	N	N	N
Pump Efficiency			
Improvement (Y/N)	N	Y	N
Improvement Cost	$0	$25,000	$25,000
Improved Flow Rate	N/A	N/A	N/A
Improved Efficiency	N/A	N/A	N/A

1. Lift station data provided by manufacturer based on installed information, system analysis and data confirmation required before performing any improvements.

2. Prior to 2015 add increased force main across SR-531.

3. Prior to 2035 add two 15-hp motors with X-peller pumps.

L/S #2

PUMP STATION ENGINEERING ORDER
CUSTOM SERIES

LOCATION Arlington, WA — STATION SERIAL NO. 06-0103-C
OWNER City of Arlington — ENGINEER

1. Station Size Duo-Duct (Dia.) 8'-0" Height 8'-6" Sump Pump Part No. 8L1
2. Suction Piping/Base Beams Pump 1 6"x6" Pump 2 6"x6"
   Pump 3 _____ Pump 4 _____
3. Suction (Gate) Valve Pump 1 6" Pump 2 6" Pump 3 _____ Pump 4 _____
4. Pump Discharge (Gate) Valve Pump 1 6" Pump 2 6"
   Pump 3 _____ Pump 4 _____
5. Common Discharge Outlet (P.E.) (Stl.) Size 8"
6. Entrance Tube 36" Dia. x 13'-6" Long
7. Main Conduit Size 1-1/2" Aux. Conduit 2) 1/2" (Describe) Telemetry
   Blower Part No. 7L277
8. Electrical Service System Data: 3 Phase 60 Cycle 460 Volts
   3 Wire
9. 110V Single Phase Current available No 5 KVA Trans. Req'd
   YES V to 120 VAC
10. Depth of Bury Ground Elevation to Base Pad 21 ' - 0 "
    Base Reinforcing Package (No).

PUMP & MOTOR DATA

PUMP DATA	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Design Characteristics (GPM @ TDH)	460 @ 33'	460 @ 33'		
Pump Model	4B2G	4B2G		
Impeller Diameter	7-1/8"	7-1/8"		
Rotation (CW) (CCW)	CW	CCW		
S&L Mech. Seal-Filter Ass'y (Size)	1-7/8"	1-7/8"		
Pump Serial Number				

MOTOR DATA (INVENTORY CODE)

Horsepower	15	15		
R.P.M.	1760	1760		
Phase/Cycle/Volts	3/60/460	3/60/460		
Motor Serial No. (Code Ltr.)				
Squirrel Cage (SC) or Wound Rotor (WR)	SC	SC		
Special Modifications				
Across-The-Line (AL) or Part Winding (PW) Start	AL	AL		

CONTROL PANEL DATA TYPE NEMA 1 U.L. Listed — WIRING DIAGRAM NO. C06-0103-30

MOTOR CONTROL EQUIPMENT		PUMP 1	PUMP 2	PUMP 3	PUMP 4
Circuit Breaker - Trip Rating - Amps	40	4L258CF	4L258CF		
Magnetic Starter - Nema Size	2	4L330CC	4L330CC		
O.L. Coil No. FH					

AUXILIARY CIRCUIT BREAKERS	LIGHTS	BLOWER DEHUMIDIFIER	SUMP PUMP	AIR COMPRESSORS & CONTROL	TRANSFOMER
Trip Rating-Amps	15	20	15	15	15

L/S #2

Serial No. 06-0103-C

PUMP STATION ENGINEERING ORDER (PAGE 2 OF 2)

S&L BUBBLER CONTROL SYSTEM PRESSURE SWITCH SETTINGS	LOW LEVEL	HIGH LEVEL	LOW WATER ALARM	HIGH WATE ALARM
P. S. S&L Part No.	4L200B	4L200D	4L200B	4L200A
High Level Actuation (Feet)	4.0	4.5	3.0	5.0
Low Level Actuation (Feet)	2.5	2.0	1.5	3.0

OTHER CONTROL & AUXILIARY APPARATUS:

(The following equipment is standard equipment on all Smith & Loveless Pump Stations. It is listed here for the engineers and customers information only. Any deviations shall be listed in space provided below).

Automatic Alternator	Plastic "Level-Set" Indicator Tube
	Magnesium Anodes (4 provided)
	Spare Volute Gaskets
Nema 3 Wire 1 Phase Duplex Receptacle	
S&L Damtite Seal (Spare)	Touch-Up Kit (Paint-Brushes)
Dehumidifier	Blower Timer

SPECIAL MODIFICATIONS - ADDITIONS - AUXILIARY EQUIPMENT

1. Provide 1/4" plugged taps on suction and discharge pipes.

2. Provide a NEMA 1 U.L. Listed control panel.

3. Provide a total of four anodes.

4. Provide a Norton safety climb device with strap.

5. Provide elapsed time meters (one per pump).

6. Provide low and high water alarms for remote indication. Include terminal strips for alarms for future customer furnished telemetry.

7. Provide emergency generator power interlock.

8. Provide connection for wet well blower furnished by others.

SALES ENGINEERING		Maintenance Manual Qty.	COMPANION JOB SERIAL NOS.
PREPARED BY	DATE	Rep 1	
		Job File	
CME	6-16-88	Contractor 6	

Form No. 04-06-82 (Rev. 11/83)

#3

PUMP STATION ENGINEERING ORDER
CUSTOM SERIES

LOCATION Arlington, WA STATION SERIAL NO. 06-0101-C
OWNER Pape & Sons Construction, Inc. ENGINEER CH2M Hill

1. Station Size Du-O-Duct (Dia.) 8'-0" Height 8'-6" Sump Pump Part No. 8L9
2. Suction Piping (P.E.) (Stl.) Pump 1 4"x6" Pump 2 4"x6"
   Pump 3 _____ Pump 4 _____
3. Suction (Gate) Valve Pump 1 4" Pump 2 4" Pump 3 _____ Pump 4 _____
4. Pump Discharge (Gate) Valve Pump 1 4" Pump 2 4"
   Pump 3 _____ Pump 4 _____
5. Common Discharge Outlet (P.E.) (Stl.) Size 6"
6. Entrance Tube 36" Dia. x 8'-6" Long
7. Main Conduit Size 1-1/2" Aux. Conduit 2)1/2" (Describe) Alarm, Telemetry
   Blower Part No. 7L277
8. Electrical Service System Data: 3 Phase 60 Cycle 460 Volts
   3 Wire
9. 110V Single Phase Current available No 3 KVA Trans. Req'd Yes
   460 V to 120 VAC
10. Depth of Bury Ground Elevation to Base Pad 15 ' - 6 "
    Base Reinforcing Package (No).

PUMP & MOTOR DATA

PUMP DATA	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Design Characteristics (GPM @ TDH)	200 @ 46'	200 @ 46'		
Pump Model	4B2G	4B2G		
Impeller Diameter	7-3/8"	7-3/8"		
Rotation (CW) (CCW)	CW	CCW		
S&L Mech. Seal-Filter Ass'y (Size)	1-7/8"	1-7/8"		
Pump Serial Number				

MOTOR DATA (INVENTORY CODE)

Horsepower	7-1/2	7-1/2		
R.P.M.	1760	1760		
Phase/Cycle/Volts	3/60/460	3/60/460		
Motor Serial No. (Code Ltr.)				
Squirrel Cage (SC) or Wound Rotor (WR)	SC	SC		
Special Modifications				
Across-The-Line (AL) or Part Winding (PW) Start	AL	AL		

CONTROL PANEL DATA TYPE NEMA 1 (U.L. LISTED WIRING DIAGRAM NO. A06-0101-30, C06-0101-30

MOTOR CONTROL EQUIPMENT

		PUMP 1	PUMP 2	PUMP 3	PUMP 4
Circuit Breaker - Trip Rating - Amps	20	4L258CB	4L258CB		
Magnetic Starter - Nema Size	1	4L330BB	4L330BB		
O.L. Coil No. FH					

AUXILIARY CIRCUIT BREAKERS	LIGHTS	BLOWER DEHUMIDIFIER	SUMP PUMP	AIR COMPRESSORS & CONTROL	TRANSFOMER
Trip Rating-Amps	15	20	15	15	

L/S #3

Serial No. 06-0101-C

PUMP STATION ENGINEERING ORDER (PAGE 2 OF 2)

S&L BUBBLER CONTROL SYSTEM PRESSURE SWITCH SETTINGS	LOW LEVEL	HIGH LEVEL	ALARM	HI-WATER ALARM L&R
P. S. S&L Part No.	4L200D	4L200D		4L200D
High Level Actuation (Feet)	4.0	4.5		5.0
Low Level Actuation (Feet)	2.5	2.0		3.0

OTHER CONTROL & AUXILIARY APPARATUS:

(The following equipment is standard equipment on all Smith & Loveless Pump Stations. It is listed here for the engineers and customers information only. Any deviations shall be listed in space provided below).

Automatic Alternator	Plastic "Level-Set" Indicator Tube
Air Compressors	Magnesium Anodes (4 provided)
S&L Air Flow Indicator	Spare Volute Gaskets
Nema 3 Wire 1 Phase Duplex Receptacle	Spare Pump Filter Cone
S&L Damtite Seal (Spare)	Touch-Up Kit (Paint-Brushes)
Dehumidifier	Blower Timer

SPECIAL MODIFICATIONS - ADDITIONS - AUXILIARY EQUIPMENT

1. Provide U.L. listed control panel.
2. Provide 1/4" taps for suction and discharge.
3. Provide a total of 4 anodes with 15 ft. copper leads.
4. Provide elapsed time meters (one per pump).
5. Provide terminal strip for alarm for future telemetry.
6. Provide high water alarm for local and remote indication. Indicating devices are not by S&L.

SALES ENGINEERING		Maintenance Manual Qty.	COMPANION JOB SERIAL NOS.
PREPARED BY	DATE	Rep 1	
CME	11-20-86	Job File 0	
		Contractor 5	

From No. 04-06-82 (Rev. 11/83)

L/S
#4

PUMP STATION ENGINEERING ORDER
DUO-DUCT

LOCATION Arlington, WA — STATION SERIAL NO. 06-0105-C
OWNER Wilder Construction Co. — ENGINEER Cascade Surveying & Eng

1. Station Size Duo-Duct (Dia.) 8' Inside Height 8'-6" Sump Pump Part No. 8L47
2. Suction Piping/Base Beams Pump 1 8"x8" Pump 2 8"x8"
   Pump 3 _____ Pump 4 _____
3. Suction (Gate) Valve Pump 1 6" Pump 2 6" Pump 3 _____ Pump 4 _____
4. Pump Discharge (Gate) Valve Pump 1 6" Pump 2 6"
   Pump 3 _____ Pump 4 _____
5. Common Discharge Outlet (P.E.) (Stl.) Size 8"
6. Entrance Tube 36" Dia. x 13'-6" Long
7. Main Conduit Size 1-1/2" Aux. Conduit 1/2 (Describe) Alarms
   Blower Part No. 7L277
8. Electrical Service System Data: 3 Phase 60 Cycle 460 Volts
   3 Wire
9. 110V Single Phase Current (not) available 5 KVA Trans. Req'd
   460 V to 120 VAC
10. Depth of Bury Ground Elevation to Base Pad 21 ' - 0 "
    Base Reinforcing Package (No).

PUMP & MOTOR DATA

PUMP DATA	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Design Characteristics (GPM @ TDH)	400 @ 37'	400 @ 37'		
Pump Model	4B2G	4B2G		
Impeller Diameter	7-1/4"	7-1/4"		
Rotation (CW) (CCW)	CW	CCW		
S&L Mech. Seal-Filter Ass'y (Size)	1-7/8"	1-7/8"		
Pump Serial Number				

MOTOR DATA (INVENTORY CODE)

Horsepower	15	15		
R.P.M.	1760	1760		
Phase/Cycle/Volts	3/60/460	3/60/460		
Motor Serial No. (Code Ltr.)				
Squirrel Cage (SC) or Wound Rotor (WR)	SC	SC		
Special Modifications				
Across-The-Line (AL) or Part Winding (PW) Start	AL	AL		

CONTROL PANEL DATA TYPE NEMA 1 (UL) WIRING DIAGRAM NO. C06-0105-30

MOTOR CONTROL EQUIPMENT		PUMP 1	PUMP 2	PUMP 3	PUMP 4
Circuit Breaker - Trip Rating - Amps	40	4L258CF	4L258CF		
Magnetic Starter - Nema Size	2	4L330CC	4L330CC		
O.L. Coil No. FH					

AUXILIARY CIRCUIT BREAKERS	LIGHTS	BLOWER DEHUMIDIFIER	SUMP PUMP	AIR COMPRESSORS & CONTROL	TRANSFORMER
Trip Rating-Amps	15	20	15	15	15

L/S # 4

Serial No. 06-0105-C

PUMP STATION ENGINEERING ORDER (PAGE 2 OF 2)

S&L BUBBLER CONTROL SYSTEM PRESSURE SWITCH SETTINGS	LOW LEVEL	HIGH LEVEL	LOW WATER REMOTE ALARM	HIGH WATER REMOTE ALARM
P. S. S&L Part No.	4L200D	4L200D	4L200	4L200
High Level Actuation (Feet)	4.0	4.5	3.5	5.0
Low Level Actuation (Feet)	2.5	3.0	1.5	3.0

OTHER CONTROL & AUXILIARY APPARATUS:

(The following equipment is standard equipment on all Smith & Loveless Pump Stations. It is listed here for the engineers and customers information only. Any deviations shall be listed in space provided below).

Automatic Alternator

Nema 3 Wire 1 Phase Duplex Receptacle
S&L Damtite Seal (Spare)
Dehumidifier

Plastic "Level-Set" Indicator Tube
Magnesium Anodes (2 provided)
Spare Volute Gaskets

Touch-Up Kit (Paint-Brushes)
Blower Timer

SPECIAL MODIFICATIONS - ADDITIONS - AUXILIARY EQUIPMENT

1. Provide a total of four anodes.
2. Provide running time meter for each pump.
3. Provide generator interlock connection to lockout the high level pump.
4. Provide a complete Norton safety climb system.
5. Provide a U.L. labeled control panel.
6. Provide 1/4" taps and plugs in the suction and discharge lines of each pump.
7. Provide terminal strip in panel to provide connection points for high and low water ala
8. Provide breaker and connection for wet well blower (blower by others).

SALES ENGINEERING		Maintenance Manual Qty.	COMPANION JOB SERIAL NOS.
PREPARED BY	DATE	Rep 1	
Chuck Miller	10-3-89	Job File 0	
		Contractor 5	

Form No. 04-06-82 (Rev. 11/83)

L/S #5

PUMP STATION ENGINEERING ORDER
DUO-DUCT

LOCATION Arlington, WA STATION SERIAL NO. 06-0107-C
OWNER Selland Construction ENGINEER Cascade Surveying & Engineering

1. Station Size Duo-Duct (Dia.) 8'-0" Height 8'-6" Sump Pump Part No. 8L47
2. Suction Piping/Base Beams Pump 1 8"x8" Pump 2 8"x8"
   Pump 3 _____ Pump 4 _____
3. Suction (Gate) Valve Pump 1 6" Pump 2 6" Pump 3 _____ Pump 4 _____
4. Pump Discharge (Gate) Valve Pump 1 6" Pump 2 6"
   Pump 3 _____ Pump 4 _____
5. Common Discharge Outlet (P.E.) (Stl) Size 8"
6. Entrance Tube 36" Dia. x 16'-5" Long
7. Main Conduit Size 1-1/2" Aux. Conduit 2)1/2" (Describe) Alarms WW blower
   Blower Part No. 7L277
8. Electrical Service System Data: 3 Phase 60 Cycle 460 Volts
   3 Wire
9. 110V Single Phase Current (not) available 5 KVA Trans. Req'd
   460 V to 120 VAC
10. Depth of Bury Ground Elevation to Base Pad 24 ' - 0 "
    Base Reinforcing Package (No).

PUMP & MOTOR DATA

PUMP DATA	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Design Characteristics (GPM @ TDH)	520 @ 30.5'	520 @ 30.5'		
Pump Model	4B2G	4B2G		
Impeller Diameter	7-1/8"	7-1/8"		
Rotation (CW) (CCW)	CW	CCW		
S&L Mech. Seal-Filter Ass'y (Size)	1-7/8"	1-7/8"		
Pump Serial Number				

MOTOR DATA (INVENTORY CODE)

Horsepower	15	15		
R.P.M.	1760	1760		
Phase/Cycle/Volts	3/60/460	3/60/460		
Motor Serial No. (Code Ltr.)				
Squirrel Cage (SC) or Wound Rotor (WR)	SC	SC		
Special Modifications				
Across-The-Line (AL) or Part Winding (PW) Start	AL	AL		

CONTROL PANEL DATA TYPE NEMA 1 U.L. Listed WIRING DIAGRAM NO. C06-0107-30

MOTOR CONTROL EQUIPMENT		PUMP 1	PUMP 2	PUMP 3	PUMP 4
Circuit Breaker - Trip Rating - Amps	40	4L258CF	4L258CF		
Magnetic Starter - Nema Size	2	4L330CC	4L330CC		
O.L. Coil No.	FH				

AUXILIARY CIRCUIT BREAKERS	LIGHTS	BLOWER DEHUMIDIFIER	SUMP PUMP	AIR COMPRESSORS & CONTROL	TRANSFOMER
Trip Rating-Amps	15	20	15	15	15

4/5 T 5

Serial No. 06-0107-C

PUMP STATION ENGINEERING ORDER (PAGE 2 OF 2)

S&L BUBBLER CONTROL SYSTEM PRESSURE SWITCH SETTINGS	LOW LEVEL	HIGH LEVEL	LOW WATER (L&R) ALARM	HIGH WATER (L&R) ALARM
P. S. S&L Part No.	4L200B	4L200D	4L200A	4L200D
High Level Actuation (Feet)	5.5	6.5	3.5	7.0
Low Level Actuation (Feet)	3.5	4.0	2.0	5.5

OTHER CONTROL & AUXILIARY APPARATUS:

(The following equipment is standard equipment on all Smith & Loveless Pump Stations. It is listed here for the engineers and customers information only. Any deviations shall be listed in space provided below).

Automatic Alternator	Plastic "Level-Set" Indicator Tube
	Magnesium Anodes (4 provided)
	Spare Volute Gaskets
Nema 3 Wire 1 Phase Duplex Receptacle	Spare Pump Filter Cone
S&L Damtite Seal (Spare)	Touch-Up Kit (Paint-Brushes)
Dehumidifier	Blower Timer

SPECIAL MODIFICATIONS - ADDITIONS - AUXILIARY EQUIPMENT

1. Provide elapsed time meters (one per pump).
2. Provide high and low water alarms for local and remote indication. All indicating devices are by others.
3. Provide conduit and terminal strips for future telemetry system by others.
4. Provide NEMA 1 U.L. listed control panel.
5. Provide circuit breaker in the control panel and terminal points for wet well blower furnished by others.
6. Provide Norton safety climb device.
7. Provide 1/4" taps and plugs on the suction and discharge piping.
8. Provide a total of four anodes.
9. Provide an emergency generator connection for power interlock to allow only one pump to run under generator power.
10. Provide deep bury package.
11. Provide a high head sump pump.

SALES ENGINEERING		Maintenance Manual Qty.	COMPANION JOB SERIAL NOS.
PREPARED BY	DATE	Rep 1	
C. Eppler	6-8-90	Job File 1	
		Contractor 6	

Form No. 04-06-82 (Rev. 11/83)

L/S #6

SMITH & LOVELESS, INC.
UNDERGROUND PUMP STATION ENGINEERING ORDER

LOCATION Arlington, WA STATION SERIAL NO. 06-0108-T

PURCHASER Aurora Engineering ENGINEER Cascade Surveying & Engrg.

1. Station Type Duo-Duct Size 8'-0" Height 8'-6" Sump Pump No. 8L47
2. Suction Piping/Base Piping Pump 1 8"x8" Pump 2 8"x8" Pump 3 __ Pump 4
3. Suction Valve Pump 1 6" Pump 2 6" Pump 3 ____ Pump 4 ___
4. Pump Discharge Valve Pump 1 6" Pump 2 6" Pump 3 ____ Pump 4 ___
5. Common Discharge Outlet (P.E.) (Stl.) Size 6" 6" [redacted]
6. Entrance Tube 36" Dia. x 18'-6" Length
7. Main Conduit Size 1 1/2" Aux. Conduit 1) 1/2",3/4" (Describe) alarm and float switches
8. Blower Part No. 7L277
9. Electrical Service System Data: 3 Phase 60 Cycle 230 Volts 4 Wire
10. 120V Single Phase Current Available (Yes)
11. Separate 120 V Control Circuit Required (Yes)
12. 120 V Single Phase Transformer Required (Yes), 5 KVA
13. Depth of Bury: Ground Elevation to Base Pad 26' - 1-5/8"
14. Base Reinforcing Package Required (Yes)

PUMP & MOTOR DATA				
PUMP DATA	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Design Characteristics (GPM @ TDH)	500 @ 50.7'	500 @ 50.7'		
Pump Model	4B2G	4B2G		
Impeller Diameter	8'-3/8"	8'-3/8"		
Rotation (CW) (CCW)	CW	CCW		
S&L Mechanical Seal Assembly (Size)	1-7/8"	1-7/8"		
Pump Serial Number				
MOTOR DATA (INVENTORY CODE)				
Horsepower	15	15		
R.P.M.	1760	1760		
Phase/Cycle/Volts	3/60/460	3/60/460		
Motor Serial No. (Code Ltr.)				
Squirrel Cage (SC)	SC	SC		
Special Modifications				
Across-The-Line (AL)	AL	AL		

CONTROL PANEL DATA TYPE NEMA 1 WIRING DIAGRAM NO. C06-0108-30

MOTOR CONTROL EQUIPMENT	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Circuit Breaker/Trip Rating/Amps 40	4L258CF	4L258CF		
Magnetic Starter - Nema Size 2	4L330CC	4L330CC		
O.L. Coil No. FH				

AUXILIARY CIRCUIT BREAKERS	LIGHTS	BLOWER DEHUMIDIFIER	SUMP PUMP	AIR COMPRESSORS & CONTROL	TRANSFOMER
Trip Rating-Amps	15	20	15	15	

Form No. 04-06-82 (11/91)

L/S #6 Serial No. 06-0108-T

UNDERGROUND PUMP STATION ENGINEERING ORDER

FLOAT SWITCH CONTROL SYSTEM	PUMPS	LOW	HIGH	LOW WATER	HIGH LEV
FLOAT SWITCH SETTINGS	OFF	LEVEL	LEVEL	ALARM	ALARM
F.S. S&L Part No.	4L291A	4L291A	4L291A	4L291B	4L291A
High Level Actuation (Feet)		3.5'	4.0'	1.0'	4.5'
Low Level Actuation (Feet)	1.5'				

OTHER CONTROL & AUXILIARY APPARATUS:

(The following equipment is standard equipment on all Smith & Loveless Pump Stations. It is listed here for the engineers and customers information only. Any deviations shall be listed in space provided below).

Automatic Alternator
Air Compressors
S&L Air Flow Indicator
GFCI 3 Wire 1 Ph. Duplex Conv. Receptacle
S&L Mechanical Seal (Spare)
Dehumidifier
Plastic "Level-Set" Indicator Tube
Magnesium Anodes (2 provided)
Spare Volute Gaskets
Spare Pump Filter Cone
Touch-Up Kit (Paint-Brushes)
Blower Timer

SPECIAL MODIFICATIONS - ADDITIONS - AUXILIARY EQUIPMENT

1. 8" suction tubes shall be located 180° from standard location and shall be extended 18" to 24" and spread to accommodate entry into a 12'-0" dia. wet well.
2. Provide a UL listed station control panel.
3. Deep bury package.
4. Elapsed time meters.
5. Generator interlock.
6. Total of four (4) magnesium 17 lb. anode packs to ship loose.
7. Provide a "Norton" Saf-T-Climb device with personnel strap.
8. Provide additional set of alarm contacts for remote indicating device and for future telemetry system by others.
9. Separate breaker in UL panel for wet well ventilator.
10. 1/4" tapped and plugged holes in both suction and discharge piping.

SALES ENGINEERING PREPARED BY	DATE	Maintenance Manual Qty.	COMPANION JOB SERIAL NOS.
		Rep 1	
		Job File 1	
C.Smith	5-27-92	Contractor 5	

LS #7

SMITH & LOVELESS, INC.
UNDERGROUND PUMP STATION ENGINEERING ORDER
DUO-DUCT®

LOCATION Arlington, WA STATION SERIAL NO. 06-0110-Z

PURCHASER Dobbs Engineers ENGINEER Dobbs Engineers

1. Station Type Duo-Duct Size 8'-0" Height 8'-6" Sump Pump No. 8L43
2. Suction Piping/Base Piping Pump 1 6"x6" Pump 2 6"x6" Pump 3 ___ Pump 4 ___
3. Suction Valve Pump 1 6" Pump 2 6" Pump 3 ___ Pump 4 ___
4. Pump Discharge Valve Pump 1 6" Pump 2 6" Pump 3 ___ Pump 4 ___
5. Common Discharge Outlet (P.E.) (D.I.) Size 6"
6. Entrance Tube 36" Dia. x 18'-6" Length
7. Main Conduit Size 1-1/4" Aux. Conduit 3/4" (Describe) Alarm
8. Blower Part No. ___
9. Electrical Service System Data: 3 Phase 60 Cycle 460 Volts ___ Wire
10. 120V Single Phase Current Available (Yes)
11. Separate 120 V Control Circuit Required (Yes)
12. 120 V Single Phase Transformer Required (No), ___ KVA
13. Depth of Bury: Ground Elevation to Base Pad 26 ' - 3 "
14. Base Reinforcing Package Required (Yes)

PUMP & MOTOR DATA				
PUMP DATA	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Design Characteristics (GPM @ TDH)	176 @ 74'	176 @ 74'		
Pump Model	4B2G	4B2G		
Impeller Diameter	8-3/4"	8-3/4"		
Rotation (CW) (CCW)	CW	CCW		
S&L Mechanical Seal Assembly (Size)	1-7/8"	1-7/8"		
Pump Serial Number				
MOTOR DATA (INVENTORY CODE)				
Horsepower	10	10		
R.P.M.	1760	1760		
Phase/Cycle/Volts	3/60/460	3/60/460		
Motor Serial No. (Code Ltr.)				
Squirrel Cage (SC)	SC	SC		
Special Modifications				
Across-The-Line (AL) or Part Winding	AL	AL		

CONTROL PANEL DATA TYPE UL Listed Panel WIRING DIAGRAM NO. C06-0110-30

MOTOR CONTROL EQUIPMENT	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Circuit Breaker - Trip Rating - Amps 30	4L258CD	4L258CD		
Magnetic Starter - Nema Size 1	4L330BB	4L330BB		
O.L. Coil No. FH				

AUXILIARY CIRCUIT BREAKERS	LIGHTS	BLOWER DEHUMIDIFIER	SUMP PUMP	AIR COMPRESSORS & CONTROL	TRANSFORMER
Trip Rating-Amps	15	20	15	15	

Form No. 04-06-82 (11/91)

L/S

SMITH & LOVELESS, INC.
UNDERGROUND PUMP STATION ENGINEERING ORDER

LOCATION Arlington, WA STATION SERIAL NO. 06-0112-C

PURCHASER Mona Lisa Partners ENGINEER Datum Pacific

1. Station Type Duo-Duct® Size 8'-0" Height 8'-6" Sump Pump No. 8L43
2. Suction Piping (P.E.) (Stl.) Pump 1 6" Pump 2 6" Pump 3 __ Pump 4__
3. Suction Valve Pump 1 6" Pump 2 6" Pump 3 ___ Pump 4 ____
4. Pump Discharge Valve Pump 1 6" Pump 2 6" Pump 3 ____ Pump 4 ____
5. Common Discharge Outlet (P.E.) (Stl.) Size 6"
6. Entrance Tube 36" Dia. x 8'-6" Length
7. Main Conduit Size 3/4" Aux. Conduit 2x1/2", 3/4" (Describe) ____
8. Blower Part No. 7L277
9. Electrical Service System Data: 3 Phase 60 Cycle 460 Volts 4 Wire
10. 120V Single Phase Current Available (Yes)
11. Separate 120 V Control Circuit Required (Yes)
12. 120 V Single Phase Transformer Required (No), ____ KVA
13. Depth of Bury: Ground Elevation to Base Pad 18 ' - 0 "
14. Base Reinforcing Package Required (No)

PUMP & MOTOR DATA	PUMP 1	PUMP 2	PUMP 3	PUMP 4
PUMP DATA				
Design Characteristics (GPM @ TDH)	225 @ 76'	225 @ 76'		
Pump Model	4B2G	4B2G		
Impeller Diameter	9"	9"		
Rotation (CW) (CCW)	CW	CCW		
S&L Mechanical Seal Assembly (Size)	1-7/8"	1-7/8"		
Pump Serial Number				
MOTOR DATA (INVENTORY CODE)	10	10		
Horsepower	1760	1760		
R.P.M.	3/60/460	3/60/460		
Phase/Cycle/Volts				
Motor Serial No. (Code Ltr.)	SC	SC		
Squirrel Cage (SC) or Wound Rotor (WR)				
Special Modifications				
Across-The-Line (AL) Start	AL	AL		

CONTROL PANEL DATA TYPE ____ WIRING DIAGRAM NO. B06-0112-30

MOTOR CONTROL EQUIPMENT	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Circuit Breaker - Trip Rating - Amps 30	4L258CD	4L258CD		
Magnetic Starter - Nema Size 1	4L330BB	4L330BB		
O.L. Coil No. FH				

AUXILIARY CIRCUIT BREAKERS	LIGHTS	BLOWER DEHUMIDIFIER	SUMP PUMP	AIR COMPRESSORS & CONTROL	TRANSFORMER
Trip Rating-Amps	15	20	15	15	

L/S #4

SMITH & LOVELESS, INC.
UNDERGROUND PUMP STATION ENGINEERING ORDER

LOCATION Arlington, WA STATION SERIAL NO. 06-0114-C

PURCHASER Plats Plus, Inc. ENGINEER Ostegard & Robinson

1. Station Type Duo-Duct® Size 8'-0" Height 8'-6" Sump Pump No. 8L47
2. Suction Piping (Stl.) Pump 1 6 Pump 2 6 Pump 3 ___ Pump 4 ___
3. Suction Valve Pump 1 6 Pump 2 6 Pump 3 ___ Pump 4 ___
4. Pump Discharge Valve Pump 1 6 Pump 2 6 Pump 3 ___ Pump 4 ___
5. Common Discharge Outlet (Stl.) Size 6"
6. Entrance Tube 2" Dia. X 13'-6" Length
7. Main Conduit Size 2" Aux. Conduit 2)3/4" (Describe) Remote pane, float switches
8. Blower Part No. 7L277
9. Electrical Service System Data: 3 Phase 60 Cycle 460 Volts 4 Wire
10. 120V Single Phase Current Available (Yes)
11. Separate 120 V Control Circuit Required (Yes)
12. 120 V Single Phase Transformer Required (No), ___ KVA
13. Depth of Bury: Ground Elevation to Base Pad 20 ' - 10 "
14. Base Reinforcing Package Required (No)

PUMP & MOTOR DATA

PUMP DATA	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Design Characteristics (GPM @ TDH)	225 @ 79'	225 @ 79'		
Pump Model	4B2G	4B2G		
Impeller Diameter	9-1/8"	9-1/8"		
Rotation (CW) (CCW)	CCW	CW		
S&L Mechanical Seal Assembly (Size)	1-7/8"	1-7/8"		
Pump Serial Number				

MOTOR DATA (INVENTORY CODE)				
Horsepower	10	10		
R.P.M.	1800	1800		
Phase/Cycle/Volts	3/60/460	3/60/460		
Motor Serial No. (Code Ltr.)				
Squirrel Cage (SC) or Wound Rotor (WR)	SC	SC		
Special Modifications				
Across-The-Line (AL) Start	AL	AL		

CONTROL PANEL DATA TYPE U.L. NEMA 1 WIRING DIAGRAM NO. B06-0114-30

MOTOR CONTROL EQUIPMENT	PUMP 1	PUMP 2	PUMP 3	PUMP 4
Circuit Breaker - Trip Rating - Amps 30	4L258CD	4L258CD		
Magnetic Starter - Nema Size 1	4L330BB	4L330BB		
O.L. Coil No. FH				

AUXILIARY CIRCUIT BREAKERS	LIGHTS	BLOWER DEHUMIDIFIER	SUMP PUMP	AIR COMPRESSORS & CONTROL	TRANSFORMER
Trip Rating-Amps	15	20	15	15	

L/S #9

Serial No. 06-0114-C

UNDERGROUND PUMP STATION ENGINEERING ORDER (PAGE 2 OF 3)

S&L BUBBLER CONTROL SYSTEM PRESSURE SWITCH SETTINGS	LOW LEVEL	SECOND LEVEL	HIGH LEVEL	HIGH LEVEL ALARM	LOW LEVEL ALARM
P. S. S&L Part No.	4L291A	4L291A	4L291A	4L291B	4L291A
High Level Actuation (Feet)		2.0'	4.0'	4.5'	
Low Level Actuation (Feet)	1.5'				1.0'

OTHER CONTROL & AUXILIARY APPARATUS:

(The following equipment is standard equipment on all Smith & Loveless Pump Stations. It is listed here for the engineers and customers information only. Any deviations shall be listed in space provided below).

Automatic Alternator
Air Compressors
S&L Air Flow Indicator
GFCI 3 Wire 1 Ph. Duplex Conv. Receptacle
S&L Mechanical Seal (Spare)
Dehumidifier
Plastic "Level-Set" Indicator Tube
Magnesium Anodes (2 provided)
Spare Volute Gaskets
Spare Pump Filter Cone
Touch-Up Kit (Paint-Brushes)
Blower Timer

SPECIAL MODIFICATIONS - ADDITIONS - AUXILIARY EQUIPMENT

1. Provide a generator interlock.
2. Provide ¼" tap on suction and discharge.
3. Provide an auto lid switch.
4. Provide pump control with gem float switches and relays in lieu of standard controls.
5. Mount run-time meters for each pump and an H-O-A switch for each pump in a U.L. listed NEMA 1 enclosure that is to be remote of the station. There is still a [illegible] panel inside station.
6. Provide two additional anodes (four total.)
7. Main station panel is to be U.L. labeled.
8. Provide a redundant pump cut-off on a low water alarm condition.
9. Provide a terminal strip for customer to use with future telemetry.
10. Provide a Saf-T-Climb fan prevention system.

SALES ENGINEERING		MAINTENANCE MANUAL QTY.		COMPANION JOB SERIAL NO
PREPARED BY	DATE	Preliminary Copies		
		M.C. Copy	1	
		Start-Up Copy	1	
		Equipment Copies	1	
		Rep Copy	1	
		Customer	4	
A. McCullough	1-29-97	Total O&M's	8	

4/5 12

SMITH & LOVELESS, INC.
UNDERGROUND PUMP STATION ENGINEERING ORDER

LOCATION: ARLINGTON , WA STATION SERIAL # : 06-0118-V
PURCHASER: COLACURCIO BROS. CONST. ENGINEER: HIGA BURKHOLDER

1. Station Type Duo-Duct Size 8'-0" Height 8'-6" Sump Pump # 8L47
2. Suction Piping (P.E. Stl.) Pump 1 6" Pump 2 6"
3. Suction Valve Pump 1 6" Pump 2 6"
4. Pump Discharge Valve Pump 1 6" Pump 2 6"
5. Common Discharge Outlet (P.E. Stl.) Size 8"
6. Entrance Tube 36" Diameter x 18'-6" Length
7. Main Conduit Size 2" Aux. Conduit 1) ½", 1)3/4"
8. Blower Part # 7L277
9. Electrical Service System Data: 3 Phase 60 Cycle 460 Volts ___ Wire
10. 120V Single Phase Current Available (NO)
11. Separate 120 V Control Circuit Required (Yes)
12. 120 V Single Phase Transformer Required (Yes), By Others KVA
13. Depth of Bury: Ground Elevation to Base Pad 26' - 9-3/4"
14. Base Reinforcing Package Required (NO)

PUMP & MOTOR DATA

PUMP DATA	PUMP 1	PUMP 2
Design Characteristics (GPM @TDH)	250 @ 33	250 @ 33
Pump Model	4B2G	4B2G
Impeller Diameter	9 1/4"	9 1/4"
Rotation (CW) (CCW)	CW	CCW
S&L Mechanical Seal Assy. (Size)	1-7/8"	1-7/8"
Pump Serial Number		

MOTOR DATA (INVENTORY CODE)		
Horsepower	5	5
R.P.M.	1170	1170
Phase / Cycle / Volts	3/60/460	3/60/460
Motor Serial # (Code Ltr.)		
Squirrel Cage (SC)	SC	SC
Special Modifications		
Across-The-Line (AL) Start	AL	AL

CONTROL PANEL DATA TYPE UL Listed NEMA 1 WIRING DIAGRAM #

MOTOR CONTROL EQUIPMENT	PUMP 1	PUMP 2
Circuit Breaker – Trip Rating –		

Auxiliary Circuit Breakers	Lights	Blower Dehumidifier	Sump Pump	Control
Trip Rating – Amps	15	20	15	15

B HYDRAULIC MODEL RESULTS

B.1 BRIEF DESCRIPTION OF MODEL RESULTS

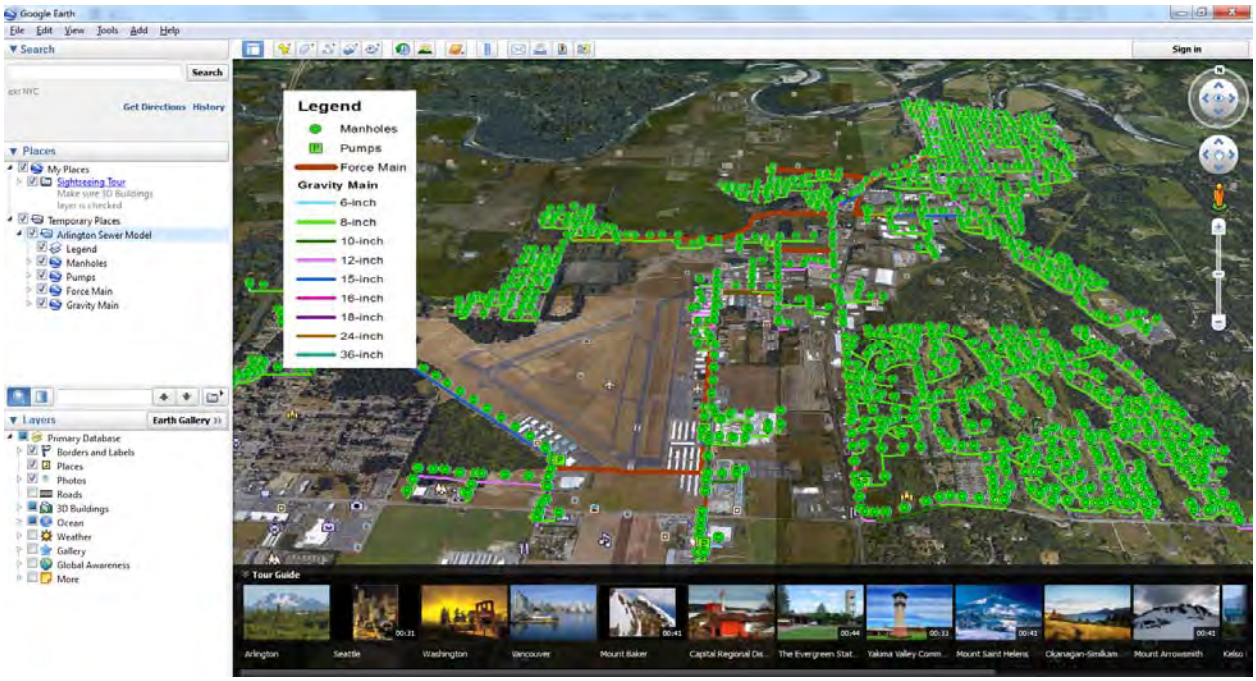
B.2 CD CONTAINING GOOGLE EARTH KMZ FILE

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Results of Hydraulic Analyses

Model results have been captured in a Google Earth KMZ file. A copy of the file is included in the CD containing the City of Arlington Comprehensive Wastewater Plan, and is also available from the Wastewater Department upon request.

A screenshot of the file structure is provided below.



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C LIFT STATION CAPITAL IMPROVEMENTS

C.1 LIFT STATION COST ESTIMATES FOR 8 PROJECTS

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City of Arlington Lift Station 2 Replacement Preliminary Construction Cost Estimate

Description	Total Cost
1 Mobilization, Demo, Site Prep, and Cleanup	$90,000
Mobilization / Demobilization	$75,000
Salvage and Demolition	$15,000
2 Site Work	$70,000
Grading & Site Prep	$30,000
Dewatering System	$15,000
Trench Safety and Shoring	$15,000
Miscellaneous Site work	$10,000
3 Structural	$215,000
Building	$140,000
Driveway/Sidewalk	$15,000
Wet Well Repair/Replace	$60,000
4 Lift Station Pumps, Motors, Cans	$200,000
S&L Duo-Duct Pump Station	$200,000
5 Mechanical	$150,000
Temporary bypass system	$50,000
Facility Piping & Fittings	$60,000
Miscellaneous Mechanical	$40,000
6 Electrical	$160,000
Controls / Telemetry / Instrumentation	$80,000
Engine Generator	$60,000
Miscellaneous Electrical	$20,000

Subtotal Construction Costs **$885,000**

City of Arlington Lift Station 4 Replacement Preliminary Construction Cost Estimate

Description	Total Cost
1 Mobilization, Demo, Site Prep, and Cleanup	$68,000
Mobilization / Demobilization	$60,000
Salvage and Demolition	$8,000
2 Site Work	$52,000
Grading & Site Prep	$15,000
Dewatering System	$10,000
Trench Safety and Shoring	$15,000
Miscellaneous Site work	$12,000
3 Structural	$195,000
Building	$120,000
Driveway/Sidewalk	$15,000
Wet Well Repair/Replace	$60,000
4 Lift Station Pumps, Motors, Cans	$75,000
Smith & Loveless Duo-Duct Package Pump Station	$75,000
5 Mechanical	$91,000
Temporary bypass system	$50,000
Facility Piping & Fittings	$30,000
Miscellaneous Mechanical	$11,000
6 Electrical	$130,000
Controls / Telemetry / Instrumentation	$60,000
Engine Generator	$55,000
Miscellaneous Electrical	$15,000

Subtotal Construction Costs **$611,000**

City of Arlington Lift Station 7 Replacement Preliminary Construction Cost Estimate

Description	Total Cost
1 Mobilization, Demo, Site Prep, and Cleanup	$18,000
Mobilization / Demobilization	$10,000
Salvage and Demolition	$8,000
2 Site Work	$40,000
Grading & Site Prep	$10,000
Dewatering System	$10,000
Trench Safety and Shoring	$10,000
Miscellaneous Site work	$10,000
3 Structural	$100,000
Building	$50,000
Driveway/Sidewalk	$10,000
Wet Well Repair/Replace	$40,000
4 Lift Station Pumps, Motors, Cans	$30,000
Smith & Loveless Duo-Duct Package Pump Station	$30,000
5 Mechanical	$17,000
Temporary bypass system	$10,000
Facility Piping & Fittings	$5,000
Miscellaneous Mechanical	$2,000
6 Electrical	$8,000
Controls / Telemetry / Instrumentation	$6,000
Engine Generator	$0
Miscellaneous Electrical	$2,000

Subtotal Construction Costs **$213,000**

City of Arlington Lift Station 8 Rehabilitation Preliminary Construction Cost Estimate

Description	Total Cost
1 Mobilization, Demo, Site Prep, and Cleanup	$1,500
Mobilization / Demobilization	$0
Salvage and Demolition	$1,500
2 Site Work	$15,000
Excavation, Grading, & Site Prep	$2,500
Dewatering System	$7,500
Trench Safety and Shoring	$5,000
3 Mechanical / Structural	$52,500
Smith & Loveless Duo-Duct Pump Station Internals	$30,000
Temporary bypass system	$5,000
Miscellaneous Structural	$5,000
Miscellaneous Mechanical	$5,000
Wet Well Repair/Replace	$7,500
4 Electrical	$5,000
Controls / Telemetry / Instrumentation	$5,000
Miscellaneous Electrical	$0

Subtotal Construction Costs **$74,000**

City of Arlington Lift Station 11 Rehabilitation Preliminary Construction Cost Estimate

Description	Total Cost
1 Mobilization, Demo, Site Prep, and Cleanup	$50,000
Mobilization / Demobilization	$35,000
Salvage and Demolition	$15,000
2 Site Work	$50,000
Excavation, Grading, & Site Prep	$20,000
Dewatering System	$15,000
Trench Safety and Shoring	$15,000
3 Mechanical / Structural	$215,000
Smith & Loveless Duo-Duct Pump Station Internals	$120,000
Temporary bypass system	$15,000
Miscellaneous Structural	$10,000
Miscellaneous Mechanical	$20,000
Wet Well Repair/Replace/Coating	$50,000
4 Electrical	$125,000
Controls / Telemetry / Instrumentation	$60,000
Standby Power System	$50,000
Miscellaneous Electrical	$15,000

Subtotal Construction Costs **$440,000**

City of Arlington Lift Station 12 Rehabilitation Preliminary Construction Cost Estimate

Description	Total Cost
1 Mobilization, Demo, Site Prep, and Cleanup	$3,000
Mobilization / Demobilization	$0
Salvage and Demolition	$3,000
2 Site Work	$25,500
Excavation, Grading, & Site Prep	$7,500
Dewatering System	$10,000
Trench Safety and Shoring	$8,000
3 Mechanical / Structural	$102,000
Smith & Loveless Duo-Duct Pump Station Internals	$70,000
Temporary bypass system	$10,000
Miscellaneous Structural	$6,000
Miscellaneous Mechanical	$6,000
Wet Well Repair/Replace	$10,000
4 Electrical	$15,000
Controls / Telemetry / Instrumentation	$15,000
Miscellaneous Electrical	$0

Subtotal Construction Costs **$145,500**

City of Arlington Lift Station 14 Construction Preliminary Construction Cost Estimate

Description	Total Cost
1 Mobilization, Demo, Site Prep, and Cleanup	$101,000
Mobilization / Demobilization	$90,000
Removal of Structures/Obstructions	$6,000
Clearing and Grubbing	$5,000
2 Site Work	$75,000
Grading & Site Prep	$30,000
Dewatering System	$15,000
Trench Safety and Shoring	$15,000
Temporary Traffic Control	$5,000
Miscellaneous Site work	$10,000
3 Structural	$270,000
Building	$200,000
Driveway/Sidewalk	$10,000
Wet Well Installation	$60,000
4 Lift Station Pumps, Motors, Cans	$200,000
Smith & Loveless Package Pumps & Motors	$200,000
5 Mechanical	$150,000
Temporary bypass system	$50,000
Facility Piping & Fittings	$60,000
Miscellaneous Mechanical	$40,000
6 Electrical	$205,000
Controls / Telemetry / Instrumentation	$100,000
Engine Generator	$80,000
Miscellaneous Electrical	$25,000

Subtotal Construction Costs **$1,001,000**

D Current & Future Developed Flows

D.1 SUMMARY TABLE WITH FLOW DATA BY LIFT STATION AND PLANNING HORIZON (2013, 2024, 2035)

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Peak Hour Flows (gpm) by Basin Under Current (2013) and Future Developed Conditions

Basin	Name	Upstream Basins (LS No.)	Current			2015			2035		
			Basin Flow	Pumped Inflow	Total	Basin Flow	Pumped Inflow	Total	Basin Flow	Pumped Inflow	Total
WRF		PI, Old Town									
Primary Interceptor	PI at Division St	Gleneagle									
Old Town											
Gleneagle											
LS-01	WRF		20	-	20	20	-	20	20	-	20
LS-02	Kent Prairie	13	605	100	705	935	100	1,035	1,295	100	1,395
LS-03	Transfer Stn		50	-	50	55	-	55	60	-	60
LS-04	AAMP	5, 12	35	700	735	60	700	760	85	925	1,010
LS-05	Westside AP	6[a]	180	500	680	295	-	295	420	-	420
LS-06	Rest Areas	11[b]	215	115	330	225		225	240	-	240
LS-07	High Clover	14[c]	190	-	190	215	1,425	1,640	235	1,425	1,660
LS-08	Highland View		135	-	135	200	-	200	270	-	270
LS-09	River Crest		110	-	110	110	-	110	115	-	115
LS-11	Island Xing		40	-	40	95	-	95	155	-	155
LS-12	Crown Park		30	-	30	240	-	240	475	-	475
LS-13	Yarmuth		5		5	5	-	5	5	-	5
LS-14	Westside I-5	6, 11, 15[d]	-	-	-	40	1,265	1,305	85	1,325	1,410
LS-15	UGA Expansion		-	-	-	305	-	305	635	-	635

Notes

[a] LS-6 flows are diverted away from LS-5 prior to 2024

[b] LS-11 flows are diverted away from LS-6 prior to 2024

[c] Flows from new LS-14 are delivered to LS-7 just prior to 2024

[d] Flows from LS-6, LS-11, and new LS-15 are delivered to LS-14 just prior to 2024

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E INFLOW AND INFILTRATION DATA

E.1 INFLOW ANALYSES DATA FOR 2009 TO 2014 (45 PAGES)

E.2 INFILTRATION ANALYSES DATA FOR 2009 TO 2014 (1 PAGE)

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Year	Pop.
2009	16,073
2010	16,288
2011	16,292
2012	16,332
2013	16,632
2014	16,116

Max. Q_{res} for Inflow (gpcd)
275

	Max Inflow Day
	Notable Rain Event (> 0.30 in.)

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
2009							
1-Jan	1.70	0.11	31	39	0.000	1.70	106
2-Jan	1.65	0.00	26	38	0.000	1.65	103
3-Jan	1.56	0.02	28	37	0.000	1.56	97
4-Jan	1.74	0.51	31	40	0.000	1.74	108
5-Jan	1.70	0.33	33	43	0.000	1.70	106
6-Jan	2.21	1.74	37	51	0.000	2.21	137
7-Jan	2.41	1.24	42	53	0.000	2.41	150
8-Jan	3.02	0.42	31	43	0.000	3.02	188
9-Jan	2.01	0.22	31	42	0.000	2.01	125
10-Jan	2.33	0.98	34	41	0.000	2.33	145
11-Jan	2.22	0.20	35	43	0.000	2.22	138
12-Jan	2.02	0.10	39	46	0.000	2.02	126
13-Jan	1.97	0.10	32	45	0.000	1.97	123
14-Jan	1.81	0.01	31	42	0.000	1.81	113
15-Jan	1.80	0.00	28	39	0.000	1.80	112
16-Jan	1.69	0.00	28	36	0.000	1.69	105
17-Jan	1.65	0.00	26	37	0.000	1.65	103
18-Jan	1.57	0.00	25	57	0.000	1.57	98
19-Jan	1.63	0.00	25	50	0.000	1.63	101
20-Jan	1.53	0.00	23	48	0.000	1.53	95
21-Jan	1.46	0.00	23	39	0.000	1.46	91
22-Jan	1.42	0.00	25	32	0.000	1.42	88
23-Jan	1.38	0.00	27	36	0.000	1.38	86
24-Jan	1.35	0.09	22	30	0.000	1.35	84
25-Jan	1.27	0.00	19	34	0.000	1.27	79
26-Jan	1.43	0.00	19	42	0.000	1.43	89
27-Jan	1.31	0.13	33	40	0.000	1.31	82
28-Jan	1.26	0.02	34	46	0.000	1.26	78
29-Jan	1.26	0.00	26	46	0.000	1.26	78
30-Jan	1.21	0.03	26	46	0.000	1.21	75
31-Jan	1.16	0.00	29	44	0.000	1.16	72
1-Feb	1.27	0.00	31	45	0.000	1.27	79
2-Feb	1.24	0.00	28	55	0.000	1.24	77
3-Feb	1.16	0.00	28	61	0.000	1.16	72
4-Feb	1.26	0.00	30	63	0.000	1.26	78
5-Feb	1.16	0.00	31	49	0.000	1.16	72
6-Feb	1.14	0.00	31	45	0.000	1.14	71
7-Feb	1.14	0.00	30	49	0.000	1.14	71
8-Feb	1.21	0.14	30	47	0.000	1.21	75
9-Feb	1.19	0.18	30	45	0.000	1.19	74

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
10-Feb	1.20	0.09	31	44	0.000	1.20	75
11-Feb	1.12	0.00	28	47	0.000	1.12	70
12-Feb	1.13	0.00	27	46	0.000	1.13	70
13-Feb	1.19	0.00	30	46	0.000	1.19	74
14-Feb	1.10	0.00	24	49	0.000	1.10	68
15-Feb	1.11	0.15	24	49	0.000	1.11	69
16-Feb	1.19	0.00	25	51	0.000	1.19	74
17-Feb	1.07	0.00	29	54	0.000	1.07	67
18-Feb	1.10	0.00	27	56	0.000	1.10	68
19-Feb	1.10	0.00	25	50	0.000	1.10	68
20-Feb	1.03	0.00	25	55	0.000	1.03	64
21-Feb	1.11	0.01	25	56	0.000	1.11	69
22-Feb	1.10	0.09	37	61	0.000	1.10	69
23-Feb	1.16	0.23	42	56	0.000	1.16	72
24-Feb	1.09	0.04	43	51	0.000	1.09	68
25-Feb	1.12	0.15	29	46	0.000	1.12	69
26-Feb	1.10	0.00	29	42	0.000	1.10	68
27-Feb	1.08	0.00	32	53	0.000	1.08	67
28-Feb	1.11	0.04	34	52	0.000	1.11	69
1-Mar	1.13	0.41	44	57	0.000	1.13	70
2-Mar	1.11	0.14	38	62	0.000	1.11	69
3-Mar	1.10	0.00	33	60	0.000	1.10	68
4-Mar	1.15	0.27	34	54	0.000	1.15	72
5-Mar	1.15	0.05	25	47	0.000	1.15	72
6-Mar	1.10	0.08	26	51	0.000	1.10	69
7-Mar	1.07	0.89	29	45	0.000	1.07	67
8-Mar	1.12	0.13	26	46	0.000	1.12	70
9-Mar	1.11	0.08	17	46	0.000	1.11	69
10-Mar	1.07	0.00	18	41	0.000	1.07	67
11-Mar	1.13	0.00	20	43	0.000	1.13	70
12-Mar	1.08	0.00	20	52	0.000	1.08	67
13-Mar	1.08	0.20	24	61	0.000	1.08	67
14-Mar	1.22	0.71	32	44	0.000	1.22	76
15-Mar	1.20	0.08	30	49	0.000	1.20	75
16-Mar	1.19	0.03	30	45	0.000	1.19	74
17-Mar	1.14	0.06	33	50	0.000	1.14	71
18-Mar	1.17	0.02	37	49	0.000	1.17	73
19-Mar	1.28	0.33	40	51	0.000	1.28	80
20-Mar	1.20	0.24	29	54	0.000	1.20	75
21-Mar	1.23	0.00	29	54	0.000	1.23	77
22-Mar	1.25	0.37	33	46	0.000	1.25	78
23-Mar	1.23	0.20	37	47	0.000	1.23	77
24-Mar	1.34	0.46	37	49	0.000	1.34	83
25-Mar	1.40	0.31	28	50	0.000	1.40	87
26-Mar	1.31	0.10	27	56	0.000	1.31	82
27-Mar	1.21	0.06	37	49	0.000	1.21	75
28-Mar	1.38	0.45	34	40	0.000	1.38	86
29-Mar	1.24	0.00	32	52	0.000	1.24	77
30-Mar	1.45	0.57	34	48	0.000	1.45	90

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
31-Mar	1.28	0.05	36	48	0.000	1.28	80
1-Apr	1.61	1.03	34	41	0.000	1.61	100
2-Apr	1.56	0.21	33	49	0.000	1.56	97
3-Apr	1.42	0.00	28	52	0.000	1.42	89
4-Apr	1.29	0.00	28	62	0.000	1.29	80
5-Apr	1.39	0.00	34	74	0.000	1.39	86
6-Apr	1.31	0.00	35	74	0.000	1.31	81
7-Apr	1.25	0.00	35	67	0.000	1.25	77
8-Apr	1.29	0.00	43	56	0.000	1.29	80
9-Apr	1.23	0.00	41	64	0.000	1.23	76
10-Apr	1.17	0.03	40	51	0.000	1.17	73
11-Apr	1.26	0.30	42	54	0.000	1.26	78
12-Apr	1.43	0.93	38	52	0.000	1.43	89
13-Apr	1.43	0.15	34	44	0.000	1.43	89
14-Apr	1.35	0.00	31	55	0.000	1.35	84
15-Apr	1.30	0.00	35	55	0.000	1.30	81
16-Apr	1.32	0.40	40	63	0.000	1.32	82
17-Apr	1.35	0.03	35	57	0.000	1.35	84
18-Apr	1.18	0.00	35	61	0.000	1.18	73
19-Apr	1.32	0.00	39	65	0.000	1.32	82
20-Apr	1.26	0.00	40	73	0.000	1.26	78
21-Apr	1.22	0.02	40	69	0.000	1.22	76
22-Apr	1.22	0.02	39	56	0.000	1.22	76
23-Apr	1.20	0.00	31	54	0.000	1.20	75
24-Apr	1.28	0.02	33	62	0.000	1.28	79
25-Apr	1.18	0.09	32	58	0.000	1.18	74
26-Apr	1.18	0.00	34	62	0.000	1.18	73
27-Apr	1.13	0.02	32	66	0.000	1.13	70
28-Apr	1.14	0.00	40	61	0.000	1.14	71
29-Apr	1.18	0.00	38	62	0.000	1.18	73
30-Apr	1.14	0.00	35	68	0.000	1.14	71
1-May	1.09	0.00	28	78	0.000	1.09	68
2-May	1.06	0.19	30	67	0.000	1.06	66
3-May	1.15	0.04	39	64	0.000	1.15	72
4-May	1.27	0.62	40	64	0.000	1.27	79
5-May	1.25	0.10	42	57	0.000	1.25	78
6-May	1.27	0.39	43	52	0.000	1.27	79
7-May	1.17	0.07	43	58	0.000	1.17	72
8-May	1.21	0.00	35	60	0.000	1.21	76
9-May	1.14	0.00	38	67	0.000	1.14	71
10-May	1.20	0.16	38	70	0.000	1.20	74
11-May	1.23	0.30	40	64	0.000	1.23	77
12-May	1.26	0.14	40	57	0.000	1.26	79
13-May	1.24	0.39	43	56	0.000	1.24	77
14-May	1.22	0.06	38	63	0.000	1.22	76
15-May	1.18	0.00	41	68	0.000	1.18	73
16-May	1.21	0.00	45	77	0.000	1.21	75
17-May	1.20	0.00	47	77	0.000	1.20	75
18-May	1.26	0.63	45	64	0.000	1.26	79

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
19-May	1.24	0.35	43	55	0.000	1.24	77
20-May	1.19	0.05	35	65	0.000	1.19	74
21-May	1.21	0.00	39	69	0.000	1.21	75
22-May	1.16	0.00	39	71	0.000	1.16	72
23-May	1.13	0.00	39	72	0.000	1.13	70
24-May	1.09	0.00	42	72	0.000	1.09	68
25-May	1.11	0.00	44	70	0.000	1.11	69
26-May	1.15	0.01	43	63	0.000	1.15	72
27-May	1.17	0.00	41	69	0.000	1.17	73
28-May	1.11	0.00	45	80	0.000	1.11	69
29-May	1.13	0.00	44	80	0.000	1.13	70
30-May	1.09	0.00	46	78	0.000	1.09	68
31-May	1.12	0.00	44	78	0.000	1.12	69
1-Jun	1.14	0.00	50	83	0.000	1.14	71
2-Jun	1.09	0.00	51	87	0.000	1.09	68
3-Jun	1.16	0.00	52	88	0.000	1.16	72
4-Jun	1.14	0.00	57	92	0.000	1.14	71
5-Jun	1.03	0.00	58	78	0.000	1.03	64
6-Jun	1.03	0.00	56	68	0.000	1.03	64
7-Jun	1.04	0.00	50	73	0.000	1.04	65
8-Jun	1.22	0.00	46	73	0.000	1.22	76
9-Jun	1.12	0.00	48	79	0.000	1.12	70
10-Jun	1.19	0.00	48	74	0.000	1.19	74
11-Jun	1.12	0.00	53	74	0.000	1.12	70
12-Jun	1.17	0.00	49	74	0.000	1.17	73
13-Jun	1.14	0.00	49	76	0.000	1.14	71
14-Jun	1.04	0.00	53	65	0.000	1.04	65
15-Jun	1.16	0.00	48	76	0.000	1.16	72
16-Jun	1.16	0.02	52	74	0.000	1.16	72
17-Jun	1.13	0.00	54	72	0.000	1.13	70
18-Jun	1.08	0.02	54	75	0.000	1.08	67
19-Jun	1.16	0.13	49	70	0.000	1.16	72
20-Jun	1.04	0.01	47	67	0.000	1.04	65
21-Jun	1.12	0.42	49	66	0.000	1.12	70
22-Jun	1.11	0.02	45	67	0.000	1.11	69
23-Jun	1.16	0.00	48	74	0.000	1.16	72
24-Jun	1.09	0.00	55	74	0.000	1.09	68
25-Jun	1.11	0.06	44	64	0.000	1.11	69
26-Jun	1.01	0.00	42	70	0.000	1.01	63
27-Jun	1.05	0.00	48	78	0.000	1.05	65
28-Jun	1.03	0.00	40	71	0.000	1.03	64
29-Jun	1.18	0.00	42	73	0.000	1.18	73
30-Jun	1.08	0.00	40	74	0.000	1.08	67
1-Jul	1.13	0.00	46	78	0.000	1.13	71
2-Jul	1.20	0.00	48	84	0.000	1.20	75
3-Jul	1.05	0.00	52	89	0.000	1.05	65
4-Jul	1.00	0.00	52	86	0.000	1.00	62
5-Jul	0.99	0.00	53	88	0.000	0.99	62
6-Jul	1.10	0.07	53	64	0.000	1.10	68

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
7-Jul	1.01	0.00	53	65	0.000	1.01	63
8-Jul	1.21	0.03	52	63	0.000	1.21	75
9-Jul	1.11	0.00	47	74	0.000	1.11	69
10-Jul	1.11	0.00	50	84	0.000	1.11	69
11-Jul	1.14	0.00	52	86	0.000	1.14	71
12-Jul	1.01	0.24	54	63	0.000	1.01	63
13-Jul	1.05	0.02	53	62	0.000	1.05	66
14-Jul	1.06	0.00	49	75	0.000	1.06	66
15-Jul	1.16	0.00	49	80	0.000	1.16	72
16-Jul	1.12	0.00	53	85	0.000	1.12	70
17-Jul	1.05	0.00	52	87	0.000	1.05	65
18-Jul	1.05	0.00	54	73	0.000	1.05	66
19-Jul	1.06	0.00	48	76	0.000	1.06	66
20-Jul	1.12	0.00	51	83	0.000	1.12	70
21-Jul	1.06	0.00	53	89	0.000	1.06	66
22-Jul	1.17	0.00	54	83	0.000	1.17	73
23-Jul	1.05	0.00	55	72	0.000	1.05	66
24-Jul	1.12	0.07	56	81	0.000	1.12	70
25-Jul	0.92	0.04	59	88	0.000	0.92	57
26-Jul	1.09	0.00	60	89	0.000	1.09	68
27-Jul	1.06	0.00	64	95	0.000	1.06	66
28-Jul	1.09	0.00	65	95	0.000	1.09	68
29-Jul	1.03	0.00	67	104	0.000	1.03	64
30-Jul	1.05	0.00	57	96	0.000	1.05	66
31-Jul	1.03	0.00	53	84	0.000	1.03	64
1-Aug	1.03	0.00	54	88	0.000	1.03	64
2-Aug	1.00	0.00	54	89	0.000	1.00	62
3-Aug	1.09	0.00	51	84	0.000	1.09	68
4-Aug	1.03	0.00	50	80	0.000	1.03	64
5-Aug	0.99	0.00	47	72	0.000	0.99	62
6-Aug	1.11	0.00	52	69	0.000	1.11	69
7-Aug	1.06	0.00	54	66	0.000	1.06	66
8-Aug	1.01	0.00	58	70	0.000	1.01	63
9-Aug	1.06	0.00	53	80	0.000	1.06	66
10-Aug	1.14	0.50	57	69	0.000	1.14	71
11-Aug	1.02	0.05	54	76	0.000	1.02	63
12-Aug	1.08	0.16	53	74	0.000	1.08	67
13-Aug	1.05	0.03	53	67	0.000	1.05	65
14-Aug	1.00	0.00	54	68	0.000	1.00	62
15-Aug	0.97	0.00	46	73	0.000	0.97	60
16-Aug	1.11	0.00	47	77	0.000	1.11	69
17-Aug	1.13	0.00	51	83	0.000	1.13	70
18-Aug	1.25	0.00	52	87	0.000	1.25	78
19-Aug	1.05	0.00	55	89	0.000	1.05	66
20-Aug	1.08	0.00	58	88	0.000	1.08	67
21-Aug	0.97	0.00	53	72	0.000	0.97	60
22-Aug	0.98	0.00	48	73	0.000	0.98	61
23-Aug	1.03	0.00	44	73	0.000	1.03	64
24-Aug	1.06	0.00	44	79	0.000	1.06	66

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
25-Aug	0.98	0.00	45	71	0.000	0.98	61
26-Aug	1.03	0.00	46	81	0.000	1.03	64
27-Aug	1.01	0.00	47	89	0.000	1.01	63
28-Aug	0.89	0.00	50	77	0.000	0.89	55
29-Aug	1.00	0.00	50	77	0.000	1.00	62
30-Aug	0.99	0.00	50	80	0.000	0.99	62
31-Aug	1.02	0.00	51	78	0.000	1.02	63
1-Sep	1.12	0.00	52	72	0.000	1.12	70
2-Sep	1.13	0.38	51	80	0.000	1.13	70
3-Sep	1.01	0.00	53	75	0.000	1.01	63
4-Sep	1.02	0.06	54	84	0.000	1.02	63
5-Sep	0.96	0.20	52	72	0.000	0.96	60
6-Sep	1.03	0.32	52	62	0.000	1.03	64
7-Sep	1.04	0.00	47	71	0.000	1.04	65
8-Sep	1.12	0.00	47	73	0.000	1.12	70
9-Sep	1.16	0.03	52	71	0.000	1.16	72
10-Sep	1.04	0.00	48	76	0.000	1.04	65
11-Sep	1.03	0.00	49	89	0.000	1.03	64
12-Sep	0.92	0.00	51	88	0.000	0.92	58
13-Sep	1.07	0.00	51	83	0.000	1.07	67
14-Sep	1.06	0.00	53	73	0.000	1.06	66
15-Sep	2.29	0.00	54	82	0.000	2.29	143
16-Sep	0.93	0.00	52	78	0.000	0.93	58
17-Sep	1.02	0.00	50	78	0.000	1.02	63
18-Sep	1.04	0.50	51	86	0.000	1.04	65
19-Sep	0.97	0.17	50	75	0.000	0.97	60
20-Sep	1.06	0.00	41	69	0.000	1.06	66
21-Sep	1.05	0.00	41	75	0.000	1.05	65
22-Sep	1.00	0.00	44	92	0.000	1.00	62
23-Sep	1.02	0.00	48	84	0.000	1.02	63
24-Sep	1.01	0.00	40	71	0.000	1.01	63
25-Sep	1.03	0.00	41	75	0.000	1.03	64
26-Sep	0.94	0.00	36	70	0.000	0.94	58
27-Sep	0.98	0.00	36	71	0.000	0.98	61
28-Sep	1.06	0.14	38	66	0.000	1.06	66
29-Sep	1.01	0.70	43	56	0.000	1.01	63
30-Sep	1.03	0.04	41	62	0.000	1.03	64
1-Oct	1.16	0.56	45	58	0.000	1.16	72
2-Oct	1.04	0.01	34	61	0.000	1.04	65
3-Oct	0.97	0.00	33	61	0.000	0.97	60
4-Oct	1.05	0.00	33	69	0.000	1.05	65
5-Oct	1.05	0.00	33	68	0.000	1.05	65
6-Oct	1.05	0.00	34	65	0.000	1.05	65
7-Oct	1.02	0.00	35	63	0.000	1.02	63
8-Oct	1.05	0.00	35	66	0.000	1.05	66
9-Oct	1.07	0.00	35	64	0.000	1.07	67
10-Oct	0.97	0.00	29	65	0.000	0.97	60
11-Oct	1.05	0.00	27	58	0.000	1.05	66
12-Oct	1.00	0.00	27	56	0.000	1.00	62

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
13-Oct	1.01	0.25	43	62	0.000	1.01	63
14-Oct	1.13	0.17	48	62	0.000	1.13	70
15-Oct	1.04	0.07	48	66	0.000	1.04	65
16-Oct	1.42	1.93	53	67	0.000	1.42	88
17-Oct	1.81	1.58	53	62	0.000	1.81	112
18-Oct	1.18	0.06	46	60	0.000	1.18	73
19-Oct	1.14	0.00	42	59	0.000	1.14	71
20-Oct	1.06	0.04	42	60	0.000	1.06	66
21-Oct	1.14	0.28	43	58	0.000	1.14	71
22-Oct	1.07	0.46	44	56	0.000	1.07	66
23-Oct	1.15	0.49	41	57	0.000	1.15	72
24-Oct	1.02	0.00	32	58	0.000	1.02	63
25-Oct	1.24	1.25	32	48	0.000	1.24	77
26-Oct	1.51	0.50	42	56	0.000	1.51	94
27-Oct	1.23	0.09	33	50	0.000	1.23	77
28-Oct	1.12	0.26	34	48	0.000	1.12	70
29-Oct	1.34	0.62	41	48	0.000	1.34	83
30-Oct	1.30	0.78	39	61	0.000	1.30	81
31-Oct	1.42	0.32	30	52	0.000	1.42	88
1-Nov	1.26	0.00	34	59	0.000	1.26	78
2-Nov	1.25	0.00	32	56	0.000	1.25	78
3-Nov	1.26	0.00	31	59	0.000	1.26	79
4-Nov	1.19	0.00	34	63	0.000	1.19	74
5-Nov	1.34	0.49	44	62	0.000	1.34	83
6-Nov	1.24	0.12	42	53	0.000	1.24	77
7-Nov	1.24	0.40	42	47	0.000	1.24	77
8-Nov	1.28	0.01	43	54	0.000	1.28	80
9-Nov	1.37	0.65	42	51	0.000	1.37	85
10-Nov	1.35	0.45	40	48	0.000	1.35	84
11-Nov	1.24	0.04	33	51	0.000	1.24	77
12-Nov	1.61	0.08	32	54	0.000	1.61	100
13-Nov	1.18	0.12	29	47	0.000	1.18	73
14-Nov	1.26	0.25	31	46	0.000	1.26	79
15-Nov	1.28	0.14	40	56	0.000	1.28	80
16-Nov	1.56	1.09	43	56	0.000	1.56	97
17-Nov	1.47	0.24	38	51	0.000	1.47	91
18-Nov	1.40	0.27	38	47	0.000	1.40	87
19-Nov	1.59	0.62	42	54	0.000	1.59	99
20-Nov	1.59	0.27	35	50	0.000	1.59	99
21-Nov	1.39	0.43	36	46	0.000	1.39	86
22-Nov	1.61	0.50	38	44	0.000	1.61	100
23-Nov	1.51	0.17	41	50	0.000	1.51	94
24-Nov	1.52	0.04	42	50	0.000	1.52	95
25-Nov	1.78	1.31	45	59	0.000	1.78	111
26-Nov	1.70	0.03	43	50	0.000	1.70	105
27-Nov	1.42	0.00	35	50	0.000	1.42	88
28-Nov	1.44	0.12	42	48	0.000	1.44	90
29-Nov	1.44	0.00	43	51	0.000	1.44	90
30-Nov	1.38	0.12	30	49	0.000	1.38	86

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
1-Dec	1.29	0.00	24	49	0.000	1.29	80
2-Dec	1.32	0.00	24	46	0.000	1.32	82
3-Dec	1.29	0.00	23	44	0.000	1.29	80
4-Dec	1.33	0.00	20	42	0.000	1.33	83
5-Dec	1.19	0.00	20	45	0.000	1.19	74
6-Dec	1.22	0.00	14	36	0.000	1.22	76
7-Dec	1.12	0.00	11	35	0.000	1.12	70
8-Dec	1.19	0.00	11	34	0.000	1.19	74
9-Dec	1.14	0.00	8	35	0.000	1.14	71
10-Dec	1.15	0.00	9	37	0.000	1.15	72
11-Dec	1.09	0.00	13	35	0.000	1.09	68
12-Dec	1.11	0.00	13	39	0.000	1.11	69
13-Dec	1.09	0.16	25	34	0.000	1.09	68
14-Dec	1.22	0.27	28	44	0.000	1.22	76
15-Dec	1.23	0.37	37	51	0.000	1.23	76
16-Dec	1.15	0.09	42	51	0.000	1.15	72
17-Dec	1.14	0.00	38	50	0.000	1.14	71
18-Dec	1.16	0.13	40	50	0.000	1.16	72
19-Dec	1.20	0.29	42	49	0.000	1.20	75
20-Dec	1.16	0.37	46	55	0.000	1.16	72
21-Dec	1.86	1.73	31	51	0.000	1.86	116
22-Dec	1.48	0.03	31	43	0.000	1.48	92
23-Dec	1.51	0.00	25	45	0.000	1.51	94
24-Dec	1.49	0.00	21	42	0.000	1.49	93
25-Dec	1.13	0.00	22	46	0.000	1.13	70
26-Dec	1.24	0.00	22	52	0.000	1.24	77
27-Dec	1.23	0.00	21	51	0.000	1.23	77
28-Dec	1.20	0.00	24	44	0.000	1.20	75
29-Dec	1.23	0.07	24	41	0.000	1.23	76
30-Dec	1.21	0.02	34	44	0.000	1.21	75
31-Dec	1.27	0.36	35	52	0.000	1.27	79
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1-Jan	1.15	0.04	46	52	0.000	1.15	71
2-Jan	1.11	0.05	38	49	0.000	1.11	68
3-Jan	1.27	0.30	38	47	0.000	1.27	78
4-Jan	1.54	1.26	42	46	0.000	1.54	94
5-Jan	1.63	0.26	35	45	0.000	1.63	100
6-Jan	1.42	0.00	28	50	0.000	1.42	87
7-Jan	1.38	0.20	29	46	0.000	1.38	85
8-Jan	1.48	0.35	39	50	0.000	1.48	91
9-Jan	1.44	0.00	37	61	0.000	1.44	88
10-Jan	1.34	0.15	37	51	0.000	1.34	83
11-Jan	1.64	0.83	45	54	0.000	1.64	100
12-Jan	1.52	0.11	45	54	0.000	1.52	94
13-Jan	1.64	0.32	44	53	0.000	1.64	100
14-Jan	1.40	0.02	45	58	0.000	1.40	86
15-Jan	1.55	0.46	28	53	0.000	1.55	95
16-Jan	1.36	0.16	28	47	0.000	1.36	84
17-Jan	1.45	0.07	43	57	0.000	1.45	89

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
18-Jan	1.44	0.02	40	59	0.000	1.44	89
19-Jan	1.40	0.00	39	60	0.000	1.40	86
20-Jan	1.28	0.00	34	62	0.000	1.28	79
21-Jan	1.27	0.00	33	63	0.000	1.27	78
22-Jan	1.30	0.00	34	53	0.000	1.30	80
23-Jan	1.15	0.00	29	49	0.000	1.15	71
24-Jan	1.21	0.25	35	45	0.000	1.21	75
25-Jan	1.22	0.02	30	54	0.000	1.22	75
26-Jan	1.18	0.00	29	51	0.000	1.18	72
27-Jan	1.10	0.00	29	53	0.000	1.10	67
28-Jan	1.16	0.00	37	52	0.000	1.16	71
29-Jan	1.15	0.14	39	56	0.000	1.15	70
30-Jan	1.06	0.12	39	50	0.000	1.06	65
31-Jan	1.19	0.08	36	47	0.000	1.19	73
1-Feb	1.13	0.07	35	48	0.000	1.13	70
2-Feb	1.09	0.00	33	56	0.000	1.09	67
3-Feb	1.12	0.12	34	49	0.000	1.12	69
4-Feb	1.23	0.13	38	58	0.000	1.23	75
5-Feb	1.09	0.00	---	---	0.000	1.09	67
6-Feb	1.07	0.12	---	---	0.000	1.07	66
7-Feb	1.09	0.05	---	---	0.000	1.09	67
8-Feb	1.10	0.00	28	56	0.000	1.10	67
9-Feb	1.10	0.00	28	54	0.000	1.10	67
10-Feb	1.13	0.25	30	48	0.000	1.13	69
11-Feb	1.12	0.18	30	50	0.000	1.12	69
12-Feb	1.14	0.14	44	55	0.000	1.14	70
13-Feb	1.17	0.50	42	53	0.000	1.17	72
14-Feb	1.13	0.15	35	54	0.000	1.13	69
15-Feb	1.19	0.13	35	57	0.000	1.19	73
16-Feb	1.22	0.20	30	49	0.000	1.22	75
17-Feb	1.15	0.00	27	57	0.000	1.15	70
18-Feb	1.14	0.00	27	60	0.000	1.14	70
19-Feb	1.12	0.00	27	60	0.000	1.12	69
20-Feb	1.09	0.00	22	60	0.000	1.09	67
21-Feb	1.12	0.00	22	59	0.000	1.12	69
22-Feb	1.10	0.00	26	61	0.000	1.10	67
23-Feb	1.10	0.23	28	51	0.000	1.10	68
24-Feb	1.14	0.08	40	51	0.000	1.14	70
25-Feb	1.10	0.02	43	59	0.000	1.10	68
26-Feb	1.12	0.36	45	55	0.000	1.12	68
27-Feb	1.09	0.08	43	59	0.000	1.09	67
28-Feb	1.09	0.00	39	62	0.000	1.09	67
1-Mar	1.17	0.00	38	65	0.000	1.17	72
2-Mar	1.02	0.13	43	61	0.000	1.02	63
3-Mar	1.00	0.00	32	56	0.000	1.00	62
4-Mar	1.10	0.00	31	56	0.000	1.10	67
5-Mar	1.03	0.00	29	60	0.000	1.03	63
6-Mar	1.07	0.00	29	62	0.000	1.07	66
7-Mar	1.06	0.11	30	62	0.000	1.06	65

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
8-Mar	1.06	0.01	26	49	0.000	1.06	65
9-Mar	1.07	0.03	31	49	0.000	1.07	65
10-Mar	1.10	0.03	35	53	0.000	1.10	68
11-Mar	1.16	0.65	39	46	0.000	1.16	71
12-Mar	1.13	0.03	39	52	0.000	1.13	69
13-Mar	1.07	0.00	29	53	0.000	1.07	66
14-Mar	1.05	0.08	29	56	0.000	1.05	65
15-Mar	1.12	0.00	43	67	0.000	1.12	68
16-Mar	1.16	0.20	41	62	0.000	1.16	71
17-Mar	1.15	0.00	27	55	0.000	1.15	71
18-Mar	1.00	0.00	27	54	0.000	1.00	61
19-Mar	1.06	0.00	28	63	0.000	1.06	65
20-Mar	1.00	0.00	31	69	0.000	1.00	62
21-Mar	1.13	0.27	41	57	0.000	1.13	69
22-Mar	0.99	0.02	36	58	0.000	0.99	61
23-Mar	1.06	0.00	35	60	0.000	1.06	65
24-Mar	1.04	0.03	35	74	0.000	1.04	64
25-Mar	1.47	1.69	40	56	0.000	1.47	90
26-Mar	1.16	0.03	40	57	0.000	1.16	71
27-Mar	1.10	0.14	41	67	0.000	1.10	68
28-Mar	1.18	0.23	44	57	0.000	1.18	72
29-Mar	1.17	0.14	37	50	0.000	1.17	72
30-Mar	1.12	0.10	37	53	0.000	1.12	69
31-Mar	1.09	0.02	38	57	0.000	1.09	67
1-Apr	1.07	0.01	40	55	0.000	1.07	66
2-Apr	1.20	0.29	38	50	0.000	1.20	74
3-Apr	1.17	0.14	37	50	0.000	1.17	72
4-Apr	1.14	0.13	37	60	0.000	1.14	70
5-Apr	1.39	0.92	38	56	0.000	1.39	86
6-Apr	1.29	0.05	38	53	0.000	1.29	79
7-Apr	1.48	0.68	35	49	0.000	1.48	91
8-Apr	1.18	0.04	34	50	0.000	1.18	73
9-Apr	1.27	0.10	29	52	0.000	1.27	78
10-Apr	1.19	0.00	30	63	0.000	1.19	73
11-Apr	1.25	0.00	38	63	0.000	1.25	77
12-Apr	1.28	0.06	41	56	0.000	1.28	79
13-Apr	1.38	0.55	39	52	0.000	1.38	85
14-Apr	1.25	0.00	36	63	0.000	1.25	77
15-Apr	1.20	0.00	36	63	0.000	1.20	74
16-Apr	1.34	0.08	36	68	0.000	1.34	82
17-Apr	1.07	0.11	38	64	0.000	1.07	66
18-Apr	1.17	0.00	45	72	0.000	1.17	72
19-Apr	1.22	0.00	49	76	0.000	1.22	75
20-Apr	1.21	0.84	44	57	0.000	1.21	74
21-Apr	1.46	0.33	39	55	0.000	1.46	90
22-Apr	1.28	0.00	35	60	0.000	1.28	79
23-Apr	1.25	0.38	38	61	0.000	1.25	77
24-Apr	1.34	0.29	40	57	0.000	1.34	82
25-Apr	1.41	0.00	41	62	0.000	1.41	87

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
26-Apr	1.28	0.33	46	73	0.000	1.28	78
27-Apr	1.33	0.40	44	60	0.000	1.33	82
28-Apr	1.44	0.40	41	58	0.000	1.44	88
29-Apr	1.20	0.00	45	60	0.000	1.20	74
30-Apr	1.10	0.18	43	58	0.000	1.10	67
1-May	1.05	0.16	43	58	0.000	1.05	65
2-May	1.18	0.47	43	52	0.000	1.18	72
3-May	1.12	0.00	39	53	0.000	1.12	68
4-May	1.12	0.03	33	56	0.000	1.12	69
5-May	1.10	0.03	36	52	0.000	1.10	67
6-May	1.07	0.00	33	62	0.000	1.07	65
7-May	1.09	0.00	34	67	0.000	1.09	67
8-May	1.01	0.00	35	69	0.000	1.01	62
9-May	1.03	0.00	36	69	0.000	1.03	63
10-May	1.09	0.00	38	56	0.000	1.09	67
11-May	1.19	0.00	41	68	0.000	1.19	73
12-May	1.07	0.00	38	65	0.000	1.07	66
13-May	1.06	0.00	40	71	0.000	1.06	65
14-May	0.98	0.00	41	72	0.000	0.98	60
15-May	1.04	0.00	43	74	0.000	1.04	64
16-May	0.96	0.00	46	71	0.000	0.96	59
17-May	1.05	0.02	49	74	0.000	1.05	64
18-May	1.11	0.06	47	68	0.000	1.11	68
19-May	1.18	0.38	40	79	0.000	1.18	73
20-May	1.00	0.02	41	59	0.000	1.00	61
21-May	1.13	0.00	42	62	0.000	1.13	69
22-May	1.11	0.15	45	62	0.000	1.11	68
23-May	1.15	0.00	43	61	0.000	1.15	71
24-May	1.04	0.00	47	67	0.000	1.04	64
25-May	1.09	0.05	50	67	0.000	1.09	67
26-May	1.19	0.42	45	63	0.000	1.19	73
27-May	1.13	1.12	47	56	0.000	1.13	70
28-May	1.43	0.76	48	54	0.000	1.43	88
29-May	1.31	0.75	43	52	0.000	1.31	80
30-May	1.23	0.24	44	61	0.000	1.23	76
31-May	1.44	0.31	51	67	0.000	1.44	89
1-Jun	1.09	0.57	51	65	0.000	1.09	67
2-Jun	1.11	0.16	45	66	0.000	1.11	68
3-Jun	1.49	0.31	47	66	0.000	1.49	91
4-Jun	1.15	0.05	47	62	0.000	1.15	70
5-Jun	1.02	0.04	49	71	0.000	1.02	63
6-Jun	1.02	1.41	52	65	0.000	1.02	63
7-Jun	1.12	0.12	42	65	0.000	1.12	69
8-Jun	1.42	0.62	45	72	0.000	1.42	87
9-Jun	1.73	1.47	48	67	0.000	1.73	106
10-Jun	1.63	0.06	49	65	0.000	1.63	100
11-Jun	1.36	0.02	43	65	0.000	1.36	83
12-Jun	1.22	0.00	44	76	0.000	1.22	75
13-Jun	1.20	0.00	43	67	0.000	1.20	74

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
14-Jun	1.24	0.06	47	65	0.000	1.24	76
15-Jun	1.32	0.35	46	62	0.000	1.32	81
16-Jun	1.18	0.16	46	64	0.000	1.18	73
17-Jun	1.24	0.02	49	56	0.000	1.24	76
18-Jun	1.14	0.00	49	70	0.000	1.14	70
19-Jun	1.07	0.12	50	66	0.000	1.07	65
20-Jun	1.18	0.23	48	57	0.000	1.18	73
21-Jun	1.19	0.04	48	65	0.000	1.19	73
22-Jun	1.15	0.00	52	75	0.000	1.15	70
23-Jun	1.10	0.00	49	80	0.000	1.10	67
24-Jun	1.10	0.00	53	76	0.000	1.10	68
25-Jun	1.10	0.00	50	68	0.000	1.10	68
26-Jun	1.10	0.00	49	71	0.000	1.10	68
27-Jun	0.99	0.00	52	68	0.000	0.99	60
28-Jun	1.02	0.00	51	76	0.000	1.02	62
29-Jun	0.98	0.09	48	67	0.000	0.98	60
30-Jun	0.92	0.00	46	68	0.000	0.92	57
1-Jul	0.98	0.02	49	64	0.000	0.98	60
2-Jul	0.96	0.00	50	70	0.000	0.96	59
3-Jul	0.92	0.00	45	70	0.000	0.92	57
4-Jul	0.90	0.00	48	58	0.000	0.90	55
5-Jul	0.97	0.05	44	69	0.000	0.97	59
6-Jul	1.00	0.00	49	79	0.000	1.00	61
7-Jul	0.95	0.00	55	91	0.000	0.95	58
8-Jul	0.93	0.00	57	95	0.000	0.93	57
9-Jul	0.96	0.00	60	91	0.000	0.96	59
10-Jul	0.96	0.00	53	84	0.000	0.96	59
11-Jul	0.97	0.00	52	79	0.000	0.97	60
12-Jul	0.98	0.00	51	68	0.000	0.98	60
13-Jul	0.91	0.00	46	72	0.000	0.91	56
14-Jul	0.95	0.00	49	80	0.000	0.95	58
15-Jul	0.98	0.00	48	79	0.000	0.98	60
16-Jul	0.91	0.00	49	73	0.000	0.91	56
17-Jul	0.87	0.00	49	76	0.000	0.87	53
18-Jul	0.90	0.00	51	73	0.000	0.90	55
19-Jul	1.01	0.00	49	72	0.000	1.01	62
20-Jul	0.92	0.00	50	77	0.000	0.92	57
21-Jul	0.92	0.00	51	80	0.000	0.92	56
22-Jul	0.92	0.00	49	72	0.000	0.92	56
23-Jul	0.87	0.00	49	79	0.000	0.87	54
24-Jul	0.95	0.00	49	85	0.000	0.95	58
25-Jul	0.91	0.00	50	84	0.000	0.91	56
26-Jul	0.89	0.00	52	85	0.000	0.89	55
27-Jul	0.96	0.00	52	85	0.000	0.96	59
28-Jul	0.90	0.00	51	76	0.000	0.90	55
29-Jul	0.88	0.00	48	76	0.000	0.88	54
30-Jul	0.94	0.00	49	79	0.000	0.94	58
31-Jul	0.91	0.00	52	74	0.000	0.91	56
1-Aug	0.91	0.00	51	71	0.000	0.91	56

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
2-Aug	0.93	0.00	51	77	0.000	0.93	57
3-Aug	0.94	0.00	52	78	0.000	0.94	58
4-Aug	0.86	0.00	55	83	0.000	0.86	52
5-Aug	0.90	0.00	51	84	0.000	0.90	55
6-Aug	0.92	0.00	54	70	0.000	0.92	56
7-Aug	0.92	0.47	54	67	0.000	0.92	56
8-Aug	0.94	0.00	53	66	0.000	0.94	57
9-Aug	0.93	0.05	54	65	0.000	0.93	57
10-Aug	0.85	0.00	49	72	0.000	0.85	52
11-Aug	0.93	0.00	49	80	0.000	0.93	57
12-Aug	1.09	0.00	50	80	0.000	1.09	67
13-Aug	0.90	0.00	50	88	0.000	0.90	55
14-Aug	0.88	0.00	53	96	0.000	0.88	54
15-Aug	0.86	0.00	56	96	0.000	0.86	53
16-Aug	0.89	0.00	54	91	0.000	0.89	54
17-Aug	0.85	0.00	50	87	0.000	0.85	52
18-Aug	0.87	0.00	52	75	0.000	0.87	54
19-Aug	0.84	0.00	48	71	0.000	0.84	52
20-Aug	0.83	0.00	44	70	0.000	0.83	51
21-Aug	0.86	0.14	45	72	0.000	0.86	53
22-Aug	0.88	0.00	43	68	0.000	0.88	54
23-Aug	0.92	0.00	44	75	0.000	0.92	57
24-Aug	0.84	0.00	48	85	0.000	0.84	52
25-Aug	0.89	0.00	49	84	0.000	0.89	55
26-Aug	0.84	0.19	50	63	0.000	0.84	52
27-Aug	0.86	0.05	42	69	0.000	0.86	53
28-Aug	0.86	0.00	42	71	0.000	0.86	53
29-Aug	0.86	0.00	43	67	0.000	0.86	53
30-Aug	0.88	0.00	46	72	0.000	0.88	54
31-Aug	1.07	1.22	50	57	0.000	1.07	66
1-Sep	0.92	0.00	42	70	0.000	0.92	56
2-Sep	0.92	0.00	43	79	0.000	0.92	56
3-Sep	0.90	0.00	48	81	0.000	0.90	55
4-Sep	0.84	0.00	48	68	0.000	0.84	51
5-Sep	0.79	0.07	48	65	0.000	0.79	48
6-Sep	1.04	0.75	50	58	0.000	1.04	64
7-Sep	0.98	0.04	51	65	0.000	0.98	60
8-Sep	0.92	0.00	52	68	0.000	0.92	56
9-Sep	0.89	0.00	53	67	0.000	0.89	55
10-Sep	0.88	0.11	47	62	0.000	0.88	54
11-Sep	0.83	0.12	43	70	0.000	0.83	51
12-Sep	0.96	0.21	53	63	0.000	0.96	59
13-Sep	0.91	0.00	52	73	0.000	0.91	56
14-Sep	0.88	0.00	47	73	0.000	0.88	54
15-Sep	0.89	0.11	50	71	0.000	0.89	55
16-Sep	0.98	0.40	58	68	0.000	0.98	60
17-Sep	0.88	0.72	57	73	0.000	0.88	54
18-Sep	1.08	0.51	51	76	0.000	1.08	66
19-Sep	1.02	0.03	54	69	0.000	1.02	63

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
20-Sep	1.21	1.08	47	59	0.000	1.21	74
21-Sep	0.97	0.00	40	67	0.000	0.97	59
22-Sep	0.95	0.04	40	71	0.000	0.95	58
23-Sep	0.96	0.17	51	58	0.000	0.96	59
24-Sep	0.94	0.00	50	68	0.000	0.94	57
25-Sep	0.91	0.28	50	80	0.000	0.91	56
26-Sep	1.01	0.09	51	68	0.000	1.01	62
27-Sep	0.97	0.00	59	74	0.000	0.97	60
28-Sep	0.87	0.00	46	71	0.000	0.87	53
29-Sep	0.95	0.00	43	68	0.000	0.95	58
30-Sep	0.93	0.00	44	72	0.000	0.93	57
1-Oct	0.91	0.01	45	77	0.000	0.91	56
2-Oct	0.87	0.00	51	67	0.000	0.87	54
3-Oct	0.87	0.00	48	62	0.000	0.87	53
4-Oct	0.89	0.00	38	64	0.000	0.89	54
5-Oct	0.84	0.00	38	65	0.000	0.84	51
6-Oct	0.90	0.00	37	72	0.000	0.90	56
7-Oct	0.83	0.00	43	68	0.000	0.83	51
8-Oct	0.85	0.29	54	70	0.000	0.85	52
9-Oct	1.01	0.83	51	66	0.000	1.01	62
10-Oct	1.01	0.01	42	65	0.000	1.01	62
11-Oct	0.98	0.00	42	64	0.000	0.98	60
12-Oct	0.95	0.00	36	66	0.000	0.95	58
13-Oct	0.93	0.00	35	73	0.000	0.93	57
14-Oct	0.86	0.00	39	61	0.000	0.86	53
15-Oct	0.87	0.00	30	60	0.000	0.87	54
16-Oct	0.84	0.00	28	58	0.000	0.84	52
17-Oct	0.85	0.00	28	61	0.000	0.85	52
18-Oct	0.89	0.00	34	56	0.000	0.89	55
19-Oct	0.87	0.00	34	67	0.000	0.87	53
20-Oct	0.91	0.00	36	69	0.000	0.91	56
21-Oct	0.84	0.00	36	65	0.000	0.84	51
22-Oct	0.85	0.05	43	65	0.000	0.85	52
23-Oct	0.90	0.61	44	63	0.000	0.90	56
24-Oct	1.02	0.49	45	53	0.000	1.02	63
25-Oct	1.01	0.34	42	52	0.000	1.01	62
26-Oct	0.94	0.08	43	49	0.000	0.94	57
27-Oct	0.91	0.02	43	63	0.000	0.91	56
28-Oct	0.89	0.07	46	53	0.000	0.89	55
29-Oct	0.84	0.00	38	61	0.000	0.84	51
30-Oct	0.88	0.46	38	53	0.000	0.88	54
31-Oct	0.98	0.24	45	54	0.000	0.98	60
1-Nov	1.03	0.46	44	59	0.000	1.03	63
2-Nov	0.94	0.00	38	64	0.000	0.94	58
3-Nov	0.93	0.00	37	75	0.000	0.93	57
4-Nov	0.92	0.00	38	70	0.000	0.92	56
5-Nov	0.90	0.08	45	53	0.000	0.90	55
6-Nov	0.88	0.28	45	56	0.000	0.88	54
7-Nov	1.05	0.96	39	54	0.000	1.05	65

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
8-Nov	1.10	0.09	39	53	0.000	1.10	67
9-Nov	0.88	0.03	29	48	0.000	0.88	54
10-Nov	0.94	0.00	29	53	0.000	0.94	57
11-Nov	0.94	0.26	31	51	0.000	0.94	57
12-Nov	0.85	0.11	40	55	0.000	0.85	52
13-Nov	0.89	0.31	40	48	0.000	0.89	55
14-Nov	0.94	0.16	43	51	0.000	0.94	57
15-Nov	1.07	0.54	42	54	0.000	1.07	65
16-Nov	0.96	0.15	42	52	0.000	0.96	59
17-Nov	1.26	1.26	34	48	0.000	1.26	78
18-Nov	1.21	0.10	35	42	0.000	1.21	74
19-Nov	1.01	0.13	33	48	0.000	1.01	62
20-Nov	1.05	0.00	29	46	0.000	1.05	64
21-Nov	1.14	0.00	20	35	0.000	1.14	70
22-Nov	0.99	0.15	11	30	0.000	0.99	61
23-Nov	0.98	0.00	11	29	0.000	0.98	60
24-Nov	1.03	0.08	16	29	0.000	1.03	63
25-Nov	1.00	0.20	26	43	0.000	1.00	61
26-Nov	1.05	0.10	32	48	0.000	1.05	64
27-Nov	0.97	0.23	32	42	0.000	0.97	59
28-Nov	0.98	0.00	29	42	0.000	0.98	60
29-Nov	0.99	0.15	32	41	0.000	0.99	61
30-Nov	0.91	0.42	36	47	0.000	0.91	56
1-Dec	0.90	0.05	31	48	0.000	0.90	55
2-Dec	0.88	0.26	31	49	0.000	0.88	54
3-Dec	0.88	0.00	23	48	0.000	0.88	54
4-Dec	0.96	0.00	22	48	0.000	0.96	59
5-Dec	0.94	0.00	27	46	0.000	0.94	58
6-Dec	0.97	0.00	27	48	0.000	0.97	60
7-Dec	0.88	0.34	43	55	0.000	0.88	54
8-Dec	1.00	0.74	44	53	0.000	1.00	61
9-Dec	1.02	0.41	39	52	0.000	1.02	63
10-Dec	0.96	0.02	37	51	0.000	0.96	59
11-Dec	1.06	0.84	37	54	0.000	1.06	65
12-Dec	1.34	0.43	37	57	0.000	1.34	82
13-Dec	1.25	0.67	37	54	0.000	1.25	77
14-Dec	1.35	0.11	38	45	0.000	1.35	83
15-Dec	1.22	0.00	30	45	0.000	1.22	75
16-Dec	1.17	0.00	31	45	0.000	1.17	72
17-Dec	1.13	0.00	28	52	0.000	1.13	69
18-Dec	1.14	0.10	31	48	0.000	1.14	70
19-Dec	1.09	0.00	30	48	0.000	1.09	67
20-Dec	1.09	0.07	34	45	0.000	1.09	67
21-Dec	0.98	0.02	34	53	0.000	0.98	60
22-Dec	0.95	0.00	37	52	0.000	0.95	58
23-Dec	0.95	0.24	40	54	0.000	0.95	58
24-Dec	0.99	0.34	43	52	0.000	0.99	61
25-Dec	0.87	0.15	41	54	0.000	0.87	53
26-Dec	0.96	0.15	38	46	0.000	0.96	59

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
27-Dec	0.95	0.24	37	46	0.000	0.95	58
28-Dec	1.02	0.05	32	44	0.000	1.02	62
29-Dec	1.13	0.21	21	38	0.000	1.13	70
30-Dec	1.02	0.00	18	38	0.000	1.02	63
31-Dec	1.07	0.00	15	38	0.000	1.07	65
2011							
1-Jan	1.00	0.00	15	42	0.000	1.00	61
2-Jan	1.07	0.00	15	41	0.000	1.07	65
3-Jan	1.00	0.00	17	44	0.000	1.00	61
4-Jan	1.07	0.30	23	36	0.000	1.07	66
5-Jan	1.05	0.18	33	47	0.000	1.05	65
6-Jan	1.02	0.72	40	48	0.000	1.02	62
7-Jan	1.13	0.49	33	49	0.000	1.13	70
8-Jan	1.44	1.12	31	36	0.000	1.44	88
9-Jan	1.44	0.03	29	38	0.000	1.44	89
10-Jan	1.27	0.00	25	37	0.000	1.27	78
11-Jan	1.27	0.31	25	41	0.000	1.27	78
12-Jan	1.22	0.57	38	48	0.000	1.22	75
13-Jan	1.24	0.08	45	55	0.000	1.24	76
14-Jan	1.17	0.02	48	56	0.000	1.17	72
15-Jan	1.26	0.95	45	56	0.000	1.26	77
16-Jan	1.45	1.21	45	56	0.000	1.45	89
17-Jan	1.89	0.50	37	48	0.000	1.89	116
18-Jan	1.59	0.28	34	41	0.000	1.59	97
19-Jan	1.48	0.03	33	46	0.000	1.48	91
20-Jan	1.58	1.37	34	41	0.000	1.58	97
21-Jan	2.07	0.80	38	47	0.000	2.07	127
22-Jan	1.67	0.08	25	48	0.000	1.67	103
23-Jan	1.56	0.16	39	49	0.000	1.56	96
24-Jan	1.54	0.31	42	48	0.000	1.54	94
25-Jan	1.50	0.07	42	50	0.000	1.50	92
26-Jan	1.32	0.00	32	57	0.000	1.32	81
27-Jan	1.21	0.00	33	48	0.000	1.21	75
28-Jan	1.16	0.10	34	51	0.000	1.16	71
29-Jan	1.10	0.25	34	49	0.000	1.10	68
30-Jan	1.12	0.03	30	41	0.000	1.12	69
31-Jan	1.16	0.00	24	44	0.000	1.16	71
1-Feb	1.14	0.00	24	47	0.000	1.14	70
2-Feb	0.98	0.00	25	49	0.000	0.98	60
3-Feb	0.89	0.41	37	50	0.000	0.89	55
4-Feb	1.01	0.31	39	50	0.000	1.01	62
5-Feb	1.02	0.17	39	48	0.000	1.02	63
6-Feb	1.12	0.22	39	50	0.000	1.12	69
7-Feb	1.10	0.10	32	47	0.000	1.10	68
8-Feb	1.05	0.00	25	49	0.000	1.05	64
9-Feb	1.34	0.00	24	47	0.000	1.34	82
10-Feb	1.37	0.00	24	50	0.000	1.37	84
11-Feb	1.52	0.00	32	51	0.000	1.52	94
12-Feb	1.08	0.28	38	55	0.000	1.08	66

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
13-Feb	1.10	0.30	38	52	0.000	1.10	68
14-Feb	1.22	0.59	36	50	0.000	1.22	75
15-Feb	1.17	0.05	36	46	0.000	1.17	72
16-Feb	1.16	0.35	31	50	0.000	1.16	71
17-Feb	1.20	0.03	31	46	0.000	1.20	74
18-Feb	1.17	0.00	25	52	0.000	1.17	72
19-Feb	1.13	0.00	22	47	0.000	1.13	69
20-Feb	1.08	0.00	23	46	0.000	1.08	66
21-Feb	1.14	0.40	30	43	0.000	1.14	70
22-Feb	1.15	0.43	30	44	0.000	1.15	71
23-Feb	1.15	0.45	24	38	0.000	1.15	70
24-Feb	1.17	0.03	16	38	0.000	1.17	72
25-Feb	1.14	0.00	16	33	0.000	1.14	70
26-Feb	1.15	0.21	18	36	0.000	1.15	71
27-Feb	1.15	0.13	30	41	0.000	1.15	71
28-Feb	1.32	0.00	30	39	0.000	1.32	81
1-Mar	1.25	0.10	32	49	0.000	1.25	76
2-Mar	1.23	0.00	36	54	0.000	1.23	75
3-Mar	1.27	0.22	29	48	0.000	1.27	78
4-Mar	1.21	0.39	30	45	0.000	1.21	74
5-Mar	1.32	0.16	32	50	0.000	1.32	81
6-Mar	1.27	0.00	26	49	0.000	1.27	78
7-Mar	1.15	0.08	27	51	0.000	1.15	71
8-Mar	1.12	0.16	34	49	0.000	1.12	69
9-Mar	1.21	0.55	43	58	0.000	1.21	74
10-Mar	1.36	0.60	39	55	0.000	1.36	83
11-Mar	1.32	0.12	39	50	0.000	1.32	81
12-Mar	1.34	0.49	39	46	0.000	1.34	82
13-Mar	1.35	0.71	40	53	0.000	1.35	83
14-Mar	1.47	0.18	41	56	0.000	1.47	90
15-Mar	1.51	0.53	41	50	0.000	1.51	93
16-Mar	1.54	0.97	32	50	0.000	1.54	95
17-Mar	1.78	0.00	34	54	0.000	1.78	110
18-Mar	1.53	0.35	34	56	0.000	1.53	94
19-Mar	1.50	0.00	33	57	0.000	1.50	92
20-Mar	1.45	0.00	37	58	0.000	1.45	89
21-Mar	1.51	0.31	37	49	0.000	1.51	92
22-Mar	1.35	0.00	31	56	0.000	1.35	83
23-Mar	1.33	0.00	32	65	0.000	1.33	81
24-Mar	1.25	0.19	38	64	0.000	1.25	77
25-Mar	1.28	0.16	35	60	0.000	1.28	79
26-Mar	1.22	0.15	36	55	0.000	1.22	75
27-Mar	1.21	0.05	36	56	0.000	1.21	74
28-Mar	1.24	0.14	42	55	0.000	1.24	76
29-Mar	1.19	0.98	42	51	0.000	1.19	73
30-Mar	1.81	1.54	44	51	0.000	1.81	111
31-Mar	1.74	0.10	43	57	0.000	1.74	107
1-Apr	1.73	1.20	35	47	0.000	1.73	106
2-Apr	2.08	0.48	36	51	0.000	2.08	128

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
3-Apr	1.80	0.18	39	50	0.000	1.80	110
4-Apr	1.91	0.81	36	46	0.000	1.91	117
5-Apr	1.82	0.52	34	46	0.000	1.82	112
6-Apr	1.96	0.10	31	51	0.000	1.96	120
7-Apr	1.79	0.00	28	51	0.000	1.79	110
8-Apr	1.71	0.02	28	58	0.000	1.71	105
9-Apr	1.62	0.06	39	56	0.000	1.62	100
10-Apr	1.71	0.67	37	54	0.000	1.71	105
11-Apr	1.75	0.20	35	52	0.000	1.75	107
12-Apr	1.48	0.00	35	60	0.000	1.48	91
13-Apr	1.54	0.14	35	51	0.000	1.54	94
14-Apr	1.57	0.39	34	47	0.000	1.57	96
15-Apr	1.48	0.15	35	49	0.000	1.48	91
16-Apr	1.45	0.16	37	48	0.000	1.45	89
17-Apr	1.47	0.03	34	54	0.000	1.47	90
18-Apr	1.43	0.05	34	55	0.000	1.43	88
19-Apr	1.35	0.00	31	56	0.000	1.35	83
20-Apr	1.31	0.34	31	51	0.000	1.31	81
21-Apr	1.39	0.04	32	53	0.000	1.39	85
22-Apr	1.22	0.00	31	60	0.000	1.22	75
23-Apr	1.25	0.00	31	70	0.000	1.25	76
24-Apr	1.25	0.04	39	55	0.000	1.25	76
25-Apr	1.44	0.98	39	49	0.000	1.44	88
26-Apr	---	0.03	39	60	0.000	---	---
27-Apr	---	0.39	37	55	0.000	---	---
28-Apr	1.47	0.07	35	54	0.000	1.47	90
29-Apr	1.25	0.06	37	58	0.000	1.25	77
30-Apr	1.22	0.00	32	59	0.000	1.22	75
1-May	1.19	0.00	34	65	0.000	1.19	73
2-May	1.34	0.82	41	50	0.000	1.34	82
3-May	1.35	0.06	33	55	0.000	1.35	83
4-May	1.24	0.06	35	66	0.000	1.24	76
5-May	1.18	0.10	44	55	0.000	1.18	72
6-May	1.26	0.33	44	52	0.000	1.26	78
7-May	1.36	0.70	41	51	0.000	1.36	83
8-May	1.26	0.05	40	57	0.000	1.26	77
9-May	1.34	0.00	43	60	0.000	1.34	82
10-May	1.21	0.05	45	65	0.000	1.21	74
11-May	1.29	0.34	42	54	0.000	1.29	79
12-May	1.16	0.00	39	65	0.000	1.16	71
13-May	1.17	0.00	43	69	0.000	1.17	72
14-May	1.21	0.39	43	65	0.000	1.21	74
15-May	1.35	0.46	44	54	0.000	1.35	83
16-May	1.31	0.10	44	53	0.000	1.31	80
17-May	1.23	0.00	36	64	0.000	1.23	75
18-May	1.16	0.00	36	68	0.000	1.16	71
19-May	1.19	0.00	38	70	0.000	1.19	73
20-May	1.12	0.00	42	71	0.000	1.12	69
21-May	1.11	0.03	46	54	0.000	1.11	68

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
22-May	1.14	0.00	44	58	0.000	1.14	70
23-May	---	0.00	46	62	0.000	---	---
24-May	1.09	0.00	45	65	0.000	1.09	67
25-May	1.13	0.24	44	56	0.000	1.13	69
26-May	1.12	0.05	44	62	0.000	1.12	69
27-May	1.09	0.30	45	60	0.000	1.09	67
28-May	1.05	0.00	45	60	0.000	1.05	65
29-May	1.01	0.05	47	63	0.000	1.01	62
30-May	1.09	0.00	44	63	0.000	1.09	67
31-May	1.29	0.15	44	65	0.000	1.29	79
1-Jun	1.14	0.43	48	58	0.000	1.14	70
2-Jun	1.20	0.38	48	57	0.000	1.20	74
3-Jun	1.14	0.00	43	70	0.000	1.14	70
4-Jun	1.02	0.00	45	80	0.000	1.02	63
5-Jun	1.10	0.00	51	80	0.000	1.10	68
6-Jun	1.05	0.00	52	76	0.000	1.05	65
7-Jun	1.10	0.21	49	58	0.000	1.10	68
8-Jun	1.11	0.03	49	66	0.000	1.11	68
9-Jun	1.06	0.00	50	69	0.000	1.06	65
10-Jun	1.07	0.00	49	60	0.000	1.07	66
11-Jun	1.00	0.00	42	68	0.000	1.00	61
12-Jun	1.06	0.08	47	72	0.000	1.06	65
13-Jun	1.02	0.13	48	68	0.000	1.02	62
14-Jun	1.00	0.16	47	68	0.000	1.00	61
15-Jun	0.98	0.04	44	64	0.000	0.98	60
16-Jun	0.99	0.00	45	67	0.000	0.99	61
17-Jun	0.93	0.06	46	72	0.000	0.93	57
18-Jun	0.96	0.10	50	58	0.000	0.96	59
19-Jun	1.00	0.03	51	60	0.000	1.00	61
20-Jun	1.03	0.00	46	75	0.000	1.03	63
21-Jun	0.95	0.00	50	79	0.000	0.95	58
22-Jun	0.93	0.00	48	65	0.000	0.93	57
23-Jun	0.97	0.11	49	69	0.000	0.97	59
24-Jun	0.97	0.08	47	66	0.000	0.97	59
25-Jun	0.92	0.00	42	68	0.000	0.92	56
26-Jun	0.92	0.00	47	76	0.000	0.92	56
27-Jun	0.92	0.00	53	76	0.000	0.92	56
28-Jun	1.00	0.00	57	74	0.000	1.00	61
29-Jun	0.98	0.48	48	65	0.000	0.98	60
30-Jun	0.96	0.00	49	64	0.000	0.96	59
1-Jul	1.02	0.00	47	73	0.000	1.02	62
2-Jul	0.92	0.19	50	80	0.000	0.92	57
3-Jul	0.90	0.19	44	71	0.000	0.90	55
4-Jul	0.91	0.00	44	78	0.000	0.91	56
5-Jul	0.94	0.00	49	79	0.000	0.94	57
6-Jul	0.92	0.00	53	79	0.000	0.92	56
7-Jul	1.02	0.20	49	59	0.000	1.02	63
8-Jul	0.96	0.13	42	66	0.000	0.96	59
9-Jul	0.88	0.00	44	73	0.000	0.88	54

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
10-Jul	0.91	0.00	46	75	0.000	0.91	56
11-Jul	0.90	0.00	50	71	0.000	0.90	55
12-Jul	0.94	0.02	54	71	0.000	0.94	57
13-Jul	0.95	0.40	54	72	0.000	0.95	59
14-Jul	0.95	0.16	54	63	0.000	0.95	58
15-Jul	0.87	0.07	55	77	0.000	0.87	54
16-Jul	0.97	0.15	53	76	0.000	0.97	59
17-Jul	0.94	0.10	52	63	0.000	0.94	58
18-Jul	0.95	0.00	49	74	0.000	0.95	58
19-Jul	0.87	0.07	51	64	0.000	0.87	54
20-Jul	0.96	0.15	53	76	0.000	0.96	59
21-Jul	0.91	0.15	50	65	0.000	0.91	56
22-Jul	0.92	0.00	47	73	0.000	0.92	57
23-Jul	0.87	0.00	48	78	0.000	0.87	53
24-Jul	0.82	0.00	49	85	0.000	0.82	51
25-Jul	0.95	0.31	53	64	0.000	0.95	58
26-Jul	0.92	0.00	52	69	0.000	0.92	57
27-Jul	0.85	0.00	40	75	0.000	0.85	52
28-Jul	0.88	0.00	50	75	0.000	0.88	54
29-Jul	0.89	0.00	48	77	0.000	0.89	55
30-Jul	0.89	0.00	49	78	0.000	0.89	55
31-Jul	0.91	0.04	45	71	0.000	0.91	56
1-Aug	0.91	0.00	45	79	0.000	0.91	56
2-Aug	0.95	0.00	51	79	0.000	0.95	58
3-Aug	0.85	0.00	50	80	0.000	0.85	52
4-Aug	0.87	0.00	51	81	0.000	0.87	53
5-Aug	0.91	0.00	54	69	0.000	0.91	56
6-Aug	0.84	0.00	49	76	0.000	0.84	51
7-Aug	0.90	0.00	48	78	0.000	0.90	55
8-Aug	0.89	0.00	51	73	0.000	0.89	55
9-Aug	0.85	0.00	52	67	0.000	0.85	52
10-Aug	---	0.00	52	73	0.000	---	---
11-Aug	0.85	0.00	49	76	0.000	0.85	52
12-Aug	0.86	0.00	49	78	0.000	0.86	53
13-Aug	0.87	0.00	52	68	0.000	0.87	54
14-Aug	0.86	0.00	51	74	0.000	0.86	53
15-Aug	0.88	0.00	49	75	0.000	0.88	54
16-Aug	0.88	0.00	45	79	0.000	0.88	54
17-Aug	0.88	0.00	47	74	0.000	0.88	54
18-Aug	0.88	0.00	49	73	0.000	0.88	54
19-Aug	0.87	0.00	48	77	0.000	0.87	53
20-Aug	0.83	0.00	50	87	0.000	0.83	51
21-Aug	0.85	0.00	54	86	0.000	0.85	52
22-Aug	0.87	0.19	58	72	0.000	0.87	54
23-Aug	0.90	0.00	51	80	0.000	0.90	55
24-Aug	0.82	0.00	53	82	0.000	0.82	51
25-Aug	0.87	0.00	53	83	0.000	0.87	53
26-Aug	0.98	0.00	50	85	0.000	0.98	60
27-Aug	0.80	0.00	48	78	0.000	0.80	49

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
28-Aug	0.84	0.00	45	81	0.000	0.84	52
29-Aug	---	0.00	54	75	0.000	---	---
30-Aug	0.88	0.00	49	69	0.000	0.88	54
31-Aug	---	0.00	43	70	0.000	---	---
1-Sep	0.88	0.00	43	74	0.000	0.88	54
2-Sep	0.87	0.00	43	72	0.000	0.87	54
3-Sep	0.80	0.00	43	82	0.000	0.80	49
4-Sep	0.81	0.00	45	85	0.000	0.81	50
5-Sep	0.90	0.00	45	81	0.000	0.90	55
6-Sep	0.90	0.00	45	82	0.000	0.90	55
7-Sep	0.89	0.00	45	85	0.000	0.89	55
8-Sep	0.90	0.00	49	85	0.000	0.90	55
9-Sep	---	0.00	48	85	0.000	---	---
10-Sep	0.89	0.00	49	83	0.000	0.89	55
11-Sep	0.84	0.00	50	84	0.000	0.84	52
12-Sep	0.89	0.00	52	75	0.000	0.89	55
13-Sep	0.91	0.00	55	67	0.000	0.91	56
14-Sep	0.86	0.00	54	67	0.000	0.86	53
15-Sep	0.88	0.05	47	59	0.000	0.88	54
16-Sep	0.83	0.00	46	70	0.000	0.83	51
17-Sep	0.82	0.22	49	63	0.000	0.82	50
18-Sep	0.93	0.00	48	66	0.000	0.93	57
19-Sep	0.90	0.00	42	70	0.000	0.90	55
20-Sep	0.82	0.00	41	80	0.000	0.82	50
21-Sep	0.88	0.08	54	77	0.000	0.88	54
22-Sep	0.91	0.12	59	76	0.000	0.91	56
23-Sep	0.85	0.00	55	86	0.000	0.85	52
24-Sep	0.85	0.05	53	82	0.000	0.85	52
25-Sep	0.92	0.05	48	70	0.000	0.92	56
26-Sep	0.91	0.19	50	62	0.000	0.91	56
27-Sep	0.93	0.10	42	67	0.000	0.93	57
28-Sep	0.80	0.00	37	69	0.000	0.80	49
29-Sep	0.84	0.00	37	83	0.000	0.84	51
30-Sep	0.77	0.02	42	67	0.000	0.77	47
1-Oct	0.82	0.02	46	57	0.000	0.82	50
2-Oct	0.89	0.20	45	66	0.000	0.89	55
3-Oct	0.83	0.02	48	61	0.000	0.83	51
4-Oct	0.91	0.07	48	68	0.000	0.91	56
5-Oct	0.92	0.52	47	55	0.000	0.92	56
6-Oct	0.86	0.07	47	58	0.000	0.86	53
7-Oct	0.91	0.06	37	62	0.000	0.91	56
8-Oct	0.83	0.06	37	69	0.000	0.83	51
9-Oct	0.88	0.02	48	66	0.000	0.88	54
10-Oct	0.89	0.14	49	62	0.000	0.89	54
11-Oct	0.87	0.00	50	60	0.000	0.87	53
12-Oct	0.82	0.00	39	62	0.000	0.82	50
13-Oct	0.89	0.00	39	62	0.000	0.89	55
14-Oct	0.80	0.00	34	61	0.000	0.80	49
15-Oct	0.85	0.00	34	64	0.000	0.85	52

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
16-Oct	0.84	0.00	36	56	0.000	0.84	52
17-Oct	0.86	0.00	34	65	0.000	0.86	53
18-Oct	0.87	0.00	33	69	0.000	0.87	53
19-Oct	0.85	0.11	41	65	0.000	0.85	52
20-Oct	0.85	0.05	43	57	0.000	0.85	52
21-Oct	0.93	0.88	45	58	0.000	0.93	57
22-Oct	1.02	0.37	48	60	0.000	1.02	63
23-Oct	0.94	0.09	38	60	0.000	0.94	58
24-Oct	0.92	0.00	38	57	0.000	0.92	56
25-Oct	0.93	0.00	36	58	0.000	0.93	57
26-Oct	0.85	0.07	33	58	0.000	0.85	52
27-Oct	0.85	0.00	33	58	0.000	0.85	52
28-Oct	0.85	0.14	39	55	0.000	0.85	52
29-Oct	0.88	0.07	40	61	0.000	0.88	54
30-Oct	0.93	0.27	42	53	0.000	0.93	57
31-Oct	0.90	0.04	32	52	0.000	0.90	55
1-Nov	0.79	0.00	29	55	0.000	0.79	48
2-Nov	0.95	1.03	29	60	0.000	0.95	58
3-Nov	1.14	0.63	30	56	0.000	1.14	70
4-Nov	0.95	0.00	31	45	0.000	0.95	58
5-Nov	0.86	0.00	20	54	0.000	0.86	53
6-Nov	0.97	0.00	20	49	0.000	0.97	59
7-Nov	0.85	0.07	33	48	0.000	0.85	52
8-Nov	0.92	0.00	33	60	0.000	0.92	56
9-Nov	1.01	0.00	34	64	0.000	1.01	62
10-Nov	0.86	0.02	34	66	0.000	0.86	53
11-Nov	1.06	0.67	33	52	0.000	1.06	65
12-Nov	0.94	0.52	34	48	0.000	0.94	57
13-Nov	1.10	0.45	34	45	0.000	1.10	68
14-Nov	1.01	0.51	31	49	0.000	1.01	62
15-Nov	1.05	0.00	28	51	0.000	1.05	65
16-Nov	1.01	0.35	32	51	0.000	1.01	62
17-Nov	1.05	0.34	33	54	0.000	1.05	65
18-Nov	1.04	0.00	24	47	0.000	1.04	64
19-Nov	0.98	0.00	22	46	0.000	0.98	60
20-Nov	0.97	0.15	23	43	0.000	0.97	60
21-Nov	1.04	0.93	37	50	0.000	1.04	64
22-Nov	1.53	3.03	38	54	0.000	1.53	94
23-Nov	2.47	0.56	36	54	0.000	2.47	152
24-Nov	1.62	0.24	36	54	0.000	1.62	99
25-Nov	1.41	0.00	34	52	0.000	1.41	86
26-Nov	1.28	0.00	40	59	0.000	1.28	78
27-Nov	1.60	0.86	36	56	0.000	1.60	98
28-Nov	1.40	0.00	31	50	0.000	1.40	86
29-Nov	1.39	0.19	34	43	0.000	1.39	86
30-Nov	1.29	0.00	26	51	0.000	1.29	79
1-Dec	1.22	0.00	25	41	0.000	1.22	75
2-Dec	1.23	0.00	25	48	0.000	1.23	75
3-Dec	1.22	0.00	26	40	0.000	1.22	75

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
4-Dec	1.14	0.00	23	46	0.000	1.14	70
5-Dec	1.12	0.00	21	44	0.000	1.12	69
6-Dec	1.16	0.04	22	38	0.000	1.16	71
7-Dec	1.05	0.00	29	41	0.000	1.05	64
8-Dec	1.03	0.00	24	44	0.000	1.03	63
9-Dec	0.99	0.00	22	45	0.000	0.99	61
10-Dec	1.06	0.05	22	45	0.000	1.06	65
11-Dec	1.00	0.00	22	41	0.000	1.00	61
12-Dec	1.04	0.00	21	43	0.000	1.04	64
13-Dec	0.93	0.00	25	38	0.000	0.93	57
14-Dec	1.01	0.09	30	41	0.000	1.01	62
15-Dec	0.91	0.09	34	42	0.000	0.91	56
16-Dec	0.97	0.00	32	52	0.000	0.97	59
17-Dec	0.93	0.15	32	56	0.000	0.93	57
18-Dec	0.95	0.01	37	46	0.000	0.95	58
19-Dec	0.95	0.00	38	47	0.000	0.95	58
20-Dec	0.89	0.03	35	44	0.000	0.89	55
21-Dec	0.93	0.00	23	50	0.000	0.93	57
22-Dec	---	0.00	23	48	0.000	---	---
23-Dec	---	0.16	32	48	0.000	---	---
24-Dec	1.02	0.23	38	48	0.000	1.02	62
25-Dec	0.88	0.10	32	50	0.000	0.88	54
26-Dec	0.95	0.33	34	46	0.000	0.95	58
27-Dec	0.95	0.15	43	54	0.000	0.95	59
28-Dec	1.06	0.14	37	55	0.000	1.06	65
29-Dec	0.94	0.10	36	50	0.000	0.94	58
30-Dec	1.12	0.03	30	47	0.000	1.12	69
31-Dec	1.02	0.00	30	46	0.000	1.02	63
2012							
1-Jan	0.98	0.00	30	53	0.000	0.98	60
2-Jan	1.13	0.13	30	55	0.000	1.13	69
3-Jan	1.04	0.10	41	59	0.000	1.04	64
4-Jan	1.09	0.61	35	58	0.000	1.09	67
5-Jan	1.09	0.06	35	50	0.000	1.09	67
6-Jan	0.99	0.04	33	42	0.000	0.99	60
7-Jan	1.01	0.05	34	42	0.000	1.01	62
8-Jan	1.04	0.00	39	53	0.000	1.04	64
9-Jan	1.00	0.07	29	50	0.000	1.00	61
10-Jan	1.02	0.00	25	47	0.000	1.02	62
11-Jan	1.01	0.00	22	44	0.000	1.01	62
12-Jan	1.03	0.00	22	41	0.000	1.03	63
13-Jan	0.92	0.27	22	37	0.000	0.92	57
14-Jan	1.07	0.17	22	38	0.000	1.07	65
15-Jan	1.02	0.05	23	37	0.000	1.02	62
16-Jan	1.01	0.24	26	35	0.000	1.01	62
17-Jan	1.00	0.45	22	35	0.000	1.00	62
18-Jan	0.98	0.26	21	31	0.000	0.98	60
19-Jan	0.98	0.27	20	34	0.000	0.98	60
20-Jan	1.07	0.90	31	46	0.000	1.07	66

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
21-Jan	1.94	0.52	32	42	0.000	1.94	119
22-Jan	1.53	0.22	32	44	0.000	1.53	94
23-Jan	1.40	0.04	33	51	0.000	1.40	86
24-Jan	1.45	0.26	35	52	0.000	1.45	89
25-Jan	1.30	0.05	35	47	0.000	1.30	79
26-Jan	1.32	0.00	28	46	0.000	1.32	81
27-Jan	1.31	0.00	28	49	0.000	1.31	80
28-Jan	1.19	0.20	32	57	0.000	1.19	73
29-Jan	1.43	0.58	40	57	0.000	1.43	88
30-Jan	1.40	0.00	39	46	0.000	1.40	86
31-Jan	1.26	0.72	39	51	0.000	1.26	77
1-Feb	1.56	0.02	35	50	0.000	1.56	95
2-Feb	1.39	0.00	27	54	0.000	1.39	85
3-Feb	1.30	0.00	26	62	0.000	1.30	80
4-Feb	1.29	0.00	26	63	0.000	1.29	79
5-Feb	1.33	0.00	26	58	0.000	1.33	82
6-Feb	1.24	0.00	25	62	0.000	1.24	76
7-Feb	1.18	0.02	25	67	0.000	1.18	72
8-Feb	1.19	0.04	25	51	0.000	1.19	73
9-Feb	1.17	0.36	41	49	0.000	1.17	72
10-Feb	1.17	0.13	40	58	0.000	1.17	72
11-Feb	1.13	0.01	40	51	0.000	1.13	69
12-Feb	1.16	0.09	38	49	0.000	1.16	71
13-Feb	1.15	0.00	38	57	0.000	1.15	71
14-Feb	1.05	0.09	29	48	0.000	1.05	64
15-Feb	1.09	0.00	32	51	0.000	1.09	67
16-Feb	1.04	0.15	34	44	0.000	1.04	64
17-Feb	1.16	0.45	33	50	0.000	1.16	71
18-Feb	1.22	0.75	33	43	0.000	1.22	75
19-Feb	1.27	0.15	33	43	0.000	1.27	78
20-Feb	1.26	0.82	33	46	0.000	1.26	77
21-Feb	2.15	2.60	38	48	0.000	2.15	131
22-Feb	2.26	0.00	37	49	0.000	2.26	138
23-Feb	1.81	0.05	36	56	0.000	1.81	111
24-Feb	1.70	0.46	36	47	0.000	1.70	104
25-Feb	1.81	0.58	29	42	0.000	1.81	111
26-Feb	1.73	0.00	24	44	0.000	1.73	106
27-Feb	1.60	0.00	24	50	0.000	1.60	98
28-Feb	1.53	0.24	29	46	0.000	1.53	94
29-Feb	1.71	0.98	30	40	0.000	1.71	105
1-Mar	1.79	0.11	30	40	0.000	1.79	109
2-Mar	1.76	0.55	32	41	0.000	1.76	108
3-Mar	1.78	0.05	37	49	0.000	1.78	109
4-Mar	1.68	0.00	43	51	0.000	1.68	103
5-Mar	1.65	0.47	30	46	0.000	1.65	101
6-Mar	1.57	0.00	24	46	0.000	1.57	96
7-Mar	1.55	0.00	27	48	0.000	1.55	95
8-Mar	1.47	0.00	28	59	0.000	1.47	90
9-Mar	1.49	0.56	41	49	0.000	1.49	91

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
10-Mar	1.50	0.23	38	47	0.000	1.50	92
11-Mar	1.46	0.24	30	46	0.000	1.46	89
12-Mar	1.96	1.08	31	44	0.000	1.96	120
13-Mar	1.80	0.02	31	43	0.000	1.80	111
14-Mar	1.74	0.42	32	49	0.000	1.74	106
15-Mar	1.83	0.20	38	56	0.000	1.83	112
16-Mar	1.70	0.10	36	55	0.000	1.70	104
17-Mar	1.61	0.46	32	50	0.000	1.61	99
18-Mar	1.77	0.45	29	44	0.000	1.77	108
19-Mar	1.65	0.10	29	48	0.000	1.65	101
20-Mar	1.63	0.57	30	47	0.000	1.63	100
21-Mar	1.65	0.08	30	53	0.000	1.65	101
22-Mar	1.52	0.00	29	52	0.000	1.52	93
23-Mar	1.49	0.00	28	60	0.000	1.49	91
24-Mar	1.44	0.00	28	65	0.000	1.44	88
25-Mar	1.50	0.07	30	60	0.000	1.50	92
26-Mar	1.45	0.00	39	54	0.000	1.45	89
27-Mar	1.26	0.05	41	67	0.000	1.26	77
28-Mar	1.32	0.45	37	53	0.000	1.32	81
29-Mar	1.50	0.37	41	48	0.000	1.50	92
30-Mar	1.38	0.20	35	52	0.000	1.38	84
31-Mar	1.39	0.47	37	48	0.000	1.39	85
1-Apr	1.45	0.07	38	51	0.000	1.45	89
2-Apr	1.37	0.00	41	67	0.000	1.37	84
3-Apr	1.48	0.55	35	50	0.000	1.48	90
4-Apr	1.36	0.03	34	55	0.000	1.36	83
5-Apr	1.31	0.15	34	52	0.000	1.31	80
6-Apr	1.33	0.03	35	54	0.000	1.33	81
7-Apr	1.35	0.00	39	68	0.000	1.35	83
8-Apr	1.36	0.00	38	76	0.000	1.36	83
9-Apr	1.24	0.00	37	72	0.000	1.24	76
10-Apr	1.17	0.00	41	71	0.000	1.17	71
11-Apr	1.20	0.32	41	53	0.000	1.20	74
12-Apr	1.19	0.00	31	64	0.000	1.19	73
13-Apr	1.16	0.00	36	61	0.000	1.16	71
14-Apr	1.07	0.00	37	64	0.000	1.07	66
15-Apr	1.11	0.14	42	65	0.000	1.11	68
16-Apr	1.24	0.76	40	55	0.000	1.24	76
17-Apr	1.27	0.05	39	52	0.000	1.27	78
18-Apr	1.20	0.05	38	59	0.000	1.20	74
19-Apr	1.24	1.12	39	60	0.000	1.24	76
20-Apr	1.36	0.00	34	62	0.000	1.36	83
21-Apr	1.22	0.00	35	66	0.000	1.22	75
22-Apr	1.27	0.00	43	73	0.000	1.27	78
23-Apr	1.15	0.00	43	73	0.000	1.15	70
24-Apr	1.22	0.33	49	56	0.000	1.22	75
25-Apr	1.21	0.52	46	63	0.000	1.21	74
26-Apr	1.32	0.26	43	52	0.000	1.32	81
27-Apr	1.20	0.00	42	60	0.000	1.20	74

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
28-Apr	1.14	0.00	42	65	0.000	1.14	70
29-Apr	1.20	0.52	44	63	0.000	1.20	74
30-Apr	1.46	0.88	40	57	0.000	1.46	89
1-May	1.59	0.46	40	51	0.000	1.59	97
2-May	1.60	0.08	39	61	0.000	1.60	98
3-May	1.52	0.69	40	57	0.000	1.52	93
4-May	1.73	0.40	40	55	0.000	1.73	106
5-May	1.73	0.02	35	60	0.000	1.73	106
6-May	1.51	0.00	38	66	0.000	1.51	93
7-May	1.49	0.00	39	77	0.000	1.49	91
8-May	1.41	0.00	43	63	0.000	1.41	86
9-May	1.38	0.00	40	57	0.000	1.38	85
10-May	1.31	0.00	33	62	0.000	1.31	80
11-May	1.25	0.00	36	68	0.000	1.25	77
12-May	1.29	0.00	37	79	0.000	1.29	79
13-May	1.19	0.00	37	80	0.000	1.19	73
14-May	1.19	0.00	43	80	0.000	1.19	73
15-May	1.20	0.00	40	75	0.000	1.20	73
16-May	1.17	0.00	39	69	0.000	1.17	72
17-May	1.09	0.00	42	66	0.000	1.09	67
18-May	1.11	0.00	38	65	0.000	1.11	68
19-May	1.03	0.00	38	72	0.000	1.03	63
20-May	1.12	0.42	52	62	0.000	1.12	69
21-May	1.14	0.29	45	62	0.000	1.14	70
22-May	1.12	0.45	45	57	0.000	1.12	69
23-May	1.43	1.26	44	54	0.000	1.43	87
24-May	1.26	0.02	39	64	0.000	1.26	77
25-May	1.17	0.01	41	73	0.000	1.17	72
26-May	1.09	0.00	47	77	0.000	1.09	67
27-May	1.06	0.00	50	66	0.000	1.06	65
28-May	1.16	0.13	45	62	0.000	1.16	71
29-May	1.18	0.00	47	64	0.000	1.18	72
30-May	1.15	0.18	49	67	0.000	1.15	70
31-May	1.13	0.32	53	61	0.000	1.13	69
1-Jun	1.14	0.11	47	66	0.000	1.14	70
2-Jun	1.04	0.00	45	66	0.000	1.04	64
3-Jun	1.15	0.00	44	64	0.000	1.15	70
4-Jun	1.10	0.12	44	57	0.000	1.10	68
5-Jun	1.15	0.25	45	59	0.000	1.15	70
6-Jun	1.11	0.14	45	63	0.000	1.11	68
7-Jun	1.13	0.39	44	61	0.000	1.13	69
8-Jun	1.16	0.30	45	64	0.000	1.16	71
9-Jun	1.02	0.00	46	62	0.000	1.02	62
10-Jun	1.03	0.00	42	68	0.000	1.03	63
11-Jun	1.08	0.01	43	76	0.000	1.08	66
12-Jun	1.08	0.32	47	66	0.000	1.08	66
13-Jun	1.07	0.02	47	60	0.000	1.07	65
14-Jun	1.04	0.00	38	62	0.000	1.04	64
15-Jun	1.04	0.03	46	72	0.000	1.04	64

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
16-Jun	1.03	0.42	53	66	0.000	1.03	63
17-Jun	1.20	0.65	47	65	0.000	1.20	73
18-Jun	1.24	0.11	48	63	0.000	1.24	76
19-Jun	1.22	0.00	43	69	0.000	1.22	75
20-Jun	1.16	0.00	46	76	0.000	1.16	71
21-Jun	1.08	0.00	46	72	0.000	1.08	66
22-Jun	1.24	0.80	50	61	0.000	1.24	76
23-Jun	1.27	0.28	43	62	0.000	1.27	78
24-Jun	1.24	0.00	42	69	0.000	1.24	76
25-Jun	1.14	0.00	43	66	0.000	1.14	70
26-Jun	1.10	0.00	47	61	0.000	1.10	67
27-Jun	1.10	0.00	49	74	0.000	1.10	67
28-Jun	1.13	0.05	53	76	0.000	1.13	69
29-Jun	1.00	0.20	58	76	0.000	1.00	61
30-Jun	1.14	0.27	52	70	0.000	1.14	70
1-Jul	1.09	0.00	50	68	0.000	1.09	67
2-Jul	1.07	0.72	50	65	0.000	1.07	66
3-Jul	1.30	0.12	48	60	0.000	1.30	79
4-Jul	1.13	0.00	42	71	0.000	1.13	69
5-Jul	1.11	0.00	45	78	0.000	1.11	68
6-Jul	1.15	0.00	47	77	0.000	1.15	70
7-Jul	1.05	0.00	50	80	0.000	1.05	64
8-Jul	1.08	0.00	53	81	0.000	1.08	66
9-Jul	1.04	0.00	48	75	0.000	1.04	64
10-Jul	1.05	0.00	49	76	0.000	1.05	64
11-Jul	1.00	0.00	49	79	0.000	1.00	62
12-Jul	0.97	0.00	52	81	0.000	0.97	60
13-Jul	1.03	0.14	50	70	0.000	1.03	63
14-Jul	0.98	0.00	52	81	0.000	0.98	60
15-Jul	1.00	0.05	51	71	0.000	1.00	61
16-Jul	0.96	0.00	52	80	0.000	0.96	59
17-Jul	1.00	0.00	58	83	0.000	1.00	61
18-Jul	0.95	0.00	55	69	0.000	0.95	58
19-Jul	0.98	0.05	57	80	0.000	0.98	60
20-Jul	0.97	0.31	58	68	0.000	0.97	59
21-Jul	0.95	0.00	51	77	0.000	0.95	58
22-Jul	0.97	0.12	50	68	0.000	0.97	59
23-Jul	1.01	0.00	49	66	0.000	1.01	62
24-Jul	0.95	0.00	49	74	0.000	0.95	58
25-Jul	0.93	0.00	51	81	0.000	0.93	57
26-Jul	0.95	0.00	52	81	0.000	0.95	58
27-Jul	0.99	0.00	54	72	0.000	0.99	61
28-Jul	0.84	0.00	49	75	0.000	0.84	51
29-Jul	0.94	0.00	49	76	0.000	0.94	57
30-Jul	0.89	0.00	52	69	0.000	0.89	55
31-Jul	0.93	0.00	47	74	0.000	0.93	57
1-Aug	0.91	0.00	48	74	0.000	0.91	56
2-Aug	0.95	0.00	48	75	0.000	0.95	58
3-Aug	0.91	0.00	48	82	0.000	0.91	55

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
4-Aug	0.93	0.00	52	94	0.000	0.93	57
5-Aug	0.89	0.00	58	92	0.000	0.89	55
6-Aug	0.96	0.00	55	81	0.000	0.96	59
7-Aug	0.89	0.00	57	69	0.000	0.89	55
8-Aug	0.89	0.00	48	74	0.000	0.89	54
9-Aug	0.93	0.00	47	75	0.000	0.93	57
10-Aug	0.90	0.00	48	78	0.000	0.90	55
11-Aug	0.90	0.00	49	81	0.000	0.90	55
12-Aug	0.92	0.00	50	85	0.000	0.92	56
13-Aug	0.90	0.00	51	81	0.000	0.90	55
14-Aug	0.94	0.00	52	86	0.000	0.94	57
15-Aug	0.88	0.00	51	89	0.000	0.88	54
16-Aug	0.91	0.00	54	94	0.000	0.91	56
17-Aug	0.88	0.00	53	92	0.000	0.88	54
18-Aug	0.91	0.02	53	78	0.000	0.91	56
19-Aug	0.90	0.00	55	77	0.000	0.90	55
20-Aug	0.93	0.00	50	79	0.000	0.93	57
21-Aug	0.93	0.00	50	71	0.000	0.93	57
22-Aug	0.92	0.00	49	73	0.000	0.92	56
23-Aug	0.90	0.00	49	68	0.000	0.90	55
24-Aug	0.93	0.00	43	74	0.000	0.93	57
25-Aug	0.88	0.00	45	82	0.000	0.88	54
26-Aug	0.86	0.00	52	80	0.000	0.86	53
27-Aug	0.91	0.00	50	79	0.000	0.91	56
28-Aug	0.92	0.00	50	74	0.000	0.92	56
29-Aug	0.87	0.00	52	72	0.000	0.87	54
30-Aug	0.93	0.00	43	75	0.000	0.93	57
31-Aug	0.86	0.00	43	72	0.000	0.86	53
1-Sep	0.90	0.00	43	73	0.000	0.90	55
2-Sep	0.78	0.00	44	72	0.000	0.78	48
3-Sep	0.95	0.00	44	74	0.000	0.95	58
4-Sep	0.95	0.00	43	76	0.000	0.95	58
5-Sep	0.90	0.00	45	79	0.000	0.90	55
6-Sep	0.87	0.00	47	85	0.000	0.87	53
7-Sep	0.87	0.00	48	89	0.000	0.87	53
8-Sep	0.89	0.00	49	85	0.000	0.89	54
9-Sep	0.90	0.34	48	70	0.000	0.90	55
10-Sep	0.92	0.00	42	65	0.000	0.92	56
11-Sep	0.93	0.00	37	67	0.000	0.93	57
12-Sep	0.89	0.00	36	75	0.000	0.89	54
13-Sep	0.83	0.00	40	80	0.000	0.83	51
14-Sep	0.92	0.00	44	79	0.000	0.92	57
15-Sep	0.82	0.00	43	79	0.000	0.82	50
16-Sep	0.92	0.00	44	77	0.000	0.92	57
17-Sep	0.90	0.00	44	82	0.000	0.90	55
18-Sep	0.91	0.00	45	85	0.000	0.91	56
19-Sep	0.88	0.00	45	76	0.000	0.88	54
20-Sep	0.92	0.00	46	75	0.000	0.92	56
21-Sep	0.87	0.02	46	75	0.000	0.87	53

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
22-Sep	0.89	0.00	39	67	0.000	0.89	55
23-Sep	0.93	0.00	39	70	0.000	0.93	57
24-Sep	0.94	0.00	41	72	0.000	0.94	58
25-Sep	0.88	0.00	40	69	0.000	0.88	54
26-Sep	0.88	0.00	39	69	0.000	0.88	54
27-Sep	0.88	0.00	41	73	0.000	0.88	54
28-Sep	0.83	0.00	49	76	0.000	0.83	51
29-Sep	0.85	0.00	37	70	0.000	0.85	52
30-Sep	0.91	0.00	36	70	0.000	0.91	56
1-Oct	0.91	0.00	40	75	0.000	0.91	56
2-Oct	0.81	0.00	30	62	0.000	0.81	49
3-Oct	0.89	0.00	30	69	0.000	0.89	55
4-Oct	0.84	0.00	31	68	0.000	0.84	51
5-Oct	0.87	0.00	31	73	0.000	0.87	53
6-Oct	0.80	0.00	32	77	0.000	0.80	49
7-Oct	0.88	0.00	34	75	0.000	0.88	54
8-Oct	0.84	0.00	36	75	0.000	0.84	51
9-Oct	0.89	0.00	38	56	0.000	0.89	54
10-Oct	0.79	0.00	39	59	0.000	0.79	49
11-Oct	0.88	0.00	40	61	0.000	0.88	54
12-Oct	0.80	0.10	45	58	0.000	0.80	49
13-Oct	0.95	0.57	52	63	0.000	0.95	58
14-Oct	1.02	0.55	47	64	0.000	1.02	62
15-Oct	0.92	0.51	46	63	0.000	0.92	57
16-Oct	0.93	0.00	39	59	0.000	0.93	57
17-Oct	0.87	0.00	40	61	0.000	0.87	53
18-Oct	1.00	0.97	41	61	0.000	1.00	61
19-Oct	1.08	0.79	39	58	0.000	1.08	66
20-Oct	1.00	0.32	38	49	0.000	1.00	62
21-Oct	1.00	0.12	33	56	0.000	1.00	61
22-Oct	0.97	0.32	37	48	0.000	0.97	60
23-Oct	1.06	0.34	36	54	0.000	1.06	65
24-Oct	0.96	0.10	37	55	0.000	0.96	59
25-Oct	0.92	0.00	39	56	0.000	0.92	57
26-Oct	0.95	0.33	40	52	0.000	0.95	58
27-Oct	1.05	0.39	46	50	0.000	1.05	64
28-Oct	1.02	0.33	48	61	0.000	1.02	62
29-Oct	1.04	0.22	49	63	0.000	1.04	64
30-Oct	1.10	1.37	49	58	0.000	1.10	68
31-Oct	1.42	0.36	48	59	0.000	1.42	87
1-Nov	1.16	0.05	48	56	0.000	1.16	71
2-Nov	1.17	0.18	48	60	0.000	1.17	72
3-Nov	1.17	0.14	50	59	0.000	1.17	72
4-Nov	1.14	0.22	45	64	0.000	1.14	70
5-Nov	1.09	0.00	41	60	0.000	1.09	67
6-Nov	1.05	0.17	40	56	0.000	1.05	64
7-Nov	1.06	0.00	30	56	0.000	1.06	65
8-Nov	0.99	0.00	27	54	0.000	0.99	61
9-Nov	0.98	0.02	24	50	0.000	0.98	60

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
10-Nov	1.01	0.03	24	48	0.000	1.01	62
11-Nov	1.12	0.55	32	43	0.000	1.12	69
12-Nov	1.06	0.42	39	49	0.000	1.06	65
13-Nov	1.08	0.39	42	48	0.000	1.08	66
14-Nov	1.11	0.05	27	50	0.000	1.11	68
15-Nov	1.04	0.00	27	53	0.000	1.04	64
16-Nov	1.00	0.36	29	48	0.000	1.00	61
17-Nov	1.09	0.22	40	55	0.000	1.09	67
18-Nov	1.15	0.68	42	52	0.000	1.15	70
19-Nov	1.72	1.43	43	53	0.000	1.72	105
20-Nov	1.36	0.53	39	52	0.000	1.36	84
21-Nov	1.52	0.22	34	45	0.000	1.52	93
22-Nov	1.31	0.21	35	50	0.000	1.31	81
23-Nov	1.35	0.03	34	52	0.000	1.35	83
24-Nov	1.30	0.03	30	55	0.000	1.30	79
25-Nov	1.34	0.00	24	49	0.000	1.34	82
26-Nov	1.27	0.00	24	49	0.000	1.27	78
27-Nov	1.23	0.00	29	51	0.000	1.23	76
28-Nov	1.24	0.18	30	48	0.000	1.24	76
29-Nov	1.19	0.45	42	53	0.000	1.19	73
30-Nov	1.47	1.47	44	54	0.000	1.47	90
1-Dec	1.59	0.63	41	50	0.000	1.59	98
2-Dec	1.65	0.14	40	48	0.000	1.65	101
3-Dec	1.50	0.28	42	52	0.000	1.50	92
4-Dec	1.60	0.47	32	54	0.000	1.60	98
5-Dec	1.68	0.03	33	49	0.000	1.68	103
6-Dec	1.57	0.45	36	44	0.000	1.57	96
7-Dec	1.54	0.14	30	43	0.000	1.54	95
8-Dec	1.51	0.02	30	42	0.000	1.51	92
9-Dec	1.54	0.19	33	41	0.000	1.54	94
10-Dec	1.43	0.03	35	43	0.000	1.43	88
11-Dec	1.43	0.61	36	44	0.000	1.43	88
12-Dec	1.52	0.12	34	42	0.000	1.52	93
13-Dec	1.47	0.53	33	43	0.000	1.47	90
14-Dec	1.56	0.02	28	48	0.000	1.56	96
15-Dec	1.55	0.26	31	40	0.000	1.55	95
16-Dec	1.61	0.96	34	43	0.000	1.61	98
17-Dec	1.91	0.37	30	42	0.000	1.91	117
18-Dec	1.70	0.06	30	40	0.000	1.70	104
19-Dec	1.80	1.04	33	44	0.000	1.80	110
20-Dec	1.96	0.43	28	43	0.000	1.96	120
21-Dec	1.81	0.08	30	42	0.000	1.81	111
22-Dec	1.72	0.22	35	49	0.000	1.72	105
23-Dec	1.62	0.18	34	45	0.000	1.62	99
24-Dec	1.53	0.05	33	42	0.000	1.53	94
25-Dec	1.50	0.10	33	43	0.000	1.50	92
26-Dec	1.51	0.34	35	45	0.000	1.51	92
27-Dec	1.50	0.05	34	44	0.000	1.50	92
28-Dec	1.40	0.05	33	45	0.000	1.40	85

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
29-Dec	1.49	0.11	28	41	0.000	1.49	91
30-Dec	1.42	0.00	28	37	0.000	1.42	87
31-Dec	1.35	0.00	24	40	0.000	1.35	83
2013							
1-Jan	1.34	0.00	24	41	0.000	1.34	81
2-Jan	1.26	0.00	21	51	0.000	1.26	76
3-Jan	1.24	0.06	21	51	0.000	1.24	75
4-Jan	1.13	0.00	36	48	0.000	1.13	68
5-Jan	1.18	0.21	31	43	0.000	1.18	71
6-Jan	1.22	1.09	32	46	0.000	1.22	73
7-Jan	1.53	0.24	36	48	0.000	1.53	92
8-Jan	1.47	0.96	37	52	0.000	1.47	88
9-Jan	2.07	0.90	28	44	0.000	2.07	124
10-Jan	1.85	0.13	22	37	0.000	1.85	111
11-Jan	1.65	0.00	19	40	0.000	1.65	99
12-Jan	1.65	0.00	18	39	0.000	1.65	99
13-Jan	1.57	0.00	18	36	0.000	1.57	94
14-Jan	1.56	0.06	27	33	0.000	1.56	94
15-Jan	1.44	0.00	21	48	0.000	1.44	87
16-Jan	1.43	0.00	21	45	0.000	1.43	86
17-Jan	1.41	0.00	21	42	0.000	1.41	85
18-Jan	1.36	0.00	21	34	0.000	1.36	82
19-Jan	1.28	0.00	20	36	0.000	1.28	77
20-Jan	1.29	0.00	22	35	0.000	1.29	78
21-Jan	1.28	0.00	21	32	0.000	1.28	77
22-Jan	1.18	0.00	21	35	0.000	1.18	71
23-Jan	1.25	0.62	26	41	0.000	1.25	75
24-Jan	1.28	0.26	31	46	0.000	1.28	77
25-Jan	1.14	0.18	34	56	0.000	1.14	69
26-Jan	1.34	0.92	34	41	0.000	1.34	81
27-Jan	1.48	0.90	32	42	0.000	1.48	89
28-Jan	2.10	1.70	31	38	0.000	2.10	126
29-Jan	2.16	0.93	34	41	0.000	2.16	130
30-Jan	2.12	0.40	36	40	0.000	2.12	127
31-Jan	2.01	0.16	37	47	0.000	2.01	121
1-Feb	1.76	0.00	27	54	0.000	1.76	106
2-Feb	1.77	0.00	29	47	0.000	1.77	106
3-Feb	1.68	0.20	35	48	0.000	1.68	101
4-Feb	1.66	0.06	40	52	0.000	1.66	100
5-Feb	1.53	0.00	41	51	0.000	1.53	92
6-Feb	1.55	0.31	38	49	0.000	1.55	93
7-Feb	1.58	0.05	26	48	0.000	1.58	95
8-Feb	1.45	0.05	27	43	0.000	1.45	87
9-Feb	1.43	0.04	28	44	0.000	1.43	86
10-Feb	1.45	0.02	28	47	0.000	1.45	87
11-Feb	1.40	0.10	35	44	0.000	1.40	84
12-Feb	1.36	0.02	38	49	0.000	1.36	82
13-Feb	1.36	0.11	38	48	0.000	1.36	82
14-Feb	1.27	0.00	31	52	0.000	1.27	77

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
15-Feb	1.27	0.05	31	58	0.000	1.27	76
16-Feb	1.32	0.72	36	49	0.000	1.32	79
17-Feb	1.38	0.00	29	45	0.000	1.38	83
18-Feb	1.40	0.00	30	47	0.000	1.40	84
19-Feb	1.28	0.00	28	53	0.000	1.28	77
20-Feb	1.23	0.10	31	46	0.000	1.23	74
21-Feb	1.25	0.20	36	43	0.000	1.25	75
22-Feb	1.24	0.45	33	45	0.000	1.24	75
23-Feb	1.32	0.14	33	48	0.000	1.32	79
24-Feb	1.31	0.11	37	47	0.000	1.31	79
25-Feb	1.30	0.15	34	48	0.000	1.30	78
26-Feb	1.24	0.08	34	48	0.000	1.24	75
27-Feb	1.25	0.06	35	52	0.000	1.25	75
28-Feb	1.30	0.46	37	55	0.000	1.30	78
1-Mar	1.20	0.00	50	58	0.000	1.20	72
2-Mar	1.31	0.40	34	58	0.000	1.31	79
3-Mar	1.28	0.00	25	52	0.000	1.28	77
4-Mar	1.26	0.01	25	58	0.000	1.26	76
5-Mar	1.26	0.00	33	55	0.000	1.26	76
6-Mar	1.31	0.62	35	43	0.000	1.31	79
7-Mar	1.35	0.00	26	48	0.000	1.35	81
8-Mar	1.29	0.00	25	55	0.000	1.29	78
9-Mar	1.24	0.00	26	57	0.000	1.24	75
10-Mar	1.16	0.00	31	48	0.000	1.16	70
11-Mar	1.21	0.06	30	56	0.000	1.21	73
12-Mar	1.30	0.51	48	53	0.000	1.30	78
13-Mar	1.27	0.27	45	54	0.000	1.27	76
14-Mar	1.25	0.16	44	55	0.000	1.25	75
15-Mar	1.23	0.23	43	64	0.000	1.23	74
16-Mar	1.37	0.51	34	54	0.000	1.37	82
17-Mar	1.38	0.19	33	54	0.000	1.38	83
18-Mar	1.38	0.00	31	52	0.000	1.38	83
19-Mar	1.25	0.35	33	54	0.000	1.25	75
20-Mar	1.41	0.23	34	54	0.000	1.41	85
21-Mar	1.28	0.34	29	48	0.000	1.28	77
22-Mar	1.30	0.00	27	50	0.000	1.30	78
23-Mar	1.27	0.00	29	63	0.000	1.27	76
24-Mar	1.28	0.00	29	63	0.000	1.28	77
25-Mar	1.21	0.00	30	64	0.000	1.21	73
26-Mar	1.23	0.00	36	62	0.000	1.23	74
27-Mar	1.21	0.00	35	58	0.000	1.21	73
28-Mar	1.19	0.00	37	65	0.000	1.19	72
29-Mar	1.18	0.00	33	66	0.000	1.18	71
30-Mar	1.15	0.00	33	70	0.000	1.15	69
31-Mar	1.04	0.00	35	72	0.000	1.04	63
1-Apr	1.11	0.00	36	64	0.000	1.11	67
2-Apr	1.06	0.00	43	57	0.000	1.06	63
3-Apr	1.08	0.00	42	66	0.000	1.08	65
4-Apr	1.10	0.54	45	56	0.000	1.10	66

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
5-Apr	1.12	0.16	44	61	0.000	1.12	67
6-Apr	1.17	0.45	38	55	0.000	1.17	70
7-Apr	1.45	1.28	38	44	0.000	1.45	87
8-Apr	1.47	0.03	40	56	0.000	1.47	88
9-Apr	1.33	0.00	42	56	0.000	1.33	80
10-Apr	1.35	0.35	42	58	0.000	1.35	81
11-Apr	1.30	0.00	33	57	0.000	1.30	78
12-Apr	1.35	0.46	35	48	0.000	1.35	81
13-Apr	1.44	0.45	35	48	0.000	1.44	86
14-Apr	1.38	0.01	36	53	0.000	1.38	83
15-Apr	1.36	0.08	29	56	0.000	1.36	82
16-Apr	1.32	0.02	31	59	0.000	1.32	79
17-Apr	1.23	0.03	35	62	0.000	1.23	74
18-Apr	1.30	0.78	41	51	0.000	1.30	78
19-Apr	1.48	0.49	44	55	0.000	1.48	89
20-Apr	1.41	0.21	42	55	0.000	1.41	85
21-Apr	1.41	0.08	28	55	0.000	1.41	85
22-Apr	1.38	0.00	29	62	0.000	1.38	83
23-Apr	1.34	0.00	32	63	0.000	1.34	80
24-Apr	1.31	0.00	34	71	0.000	1.31	79
25-Apr	1.19	0.00	37	73	0.000	1.19	72
26-Apr	1.24	0.00	39	70	0.000	1.24	75
27-Apr	1.21	0.32	44	58	0.000	1.21	73
28-Apr	1.28	0.17	42	56	0.000	1.28	77
29-Apr	1.23	0.35	34	55	0.000	1.23	74
30-Apr	1.24	0.04	28	58	0.000	1.24	75
1-May	1.14	0.00	32	65	0.000	1.14	68
2-May	1.15	0.00	36	68	0.000	1.15	69
3-May	1.12	0.00	38	72	0.000	1.12	68
4-May	1.13	0.00	43	78	0.000	1.13	68
5-May	1.08	0.00	44	82	0.000	1.08	65
6-May	1.14	0.00	45	86	0.000	1.14	69
7-May	1.08	0.00	45	75	0.000	1.08	65
8-May	1.07	0.00	43	69	0.000	1.07	65
9-May	1.08	0.00	42	72	0.000	1.08	65
10-May	1.08	0.00	44	79	0.000	1.08	65
11-May	1.08	0.23	52	84	0.000	1.08	65
12-May	1.14	0.03	41	70	0.000	1.14	68
13-May	1.12	0.30	42	65	0.000	1.12	67
14-May	1.05	0.00	40	67	0.000	1.05	63
15-May	1.06	0.10	45	70	0.000	1.06	64
16-May	1.07	0.05	48	72	0.000	1.07	64
17-May	1.07	0.05	50	62	0.000	1.07	64
18-May	1.02	0.00	49	64	0.000	1.02	62
19-May	1.05	0.00	41	66	0.000	1.05	63
20-May	1.07	0.28	43	70	0.000	1.07	64
21-May	1.11	0.32	43	57	0.000	1.11	67
22-May	1.12	0.19	39	51	0.000	1.12	67
23-May	0.99	0.01	38	63	0.000	0.99	59

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
24-May	1.02	0.08	43	67	0.000	1.02	61
25-May	0.99	0.02	47	70	0.000	0.99	60
26-May	1.01	0.09	47	65	0.000	1.01	61
27-May	1.05	0.13	49	62	0.000	1.05	63
28-May	1.03	0.00	48	65	0.000	1.03	62
29-May	1.09	0.56	45	55	0.000	1.09	66
30-May	1.07	0.17	45	61	0.000	1.07	64
31-May	1.04	0.01	45	69	0.000	1.04	63
1-Jun	1.04	0.03	48	72	0.000	1.04	63
2-Jun	1.00	0.00	48	69	0.000	1.00	60
3-Jun	1.05	0.00	48	73	0.000	1.05	63
4-Jun	1.01	0.00	47	80	0.000	1.01	61
5-Jun	1.04	0.00	46	77	0.000	1.04	62
6-Jun	0.95	0.00	49	79	0.000	0.95	57
7-Jun	0.97	0.00	46	70	0.000	0.97	58
8-Jun	1.00	0.00	46	66	0.000	1.00	60
9-Jun	1.02	0.00	40	67	0.000	1.02	61
10-Jun	1.00	0.00	43	71	0.000	1.00	60
11-Jun	0.95	0.00	50	76	0.000	0.95	57
12-Jun	1.03	0.03	49	69	0.000	1.03	62
13-Jun	0.96	0.00	49	69	0.000	0.96	58
14-Jun	0.95	0.00	43	72	0.000	0.95	57
15-Jun	1.02	0.00	49	79	0.000	1.02	61
16-Jun	0.99	0.02	47	73	0.000	0.99	60
17-Jun	0.92	0.13	50	80	0.000	0.92	55
18-Jun	1.01	0.09	52	75	0.000	1.01	60
19-Jun	1.01	0.33	50	71	0.000	1.01	61
20-Jun	1.15	0.65	49	56	0.000	1.15	69
21-Jun	0.99	0.00	48	71	0.000	0.99	59
22-Jun	0.94	0.00	51	79	0.000	0.94	57
23-Jun	0.97	0.10	54	72	0.000	0.97	58
24-Jun	1.04	0.19	53	72	0.000	1.04	63
25-Jun	0.99	0.23	52	77	0.000	0.99	60
26-Jun	1.03	0.26	54	72	0.000	1.03	62
27-Jun	1.06	0.09	54	75	0.000	1.06	64
28-Jun	1.05	0.00	58	86	0.000	1.05	63
29-Jun	0.98	0.00	55	85	0.000	0.98	59
30-Jun	1.04	0.00	58	92	0.000	1.04	63
1-Jul	0.96	0.00	54	86	0.000	0.96	58
2-Jul	1.03	0.00	50	78	0.000	1.03	62
3-Jul	0.97	0.00	53	77	0.000	0.97	59
4-Jul	0.97	0.00	47	74	0.000	0.97	58
5-Jul	0.89	0.00	48	79	0.000	0.89	54
6-Jul	0.95	0.00	51	80	0.000	0.95	57
7-Jul	1.00	0.00	51	81	0.000	1.00	60
8-Jul	0.97	0.00	52	80	0.000	0.97	59
9-Jul	0.97	0.00	50	82	0.000	0.97	59
10-Jul	0.94	0.00	52	75	0.000	0.94	57
11-Jul	0.96	0.00	45	70	0.000	0.96	58

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
12-Jul	0.99	0.00	43	71	0.000	0.99	60
13-Jul	0.93	0.00	43	77	0.000	0.93	56
14-Jul	1.00	0.00	45	80	0.000	1.00	60
15-Jul	0.93	0.00	47	82	0.000	0.93	56
16-Jul	0.94	0.07	52	88	0.000	0.94	57
17-Jul	0.96	0.00	55	75	0.000	0.96	57
18-Jul	0.96	0.00	49	78	0.000	0.96	58
19-Jul	0.99	0.00	50	78	0.000	0.99	60
20-Jul	0.97	0.00	49	79	0.000	0.97	58
21-Jul	0.99	0.00	51	80	0.000	0.99	60
22-Jul	0.96	0.00	50	79	0.000	0.96	58
23-Jul	0.95	0.00	48	86	0.000	0.95	57
24-Jul	0.90	0.00	46	83	0.000	0.90	54
25-Jul	0.94	0.00	47	83	0.000	0.94	57
26-Jul	0.92	0.00	46	82	0.000	0.92	55
27-Jul	0.90	0.00	46	80	0.000	0.90	54
28-Jul	0.88	0.00	47	75	0.000	0.88	53
29-Jul	0.89	0.00	48	78	0.000	0.89	54
30-Jul	0.91	0.00	50	79	0.000	0.91	55
31-Jul	0.92	0.10	51	75	0.000	0.92	55
1-Aug	0.91	0.26	54	67	0.000	0.91	55
2-Aug	0.99	0.25	54	63	0.000	0.99	59
3-Aug	0.94	0.00	52	75	0.000	0.94	57
4-Aug	0.87	0.00	52	82	0.000	0.87	52
5-Aug	0.94	0.00	47	82	0.000	0.94	56
6-Aug	0.88	0.00	47	84	0.000	0.88	53
7-Aug	0.89	0.00	52	85	0.000	0.89	54
8-Aug	0.93	0.00	49	80	0.000	0.93	56
9-Aug	0.89	0.05	51	82	0.000	0.89	54
10-Aug	0.88	0.13	52	84	0.000	0.88	53
11-Aug	0.95	0.00	52	76	0.000	0.95	57
12-Aug	0.92	0.00	52	79	0.000	0.92	56
13-Aug	0.89	0.00	50	83	0.000	0.89	53
14-Aug	0.95	0.07	53	85	0.000	0.95	57
15-Aug	0.93	0.05	58	72	0.000	0.93	56
16-Aug	0.89	0.00	58	86	0.000	0.89	53
17-Aug	0.90	0.00	55	82	0.000	0.90	54
18-Aug	0.93	0.00	55	78	0.000	0.93	56
19-Aug	0.88	0.00	48	78	0.000	0.88	53
20-Aug	0.88	0.00	45	78	0.000	0.88	53
21-Aug	0.91	0.00	46	81	0.000	0.91	55
22-Aug	0.85	0.00	50	86	0.000	0.85	51
23-Aug	0.91	0.18	54	78	0.000	0.91	54
24-Aug	0.98	0.07	48	77	0.000	0.98	59
25-Aug	0.83	0.01	48	79	0.000	0.83	50
26-Aug	0.91	0.00	51	80	0.000	0.91	55
27-Aug	0.90	0.18	52	83	0.000	0.90	54
28-Aug	0.90	0.15	53	82	0.000	0.90	54
29-Aug	0.95	0.30	58	80	0.000	0.95	57

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
30-Aug	0.87	0.00	47	82	0.000	0.87	52
31-Aug	0.85	0.00	48	82	0.000	0.85	51
1-Sep	0.84	0.00	52	85	0.000	0.84	51
2-Sep	0.93	0.12	54	84	0.000	0.93	56
3-Sep	0.98	0.12	54	76	0.000	0.98	59
4-Sep	0.90	0.00	52	71	0.000	0.90	54
5-Sep	0.95	1.63	54	72	0.000	0.95	57
6-Sep	1.23	0.37	56	75	0.000	1.23	74
7-Sep	0.91	0.00	53	77	0.000	0.91	55
8-Sep	0.97	0.00	51	80	0.000	0.97	58
9-Sep	0.92	0.00	51	78	0.000	0.92	55
10-Sep	0.89	0.00	49	82	0.000	0.89	54
11-Sep	0.89	0.00	51	91	0.000	0.89	54
12-Sep	0.92	0.00	53	81	0.000	0.92	56
13-Sep	0.88	0.00	54	67	0.000	0.88	53
14-Sep	0.91	0.00	53	68	0.000	0.91	54
15-Sep	0.96	0.22	53	66	0.000	0.96	58
16-Sep	0.92	0.06	52	64	0.000	0.92	55
17-Sep	0.92	0.14	37	63	0.000	0.92	55
18-Sep	0.91	0.00	43	72	0.000	0.91	55
19-Sep	0.87	0.00	43	83	0.000	0.87	53
20-Sep	0.87	0.00	46	68	0.000	0.87	52
21-Sep	0.90	0.00	45	72	0.000	0.90	54
22-Sep	0.90	0.28	51	62	0.000	0.90	54
23-Sep	0.94	0.17	45	61	0.000	0.94	56
24-Sep	0.92	0.42	43	64	0.000	0.92	55
25-Sep	0.89	0.00	38	61	0.000	0.89	54
26-Sep	0.91	0.05	38	66	0.000	0.91	54
27-Sep	0.84	0.35	46	56	0.000	0.84	51
28-Sep	1.02	0.53	46	61	0.000	1.02	62
29-Sep	1.04	0.30	46	57	0.000	1.04	62
30-Sep	0.93	0.08	45	60	0.000	0.93	56
1-Oct	0.90	0.16	45	60	0.000	0.90	54
2-Oct	1.06	0.36	39	54	0.000	1.06	63
3-Oct	0.94	0.00	34	62	0.000	0.94	56
4-Oct	0.92	0.00	34	68	0.000	0.92	55
5-Oct	0.92	0.00	40	72	0.000	0.92	55
6-Oct	0.99	0.07	40	80	0.000	0.99	59
7-Oct	1.14	0.92	46	60	0.000	1.14	69
8-Oct	1.03	0.18	30	60	0.000	1.03	62
9-Oct	0.99	0.00	31	63	0.000	0.99	59
10-Oct	0.99	0.00	36	59	0.000	0.99	60
11-Oct	0.90	0.04	36	58	0.000	0.90	54
12-Oct	1.00	0.00	37	59	0.000	1.00	60
13-Oct	0.99	0.00	31	61	0.000	0.99	59
14-Oct	0.97	0.00	31	62	0.000	0.97	58
15-Oct	0.94	0.00	33	65	0.000	0.94	57
16-Oct	0.93	0.00	39	58	0.000	0.93	56
17-Oct	0.92	0.00	33	62	0.000	0.92	55

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
18-Oct	0.85	0.00	32	60	0.000	0.85	51
19-Oct	0.95	0.00	34	50	0.000	0.95	57
20-Oct	0.98	0.00	42	51	0.000	0.98	59
21-Oct	0.90	0.01	40	52	0.000	0.90	54
22-Oct	0.88	0.00	36	52	0.000	0.88	53
23-Oct	0.91	0.00	35	65	0.000	0.91	55
24-Oct	0.88	0.00	36	56	0.000	0.88	53
25-Oct	0.89	0.00	43	55	0.000	0.89	54
26-Oct	0.90	0.35	43	54	0.000	0.90	54
27-Oct	1.01	0.00	39	60	0.000	1.01	61
28-Oct	0.95	0.00	27	62	0.000	0.95	57
29-Oct	0.91	0.00	27	62	0.000	0.91	55
30-Oct	0.91	0.12	33	58	0.000	0.91	55
31-Oct	0.86	0.20	43	52	0.000	0.86	52
1-Nov	0.94	0.41	45	56	0.000	0.94	57
2-Nov	1.11	0.84	34	54	0.000	1.11	67
3-Nov	1.13	0.02	28	52	0.000	1.13	68
4-Nov	0.99	0.17	27	50	0.000	0.99	59
5-Nov	0.98	0.16	36	46	0.000	0.98	59
6-Nov	0.93	0.57	36	54	0.000	0.93	56
7-Nov	1.14	0.28	40	51	0.000	1.14	69
8-Nov	0.97	0.04	34	54	0.000	0.97	58
9-Nov	0.98	0.00	35	51	0.000	0.98	59
10-Nov	0.97	0.04	34	50	0.000	0.97	58
11-Nov	1.01	0.04	34	62	0.000	1.01	61
12-Nov	0.95	0.02	41	56	0.000	0.95	57
13-Nov	0.95	0.02	43	60	0.000	0.95	57
14-Nov	0.92	0.10	38	49	0.000	0.92	56
15-Nov	1.16	1.26	35	47	0.000	1.16	70
16-Nov	1.13	0.16	33	44	0.000	1.13	68
17-Nov	1.13	0.17	34	48	0.000	1.13	68
18-Nov	1.18	0.76	40	52	0.000	1.18	71
19-Nov	1.19	0.00	23	46	0.000	1.19	71
20-Nov	1.17	0.00	20	45	0.000	1.17	70
21-Nov	1.16	0.00	19	44	0.000	1.16	70
22-Nov	1.07	0.00	20	47	0.000	1.07	64
23-Nov	1.07	0.00	21	49	0.000	1.07	64
24-Nov	1.10	0.00	24	52	0.000	1.10	66
25-Nov	1.02	0.00	24	54	0.000	1.02	62
26-Nov	1.01	0.00	24	57	0.000	1.01	61
27-Nov	1.00	0.00	25	58	0.000	1.00	60
28-Nov	1.02	0.00	25	60	0.000	1.02	62
29-Nov	0.87	0.08	35	51	0.000	0.87	52
30-Nov	0.99	0.36	40	51	0.000	0.99	60
1-Dec	1.12	0.49	32	51	0.000	1.12	68
2-Dec	1.07	0.00	24	44	0.000	1.07	64
3-Dec	1.01	0.00	18	42	0.000	1.01	61
4-Dec	1.02	0.00	17	42	0.000	1.02	61
5-Dec	1.07	0.00	13	35	0.000	1.07	64

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
6-Dec	0.95	0.00	12	38	0.000	0.95	57
7-Dec	0.99	0.00	10	33	0.000	0.99	60
8-Dec	1.06	0.00	14	36	0.000	1.06	64
9-Dec	1.08	0.00	19	32	0.000	1.08	65
10-Dec	0.98	0.00	23	37	0.000	0.98	59
11-Dec	1.05	0.00	23	41	0.000	1.05	63
12-Dec	1.00	0.16	25	44	0.000	1.00	60
13-Dec	0.91	0.04	34	44	0.000	0.91	55
14-Dec	0.95	0.02	34	46	0.000	0.95	57
15-Dec	0.97	0.04	32	49	0.000	0.97	59
16-Dec	0.94	0.00	26	55	0.000	0.94	57
17-Dec	1.00	0.00	24	40	0.000	1.00	60
18-Dec	0.94	0.00	20	44	0.000	0.94	56
19-Dec	0.95	0.17	20	37	0.000	0.95	57
20-Dec	1.05	0.72	27	35	0.000	1.05	63
21-Dec	1.13	0.50	30	40	0.000	1.13	68
22-Dec	1.10	0.57	34	48	0.000	1.10	66
23-Dec	1.24	0.27	34	51	0.000	1.24	75
24-Dec	1.20	0.00	23	47	0.000	1.20	72
25-Dec	1.02	0.00	24	46	0.000	1.02	61
26-Dec	1.07	0.00	26	51	0.000	1.07	64
27-Dec	1.05	0.10	29	43	0.000	1.05	63
28-Dec	0.99	0.00	34	46	0.000	0.99	59
29-Dec	1.02	0.00	32	42	0.000	1.02	61
30-Dec	0.95	0.07	30	43	0.000	0.95	57
31-Dec	0.97	0.00	28	46	0.000	0.97	58
2014							
1-Jan	0.97	0.13	28	44	0.000	0.97	60
2-Jan	1.10	0.72	33	50	0.000	1.10	68
3-Jan	1.04	0.00	28	48	0.000	1.04	65
4-Jan	1.04	0.00	21	47	0.000	1.04	64
5-Jan	1.09	0.00	21	44	0.000	1.09	68
6-Jan	1.05	0.17	22	40	0.000	1.05	65
7-Jan	1.26	0.87	36	46	0.000	1.26	78
8-Jan	1.24	0.41	32	48	0.000	1.24	77
9-Jan	1.23	0.07	37	47	0.000	1.23	76
10-Jan	1.21	0.75	40	52	0.000	1.21	75
11-Jan	1.60	0.55	24	48	0.000	1.60	99
12-Jan	1.74	0.95	35	48	0.000	1.74	108
13-Jan	1.59	0.17	42	51	0.000	1.59	99
14-Jan	1.45	0.00	35	51	0.000	1.45	90
15-Jan	1.41	0.00	28	52	0.000	1.41	87
16-Jan	1.31	0.00	28	40	0.000	1.31	82
17-Jan	1.26	0.00	28	43	0.000	1.26	78
18-Jan	1.26	0.00	28	45	0.000	1.26	78
19-Jan	1.14	0.00	29	44	0.000	1.14	71
20-Jan	1.18	0.00	25	51	0.000	1.18	73
21-Jan	1.12	0.00	25	45	0.000	1.12	70
22-Jan	1.03	0.00	27	50	0.000	1.03	64

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
23-Jan	1.08	0.00	26	49	0.000	1.08	67
24-Jan	1.05	0.00	25	57	0.000	1.05	65
25-Jan	0.98	0.00	22	61	0.000	0.98	61
26-Jan	1.03	0.00	24	47	0.000	1.03	64
27-Jan	1.08	0.02	26	41	0.000	1.08	67
28-Jan	0.99	0.50	36	46	0.000	0.99	62
29-Jan	1.14	0.88	36	50	0.000	1.14	71
30-Jan	1.28	0.45	35	43	0.000	1.28	79
31-Jan	1.15	0.00	27	44	0.000	1.15	71
1-Feb	1.14	0.00	28	49	0.000	1.14	70
2-Feb	1.05	0.00	23	46	0.000	1.05	65
3-Feb	1.11	0.00	22	43	0.000	1.11	69
4-Feb	1.03	0.00	14	36	0.000	1.03	64
5-Feb	1.05	0.00	10	38	0.000	1.05	65
6-Feb	1.05	0.00	10	32	0.000	1.05	65
7-Feb	1.04	0.00	12	40	0.000	1.04	65
8-Feb	1.02	0.05	13	41	0.000	1.02	63
9-Feb	1.03	0.28	28	40	0.000	1.03	64
10-Feb	1.08	0.07	33	48	0.000	1.08	67
11-Feb	1.02	0.17	33	51	0.000	1.02	63
12-Feb	1.00	0.08	37	52	0.000	1.00	62
13-Feb	0.96	0.09	36	57	0.000	0.96	60
14-Feb	1.07	0.12	34	57	0.000	1.07	67
15-Feb	1.10	0.62	34	50	0.000	1.10	68
16-Feb	1.17	0.64	34	46	0.000	1.17	72
17-Feb	1.29	0.17	33	46	0.000	1.29	80
18-Feb	1.16	0.21	32	48	0.000	1.16	72
19-Feb	1.13	0.07	31	48	0.000	1.13	70
20-Feb	1.10	0.25	30	50	0.000	1.10	68
21-Feb	1.15	0.00	26	43	0.000	1.15	72
22-Feb	1.18	0.92	28	37	0.000	1.18	73
23-Feb	1.48	0.71	32	37	0.000	1.48	92
24-Feb	1.47	0.52	31	41	0.000	1.47	91
25-Feb	1.35	0.00	28	54	0.000	1.35	84
26-Feb	1.31	0.00	27	63	0.000	1.31	82
27-Feb	1.25	0.00	32	51	0.000	1.25	77
28-Feb	1.18	0.00	34	60	0.000	1.18	73
1-Mar	1.17	0.05	31	46	0.000	1.17	73
2-Mar	1.21	0.35	34	50	0.000	1.21	75
3-Mar	1.22	0.44	37	51	0.000	1.22	76
4-Mar	1.28	0.89	37	48	0.000	1.28	79
5-Mar	1.64	0.82	40	60	0.000	1.64	102
6-Mar	1.70	0.56	42	52	0.000	1.70	105
7-Mar	1.57	0.00	40	61	0.000	1.57	97
8-Mar	1.52	0.38	42	55	0.000	1.52	95
9-Mar	1.50	0.39	41	55	0.000	1.50	93
10-Mar	1.53	0.00	35	55	0.000	1.53	95
11-Mar	1.43	0.00	29	61	0.000	1.43	89
12-Mar	1.37	0.00	29	64	0.000	1.37	85

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
13-Mar	1.36	0.17	29	62	0.000	1.36	84
14-Mar	1.33	0.24	39	57	0.000	1.33	83
15-Mar	1.34	0.97	39	60	0.000	1.34	83
16-Mar	1.85	0.83	34	44	0.000	1.85	115
17-Mar	1.74	0.10	33	52	0.000	1.74	108
18-Mar	1.53	0.31	34	54	0.000	1.53	95
19-Mar	1.72	0.63	32	46	0.000	1.72	107
20-Mar	1.60	0.19	27	51	0.000	1.60	99
21-Mar	1.53	0.00	27	55	0.000	1.53	95
22-Mar	1.41	0.00	27	51	0.000	1.41	87
23-Mar	1.39	0.00	28	57	0.000	1.39	86
24-Mar	1.28	0.00	38	72	0.000	1.28	79
25-Mar	1.28	0.20	42	58	0.000	1.28	79
26-Mar	1.26	0.17	41	55	0.000	1.26	78
27-Mar	1.25	0.12	41	56	0.000	1.25	78
28-Mar	1.24	0.48	40	54	0.000	1.24	77
29-Mar	1.31	0.30	42	54	0.000	1.31	82
30-Mar	1.30	0.10	30	57	0.000	1.30	81
31-Mar	1.19	0.00	30	65	0.000	1.19	74
1-Apr	1.14	0.00	32	63	0.000	1.14	71
2-Apr	1.11	0.00	37	62	0.000	1.11	69
3-Apr	1.13	0.07	38	57	0.000	1.13	70
4-Apr	1.14	0.08	41	61	0.000	1.14	71
5-Apr	1.12	0.45	41	53	0.000	1.12	69
6-Apr	1.14	0.00	42	63	0.000	1.14	71
7-Apr	1.09	0.00	43	76	0.000	1.09	67
8-Apr	1.12	0.45	36	60	0.000	1.12	70
9-Apr	1.12	0.00	34	61	0.000	1.12	69
10-Apr	1.05	0.00	35	59	0.000	1.05	65
11-Apr	1.06	0.00	33	62	0.000	1.06	66
12-Apr	1.04	0.00	30	63	0.000	1.04	65
13-Apr	1.07	0.00	31	72	0.000	1.07	67
14-Apr	1.04	0.00	33	69	0.000	1.04	65
15-Apr	1.01	0.07	43	69	0.000	1.01	62
16-Apr	1.07	0.61	44	52	0.000	1.07	66
17-Apr	1.21	0.72	38	54	0.000	1.21	75
18-Apr	1.10	0.00	37	61	0.000	1.10	69
19-Apr	1.25	0.78	39	55	0.000	1.25	78
20-Apr	1.19	0.00	39	62	0.000	1.19	74
21-Apr	1.15	0.45	40	62	0.000	1.15	71
22-Apr	1.17	0.25	39	62	0.000	1.17	73
23-Apr	1.19	0.32	41	59	0.000	1.19	74
24-Apr	1.17	0.00	37	58	0.000	1.17	73
25-Apr	1.10	0.00	33	60	0.000	1.10	68
26-Apr	1.07	0.11	37	63	0.000	1.07	67
27-Apr	1.13	0.09	37	58	0.000	1.13	70
28-Apr	1.09	0.00	39	66	0.000	1.09	68
29-Apr	1.02	0.00	40	79	0.000	1.02	64
30-Apr	1.06	0.00	43	83	0.000	1.06	66

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
1-May	0.97	0.00	43	89	0.000	0.97	60
2-May	1.05	0.12	48	72	0.000	1.05	65
3-May	1.09	0.59	45	60	0.000	1.09	68
4-May	1.14	0.25	44	57	0.000	1.14	71
5-May	1.15	0.20	42	62	0.000	1.15	71
6-May	1.11	0.00	35	65	0.000	1.11	69
7-May	1.08	0.00	43	69	0.000	1.08	67
8-May	1.20	1.18	42	60	0.000	1.20	75
9-May	1.47	1.18	43	57	0.000	1.47	91
10-May	1.45	0.03	39	60	0.000	1.45	90
11-May	1.31	0.00	41	68	0.000	1.31	81
12-May	1.44	0.00	43	79	0.000	1.44	90
13-May	1.23	0.00	46	82	0.000	1.23	77
14-May	1.15	0.00	48	84	0.000	1.15	71
15-May	1.13	0.00	51	82	0.000	1.13	70
16-May	1.15	0.00	50	72	0.000	1.15	71
17-May	1.10	0.16	47	68	0.000	1.10	68
18-May	1.34	0.85	49	72	0.000	1.34	83
19-May	1.33	0.00	44	71	0.000	1.33	82
20-May	1.21	0.00	44	70	0.000	1.21	75
21-May	1.17	0.00	47	70	0.000	1.17	73
22-May	1.09	0.04	50	75	0.000	1.09	68
23-May	1.20	0.17	49	59	0.000	1.20	74
24-May	1.07	0.00	49	69	0.000	1.07	66
25-May	1.12	0.20	46	62	0.000	1.12	69
26-May	1.18	0.06	42	65	0.000	1.18	73
27-May	1.19	0.00	41	68	0.000	1.19	74
28-May	1.09	0.07	44	69	0.000	1.09	67
29-May	1.14	0.02	41	62	0.000	1.14	71
30-May	1.61	0.00	40	70	0.000	1.61	100
31-May	0.98	0.00	44	77	0.000	0.98	61
1-Jun	1.08	0.00	44	75	0.000	1.08	67
2-Jun	1.12	0.00	48	77	0.000	1.12	69
3-Jun	1.02	0.00	50	71	0.000	1.02	63
4-Jun	1.01	0.00	44	71	0.000	1.01	63
5-Jun	1.05	0.00	42	74	0.000	1.05	65
6-Jun	0.98	0.00	45	77	0.000	0.98	61
7-Jun	1.03	0.00	50	74	0.000	1.03	64
8-Jun	1.05	0.00	50	76	0.000	1.05	65
9-Jun	1.06	0.00	45	69	0.000	1.06	66
10-Jun	0.94	0.00	43	68	0.000	0.94	58
11-Jun	1.07	0.00	47	75	0.000	1.07	67
12-Jun	1.06	1.08	48	69	0.000	1.06	66
13-Jun	1.16	0.44	48	60	0.000	1.16	72
14-Jun	1.11	0.20	47	64	0.000	1.11	69
15-Jun	1.03	0.17	46	60	0.000	1.03	64
16-Jun	1.11	0.13	43	66	0.000	1.11	69
17-Jun	1.03	0.00	48	70	0.000	1.03	64
18-Jun	1.04	0.00	48	70	0.000	1.04	65

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
19-Jun	1.01	0.10	48	76	0.000	1.01	63
20-Jun	1.10	0.00	41	69	0.000	1.10	68
21-Jun	0.96	0.00	42	74	0.000	0.96	59
22-Jun	1.07	0.00	47	77	0.000	1.07	66
23-Jun	1.00	0.00	53	75	0.000	1.00	62
24-Jun	0.97	0.00	50	79	0.000	0.97	60
25-Jun	1.01	0.00	50	79	0.000	1.01	62
26-Jun	1.00	0.02	55	75	0.000	1.00	62
27-Jun	0.98	0.11	54	72	0.000	0.98	61
28-Jun	0.96	0.22	52	71	0.000	0.96	59
29-Jun	0.99	0.03	46	71	0.000	0.99	61
30-Jun	1.09	0.00	48	79	0.000	1.09	67
1-Jul	0.96	0.00	51	94	0.000	0.96	59
2-Jul	0.96	0.00	53	78	0.000	0.96	60
3-Jul	1.03	0.00	48	70	0.000	1.03	64
4-Jul	0.88	0.00	47	75	0.000	0.88	55
5-Jul	0.87	0.00	47	75	0.000	0.87	54
6-Jul	0.96	0.00	55	84	0.000	0.96	60
7-Jul	0.97	0.00	51	81	0.000	0.97	60
8-Jul	1.04	0.00	50	85	0.000	1.04	65
9-Jul	0.92	0.00	48	81	0.000	0.92	57
10-Jul	0.97	0.00	49	82	0.000	0.97	61
11-Jul	0.95	0.00	53	88	0.000	0.95	59
12-Jul	0.92	0.00	50	90	0.000	0.92	57
13-Jul	0.98	0.00	53	88	0.000	0.98	61
14-Jul	0.94	0.00	51	85	0.000	0.94	58
15-Jul	1.00	0.00	49	86	0.000	1.00	62
16-Jul	1.00	0.00	52	89	0.000	1.00	62
17-Jul	0.92	0.00	49	81	0.000	0.92	57
18-Jul	0.93	0.00	52	78	0.000	0.93	58
19-Jul	0.92	0.04	48	68	0.000	0.92	57
20-Jul	0.96	0.00	52	65	0.000	0.96	59
21-Jul	0.96	0.00	47	77	0.000	0.96	60
22-Jul	0.92	0.04	46	77	0.000	0.92	57
23-Jul	1.09	0.98	41	64	0.000	1.09	68
24-Jul	1.03	0.22	50	62	0.000	1.03	64
25-Jul	0.93	0.00	48	75	0.000	0.93	58
26-Jul	0.92	0.00	47	80	0.000	0.92	57
27-Jul	0.98	0.00	49	82	0.000	0.98	61
28-Jul	0.97	0.00	47	86	0.000	0.97	60
29-Jul	0.99	0.00	50	82	0.000	0.99	61
30-Jul	0.99	0.00	48	83	0.000	0.99	61
31-Jul	0.92	0.00	48	86	0.000	0.92	57
1-Aug	0.95	0.00	51	84	0.000	0.95	59
2-Aug	0.93	0.00	52	84	0.000	0.93	58
3-Aug	1.00	0.00	49	89	0.000	1.00	62
4-Aug	0.96	0.00	50	88	0.000	0.96	60
5-Aug	0.98	0.00	52	79	0.000	0.98	61
6-Aug	0.95	0.00	49	80	0.000	0.95	59

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
7-Aug	0.98	0.00	49	80	0.000	0.98	61
8-Aug	0.93	0.00	45	79	0.000	0.93	58
9-Aug	0.91	0.00	46	81	0.000	0.91	56
10-Aug	0.98	0.00	48	86	0.000	0.98	61
11-Aug	0.93	0.00	52	96	0.000	0.93	58
12-Aug	1.03	0.67	58	79	0.000	1.03	64
13-Aug	1.16	0.19	54	73	0.000	1.16	72
14-Aug	1.03	0.05	53	67	0.000	1.03	64
15-Aug	1.02	0.01	56	72	0.000	1.02	63
16-Aug	0.98	0.00	53	79	0.000	0.98	61
17-Aug	0.98	0.00	53	81	0.000	0.98	61
18-Aug	0.98	0.00	54	84	0.000	0.98	61
19-Aug	0.91	0.00	54	83	0.000	0.91	56
20-Aug	0.96	0.00	48	75	0.000	0.96	60
21-Aug	0.89	0.00	45	74	0.000	0.89	55
22-Aug	0.98	0.00	47	75	0.000	0.98	61
23-Aug	0.90	0.00	48	82	0.000	0.90	56
24-Aug	0.93	0.00	48	80	0.000	0.93	58
25-Aug	1.00	0.00	50	87	0.000	1.00	62
26-Aug	0.91	0.00	54	89	0.000	0.91	56
27-Aug	1.00	0.00	54	84	0.000	1.00	62
28-Aug	0.81	0.00	55	79	0.000	0.81	50
29-Aug	0.95	0.12	49	70	0.000	0.95	59
30-Aug	0.92	0.03	50	69	0.000	0.92	57
31-Aug	0.93	0.00	51	76	0.000	0.93	58
1-Sep	1.00	0.00	54	78	0.000	1.00	62
2-Sep	1.09	1.08	49	66	0.000	1.09	68
3-Sep	1.04	0.00	42	73	0.000	1.04	65
4-Sep	0.95	0.00	42	75	0.000	0.95	59
5-Sep	0.99	0.00	43	84	0.000	0.99	61
6-Sep	0.89	0.00	46	89	0.000	0.89	55
7-Sep	0.99	0.00	47	87	0.000	0.99	62
8-Sep	0.99	0.00	47	71	0.000	0.99	61
9-Sep	0.98	0.00	46	74	0.000	0.98	61
10-Sep	0.96	0.00	39	74	0.000	0.96	59
11-Sep	0.92	0.00	35	76	0.000	0.92	57
12-Sep	0.94	0.00	35	78	0.000	0.94	58
13-Sep	0.90	0.00	37	83	0.000	0.90	56
14-Sep	0.95	0.00	42	88	0.000	0.95	59
15-Sep	0.97	0.00	42	88	0.000	0.97	60
16-Sep	0.91	0.00	47	76	0.000	0.91	57
17-Sep	0.91	0.23	53	74	0.000	0.91	57
18-Sep	0.86	0.19	49	68	0.000	0.86	53
19-Sep	0.85	0.20	49	76	0.000	0.85	53
20-Sep	0.83	0.00	46	80	0.000	0.83	51
21-Sep	0.87	0.00	46	87	0.000	0.87	54
22-Sep	0.83	0.04	52	74	0.000	0.83	51
23-Sep	0.87	0.76	53	71	0.000	0.87	54
24-Sep	1.01	0.28	52	67	0.000	1.01	62

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
25-Sep	0.90	0.62	51	72	0.000	0.90	56
26-Sep	1.08	0.91	48	65	0.000	1.08	67
27-Sep	0.89	0.00	48	69	0.000	0.89	55
28-Sep	0.92	0.00	45	66	0.000	0.92	57
29-Sep	0.91	0.18	42	63	0.000	0.91	57
30-Sep	0.89	0.00	48	63	0.000	0.89	55
1-Oct	0.86	0.00	42	67	0.000	0.86	53
2-Oct	0.85	0.00	39	69	0.000	0.85	53
3-Oct	0.84	0.00	39	75	0.000	0.84	52
4-Oct	0.84	0.02	47	72	0.000	0.84	52
5-Oct	0.86	0.00	47	78	0.000	0.86	54
6-Oct	0.86	0.00	48	76	0.000	0.86	54
7-Oct	0.85	0.00	49	63	0.000	0.85	53
8-Oct	0.89	0.00	43	65	0.000	0.89	55
9-Oct	0.91	0.00	43	72	0.000	0.91	56
10-Oct	0.83	0.03	43	65	0.000	0.83	52
11-Oct	0.89	0.40	43	65	0.000	0.89	55
12-Oct	0.87	0.02	48	65	0.000	0.87	54
13-Oct	0.98	1.34	47	70	0.000	0.98	61
14-Oct	1.06	0.29	47	63	0.000	1.06	66
15-Oct	0.99	0.38	42	69	0.000	0.99	62
16-Oct	0.94	0.00	42	71	0.000	0.94	58
17-Oct	0.91	0.50	47	70	0.000	0.91	56
18-Oct	0.87	0.00	53	69	0.000	0.87	54
19-Oct	0.91	0.18	52	75	0.000	0.91	57
20-Oct	0.93	0.21	48	67	0.000	0.93	58
21-Oct	0.92	0.53	48	63	0.000	0.92	57
22-Oct	1.16	0.78	48	57	0.000	1.16	72
23-Oct	1.00	0.06	43	58	0.000	1.00	62
24-Oct	0.93	0.16	41	59	0.000	0.93	58
25-Oct	1.08	0.95	41	62	0.000	1.08	67
26-Oct	1.11	0.25	39	53	0.000	1.11	69
27-Oct	1.03	0.10	38	60	0.000	1.03	64
28-Oct	1.10	0.28	46	63	0.000	1.10	68
29-Oct	1.08	0.03	45	64	0.000	1.08	67
30-Oct	1.23	1.32	46	60	0.000	1.23	77
31-Oct	1.38	0.45	37	53	0.000	1.38	86
1-Nov	1.20	0.03	36	51	0.000	1.20	74
2-Nov	1.21	0.30	41	56	0.000	1.21	75
3-Nov	1.27	0.83	45	56	0.000	1.27	79
4-Nov	1.32	0.21	45	51	0.000	1.32	82
5-Nov	1.24	0.42	45	56	0.000	1.24	77
6-Nov	1.38	0.58	39	60	0.000	1.38	85
7-Nov	1.26	0.03	30	60	0.000	1.26	78
8-Nov	1.22	0.29	31	56	0.000	1.22	76
9-Nov	1.27	0.09	33	53	0.000	1.27	79
10-Nov	1.18	0.01	29	55	0.000	1.18	73
11-Nov	1.16	0.00	17	50	0.000	1.16	72
12-Nov	1.11	0.00	14	49	0.000	1.11	69

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)
13-Nov	1.08	0.00	14	47	0.000	1.08	67
14-Nov	1.06	0.00	14	45	0.000	1.06	66
15-Nov	1.03	0.00	14	47	0.000	1.03	64
16-Nov	1.06	0.00	16	48	0.000	1.06	66
17-Nov	1.05	0.00	18	51	0.000	1.05	65
18-Nov	1.05	0.00	20	47	0.000	1.05	65
19-Nov	1.01	0.09	27	50	0.000	1.01	63
20-Nov	1.05	0.07	42	54	0.000	1.05	65
21-Nov	1.11	0.85	36	57	0.000	1.11	69
22-Nov	1.08	0.24	39	50	0.000	1.08	67
23-Nov	1.16	0.16	35	54	0.000	1.16	72
24-Nov	1.13	0.87	37	50	0.000	1.13	70
25-Nov	1.39	0.41	37	56	0.000	1.39	86
26-Nov	1.29	0.00	46	61	0.000	1.29	80
27-Nov	1.21	0.13	33	51	0.000	1.21	75
28-Nov	1.35	1.04	27	48	0.000	1.35	84
29-Nov	1.38	0.00	9	38	0.000	1.38	86
30-Nov	1.34	0.00	9	37	0.000	1.34	83
1-Dec	1.26	0.00	10	39	0.000	1.26	78
2-Dec	1.21	0.00	11	41	0.000	1.21	75
3-Dec	1.18	0.00	17	41	0.000	1.18	73
4-Dec	1.15	0.18	30	44	0.000	1.15	71
5-Dec	1.12	0.43	38	51	0.000	1.12	69
6-Dec	1.19	0.07	38	53	0.000	1.19	74
7-Dec	1.15	0.02	38	55	0.000	1.15	71
8-Dec	1.16	0.29	43	61	0.000	1.16	72
9-Dec	1.21	0.49	46	62	0.000	1.21	75
10-Dec	1.44	0.69	43	66	0.000	1.44	89
11-Dec	1.54	0.69	33	58	0.000	1.54	95
12-Dec	1.39	0.16	35	50	0.000	1.39	87
13-Dec	1.39	0.10	24	51	0.000	1.39	86
14-Dec	1.40	0.00	22	51	0.000	1.40	87
15-Dec	1.33	0.03	22	45	0.000	1.33	83
16-Dec	1.26	0.00	31	50	0.000	1.26	78
17-Dec	1.24	0.22	32	46	0.000	1.24	77
18-Dec	1.26	0.42	39	51	0.000	1.26	78
19-Dec	1.25	0.18	39	53	0.000	1.25	77
20-Dec	1.28	0.29	39	55	0.000	1.28	80
21-Dec	1.24	0.00	32	52	0.000	1.24	77
22-Dec	1.20	0.02	31	49	0.000	1.20	74
23-Dec	1.32	0.92	34	52	0.000	1.32	82
24-Dec	1.41	0.10	33	43	0.000	1.41	88
25-Dec	1.26	0.09	30	41	0.000	1.26	78
26-Dec	1.25	0.46	32	44	0.000	1.25	77
27-Dec	1.33	0.29	33	47	0.000	1.33	82
28-Dec	1.26	0.05	27	44	0.000	1.26	78
29-Dec	1.25	0.00	19	45	0.000	1.25	78
30-Dec	1.24	0.00	17	39	0.000	1.24	77
31-Dec	1.21	0.00	17	39	0.000	1.21	75

City of Arlington
2015 Comprehensive Sewer System Plan
Appendix E - Infiltration Data and Analyses

Year	Pop.
2009	16,073
2010	16,288
2011	16,292
2012	16,332
2013	16,632
2014	16,116

Max. Q_{res} for Infiltration (gpcd)
120

	Max Inflow Day
	Max Dry-Weather Infiltration - First Day
	Notable Rain Event (> 0.30 in.)

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)	Q_{avg} Dry-Weather Average (MGD)	Q_{res} Dry-Weather Average (gpcd)
2009									
4-Jan	1.74	0.51	31	40	0.000	1.74	108		
5-Jan	1.70	0.33	33	43	0.000	1.70	106		
6-Jan	2.21	1.74	37	51	0.000	2.21	137		
7-Jan	2.41	1.24	42	53	0.000	2.41	150		
8-Jan	3.02	0.42	31	43	0.000	3.02	188		
9-Jan	2.01	0.22	31	42	0.000	2.01	125		
10-Jan	2.33	0.98	34	41	0.000	2.33	145		
11-Jan	2.22	0.20	35	43	0.000	2.22	138	1.88	117
12-Jan	2.02	0.10	39	46	0.000	2.02	126		
13-Jan	1.97	0.10	32	45	0.000	1.97	123		
14-Jan	1.81	0.01	31	42	0.000	1.81	113		
15-Jan	1.80	0.00	28	39	0.000	1.80	112		
16-Jan	1.69	0.00	28	36	0.000	1.69	105		
17-Jan	1.65	0.00	26	37	0.000	1.65	103		
18-Jan	1.57	0.00	25	57	0.000	1.57	98		

Note:
-Q_{avg} = Average of January 11th through January 17th only; January 4th through January 10th WWTP flows could be attributed to inflow events

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)	Q_{avg} Dry-Weather Average (MGD)	Q_{res} Dry-Weather Average (gpcd)
2011									
29-Mar	1.19	0.98	42	51	0.000	1.19	73		
30-Mar	1.81	1.54	44	51	0.000	1.81	111		
31-Mar	1.74	0.10	43	57	0.000	1.74	107		
1-Apr	1.73	1.20	35	47	0.000	1.73	106		
2-Apr	2.08	0.48	36	51	0.000	2.08	128		
3-Apr	1.80	0.18	39	50	0.000	1.80	110		
4-Apr	1.91	0.81	36	46	0.000	1.91	117		
5-Apr	1.82	0.52	34	46	0.000	1.82	112		
6-Apr	1.96	0.10	31	51	0.000	1.96	120	1.77	109
7-Apr	1.79	0.00	28	51	0.000	1.79	110		
8-Apr	1.71	0.02	28	58	0.000	1.71	105		
9-Apr	1.62	0.06	39	56	0.000	1.62	100		
10-Apr	1.71	0.67	37	54	0.000	1.71	105		

Note:
-Q_{avg} = Average of April 6th through April 9th only; March 29th through April 5th WWTP flows could be attributed to inflow events

Date	Q (MGD)	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Q_{ind} (MGD)	Q_{res} (MGD)	Q_{res} (gpcd)	Q_{avg} Dry-Weather Average (MGD)	Q_{res} Dry-Weather Average (gpcd)
2013									
23-Jan	1.25	0.62	26	41	0.000	1.25	75		
24-Jan	1.28	0.26	31	46	0.000	1.28	77		
25-Jan	1.14	0.18	34	56	0.000	1.14	69		
26-Jan	1.34	0.92	34	41	0.000	1.34	81		
27-Jan	1.48	0.90	32	42	0.000	1.48	89		
28-Jan	2.10	1.70	31	38	0.000	2.10	126		
29-Jan	2.16	0.93	34	41	0.000	2.16	130		
30-Jan	2.12	0.40	36	40	0.000	2.12	127		
31-Jan	2.01	0.16	37	47	0.000	2.01	121	1.73	104
1-Feb	1.76	0.00	27	54	0.000	1.76	106		
2-Feb	1.77	0.00	29	47	0.000	1.77	106		
3-Feb	1.68	0.20	35	48	0.000	1.68	101		
4-Feb	1.66	0.06	40	52	0.000	1.66	100		
5-Feb	1.53	0.00	41	51	0.000	1.53	92		
6-Feb	1.55	0.31	38	49	0.000	1.55	93		

Note:
-Q_{avg} = Average of January 31st through February 5th only; January 23rd through January 30th WWTP flows could be attributed to inflow events

F BREKHUS-BEACH INFORMATION

F.1 BREKHUS-BEACH CONCEPTUAL ROAD LAYOUT

F.2 BREKHUS-BEACH CONCEPTUAL SEWER COLLECTION SYSTEM

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E MAPLE ST
S HAMLIN DR
215TH PL NE
87TH AVE NE
MEDICAL CENTER DR
89TH AVE NE
92ND AVE NE
E HIGHLAND DR
TVEIT RD
PORTAGE ST
207TH ST NE
BURN RD
OLD BURN RD
97TH AVE NE
200TH ST NE
196TH PL NE
95TH AVE NE
196TH ST NE
195TH ST NE
CROWN RIDGE BLVD

Critical Areas

- Wetlands (NWI)
- Moderate slopes (>15%)
- Steep slopes (>33%)

DRAFT

Maps and GIS data are distributed "AS-IS" without warranties of any kind, either express or implied, including but not limited to warranties of suitability for a particular purpose or use. Map data are compiled from a variety of sources which may contain errors and users who rely upon the information do so at their own risk. Users agree to indemnify, defend, and hold harmless the City of Arlington for any and all liability of any nature arising out of or resulting from the lack of accuracy or correctness of the data, or the use of the data presented in the maps.

CITY OF ARLINGTON

N

Legend

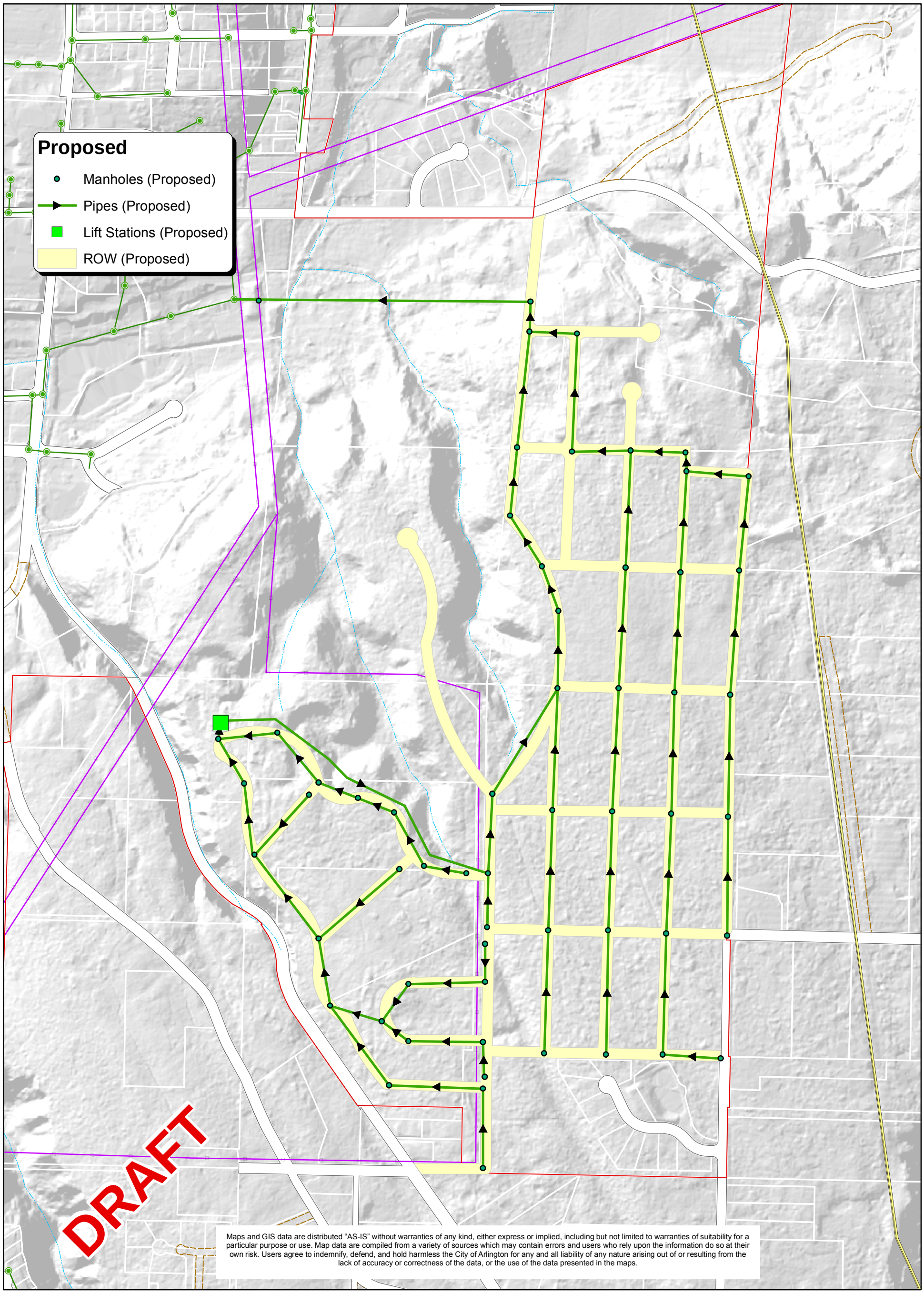
- Connections to existing roads
- Power lines
- Roads
- County mapped streams
- City Limits
- ROW (Proposed)
- Developable land

0 0.05 0.1 0.2
Miles

City of Arlington

Brekhus Beach Critical Areas, Developable Lands and Road Areas

Scale:	File:
1 inch = 500 feet	BBCriticalAreas11x17_15
Date:	**Cartographer:**
April 22, 2015	kdh / akc



CITY OF ARLINGTON

N

Legend

- Manholes (Proposed)
- Pipes (Proposed)
- Lift Stations (Proposed)
- Manholes
- Pipes - Gravity
- Pipes - Force
- Gas Line
- City Limits
- Power lines
- County mapped streams
- Public ROW
- Private ROW*
- Rail ROW
- Trail
- Assessor parcels

0 0.05 0.1 0.2
Miles

City of Arlington

Brekhus Beach Proposed Sewer Infrastructure

Scale:	File:
1 inch = 500 feet	BBProposedSewer11x17_15
Date:	**Cartographer:**
April 22, 2015	kdh / akc

G SEPA

G.1 2017 DETERMINATION OF NON-SIGNIFICANCE (DNS) ADDENDUM

G.2 2015 DETERMINATION OF NON-SIGNIFICANCE (DNS)

G.3 2015 SEPA CHECKLIST FOR A NON-PROJECT ACTION

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ADDENDUM
DETERMINATION OF NON-SIGNIFICANCE
CITY OF ARLINGTON

FILE NAME: 2015 Comprehensive Wastewater Plan, 2017 Amendment

FILE NUMBER: PLN#166

ADDENDUM: The City of Arlington 2015 Comprehensive Wastewater Plan serves, by adoption, as a critical element to the City of Arlington's GMA Comprehensive Plan. Changes to planned City expansion and redistribution of population, as documented in the City of Arlington's GMA Comprehensive Plan as amended in 2017, has required this 2015 Comprehensive Wastewater Plan, 2017 Amendment to assure compliance with state and federal regulations and laws, to assure adequate wastewater infrastructure, to assure a high level of service to existing customers, and to facilitate the growth of new customers.

ORIGINAL DESCRIPTION OF PROPOSAL: Planned update of the City's Comprehensive Wastewater Plan. Noteworthy changes in this update include identification of six focus areas to accommodate residential growth and commercial/industrial expansion, including expansion of the City's UGA and Wastewater Service Area west of I-5 (dependent on Snohomish County Council approval of its 2016 docket). Capital projects are identified for 10 and 20 year horizons.

PROPONENT: City of Arlington Public Works Department

LOCATION OF PROPOSAL: The City's Comprehensive Wastewater Plan, 2017 Amendment, applies to the City's wastewater service area, which occupies the Arlington city limits, unless service is arranged by special agreement as allowed by RCW 35.67.310.

LEAD AGENCY: City of Arlington department of Community and Economic Development

DETERMINATION: The lead agency for this proposal has determined that the proposal 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 determination assumes compliance with State law and City of Arlington ordinances related to general environmental protection. 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 upon request.

Responsible Official:	Marc Hayes
Title:	Director, Community & Economic Development
Address:	City of Arlington 238 N Olympic Ave Arlington, WA 98223
Phone:	(360) 403-3457
Issue Date:	June 26, 2017

Signature: Marc Hayes **Date:** 6/20/2017

There is no comment period or agency appeal associated with this addendum.

COMMUNITY & ECONOMIC DEVELOPMENT
PLANNING & LAND USE DIVISION

★

ARLINGTON AIRPORT OFFICE
18204 59TH AVE NE
ARLINGTON, WA 98223
8am – 5pm M-F
Closed Holidays

T: 360.403.3551

TO LEARN MORE

You may email the planner assigned to the project or review the project file at the address listed above.

TO COMMENT

Send written comments to the listed Staff Contact within the specified comment period.

SEPA THRESHOLD DETERMINATION

Determination of Non-Significance (DNS)

FILE NAME: 2015 Wastewater Comprehensive Plan SEPA

FILE NUMBER: PLN#166 (SEPA Only)

LEAD AGENCY: City of Arlington, Community & Economic Development Department

DESCRIPTION: Planned update of the City's Comprehensive Wastewater Plan. Noteworthy changes in this update include identification of six focus areas to accommodate residential growth and commercial/industrial expansion, including expansion of the City's UGA and Wastewater Service Area west of I-5 (dependent on Snohomish County Council approval of its 2016 docket). Capital projects are identified for 10 and 20 year horizons.

LOCATION: City of Arlington

APPLICANT: City of Arlington Department of Public Works

STAFF CONTACT: Troy Davis, Senior Planner, tdavis@arlingtonwa.gov

DATE CHECKLIST PREPARED: July 15, 2015

APPROVALS REQUIRED: City of Arlington, Washington State Department of Ecology

SEPA THRESHOLD DETERMINATION: The City has determined that this proposal 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. Impacts of the project will be mitigated by the requirement that the development must comply with all City of Arlington zoning and development regulations.

DISCLAIMER: The determination that an environmental impact statement does not have to be filed does not mean there will be no adverse environmental impacts. The City of Arlington codes governing noise control, land use performance standards, construction and improvements of roads, off site road improvement obligations, drainage control, traffic, school, park, stormwater, and utility mitigations, fire protection; and building practices will provide substantial mitigation of the aforementioned impacts.

The issuance of this DNS should not be interpreted as acceptance or approval of this proposal as presented. The City of Arlington reserves the right to deny or

approve said proposal subject to conditions if it is determined to be in the best interest of the city and/or necessary for the general health, safety, and welfare of the public to do so.

STUDIES REQUIRED: None

DATE OF MITIGATED DETERMINATION OF NON-SIGNIFICANCE: 08/12/2015

COMMENT PERIOD: There is a 14-day comment period for this DNS. If you would like to comment on this Threshold Determination, written comments must be received prior to 5:00 p.m. on August 26, 2015. The Responsible Official may incorporate any substantial comments into the DNS. If the DNS is substantially modified, it will be reissued for further public review.

SEPA RESPONSIBLE OFFICIAL: Chris Young, Director of Community & Economic Development

8/13/15 | Christopher Young

DATE | SIGNATURE OF SEPA RESPONSIBLE OFFICIAL

TO APPEAL A DECISION: An agency or person may appeal the City's procedural compliance with WAC Chapter 197-11 (SEPA) for issuance of this DNS. Appeal of the final DNS must be made to the Hearing Examiner within 10 days of the date the DNS is final (see WAC 197-11-390 (2)(a)). The DNS is a final DNS when the City issues the land use permit. Appeal of the land use permit must be made to the Hearing Examiner within 14 days of the date the permit is issued.

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

***Instructions for applicants*:**

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals: [help]

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background [help]

1. Name of proposed project, if applicable: [help]

City of Arlington 2015 Comprehensive Wastewater Plan

2. Name of applicant: [help]

City of Arlington

3. Address and phone number of applicant and contact person: [help]

Jim Kelly
Public Works Director
City of Arlington
238 N Olympic Avenue
Arlington, WA 98223
360.403.3505
jkelly@arlingtonwa.gov

4. Date checklist prepared: [help]

July 15, 2015

5. Agency requesting checklist: [help]

City of Arlington

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

The City of Arlington's *2015 Comprehensive Wastewater Plan* (CWP) is an update of the 2008 version. It is a General Sewer Plan designed to meet state regulatory requirements. It also identifies Capital Improvement Projects necessary to facilitate and extend wastewater services to a customer base envisioned to grow as described in the City's 2015 Update to its General Comprehensive Plan. The implementation of the proposed plan would be phased. This non-project action is within the 2015 City of Arlington Comprehensive Plan Update docket cycle.

It is anticipated that a public hearing on the CWP will be held at City Council in fall 2015. Adoption of the Plan by City Council is anticipated to be completed by year-end 2015.

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

Arlington Public Works would continue to focus on programs that address wastewater capital and O&M needs. The City would periodically review and update the *2015 Comprehensive Wastewater Plan*, as needed (probably on a 6 to 10 year cycle). In addition, the City is concurrently producing updates to its Comprehensive Water System Plan, Comprehensive

Transportation Plan, and General Comprehensive Plan. Any future updates of this proposed plan and the related plans would undergo environmental review under SEPA.

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

None.

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. [help]

There are no other applications pending for governmental approvals. However, individual projects related to the proposed plan may require additional approvals, and such approvals would be sought for the individual projects prior to construction or development.

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

City Council approval of the Comprehensive Plan Amendments, which include the Comprehensive Wastewater Plan. Ecology reviews and approves General Sewer Plans such as this one, as required by Section 173-240-050 WAC.

More specific information on approvals or permits for projects anticipated under the proposed plan would be determined during project-level environmental review. Future programs and projects that would result from the *2015 Comprehensive Wastewater Plan* must comply with applicable federal, state, and local regulations. Future projects to implement the proposed plan could require certain federal, state, and local government approvals and permits, including SEPA review, and potentially NEPA review if a project involves federal funding or agency approval.

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.) [help]

Planned update of the City's Comprehensive Wastewater Plan. Noteworthy changes in this update include identification of six focus areas to accommodate residential growth and commercial/industrial expansion, including expansion of the City's UGA and Wastewater Service Area west of I-5 (dependent on Snohomish County Council approval of its 2016 docket). Capital projects are identified for 10 and 20 year horizons.

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. [help]

This SEPA checklist evaluates an update of the City's Comprehensive Wastewater Plan which applies citywide. The City's wastewater service area occupies its urban growth area (UGA). See the attached map.

B. ENVIRONMENTAL ELEMENTS [help]

1. Earth [help]

a. General description of the site: [help]

(circle one): Flat, rolling, hilly, steep slopes, mountainous, other _____

N/A for this nonproject action.

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

N/A

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. [help]

N/A

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

N/A

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. [help]

N/A

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

N/A

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

N/A

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

N/A

2. Air [help]

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. [help]

N/A for this nonproject action.

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

N/A

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

N/A

3. Water [help]

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. [help]

There is surface water in the form of the Stillaguamish River and numerous streams and creeks throughout the City of Arlington. A City-owned constructed wetland lies adjacent to the water reclamation facility (WRF, aka WWTP). The WRF is currently permitted to discharge treated effluent to both the river and the wetland and would continue to do so. This non-project action could allow specific projects that would affect the wastewater collection and treatment process.

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. [help]

N/A for this nonproject action.

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. [help]

N/A

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

N/A

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

N/A

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. [help]

N/A

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. [help]

N/A

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, thenumber 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. [help]

Effluent of Class B reclaimed water quality would continue to be discharged to the Stillaguamish River. In addition, effluent of Class A reclaimed water quality could also be discharged to the constructed wetland. This non-project action would not affect these processes.

c. Water runoff (including stormwater):

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. [help]

N/A for this nonproject action.

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

N/A

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

N/A

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

N/A

4. Plants [help]

a. Check the types of vegetation found on the site: [help]

N/A for this nonproject action.

____deciduous tree: alder, maple, aspen, other
____evergreen tree: fir, cedar, pine, other
____shrubs
____grass
____pasture
____crop or grain
____ Orchards, vineyards or other permanent crops.
____ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: water lily, eelgrass, milfoil, other
____other types of vegetation

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

N/A

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

N/A

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

N/A

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

N/A

5. Animals [help]

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. [help]

N/A for this nonproject action.

Examples include:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other _____

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

N/A for this non-project action, although salmon and bullhead trout likely exist in the Stillaguamish River.

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

N/A

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

N/A

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

N/A

6. Energy and Natural Resources [help]

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. [help]

N/A for this nonproject action.

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

N/A

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: [help]

N/A

7. Environmental Health [help]

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

N/A for this nonproject action.

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

N/A

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. [help]

N/A

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. [help]

N/A

4) Describe special emergency services that might be required. [help]

N/A

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

N/A

b. Noise [help]

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

N/A for this nonproject action.

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 hours noise would come from the site. [help]

N/A

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

N/A

8. Land and Shoreline Use [help]

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. [help]

N/A for this nonproject action.

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 nonforest use? [help]

N/A for this nonproject action.

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: [help]

N/A for this nonproject action.

c. Describe any structures on the site. [help]

N/A for this nonproject action.

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

N/A for this nonproject action.

e. What is the current zoning classification of the site? [help]

This nonproject action covers all City zoning classifications.

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

This nonproject action covers all City comprehensive plan designations.

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

N/A

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

N/A

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

N/A

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

N/A

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

N/A

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

N/A

m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any: [help]

N/A

9. Housing [help]

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

N/A for this nonproject action.

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

N/A

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

N/A

10. Aesthetics [help]

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

N/A for this nonproject action.

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

N/A

b. Proposed measures to reduce or control aesthetic impacts, if any: [help]

N/A

11. Light and Glare [help]

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

N/A for this nonproject action.

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

N/A

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

N/A

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

N/A

12. Recreation [help]

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

N/A for this nonproject action.

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

N/A

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

N/A

13. Historic and cultural preservation [help]

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 located on or near the site? If so, specifically describe. [help]

N/A for this nonproject action.

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. [help]

N/A

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. [help]

N/A

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. [help]

N/A

14. Transportation [help]

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. [help]

N/A for this nonproject action.

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? [help]

N/A

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

N/A

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). [help]

N/A

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

N/A

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 nonpassenger vehicles). What data or transportation models were used to make these estimates? [help]

N/A

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. [help]

N/A

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

N/A

15. Public Services [help]

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. [help]

N/A for this nonproject action.

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

N/A

16. Utilities [help]

a. Circle utilities currently available at the site: [help]
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____

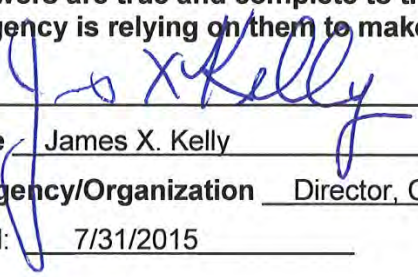
N/A for this nonproject action.

c. 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 mightbe needed. [help]

N/A

C. Signature [help]

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: 

Name of signee James X. Kelly

Position and Agency/Organization Director, City of Arlington Pubic Works

Date Submitted: 7/31/2015

D. supplemental sheet for nonproject actions [help]

(**IT IS NOT NECESSARY** to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

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?

This non-project action references separate, preliminary, capital improvement projects which could individually facilitate increases in discharges to receiving waters, and which could affect the quality of the effluent and the loading of contaminants to those receiving waters. These changes in quantity and quality would be within (or restricted by) limits specified by permit under state and federal law. This non-project action itself is not likely to increase: emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise. Any projects that may occur as listed within the CWP would likely be reviewed under SEPA and require environmental analysis and review.

Proposed measures to avoid or reduce such increases are:

The return of water supply as wastewater flows to the river are addressed under this CWP and the Wastewater Utility's NPDES operating permit. Return flows discharged as reclaimed water to a riparian, created wetland are addressed within the City's reclaimed water permit. The Department of Ecology monitors compliance with permit conditions intended to avoid or mitigate impacts from these discharges.

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

Permit conditions require specific monitoring and reporting of temperature and copper levels to Ecology. Discharges to the constructed wetland are an adaptive management measure to reduce impacts to the river. Also, protections are afforded through SEPA review and compliance with the City's Environmentally Critical Areas regulations and the requirements of the Endangered Species Act.

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

Permit conditions require specific monitoring and reporting of temperature and copper levels to Ecology. Discharges to the constructed wetland are an adaptive management measure to reduce impacts to the river. Also, protections are afforded through SEPA review and

compliance with the City's Environmentally Critical Areas regulations and the requirements of the Endangered Species Act.

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

This non-project action itself is not likely to deplete energy or natural resources

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

None proposed.

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?

This non-project action itself is not likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection.

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

See D.2 above.

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

This non-project action would continue without physical modification the operation of the Haller Water Reclamation Facility on the south bank of the Stillaguamish River, a facility which has been previously approved under the Shorelines review process. It is not likely to affect land and shoreline use nor is it likely to allow or encourage land or shoreline uses incompatible with existing plans.

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

This non-project would not allow uses that are incompatible with existing plans.

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

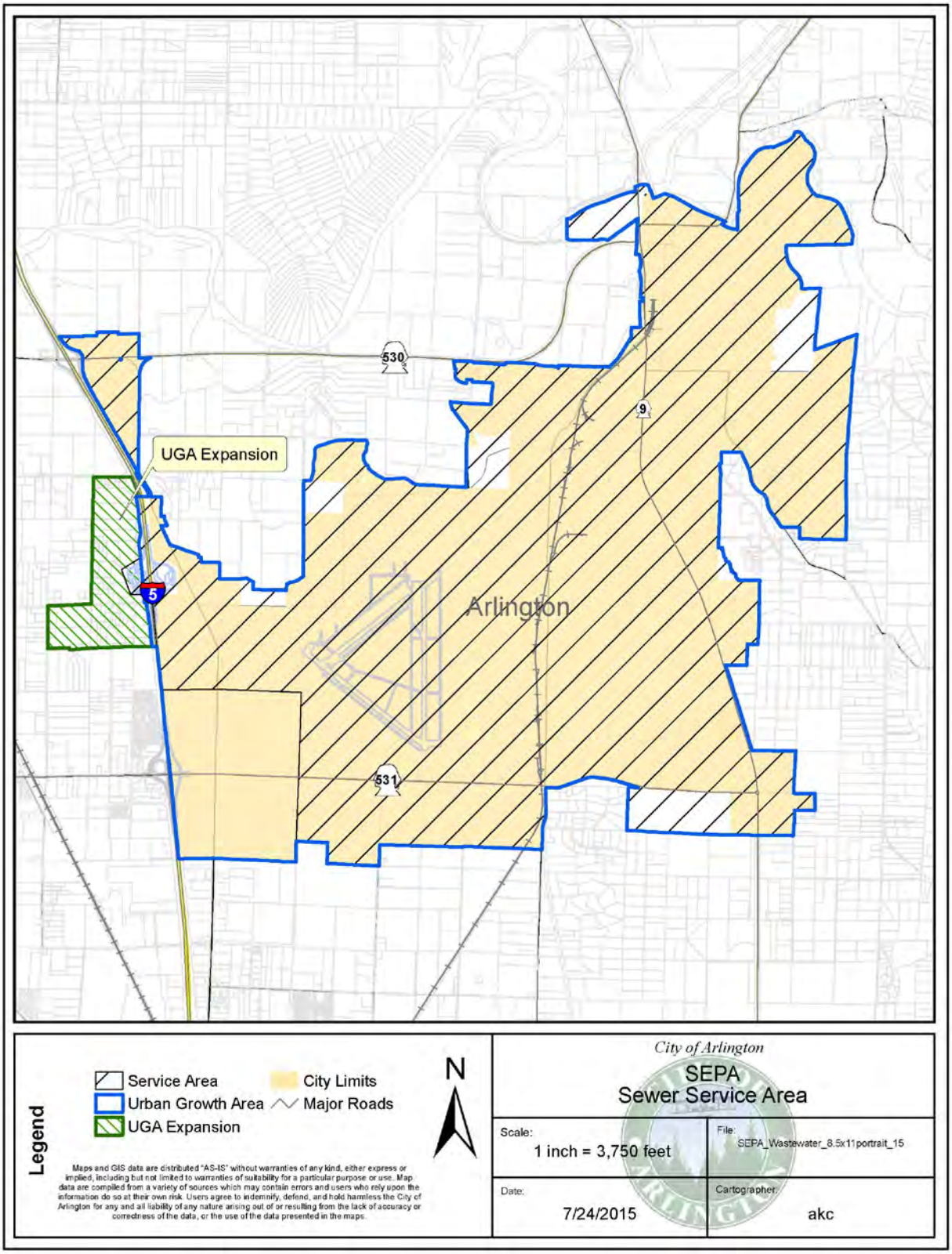
This non-project action itself is not likely to increase demands on transportation or public services and utilities.

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

None proposed since no increase is anticipated.

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

This non-project action itself is not known to be in conflict with local, state, or federal laws or requirements for the protection of the environment.


530
9
UGA Expansion
5
Arlington
531
Legend
Service Area
City Limits
Urban Growth Area
Major Roads
UGA Expansion
N
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City of Arlington
SEPA
Sewer Service Area
Scale:
1 inch = 3,750 feet
File:
SEPA_Wastewater_8.5x11portrait_15
Date:
7/24/2015
Cartographer:
akc

H SEWER CONSTRUCTION STANDARDS AND SPECIFICATIONS

H.1 CHAPTER 3 OF JANUARY 2015 DRAFT ENGINEERING STANDARDS (26 PAGES)

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5-1 GENERAL REQUIREMENTS

5-1.01 STANDARDS

No extension or modification to the City's sewer system shall be made without approved construction plans with the signature of the City Engineer. Except where modified or amended in these Standards, all work and materials shall conform to the current edition of the following:

(AMC) Arlington Municipal Code
Title 13, and Title 20.60

(COA Comp Plan) City of Arlington Sewer Comprehensive Plan

(DOE) Washington State Department of Ecology, Criteria for Sewage Work Design

(WSDOT) Washington Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction.

5-1.02 LIMITS OF PUBLIC SEWER SYSTEM

Standards contained within this section shall apply to public sewer systems owned and maintained by the City of Arlington. Public sewer systems shall include all sewer systems within the public right-of-way up to the property line of the lot, unless a recorded utility easement is established for extension of the public sewer main onto private property. Utility easements shall be in accordance with Section 1-??? of these Standards. Sewer systems outside of the public right-of-way and utility easements shall be the responsibility of the property owner and shall be installed in accordance with applicable building and plumbing codes.

5-1.03 SANITARY SEWER MAIN EXTENSION

A sanitary sewer main extension shall be required when the property does not front a sewer main. The sewer main shall be extended 5 feet beyond the farthest edge(s) of the property, or as directed by the City Engineer. The sanitary sewer shall be sized for the ultimate development of the tributary area and match the City's Sanitary Sewer Comprehensive Plan. The City may require the installation of a larger size main if the City determines that it is needed to meet the requirement for future service. Sewer main replacement and upgrade shall be required when the existing sewer main is not adequate for the proposed use. Such criteria used to determine adequacy include but are not limited to age, pipe diameter, type, and conditions of existing sewer mains. If the proposed development requires pump station and/or force main upgrade, it shall be done at the Developer's expense. The extent of the improvements shall be extended from the project to a point where the system is deemed reliable. The improvements shall be consistent with the City's Design Standards for new construction and must be approved by the City Engineer.

If the Developer's project directly benefits other property owners, the Developer may enter into a reimbursement agreement with the City per AMC Chapter 12.32.

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5-1.04 SEWER PIPE SIZING

No public gravity sewer conveying raw wastewater shall be less than 8 inches in diameter. The pipe diameter and slope shall be selected to obtain the greatest practical velocities to minimize settling problems. Oversize sewers will not be approved to justify flatter slopes.

New sewer mains shall be designed so that, under ultimate development, peak flow including inflow/infiltration (I/I) shall not exceed 50% capacity of the main.

No storm drainage connections shall be made to the City's sanitary sewer system.

5-1.05 SLOPE

Sanitary sewers shall be laid with uniform slope between manholes. All sanitary sewers shall be designed and constructed to give mean velocities of not less than 2.0 feet per second when flowing full, based on Manning's Formula using an "N" value of 0.013. The following are the minimum slopes, however, slopes greater than these are desirable.

Sewer Pipe Diameter	**Minimum Slope**
(inches)	**(% or feet per 100 feet)**
4	2.00
6	1.00
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06
36	0.05

Maximum sewer main slope shall not induce velocities greater than 10 feet per second under daily peak flows.

Pipe anchor blocks shall be installed where the pipe slope exceeds 20%. Each pipe length shall have one anchor block and they shall be spaced at 20 foot on center.

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Timber baffle or hill holders shall be required on unpaved slopes that exceed 20%, with minimum spacing of 20 feet on center.

Alignment

In general, sanitary sewers 24 inches or smaller shall be laid with straight alignment between manholes. Curvilinear alignment of sewer larger than 24 inches may be considered on a case-by-case basis, providing compression joints are specified and the specific pipe manufacturer's maximum allowable pipe joint deflection limits are not exceeded. Curvilinear sewers shall be limited to simple curves which start and end at manholes. When curvilinear sewers are proposed, minimum slopes required in these Standards must be increased accordingly to provide a recommended minimum velocity of 2.0 feet per second when flowing full.

Changes in Pipe Size

Where a smaller sewer main joins a larger one, the invert of the larger sewer main at the manhole should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the crowns of both sewers at the same elevation.

5-1.06 MINIMUM DEPTH

The minimum depth of gravity sewer main is 5 feet.

5-1.07 SEWER IN RELATION TO STREAMS

Sanitary sewers crossing streams shall be designed to cross the stream as nearly perpendicular to the stream flow as possible and shall be free from change in grade. Sewer systems shall be designed to minimize the number of stream crossings.

Sanitary sewers located along streams shall be located outside of the stream bed and sufficiently away from the stream to provide for future possible stream widening and to prevent pollution by siltation during construction. Sanitary sewer structures shall not interfere with the free discharge of flood flows of the stream.

The top of all sewers entering or crossing streams shall be at sufficient depth below the natural bottom of the stream bed to protect the sewer line. In general, the following cover requirements shall be met.

A minimum of 1 foot of cover above the top of the casing pipe if the sewer is located in rock;

A minimum of 5 feet of cover above the top of the casing pipe in other material.

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5-1.08 HORIZONTAL SEPARATION

Sanitary sewer mains shall be laid at least 10 feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the City may allow deviation on a case-by-case basis using DOE criteria. Side sewer and water service lines shall have minimum horizontal clearances of 10 feet unless otherwise approved by the City Engineer.

Horizontal clearances from sanitary sewers:

Cable	5’
Gas	5’
Power	10’
Storm drain	5’
Telephone, Fiber optic	10’
Water	10’

5-1.09 VERTICAL SEPARATION

Sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the sewer and the outside of the water main. The City prefers the water main to be above the sewer main. Where a sewer crosses a water main, one full length of water pipe (18 feet minimum) shall be used with the pipe centered over the sewer for maximum joint separation. When the above conditions cannot be met, the City has the right to approve a variance, but shall require that the sewer be constructed of ductile iron pipe and be pressure tested before being activated, and/or be encased as directed by the City Engineer. DOE criteria shall also apply.

Vertical clearances from sanitary sewer:

Cable	1’
Gas	1’
Power	1’
Storm drain	1’
Telephone, Fiber optic	1’
Water	1.5’

5-1.10 STEEL CASING

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Sewer pipe shall be encased in a steel or ductile iron casing when crossing under improvements where the ability to remove and replace pipe without disturbance to the improvement is needed. Casings are required when:

Crossing under rockeries over 5 feet high;

Crossing under retaining wall footings over 5 feet wide;

Crossing under reinforced earth retaining walls;

Crossing under streams or wetlands; and

Crossing under railways and highways.

Casings shall extend a minimum of 5 feet past each edge of the structure, or a distance equal to the depth of pipe, whichever is greater. The carrier pipe shall be supported by casing spacers per City Standard Detail W-230. The minimum vertical clearance between the bottom of the wall (or footing) and top of the pipe (or casing) shall be 2 feet. The pipe trench at the casing shall be backfilled with gravel backfill material when the vertical clearance is less than 3 feet.

Ductile iron pipe shall be encased in a steel casing when crossing under a railroad or highway where open cut is not allowed. Casings shall extend a minimum of six feet (6') beyond the edges of the right-of-way if not owned by the City. The casing pipe and carrier pipe shall be installed in accordance with the applicable Federal, State and local regulations. In the case of railroad crossings, the project shall also comply with regulations established by the railroad company. Casing spacers shall be placed under the carrier pipe to ensure approximate centering within the casing pipe and to prevent damage during installation. Voids between all steel casings and native soil shall be pressure grouted. The Design Engineer shall refer to the City Standard Detail W-230.

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5-1.11 SEWER CONNECTION

All new sanitary sewer mains (8 inches and larger) shall connect to existing sewer mains at manholes. If an existing manhole is not available, a new saddle manhole on existing sewer is required per the City Standard Detail SS-020.

The Design Engineer shall check that the existing manhole diameter is adequate to accommodate the new sewer mains. If not, the existing manhole shall be upgraded at the Developer's expenses. If the existing manhole access is less than 24 inches in diameter, and/or concentric cone (manhole over 7 feet deep), the manhole shall be upgraded to include new 24 inch ring and cover and/or eccentric cone.

At the connection to the existing sewer system, new sewer connections shall be physically plugged until all tests have been completed and the City approves the removal of the plugs.

5-1.12 FAT, OIL, AND GREASE SEPARATION

Oil/Water Separator

An oil/water separator is required whenever an industrial or commercial business generates or has the potential to generate fats, oils, or greases exceeding 100 milligrams per liter which will be discharged to the sanitary sewer system. An oil/water separation device shall be installed on the private property by the property owner. Water discharged from any oil/water separator to the sanitary sewer system shall not contain more than 100 milligrams per liter of fats, oils or greases.

The oil/water separator shall be covered with removable sections. Access and inspection covers, weighing not more than 30 lbs., with suitable hand holds, are to be provided directly above the inspection "tee" and oil/grit collection compartments.

Only wastewater from floor drains and covered parking areas shall drain to the separator. The location and design shall eliminate the possibility of stormwater reaching the separator.

The separator shall be located within 20 feet from the driveway for access by maintenance vehicles.

A sampling tee shall be located on the outlet with a minimum 18 inch drop below the invert. Access to the separator shall be available for inspection and compliance determination sampling at all times.

When pre-treatment is no longer required, the inlet and outlet pipes shall be permanently plugged, the separation chambers pumped out, and the vault removed, or filled with compacted crushed rock or controlled density fill.

Grease Interceptor

The size and design of grease interceptors and hydromechanical grease interceptors (HGI's) shall conform to the Uniform Plumbing Code and shall be approved by the City Building Official after review by the Utilities Division. The interceptor shall be located on private property outside the building within 20 feet of driveway for access by maintenance vehicles. An HGI may be located inside the building, and shall remain privately owned, maintained at the owner's or occupant's expense. A maintenance program must be submitted and approved that includes maintenance, testing requirements and reporting intervals. These facilities shall be available for the inspection by City Utilities crews any time with a 24 hour verbal notification to the occupant or property owner, or as allowed by the discharge agreement.

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When pre-treatment is no longer required, the inlet and outlet pipes shall be permanently plugged, the separation chambers pumped out, and the vault removed, or filled with compacted crushed rock or controlled density fill.

5-1.13 SEPTIC TANKS

Septic systems are generally not allowed within the City limits. If the City Engineer determines that public sanitary sewer service is not available or it is not "practical" to provide public sewer service, the septic tank systems may be installed upon approval by the City Engineer and issuance of a septic permit by the Snohomish Health District.

5-1.14 PRIVATE GRINDER PUMP

Use of grinder pumps requires approval by the City Engineer and will be evaluated on a case-by-case basis. The City may require the applicant to deepen the existing gravity sewer at their expense to eliminate the need for grinder pumps. The applicant shall demonstrate that there is no other feasible means of sewer service available.

The Design Engineer shall specify pumps with proper flow rate and dynamic head and provide pump curves from the manufacture to the City for review and approval. The minimum diameter of the force main shall be 2 inches (Schedule 80 PVC or approved equal). Interior grinder pump systems shall meet the requirements of UPC. Exterior grinder pumps systems shall be approved by the City Engineer.

5-1.15 MONITORING MANHOLE

Monitoring manholes are required for all industrial/commercial applications and other applications as determined by the City Utilities Manager. The monitoring manhole shall be located to be accessed for inspection by City staff at any time and under all weather conditions. The depths of monitoring manholes shall be 4 feet minimum and 8 feet maximum. If the depth is less than 7 feet, a flat top manhole shall be used. Monitoring manholes shall be 48 inch Type I (or larger) with locking rings and covers. The rim elevations of the monitoring manholes shall be set to finished grade or as directed by the City Inspector. See City of Arlington Standard Detail SS-130.

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5-2 CONSTRUCTION

5-2.01 SEWER MAIN

5-2.01(1) MATERIALS

5-2.01(1)A GENERAL

All materials shall be new and undamaged. The same manufacturer of each item shall be used throughout the work.

When specific manufacturers or models are specified in these Standards, no substitutions will be allowed without prior approval by the City Engineer. If required by the City, the Contractor shall furnish certification from the manufacturer of the materials being supplied that the inspection and all of the specified tests have been made and the results thereof comply with the requirements of the reference standards.

The Developer/Contractor shall provide material submittals to the City for approval after the plans are approved for construction. The Developer shall assume the risk for material or equipment, which is fabricated or delivered prior to the City's approval of material submittals.

Five (5) sets of material submittals are required. The City shall either approve or otherwise indicate the reasons for disapproval. Disapproved submittals shall be resubmitted to the City for approval.

The City's review of material submittals covers only general conformity to the plans and these Standards. The Developer is responsible for quantity determination. No quantities are to be verified by the City. The Developer is responsible for any errors, omissions or deviations from the contract requirements. Review and approval of submittals by the City does not relieve the Developer from his obligation to furnish required items in accordance with the plans and these Standards.

Each "Material Submittal" section shall follow a Material Submittal Form provided by the City. Each submittal must have the specific part number(s) checked or highlighted along with its specific purpose.

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5-2.01(1)B SEWER PIPE & FITTINGS

Sanitary sewer pipe shall be polyvinyl chloride (PVC) where cover depths are from 4 feet to 12 feet. For cover depths outside of these parameters, ductile iron pipe (DIP) or AWWA C900/C905 PVC pipe shall be used. If the cover depth exceeds maximum cover on any portion of the pipe segment, the entire segment between manholes must be DIP or C900/C905. If product manufacturer's specifications for maximum cover requirements are less than that stated above, the more conservative cover requirement shall govern.

1. PVC sanitary sewer pipe and fittings shall conform to the requirements of ASTM D-3034 SDR-35 with joints and rubber gaskets conforming to ASTM D 3212. All pipes shall be clearly marked with the data of manufacture. All pipe shall be provided with a reference mark for proper spigot insertion. Joint gaskets shall be fabricated from a

compound of which the basic polymer shall be a synthetic rubber consisting of styrene, butadiene, polyisoprene or any combination thereof and shall meet the requirements of ASTM D-3212.

2. DIP sanitary sewer pipe shall be Class 52 epoxy coated pipe and shall be in accordance with Chapter 4 of these Standards. Interior of DIP shall be epoxy coated with amine-cured Novalac Epoxy lining. Cement-lined ductile iron pipe shall not be used for sanitary sewer.

3. AWWA C900/C905 PVC sanitary sewer pipe shall be pressure class 150 (SDR 18) unless otherwise called for in the plans, and pipe material color shall be white or light grey. Black pipe shall not be used as it hinders video inspection. Pipe joints shall be manufactured using an integral bell with an elastomeric gasket push-on type joint. Elastomeric gaskets shall conform to ASTM F477. All fittings shall be PVC, compatible with C900 with respect to joint dimensions and physical properties.

4. ADS Santite Pipe?????

5-2.01(1)C DETECTABLE MARKING TAPE

Utility pipe tracer tape shall be detectable below ground surface, color coded, with utility name printed on tape. Tracer tape shall be detectable type, up to 6 inches in width, and buried 24 inches to 48 inches below finished grades. The color of the tape for sanitary sewer shall be green with black printing reading "CAUTION SANITARY SEWER BURIED BELOW". Tracer tape shall be “Lineguard Type II Detectable”, or approved equal.

5-2.01(1)D STEEL CASING

Steel casing shall be black steel pipe conforming to ASTM A53. Casing thickness shall be 0.250 inch for casing 24 inches or less in diameter and 0.375 inch for casings over 24 inches in diameter.

5-2.01(1)E CASING SPACER

Casing spacers and end seals shall be sized for pipe installation and shall be manufactured by Advance Products & Systems, Cascade Waterworks, Pipeline Seal and Insulators Co., or approved equal. See Standard Detail W-230.

5-2.01(1)F PLUGS

Plugs shall be able to withstand all test pressures without leakage. All plugs shall be approved by the City Inspector.

5-2.01(1)G CONTROLLED DENSITY FILL

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Controlled Density Fill (CDF) shall conform to the requirements of WSDOT Section 2-09.3(1) E..

5-2.01(1)H CONCRETE

Concrete used for pads, thrust blocking, encasement, or slope anchor shall be mixed from materials acceptable to the City and shall have a 30 day compressive strength of not less than 2,500 psi. The mix shall contain five (5) sacks of cement per cubic yard and shall be of such consistency that the slump is between 1 inch and 5 inches.

5-2.01(1)I BEDDING MATERIAL

Bedding material shall be clean ⅜ inch minus manufactured pea gravel. Pipe bedding shall be ⅜ inch minus pea gravel meeting the requirements of WSDOT Section 9-03.17.

5-2.01(2) CONSTRUCTION

5-2.01(2)A HANDLING OF PIPE

All types of pipe shall be handled in a manner that prevents damage to the pipe, pipe lining or coating. Pipe and fittings shall be loaded and unloaded using forks or cable choker in a manner that avoids shock or damage, and under no circumstances shall they be dropped, skidded, or rolled against other pipe. Damaged pipe will be rejected, and the Contractor shall immediately place all damaged pipe apart from the undamaged and shall remove the damaged pipe from the project site within 24 hours.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails or other similar supports. Pipe on succeeding tiers shall be alternated by bell and plain end. Timbers of 4 inch × 4 inch shall be placed between tiers and chocks shall be placed at each end to prevent movement. Each size of pipe shall be stacked separately.

Threaded pipe ends shall be protected by couplings or other means until the pipe is installed. Dirt or other foreign material shall be prevented from entering the pipe or pipe joints during handling and installation. When pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the City.

5-2.01(2)B STAKING

Staking shall be performed by or under the direct supervision of the Developer's Land Surveyor licensed in the State of Washington. Provide the City with two (2) business days notice to inspect construction staking before construction begins.

The minimum staking of sewer lines shall be as directed by the City Engineer or as follows:

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Staking location of sewer mains and side sewers every 50 feet with cut or fill to invert of pipe.

Staking location of all manholes for alignment and grade with cut or fill to rim and pipe inverts.

Staking front lot corners prior to installation for side sewer tees.

5-2.01(2)C TRENCH EXCAVATION

Trench excavation and backfill operations within State right-of-way: All excavation and backfill within state right-of-way shall adhere to WSDOT.

Trench excavation and backfill operations within County right-of-way: Excavation within Snohomish County right-of-way shall conform first to Snohomish County Road Standards, and secondly WSDOT.

Trench excavation and backfill operations within City right-of-way:
Excavation within the City right-of-way shall conform to WSDOT Section 7-09.3. Trench backfill shall be in accordance with Section 2-??? of these Standards.

The length of trench excavation in advance of pipe laying shall be kept to a minimum and shall not exceed more than 150 feet without written approval of the City Engineer.

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5-2.01(2)D GENERAL PIPE INSTALLATION

Pipe shall be installed in accordance with WSDOT Section 7-08 and 7-17.
Compaction tests shall be required for all backfilled trenches in paved public roadways and in roadway shoulders. A minimum of one test location shall be chosen by the City Inspector for every 200 lineal feet of sewer main installed. The City Inspector has the discretion to require additional tests, in locations specified by the City Inspector. All testing shall be at the expense of the Developer.

No construction materials, soil, debris etc. shall be stockpiled in the public right-of-way unless specific permission is granted in writing by the City Inspector.

Under no circumstances shall pipe materials be dropped or dumped into trench. Broken or otherwise defective pipe shall be removed from the job site and replaced.

Every precaution shall be taken to ensure foreign material does not enter the pipe. When pipe laying is not in progress, the open ends of the pipe shall be closed by a water tight plug or other means approved by the City Inspector. If water is in the trench when work resumes, the seal on the pipe shall remain in place until the trench is completely pumped dry. No pipe shall be laid in water, or when in the opinion of the City Inspector, trench conditions are unsuitable.

No willows, poplars, cottonwoods, birches, soft maple, gum or any other tree or shrub whose roots are likely to obstruct public sewers are allowed within 30 feet of any public sewer. Any of these trees found to be located within 30 feet of a proposed sewer main shall be removed at the Developer's expense.

Ponding of water within alignment of pipe will not be acceptable.

5-2.01(2)E PIPE BEDDING

Bedding shall be installed and spread smoothly so that the pipe is uniformly supported. Subsequent lifts are not to exceed 6 inches in thickness and shall be installed to the crown of the pipe. A 12 inch lift of material shall be placed and compacted over the crown of the pipe prior to backfilling the trench. The Developer may use Controlled Density Fill (CDF), in accordance with Section 2-???? of these Standards, for pipe backfill above the pipe's invert level.

5-2.01(2)F CONNECTION TO EXISTING PIPE

When connecting to the end of a existing pipe known to have a bell at the end of the pipe, a new pipe in the same material as the existing pipe, plans can specify connection by inserting a spigot of the new pipe into the existing bell end, with a "donut" gasket.

When connecting to the end of a existing pipe known to have a plain end, or must be cut, plans shall specify use of a coupling to connect new and existing lines.

Couplings and O-ring adapters utilized for joining pipes of dissimilar materials or different nominal sizes shall be flexible elastomeric PVC as manufactured by Fernco, Inc. or approved equal. Couplings shall be supplied with 316 stainless steel band clamps, fasteners and shear rings as applicable to the sizes and types that are being connected together.

5-2.01(2)G PLUGS AND CONNECTIONS

All fittings shall be capped or plugged with a plug of an approved material and gasketed with the same gasket material as the pipe unit, or the pipe shall be fitted with an approved mechanical stopper, or the pipe shall have an integrally cast knock-out plug. The plug shall be able to withstand all test pressures without leaking.

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5-2.01(2)H JOINTING

Where it is necessary to break out or connect to an existing sewer during construction, only new pipe having the same inside diameter will be used in reconnecting the sewer. Where joints must be made between pipes with a mismatched wall thickness, the Developer shall use flexible gasket coupling, adapter or coupling-adapter to make a watertight joint. Rigid connection couplers shall be required within the mainline pipe. Couplings shall be those manufactured by "Romac", "Smith Blair", or approved equal for reinforced pipes and "Fernco" or approved equal as approved by the City Inspector for non-reinforced pipes.

5-2.01(2)I JACKING, AUGURING AND TUNNELING

See Section 2-10 – Underground Utilities.

5-2.01(2)J SEWER ABANDONMENT

Existing sewer lines to be abandoned shall be removed or filled completely with sand, concrete or controlled density fill. At the manhole connection, where existing sewer main is to be abandoned, the manhole shall be rechanneled with 3,000 psi cement concrete.

5-2.01(2)K CLEANING AND TESTING

All sanitary sewer pipe shall be cleaned and tested in accordance with WSDOT Section 7-17.3(2) after backfilling at Contractor's expense.

Testing shall be by either exfiltration or low pressure air method. The Contractor has the option to select the method of testing, unless the ground water table is such that the City Inspector may require the exfiltration test.

The Contractor shall clean and flush all sewer lines with clean water using approved jet vactoring equipment prior to testing. Cleaning by jetting and vacuuming of pipe shall be performed at downstream manhole.

The Developer shall notify the City Inspector at least 2 business days prior to the start of any testing.

All tees and stubs shall be plugged with flexible jointed caps, or acceptable alternate, securely fastened to withstand the internal test pressure. These plugs or caps shall be readily removable and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

If the Contractor elects to test larger diameter pipe one joint at a time, leakage allowances shall be converted from GPH per 100 feet to GPH per joint by dividing the number of joints occurring in 100 feet. If leakage exceeds the allowable amount, corrective measures shall be taken and the line shall be re-tested to the satisfaction of the City Inspector.

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5-2.01(2)L VIDEO INSPECTION

All new sanitary sewer mains within the public right-of-way and those in the easements to be maintained by the City will be subject to a visual inspection with a video camera. Any deficiencies noted by the video camera inspection shall be corrected to the satisfaction of the City Inspector. Contractor shall use a tractor style camera, as push cameras are not acceptable.

Video inspection shall be done after the air test has successfully passed inspection but before the roadway is paved. Immediately prior to a television inspection, pipe shall be thoroughly cleaned with no debris present at the time of video inspection. Additionally at the start of inspection, enough water shall run down the line so it comes out the lower manhole. Video inspection of pipe shall be from downstream to upstream.

A copy of the recorded video inspection and written report shall be submitted to the City. The recorded video shall show an accurate measurement from entry point at manhole to location of video camera along the pipe. If the City determines that the location measurement is not accurate, or there are other deficiencies with the video inspection, a new video inspection shall be performed at the Contractor's expense. The video inspection shall also show 365° inspection of all pipe joints and lateral connections.

Acceptance of the sewer will be made after the tape has been reviewed and approved by the City Inspector. Contractor shall provide additional video inspections after corrections are made until system is accepted by City Inspector.

5-2.02 SIDE SEWER

5-2.02(1) GENERAL

Side sewers shall be installed in accordance with WSDOT Section 7-18 and the provisions of these Standards.

A side sewer stub shall extend from the main line to 10 feet past the edge of the property line. A side sewer stub shall also extend additional 5 feet beyond any easements including the standard 10 feet utility easement required on lots fronting public right-of-way. Pipe of 6 inches in diameter shall be used within the public right-of-way or easement unless expected flow requires a larger size of line. See Standard Detail SS-090.

4 inch side sewers on private property from the end of a 6 inch stub to the building may be a minimum of 4 inches for residential side sewers with a single connection within the lot.

Each unit in a duplex or triplex shall have its own separate side sewer stub and connection. 6 inch minimum pipe shall be used for commercial side sewers.

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For a multi-family development four-plex and larger, a side sewer for each separate building is required and must be at least 6 inches in diameter. For side sewers serving more than ten units or serving more than one building, side sewers shall be a minimum of 8 inches in diameter and must connected to a manhole.

Maximum distances between side sewer clean-outs shall be 100 feet. All side sewer clean-outs on commercial and multi-family developments shall include at grade access with covers per the City Standard Detail SS-080.

A side sewer shall be connected to the sewer main with a 6 inch tee connection or at a manhole. Where an existing side sewer stub is not available, a ROMAC tapping tee is required for an existing sewer main. A core drilled INSERT-A-TEE may be allowed upon approval of the City Engineer.

5-2.02(2) MATERIALS

5-2.02(2)A SIDE SEWER PIPE

Side sewer services shall be PVC, ASTM D-3034 SDR-35, with flexible gasket joints. Depths greater than 14 feet shall be AWWA C900 or CL 52 epoxy coated DIP.

5-2.02(2)B BEDDING MATERIAL

Bedding material shall be clean ⅜ inch minus manufactured pea gravel. Pipe bedding shall be ⅜ inch minus pea gravel meeting the requirements of WSDOT Section 9-03.17.

5-2.02(2)C BACKWATER CHECK VALVE

Backwater check valves installed on 4 inch through 8 inch diameter side sewers shall be rubber flapper swing type check valves. Flapper shall be constructed from steel reinforced rubber with 45 durometer standard rubber hardness. Valve seat shall be at 45 degree angle to direction of flow. Flow area through valve shall equal full pipe area. Valve body shall be cast iron with flanged ends and bolted over to allow removal of flapper without removing valve from line.

The backwater valve shall be housed in a 48 inch diameter pre-cast concrete valve chamber with concentric 48 inch by 24 inch concentric reducing cone, or concrete meter box, depending on depth. The 24 inch frame and cover shall be marked “SEWER”.

5-2.02(3) CONSTRUCTION

5-2.02(3)A FITTINGS AND CLEAN-OUTS FOR SIDE SEWERS

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All fittings shall be factory produced and shall be designed for installation on the pipe to be used. Fittings shall be of the same quality and material as the pipe used, except when installing a PVC insert on existing pipe.

Side sewers shall be connected to the tee provided in the public sewer where such is available, utilizing approved fittings or adapters. Where no tee is provided or available, connection shall be made by the use of a Romac tapping tee or core drilled INSERT-A-TEE. See City Standard Detail SS-100.

All side sewers shall have a 6 inch clean-out at the property line per City Standard Detail SS-080. The riser portion of the clean-out shall be PVC unless otherwise approved by the City Inspector. For longer side sewer installations, extra clean-outs will be required at spacing not to exceed 100 feet.

5-2.02(3)B MARKING OF SIDE SEWERS

Tracer tape shall be installed over side sewer pipes and side sewer stubs. The tracer tape shall be placed 24 inches to 48 inches below the finished grade and it shall extend its full length. The location of all side sewers shall be marked with a 12 gauge wire and 2 inch x 4 inch wood marker at the termination of the stub. The marker shall be connected to the pipe at the invert and wrapped around marker post. Above the ground surface, it shall be painted white with black letters of 2 inches in height “SEWER LOT xx INVERT DEPTH xx”. Offset markers may be used when the side sewer location is within an existing driveway or other obstacle.

5-2.02(3)C PRIVATE GRINDER PUMP

Private grinder pumps shall be installed in accordance with the manufacture procedures and per approved plans by the City. The force main shall be pressure tested at 150% of the total dynamic head. All inspections must be completed prior to backfilling.

5-2.02(3)D TESTING OF SIDE SEWERS

All side sewers shall be tested in accordance with Section 5-2.01(2)K of these Standards after backfill. Side sewers that are reconstructed or repaired to a length of 10 feet or more shall be tested for water-tightness. Testing of newly reconstructed sections of side sewers consisting of a single length of pipe will not be required. Testing shall be performed in the presence of the City Inspector in accordance with these Standards or as directed by the City Inspector.

When a new side sewer is installed, the entire length of new pipe installed shall be tested.

In cases where a new tap is made on the main, the first joint of pipe off the main shall be installed with a test tee, so that an inflatable rubber ball can be inserted for sealing off the side sewer installation for testing. In cases where the side sewer stub is existing to the

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property line, the test ball may be inserted through the clean-out wye to test the new portion of the side sewer installation.

5-2.02(3)E VIDEO INSPECTION

Video inspection of side sewer shall be performed in accordance with Section 5-2.01(2)L of these Standards.

5-2.02(3)F SIDE SEWER AS-BUILT PLANS

The as-built drawings shall show the following:

- Location of the side sewer, its connection with the building(s) and all dimensions.
- Show station as distance of side sewer tee from the center of the next downstream manhole.
- The depth and point of connection of the side sewer to the sanitary sewer main.
- Any additional information which might be deemed pertinent.

5-2.02(3)G SIDE SEWER DEMOLITION

Side sewer demolition shall be performed prior to removal of building foundation. The side sewer for each building shall be excavated and removed from the house connection to the property line or the main as required by the City. The contractor shall cap the end of the side sewer to remain in place. Side sewer demolition shall be performed in the presence of the City Inspector.

5-2.03 MANHOLES AND STRUCTURES

5-2.03(1) MATERIALS

5-2.03(1)A MANHOLE

Manholes shall be constructed of pre-cast sections with a confined O-ring rubber gasket joints, and with either a pre-cast base or a cast-in-place base in accordance with the City Standard Details SS-010. Any request to deviate from these details must be reviewed by the City Engineer.

Manholes shall be constructed in accordance with AASHTO M-199 (ASTM C 478) unless otherwise shown on plans and approved by the City.

All pre-cast concrete and reinforced cast-in-place concrete shall be Class 4000. Non-reinforced concrete in channel and shelf shall be Class 3000. Concrete blocks or concrete (masonry) rings may be used for adjustment of the casting to final street grade. Pre-cast bases shall be furnished with cutouts or knockouts. Knockouts shall have a wall thickness of 2 inch minimum.

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All base reinforcing steel shall have a minimum yield strength of 60,000 psi and be placed in the upper half of the base with one inch minimum clearance.

5-2.03(1)B MANHOLE RING AND COVER

Ductile iron rings and cast iron rings and covers shall conform to the City Standard Detail SS-030 and WSDOT Section 9-05.15.

Manhole rings shall be gray iron conforming to the requirements of AASHTO M 105 Grade 30B. Manhole cover shall be ductile iron conforming to ASTM A536, GR 80-55-06, and Olympic Foundry Part No. MH 30 or approved equal. Rings and covers shall be tested for accuracy of fit and shall be locked down with a 5 ⅝ inch stainless steel socket head cap screws. All castings shall have a bituminous coating.

5-2.03(1)C GROUT

Grout shall conform to WSDOT Section 9-20.3(2) Type 2 for non-shrink applications. Approved prepackaged materials are as follows:

1. Blueline
2. All-Patch
3. Rapid-Set

Jet-Set brand prepackaged grout shall not be allowed. The Contractor may also use an onsite blend comprised of two parts Portland cement Type I/II and fine aggregates conforming to WSDOT Section 9-03.2.

Material must withstand movement caused by thermal cycle changes and or settling of the structure. The grout shall be resistant to chemicals, most organic solvents, mild acids and alkali. The grout shall also be able to withstand freeze-thaw and moving load conditions.

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5-2.03(2) CONSTRUCTION

5-2.03(2)A MANHOLE LOCATION

Sanitary sewer manholes shall be located so that the center of the frames and covers shall be in the middle of the traveled lanes on the west or south side of the street center lines, or as directed by the City to make sure frames and covers are not located in the tire track of a traveled lane. If sanitary sewers are in easements, they shall be in the middle of the easements and parallel to the easement lines unless otherwise directed by the City Engineer.

Sanitary manholes shall be installed at the end of each line; all changes in grade, size, or alignment; all intersections; and at distances not greater than 400 feet. Upon approval by the City Engineer, cleanouts may be installed at the end of a pipe run if less than 250’ from last manhole and no lateral connections are present between last manhole and end of run.

5-2.03(2)B MANHOLE DIAMETER

The sanitary manhole diameter depends on sizes, location and number of holes for pipes. The minimum diameter of manholes shall be 48 inches. Larger diameters are required for larger diameter sewers. The following configurations shall provide adequate shelves and room for maintenance and performing video inspections, and represent maximum pipe size and number for connection to sanitary manholes.

48" manhole
1. 2 connecting pipes, up to 12" diam.
2. 3 connecting pipes, up to 10" pipe

54" manhole
1. 2 connecting pipes, 15" diam. to 21" diam.
2. 3 connecting pipes, 10" diam. to 15" diam.
3. 4 connecting pipes, up to 12" diam.

72" manhole
1. 2 connecting pipes, 21" diam. to 24" diam.
2. 3 connecting pipes, 15" diam.
3. 4 connecting pipes, 15" diam.

For other pipe configurations and hydraulic concerns, the size of the manhole will be investigated on a case by case basis.

The minimum distance between knockout holes is 8 inch (48 inch or 54 inch manholes) and 12 inches (72 inch or 96 inch manholes) measured on the inside of the manhole. The knockout hole size is equal to the outer pipe diameter plus manhole wall thickness. A minimum access diameter of 24 inches shall be provided.

5-2.03(2)C MANHOLE DEPTH

The minimum sanitary manhole depth shall be 7 feet. The minimum depth of flat-top manholes may be used with the approval of the City. Where depths are more than 25 feet, the manhole base slabs shall be designed by a Professional Structural Engineer licensed in the State of Washington.

5-2.03(2)D MANHOLE INVERTS

Drop in invert elevation across the manhole shall typically be from 0.1 to 0.2 feet. Maximum allowable drop in invert elevation across the manhole shall be 2.0 feet.

Where a side sewer connects to a manhole, the invert of the side sewer shall be equal to or above the main sewer crown, but not to exceed 18 inches above the invert of the main sewer.

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5-2.03(2)E MANHOLE FOUNDATION

Unless otherwise directed by the City, manhole bases (pre-cast base sections or cast-in-place) shall be placed on a minimum thickness of 6 inches of crushed surfacing base course meeting the requirements of WSDOT Section 9-03.9(3). The crushed surfacing base course must be compacted to 95% of standard density.

5-2.03(2)F MANHOLE SECTIONS

Manhole sections shall be placed and aligned so as to provide vertical sides and vertical alignment of the ladder steps. The completed manholes shall be rigid, true to dimension and watertight. Rough or uneven surfaces shall not be permitted inside or outside. All manhole sections shall be newly manufactured and free of breaks or cracks.

Manholes shall have eccentric cones aligned with the ladder access.

Joints between pre-cast manhole elements shall be rubber gasketed in a manner similar to pipe joints conforming to ASTM C-443 and they shall be grouted inside and outside. Joints in the pre-cast sections and for laying manhole adjustment rings shall be thoroughly wetted and completely filled with grout, smoothed both inside and outside. Grout shall be ½ inch minimum thick and 3 inch minimum on each side of joints. The exterior joints shall receive a water proof coating that overlaps the manufacturer's water proofing by a minimum of 1 inch when required by the City Inspector. Shop drawings of the joint design shall be submitted to the City Inspector for approval prior to manufacture.

Completed joints shall show no visible leakage and shall conform to the dimensional requirements of ASTM 478. They must be inspected before backfill.

5-2.03(2)G DROP MANHOLE

Drop manholes may be allowed if a sanitary sewer extension has no possibility of future extension to avoid unnecessary construction costs.

5-2.03(2)H LIFT HOLES AND STEEL LOOPS

All manhole lift holes shall be completely filled with non-shrink grout and smoothed both inside and outside to ensure water tightness. All steel loops must be removed, flush with the manhole structure. The stubs shall be covered with grout and smoothed. Rough or uneven surfaces shall not be permitted.

5-2.03(2)I MANHOLE CHANNELS

All manholes shall be channeled unless otherwise approved by the City. Channels shall match existing sewer grades. Channels shall converge with smooth transitions rounded into well finished junctions. Channel sides shall be carried up vertically to the crown elevation of

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the various pipes. Concrete shelves between channels shall be smoothly finished, warped evenly and sloped to drain.

All manholes shall have a minimum drop of 0.10 feet to a maximum drop of 2.0 feet between the invert in and the invert out.

5-2.03(2)J PIPE CONNECTIONS AT MANHOLES

All pipes except PVC pipe entering or leaving the manhole shall be provided with flexible joints within ½ of a pipe diameter or 12 inches, whichever is greater, from the outside face of the manhole structure. The flexible joint shall be placed on firmly compacted bedding, particularly within the area of the manhole excavation which normally is deeper than that of the sewer trench. Special care shall be taken to see that the openings through which pipes enter the manhole are completely and firmly rammed full of non-shrink grout to ensure water tightness.

PVC pipe connected to manholes shall be provided with a manhole adapter complete with gasket and approved by the City Engineer. No PVC pipe joint shall be placed within 10 feet of the outside face of the manhole.

All stubbed out pipes placed through manhole walls for future connections shall be suitably plugged and blocked, with bell end left intact in a manner acceptable to the City.

5-2.03(2)K CONNECTION TO EXISTING MANHOLES

When connecting to an existing manhole, check that the existing manhole diameter is adequate to accommodate the new sewer mains. The existing manhole may need upgrade or repair at the Developer's expenses. If the existing manhole access is less than 24 inches in diameter, and/or concentric cone (manhole over 7 feet deep), the manhole shall be upgraded to include new 24 inch ring and cover and/or eccentric cone. If connection to an existing manhole places a channel directly under access opening, move the ladder and rotate the cone section to place the access the over concrete shelf.

Connection of new sewer pipe to an existing manhole shall be accomplished by using core drilled holes to match the size of pipe. Sawcutting of square openings or hammer drilling in manhole will not be acceptable. All openings must provide a minimum of 1 inch and a maximum of 2 inch clearance around the outside circumference of the pipe. Pipe connections shall use manhole adapter in accordance with Section 5-2.03(2)E of these Standards.

The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.

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5-2.03(2)L PIPE PLUGGING AT CONNECTIONS

At the connection to the existing sewer system, Contractor shall physically plug all new sewer connections until all tests have been completed and the City approves the removal of the plugs. Plugs shall be secured in place in such a manner as to prevent them from traveling downstream in the pipe, in the event of a plug failure. If the Contractor fails to take necessary precautions to secure the plug, all costs associated with damage to downstream systems and backing up of sewer system shall be borne by the Contractor.

5-2.03(2)M SADDLE MANHOLE

The existing pipe shall not be cut until approval is received from the City.

5-2.03(2)N GRADE ADJUSTMENT

Grade adjustments of structures shall be in accordance with Section 2-??? of these Standards.

Manholes located in the public right-of-way, adjustment rings not less than 8 inches and not more than 26 inches shall be provided between the top of the cone (or slab for flat top manholes) and the bottom of the manhole frame. Grade adjustments shall be done within 24 hours after paving. Paving, repaving, and patching shall be completed within 72 hours.

Manhole rim elevations in unpaved areas (planters and grassed areas) shall be 4 inches to 6 inches above the finished grade or as directed by the City Inspector. See Standard Detail SS-070.

Locking cover shall be used for all manholes. Manholes shall not be located in areas subject to inflow. If a manhole must be located in an area subject to inflow in the opinion of the City Engineer, the manhole shall be equipped with a PRECO sewer guard watertight manhole insert or approved equal.

5-2.03(2)O CLEANOUT

All clean-outs in the City right-of-way or easements shall be extended to grade and a 3 feet x 3 feet x 4 inch concrete pad shall be installed around all clean-outs in unpaved areas.

5-2.03(2)P GREASE TRAP AND INTERCEPTOR

Grease traps and interceptors shall be installed and sized according to the criteria in the Uniform Plumbing Code. Grease trap and interceptors shall be located on private property, and they shall remain privately owned and maintained at the owner's or occupant's expense. These facilities shall be available for the inspection by the City's Public Works crews with a 24 hour verbal notification to the occupant or property owners.

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5-2.03(2)Q FRAMES/LIDS/GRATES/COVERS

The cover or grating of a manhole or catch basin shall not be grouted to final grade until the final elevation of the pavement, gutter, ditch, or sidewalk in which it is to be placed has been established, and until permission thereafter is given by the City inspector to grout the cover or grating in place.

Lids, grates, and covers shall be seated properly to prevent rocking.

All lids and grates shall be locking type.

Round lids on all sewer structures shall have “Sewer” cast into the lid.

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5-3 STANDARD DETAILS

The following standard details shall be included as part of these standards. In the event that reference to the standard details is not made in the above requirements, the standard details shall still apply.

Detail Number	Detail Name
SS - 010	Manhole T1
SS - 015	Manhole T2
SS - 020	Saddle Manhole
SS - 030	Manhole Cover
SS - 040	Manhole Ladder
SS - 050	Manhole Ladder Step
SS - 060	Manhole Drop Connection
SS - 070	Manhole Pad & Adjustment
SS -080	Sewer Cleanout
SS -090	Side Sewer Stub
SS - 100	New Service on Existing
SS -110	Back Water Valve
SS - 120	Trench Section
SS - 130	Monitoring Manhole

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I RELEVANT PERMITS

I.1 NPDES AND RECLAIMED WATER WASTE DISCHARGE PERMIT NO. WA0022560, EFFECTIVE MARCH 1, 2014 (54 PAGES)

I.2 GENERAL PERMIT FOR BIOSOLIDS MANAGEMENT, DRAFT, EFFECTIVE 2015 (40 PAGES)

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Issuance Date: January 31, 2014
Effective Date: March 1, 2014
Expiration Date: February 28, 2019

National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0022560

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008-5452

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The State of Washington Reclaimed Water Act
Chapter 90.46 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.
and
State of Washington
DEPARTMENT OF HEALTH
In compliance with the provisions of
Chapter 90.46 and 43.70 Revised Code of Washington

CITY OF ARLINGTON
154 West Cox Avenue
Arlington, Washington 98223

is authorized to discharge in accordance with the Special and General Conditions that follow.

Plant Location: Arlington Water Reclamation Facility 108 W Haller Avenue, Arlington, WA	**Receiving Water**: Stillaguamish River
Treatment Type: Membrane Bioreactor and Biological Nutrient Removal	**Reclaimed Water Use Area Location:** Constructed Wetland in Arlington, WA

Kevin C. Fitzpatrick
Water Quality Section Manager
Northwest Regional Office
Washington State Department of Ecology

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Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
Wastewater Discharge through Outfall #001 to Stillaguamish River			
S2.A(5) and S3.A(8)	Permit Renewal Application Requirements – Conventional Pollutants	Testing 3/permit cycle	September 1, 2018 - with the next permit renewal application
S2.A(5) and S3.A(8)	Permit Renewal Application Requirements – Priority Pollutants	Sampling and Testing 3/permit cycle: January 2015, July 2016, and May 2017	September 1, 2018 - with the next permit renewal application
S3.A(1)	Discharge Monitoring Report (DMR) for parameters in S2.A(1), (2), and (3)	Monthly	April 15, 2014
S3.E	Reporting Permit Violations	As necessary	
S3.F	Other Reporting	As necessary	
S4.B	Plans for Maintaining Adequate Capacity	As necessary	
S4.D	Notification of New or Altered Sources	As necessary	
S5.F	Bypass Notification	As necessary	
S5.G (a)(2)	Operations and Maintenance Manual Substantial Changes or Updates	As necessary	
S6.E	Industrial User Survey Submittal	1/permit cycle	September 1, 2018 - with the next permit renewal application
S8(3)	Effluent and Receiving Water Temperature Study Report	1/permit cycle	March 31, 2017
S9(1)	Effluent and Receiving Water Copper and Zinc Study - Sampling and Quality Assurance Plan	1/permit cycle	June 30, 2014
S9(4)	Effluent and Receiving Water Copper and Zinc Study Report	1/permit cycle	March 31, 2016
S10	Acute Toxicity Effluent Test Results with Permit Renewal Application	Testing during: August 2017 February 2018	Report submittal by September 1, 2018, with the next permit renewal application
S11	Chronic Toxicity Effluent Test Results with Permit Renewal Application	Testing during: November 2017 May 2018	Report submittal by September 1, 2018, with the next permit renewal application
S12	Application for Permit Renewal	1/permit cycle	September 1, 2018
Reclaimed Water Production and Use - Outfall #002			
S3.A	Discharge Monitoring Report (DMR) for parameters in R2.A	Monthly	April 15, 2014
S3.E	Reporting Permit Violations	As needed	
R3.F	Other Reporting	As necessary	
S3.G(4)	Cross Connection Control Coordination Letter	Annually	June 1, 2014
S5.C	Reclaimed Water Use Summary Plan Update	Annually	March 31, 2015
S5.D(2)	Sale and Distribution Agreements	As needed	
S5.E(3)	Service and Use Area Agreements	As needed	

Permit Section	Submittal	Frequency	First Submittal Date
S5.G	Net Environmental Benefit Report	1/permit cycle	September 1, 2018 - with the next permit renewal application
General Conditions			
G1	Notice of Change in Authorization	As necessary	
G4	Reporting Planned Changes	As necessary	
G5	Engineering Report for Construction or Modification Activities	As necessary	
G7	Notice of Permit Transfer	As necessary	
G10	Duty to Provide Information	As necessary	
G13	Payment of Fees	As assessed	
G20	Compliance Schedules	As necessary	
G21	Contract Submittal	As necessary	

Special Conditions

S1. Discharge Limits

S1.A. Effluent Limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a level in excess of, that identified and authorized by this permit violates the terms and conditions of this permit.

Beginning on the effective date of this permit, the Permittee may discharge treated municipal wastewater to the Stillaguamish River at the permitted location subject to compliance with the following limits:

Effluent Limits: Outfall 001 Latitude: 48.203320 Longitude -122.129951		
Parameter	**Average Monthly [a]**	
Flow (July through September)	2.01 million gallons per day (MGD)	
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand (5-day) (BOD_5)	30 milligrams/liter (mg/L), 500 pounds/day (lbs/day) 85% removal of influent BOD_5	45 mg/L, 751 lbs/day
Total Suspended Solids (TSS)	30 mg/L, 500 lbs/day 85% removal of influent TSS	45 mg/L, 751 lbs/day
Parameter	**Minimum**	**Maximum**
pH	6.0 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	39/100 milliliter (mL)	100/100 mL
[a]	Average monthly effluent limit means the highest allowable (arithmetic) average of daily discharges over a calendar month.	
[b]	Average weekly discharge limitation means the highest allowable (arithmetic) average of daily discharges over a calendar week.	
[c]	Ecology provides directions to calculate the monthly and the weekly geometric mean in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: http://www.ecy.wa.gov/pubs/0410020.pdf	

S1.B. Mixing Zone Authorization

Mixing Zone for Outfall 001

The mixing zone boundaries are based on the allowable percentage of the ambient 7Q20 flows. The allowable flow in the chronic mixing zone is 25% of the 7Q20 ambient flow. The allowable flow in the acute mixing zone is 2.5% of the 7Q20 ambient flow.

The maximum allowable ambient flows for the chronic mixing zone are:

(i) 67.75 cfs for the July through September period.

(ii) 95.0 cfs for the October through June period.

The maximum allowable ambient flows for the acute mixing zone are:

(i) 6.78 cfs for the July through September period.

(ii) 9.5 cfs for the October through June period.

The mixing zones extend from the discharge port to the top of the water surface.

Available Dilution (Dilution Factors)		
	July through September	October through June
Acute Aquatic Life Criteria	3	3
Chronic Aquatic Life Criteria	23	24
Human Health Criteria - Non-carcinogen	23	24

S2. Monitoring Requirements

S2.A. Monitoring Schedule

The Permittee must monitor in accordance with the following schedule and the requirements specified in Appendix A.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
(1) Wastewater Influent			
Wastewater Influent means the raw sewage flow from the collection system into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant.			
Flow	MGD	Continuous [a]	Metered/recorded
Biochemical Oxygen Demand (BOD_5)	mg/L	1/week	24-hr composite [b]
	lbs/day		Calculated [c]
Total Suspended Solids (TSS)	mg/L	1/week	24-hr composite [b]
	lbs/day		Calculated [c]
(2) Final Wastewater Effluent			
Final Wastewater Effluent means wastewater exiting the last treatment process or operation. This is after or at the exit from the UV disinfection process.			
Flow	MGD	Continuous [a]	Metered/recorded
BOD_5	mg/L	1/week	24-hr composite [b]
	lbs/day	1/week	Calculated [c]
	% removal	1/month	Calculated [d]
TSS	mg/L	1/week	24-hr composite [b]
	lbs/day	1/week	Calculated [c]
	% removal	1/month	Calculated [d]
Fecal Coliform [f]	# /100 ml	1/week	Grab [e]
pH [g]	Standard Units	Daily	Grab [e]
Total Phosphorus	mg/L as P	1/week	24-hr composite [b]
	lbs/day as P	1/week	Calculated [c]
(3) Effluent Characterization – Final Wastewater Effluent			
Soluble Reactive Phosphorus	mg/L as P	1/month	24-hr composite [b]
Total Ammonia	mg/L as N	1/month	24-hr composite [b]

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Nitrate plus Nitrite -Nitrogen	mg/L as N	1/month	24-hr composite [b]
Total Kjeldahl Nitrogen (TKN)	mg/L as N	1/month	24-hr composite [b]
(4) Whole Effluent Toxicity Testing – Final Wastewater Effluent			
Acute Toxicity Testing	--------	2/permit cycle: August 2017 and February 2018	24-hr composite [b]
Chronic Toxicity Testing	--------	2/permit cycle: November 2017 and May 2018	
Additional requirements specified in Special Conditions S10 and S11.			
(5) Permit Renewal Application Requirements – Final Wastewater Effluent The final effluent must be analyzed for the following parameters during the permit cycle. The analysis results must be submitted with the next permit renewal application - EPA Form 3510-2A. The Permittee must record and report the wastewater treatment plant flow discharged on the day it collects the sample for priority pollutant testing with the discharge monitoring report.			
Dissolved Oxygen	mg/L	3/permit cycle	
Oil and Grease			
Total Dissolved Solids			
Cyanide	µg/L	3/permit cycle: January 2015, July 2016, and May 2017	Grab
Total Phenolic Compounds	µg/L		Grab
Priority Pollutants (PP) – Total Metals	µg/L;nanograms(ng/L) for Mercury		24-hr composite [b] Grab for Mercury [e]
PP – Volatile Organic Compounds	µg/L		Grab [e]
PP – Acid-extractable Compounds	µg/L		24-hr composite [b]
PP – Base-neutral Compounds	µg/L		24-hr composite [b]
(6) Receiving Water Study of Temperature			
As specified in Special Condition S8.			
(7) Receiving Water Study of Copper and Zinc			
As specified in Special Condition S9.			

[a]	Continuous means uninterrupted except for brief lengths of time for calibration, power failure, or unanticipated equipment repair or maintenance.
[b]	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
[c]	Calculated means figured concurrently with the respective sample, using the following formula: Concentration (in mg/L) X Flow (in MGD) X Conversion Factor (8.34) = lbs/day
[d]	% removal = $\frac{\text{Influent concentration (mg/L)} - \text{Effluent concentration (mg/L)}}{\text{Influent concentration (mg/L)}} \times 100$ Calculate the percent (%) removal of BOD_5 and TSS using the above equation.
[e]	Grab means an individual sample collected over a fifteen (15) minute, or less, period.
[f]	Report a numerical value for fecal coliforms following the procedures in Ecology's *Information Manual for Wastewater Treatment Plant Operators*, Publication Number 04-10-020 available at: http://www.ecy.wa.gov/programs/wq/permits/guidance.html . Do not report a result as too numerous to count (TNTC).
[g]	Report the daily pH and the minimum and maximum for the monitoring period.

S2.B. Sampling and Analytical Procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters. The Permittee must conduct representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions that may affect effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit . Ecology may only specify alternative methods for parameters without permit limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

S2.C. Flow Measurement Devices

The Permittee must:

1. Select and use appropriate flow measurement device and methods consistent with accepted scientific practices.
2. Install and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard and the manufacturer's recommendation for that type of device.
3. Calibrate these devices at the frequency recommended by the manufacturer and at a minimum frequency of at least one calibration per year.
4. Maintain calibration records for at least three years.

S2.D. Laboratory Accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, temperature, pH, and internal process control parameters are exempt from this requirement. The Permittee must obtain accreditation for pH if it must receive accreditation or registration for other parameters.

S2.E. Request for Reduction in Monitoring

The Permittee may request a reduction of the sampling frequency after twelve (12) months of monitoring. Ecology will review each request and at its discretion grant the request when it reissues the permit or by a permit modification.

The Permittee must:

1. Provide a written request.
2. Clearly state the parameters for which it is requesting reduced monitoring.
3. Clearly state the justification for the reduction.

S3. Reporting and Recording Requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

S3.A. Reporting

The first monitoring period begins on the effective date of the permit. The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic Discharge Monitoring Report (DMR) form provided by Ecology within WQWebDMR. Include data for each of the parameters tabulated in Special Conditions S2.A(1), (2) and (3), and as required by the form. Report a value for each day sampling occurred and for the summary values (when applicable) included on the electronic form.

   To find out more information and to sign up for WQWebDMR go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html

2. Enter the "no discharge" reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.
3. Report single analytical values below detection as "less than the detection level (DL)" by entering < followed by the numeric value of the detection level (e.g. < 2.0) on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.
4. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A.
5. Calculate average values (unless otherwise specified in the permit) using:
   a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.
   b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample for the reporting period.
   c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.
6. Ensure that DMRs for the parameters tabulated in Special Conditions S2.A.(1), (2) and (3) are electronically submitted no later than the 15th day of the following month.

7. Submit reports to Ecology online using Ecology's electronic WQWebDMR submittal forms (electronic DMRs) as required above. Send paper reports to Ecology at:

   Water Quality Permit Coordinator
   Department of Ecology
   Northwest Regional Office
   3190 160th Avenue SE
   Bellevue, WA 98008-5452

8. Submit permit renewal application monitoring requirement data [Parameters listed in Conditions S2.A(5)] in the next permit renewal application form. For the priority pollutants analyses required in this condition, the Permittee must submit an electronic PDF copy of the laboratory report, when submitting the next permit renewal application form.

9. Include the following information (for priority pollutant organic and metal parameters lab reports): sampling date, sample location, date of analysis, parameter name, CAS number, analytical method/number, method detection limit (MDL), laboratory practical quantitation limit (PQL), reporting units, and concentration detected. The Permittee must submit a copy of the contract laboratory report to provide this information. Analytical results from samples sent to a contract laboratory must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.

S3.B. Records Retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.C. Recording of Results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

S3.D. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Special Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR.

S3.E. Reporting Permit Violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

a. Immediate Reporting

The Permittee must immediately report to Ecology and the Local Health Jurisdiction (at the numbers listed below), all:

- Failures of the disinfection system.
- Collection system overflows.
- Plant bypasses resulting in a discharge.
- Any other failures of the sewage system (pipe breaks, etc).

Northwest Regional Office	425-649-7000
Snohomish Health District, Environmental Health Division	425-339-5200 (Business Hours)

b. Twenty-four-hour Reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone number listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.
2. Any unanticipated bypass that causes an exceedance of an effluent limit in the permit (See Part S5.F, "Bypass Procedures").
3. Any upset that causes an exceedance of an effluent limit in the permit (See G.15, "Upset").
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.
5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit.

c. Report Within Five Days

The Permittee must also submit a written report within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of Written Reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All other Permit Violation Reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

f. Report Submittal

The Permittee must submit reports to the address listed in S3.A(7).

S3.F. Other Reporting

a. Spills of Oil or Hazardous Materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website:
http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm .

b. Failure to submit Relevant or Correct Facts

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

S3.G. Maintaining a Copy of this Permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. Facility Loading

S4.A. Design Criteria

The flows or waste loads for the permitted facility must not exceed the following design criteria:

Maximum Month Design Flow (MMDF)	2.67 MGD
BOD_5 Influent Loading for Maximum Month	8,284 lb/day
TSS Influent Loading for Maximum Month	8,284 lb/day

S4.B. Plans for Maintaining Adequate Capacity

a. Conditions triggering Plan Submittal

The Permittee must submit a plan and a schedule for continuing to maintain capacity to Ecology when:

1. The actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.
2. The projected plant flow or loading would reach design capacity within five years.

b. Plan and Schedule Content

The plan and schedule must identify the actions necessary to maintain adequate capacity for the expected population growth and to meet the limits and requirements of the permit. The Permittee must consider the following topics and actions in its plan.

1. Analysis of the present design and proposed process modifications.
2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system.
3. Limits on future sewer extensions or connections or additional waste loads.
4. Modification or expansion of facilities.
5. Reduction of industrial or commercial flows or waste loads

Engineering documents associated with the plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by Ecology prior to any construction.

S4.C. Duty to Mitigate

The Permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

S4.D. Notification of New or Altered Sources

1. The Permittee must submit written notice to Ecology whenever any new discharge or a substantial change in volume or character of an existing discharge into the wastewater treatment plant is proposed which:
   a. Would interfere with the operation of, or exceed the design capacity of, any portion of the wastewater treatment plant.
   b. Is not part of an approved general sewer plan or approved plans and specifications.
   c. Is subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act.
2. This notice must include an evaluation of the wastewater treatment plant's ability to adequately transport and treat the added flow and/or waste load, the quality and volume of effluent to be discharged to the treatment plant, and the anticipated impact on the Permittee's effluent [40 CFR 122.42(b)].

S5. Operation and Maintenance

The Permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

S5.A. Certified Operator

This permitted facility must be operated by an operator certified by the state of Washington for at least a Class III plant. This operator must be in responsible charge of the day-to-day operation of the wastewater treatment plant. An operator certified for at least a Class II plant must be in charge during all regularly scheduled shifts.

S5.B. Operation and Maintenance Program

The Permittee must:

1. Institute an adequate operation and maintenance program for the entire sewage system.

2. Keep maintenance records on all major electrical and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.
3. Make maintenance records available for inspection at all times.

S5.C. Short-term Reduction

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out in a manner approved by Ecology.

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limits on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee must:

1. Give written notification to Ecology, if possible, thirty (30) days prior to such activities.
2. Detail the reasons for, length of time of, and the potential effects of the reduced level of treatment.

This notification does not relieve the Permittee of its obligations under this permit.

S5.D. Electrical Power Failure

The Permittee must ensure that adequate safeguards prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations. Adequate safeguards include, but are not limited to, alternate power sources, standby generator(s), or retention of inadequately treated wastes.

The Permittee must maintain Reliability Class I (EPA 430/9-74-001) at the wastewater treatment plant. Reliability Class I requires a backup power source sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions.

S5.E. Prevent Connection of Inflow

The Permittee must strictly enforce its sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

S5.F. Bypass Procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass which is unavoidable, unanticipated, and results in noncompliance of this permit.

   This permit authorizes such a bypass only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. No feasible alternatives to the bypass exist, such as:

      - The use of auxiliary treatment facilities.
      - Retention of untreated wastes.
      - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
      - Transport of untreated wastes to another treatment facility or preventative maintenance), or transport of untreated wastes to another treatment facility.

   c. Ecology is properly notified of the bypass as required in Special Condition S3.E of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

   a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:

      - A description of the bypass and its cause.
      - An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
      - A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
      - The minimum and maximum duration of bypass under each alternative.
      - A recommendation as to the preferred alternative for conducting the bypass.

- The projected date of bypass initiation.
- A statement of compliance with SEPA.
- A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
- Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during preparation of the engineering report or facilities plan and plans and specifications and must include these to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

- If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
- If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

S5.G. Operations and Maintenance (O&M) Manual

a. O&M Manual Submittal and Requirements

The Permittee must:

1. Review the O&M Manual at least annually.
2. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual. The Permittee must submit an electronic copy (preferably as a PDF).
3. Keep the approved O&M Manual at the permitted facility.
4. Follow the instructions and procedures of this manual.

b. O&M Manual Components

When the Permittee updates the O&M manual for the permitted facility, the updated manual must meet the content requirements of WAC 173-240-080 (4) and be consistent with the guidance in Table G1-3 in the *Criteria for Sewage Works Design* (Orange Book), 2008 Version. The O&M Manual must include:

1. Emergency procedures for cleanup in the event of wastewater system upset or failure.
2. A review of system components which if failed could pollute surface water or could impact human health. Provide a procedure for a routine schedule of checking the function of these components.
3. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
4. Reporting protocols for submitting reports to Ecology to comply with the reporting requirements in the discharge permit.
5. Any directions to maintenance staff when cleaning or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine).
6. The treatment plant process control monitoring schedule.
7. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.
8. Specify other items on case-by-case basis such as O&M for collection systems pump stations, lagoon liners, etc.

S6. Pretreatment

S6.A. General Requirements

The Permittee must work with Ecology to ensure that all commercial and industrial users of the publicly owned treatment works (POTW) comply with the pretreatment regulations in 40 CFR Part 403 and any additional regulations that the Environmental Protection Agency (U.S. EPA) may promulgate under Section 307(b) (pretreatment) and 308 (reporting) of the Federal Clean Water Act.

S6.B. Duty to Enforce Discharge Prohibitions

1. Under federal regulations (40 CFR 403.5(a) and (b)), the Permittee must not authorize or knowingly allow the discharge of any pollutants into its POTW which may be reasonably expected to cause pass through or interference, or which otherwise violate general or specific discharge prohibitions contained in 40 CFR Part 403.5 or WAC-173-216-060.

2. The Permittee must not authorize or knowingly allow the introduction of any of the following into their treatment works:
   a. Pollutants which create a fire or explosion hazard in the POTW (including, but not limited to waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21).
   b. Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, or greater than 11.0 standard units, unless the works are specifically designed to accommodate such discharges.
   c. Solid or viscous pollutants in amounts that could cause obstruction to the flow in sewers or otherwise interfere with the operation of the POTW.
   d. Any pollutant, including oxygen-demanding pollutants, (BOD_5, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW.
   e. Petroleum oil, non-biodegradable cutting oil, or products of mineral origin in amounts that will cause interference or pass through.
   f. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity which may cause acute worker health and safety problems.
   g. Heat in amounts that will inhibit biological activity in the POTW resulting in interference but in no case heat in such quantities such that the temperature at the POTW headworks exceeds 40 degrees Centigrade (104 degrees Fahrenheit) unless Ecology, upon request of the Permittee, approves, in writing, alternate temperature limits.
   h. Any trucked or hauled pollutants, except at discharge points designated by the Permittee.
   i. Wastewaters prohibited to be discharged to the POTW by the Dangerous Waste Regulations (chapter 173-303 WAC), unless authorized under the Domestic Sewage Exclusion (WAC 173-303-071).
3. The Permittee must also not allow the following discharges to the POTW unless approved in writing by Ecology:
   a. Noncontact cooling water in significant volumes.
   b. Stormwater and other direct inflow sources.
   c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment, or would not be afforded a significant degree of treatment by the system.
   d. The Permittee must notify Ecology if any industrial user violates the prohibitions listed in this section (S6.B), and initiate enforcement action to promptly curtail any such discharge.

S6.C. Wastewater Discharge Permit Required

The Permittee must

1. Establish a process for authorizing non-domestic wastewater discharges that ensures all SIUs in all tributary areas meet the applicable state waste discharge permit (SWDP) requirements in accordance with chapter 90.48 RCW and chapter 173-216 WAC.
2. Immediately notify Ecology of any proposed discharge of wastewater from a source, which may be a significant industrial user (SIU) [see fact sheet definitions or refer to 40 CFR 403.3(t)(i)(ii)].
3. Require all SIUs to obtain a SWDP from Ecology prior to accepting their non-domestic wastewater, or require proof that Ecology has determined they do not require a permit.
4. Require the documentation as described in S6.C.3 at the earliest practicable date as a condition of continuing to accept non-domestic wastewater discharges from a previously undiscovered, currently discharging and unpermitted SIU.
5. Require sources of non-domestic wastewater, which do not qualify as SIUs but merit a degree of oversight, to apply for a SWDP and provide it a copy of the application and any Ecology responses.
6. Keep all records documenting that its users have met the requirements of S6.C.

S6.D. Identification and Reporting of Existing, New, and Proposed Industrial Users

1. The Permittee must take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging or proposing to discharge to the Permittee's sewer system (see Appendix C of the fact sheet for definitions).
2. Within 30 days of becoming aware of an unpermitted existing, new, or proposed industrial user who may be a significant industrial user (SIU), the Permittee must notify such user by registered mail that, if classified as an SIU, they must apply to Ecology and obtain a State Waste Discharge Permit. The Permittee must send a copy of this notification letter to Ecology within this same 30-day period.
3. The Permittee must also notify all Potential SIUs (PSIUs), as they are identified, that if their classification should change to an SIU, they must apply to Ecology for a State Waste Discharge Permit within 30 days of such change.

S6.E. Industrial User Survey

The Permittee must complete an industrial user survey listing all SIUs and potential significant industrial users (PSIUs) discharging to the POTW. The Permittee must submit the survey to Ecology with the Permit Renewal Application by September 1, 2018. At a minimum, the Permittee must develop the list of SIUs and PSIUs by means

of a telephone book search, a water utility billing records search, and a physical reconnaissance of the service area. Information on PSIUs must include, at a minimum, the business name, telephone number, address, description of the industrial process(s), and the known wastewater volumes and characteristics.

S7. Solid Wastes

S7.A. Solid Waste Handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

S7.B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S8. Receiving Water Study of Temperature

The Permittee must collect effluent and receiving water information necessary to determine if the effluent has a reasonable potential to cause a violation of the water quality standards for temperature. If reasonable potential exists, Ecology will use this information to calculate effluent limits.

The Permittee must:

1. Conduct the temperature study during the months of July through September in 2015 and 2016.
2. Conduct all sampling and analysis in accordance with the Ecology approved Sampling Quality Assurance Project Plan.
3. Submit the results of the study in a report to Ecology by March 31, 2017. The Permittee must submit electronic copies (in WORD and PDF).

S9. Receiving Water Study of Copper and Zinc

The Permittee must collect effluent and receiving water information necessary to determine if the effluent has a reasonable potential to cause a violation of the water quality standards for copper and zinc. If reasonable potential exists, Ecology will use the study information to calculate effluent limits.

The Permittee must:

1. Submit a sampling and quality assurance plan for Ecology review and approval by June 30, 2014. The Permittee must submit electronic copies (in WORD and PDF).
2. The sampling and quality assurance plan must include, at minimum, sampling and analysis protocols for copper, zinc, total suspended solids, hardness, and pH.

3. Conduct all chemical analysis in accordance with the Ecology approved sampling and quality assurance plan and using the methods and the detection levels identified in Appendix A.
4. Submit the results of the study in a report to Ecology by March 31, 2016. The Permittee must submit electronic copies (in WORD and PDF).

S10. Acute Toxicity

S10.A. Testing when there is no Permit Limit for Acute Toxicity

The Permittee must:

1. Conduct acute toxicity testing on final effluent during the months shown in the following table.
2. Submit the results to Ecology with the permit renewal application.
3. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100% effluent and a control.
4. Use each of the following species and protocols for each acute toxicity test:

Acute Toxicity Tests	Species	Method	Test Date	Written Report Submittal Date
Fathead minnow 96-hour static-renewal test	*Pimephales promelas*	EPA-821-R-02-012	August 2017 February 2018	September 1, 2018 - with the next permit renewal application
Daphnid 48-hour static test	*Ceriodaphnia dubia*, *Daphnia pulex*, or *Daphnia magna*			

S10.B. Sampling and Reporting Requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.* Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.
2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.*

4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Subsection C and the Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.* If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Section A or pristine natural water of sufficient quality for good control performance.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the acute critical effluent concentration (ACEC). The ACEC equals 33.3% effluent.
8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing must comply with the acute statistical power standard of 29% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

S11. Chronic Toxicity

S11.A. Testing when there is no Permit Limit for Chronic Toxicity

The Permittee must:

1. Conduct chronic toxicity testing on final effluent during the months shown in the following table.
2. Submit the results to Ecology with the permit renewal application.
3. Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The ACEC equals 33.3% effluent. The series of dilutions should also contain the CCEC of 4.3% effluent July through September, and 4.2% October through June.
4. Compare the ACEC to the control using hypothesis testing at the 0.05 level of significance as described in Appendix H, EPA/600/4-89/001.

5. Perform chronic toxicity tests with all of the following species and the most recent version of the following protocols:

Freshwater Chronic Test	Species	Method	Test Date	Written Report Submittal Date
Fathead minnow survival and growth	*Pimephales promelas*	EPA-821-R-02-013	November 2017; May 2018	September 1, 2018 - with the next permit renewal application
Water flea survival and reproduction	*Ceriodaphnia dubia*			

S11.B. Sampling and Reporting Requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.* Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.
2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.*
4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Section C and the Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.* If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Subsection C or pristine natural water of sufficient quality for good control performance.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the CCEC and the ACEC. The CCEC and the ACEC may either substitute for the effluent concentrations

that are closest to them in the dilution series or be extra effluent concentrations. The ACEC equals 33.3% effluent. The CCEC equals 4.4% effluent (July through September) and 4.2% (October through June).

8. All whole effluent toxicity tests that involve hypothesis testing must comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

S12. Application for Permit Renewal or Modification for Facility Changes

The Permittee must submit an application for renewal of this permit by September 1, 2018. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).

The Permittee must also submit a new application or supplement at least one hundred eighty (180) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

Reclaimed Water Conditions

Beginning on the effective date of this permit and lasting through its expiration date, all water produced by the Permittee for reclamation under this permit must comply with the Special Conditions (S.) and General Conditions (G.) as well as the Reclaimed Water Conditions (R.) of this permit.

R1. Reclaimed Water Limits

All reclaimed water distribution and activities authorized by this permit must be consistent with the terms and conditions of this permit. The distribution of reclaimed water containing any of the following constituents more frequently than, or at a concentration in excess of, that authorized by this permit constitutes a violation of the terms and conditions of this permit.

The Permittee is authorized to produce Class A reclaimed water at its water reclamation facility, and use it on the Permittee's constructed wetland as needed during the plant growing season to provide for wetland functions and maintain wetland vegetation growth. The location of the Permittee's constructed wetland is identified in Condition R5.A of this permit.

The production, distribution, and use of reclaimed water must comply with all specific conditions and requirements of the Washington State Water Reclamation and Reuse Standards, 1997, and is subject to the limits listed in Table 1. The Permittee must operate the system in accordance with the permit conditions to ensure statutory requirements are met including protecting the existing and future beneficial uses of waters of the State.

Table 1. Reclaimed Water Limits

Class A Reclaimed Water Limits – Outfall 002			
Class A Reclaimed Water Prior to Distribution			
BOD_5	**Average Monthly** [a] 30 mg/L	**Average Weekly** [b] 45 mg/L	**Average Annual** [c] 20 mg/L
TSS	**Average Monthly** [a] 30 mg/L	**Average Weekly** [b] 45 mg/L	**Average Annual** [c] 20 mg/L
Turbidity	**Average Monthly** 0.2 NTU [d]		**Instantaneous Maximum** 0.5 NTU [e]
Total Coliform	**7-day Median** [f] 2.2 / 100 ml		**Sample Maximum** [g] 23 / 100 ml
pH [h]	**Minimum** 6.0 standard units		**Maximum** 9.0 standard units

[a]	Average monthly effluent limit is defined as the highest allowable (arithmetic) average of daily discharges over a calendar month.
[b]	Average weekly limits are based on an arithmetic mean of the samples taken during a calendar week.
[c]	Average annual effluent limit is defined as the highest allowable (arithmetic) average of daily discharges over a calendar year.
[d]	Compliance with the average operating turbidity limit of 0.2 NTU is based on arithmetic mean of all measurements read during the month.
[e]	The instantaneous maximum turbidity (NTU) is defined as the value not to be exceeded by a continuous measurement. Turbidity excursions lasting less than 5 minutes are allowed and not considered a permit violation.

f	The median number of total coliform organisms in the reclaimed water after disinfection must not exceed 2.2 per 100 milliliters, as determined from the bacteriological results of the last 7 days for which reclaimed water was distributed. This value is **NOT** an arithmetic average or geometric average. Median is defined as the middle number of a group of numbers; that is, half the numbers have values that are greater than the median, and half the numbers have values that are less than the median. The 7-day median must include all the analytical results from samples collected the previous 7 days. If there is an even number of values over the 7 days, the Permittee must report the larger of the two median values.
g	The number of total coliform organisms must not exceed 23 per 100 milliliters in any single sample.
h	The Permittee must report the maximum and minimum pH monthly.

The Class A reclaimed water must contain dissolved oxygen.

All Class A reclaimed water must at all times be oxidized, filtered via membranes, and disinfected.

R2. Monitoring Requirements

R2.A. Class A Reclaimed Water Monitoring

The Permittee must monitor the reclaimed water (RW) that will be or is being distributed in accordance with the schedule in Table 2 and the requirements specified in Appendix A.

Table 2. Monitoring Schedule

Parameter	Units	Sample Location Point	Sampling Frequency	Sample Type
Distributed Flow	Gallons per day (GPD)	Reclaimed Water Pump Station	Continuous	Metered
BOD_5	mg/L	Immediately downstream of UV Disinfection System	1/week	24-hr composite [a]
TSS	mg/L		1/week	24-hr composite [a]
Total Coliform	# / 100 mL		1/day	Grab [b]
pH	Standard units		1/day	Grab [b]
Dissolved Oxygen	mg/L		1/day	Grab [b]
Total Ammonia [c]	mg/L as N		1/month	24-hr Composite [a]
Total Kjeldahl Nitrogen [c]	mg/L as N		1/month	24-hr Composite [a]
Total Phosphorus [c]	mg/L as P		1/month	24-hr Composite [a]
Turbidity	NTU		Continuous [d]	On-line analyzer with recorder
UV Dose [e]	mJ / cm^2	UV Disinfection System	1/day	Measure
UV Transmittance [e]	%	UV Disinfection System	1/day	Measure

a	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample. When the Permittee monitors the effluent for BOD_5 and TSS as a requirement of Permit Condition S2.A, the Permittee does not need to repeat these analyses for the reclaimed water distributed to the wetland.
b	Grab means an individual sample collected over a fifteen (15)-minute, or less, period.
c	Nutrient monitoring conducted for the final effluent discharge to the Stillaguamish River in accordance with Condition S2.A(3) can be used by the Permittee to fulfill this monitoring requirement.

	Parameter	Units	Sample Location Point	Sampling Frequency	Sample Type
[d]	Effluent turbidity analysis must be performed by a continuous recording turbidimeter. "Continuous" means uninterrupted except for brief periods of time for calibration, for power failure, or for unanticipated equipment repair or maintenance. The Permittee must report the maximum value that exceeds five minutes during times of RW production. The Permittee must sample every four hours when continuous monitoring is not possible.				
[e]	The Permittee must report the minimum UV dose and minimum UV transmittance monthly.				

R2.B. Sampling and Analytical Procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters. The Permittee must conduct representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions that may affect effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit . Ecology may only specify alternative methods for parameters without permit limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

R2.C. Flow Measurement and Continuous Monitoring Devices

The Permittee must:

1. Select and use appropriate flow measurement and continuous monitoring devices and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard and the manufacturer's recommendation for that type of device.
3. Calibrate flow measurement devices at the frequency recommended by the manufacturer and at a minimum frequency of at least one calibration per year.
4. Verify the accuracy of turbidimeters at least once every two weeks during times of reclaimed water production.
5. Maintain calibration records for at least three years.

R2.D. Laboratory Accreditation

The Permittee must ensure that all monitoring data required by Ecology is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* Flow, pH, dissolved oxygen, and internal process control parameters are exempt from this requirement. The Permittee must obtain accreditation for pH if it must receive accreditation or registration for other parameters.

R3. Reporting and Record Keeping Requirements

The Permittee must monitor and report in accordance with the following conditions. The falsification of information submitted to Ecology constitutes a violation of the terms and conditions of this permit.

R3.A. Reporting

The first monitoring period begins on the effective date of the permit. The Permittee must:

a. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic Discharge Monitoring Report (DMR) form provided by Ecology within WQWebDMR. Include data for each of the parameters tabulated in Special Condition R2.A and as required by the form. Report a value for each day sampling occurred and for the summary values (when applicable) included on the electronic form.

   To find out more information and to sign up for WQWebDMR go to:
   http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html

b. Enter the "no discharge" reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.

c. Report single analytical values below detection as "less than the detection level (DL)" by entering < followed by the numeric value of the detection level (e.g. < 2.0) on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.

d. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A.

e. Calculate average values (unless otherwise specified in the permit) using:

   a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.

   b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample for the reporting period.

   c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.

f. Ensure that DMRs for the parameters tabulated in Special Condition R2.(A) are electronically submitted no later than the 15th day of the following month.

g. Submit reports to Ecology online using Ecology's electronic WQWebDMR submittal forms (electronic DMRs) as required above. Send paper reports to Ecology at:

   Water Quality Permit Coordinator
   Department of Ecology
   Northwest Regional Office
   3190 160th Avenue SE
   Bellevue, WA 98008-5452

R3.B. Records Retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

R3.C. Recording of Results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place and time of sampling;
2. The individual who performed the sampling or measurement;
3. The dates the analyses were performed;
4. The individual who performed the analyses;
5. The analytical techniques or methods used; and
6. The results of all analyses.

R3.D. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Condition R2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR.

R3.E. Reporting Permit Violations

1. The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

    a. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.

    b. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

2. Follow the established protocols for managing the system regarding sampling and wasting of reclaimed waters.

3. Within 24 hours of discovering the noncompliance condition, notify the Department of Ecology (Ecology) of the failure to comply. Notify the local health authorities of any discharge of inadequately treated reclaimed water. The Permittee must notify:

- Ecology by calling Ecology's ERTS (Environmental Reporting Tracking System) at 425-649-7000.
- Snohomish Health District, Environmental Health Division by calling 425-339-5200 (business hours).

4. Submit a detailed, written report to Ecology with that month's DMR submittal, unless requested earlier by Ecology, describing the nature of the violation, corrective action taken and/or planned, steps to be taken to prevent a recurrence, results of the resampling, and any other pertinent information.

Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

R3.F. Other Reporting

The Permittee must report all instances of noncompliance, not required to be reported immediately or within 24 hours, at the time that monitoring reports for R3.A ("Reporting") are submitted. The reports must contain the information listed in paragraph E4, above.

R3.G. Reclaimed Water Operational Records

The Permittee must:

1. Keep maintenance records for a minimum of three (3) years, on all major electrical and mechanical components of the water reclamation facility, distribution, and use areas. Records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed. These maintenance records must be available for inspection at all times.

2. Maintain operating records at the water reclamation facility or within a central depository within the Permittee's operating agency for a minimum of three (3) years. These records must include records of all analyses performed, records of operational problems, unit process and equipment breakdowns, and diversions to emergency storage or disposal; and all corrective or preventative action taken.

3. Record and maintain separate record files of process or equipment failures triggering an alarm that is key to maintaining reliability of reclaimed water quality. The recorded information must include the time and cause of failure and corrective action taken.

4. Cross Connection Control Coordination: Beginning June 1, 2014 and annually thereafter, the Permittee must provide to the Departments of Health and Ecology a letter confirming that the Permittee has contacted all the public water supplier(s) where reclaimed water is being used in their service area. The letter must indicate where reclaimed water is used and for what purpose, and remind the water suppliers(s) of their duty to comply with the cross connection control report requirements from the Department of Health.

R3.H. Maintaining a Copy of this Permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

R4. Operation and Maintenance

The Permittee must, at all times, properly operate and maintain all facilities or systems of treatment and control (and related appurtenances) which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

R4.A. Certified Operator

When producing and distributing Class A reclaimed water, this permitted facility must be operated by an operator certified by the state of Washington for at least a Class III plant. An operator certified for at least a Class III plant must be in charge during all regularly scheduled shifts, and in responsible charge of the day-to-day operation of the water reclamation facility.

R4.B. O & M Program

The Permittee must:

1. Institute an adequate operation and maintenance program for the entire water reclamation system.
2. Keep maintenance records on all major electrical and mechanical components of the reclaimed water facility. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.
3. Make maintenance records available for inspection at all times.
4. Maintain, at all times, the water reclamation facility, Permittee-owned distribution system, and keep all equipment in a reliable operating condition.

R4.C. Electrical Power Failure

The Permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the water reclamation facility. The power supply must be provided with one of the following reliability features to assure that inadequately treated wastewater is not discharged to distribution or use areas:

1. An alarm and a standby power source.
2. An alarm and automatically actuated alternative disposal provisions.

R4.D. Decontamination of Reclaimed Water Conveyance System

The Permittee must:

1. Have a procedure contained in the Operations and Maintenance Manual, to decontaminate reclaimed water piping and other appurtenances following incidents when the permit limits, as listed in Table 1, are exceeded.
2. Monitor, and if necessary disinfect, the reclaimed water pipelines and other appurtenances that were exposed to reclaimed water that exceeds the permit limits.
3. Ensure that reclaimed water piping and other appurtenances are decontaminated prior to returning the facilities to reclaimed water service.

R4.E. Operations and Maintenance (O&M) Manual

a. O&M Manual Submittal and Requirements

The Permittee must:

1. Review the O&M Manual at least annually.
2. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual. The Permittee must submit an electronic copy (preferably as a PDF).
3. Keep the approved O&M Manual at the permitted facility.
4. Follow the instructions and procedures of this manual.

b. O&M Manual Components

When the Permittee updates the O&M manual for the permitted facility, the updated manual must meet the content requirements of WAC 173-240-080 (4) and be consistent with the guidance in Table G1-3 in the *Criteria for Sewage Works Design* (Orange Book), 2008 Version. The O&M Manual must include:

1. Emergency procedures for plant shutdown and cleanup in event of reclaimed water system upset or failure.
2. Reclaimed water system maintenance procedures and the proper handling of any associated wastewater as a result of these procedures (i.e. pipeline flushing, disinfection of conveyance lines, etc.).
3. Reclaimed water system maintenance procedures that generate wastewater.
4. Procedures to maintenance staff when cleaning, or maintaining other equipment or performing other tasks which are necessary to protect the operation of the reclaimed water system.
5. Reclaimed water facility process control monitoring schedule.

6. Reclaimed water sampling protocols and procedures for compliance with the sampling and reporting requirements in the reclaimed water permit.
7. Adequate staffing levels to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.
8. Alarm condition response plan to ensure that no untreated or inadequately treated wastewater will be delivered to reclaimed water use areas.
9. Discussion of the cross-connection control and inspection program, including who will be responsible for compliance and testing of the cross connection control devices.
10. Operational Control Strategies for reclaimed water use under the Permittee's control.

R5. Reclaimed Water Distribution and Use

R5.A. Authorized Uses and Locations

The Permittee is authorized to distribute reclaimed water in accordance with the terms and conditions of this permit for authorized uses.

The distribution of reclaimed water by the Permittee that does not meet the treatment, water quality and monitoring requirements established in this permit or the use of reclaimed water other than for the uses specified in this permit is a violation of the terms and conditions of this permit.

The Permittee may produce Class A reclaimed water at its water reclamation facility, and distribute it to the Permittees' constructed wetland as needed during the plant growing season at the location listed in Table 3. The Permittee may also use the reclaimed water at new locations as described in Condition R7.B of this permit.

Table 3. Reclaimed Water Uses and Locations

Customer	Use	Location
The City of Arlington (the Permittee)	To provide water during the plant growing season for wetland functions and maintain wetland vegetation growth.	Permittee's Constructed Wetlands adjacent to the Stillaguamish River, near SR 9, Arlington. Latitude: 48.200824° Longitude: -122.130125°

R5.B. Authorization for New Non-potable Uses of Reclaimed Water

The Permittee may provide reclaimed water for all irrigation, and commercial and industrial uses as listed in the 1997 Washington State Water Reclamation and Reuse Standards at additional locations not listed in Condition R5.A.

The Permittee must document new locations for irrigation, and commercial and industrial use sites in the Reclaimed Water Use Summary Plan required by Condition R5.C of this permit. In accordance with the terms and conditions of this permit, the Permittee must meet the following conditions:

1. The Permittee must submit a Water Rights Impairment Analysis to Ecology for review and comments prior to distributing the reclaimed water to new locations.
2. For proposed new irrigation uses, the Permittee must submit a Water Balance Analysis to Ecology for review and approval prior to distributing the reclaimed water to new locations. The Permittee must not distribute the reclaimed water to new irrigation use locations until after approval of the Water Balance Analysis by Ecology.
3. Beneficial use areas and requirements for use must comply with the Washington State Water Reclamation and Reuse Standards. The class of reclaimed water provided must meet or exceed the minimum requirements for the proposed use, and irrigation uses must not exceed agronomic rates of application.
4. The reclaimed water must meet all applicable requirements of this permit for the approved class of reclaimed water, including source control, treatment, water quality limits, monitoring, reporting, record keeping, operation and maintenance, distribution, and use.
5. The Permittee must list the new use areas in the next annual Reclaimed Water Use Summary Plan and must submit a copy of the revised plan to Ecology as described in Condition R5.C of this permit.
6. The Permittee must submit to Ecology, the Sale and Distribution of Reclaimed Water Agreement (if applicable) which is the contract between the Permittee and the water purveyor, and/or the Service and Use Area Agreement which is the contract between the Permittee and the end user.

Groundwater recharge and streamflow augmentation as beneficial uses are not authorized by this permit. A new "type" of use (i.e. groundwater recharge, streamflow augmentation, etc.) will require the approval of an engineering report or amendments to the existing engineering report and reopening of this permit for review and public comment prior to implementation of the new type of use.

R5.C. Reclaimed Water Use Summary Plan

The Permittee must prepare a Water Use Summary Plan, which contains a summary description of the reclaimed water distribution system. The Permittee must review and update the plan annually and submit updates to Ecology. The annual updates are due March 31st of each year, and cover the previous calendar year. The first submittal is due on March 31, 2015. The plan must, at a minimum:

1. Describe the current reuse distribution system.
2. Identify all current water purveyors, end users, uses, and location of reuse sites.
3. Provide for the existing reuse sites: Evaluation of the reuse sites, estimated volume of reclaimed water use at each site, means of application, purpose of application (e.g., irrigation), the application rates, and water and nutrient balances (for agronomic uptake analysis).

4. Provide for the new reuse sites: Evaluation of the reuse sites, estimated volume of reclaimed water use at each site, means of application, purpose of application (e.g., irrigation), application rates, water and nutrient balances, and expected agronomic uptake at irrigation sites.

R5.D. Sale and Distribution Agreements

Where the reclaimed water distribution system or additional treatment system to maintain reclaimed water quality is not under direct control of the Permittee:

1. The entity that provides additional treatment, distributes, owns, or otherwise maintains control over the reclaimed water use area is responsible for reuse facilities and activities inherent to the distribution and use of the reclaimed water to ensure that the system operates as approved by Ecology in accordance with this permit.

2. A binding Sale & Distribution Agreement among the parties involved is required to ensure that distribution, operation, maintenance, and monitoring meet all requirements of the Departments of Health and Ecology. The Sale & Distribution Agreement must be consistent with the requirements of the *Water Reclamation and Reuse Standards*, 1997. A standard Sale & Distribution Agreement must be reviewed and approved by Ecology prior to implementation. A copy of each site-specific Sale & Distribution Agreement must be provided to Ecology prior to use.

3. The Sale & Distribution Agreements must provide the Permittee with authority to terminate service of reclaimed water to a customer violating the *Water Reclamation and Reuse Standards* and restrictions outlined in the Sale & Distribution Agreement.

4. The Permittee must maintain all Sale & Distribution Agreements for the duration of the permit. The Permittee must inform Ecology in writing of any proposed changes to the approved, standard Sale & Distribution Agreement.

R5.E. Service and Use Area Agreements

Where the reclaimed water use area is not under direct control of the Permittee:

1. The entity that owns or otherwise maintains control over the reclaimed water use area is responsible for on-site reclaimed water facilities, infrastructure, and activities inherent to the use of the reclaimed water to ensure that the system operates as approved by Ecology, and in accordance with this permit.

2. Reclaimed water use, including runoff and spray, must be confined to the designated and approved use areas.

3. A binding Service and Use Area Agreement among the parties involved is required to ensure that construction, operation, maintenance, and monitoring meet all requirements of the Departments of Health and

Ecology. This Service and Use Area Agreement must be consistent with the requirements of the *Water Reclamation and Reuse Standards*, 1997. A standard Service and Use Area Agreement must be reviewed and approved by Ecology prior to implementation. A copy of each site-specific Service and Use Area Agreement must be provided to Ecology prior to use.

4. The Service and Use Area Agreement must provide the Permittee with authority to terminate service of reclaimed water to a customer violating the *Water Reclamation and Reuse Standards* and restrictions outlined in the reclaimed water use agreement.

5. The Permittee must maintain all Service and Use Area Agreements for the duration of the permit. The Permittee must inform Ecology in writing of any proposed changes to the approved, standard Service and Use Area Agreement.

R5.F. Use Area Responsibilities

1. The Permittee must develop general language, symbols, and colors to be used for notification signs and have it approved by Ecology. The signs must be used in all reclaimed water use areas, consistent with the *Water Reclamation and Reuse Standards*.

2. All reclaimed water valves, storage facilities, and outlets must be tagged or labeled to warn the public or employees that the water is not intended for drinking. The signage or advisory notification must be colored purple with white or black lettering.

3. Reclaimed water use, including runoff and spray, must be confined to the designated and approved use area.

4. Precautions must be taken to assure that reclaimed water will not be sprayed on people or any facility or area not designated for reuse, including but not limited to buildings, passing vehicles, and drinking water fountains.

5. There must be no hose bibs on reclaimed irrigation lines unless approved by Ecology.

6. Where the reclaimed water production, distribution, and use areas are under direct control of the Permittee, the Permittee must maintain control and be responsible for all facilities and activities inherent to the production, distribution, and use of the reclaimed water. The Permittee must ensure that the reuse system operates as approved by the Departments of Health and Ecology.

7. The Permittee must assure that all customers or authorized personnel using reclaimed water have completed training in the requirements for appropriate use of the water, including signage, cross connection control requirements, public health, and environmental protection.

R5.G. Net Environmental Benefit Report

The Permittee must submit a Net Environmental Benefit (NEB) Report that analyzes whether an NEB can be claimed for the reclaimed water use on the Permittee's constructed wetland. In order to demonstrate NEB, the report must show at a minimum that the use of reclaimed water provides full and uninterrupted protection of all significant beneficial uses. The report must evaluate total ammonia, total nitrogen, and total phosphorus loading the reclaimed water provides to create new or enhances the existing beneficial uses. In addition, the report must show that the annual average hydraulic loading of the reclaimed water does not exceed the moisture requirement of the wetland to maintain its functions and vegetation growth. The Permittee must submit this report with the next permit renewal application.

R5.H. Irrigation Uses

1. For any future irrigation use of reclaimed water, the hydraulic loading rate of reclaimed water must be applied at agronomic rates and be determined based on a water balance analysis or other methods such as moisture sensors, rain sensors, or hand inspections.

2. There must be no runoff of reclaimed water applied to land by spray irrigation to any surface waters of the state or to any land not authorized by approved Service and Use Area Agreement.

3. There must be no application of reclaimed water for irrigation purposes when the ground is saturated or frozen during the winter months.

4. The reclaimed water must not be applied to the irrigation lands in quantities that:

    a. Significantly reduce or destroy the long-term infiltration rate of the soil.

    b. Cause long-term anaerobic conditions in the soil.

    c. Cause ponding of reclaimed water and produce objectionable odors or support insects or vectors.

R5.I. Commercial and Industrial Uses

Commercial and industrial uses must conform to the state Water Reclamation and Reuse Standards for Class A reclaimed water. Any wastewater discharged from commercial or industrial uses is regulated as wastewater and subject to waste discharge permit requirements.

R5.J. Other Uses of Reclaimed Water

Water reclamation facility effluent used for sewage treatment purposes within the bounds of the wastewater treatment facility and other Permittee-owned facilities (not subject to public exposure) is not required to meet the state Water Reclamation and Reuse Standards for Class A reclaimed water, except in areas where there is potential public exposure as determined by Ecology.

R5.K. Reliability

The Permittee must maintain the highest reliability class as described in the Water Reclamation and Reuse Standards, which require one of the following features for turbidity and disinfection:

1. Alarms and standby power source.

2. Alarms and automatically actuated disposal provisions.

R5.L. Bypass Prohibited

The Permittee must not bypass untreated or partially treated wastewater from the water reclamation facility or any intermediate unit processes to the distribution system or point of use at any time. All reclaimed water distributed for beneficial use must meet Class A requirements at all times. The Permittee must retain water not meeting Class A Reclaimed Water Standards for additional treatment by diversion to a bypass storage structure or discharged back to the sewer system or headworks for additional treatment or discharge to the Stillaguamish River through the permitted NPDES outfall.

The Permittee must notify Ecology by telephone within 24 hours of any discharge not meeting Class A entering the distribution system. The Permittee must not discharge substandard reclaimed water to the reclaimed water use areas.

R5.M. Revocation of Authorization

Ecology may revoke authorization to provide service if the Permittee fails to comply with any requirement in this permit. Ecology will base its determination to revoke authorization on the risk to public health and safety or threat to waters of the state. Ecology may revoke the authorization for any or all reclamation facilities and use areas located within a specific geographic area if, due to a geologic or hydrologic condition, the cumulative effect of the water reclamation facilities and use areas causes the violation of state water quality standards. Before revoking the authorization, Ecology will notify the Permittee in writing and provide a reasonable opportunity and time frame to correct the noncompliance.

General Conditions

G1. Signatory requirements

1. All applications, reports, or information submitted to Ecology must be signed and certified.

   a. In the case of corporations, by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

      - A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or
      - The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

   b. In the case of a partnership, by a general partner.

   c. In the case of sole proprietorship, by the proprietor.

   d. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

      Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity shall be submitted by the public entity.

2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to Ecology.

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph G1.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph G1.2, above, must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section must make the following certification:

   "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. Right of inspection and entry

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

1. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.
2. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.
3. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.
4. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. Permit actions

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 40 CFR 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

1. The following are causes for terminating this permit during its term, or for denying a permit renewal application:
   a. Violation of any permit term or condition.
   b. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.
   c. A material change in quantity or type of waste disposal.
   d. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.

e. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.

f. Nonpayment of fees assessed pursuant to RCW 90.48.465.

g. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

2. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:

a. A material change in the condition of the waters of the state.

b. New information not available at the time of permit issuance that would have justified the application of different permit conditions.

c. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.

d. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.

e. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.

f. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.

g. Incorporation of an approved local pretreatment program into a municipality's permit.

3. The following are causes for modification or alternatively revocation and reissuance:

a. When cause exists for termination for reasons listed in 1.a through 1.g of this section, and Ecology determines that modification or revocation and reissuance is appropriate.

b. When Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G7) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. Reporting planned changes

The Permittee must, as soon as possible, but no later than one hundred eighty (180) days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

1. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b)

2. A significant change in the nature or an increase in quantity of pollutants discharged.

3. A significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in this permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

1. Transfers by Modification

   Except as provided in paragraph (2) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

2. Automatic Transfers

   This permit may be automatically transferred to a new Permittee if:

   a. The Permittee notifies Ecology at least thirty (30) days in advance of the proposed transfer date.

   b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.

   c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. Reduced production for compliance

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. Other requirements of 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. Additional monitoring

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. Upset

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.
2. The permitted facility was being properly operated at the time of the upset.
3. The Permittee submitted notice of the upset as required in Special Condition S3.E.
4. The Permittee complied with any remedial measures required under S3.E of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. Toxic pollutants

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. Penalties for tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both.

If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment shall be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. Compliance schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

G21. Service agreement review

The Permittee must submit to Ecology any proposed service agreements and proposed revisions or updates to existing agreements for the operation of any wastewater treatment facility covered by this permit. The review is to ensure consistency with chapters 90.46 and 90.48 RCW as required by RCW 70.150.040(9). In the event that Ecology does not comment within a thirty-day (30) period, the Permittee may assume consistency and proceed with the service agreement or the revised/updated service agreement.

Appendix A

LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels, OR
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

Ecology added this appendix to the permit in order to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

CONVENTIONAL PARAMETERS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection Level (DL)[1]** *µg/L unless specified*	**Quantitation Level (QL)[2]** *µg/L unless specified*
Biochemical Oxygen Demand	SM5210-B		2 mg/L
Total Suspended Solids	SM2540-D		5 mg/L
Total Ammonia (as N)	SM4500-NH3-B/C/D/E		20
Dissolved oxygen	SM4500-OC/OG		0.2 mg/L
pH	SM4500-H^+ B	N/A	N/A

NONCONVENTIONAL PARAMETERS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection Level (DL)[1]** *µg/L unless specified*	**Quantitation Level (QL)[2]** *µg/L unless specified*
Fecal Coliform	SM9221E and 9222	N/A	1 MF, and 1.1 MPN
Nitrate-Nitrite (as N)	SM4500-NO3- E/F/H		100
Nitrogen, Total Kjeldahl (as N)	SM4500-N_{org}-B/C, and SM4500-NH3-B/C/D/E		300
Soluble Reactive Phosphorus (as P)	SM4500-PE/PF	3	10
Phosphorus, Total (as P)	SM 4500 PB followed by SM4500-PE/PF	3	10
Oil and Grease (HEM)	1664 A or B	1,400	5,000
Total dissolved solids	SM2540 C		20 mg/L
Total Hardness (as $CaCO_3$)	SM2340B		200 as CaCO3

PRIORITY POLLUTANTS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection Level (DL)[1]** *µg/L unless specified*	**Quantitation Level (QL)[2]** *µg/L unless specified*
METALS, CYANIDE & TOTAL PHENOLS			
Antimony, Total (7440-36-0)	200.8	0.3	1.0
Arsenic, Total (7440-38-2)	200.8	0.1	0.5
Beryllium, Total (7440-41-7)	200.8	0.1	0.5
Cadmium, Total (7440-43-9)	200.8	0.05	0.25
Chromium, Total (7440-47-3)	200.8	0.2	1.0
Copper, Total (7440-50-8)	200.8	0.4	2.0
Lead, Total (7439-92-1)	200.8	0.1	0.5
Mercury, Total (7439-97-6)	1631E	0.0002	0.0005
Nickel, Total (7440-02-0)	200.8	0.1	0.5
Selenium, Total (7782-49-2)	200.8	1.0	1.0
Silver, Total (7440-22-4)	200.8	0.04	0.2
Thallium, Total (7440-28-0)	200.8	0.09	0.36
Zinc, Total (7440-66-6)	200.8	0.5	2.5
Cyanide, Total (57-12-5)	335.4	5	10

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection Level (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
Total Phenolic Compounds	EPA 420.1		50
VOLATILE ORGANIC COMPOUNDS			
Acrolein (107-02-8)	624	5	10
Acrylonitrile (107-13-1)	624	1.0	2.0
Benzene (71-43-2)	624	1.0	2.0
Bromoform (75-25-2)	624	1.0	2.0
Carbon tetrachloride (56-23-5)	624/601 or SM6230B	1.0	2.0
Chlorobenzene (108-90-7)	624	1.0	2.0
Chlorodibromo-methane (124-48-1)	624	1.0	2.0
Chloroethane (75-00-3)	624/601	1.0	2.0
2-Chloroethylvinyl Ether (110-75-8)	624	1.0	2.0
Chloroform (67-66-3)	624 or SM6210B	1.0	2.0
Dichlorobromo-methane (75-27-4)	624	1.0	2.0
1,1-Dichloroethane (75-34-3)	624	1.0	2.0
1,2-Dichloroethane (107-06-2)	624	1.0	2.0
1,2-Trans-Dichloroethylene (156-60-5)	624	1.0	2.0
1,1-Dichloroethylene (75-35-4)	624	1.0	2.0
1,2-Dichloropropane (78-87-5)	624	1.0	2.0
1,3-dichloroproppylene (542-75-6)	624	1.0	2.0
Ethylbenzene (100-41-4)	624	1.0	2.0
Methyl bromide (74-83-9)	624/601	5.0	10.0
Methyl chloride (74-87-3)	624	1.0	2.0
Methylene chloride (75-09-2)	624	5.0	10.0
1,1,2,2-Tetrachloroethane (79-34-5)	624	1.9	2.0
Tetrachloroethylene (127-18-4)	624	1.0	2.0
Toluene (108-88-3)	624	1.0	2.0
1,1,1-Trichloroethane (71-55-6)	624	1.0	2.0
1,1,2-Trichloroethane (79-00-5)	624	1.0	2.0

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection Level (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
Trichloroethylene (79-01-6)	624	1.0	2.0
Vinyl chloride (75-01-4)	624/SM6200B	1.0	2.0
ACID-EXTRACTABLE COMPOUNDS			
Parachlorometa cresol (59-50-7)	625	1.0	2.0
2-Chlorophenol (95-57-8)	625	1.0	2.0
2,4-Dichlorophenol (120-83-2)	625	0.5	1.0
2,4-Dimethylphenol (105-67-9)	625	0.5	1.0
4,6-dinitro-o-cresol (534-52-1)	625/1625B	1.0	2.0
2,4 dinitrophenol (51-28-5)	625	1.0	2.0
2-Nitrophenol (88-75-5)	625	0.5	1.0
4-nitrophenol (100-02-7)	625	0.5	1.0
Pentachlorophenol (87-86-5)	625	0.5	1.0
Phenol (108-95-2)	625	2.0	4.0
2,4,6-Trichlorophenol (88-06-2)	625	2.0	4.0
BASE-NEUTRAL COMPOUNDS			
Acenaphthene (83-32-9)	625	0.2	0.4
Acenaphthylene (208-96-8)	625	0.3	0.6
Anthracene (120-12-7)	625	0.3	0.6
Benzidine (92-87-5)	625	12	24
Benzo(*a*)anthracene (56-55-3)	625	0.3	0.6
Benzo(*a*)pyrene (50-32-8)	610/625	0.5	1.0
3,4 Benzo-fluoranthene (205-99-2)[3]	610/625	0.8	1.6
Benzo(*ghi*)Perylene (191-24-2)	610/625	0.5	1.0
Benzo(k)fluoranthene (207-08-9)[3]	610/625	0.8	1.6
Bis (2- *chloroethoxy)* methane (111-91-1)	625	5.3	21.2
Bis (2-*chloroethyl*) ether (111-44-4)	611/625	0.3	1.0
Bis (2- *chloroisopropyl*) ether (39638-32-9)	625	0.3	0.6
Bis (2-*ethylhexyl*) phthalate (117-81-7)	625	0.1	0.5

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection Level (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
4-Bromophenyl phenyl ether (101-55-3)	625	0.2	0.4
Butyl benzyl phthalate (85-68-7)	625	0.3	0.6
2-Chloronaphthalene (91-58-7)	625	0.3	0.6
4-Chlorophenyl phenyl ether (7005-72-3)	625	0.3	0.5
Chrysene (218-01-9)	610/625	0.3	0.6
Di-n-butyl phthalate (84-74-2)	625	0.5	1.0
Di-n-octyl phthalate (117-84-0)	625	0.3	0.6
Dibenzo(a,*h*)anthracene (53-70-3)	625	0.8	1.6
1,2-Dichlorobenzene (95-50-1)	624	1.9	7.6
1,3-Dichlorobenzene (541-73-1)	624	1.9	7.6
1,4-Dichlorobenzene (106-46-7)	624	4.4	17.6
3,3-Dichlorobenzidine (91-94-1)	605/625	0.5	1.0
Diethyl phthalate (84-66-2)	625	1.9	7.6
Dimethyl phthalate (131-11-3)	625	1.6	6.4
2,4-dinitrotoluene (121-14-2)	609/625	0.2	0.4
2,6-dinitrotoluene (606-20-2)	609/625	0.2	0.4
1,2-Diphenylhydrazine (122-66-7)	1625B	5.0	20
Fluoranthene (206-44-0)	625	0.3	0.6
Fluorene (86-73-7)	625	0.3	0.6
Hexachlorobenzene (118-74-1)	612/625	0.3	0.6
Hexachlorobutadiene (87-68-3)	625	0.5	1.0
Hexachlorocyclopentadiene (77-47-4)	1625B/625	0.5	1.0
Hexachloroethane (67-72-1)	625	0.5	1.0
Indeno(*1,2,3-cd*)Pyrene (193-39-5)	610/625	0.5	1.0
Isophorone (78-59-1)	625	0.5	1.0
Naphthalene (91-20-3)	625	0.3	0.6
Nitrobenzene (98-95-3)	625	0.5	1.0

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection Level (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
N-Nitrosodi-n-propylamine (621-64-7)	607/625	0.5	1.0
N-Nitrosodimethylamine (62-75-9)	607/625	2.0	4.0
N-Nitrosodiphenylamine (86-30-6)	625	0.5	1.0
Phenanthrene (85-01-8)	625	0.3	0.6
Pyrene (129-00-0)	625	0.3	0.6
1,2,4-Trichlorobenzene (120-82-1)	625	0.3	0.6

Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.

Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency, December 2007).

Total Benzofluoranthenes – Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

General Permit for Biosolids Management

Current permit holders who have submitted a Notice of Intent and properly applied for coverage under this permit are provisionally approved to manage biosolids in accordance with this permit. Ecology may impose additional or more stringent requirements when issuing final coverage under this permit.

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General Permit Issuance Date: ##, 2015

General Permit Effective Date: ##, 2015

General Permit Expiration Date: ##, 2020

Laurie G. Davies, Program Manager
Waste 2 Resources Program
Washington Department of Ecology

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1. Overview of the General Permit for Biosolids Management

1.1 Introduction

The biosolids program in the State of Washington is based on Chapter 173-308 WAC, Biosolids Management. The state program, including this General Permit for Biosolids Management (permit), is intended to comply with all applicable federal rules adopted pursuant to the federal Clean Water Act as it existed on February 4, 1987, and Chapter 90.48 RCW, Water Pollution Control. Authority for administering a state biosolids management program is granted to Ecology in Chapter 70.95J RCW, Municipal Sewage Sludge-Biosolids.

The State program regulates biosolids (including septage) applied to the land for beneficial uses, biosolids being stored, sewage sludge disposed in a municipal solids waste landfill and biosolids transferred from one facility to another.

Although the state program does not regulate surface disposal or incineration, the transfer of biosolids from a wastewater treatment plant to an incineration facility or surface disposal site is an activity covered under this permit.

1.2 Use of the terms "Sewage Sludge", "Biosolids", and "Septage"

Sewage sludge is the solids, semisolids, or liquid residue generated during the treatment of domestic sewage in a treatment works. Biosolids are produced by treating sewage sludge to meet certain quality standards that allow it to be beneficially used. Septage is a class of biosolids that comes from septic tanks and similar systems receiving domestic wastes.

In this permit:
Sections 8, 9, and 10 apply only to biosolids or "septage managed as biosolids originating from sewage sludge".

Section 6 applies only to sewage sludge being disposed in a municipal waste landfill.
Section 11 applies only to septage being applied to the land.
All other section apply to biosolids, septage and sewage sludge unless the context requires otherwise.

1.3 Geographical Area Covered

This permit applies to facilities and biosolids management activities that occur on lands under the jurisdiction of the State of Washington.

Any treatment works located outside of the jurisdiction of the State and exporting biosolids into the State must do so in accordance with WAC 173-308-130.

1.4 Persons Required to Apply for Coverage under this Permit

Unless you are obtaining an individual permit in accordance with WAC 173-308-310, you must apply for coverage under this permit if you own or operate any of the following facilities:

- Facilities designated by Ecology as a treatment works treating domestic sewage in accordance with WAC 173-308-310(1)(b).
- Publicly owned treatment works.
- Privately owned treatment works treating only domestic sewage.

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- Industrial facilities that treat domestic sewage separately from the industrial waste stream and generate biosolids regulated by Chapter 173-308 WAC.
- Beneficial use facilities.
- Composting facilities that compost non-exceptional quality biosolids that do not have a permit meeting state program requirements as determined by Ecology.
- Facilities that mix non-exceptional quality biosolids with other material, including other biosolids.
- Septage Management facilities.

1.5 Activities Subject to Coverage under this Permit

Coverage under this permit is based on activities related to the use or disposal of biosolids. These activities include, but are not limited to, the following:

- Applying bulk biosolids to the land, including, but not limited to, agricultural lands, forest lands, public contact sites, and land reclamation sites.
- Applying septage to the land.
- Disposing sewage sludge in municipal solids waste landfills.
- Selling or giving away biosolids in bags or other containers.
- Storing biosolids.
- Transferring biosolids from one facility to another.
- Composting non-exceptional quality biosolids.

1.6 Local Health Jurisdiction Involvement

Ecology may delegate authority to a Local Health Jurisdiction (LHJ) to implement and assist in the administration of Chapter 173-308 WAC and this permit. Delegation is accomplished through an instrument of mutual consent (for example, a Memorandum of Agreement) that is acceptable to both Ecology and the LHJ. When applying for coverage under this permit, contact Ecology to find out the status of delegation agreements in the areas where you treat, store, transfer, or apply biosolids to the land.

1.7 Role of EPA

EPA has a responsibility for implementing a national biosolids management program. EPA Region 10 and Ecology work cooperatively on program implementation. EPA provides periodic technical assistance to the state; in return the state provides certain information on request to EPA regarding biosolids management in Washington.

All applicable facilities in the state must meet requirements set forth by both the state and the federal programs; satisfaction of the state program requirements does not necessarily satisfy federal obligations.

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2. Applying For Coverage under this Permit

2.1 When to Apply

All existing facilities required to be covered under this permit must submit a complete application within 90 days of the effective date of this permit unless you have received approval from your regional biosolids coordinator to submit your application within 180 days of the effective date in accordance with WAC 173-308-310(4)(a).

All new facilities must submit a complete application (subsection 2.4) at least 180 day in advance of engaging in biosolids management activities.

2.2 Complying With the State Environmental Policy Act

The act of applying for coverage under this permit triggers a requirement for review under the State Environmental Policy Act (SEPA) Chapter 197-11 WAC.

It may be possible to use previous SEPA documents to comply with the SEPA requirements. For this to be the case, the SEPA lead agency must be able to conclude that possible site specific environmental impacts of applying biosolids have been adequately considered in existing SEPA documents. As part of approving coverage under this permit, you must provide written documentation from the SEPA Lead Official showing that the SEPA requirements have been met.

You may be able to overlap the public notice period of SEPA with the public notice requirements of this permit. If you combine both public notice requirements, you must ensure that comments are directed to both the responsible SEPA and regulatory officials.

2.3 Submitting a Notice of Intent

The biosolids General Permit is reissued every five years. A Notice of Intent is written notification to Ecology that you intend to maintain coverage under the next permit. Failure to submit an NOI will result in loss of coverage and the need to reapply and pay an initial application fee.

Notices of Intent must be submitted on Ecology forms. You can obtain the current version of the Notice of Intent from Ecology's biosolids forms webpage at: http://www.ecy.wa.gov/programs/swfa/biosolids/forms.html , or you can obtain one from your regional biosolids coordinator.

In accordance with WAC 173-308-310(5)(a), you must submit a Notice of Intent form no less than 180 days before the expiration date of the General Permit for Biosolids Management.

You must submit copies of your Notice of Intent as follows:

- The signed original to the biosolids coordinator in the Ecology region where your facility is located.
- A copy to the biosolids coordinator at Ecology headquarters office.
- A copy to the Local Health Jurisdiction in each county where your biosolids will be treated, stored, disposed, or applied to the land.

You are encouraged to submit copies to Ecology regions and headquarters by email. Contact information for Ecology biosolids staff can be found on the biosolids contacts webpage at: http://www.ecy.wa.gov/programs/swfa/biosolids/contacts.html.

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2.4 Submitting a Permit Application

You can obtain the current version of the Application for Coverage form from Ecology's biosolids webpage at: http://www.ecy.wa.gov/programs/swfa/biosolids/forms.html, or from your regional biosolids coordinator.

To apply for coverage under this permit you must submit a Complete Application for Coverage package that includes, but is not limited to, the following:

- A vicinity map of the facility.
- A vicinity map of any associated treatment or storage facilities.
- A treatment facility schematic.
- Confirmation that the SEPA requirements have been met (see Subsection 2.2 for more details).
- Confirmation that the public notice requirements have been met if appropriate (see Subsection 2.5 for more details).
- Land application plans if appropriate (see Subsection 2.6 for more details).
- Monitoring data if appropriate.
- A biosolids sampling plan if appropriate (see Section 8 for more details).
- A contingency plan for handling biosolids.
- A temporary disposal plan (see Subsection 6.2 for more details).
- A spill prevention/response plan if appropriate (see Subsection 4.1 for more details).

You must submit copies of your final permit application as follows:

A signed original to the biosolids coordinator in the Ecology regional office where your facility is located.

A copy to any other Ecology regional office where your biosolids will be treated, stored, disposed, or applied to the land.

A copy to the biosolids coordinator at Ecology headquarters office.

A copy to the Local Health Jurisdiction in each county where your biosolids will be treated, stored, disposed, or applied to the land.

Submit any copies to Ecology regions and headquarters by email. You are also encouraged to submit any copies to LHJs by email if the LHJ allows electronic submittal.

Contact information for Ecology biosolids staff can be found on the biosolids contacts webpage at: http://www.ecy.wa.gov/programs/swfa/biosolids/contacts.html.

2.5 Public Notice Requirements When Applying for Coverage

When you apply for coverage under this permit, you must conduct public notice in accordance with this subsection. Follow the steps within the category that applies to your facility.

Note*: If you are a wastewater treatment plant that sends all of your biosolids to a Beneficial Use Facility, you do* ***not*** *land apply biosolids.*

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2.5.1 Wastewater Treatment Plants that DO NOT land apply biosolids

If your facility met the public notice requirements under the previous general permit (and you have documentation to show this) and you do not land apply biosolids, you are **not** required to conduct additional public notice.

If you are a new facility or for some reason had a lapse in coverage under the General Permit of August 20, 2010 and do not land apply biosolids, you must conduct public notice in the following manner:

- Issue one notice in a newspaper of general circulation in the county where you are located. The minimum required content of the notice can be found in Appendix 1.
- Submit your official interest parties list to the biosolids coordinator at Ecology headquarters office AND any other Ecology regional office where your biosolids will be treated, stored, disposed, or applied to the land.
- Send notification to all persons on your approved interested parties list, plus Ecology headquarters and regional office(s), at the same time or before notice is run in the newspaper.
- Provide a 30-day public comment period following the publication of a newspaper notice.

2.5.2 Wastewater Treatment Plants that Land Apply Biosolids

If you land apply biosolids you must conduct public notice in the following manner:

- Issue one notice in a newspaper of general circulation in the county where you are located, in each county where you land apply biosolids, and all additional counties that may be covered by a General Land Application Plan you have submitted. The minimum required content of the notice can be found in Appendix 1.
- If proposing a new land application site or to expand an existing site, post notices at the new site(s) or expanded area of the existing site.
- Submit your official interest parties list to the biosolids coordinator at Ecology headquarters office AND any other Ecology regional office where your biosolids will be treated, stored, disposed, or applied to the land.
- Send notification to all persons on your approved interested parties list, plus Ecology headquarters and regional office(s), at the same time or before notice is run in the newspaper.
- Provide a 30-day public comment period following the newspaper posting.

2.5.3 Beneficial Use Facilities

All Beneficial use facilities must conduct public notice when applying for coverage initially **and** when reapplying for coverage when a new general permit is issued. Public notice must be conducted in the following manner:

- Issue one notice in a newspaper of general circulation in the county where you are located, in each county where you land apply biosolids, and all additional counties that may be covered by a General Land Application Plan you have submitted. The minimum required content of the notice can be found in Appendix 1.
- If proposing a new land application site or to expand an existing site, post notices at the new site(s) or expanded area of the existing site.
- Submit your official interest parties list to the biosolids coordinator at Ecology headquarters office AND any other Ecology regional office where your biosolids will be treated, stored, disposed, or applied to the land.

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- Send notification to all persons on your approved interested parties list, plus Ecology headquarters and regional office(s), at the same time or before notice is run in the newspaper.
- Provide a 30-day public comment period following the newspaper posting.

2.6 Land Application Plans

2.6.1 Site Specific Land Application Plans

You must submit a Site Specific Land Application Plan (SSLAP) for every site where non-exceptional biosolids are applied to the land. The minimum required content of a SSLAP can be found in Appendix 3.

2.6.2 General Land Application Plans

You must submit a General Land Application Plan (GLAP) if you intend to develop other land application sites during the life of your permit coverage. The minimum required content of a GLAP can be found in Appendix 2.

2.6.3 Exemption for Biosolids Going to Permitted Beneficial Use Facilities

When your biosolids are sent to a permitted beneficial use facility, you do not have to prepare land application plans if the conditions in WAC 173-308-310(8)(g) have been met.

2.6.4 Exemption for Exceptional Quality Biosolids

You are not required to submit land application plans for the management of exceptional quality biosolids unless Ecology requires a plan in accordance with WAC 173-308-310(8)(a)(ii-iii).

2.7 Ecology Review of Submitted Plans

All plans submitted in the permit application process will be reviewed by Ecology prior to the issuance of Final Coverage. During that review process, Ecology may determine that changes and/or additions are necessary to effectively meet the plans' intended purpose.

Ecology will rely on several reference documents when reviewing plans. https://fortress.wa.gov/ecy/publications/publications/9380.pdf.

In addition, Ecology has prepared some sample plans that are available on its biosolids forms webpage at: http://www.ecy.wa.gov/programs/swfa/biosolids/forms.html. You can use these plans as guidance.

3. Requirements Applicable to all Permittees

3.1 Duty to Comply

You must comply with all conditions of this permit, all applicable requirements of Chapter 173-308 WAC, all applicable requirements of 40 CFR Part 503, and all applicable requirements of any other state, federal, or local laws, rules, or ordinances.

You must also comply with any provisions in your permit application, including those in any plans, unless those provisions are modified through the permit review and final coverage issuance process.

You must also comply with any additional or more stringent requirements developed as a condition of final coverage under this permit.

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Ecology may modify, revoke and reissue, or terminate coverage under this permit for cause. Permit conditions remain in effect even if you file a request to modify, revoke and reissue, or terminate coverage under this permit or notify Ecology of planned changes or anticipated noncompliance.

Ecology may modify or revoke and reissue your coverage under this permit in accordance with WAC 173-308-310(23).

Ecology may terminate your coverage under this permit in accordance with WAC 173-308-310(24).

3.2 Continuing Coverage and Duty to Reapply

If you wish to continue an activity regulated by this permit after its expiration date, you must submit a Notice of Intent at least 180 days in advance of its expiration date and subsequently apply for coverage under a new permit in accordance with WAC 173-308-310(3)-(5). If you fail to submit a timely and sufficient Notice of Intent, your coverage under this permit will cease on its expiration date.

3.3 Need to Halt or Reduce Activity Not a Defense

Other permit compliance requirements, due to enforcement actions, shall not be a defense for non-compliance with this permit.

3.4 Duty to Mitigate

You must take all reasonable steps to minimize or prevent biosolids use or disposal that may adversely affect human health or the environment. This includes, but is not limited to, the proper operation and maintenance of equipment, adequate laboratory controls and appropriate quality assurance procedures.

3.5 Duty to Provide Information to Ecology

You must furnish any information requested by Ecology to determine compliance with this permit, or to determine whether cause exists for modifying, revoking and reissuing, or terminating coverage. Any and all records required to be kept by Chapter 173-308 WAC must be furnished to Ecology upon request.

3.6 Inspection and Entry

You must allow Ecology, or an authorized representative of Ecology, upon the presentation of credentials and other documents as may be required by law, to:

- Enter the premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit.
- Have access to and copy, during reasonable times, any records that must be kept under the conditions of this permit.
- Inspect during reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit.
- Sample or monitor during reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by state law, Chapter 70.95J RCW, and the Clean Water Act, any substances, parameters, or practices at any location.

3.7 Monitoring and Records

You must monitor and report monitoring results as specified in Section 8 of this permit and in accordance with your NPDES permit or State Waste Discharge Permit, if applicable.

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You must retain all records and data used to complete the application for this permit for a period of at least 5 years from the date of the application or longer as required by other applicable laws or regulations.

3.8 Signatory Requirements

All applications, notices of intent, reports, or information submitted to Ecology must be signed and certified in accordance with WAC 173-308-310(10).

3.9 Reporting of Changes, Noncompliance, Compliance Schedules, and Other Information

3.9.1 Planned Changes

You must notify your regional biosolids coordinator and any participating delegated LHJ of significant changes in your biosolids management practices or planned physical alterations or additions to your facility.

3.9.2 Noncompliance

You must report to your regional biosolids coordinator any noncompliance which may endanger human health or the environment within 24 hours of learning of the situation. Unless waived by Ecology, you must also submit a written explanation of the noncompliance within 5 days. The written explanation must include the following:

- A description of the noncompliance and its cause.
- The period of noncompliance, including exact dates and times, and, if the noncompliance has not been corrected, the anticipated time it is expected to continue.
- Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
- Submit report no later than 14 calendar days following the incident.

3.9.3 Other Information

If you become aware that you failed to submit any relevant facts or you submitted incorrect information in a permit application or a report, you must promptly submit such facts or information to your regional biosolids coordinator.

3.10 Transferring Permits

Coverage under this permit is not transferable to any person except as provided in WAC 173-308-310(22).

3.11 Penalties

If you violate this permit, you are subject to a penalty of up to $5,000 per day per violation. In the case of a continuing violation, each day of violation is a separate violation. An act of commission or omission that procures, aids, or abets in the violation is considered a violation under this subsection.

If you willfully violate any of the provisions of this permit, you are guilty of a gross misdemeanor. Willful violation of this permit or orders issued pursuant to Chapter 70.95J RCW is a gross misdemeanor punishable by a fine of up to $10,000 per day per violation and costs of prosecution, or by imprisonment for up to 1 year, or both.

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3.12 Obtaining and Providing Information

If you prepare biosolids, you must provide information needed to comply with this permit to any person who receives your biosolids.

If you apply bulk biosolids to the land, you must:

- Obtain information needed to comply with the requirements of this permit.
- Obtain written approval of the landowner prior to applying any Class B quality biosolids to the land for the first time.
- Provide information to the landowner or leaseholder needed to comply with this permit.

3.13 Final Coverage: Additional or More Stringent Requirements

On a case-by-case basis, Ecology may impose requirements that are in addition to or more stringent than the requirements in this permit. All such requirements will be provided in writing along with Ecology's notice of final coverage under this permit.

All additional or more stringent requirements become a part of the permit and are fully enforceable. Additional or more stringent requirements may be appealed as described in Subsection 3.18.

3.14 Compliance Schedules

A schedule may be established leading to compliance with requirements of this permit and Chapter 173-308 WAC. A compliance schedule may not extend deadlines established under the Clean Water Act or Chapter 70.95J RCW. Compliance schedules must be established in accordance with the requirements of WAC 173-308-310(16).

3.15 Annual Report

You must submit an annual report to Ecology by March 1 of each year. All requested information that is required under Chapter 173-308 WAC or this permit must be submitted. The current annual report form?? is at: http://www.ecy.wa.gov/biblio/ecy070125.html.

Any required reporting to the EPA must be submitted by February 19 of each year.

3.16 Permit Fees

You must pay an annual biosolids permit fee to Ecology. Fees are determined and issued in accordance with WAC 173-308-320.

3.17 Record Keeping Requirements

You must keep records and certification statements in accordance with WAC 173-308-290.

3.18 Appeals

Any person may appeal this permit as provided by applicable law including, but not limited to, Chapter 43.21B RCW and Chapter 34.05 RCW. Appeals of this permit must be made within 30 days of the issuance date listed on the cover page.

Any person aggrieved by an Ecology decision made in accordance with this permit may appeal that decision as provided by applicable law including, but not limited to, Chapter 43.21B RCW and Chapter 34.05 RCW.

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4. Requirements for Transporting Biosolids

If you transport biosolids, you must ensure that the transportation vehicle is properly cleaned prior to use of the vehicle for the transportation of food crops, feed crops, or fiber crops.

4.1 Spill Prevention/Response Plan

A spill prevention/response plan from a facility with coverage under this permit must be in place for all biosolids transfers. The plan may be from either the sending or receiving facility, whichever has responsibility for the transfer.

You must submit a spill prevention/response plan to Ecology that describes how you will attempt to prevent and respond to any spills. The spill prevention/response plans must include the following:

- The main route traveled and any possible alternate routes
- Spill prevention measures
- Equipment needed to respond appropriately to a spill that will be carried on the vehicle transporting biosolids
- Spill response measures should a spill occur
- Contact information for Ecology, Jurisdictional Health Department(s) and Washington Department of Transportation.

Note: *The transportation of biosolids is otherwise subject to regulation by the Washington State Utilities and Transportation Commission under Title 81 RCW.*

5. Requirements for Storing Biosolids

Storage of biosolids must be conducted in a manner that is not likely to result in harm to human health and/or the environment and with approval from the regional coordinator.

5.1 Exemptions

- If you store biosolids in a manner that will not result in harm to human health and/or the environment, your storage is exempt from the provisions of Subsections 5.2 and 5.3 if either of the following applies:

- You are storing in accordance with a current local, state, or federal water pollution control permit or other environmental permit.
- You utilize temporary, small scale storage for no more than 30 days in a tank holding no more than 10,000 gallons with a total on-site maximum volume of no more than 20,000 gallons.

5.2 Surface Impoundments (Lagoons)

If you store your biosolids in a surface impoundment that was constructed and used for that purpose prior to July 1, 2007, the surface impoundment must meet the requirements for the design, construction, and operation of surface impoundments in Chapter 173-304 WAC or a higher standard.

If you store your biosolids in a surface impoundment that was constructed or upgraded since July 1, 2007, or you are proposing to use a surface impoundment for biosolids storage for the first time, the surface impoundment must meet the requirements for the design, construction, and operation of surface impoundments in Chapter 173-350 WAC or a higher standard.

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5.3 Tanks

If you store biosolids in a tank, the following must be reviewed by a licensed Professional Engineer and approved by Ecology:

- All tanks must be structurally sound.
- All tanks must be sited in a stable location.
- No tanks may be sited in an area where the seasonal ground water may come into contact with the tank unless otherwise approved by Ecology.
- If tanks are above ground, secondary containment may be required as part of the approval process.
- If tanks are below ground, leak detection tests may be required as part of the approval process.

6. Requirements for Disposal of Sewage Sludge in a Municipal Solid Waste Landfill

6.1 Disposal on an Emergency Basis

If you want to dispose of biosolids or sewage sludge on an emergency basis you must do the following:

- Obtain written approval from Ecology that disposal is an acceptable option.
- Obtain a written determination from the LHJ where the biosolids or sewage sludge is proposed for disposal

The LHJ must notify Ecology in writing of its findings and the basis for its determination. In its written notification, the LHJ must include the following:

- The date on which disposal is approved to begin.
- Any conditions of approval.
- The date after which disposal is prohibited.

6.2 Disposal on a Temporary Basis

If you want to dispose of biosolids or sewage sludge on a temporary basis you must do the following:

- Obtain written approval from Ecology that disposal is an acceptable option.
- Obtain written approval for disposal from the LHJ where the biosolids or sewage sludge is proposed for disposal.
- Provide a copy of the LHJ approval to Ecology.
- Submit a plan for approval to Ecology. The plan must include the following information:
    - The conditions that make disposal necessary.
    - The steps that will be taken to correct the conditions that make disposal necessary so that disposal will not become a long-term management option.
    - Submit a timetable for implementing the steps to be taken to correct the conditions that make disposal necessary.
    - Provide Ecology with written approval for disposal from the local health jurisdiction and the receiving health jurisdiction.

6.3 Disposal on a Long-term Basis

Disposal of biosolids or sewage sludge on a long-term basis requires:

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- Authorization in a valid NPDES or state waste discharge permit issued under chapter 90.48 RCW or a permit issued under this chapter
- You must submit, for Ecology approval, an evaluation of the various management options that demonstrates to the satisfaction of Ecology that options for beneficial use are economically infeasible.

Written approval for disposal from the local health jurisdiction in the receiving jurisdiction must be submitted to Ecology

7. Requirements for Transferring Biosolids

Coverage under this permit includes authorization for transferring biosolids from one facility to another for treatment or management if the following conditions are met:

- Nothing in the permit for either the sending or the receiving facility prohibits the transfer of biosolids.
- Both the sending and the receiving facility exchange adequate information needed to comply with this permit and Chapter 173-308 WAC. This may include, but is not limited to, information on biosolids quality and the permit status of each facility.
- Approval from Ecology

8. Requirements for Analyzing Biosolids and Monitoring Processes

This section contains the minimum requirements for biosolids analysis and process monitoring that are applicable when you prepare biosolids for land application or sale/give away.

You must submit a biosolids sampling plan that addresses how you intend to meet the requirements in this section. As part of the approval process, Ecology may require biosolids analysis and/or process monitoring beyond the minimum requirements in this section.

8.1 Representative Sampling

Samples collected for analysis and monitoring locations must be representative of the biosolids or the treatment process used to prepare the biosolids.

8.2 Frequency of Biosolids Analysis

At a minimum, you must analyze your biosolids at the frequency listed in Table 1. Ecology may require additional sampling and analysis. The frequency of biosolids analysis is based on the dry weight tonnage of biosolids applied to the land or prepared for sale/give away per 365-day period. For facilities that compost or mix Class B quality biosolids with other materials, the frequency of analysis is based on the dry weight tonnage of the total amount of material, not just the biosolids.

Table 1 applies to the pollutants in WAC 173-308-160, the pathogen density requirements in WAC 173-308-170, the vector attraction reduction standards in WAC 173-308-180, and the nitrogen concentrations and percent solids needed to support agronomic rate determinations. It does not apply to process monitoring, which is described in Subsection 8.3.

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Table 1 Minimum Frequency of Biosolids Analysis (adapted from WAC 173-308-150)

Metric tons per Year	Frequency*
<1 - 290 (<1 - 320 U.S. tons)	once per year (1X per year)
290 - 1,500 (320 - 1,653 U.S. tons)	once per quarter (4X per year)
1,500 - 15,000 (1,653 - 16,535 U.S. tons)	once per 60 days (6X per year)
>15,000 (>16,535 U.S. tons)	once per month (12X per year)
* = after 2 years of analyzing at this frequency, analysis for the pollutant concentrations may be reduced, but it must not be less than once per year	

8.3 Frequency of Process Monitoring

Monitoring of the processes used to prepare biosolids that are land applied or sold/given away must be conducted at a frequency that will ensure that the process meets the applicable requirements. This applies to the pathogen reduction processes in WAC 173-308-170 and the vector attraction reduction processes in WAC 173-308-180. As an example, Table 2 provides the minimum expectations for monitoring temperatures for a specific composting process.

Table 2 Minimum Process Monitoring Requirements for Meeting the Pathogen and Vector Attraction Reduction Requirements by the Static Aerated Pile Composting Method

Process	Required Process Monitoring*
Pathogen reduction via WAC 173-308-170(3)(b)(i)(A)	Monitor pile temperatures for at least 3 continuous days
Vector attraction reduction via WAC 173-308-180(3)	Monitor pile temperatures for at least an additional 11 continuous days (a total of 14 days)
** = applies to each composting pile*	

8.4 Point of Compliance

The point of compliance for a sample is the date on which the sample is taken, not the date on which results are subsequently reported.

You may distribute biosolids based on the most recent analytical results. However, if subsequent results show that you distributed biosolids that failed to meet the appropriate standards, you will be in violation of this permit.

8.5 Requirement for Analysis by an Accredited Laboratory

An accredited laboratory is a laboratory accredited under Chapter 173-50 WAC, Accreditation of Environmental Laboratories, for a specific analyte using a specific analytical method.

All required biosolids analyses must be performed by a laboratory that is accredited by Ecology for the respective method used if an accreditation protocol for the method exists. Accreditation must be under the "Solids and Chemical Materials" matrix, unless otherwise approved

8.6 Analytical Methods

Unless another method is approved by Ecology, the methods in Table 3 must be used for biosolids analysis. In addition, the basic preservation and maximum holding times listed in Table 3 must be met.

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Table 3 Analysis Methods, Preservation and Holding Times (adapted from WAC 173-308-140)

Parameter	Methods	Basic Preservation	Maximum Holding Time
Arsenic	SW-846 6010 SW-846 6020 SW-846 7010 SW-846 7061	Cool to ~4° C	6 months
Cadmium	SW-846 6010 SW-846 6020 SW-846 7000 SW-846 7010	Cool to ~4° C	6 months
Chromium VI	SW-846 7195 SW-846 7196 SW-846 7197 SW-846 7198	Cool to ~4° C	28 days
Copper	SW-846 6010 SW-846 6020 SW-846 7000 SW-846 7010	Cool to ~4° C	6 months
Lead	SW-846 6010 SW-846 6020 SW-846 7000 SW-846 7010	Cool to ~4° C	6 months
Mercury	SW-846 7470 SW-846 7471	Cool to ~4° C	28 days
Molybdenum	SW-846 6010 SW-846 6020 SW-846 7000 SW-846 7010	Cool to ~4° C	6 months
Nickel	SW-846 6010 SW-846 6020 SW-846 7000 SW-846 7010	Cool to ~4° C	6 months
Selenium	SW-846 6010 SW-846 6020 SW-846 7010 SW-846 7741	Cool to ~4° C	6 months
Zinc	SW-846 6010 SW-846 6020 SW-846 7000 SW-846 7010	Cool to ~4° C	6 months
Total Kjeldahl Nitrogen (TKN)	SM 4500, N_{org} B SM 4500, N_{org} C ASTM D3590-89 ASTM D3590-02	Cool to ~4° C	28 days
Nitrate-nitrogen	EPA 353.2 SM 4500-NO_3 E, F, or H	Cool to ~4° C	28 days
Ammonia-nitrogen	SM 4500-NH_3 B + C, D, E, or G	Cool to ~4° C	28 days
Organic Nitrogen	Calculated: TKN minus NH_3-N	Not applicable	Not applicable
Total Phosphorus	EPA 365.1 EPA 365.3 SM 4500-P B + E or F	Cool to ~4° C	28 days
PCBs	EPA 1668	Cool to ~4° C	1 year

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Parameter	Methods	Basic Preservation	Maximum Holding Time
	SW-846 8082		
Dioxins and Furans	EPA 1613 SW-846 8280 SW-846 8290	Freeze at -10° C	1 year
Semi-volatile Organic Compounds	SW-846 8270	Cool to ~4° C	14 days
Volatile Organic Compounds	SW-846 8260	Cool to ~4° C Freeze at -7° C or preserve with methanol	48 hours 14 days
Total Solids, Fixed Solids, or Volatile Solids	SM 2540 G	Cool to ~4° C	7 days
Volatile Solids Reduction	EPA/625/R-92/013 (Appendix C)	Not applicable	Not applicable
Additional Volatile Solids Reduction for Anaerobically Digested Solids	EPA/625/R-92/013 (Appendix D.1)	Hold at temperature of digester Maintain anaerobic conditions	6 hours
Additional Volatile Solids Reduction for Aerobically Digested Solids	EPA/625/R-92/013 (Appendix D.3)	Cool to 20° C Maintain aerated conditions	As soon as possible
Specific Oxygen Update Rate (SOUR)	EPA/625/R-92/013 (Appendix D.2) SM 2710 B	Hold at temperature of digester (10-30° C) Maintain aerobic conditions	As soon as possible
pH	SW-846 9040 (if <80% solids) SW-846 9045 (if >80% solids)	Not applicable	15 minutes
Fecal Coliform	EPA 1680 EPA 1681 EPA/625/R-92/013 (Appendix F) SM 9221 C and E SM 9222 D	Cool to ~4° C	Analysis within 8 hours from time of collection. Extended to 24 hours if using EPA 1680 or EPA 1681 for Class A compost or Class B from a digester SM 9222 D is not recommended and may only be used for Class B
Salmonella bacteria	EPA 1682 SM 9260 D EPA/625/R-92/013 (Appendix G)	Cool to ~4° C	6 hours
Helminth Ova	EPA/625/R-92/013 (Appendix I)	Cool to ~4° C	1 month
Enteric Viruses	ASTM D4994-89 EPA/625/R-92/013 (Appendix H)	Cool to ~4° C Freeze at -18° C	<24 hours 2 weeks

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8.7 Records of Analytical and Monitoring Information

Records of analytical and monitoring information must include all of the following:

- The date, place, and time of sampling or measurement.
- The individuals who performed the sampling or measurement.
- The date analysis was performed.
- The individual who performed the analysis.
- The analytical technique or method used.
- The results of the analysis or measurement, including Quality Assurance and Quality Control (QA/QC) results.

9. Requirements for Biosolids Applied to Agricultural Land, Forest Land, Public Contact Sites, or Land Reclamation Sites

9.1 Removing Manufactured Inerts

The biosolids must meet the requirements for removal of manufactured inerts in WAC 173-308-205. Minimally, the following conditions must be met:

- The biosolids must contain <1% by volume recognizable manufactured inerts.
- Material must be screened through a bar screen with a maximum 3/8 inch aperture or an Ecology-approved equivalent process is required. Screening (or an approved equivalent process) may occur at any time in the wastewater treatment or biosolids manufacturing process, but it must occur before grinding or similar processes.

9.2 Soil Testing

All new land application sites must test for the pollutants listed in WAC 173-308-160 Table 3 to determine background levels.

Soil nutrient levels must be tested prior to each land application event. Background nutrient levels will be used to calculate the agronomic rate in accordance with WAC 173-308-190, except as allowed for certain land reclamation sites or research projects approved in accordance with WAC 173-308-190(3) and WAC 173-308-192, respectively.

9.3 Agronomic Rate

The biosolids must be applied at an agronomic rate in accordance with WAC 173-308-190, except as allowed for certain land reclamation sites or research projects approved in accordance with WAC 173-308-190(3) and WAC 173-308-192, respectively.

The person who prepares the biosolids is responsible for providing information necessary to determine an agronomic rate to the person who receives the biosolids.

9.4 Pollutants

The biosolids must not exceed the ceiling concentration limits in WAC 173-308-160 Table 1. In addition, the biosolids must either not exceed the pollutant concentration limits in WAC 173-308-160 Table 3 or be applied at a rate that will not exceed the cumulative pollutant loading rates in WAC 173-308-160 Table 2.

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If the biosolids are subject to the cumulative pollutant loading rates in WAC 173-308-160 Table 2, the person who proposes to apply the biosolids must obtain approval from Ecology in accordance with the process prescribed in WAC 173-308-160(2) prior to application. Table 4 provides a summary of WAC 173-308-160 Tables 1, 2, and 3.

Table 4 Allowable Biosolids Pollutants and Loading Rates (adapted from WAC 173-308-160)

Pollutant	WAC 173-308-160 Table 1 Ceiling Limits	WAC 173-308-160 Table 2 Cumulative Loading Rates	WAC 173-308-160 Table 3 Pollutant Limits
Arsenic	75 mg/kg	41 kg/ha	41 mg/kg
Cadmium	85 mg/kg	39 kg/ha	39 mg/kg
Copper	4300 mg/kg	1500 kg/ha	1500 mg/kg
Lead	840 mg/kg	300 kg/ha	300 mg/kg
Mercury	57 mg/kg	17 kg/ha	17 mg/kg
Molybdenum	75 mg/kg	Not applicable	Not applicable
Nickel	420 mg/kg	420 kg/ha	420 mg/kg
Selenium	100 mg/kg	100 kg/ha	100 mg/kg
Zinc	7500 mg/kg	2800 kg/ha	2800 kg

9.5 Pathogens

The biosolids must meet one of the Class A processes in WAC 173-308-170(1)-(4) or one of the Class B processes in WAC 173-308-170(5)-(7).

9.6 Vector Attraction Reduction

The biosolids must meet either one of the vector attraction reduction process in WAC 173-308-180 or be managed to reduce vector attraction in the field as described in WAC 173-308-210(4)(a) and (b).

9.7 Site Management and Public Access Restrictions for Class B Biosolids

The site management and public access restrictions in this subsection apply to biosolids that are Class B for pathogens when they are applied to the land.

9.7.1 Crop Harvest Waiting Periods

The time between the last application of Class B biosolids and crop harvesting must adhere to the waiting periods in Table 5.

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Table 5 Crop Harvesting Restrictions for Class B Biosolids

Crop Type	Examples	Does the harvested part of plant contact biosolids?	Length of time the biosolids remain on soil surface	Waiting period until harvest is allowed
Above ground food crops	Cherries, wheat	No	Not applicable	30 days
Above ground food crops	Lettuce, cucumbers	Yes	Not applicable	14 months
Root food crops	Onions, potatoes	Yes	≥4 months	20 months
Root food crops	Onions, potatoes	Yes	<4 months	38 months
Feed crops	Range land, pasture	Not applicable	Not applicable	30 days
Fiber crops	Trees, cotton	Not applicable	Not applicable	30 days
Turf	Lawn grass	Not applicable	Not applicable	1 year*
** = unless a different waiting period is approved by Ecology*				

9.7.2 Public Access Restrictions

Public access must be restricted following the application of Class B biosolids. Minimally, sites must be posted during the entire time site access is restricted in accordance with the requirements in Table 6. Exceptions to these requirements must have approval by Ecology.

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Table 6 Site Posting Requirements for Class B Biosolids

Where	Notice Content*	How Long
All significant points of access to the site Every ½ mile (805 meters) around the perimeter of the site	The name and address or phone number of the generator and, if different, the person who applies the biosolids The names, addresses, and phone numbers of the regulatory and permitting authorities The material that is being applied Notice that access is restricted and, if desired, the date after which access is no longer restricted If applicable, a notice on limitations regarding the harvesting of edible plants from the site	Sites with a "high" potential for public exposure: 1 year Sites with a "low" potential for public exposure: 30 days
** = unless the use of "No Trespassing" signs has been approved by Ecology for this purpose*		

9.7.3 Additional Site Management Restrictions

Table 7 contains additional site management restrictions that must be met when Class B biosolids are land applied.

Table 7 Additional Site Management Restrictions for Class B Biosolids

Feature	Restriction
Surface waters	No application within 100 feet*
Wells	No application within 100 feet (30.5 meters)*
Wetlands	No application allowed**
Waters of the state	No application allowed**
Flooded, frozen, or snow-covered sites	No application allowed**
** = unless a different buffer is approved or required by Ecology* *** = unless approved by Ecology; applies to any Class B quality biosolids*	

10. Requirements for Biosolids Sold/Given Away in Bags or Other Containers

Any biosolids sold or given away must meet the pollution concentration limits in Table 3 of WAC 173-308-160, one of the Class A pathogen reduction requirements in WAC 173-308-170 and one of the vector attraction reduction requirements in WAC 173-308-180.

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10.1 Labeling Requirements

The biosolids must have a label or accompanying information sheet. The label or information sheet must contain the following information:

- The name, address, and phone number of the person who prepared the biosolids.
- A statement or information indicating that the product complies with applicable regulations for biosolids or that the product has been prepared to meet standards that make it safe for its intended use when used in accordance with the directions provided by the manufacturer.
- A statement or information that encourages proper use of the product and protection of public health and the environment. This may include information on product storage, hygiene, and protection of surface or ground water resources.
- Agronomic rates for typical applications or guidance on how to determine the agronomic rate of application.
- A statement or information indicating that the product contains or is derived from biosolids.
- Unless registered as a fertilizer by the Washington State Department of Agriculture, a disclaimer stating that the product is not a commercial fertilizer and that all nutrient claims are estimates or averages and not guaranteed.

11. Requirements for Septage Applied to the Land

This section contains the requirements for the land application of septage. It does not apply to "septage managed as biosolids originating from sewage sludge".

11.1 Removing Manufactured Inerts

The septage must meet the requirements for removal of manufactured inerts in WAC 173-308-205. Minimally, the following conditions must be met.

- The septage must contain <1% by volume recognizable manufactured inerts.
- Screening through a bar screen with a maximum 3/8 inch opening or an Ecology-approved equivalent process.

11.2 Soil Testing

All new land application sites must test for pollutants to determine background levels.

Soil nutrient levels must be tested prior to each land application event. Background nutrient levels will be used to calculate the agronomic rate in accordance with WAC 173-308-190.

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11.3 Application Rates

The septage must be applied at a rate not exceeding the rate determined by *Equation 1.* To determine the distance *(in feet*) over which a load of liquid septage should be spread to meet the application rate, use Equation 2.

Equation 1 – Annual Application Rate for Septage

AAR = N ÷ 0.0026

Where:

AAR = annual application rate in gallons per acre per 365-day period
N = amount of nitrogen in pounds per acre per 365-day period needed by the crop or vegetation grown on the land (subtract any nitrogen supplied by other sources—for example, commercial fertilizers or manures)

Equation 2 – Spreader Drive Length for Septage

Drive length (in feet) = gallons ÷ spread width (in feet) x 43,560 ÷ AAR

Where:
AAR = annual application rate in gallons per acre per 365-day period determined by Equation 1

11.4 Pollutants

The septage application rate formula in Equation 1 was developed by EPA. EPA included acceptable pollutant loading from septage into the formula. Testing for pollutants in WAC 173-308-160 is not required for septage applied to land. Ecology may require additional or more stringent testing requirements developed as a condition of final coverage under this permit.

11.5 Pathogen Reduction and Vector Attraction Reduction

The requirements for pathogen and vector attraction reduction for septage are based on the percent by volume of septage from households.

11.5.1 Loads with >75% from Households

For loads of septage composed of >75% septage from households, one of the following requirements must be met.

1. The septage must be injected so that no significant amount of the septage is on the surface within 1 hour after injection, or
2. The septage must be incorporated into the soil within 6 hours after application, or
3. The septage must be stabilized by raising the pH to ≥ 12 and held at this pH for ≥ 30 minutes. The following standards apply to this pH stabilization process:

    - Samples collected or monitoring locations must be representative of the septage that will be applied.
    - A minimum of 2 tests for pH must be conducted.

- The first test must occur after lime or an alkali has been added and a pH of ≥ 12 has been attained.
- The second test must occur ≥ 30 minutes after the first test to show that a pH of ≥ 12 has been retained.
- If the pH is <12 when the second test is conducted, the process must be restarted.

11.5.2 Loads with <75% from Households

For loads of septage composed of <75% septage from households, the septage must be stabilized by raising the pH to ≥12 and held at this pH for ≥30 minutes.

The following standards apply to this pH stabilization process:

- Samples collected or monitoring locations must be representative of the septage that will be applied.
- A minimum of 2 tests for pH must be conducted.
- The first test must occur after lime or an alkali has been added and a pH of ≥12 has been attained.
- The second test must occur >30 minutes after the first test to show that a pH of ≥12 has been retained.
- If the pH is <12 when the second test is conducted, the process must be restarted.

11.6 Sites where Septage Cannot be Applied

Septage cannot be applied to a public contact site, a lawn, or a home garden. A "public contact site" is land with a high potential for public exposure, including, but not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, golf courses, and reclamation sites in a city.

11.7 Site Management and Public Access Restrictions

The site management and public access restrictions in this subsection apply when septage is applied to the land.

11.7.1 Crop Harvest Waiting Periods

The time between the last application of septage and crop harvesting must adhere to the waiting periods in Table 8.

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Table 8 Crop Harvesting Restrictions for Septage

Crop Type	Examples	Does the harvested part of plant contact septage?	Length of time the septage remains on soil surface	Waiting period until harvest is allowed
Above ground food crops	Cherries, wheat	No	Not applicable	30 days
Above ground food crops	Lettuce, cucumbers	Yes	Not applicable	14 months
Root food crops	Onions, potatoes	Yes	>4 months	20 months
Root food crops	Onions, potatoes	Yes	<4 months	38 months
Feed crops	Range land, pasture	Not applicable	Not applicable	30 days
Fiber crops	Trees, cotton	Not applicable	Not applicable	30 days

11.7.2 Public Access Restrictions

Public access must be restricted following the application of septage. Minimally, sites must be posted during the entire time site access is restricted in accordance with the requirements in Table 9.

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Table 9 Site Posting Requirements for Septage

Where	Notice Content*	How Long
• **All significant points of access to the site** • **Every ½ mile (805 meters) around the perimeter of the site**	• **The name and address or phone number of the generator and, if different, the person who applies** • **The names, addresses, and phone numbers of the regulatory and permitting authorities** • **The material that is being applied** • **Notice that access is restricted and, if desired, the date after which access is no longer restricted** • **If applicable, a notice on limitations regarding the harvesting of edible plants from the site**	**30 days**
**** = unless the use of "No Trespassing" signs has been approved by Ecology for this purpose***		

11.7.3 Additional Site Management Restrictions

Table 10 contains additional site management restrictions that must be met when septage is applied.

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Table 10 Additional Site Management Restrictions for Septage

Feature	Restriction
Surface waters	**No application within 100 feet (30.5 meters)***
Wells	**No application within 100 feet (30.5 meters)***
Wetlands	**No application allowed****
Waters of the state	**No application allowed****
Flooded, frozen, or snow-covered sites	**No application allowed****

**** = unless a different buffer is approved by Ecology***
***** = unless approved by Ecology***

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APPENDIX 1 - PUBLIC NOTICE CONTENT

1) Name and address of the facility and the name of the contact person for the facility.
2) Name and address of Ecology person responsible for the permit.
3) Name and address of the local health jurisdiction person responsible for the permit if the local health jurisdiction has been delegated this responsibility.
4) A description of the proposal.
   - Proposals for coverage under this permit must cite the General Permit for Biosolids Management.
   - Proposals for land application plans must contain information on the location of the proposed land application sites and, if applicable, the sources of biosolids that may be applied.
   - Proposals for general land application plans must provide information on how the public will be notified when specific sites are identified.
5) A brief statement describing the applicant's biosolids management practices.
6) A statement describing an interested person's opportunity to comment or request a public hearing or meeting on the proposal, including the last date for comments or requests and the contact person to whom comments or requests must be directed.

   The period for comments and requests must be at least 30 days following the posting. Comments and requests should be directed to the responsible Ecology contact or the responsible local health jurisdiction contact if the authority is delegated.

   The following is an example: "*Any person who wants to comment on this proposal or wants to request a public hearing or meeting must do so in writing within 30 days of this notice. Comments should be addressed to* (insert either 'the Ecology contact listed' or 'the local health jurisdiction contact listed')*.*"
7) The statement, "*If you wish to be included on an interested parties list to receive notification of activities relating to this project, please notify, in writing, the* (insert facility name) *contact listed.* (Insert facility name) *will provide written confirmation by certified mail, return receipt requested, to each interested person or organization that their name has been placed on the list.*"
8) Any additional information considered necessary or proper.

APPENDIX 2 - GENERAL LAND APPLICATION PLAN CONTENT

1) Describes the geographical area covered by the plan, including the names of all counties and water resource inventory areas where biosolids may be applied.
2) Identifies site selection criteria.
3) Describes how sites will be managed.
4) Provides for not less than 30 days advance notice to Ecology of new or expanded land application sites, including those subject to provisional approval under WAC 173-308-310(18), to allow time for Ecology to object prior to the biosolids application.
5) Provides for advance public notice as required in WAC 173-308-310(13), and that is reasonably calculated to reach potentially interested adjacent and abutting property owners.

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APPENDIX 3 - SITE SPECIFIC LAND APPLICATION PLAN CONTENT

1) Whether or not it is known or can be determined that biosolids containing pollutants in excess of the values

- WAC 173-308-160 Table 3 have ever been applied to the site, and if so:
- The date(s) when the biosolids were applied (if known). The amount of biosolids applied (if known).
- The concentrations of the pollutants in the biosolids (if known).
- The area(s) of the site to which the biosolids were applied (if known).

2) A discussion of the types of crops grown or expected to be grown, their intended end use (for example, pasture grass for a feed crop, corn as a food crop), and the current distribution of crops on the site.

3) An explanation of how agronomic rates will be determined during the life of the site, along with any currently available calculations. Whenever agronomic rates or the method used to determine agronomic rates change, an update of the agronomic rate calculations must be filed with Ecology.

4) Method(s) of application.

5) Seasonal and daily timing of biosolids applications.

6) Provisions for conducting any soils, surface waters, or ground water sampling and any available data collected from the site within the last 2 years.

7) The name of the county and water resource inventory area where biosolids will be applied.

8) A description of how biosolids will be stored at the site that also addresses related off-site storage.

9) Map(s) for the site(s) must be submitted. Maps must be of an appropriate scale to show the detail necessary for evaluation of the proposed application areas, and so that a person may reasonably be able to locate the sites and any application units within a site (for example, 1:7,920 [8 inches to the mile] for detailed information with an overview map at 1:63,360 [1 inch to the mile]).
Minimally, maps must provide the following information:

- A legend.
- The location and means of access.
- Specific areas of the site where biosolids may be applied. If there is more than one site or more than one application unit within a site, a site or unit ID number should be included.
- The number of acres in the site or in any distinct application unit within a site.
- Location and extent of any wetlands on the site.
- A topographic relief of the application site and surrounding area.
- Adjacent properties and uses, and their zoning classification.
- Any seasonal surface water bodies located on the site.
- Any perennial surface water bodies located on or within 1/4 mile (402 meters) of the site.
- The location of any wells located on or within 1/4 mile (402 meters) of the site that are listed in public records or otherwise known to the applicant, whether for domestic, irrigation, or other purposes.
- Buffer zones to features such as surface waters, wells, property boundaries, and roadways and the width of the buffer zones.
- The presence and extent of any threatened or endangered species or related critical habitat.
- The location of any critical areas on site, as required to be identified under Chapter 36.70A RCW in the county's growth management plan.
- The location and size of any areas that will be used to store biosolids.

10) If the seasonal ground water is 3 feet (0.91 meters) or less below the surface, a management plan describing how you will protect ground water. For example, you may propose to limit applications to the time of year when ground water has receded to more than 3 feet (0.91 meters) below the surface.

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11) A description of how access to the site will be restricted (for example, signs posted around the site or other approved method of access restriction).
12) A copy of the landowner agreement required under WAC 173-308-120(6).
13) Any additional information requested by Ecology that is needed to evaluate the appropriateness of the site for biosolids application.

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GLOSSARY OF TERMS

The following definitions cover many of the terms used in this permit.

"Accredited laboratory" is a laboratory accredited under Chapter 173-50 WAC for a specific analyte using a specific analytical method.

"Administrator" means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

"Aerobic digestion" is the biochemical decomposition of organic matter in biosolids into carbon dioxide and water by microorganisms in the presence of air. Aerobic digestion does not include composting.

"Agricultural land" is land on which a food crop, feed crop, or fiber crop is grown. This includes range land and land used as pasture.

"Agronomic rate" is the biosolids application rate that provides the amount of nitrogen necessary for the optimum growth of targeted vegetation, and that will not result in the violation of applicable standards or requirements for the protection of ground or surface water as established under Chapter 90.48 RCW and related rules including Chapters 173-200 WAC and Chapter 173-201A WAC.

"Anaerobic digestion" is the biochemical decomposition of organic matter in biosolids into methane gas and carbon dioxide by microorganisms in the absence of air. Anaerobic digestion does not include composting.

"Apply biosolids or biosolids applied to the land" means the land application of biosolids for the purpose of beneficial use.

"Beneficial use facility" means a receiving-only facility consisting of a site or sites where biosolids from other treatment works treating domestic sewage are applied to the land for beneficial use, which has been permitted as a treatment works treating domestic sewage in accordance with WAC 173-308-310, and that has been designated as a beneficial use facility through the permitting process.

"Beneficial use of biosolids" means the application of biosolids to the land for the purposes of improving soil characteristics including tilth, fertility, and stability to enhance the growth of vegetation consistent with protecting human health and the environment.

"Biosolids sold/given away in a bag or other container" means biosolids sold/given away to the general public in a bag or other container holding less than 1 metric ton (1.1 U.S. tons).

"Biosolids" means municipal sewage sludge that is a primarily organic, semisolid product resulting from the wastewater treatment process that can be beneficially recycled and meets all applicable requirements under this permit. Biosolids includes a material derived from biosolids, and septic tank sludge, also known as septage, that can be beneficially recycled and meets all applicable requirements under this permit. For the purposes of this permit, semisolid products include biosolids or products derived from biosolids ranging in character from mostly liquid to fully dried solids.

"Bulk biosolids" means biosolids that are not sold/given away in a bag or other container for application to the land.

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“Ceiling concentration” means the maximum concentration of a pollutant in any biosolids sample, beyond which level the biosolids would be classified as sewage sludge not suitable for application to the land. Ceiling concentrations are established in Table 1 of WAC 173-308-160.

“Class I biosolids management facility” is any publicly owned treatment works (POTW), as defined in 40 CFR 501.2, required to have an approved pretreatment program under 40 CFR 403.8(a) (including any POTW located in a state that has elected to assume local program responsibilities under 40 CFR 403.10(e)), and any treatment works treating domestic sewage, as defined in 40 CFR 122.2, classified as a Class I biosolids management facility by the EPA Regional Administrator, or in the case of approved state programs, the Regional Administrator in conjunction with the state director, because of the potential for its biosolids use or disposal practice to affect public health and the environment adversely.

“Clean Water Act” or “CWA” means the Clean Water Act or Federal Clean Water Act (FCWA) (formerly referred to as either the Federal Water Pollution Act or the Federal Water Pollution Control Act Amendments of 1972), Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483, Public Law 97-117, and Public Law 100-4.

“Complete application” includes but, is not limited, to the following: a completed Application for Coverage, a vicinity map of the facility, a vicinity map of any associated treatment or storage facilities, a treatment facility schematic, confirmation that the SEPA requirements have been met, confirmation that public notice requirements have been met, land application plans if required, monitoring data if required, a biosolids sampling plan if required, a contingency plan for exceptional quality biosolids if required, a temporary disposal plan if required, a spill prevention/ response plan if required, and a signature by an appropriate official.

“Composting” means the biological degradation of organic materials under controlled conditions designed to promote aerobic decomposition. This does not include the treatment of sewage sludge in a digester at a wastewater treatment plant.

“Cumulative pollutant loading rate” is the maximum amount of a pollutant that can be applied to an area of land from biosolids that exceed the pollutant concentration limits established in Table 3 of WAC 173-308-160.

“Density of microorganisms” is the number of microorganisms per unit mass of total solids (dry weight) in the biosolids.

“Department” means the Washington state department of ecology and, within the scope of its delegation, a local health jurisdiction that has been delegated authority under WAC 173-308-050.

“Director” means the director of the department of ecology or his or her authorized representative.

“Disposal on a long-term basis” means to adopt disposal as a preferred method of management for at least 5 years, or for an indefinite period of time with no expectation for pursuing other management alternatives.

“Disposal on a temporary basis” means a period of more than 1 but less than 5 years. Generally, situations requiring the temporary use of disposal facilities will normally occur as a result of deficiencies in the wastewater or biosolids treatment process, or economic, administrative, or contractual constraints which cannot be resolved in less than 1 year.

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"Disposal on an emergency basis" means a period up to but not exceeding 1 year. Generally, emergency situations requiring the use of disposal facilities will normally occur as a result of inclement weather conditions at a beneficial use site, contractual or technical difficulties in the treatment, transportation, or application of the biosolids, or as a result of short term economic or administrative barriers, any and all of which are expected to be resolved within a period of 1 year.

"Domestic sewage" is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

"Dry weight basis" means calculated on the basis of having been dried at 105C (221°F) until reaching a constant mass (in other words, essentially 100% solids content).

"EPA" means the United States Environmental Protection Agency.

"Exceptional quality biosolids" means biosolids that meet the pollutant concentration limits in Table 3 of WAC 173-308-160, and at least one of the Class A pathogen reduction requirements in WAC 173-308-170, and at least one of the vector attraction reduction requirements in WAC 173-308-180.

"Facility" means a treatment works treating domestic sewage as defined in this permit, unless the context of the permit requires otherwise. For the purposes of this permit a facility is considered to be new if it has not been previously approved for the treatment, storage, use, or disposal of biosolids or sewage sludge.

"Feed crops" are crops produced primarily for consumption by animals.

"Fiber crops" are crops such as flax and cotton including, but not limited to, those whose parts or by-products may be consumed by humans or used in the production or preparation of food for human consumption.

"Food crops" are crops consumed by humans. These include, but are not limited to, fruits, vegetables, grains, and tobacco.

"Forest" is an area of land that is managed for the production of timber or other forest products, or for benefits such as recreation and watershed protection, and that is or will be dominated by trees under the current system of management. For the purposes of this permit, other areas of land that are not regulated as agricultural land, public contact sites, land reclamation sites, or lawns or home gardens are considered forest land.

"General permit" means a permit issued by Ecology in accordance with the procedures established in this permit, to be effective in a designated geographical area, that authorizes the application of biosolids to the land or the disposal of sewage sludge in a municipal solid waste landfill, under which multiple treatment works treating domestic sewage may apply for coverage.

"Geometric mean" means the antilogarithm of the arithmetic average of the logarithms of the sample values, or the nth root of the product of n sample values.

"Ground water" means water in a saturated zone or stratum beneath the surface of land or below a surface water body.

"Health jurisdiction" or "local health jurisdiction" means city, county, city-county, or district public health jurisdiction as defined in Chapter 70.05 RCW, Chapter 70.08 RCW, and Chapter 70.46 RCW.

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"Individual permit" means a permit issued by Ecology to a single treatment works treating domestic sewage in accordance with WAC 173-308-310, which authorizes the management of biosolids or sewage sludge.

"Industrial septage" or "commercial septage" is the contents from septic tanks or similar systems that receive wastewater generated in a commercial or industrial process. This definition includes, but is not limited to, grease trap wastes generated at restaurants and similar food service facilities.

"Industrial wastewater" or "commercial wastewater" is wastewater generated in a commercial or industrial process.

"Incineration" means the firing of sewage sludge as a means of disposal.

"Land application" is the application of biosolids to the land surface by means such as spreading or spraying, the injection of biosolids below the land surface, or the incorporation of biosolids into the soil, for the purpose of beneficial use.

"Land with a high potential for public exposure" is land that the public uses frequently. This includes, but is not limited to, a public contact site and a reclamation site located in a populated area (for example, a construction site located in a city).

"Land with a low potential for public exposure" is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest, and a reclamation site located in an unpopulated area (for example, a strip mine located in a rural area).

"Local health jurisdiction" see definition of health jurisdiction.

"Manufactured inerts" means wastes such as plastic, metals, ceramics and other manufactured items that remain relatively unchanged during wastewater or biosolids treatment processes.

"Monthly average" is the arithmetic mean of all measurements taken during the month.

"Municipal sewage sludge" means sewage sludge generated from a publicly owned treatment works. For the purposes of this permit, sewage sludge generated from the treatment of only domestic sewage in a privately owned or industrial treatment facility is considered municipal sewage sludge.

"Municipality" means a city, town, borough, county, parish, district, association, or other public body (including an inter-municipal agency of two or more of the foregoing entities) created by or under state law, or a designated and approved management agency under Section 208 of the Clean Water Act, as amended. The definition includes a special district created under state law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in Section 201(e) of the Clean Water Act, as amended, that has as one of its principal responsibilities the treatment, transport, use, or disposal of biosolids.

"Nonexceptional quality biosolids" means biosolids that do not meet the criteria of "exceptional quality biosolids" as defined in this section.

"Other container" is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of 1 metric ton (1.1 U.S. tons) or less.

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“Owner” means any person with ownership interest in a site or facility, or who exercises control over a site or facility, but does not include a person who, without participating in management of the site or facility, holds indicia of ownership primarily to protect the person's security interest.

“Pasture” is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

“Pathogenic organisms” are disease causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

“Permit” means an authorization, license, or equivalent control document issued by the director to implement the requirements of this permit. Unless the context requires differently, the use of the term in this permit refers to individual permits, general permits, and coverage under general permits.

“Person who prepares biosolids” is either the person who generates biosolids during the treatment of domestic sewage in a treatment works or the person who derives a material from biosolids.

“Person” is an individual, association, partnership, corporation, municipality, state or federal agency, or an agent or employee thereof.

“pH” means the logarithm of the reciprocal of the hydrogen ion concentration.

“Place sewage sludge” or “sewage sludge placed” means to dispose of sewage sludge.

“Pollutant limit” is a numerical value that describes the amount of a pollutant allowed per unit amount of biosolids (for example, milligrams per kilogram of total solids), the amount of a pollutant that can be applied to a unit area of land (for example, kilograms per hectare), the volume of a material that can be applied to a unit area of land (for example, gallons per acre), or the number of pathogens or indicator organisms per unit of biosolids. Pollutant limits are established in Tables 1 - 3 of WAC 173-308-160, in WAC 173-308-170, and in WAC 173-308-270.

“Pollutant” is an organic substance, an inorganic substance, a combination of organic and inorganic substances, or a pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could, on the basis of information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction), or physical deformations in either organisms or offspring of the organisms.

“Public contact site” is land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

“Publicly owned treatment works” means a treatment works treating domestic sewage that is owned by a municipality, the state of Washington, or the federal government.

“Range land” is generally open, uncultivated land dominated by herbaceous or shrubby vegetation that may be used for grazing or browsing, either by wildlife or livestock.

“Receiving-only facility” means a treatment works treating domestic sewage that only receives sewage sludge or biosolids from other sources for further treatment and/or application to the land, and which does not generate any biosolids from the treatment of domestic sewage.

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“Reclamation site” is drastically disturbed land that is reclaimed using biosolids. This includes, but is not limited to, strip mines and construction sites.

“Regional administrator" means the Regional Administrator of Region 10 of the Environmental Protection Agency or his/her authorized representative.

“Residential equivalent value” means the number of residential equivalents determined for a facility under Chapter 173-224 WAC or a value similarly obtained under WAC 173-308-320.

“Restrict public access” means to minimize access of nonessential personnel to land where biosolids are applied, through the use of natural or artificial barriers, signs, remoteness, or other means.

“Saturated zone” means the zone below the water table in which all interstices are filled with water.

“Septage managed as biosolids originating from sewage sludge” means septage managed as if it had originated from a sewage treatment process at a wastewater treatment facility including, but not limited to, meeting the sampling requirements in WAC 173-308-140, the monitoring requirements in WAC 173-308-150, the pollutant limits in WAC 173-308-160, the pathogen reduction requirements in WAC 173-308-170, and the vector attraction reduction requirements in this permit.

“Septage management facility” means a person who applies septage to the land or one that treats septage for application to the land.

“Septage” or “domestic septage” is liquid or solid material removed from septic tanks, cess pools, portable toilets, type III marine sanitation devices, vault toilets, pit toilets, RV holding tanks, or similar systems that receive only domestic sewage. Septage may also include commercial or industrial septage mixed with domestic septage if approved in accordance with WAC 173-308-020(3)(g).

“Sewage sludge” is solid, semisolid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works.

“Significant change in biosolids management practices” means, but is not limited to, the following: a change in the quality of biosolids that are applied to the land, either from class A to class B for pathogens, or from Table 3 to Table 1 of WAC 173-308-160 for pollutant limits; the addition of a new area to which biosolids will be applied which was not previously disclosed during a required public notice process; for class B biosolids only, a change from nonfood crops to food crops, a change from crops where the harvestable portions do not contact the biosolids/soil mixture to crops where the harvestable portions contact the biosolids/soil mixture, or a change in site classification from land with a low potential for public exposure to land with a high potential for public exposure; or any change or deletion of a requirement established in an approved land application plan or established as a condition of coverage under a permit that would result in a decrease in buffer size, site monitoring, or facility reporting requirements, which was not otherwise provided for in the permit or plan approval process.

“Site” means all areas of land, including buffer areas, which are identified in the scope of an approved Site Specific Land Application Plan. A site is considered to be new or expanded when biosolids are

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applied to an area not approved in a Site Specific Land Application Plan or that was not previously disclosed during a required public notice process.

“Specific oxygen uptake rate (SOUR)” is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in the biosolids.

“State” means the state of Washington.

“Store or storage of biosolids” is the placing of biosolids on land or in surface impoundments or other containment devices in which the biosolids remain for 2 years or less, except where a greater time period has been approved by Ecology. This does not include the placing of biosolids on land or in surface impoundments or other containment devices for treatment or disposal.

“Stover” is the non-grain, above-ground part of a grain crop, often corn or sorghum.

“Surface Disposal” is the placing of active sewage sludge into an area of land that contains one or more sewage sludge units.

“Surface impoundment” means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), and which is designed to hold an accumulation of liquids or sludges. The term includes holding, storage, settling, and aeration pits, ponds, or lagoons, but does not include injection wells.

“Surface waters of the state” means surface waters of the state as defined in WAC 173-201A-020.

“Tank” means a stationary device designed to contain an accumulation of liquid or semisolid materials and which is constructed primarily of nonearthen materials to provide structural support.

“Temporary, small-scale storage” is the storage of biosolids for no more than 30 days in a tank holding no more than 10,000 gallons with a total on-site maximum volume of no more than 20,000 gallons.

“Total solids” are the materials in biosolids that remain as residue when the biosolids are dried at 103 to 105C (217.4 to 221°F).

“Treat or treatment of biosolids” is the preparation of biosolids for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of biosolids. This does not include storage of biosolids.

“Treatment works treating domestic sewage” means a publicly owned treatment works or any other sewage sludge or wastewater treatment devices or systems, regardless of ownership, used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage or sewage sludge, including land dedicated for the disposal of sewage sludge. Treatment works treating domestic sewage also includes beneficial use facilities and septage management facilities as defined in this section, and a person, site, or facility designated as a treatment works treating domestic sewage in accordance with WAC 173-308-310(1)(b). This definition does not include septic tanks or similar devices or temporary, small-scale storage as defined in this section.

“Treatment works” is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

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“Unstabilized solids” are organic materials in biosolids that have not been treated in either an aerobic or anaerobic treatment process.

“Vector attraction” is the primarily odorous characteristic of biosolids that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

“Volatile solids” is the amount of the total solids in biosolids that are lost when the biosolids are combusted at 550C (1,022°F) in the presence of excess air.

“Waters of the state” means waters of the state as defined in RCW 90.48.020.

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J AGENCY REVIEW COMMENTS AND RESPONSES

J.1 CITY OF ARLINGTON ORDINANCE 2017-013 ADOPTING COMPREHENSIVE WASTEWATER PLAN AMENDMENT (10/2/2017)

J.2 WASHINGTON DEPARTMENT OF ECOLOGY APPROVAL LETTER FOR 2017 AMENDMENT (PROVIDED AFTER PUBLICATION 2017)

J.3 ECOLOGY—CITY OF ARLINGTON EMAIL CORRESPONDENCE REGARDING AMENDMENT (2017)

J.4 2017 AMENDMENT TO 2015 COMPREHENSIVE WASTEWATER PLAN COMMENT AND RESPONSE MATRIX

J.5 WASHINGTON DEPARTMENT OF ECOLOGY 2015 APPROVAL LETTER 10/16/2015)

J.6 ECOLOGY—CITY OF ARLINGTON EMAIL CORRESPONDENCE (2015)

J.7 2015 COMPREHENSIVE WASTEWATER PLAN COMMENT AND RESPONSE MATRIX

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ORDINANCE NO. 2017-013

AN ORDINANCE OF THE CITY OF ARLINGTON, WASHINGTON, MAKING CERTAIN FINDINGS AND ADOPTING BY REFERENCE AMENDMENTS TO THE COMPREHENSIVE WASTEWATER PLAN FOR THE CITY OF ARLINGTON

WHEREAS the City of Arlington operates a wastewater (sewer) system governed in part by Washington Administrative Code (WAC) Chapter 173-240; and

WHEREAS, the City of Arlington is required to periodically take legislative action to review and, if needed, revise its comprehensive wastewater plan, including capital improvement plans, service levels, and operational and maintenance plans to ensure compliance with city policies, state and federal regulations, to identify any deficiencies which present threats to public health and safety, and to develop and identify funding sources and requirements; and

WHEREAS, the City of Arlington's comprehensive wastewater plan was amended in 2015, but subsequent revisions to the City's Comprehensive Plan required updates to the comprehensive wastewater plan; and

WHEREAS, the City of Arlington contracted with RH2 and FCS Group to conduct a thorough review of the City's comprehensive wastewater plan and prepare with the assistance of city staff amendments to the plan for consistency with the City Comprehensive Plan; and

WHEREAS, on August 1, 2017, the City Planning Commission first considered the amendments to the comprehensive wastewater plan for the City of Arlington; and

WHEREAS, based on its review of the requirements of WAC Chapter 173-240 and other requirements of state law, the Planning Commission conducted a public hearing and took public testimony on August 15, 2017; and

WHEREAS, the City Council considered the recommendation of the Planning Commission at its workshop on September 25, 2017 and thereafter took the matter under consideration at its October 2, 2017 public meeting; and

WHEREAS, based on its review of the requirements of state law, the analysis and proposed revisions prepared by the Planning Commission and staff, and the public comments received, the City Council finds and declares that the review and needed revisions have been prepared in conformance with applicable law, including Chapter 36.70A RCW, Washington Administrative Code Chapter 173-240, RCW Chapter 43.21C RCW, and the approved public participation and adoption process; and

WHEREAS, based on its review of the requirements of state law, the analysis and proposed revisions prepared by the Planning Commission and staff, the recommended findings

on review and proposed revisions forwarded by the Planning Commission, and the public comments received, the City Council hereby finds and declares that Arlington's comprehensive wastewater plan as revised by this ordinance complies with the requirements of state law;

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF ARLINGTON, WASHINGTON, DOES MAKE THE FOLLOWING FINDINGS:

1. Findings. The Arlington City Council finds that:

a. The City has established and followed a public participation program in accordance with RCW 36.70A.130(2)(a), which program was formally adopted and followed by the City via City of Arlington Resolution #2014-022.

b. The City Council believes that the SEPA Determination of Non-Significance issued by the City's Responsible Official for the comprehensive wastewater plan update adequately evaluated all known significant environmental issues associated with the adoption of the updates to the comprehensive plan.

c. The comprehensive wastewater plan identifies operational and capital improvement projects and has been updated to address changes established in the Arlington General Comprehensive Plan, amended on September 18, 2017.

d. Notice of all amendments to the comprehensive wastewater plan adopted to fulfill the state law was sent to the Washington State Department of Ecology.

e. The City Council finds that the review and needed revisions to the Sewer Comprehensive Plan have been prepared in conformance with applicable law, including Chapter 36.70A RCW, Chapter 43.21C RCW, WAC Chapter 173-240, and the approved public participation and adoption process and, taken collectively, are in the best interests of all its citizens.

NOW, THEREFORE, the City Council of the City of Arlington does hereby ordain as follows:

Section 1. Adoption of Sewer Comprehensive Plan. The City Council approves that certain Comprehensive Wastewater Plan prepared by the City of Arlington staff with assistance from RH2 Engineers and the FCS Group dated October, 2015 and revised July, 2017, as amended, a true copy of which is attached to the original of this ordinance as Exhibit "A" hereto.

Section 2. Severability. If any provision, section, or part of this ordinance shall be adjudged to be invalid or unconstitutional, such adjudication shall not affect the validity of the ordinance as a whole or any section, provision or part thereof not adjudged invalid or unconstitutional.

Section 3. Effective Date. This ordinance or a summary thereof consisting of the title shall be published in the official newspaper of the City, and shall take effect and be in full force five (5) days after publication.

PASSED BY the City Council and APPROVED by the Mayor this 2nd day of October, 2017.

CITY OF ARLINGTON

Barbara Tolbert, Mayor

Attest:

Kristin Banfield, City Clerk

Approved as to form:

Steven J. Peiffle
City Attorney

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Ave SE • Bellevue, WA 98008-5452 • 425-649-7000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

RECEIVED
FEB 12 2018
PW Utilities

February 8, 2018

Mr. James Kelly
Public Works Director
City of Arlington
154 W Cox
Arlington, WA 98223

Re: City of Arlington 2017 Amendment to the 2015 General Sewer Plan

Dear Mr. Kelly:

Pursuant to RCW 90.48.110 and WAC 173-240-030, the above-referenced general sewer plan has been reviewed and, is hereby approved. The change to the 2015 General Sewer Plan is due to a relocation of population growth and demand for sewer service from west of I-5 across the rest of the existing City limits. Sewer collections and treatment models were re-run and it was concluded that relatively minor changes applied to the City's capital improvement plan.

Sewage collection facilities within the planning area boundary shall be constructed according to the approved general sewer plan or amendments thereto. Prior to construction, the City is required to submit a written description of the project and written assurance that the extension is in conformance with the general sewer plan. Engineering reports and plans and specifications for planned collection facilities including sewer line extensions and pump stations, need not be submitted for approval, unless:

a) The proposed sewers or pump stations involve installation of overflows or bypasses; or

b) The proposed sewers or pump stations discharge to an overloaded treatment, collection, or disposal facility.

If you have any questions concerning this approval, please contact Lazaro Eleuterio at lazaro.eleuterio@ecy.wa.gov or 425-649-7027.

Sincerely,

Rachel McCrea

Rachel McCrea
Water Quality Section Manager
Northwest Regional Office

RM:le

cc: Mike Wolaneck, Water Resources Planner, City of Arlington
Karla Kasick, PE; RH2 Engineers, Planners, Scientists

Mike Wolanek

From: Eleuterio, Lazaro (ECY) <LELE461@ECY.WA.GOV>
Sent: Monday, August 07, 2017 3:06 PM
To: Mike Wolanek
Subject: RE: City of Arlington GSP Amendment

Mike:

Thanks for the information. Ecology has no further comments on the GSP (2015 and 2017 Amendment).

Best regards,

Lazaro Eleuterio, Ph.D., CDT, PE
Municipal Facility Manager - Environmental Engineer 5
Washington State Department of Ecology | Water Quality Program
lele461@ecy.wa.gov
Phone: 425.649.7027

From: Mike Wolanek [mailto:mwolanek@arlingtonwa.gov]
Sent: Monday, August 07, 2017 2:57 PM
To: Eleuterio, Lazaro (ECY) <LELE461@ECY.WA.GOV>
Subject: RE: City of Arlington GSP Amendment

Laz, we held a public hearing on comp plan amendments a week or so ago and received only minor comments. We will wait until we receive Ecology's comments before moving to adoption and final publication.

I will prepare a hardcopy and a complete electronic copy of the agency review draft and will send it to you tomorrow. Look for it in the mail later this week.
Thanks, Mike

Mike Wolanek
Water Resources Planner
City of Arlington Public Works
360-403-3541 (Desk)

154 W. Cox Avenue
Arlington, WA 98223

From: Eleuterio, Lazaro (ECY) [mailto:LELE461@ECY.WA.GOV]
Sent: Monday, August 07, 2017 1:18 PM
To: Mike Wolanek <mwolanek@arlingtonwa.gov>
Subject: RE: City of Arlington GSP Amendment

Hi Mike:

When will the final amended GSP be issued? The draft that you sent to me is sufficient for review, but not for approval. I will need only 1 hard copy and 1 electronic copy of the plan for approval purposes.

Thanks,
Laz

Lazaro Eleuterio, Ph.D., CDT, PE
Municipal Facility Manager - Environmental Engineer 5
Washington State Department of Ecology | Water Quality Program
lele461@ecy.wa.gov
Phone: 425.649.7027

From: Mike Wolanek [mailto:mwolanek@arlingtonwa.gov]
Sent: Thursday, July 20, 2017 6:26 PM
To: Eleuterio, Lazaro (ECY) <LELE461@ECY.WA.GOV>
Subject: City of Arlington GSP Amendment

Hello Laz. The City has completed an amendment to its 2015 GSP, and we wish to engage Department of Ecology in a review of the amended plan. The amendment was brought about by changes in the City's development proposals that were significant from a land use perspective, but had little effect on our wastewater capital improvement program. Many parts of the GSP document had either no changes, or only minor changes. I'm not sure if you can provide an abbreviated review in a case like this, but it appears something less exhaustive may be warranted.

The attached letter provides additional details on the amendment background, the structure of the amended plan, and how you might evaluate how much time you may need for review. Please consider the letter and let me know how you would like to proceed. I know you have been very busy. Given it has been about two years since your review of the complete document, and the amendment results in a smaller capital improvement program with no new projects, I do not anticipate that it will take you much time to evaluate the changes in the operation of the Wastewater Utility.

I hope you are enjoying the beautiful summer weather!
Mike

PS I will be on vacation from 7/21/2017 until I return on 8/7/2017. I will be checking emails on occasion while I am gone.

Mike Wolanek
Water Resources Planner
City of Arlington Public Works
360-403-3541 (Desk)

154 W. Cox Avenue

City of Arlington 2017 Amendment to the 2015 Comprehensive Wastewater Plan

Agency Comments and City Responses

Review Phase:	**WSP Agency Review Draft Issued July 2017 [to be revised to Final based on these responses to agency comments]**		**Health (RR) Comment Date:**	**N/A**
Contact:	**James Kelly and Mike Wolanek (City)**		**Ecology Comment Date:**	**8/7/2017**
	Dan Burwell (RH2 Engineering)		**Snohomish Co PDS Comment Date:**	**N/A**
Date:	**10/31/2017**		**Snohomish Co PUD Comment Date:**	**N/A**

No.	Page No.	Section Paragraph No.	Agency Comment	Commenter Name	City Response (specific ext revisions in bright red font)	For PDS comments only, PDS reply to City response	City Responder Name	City Reviewer Name	Implementation Date	Implementation Initials
Responses to Department of Ecology Comments made during an email exchange 8/7/2017										
1		General	When will the final amended GSP be issued? The draft that you sent to me is sufficient for review, but not for approval.	Laz Eleuterio	The Final Amended GSP will be issued once all pertinent comments are addressed and all internal approvals, including City Council, are obtained. The planning commission has recommended approval, and the Council is scheduled to adopt the GSP at its 10/2/2017 meeting.	MW	JXK	####	MW	
2		General	I will need only 1 hard copy and 1 electronic copy of the plan for approval purposes.	Laz Eleuterio	A complete hardcopy of the Amended GSP, including all appendices, will be mailed to you following Council approval. A DVD of the Amended GSP will be included inside the front cover. Once you have completed Ecology's approval process, we will request that you sign a signature page demonstrating that all pertinent approvals have been received.	MW	JXK	####	MW	
3		General	Thanks for the information.	Laz Eleuterio	The initial response in the 8/7/17 email string was incorrect. The public hearing referenced in the email was a Planning Commission workshop. The public hearing was held before the Planning Commission on 8/15/2017. We delayed in sending you the final Amended GSP until Council Approvals and signatures have been obtained.	MW	JXK	####	MW	
4		General	Ecology has no further comments on the GSP (2015 and 2017 Amendment).	Laz Eleuterio	We understand you have no substantive comments with the GSP Amendment. Thank you for your time to review.	MW	JXK	####	MW	
Responses to City of Arlington Planning Commission Comments made during a Workshop on 8/1/2017										
1		General	My notes from last night's meeting showed only two comments from the Planning Commission: … Please let me know if there is any additions or correction to the comments	James Kelly, PW Director, email to Bruce Angell, Chair	We understand Planning Commission comments at the workshop were limited to the two requests listed below.		MW	JK	10/30/17	MW
2		General	1. Please edit narrative text in Land Use sections of Water, Sewer and Transportation plan to make sure it is consistent with what is stated in City's Comprehensive Plan.	Bruce Angell, Chair	A determination of consistency between planning documents that are in preparation is an iterative process. The GMA Comprehensive Plan appears to have received more comprehensive agency comments than did the WSP (e.g., PSRC), so we are waiting for final revisions to the GMA comp plan before beginning a final review and making any necessary corrections. Also, although it is not as true for Land Use as other technical subject matter, plans adopted by reference within the GMA comp plan often contain more detail that is only summarized in the GMA plan, so the absence of some information in the GMA comp plan should not be construed as inconsistent with its adopted, referenced plans.		MW	JK	10/30/17	MW

City of Arlington 2017 Amendment to the 2015 Comprehensive Wastewater Plan

Agency Comments and City Responses

Review Phase:	**WSP Agency Review Draft Issued July 2017 [to be revised to Final based on these responses to agency comments]**	**Health (RR) Comment Date:**	**N/A**
Contact:	**James Kelly and Mike Wolanek (City)**	**Ecology Comment Date:**	**8/7/2017**
	Dan Burwell (RH2 Engineering)	**Snohomish Co PDS Comment Date:**	**N/A**
Date:	**10/31/2017**	**Snohomish Co PUD Comment Date:**	**N/A**

No.	Page No.	Section Paragraph No.	Agency Comment	Commenter Name	City Response (specific ext revisions in bright red font)	For PDS comments only, PDS reply to City response	City Responder Name	City Reviewer Name	Implementation Date	Implementation Initials
3		General	2. After MU Overlay zoning is adopted, please revisit Water, Sewer, and Transportation modeling to make sure area population projections are consistent.	Bruce Angell, Chair	We will revisit your concern after final revisions to the GMA comp plan are completed. However, we are fairly certain that the water modeling results and their implications are within the precision and limits of a wide and reasonable range of population projections. For example, removing UGA expansion west of I-5 from consideration and reallocating more than 2,200 persons across the 342 pressure zone (generally Old Town plus city limits west of 67th Avenue), did not result in any new capital improvement projects, and only removed the projects situated west of the freeway.		MW	JK	10/30/17	MW
4										
Responses to Comments made in Langabeer & Traxler, P.S., letter dated 7/21/2017										
1		General	I am writing on behalf of my clients Mr. and Mrs. Robert Phillips, Mr. Mike Pitman, and Ms. Jody Heigert, with regard to the City of Arlington's (City) 2017 Comprehensive Plan Update (Comp Plan Update) and the City 's proposed changes (Draft Plan) related to the Brekhus/Beach Subarea. This letter follows two prior submissions to the City's Planning Commission and the City Council which related to the 2015 Comp Plan Update.	Dannon Traxler	Responses here will focus on letters received after publication of the 2017 update of the GMA Comprehensive Plan and the Transportation 2035 Plan, and the 2017 Amendments of the Water (WSP) and Sewer (GSP) plans, and not the two 2015 letters.		MW	JK	10/30/17	MW
2			As you may know, my clients have a pending appeal before the Growth Management Hearings Board of the 2015 Comprehensive Plan. We filed that Petition for Review in September 2015, and it has essentially been on hold since that time, pending the outcome of the revisions to the Draft Plan that the Planning Commission is reviewing now. The issues in our appeal, to summarize, pertained to the City's plan to accommodate projected growth by expanding the UGA into the King-Thompson area, the unworkable TDR overlay on Brekhus/Beach which has prevented the accommodation of higher density development in that area, and the failure of the City to plan for and identify financing components of capital facilities infrastructure to Brekhus/Beach, including the provision of roads and water and sewer infrastructure to serve development there.	Dannon Traxler	We acknowledge your appeal of the 2015 GMA Comprehensive Plan (and the plans it adopts by reference) has been "on hold" pending the completion of the 2017 Update and Amendments. We understand the first two of your three issues--UGA expansion west of I-5 and the TDR overlay on the Brekhus/Beach neighborhood are satisfactorily addressed in the revised (2017) documents. We further understand that your third issue--lack of development of municipal infrastructure to facilitate development at Brekhus/Beach--remains unsettled as the revised documents move toward adoption by City Council.		MW	JK	10/30/17	MW
3			We placed the appeal on hold with the hope that the Draft Plan would address (and moot out) the big issues in our appeal, and it has, to a certain extent. We fully agree with the City's plan to remove ARL3 from the Snohomish County docket so that the King-Thompson area is not included in the UGA. We also agree with the City's decision to remove the TOR overlay from Brekhus/Beach. We recognize that the removal will give the property owners more options. We thank you for your efforts in these respects, as it will allow us to dismiss some of the issues in our appeal.	Dannon Traxler	Concur. See the response immediately above.		MW	JK	10/30/17	MW

City of Arlington 2017 Amendment to the 2015 Comprehensive Wastewater Plan

Agency Comments and City Responses

Review Phase:	**WSP Agency Review Draft Issued July 2017 [to be revised to Final based on these responses to agency comments]**	**Health (RR) Comment Date:**	**N/A**
Contact:	**James Kelly and Mike Wolanek (City)**	**Ecology Comment Date:**	**8/7/2017**
	Dan Burwell (RH2 Engineering)	**Snohomish Co PDS Comment Date:**	**N/A**
Date:	**10/31/2017**	**Snohomish Co PUD Comment Date:**	**N/A**

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4			There are issues that remain, however. First, we do not agree with the City's decision to make up for the density capacity it won't be getting as part of the King-Thompson expansion by cramming a large part of the planned growth over the 20 year planning period into multi-family developments, which it seems from reviewing public comments over the course of this process, many of the people in this community oppose. The City should be placing at least some of that density in the available land at Brekhus/Beach and ensuring that adequate infrastructure can be installed within the 20-year planning period to support that kind of development in the area. We are deeply troubled by the fact that the reconciliation process with Snohomish County yielded an agreement of 606 units for the Brekhus/Beach area based on a development density of 5.5 dwellings per acre. This seems to be at least part of the resolution for accommodating the population projection. We do not understand how this density can be used when there's no assurance that such a density can be achieved within the planning period without adequate infrastructure. This is not GMA-compliant.	Dannon Traxler	We understand your lack of agreement. However, the City is required to make GMA and capital planning decisions in the context of many competing economic demands on the City. The reconciliation process with the County recognizes that growth is most likely to occur first in those areas which are already ready for growth. This is expected and required under GMA.		JK	MW	10/30/17	MW
5			The City concedes that the Draft Plan does not allow Brekhus/Beach to develop up to its OMA-required potential. On page 4-18 of the Draft Plan, the City states that the area is assumed to be a part of the buildable lands inventory. The City also states: "The City faces a paradox where the GMA requires that lands within Urban Growth Areas be developed at urban densities (4+ houses per acre), but there is no market or infrastructure financing available to achieve that level of development. Only a density of 20,000 square feet per acre is permissible without sewer or other facilities." Thus, in its own Comp Plan, the City is stating that it is not complying with GMA requirements in its treatment of Brekhus/Beach as far as density goes, while at the same time agreeing to use an unrealistic 5.5 acre density for growth capacity at Brekhus/Beach to satisfy population projections. This creates an internal inconsistency within the plan, which is also noncompliant with the GMA.	Dannon Traxler	See prior response immediately above.		JK	MW	10/30/17	MW
6			We are also concerned that the revised plan does not do any actual capital facilities planning for Brekhus/Beach, nor does it identify current or future funding mechanisms for such infrastructure, leaving an area that is within the City limits, to be fully funded by private property owners. While the "high-level master plan" includes some big picture mapping and discussion of roads, and water and sewer service, and a 2009 arterial study identifies potential transportation improvements, this does not constitute actual capital facilities planning and does nothing to ensure that this property which is de facto "urban" in nature will be developed to OMA-required densities within the planning period. For example, we see nothing in the section on Future Transportation Needs identifying any road projects that will aid in ensuring the build-out of Brekhus/Beach within the planning period even at only 5.5 units per acre. We also do not understand why the City isn't seeking any alternative funding mechanisms for such infrastructure, such as government grants and EDI funds.	Dannon Traxler	The water, sewer, and transportation plans use the population densities provided in the City's GMA Comprehensive Plan to develop a capital facilities improvement and financing plan. Based on the provided population densities and the conceptual Brekhus/Beach development plan, the existing and planned facilities will be adequate to meet the needs of the future population.		JK	MW	10/30/17	MW

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7			The heart of the GMA is the requirement for coordinated and comprehensive planning. Infrastructure must match and support urbanization. The costs of supplying urban services are to be taken into account at the time the urban growth boundary is extended or capacity is increased. GMA guidelines explain: The obligation to provide urban areas with adequate public facilities is not limited to new urban areas. Counties and cities must include in their capital facilities element a plan to provide adequate public facilities to all urban areas, including those existing areas that are developed, but do not currently have a full range of urban governmental services or services necessary to support urban densities. WAC 365-196-320(1)(e).	Dannon Traxler	The water, sewer, and transportation plan meet the requirements of WAC 365-196-320(1).		JK	MW	10/30/17	MW
8			The City's excuse is that "the topography and geology of the area make the installation of infrastructure such as roads and sewers very costly." The revised plan also identifies "numerous planning issues" with the Brekhus/Beach Subarea. The fact is, Brekhus/Beach is within the City limits, and per GMA requirements, the City is required to plan for growth. Capital facilities planning and financing are part and parcel of that.	Dannon Traxler	The water, sewer, and transportation plans use the population densities provided in the City's GMA Comprehensive Plan to develop a capital facilities improvement and financing plan. Based on the provided population densities and the conceptual Brekhus/Beach development plan, the existing and planned facilites will be adequate to meet the needs of the future population.		JK	MW	10/30/17	MW
9			Finally, we are also troubled by the City's imposition of a high-level master plan over Brekhus/Beach which would seem to hold hostage those folks with smaller parcels who may want to develop to higher level densities before one wealthy developer can come in and buy up the whole area. We would like some assurance from the City that property owners within Brekhus/Beach can come up with smaller-scale development plans consistent with the high-level plan and still be allowed to develop at higher densities. That only makes sense. Capital facilities planning by both the City and the property owners would of course need to be a necessary component of that.	Dannon Traxler	The City is open to work with Brekhus/Beach as a whole comprehensive development or as individual parcel developments. The development layout included in the water, sewer, and transportation plans was developed as a joint exercise with the City and a representative from Brekhus/Beach.		JK	MW	10/30/17	MW
10			We look forward to working with you cooperatively on these issues and to help draft revisions that are agreeable to all parties and that are GMA-compliant. Please include me on your email list for all notifications related to your 2017 Comp Plan Update.	Dannon Traxler	Noted. Thank you.		JK	MW	10/30/17	MW

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			Responses to Comments made in Langabeer & Traxler, P.S., letter dated 7/31/2017							
1		General	I am writing on behalf of my clients Mr. and Mrs. Robert Phillips, Mr. Mike Pitman, and Ms. Jody Heigert, with regard to the City of Arlington's (City) 2017 Updates to its Comprehensive Water and Sewer, and Transportation Plans as they relate to the Brekhus/Beach Subarea. This letter follows our prior submission to the Planning Commission on July 21, 2017 related to the 201 7 Comprehensive Plan Update and our attendance at your July 18, 201 7 Planning Commission meeting.	Dannon Traxler	Noted. Thank you.		MW	JXK	10/30/17	MW
2			We testified at the public hearing about our pending appeal before the Growth Management Hearings Board of the City's 2015 Comprehensive Plan and explained that we placed the appeal on hold with the hope that the updates to your current Plan would address the big issues in our appeal. We agreed that this update will resolve many of the appeal issues. However, we expressed concern about remaining issues related to the City's failure to properly plan for growth at Brekhus/Beach. Specifically, this iteration of the Comprehensive Plan does not ensure that adequate infrastructure (including water, sewer, and roads) can be installed to Brekhus/Beach within the 20-year planning period to support densities required by the OMA and the City's own Plan. The City does not appear to be doing any actual capital facilities planning for Brekhus/Beach, and it does not identify current or future funding mechanisms for such infrastructure, leaving an area within the City limits to be fully funded by private property owners.	Dannon Traxler	We disagree with this statement. The City has been planning for Brekhus/Beach since 2008, this early work focused on expansion of the wastewater treatment plant and obtaining additional water rights. The City is currently expanding Lift Station #2 that will eventually handle sanitary sewer flows from the Brekhus/Beach development. All of these past efforts and the current effort is fully funded by the City of Arlington. Based on the population densities projected in the City's GMS Comprehensive Plan and the conceptual Brekhus/Beach development plan, the existing and planned facilities will be adequate to meet the needs of the future population.		MW	JXK	10/30/17	MW
3			At that same meeting, we and the Planning Commission were told by City staff that new information was available from Public Works related to infrastructure planning for Brekhus/Beach in the updates for the Water, Sewer, and Transportation Plans and that it was posted online. Staff stated that Public Works was also working on a financing analysis related to that infrastructure which would be available at the Planning Commission' s work session on August 1, 2017. In response, the Planning Commission explicitly directed staff to request that Public Works work on the financing component for the next meeting. We were encouraged by this development.	Dannon Traxler	Noted. Thank you.		MW	JXK	10/30/17	MW
4			The following day, I reviewed the City's website and the online draft updates to the Water and Sewer Plans. I did not see any new information (about infrastructure or otherwise) related to Brekhus/Beach. I first emailed Kristin Foster on July 20, 2017 and asked if she could point me toward the new information on the City's website. She referred me to James Kelly with Public Works	Dannon Traxler	Noted. Thank you.		JK	MW	10/30/17	MW

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5			On July 21, 2017, I emailed Mr. Kelly and asked about Brekhus/Beach planning information and a financing analysis. He responded that same day, stating: ' The 2017 updated Water and Sewer comprehensive plans do not include any Brekhus/Beach infrastructure planning work other than what was included in the 2015 documents." This took me completely by surprise, given what staff stated at the July 18th Planning Commission meeting, so I then emailed Amy Rusko and Marc Hayes and asked for clarification on their statements to the Commission. When I did not receive a response from either one of them, I called and spoke directly with Amy Rusko. She verified staff's statements at the Planning Commission meeting that staff believed new information related to Brekhus/Beach infrastructure and future financing either existed in the new Water and Sewer Plans or was forthcoming, and that staff believed it would also be part of the Transportation Plan update. She said that she did not know why Public Works had not provided it.	Dannon Traxler	Based on the population densities projected in the City's GMA Comprehensive Plan and the conceptual Brekhus/Beach development plan, the existing and planned facilities that were included in the 2015 planning documents (water, sewer, and transportation) are adequate to meet the needs of the Brekhus/Beach population in the planning horizon.		JK	MW	10/30/17	MW
6			This is very troubling. It means that the information the Planning Commission received from staff at its July 18th public hearing was inaccurate, and the Planning Commission voted to send the draft Comprehensive Plan to Council after receiving this information. There is no new information on Brekhus/Beach infrastructure planning in the Water, Sewer and Transportation Plans (and apparently, none is planned), and there is no financing analysis forthcoming. We do not understand this disconnect between Planning and Public Works staff. Misinformation of this sort should not *be* presented to the public during meetings, and it certainly should not be presented to the Planning Commission who is tasked with vetting crucial planning documents for	Dannon Traxler	The water, sewer, and transportation plans include infrastructure improvement and financing plans for any needed infrastructure improvements to meet the population projections contained in the City's GMA Comprehensive Plan and at the service points as identified in the preliminary Brekhus/Beach development plan.		JK	MW	10/30/17	MW
7			As we stated in our testimony to you, infrastructure planning and the identification of mechanisms for funding infrastructure are crucial components in ensuring a OMA-compliant Comprehensive Plan in accordance with RCW 36.70A.1 15 and WAC 365-196-320(1)(e). This is particularly true, since the City's reconciliation process with Snohomish County yielded an agreement of 606 units for the Brekhus/Beach area based on a development density of 5.5 dwellings per acre. There is no infrastructure currently in place to accommodate that level of growth within the planning period, and the City is obligated to correct that deficiency with this Comprehensive Plan update.	Dannon Traxler	The water, sewer, and transportation plans include infrastructure improvement and financing plans for any needed infrastructure improvements to meet the population projections contained in the City's GMA Comprehensive Plan and at the service points as identified in the preliminary Brekhus/Beach development plan.		JK	MW	10/30/17	MW
8			Since infrastructure and funding information about areas within the City's urban growth area is necessary for the City's Comprehensive Plan to pass GMA muster, we request that at its August 2nd work session, the Planning Commission direct Public Works to come forward with new Brekhus/Beach planning information before any vote is taken on the Water, Sewer, and Transportation Plans. Since such information was promised to the Planning Commission by Planning staff, we also believe it is appropriate for the Commission to address the discrepancies between City departments to ensure that this process charts a smoother course in the future.	Dannon Traxler	Noted. Thank you.		JK	MW	10/30/17	MW

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Responses to City of Arlington Planning Commission Comments made during a Workshop on 8/1/2017										
1		General	My notes from last night's meeting showed only two comments from the Planning Commission: ... Please let me know if there is any additions or correction to the comments	James Kelly, PW Director, email to Bruce Angell, Chair	We understand Planning Commission comments at the workshop were limited to the two requests listed below.		MW	JK	10/30/17	MW
2		General	1. Please edit narrative text in Land Use sections of Water, Sewer and Transportation plan to make sure it is consistent with what is stated in City's Comprehensive Plan.	Bruce Angell, Chair	A determination of consistency between planning documents that are in preparation is an iterative process. The GMA Comprehensive Plan appears to have received more comprehensive agency comments than did the WSP (e.g., PSRC), so we are waiting for final revisions to the GMA comp plan before beginning a final review and making any necessary corrections. Also, although it is not as true for Land Use as other technical subject matter, plans adopted by reference within the GMA comp plan often contain more detail that is only summarized in the GMA plan, so the absence of some information in the GMA comp plan should not be construed as inconsistent with its adopted, referenced plans.		MW	JK	10/30/17	MW
3		General	2. After MU Overlay zoning is adopted, please revisit Water, Sewer, and Transportation modeling to make sure area population projections are consistent.	Bruce Angell, Chair	We will revisit your concern after final revisions to the GMA comp plan are completed. However, we are fairly certain that the water modeling results and their implications are within the precision and limits of a wide and reasonable range of population projections. For example, removing UGA expansion west of I-5 from consideration and reallocating more than 2,200 persons across the 342 pressure zone (generally Old Town plus city limits west of 67th Avenue), did not result in any new capital improvement projects, and only removed the projects situated west of the freeway.		MW	JK	10/30/17	MW
Responses to Comments made in Langabeer & Traxler, P.S., letter dated 8/4/2017										
1		General	I am writing on behalf of my clients Mr. and Mrs. Robert Phillips, Mr. Mike Pitman, and Ms. Jody Heigert, with regard to the City of Arlington's (City) 2017 Updates to its Comprehensive Water and Sewer, and Transportation Plans as they relate to the Brekhus/Beach Subarea. At the request of Planning staff, I am providing the following legal citations/analysis of the Growth Management Act (GMA) and associated Growth Management Hearings Board decisions related to the GMA requirement that the City plan for infrastructure to serve Brekhus/Beach within the 20-year planning period. This information has previously been submitted to both the Planning Commission and the City Council. The full text of the GMA citations is included on Exhibit A, attached.	Dannon Traxler	In general, please refer to the analysis in City Attorney Steven Peiffle's letter dated 8-15-17.		MW	JK	10/30/17	MW
2a			The City's most crucial "miss" related to Brekhus/Beach is the OMA requirement that the City include a capital facilities plan element, which requires the City to forecast future needs for capital facilities (these facilities are necessary to allow Brekhus/Beach to develop to its potential) and requires the City to develop a six-year plan to finance the capital facilities. RCW 36.70A.070(3) requires that each Comp Plan include a plan, scheme or design for:	Dannon Traxler	The City did complete a capital facilities plan for water, sewer, and transportation that assed current infrastructure capacities and projected future infrastructure needs based of population projections from the City's GMA Comprehensive Plan. There is a financial section for each capital facilities plan (water, sewer, and transportation).		MW	JK	10/30/17	MW

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2b			"(a) An inventory of existing capital facilities owned by public entities, showing the locations and capacities of the capital facilities; (b) a forecast of the future needs for such capital facilities: (c) the proposed locations and capacities of expanded or new capital facilities: (d) at least a six-year plan that will finance such capital facilities within projected funding capacities and clearly identifies sources of public money for such purposes: and (e) a requirement to reassess the land use element if probable funding falls short of meeting existing needs and to ensure that the land use element, capital facilities plan element. and financing plan within the capital facilities plan element are coordinated and consistent ". (emphases added).	Dannon Traxler	See reply above		MW	JK	10/30/17	MW
3			As far as we can tell, the City has never done any real capital facilities planning for Brekhus/Beach, as required by the GMA. The City has not forecast the future needs for Brekhus/Beach, has shown only very general proposed locations and capacities of infrastructure necessary to serve Brekhus/Beach, and has not included proposed infrastructure for Brekhus/Beach in its six-year financing plan, all despite the fact that Brekhus/Beach is an urban area within the City limits. Instead, the City ignores the capital facilities needs of the area by choosing simply not to recognize or plan for such needs and by calling the area "too difficult" to serve. The GMA doesn't allow for such choices.	Dannon Traxler	The City has completed capital planning (engineering, design and financing) for the Brekhus/Beach area. In 2007/2008 then planned populations for Brekhus/Beach were used to size the wastewater treatment plant upgrade and the amount of water rights that needed to be procured. The same ultimate build-out populations were used in sizing the current (2016/2017) improvements to Lift Station #2.		JXK	MW	10/30/17	MW
4			In addition, the City does not ensure that public facilities were available to serve Brekhus/Beach when it was annexed. The requirement of RCW 36.70A.020(12) is compelling and requires the City to "(e)ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards." (emphasis added). The current version of the Comp Plan is under appeal for the City's failure to plan and finance public facilities for the Brekhus/Beach area, and the City cannot perpetuate this same violation in this next round. Brekhus/Beach is "available for occupancy" because it is within the City limits. Thus, under RCW 36.70A.020(12) the City is bound to plan and finance the infrastructure to serve it, and the City must do so during this planning period.	Dannon Traxler	Please refer to the analysis in City Attorney Steven Peiffle's letter dated 8-15-17.		JXK	MW	10/30/17	MW

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5			In addition, RCW 36.70A.070(6) requires that the City include a transportation element that identifies "..state and local system needs to meet current and future demands." The transportation element also requires financing which must include "(a)n analysis of funding capability to judge needs against probable funding resources." Brekhus/Beach certainly has a "local system need" for roads to serve property that is within the City limits. We cannot see that the City has identified that need in any of its planning documents or done any analysis as to the funding capability of serving the area with roads. Instead, the City dismisses Brekhus/Beach as being too difficult and "too expensive" to serve, despite the fact that the City chose to annex the area. This approach violates RCW 36.70A.070(6). See Bothell, et al v Snohomish County. CPSGMHB Case No. 07-3-0026c, 21, Final Decision and Order (Sep. 17, 2007). GMA Guidelines explain: The obligation to provide urban areas with adequate public facilities is not limited to new urban areas. Counties and cities must include in their capital facilities element a plan to provide adequate public facilities to ***all*** *urban areas*, including those existing areas that are developed, but do not currently have a full range of urban governmental services or services necessary to support urban densities. WAC 365-196-320(1)(e). (emphases added).	Dannon Traxler	Noted. Thank you.		JXK	MW	10/30/17	MW
6			It is clear from the Draft Plan that the City has no current or future plans to make good on its annexation of Brekhus/Beach and to properly and responsibly plan for public facility needs (which should have been done years ago). This is unacceptable, since the City is on a GMA- mandated deadline to serve Brekhus/Beach: "(A)reas included in the UGA expansion areas must have adequate urban services available within 20 years of the area's inclusion in the UGA." KCRP VI, 06-3-0007, 11/5/07, at 9. (emphasis added). The City has not even begun to plan for the placement of growth within this urban area within the City limits. The City failed to properly plan for infrastructure when it annexed Brekhus/Beach, and it perpetuates this failure with its most recent Comp Plan review and update. The City's approach is a blatant violation of the	Dannon Traxler	Noted. Thank you.		JXK	MW	10/30/17	MW
7			The onus of properly planning for growth falls on the City and not on individual property owners, and the City's failure to properly shoulder the burden cannot be perpetuated in the current Comp Plan Update without violating the GMA. This is supported by relevant GMHB decisions. For example, in Fallgatter IX v. City of Sultan, CPSGMHB 07-3-0017, FDO (Jun. 29, 2006) at 8- 9, the Board found that "(A jurisdiction's) solely relying on future development to provide major infrastructure, such as sewer, and not planning to have the capacity to provide service to existing development, fails to meet the requirements of the GMA." In addition, the Board came to the conclusion that "...a jurisdiction must ensure that within urban areas there will be adequate and available sewer capacity to serve the existing, un-sewered urban population within the 20-year planning period." Id. Because Brekhus/Beach is within the City limits and the UGA, the City must permit urban densities in the area, and the area is de facto "urban" in nature. Since Brekhus/Beach is urban, the fact that the City has failed to serve the area (and continues to fail to properly plan for it) violates the GMA.	Dannon Traxler	Please refer to the analysis in City Attorney Steven Peiffle's letter dated 8-15-17.		JXK	MW	10/30/17	MW

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Date:	**10/31/2017**	**Snohomish Co PUD Comment Date:**	**N/A**

No.	Page No.	Section: Paragraph No.	Agency Comment	Commenter Name	City Response (specific ext revisions in bright red font)	For PDS comments only, PDS reply to City response	City Responder Name	City Reviewer Name	Implementation: Date	Implementation: Initials
8			In Fallgatter IX, the Board found that the city did not comply with RCW 36.70A.020(12)'s and 36.70A.070(3)'s mandate to provide adequate and necessary facilities to support existing and new development within the 20-year planning period. CPSGMHB 07-3-0017, FDO (Jun. 29, 2006) at 8-9. The city's Capital Facilities Plan in that case failed to provide an adequate needs assessment (i.e. current needs, future needs, and expected levels of service) so as to properly document the needed funding to supply these services, both in regard to the funds required as well as the source of the needed funds. Id. at 9. Arlington is similarly guilty: the City's Capital Facilities Plan does not identify the needed funding to develop the infrastructure and services necessary to serve Brekhus/Beach which is an urban area within the City.	Dannon Traxler	Please refer to the analysis in City Attorney Steven Peiffle's letter dated 8-15-17.		JXK	MW	10/30/17	MW
9			Similarly, in City of Shoreline, et al v. Snohomish County, Coordinated Case Nos. 09-3- 0013c and 10-3-001 l c, Final Decision and Order (Apr. 25, 2011), the GMHB found that the development regulations enacted by Snohomish County for the Point Wells Urban Center did not adopt a sufficient plan for infrastructure and services. Instead, the regulations established process for developing urban services commitments concurrently with approving project pennit applications. Spokane County tested the same 'wait and see' approach to infrastructure mitigation in Fenske v. Spokane County, arguing that "traffic impacts will be subsequently reviewed and mitigated during the site-specific land use approval process and will be required to meet traffic concurrency at that later point in time."EWGMHB Case No. 10-1-0010, Final Decision and Order (Sep. 3, 2010), at 7-8.	Dannon Traxler	Please refer to the analysis in City Attorney Steven Peiffle's letter dated 8-15-17.		JXK	MW	10/30/17	MW
10			But the Board in Fenske found that such an approach was unacceptable: "By its very nature, capital facilities planning must be done at the PLAN approval stage as opposed to the PROJECT approval stage in order to effectively provide for the necessary lead time and identification of probable funding sources, and also to inform decision makers and the public as they consider the public infrastructure impacts of proposed comprehensive plan amendments." Id. (emphasis in original). What this means is that the City can't just wait for a developer to make the development of Brekhus/Beach happen and worry about infrastructure needs then. The City must take action NOW.	Dannon Traxler	Please refer to the analysis in City Attorney Steven Peiffle's letter dated 8-15-17.		JXK	MW	10/30/17	MW
11			Finally, the assertion by Public Works that infrastructure planning and financing for Brekhus/Beach is not necessary because it only has a planned build-out of 200-plus units during this planning period is inaccurate. It is clear in the draft Plan (see p. 5-16) that the reconciliation process with Snohomish County yielded an agreement with the City of 606 units for the Brekhus/Beach area based on a development density of 5.5 dwellings per acre. This seems to be at least part of the resolution for accommodating the population projection. We do not understand how this density can be used when there's no assurance that such a density can be achieved within the planning period without adequate infrastructure. We also do not see anywhere in the draft Plan any reference to an acceptable build-out of only 200-plus units for Brekhus/Beach. This is not GMA-compliant.	Dannon Traxler	Please refer to the analysis in City Attorney Steven Peiffle's letter dated 8-15-17.		JXK	MW	10/30/17	MW

City of Arlington 2017 Amendment to the 2015 Comprehensive Wastewater Plan

Agency Comments and City Responses

Review Phase:	**WSP Agency Review Draft Issued July 2017 [to be revised to Final based on these responses to agency comments]**			**Health (RR) Comment Date:**	**N/A**
Contact:	**James Kelly and Mike Wolanek (City)**			**Ecology Comment Date:**	**8/7/2017**
	Dan Burwell (RH2 Engineering)			**Snohomish Co PDS Comment Date:**	**N/A**
Date:	**10/31/2017**			**Snohomish Co PUD Comment Date:**	**N/A**

No.	Section		Agency Comment	Commenter Name	City Response (specific ext revisions in bright red font)	For PDS comments only, PDS reply to City response	City Responder Name	City Reviewer Name	Implementation	
	Page No.	Paragraph No.							Date	Initials
12			The City concedes that the Draft Plan does not allow Brekhus/Beach to develop up to its OMA-required potential. On page 4-18 of the Draft Plan, the City states that the area is assumed to be a part of the buildable lands inventory. The City also states: "The City faces a paradox where the GMA requires that lands within Urban Growth Areas be developed at urban densities (4+ houses per acre), but there is no market or infrastructure financing available to achieve that level of development. Only a density of 20,000 square feet per acre is permissible without sewer or other facilities." Thus, in its own Comp Plan, the City is stating that it is not complying with GMA requirements in its treatment of Brekhus/Beach as far as density goes, while at the same time agreeing to use an unrealistic 5.5 acre density for growth capacity at Brekhus/Beach to satisfy population projections. This creates an internal inconsistency within the plan, which is also noncompliant with RCW 36.70A.070.	Dannon Traxler	Please refer to the analysis in City Attorney Steven Peiffle's letter dated 8-15-17.		JXK	MW	10/30/17	MW
Responses to Public Comments made during the Public Hearing before the City of Arlington Planning Commission on 8/15/2017										
1		General	Public Hearing Notes were obtained from Kristin Foster, City of Arlington Community and Economic Development on	Bruce Angell, Chair			MW	JK	10/30/17	MW
2		General	Clarification as to why Brekhus/Beach is a focus area in the Transportation Plan and not the Water and Sewer Plans?	Commissioner McDonald	Brekhus/Beach was mistakenly included as a focus area in the Transportation 2035 Plan and has been removed from applicable maps and text.		MW	JK	10/30/17	MW
3		General	What the definition is of signaled vs. un-signaled intersections, and is more curious about an un-signaled intersection. What category does a round-a-bout fall into?	Commissioner Levesque	Round-a-bouts have no automated signals and associated infrastructure with which to control the flow of traffic, and therefore are considered un-signaled intersections.		MW	JK	10/30/17	MW
4			Attorney representing Mr. Phillips, Ms. Heigart, and Mr. Pitman of the Brekhus/Beach area.	Dannon Traxler	Noted		MW	JK	10/30/17	MW
5			Comments are condensed for all three Public Hearings as the comments are essentially the same for all	Dannon Traxler	Noted. Thank you.		MW	JK	10/30/17	MW
6			Received an 11 page letter from Mr. Peiffle at the end of the business day today	Dannon Traxler	Noted. ("Today" would be 8/15/2017.)		MW	JK	10/30/17	MW
7			The gist of the letter seems that the City is opposed to our position on the plans that the City needs to complete adequate planning for infrastructure	Dannon Traxler	Noted. Thank you.		MW	JK	10/30/17	MW
8			Last time when commenting on the 2015 Plan update when adding King Thompson, and trying to put all the future growth into that area, we stated "Hey you can't do that, that's not GMA compliant because we've got this area over here called Brekhus/Beach that you can put your growth." Staff and the City Attorney didn't agree with us, but that is the reason we are all here. Snohomish County didn't agree with the City and said that the City can't expand in that area (King Thompson) because you do have adequate land capacity to put your growth	Dannon Traxler	Noted. Thank you.		JK	MW	10/30/17	MW
9			The City has to plan for the 20 year horizon to meet the growth projections looking at land capacity analysis and Brekhus/Beach is part of that, and these are planning documents to meet current and future	Dannon Traxler	Concur.		JK	MW	10/30/17	MW
10			This isn't just about capacity, it's about funding infrastructure to get that capacity to the land that needs it so you can meet your growth	Dannon Traxler	Concur.		JK	MW	10/30/17	MW
11		WSP Appendix S	The Comp Plan needs to show infrastructure planning for that entire 20 year period, how it's going to be financed, and it needs to be more than conceptual	Dannon Traxler	The roads, water and sewer layouts in WSP Appendix S demonstrate conceptual infrastructure connection points based on this first conceptual layout. The City will continue to work with Brekhus/Beach representatives as development		JK	MW	10/30/17	MW

City of Arlington 2017 Amendment to the 2015 Comprehensive Wastewater Plan

Agency Comments and City Responses

Review Phase:	**WSP Agency Review Draft Issued July 2017 [to be revised to Final based on these responses to agency comments]**			**Health (RR) Comment Date:**	**N/A**
Contact:	**James Kelly and Mike Wolanek (City)**			**Ecology Comment Date:**	**8/7/2017**
	Dan Burwell (RH2 Engineering)			**Snohomish Co PDS Comment Date:**	**N/A**
Date:	**10/31/2017**			**Snohomish Co PUD Comment Date:**	**N/A**

No.	Section		Agency Comment	Commenter Name	City Response (specific ext revisions in bright red font)	For PDS comments only, PDS reply to City response	City Responder Name	City Reviewer Name	Implementation	
	Page No.	Paragraph No.							Date	Initials
12			We do see conceptual planning for the Brekhus/Beach area with internal roads, water and sewer infrastructure, and potential connection points, but that's not real planning on how this is actually going to develop to Brekhus/Beach build out	Dannon Traxler	This is a conceptual layout that was developed per input from Brekhus/Beach representative to identify future connections to City infrastructure (water, sewer and streets).		JK	MW	10/30/17	MW
13			It was stated by staff at the last meeting that you're only planning for 200 plus units at Brekhus/Beach for the 20 year planning period, and that's not the case. In your reconciliation process it was agreed with Snohomish County that you would be building to 606 units, and that is part of satisfying your growth projections. So, within this 20 year planning period you need to show how that is obtainable, and that isn't occurring in your plan. There does need to be some sort of financial component showing how over the next 20 years this can be built out	Dannon Traxler	The capital planning process is naturally much shorter than the 20 year planning horizon under GMA.		JK	MW	10/30/17	MW
14			A letter was sent to Planning Commission with citations and including RCWs to back up previous comments (see Traxlor letter dated August 4, 2017)	Dannon Traxler	Please refer to the analysis in City Attorney Steven Peiffle's letter dated 8-15-17.		JK	MW	10/30/17	MW
15			Show an analysis of what funds the City is going to provide vs. what funds the private developer is going to provide	Dannon Traxler	We cannot project infrastructure designs or associated costs if there is no development plan that will connect into the City's infrastructure system (water,		JK	MW	10/30/17	MW
16			We understand that the developer is going to have significant amount of the improvements especially on the property itself within Brekhus/Beach and all the internal systems, but the City is going to have to participate in financing some of the extension to get the infrastructure to the land itself	Dannon Traxler	Noted. Thank you.		JK	MW	10/30/17	MW
17			There needs to be some indication in this plan that the City can provide urban governmental services by the end of the 20 year planning period	Dannon Traxler	The water, sewer, and transportation plans show that these infrastructure services will be available at adequate service levels for the 20 year planning period.		JK	MW	10/30/17	MW
18			The City's Capital Facilities Plan doesn't identify the needed funding.	Dannon Traxler	The water, sewer, and transportation capital plans do show adequate financial funding for planned improvements.		JK	MW	10/30/17	MW
19			The Transportation Plan has 280 million dollars over the next 20 years. Why can't some of that money be earmarked towards getting some extensions to Brekhus/Beach so you can satisfy your growth projections over the next 20 years?	Dannon Traxler	Based on Brekhus/Beach population projections contained in the City's General Comprehensive Plan, the transportation system servicing the Brekhus/Beach area is adequate to serve a development based on the conceptual design included in Appendix T of the transportation plan.		JK	MW	10/30/17	MW
20			A financing analysis was to be provided at the Workshop and that was ignored	Dannon Traxler	Financial planning is included in the water, sewer, and transportation plans.		JK	MW	10/30/17	MW
21			The letter received from the City Attorney at 5:06 pm wasn't appreciated when a meeting is being held at 7:00 pm	Bob Phillips	Noted. The City apologizes for the late notice. Notice of the public hearing was advertised as required by law.		JK	MW	10/30/17	MW
22			Believes that Mr. Pieffle misunderstand what they are asking for	Bob Phillips	Your opinion is noted.		JK	MW	10/30/17	MW
23			We are asking what is required by the GMA, which is to bring services to the property, not into the property. Plan for roads and support Fire and Police as the growth potentially moves into the area	Bob Phillips	Based on Brekhus/Beach population projections contained in the City's General Comprehensive Plan and the conceptual Brekhus/Beach development layout, there are adequate existing or planned city services (water, sewer, and transportation).		JK	MW	10/30/17	MW
24			There is interest in the property, but there is a TDR program in place that means nothing. No one is willing to look when a TDR program is in place, and is under the impression that this was to be abolished last year	Bob Phillips	The TDR program will be repealed and removed from the AMC upon adoption of the GMA Comprehensive Plan by the City Council.		JK	MW	10/30/17	MW
25			We're not looking for infrastructure to the Brekhus/Beach area or for you to build roads per say. Can't expect someone to buy 20 acres, develop it, but plan for 300	Bob Phillips	Noted. Thank you.		JK	MW	10/30/17	MW
26			Would like everyone to be on the same page	Bob Phillips	Concur.		JK	MW	10/30/17	MW
27			Asking for the City to provide what it is responsible for	Bob Phillips	Concur. This is the City's intent.		JK	MW	10/30/17	MW
28		Recommendation	Planning Commission voted 4-0-0-1 on 8-15-2017 to recommend to City Council approval of the 2017 Amendment to the 2015 WSP (4 commissioners in favor; 1 commissioner abstaining)	Planning Commission	Thank you.		MW	JK	10/30/17	MW

City of Arlington 2017 Amendment to the 2015 Comprehensive Wastewater Plan

Agency Comments and City Responses

Review Phase:	**WSP Agency Review Draft Issued July 2017 [to be revised to Final based on these responses to agency comments]**			**Health (RR) Comment Date:**	**N/A**
Contact:	**James Kelly and Mike Wolanek (City)**			**Ecology Comment Date:**	**8/7/2017**
	Dan Burwell (RH2 Engineering)			**Snohomish Co PDS Comment Date:**	**N/A**
Date:	**10/31/2017**			**Snohomish Co PUD Comment Date:**	**N/A**

No.	Page No.	Section Paragraph No.	Agency Comment	Commenter Name	City Response (specific ext revisions in bright red font)	For PDS comments only, PDS reply to City response	City Responder Name	City Reviewer Name	Implementation Date	Implementation Initials
In addition to responses and revisions initiated by Agency comments above, the Final GSP also includes the following revisions to the Agency Review Draft GSP. All necessary replacement pages will be provided to recipients of the Agency Review Draft.										
1	Cover	Top center Lower right	Change "Agency Review Draft" to "Final Amendment"; Change "January 2016" to "October 2017"	COA	OK		MW		10/30/17	MW
2	Behind Cover	Bottom Citation	Change "Agency Review Draft" to "Final Amendment"; Change "January 2016" to "October 2017"	COA	OK		MW		10/30/17	MW
3	Spine	Binder Spine	Create new one and print	COA	add to pdf version		MW		10/30/17	MW
4	iii to iv	Signatures	Circulate "Approvals" page in front of engineering certifications	COA	add to pdf version		MW		10/30/17	MW
5	v to vi	Signatures	James Kelly signature and stamp	COA	add to pdf version		MW		10/30/17	MW
6	vii to xiii	Signatures	Three RH2 signatures and stamps	COA	add to pdf version		MW		10/30/17	MW
7	xi to end	TOC	Regenerate Tables of Contents, etc.	COA	Regenerated all Tables, Lists. Created abbreviated TOC		MW		10/30/17	MW
8	All	Footers	Regenerate the final file name in all footers (does not require reprinting for currently circulating copies)	COA	OK		MW		10/30/17	MW

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PW Utilities

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

October 16, 2015

Mr. James Kelly
Public Works Director
City of Arlington
154 W Cox Avenue
Arlington, WA 98223

Re: City of Arlington General Sewer Plan (July 2015)

Dear Mr. Kelly:

Pursuant to RCW 90.48.110 and WAC 173-240-030, the above-referenced general sewer plan has been reviewed and, is hereby approved.

Sewage collection facilities within the planning area boundary shall be constructed according to the approved general sewer plan or amendments thereto. Prior to construction, the City is required to submit a written description of the project and written assurance that the extension is in conformance with the general sewer plan. Engineering reports and plans and specifications for planned collection facilities including sewer line extensions and pump stations, need not be submitted for approval, unless:

a) The proposed sewers or pump stations involve installation of overflows or bypasses; or

b) The proposed sewers or pump stations discharge to an overloaded treatment, collection, or disposal facility.

If you have any questions concerning this approval, please contact Lazaro Eleuterio at lazaro.eleuterio@ecy.wa.gov or call 425-649-7027.

Sincerely,

Kevin C. Fitzpatrick
Section Manager
NWRO Water Quality Section

KF:le:st

cc: Mike Wolaneck, Water Resources Planner, City of Arlington
Karla Kasick, PE; RH2 Engineers, Planners, Scientists

From:	Eleuterio, Lazaro (ECY)
To:	Mike Wolanek
Cc:	Karla Kasick; Kenny Schonberger (kschonberger@rh2.com); James Kelly; Fred Rapelyea
Subject:	RE: City of Arlington GSP
Date:	Tuesday, September 29, 2015 7:34:57 AM

Mike:

Thank you for your responses. No further details are required. Please, send two (2) hard copies of each page of the plan that were revised. I will replace the existing pages with the ones that were revised. One copy of the plan will be filed at Ecology's Central Records and the other I will send back to you.

Best regards,
Laz

Lazaro Eleuterio, Ph.D., CDT, PE
Municipal Facility Manager - Environmental Engineer 3
Washington State Department of Ecology | Water Quality Program
lele461@ecy.wa.gov
Phone: 425.649.7027



From: Mike Wolanek [mailto:mwolanek@arlingtonwa.gov]
Sent: Monday, September 28, 2015 3:32 PM
To: Eleuterio, Lazaro (ECY)
Cc: Karla Kasick; Kenny Schonberger (kschonberger@rh2.com); James Kelly; Fred Rapelyea
Subject: RE: City of Arlington GSP

Laz, I am in the process of implementing the revisions identified in the attached file in response to your comments. If you have any questions or desire more detail for any particular response, please do not hesitate to let me know.

One additional change we would like to implement is an Approvals page immediately behind the inside cover and in front of the Engineering Certifications by the City and RH2. The Approvals page would provide one place to record (and demonstrate) the acceptance (or adoption) of the Comp Plan by Ecology (with your signature and date), by the Planning Commission (with the chair's signature and date, and the date of the public hearing), and by the City Council (with Mayor's signature and date).

Any comments and correspondence that Ecology and other reviewers issue will go in Appendix J, Agency Review. The City's responses will also be recorded there. But we like the trust inspired up front in a well-vetted Plan by numerous signatures (State, local, and engineering). We're not expecting that you will change Ecology's review process, but we are

requesting that you will simply add your signature to what for us is a new format for an existing procedure. Look for this in our formal response to your comments.

Thanks, Mike

Mike Wolanek
Water Resources Planner
City of Arlington Public Works
360-403-3541 (Desk)

154 W. Cox Avenue
Arlington, WA 98223

From: Eleuterio, Lazaro (ECY) [mailto:LELE461@ECY.WA.GOV]
Sent: Monday, September 14, 2015 11:34 AM
To: James Kelly <jkelly@arlingtonwa.gov>; Mike Wolanek <mwolanek@arlingtonwa.gov>
Cc: Eleuterio, Lazaro (ECY) <LELE461@ECY.WA.GOV>
Subject: City of Arlington GSP

James and Mike:

Thank you for the opportunity to review the City of Arlington General Sewer Plan. Please, find enclosed my comments. I will issue an approval letter once Ecology's comments are fully addressed. Resubmit only the pages that will require editing and further clarification. Electronic PDF copies are acceptable.

Please, let me know if you have any questions or concerns.
Best regards,

Lazaro Eleuterio, Ph.D., CDT, PE
Municipal Facility Manager - Environmental Engineer 3
Washington State Department of Ecology | Water Quality Program
lele461@ecy.wa.gov
Phone: 425.649.7027

Review Phase:	Agency Review Draft Revised to Final based on thes Responses to Ecology's Comments							
Contact:	James Kelly and Mike Wolanek (City)					**Ecology Comment Date:**	**9/14/2015**	
	Karla Kasick (RH2 Engineering)					**COA Responses to Comments:**	**10/6/2015**	

No.	Page No.	Section Paragraph No.	Comment	Reviewer (Last Name, First Name)	Response (text revisions in red font)	Responder	Reviewer Check Off	Implementation Date	Implementation Initials
1	1-1	Chapter 1, Introduction	Under section 1.1 Wastewater Utility Ownership and Management, Ecology suggests the following language: "The City of Arlington (City) is a municipal corporation that **owns, operates and maintains** a public wastewater utility under NPDES Permit WA0022560."	Ecology (Eleuterio)	Agree. Changed "owns and operates" to "owns, operates and maintains" (page 1-1).	MW	JXK	29-Sep	MW
2	2-9	Chapter 2, Wastewater System Description	Under section 2.8.3 Lift Stations, Ecology recommends the following language: "The City currently **owns, operates and maintains** 12 wastewater lift stations." LS # 13 is equipped with 2 grinder pumps and below is the Ecology's position in regards to grinder pumps. Ecology's position on privately-owned and maintained grinder pumps: Per WAC 173-240-104, domestic sewage facilities will not be approved unless ownership and responsibility for operation and maintenance is by a public entity. If a waste discharge permit is required it must be issued to the public entity. Nothing in this rule precludes a public entity from contracting operation and maintenance of domestic sewage facilities. The exception is that ownership by nonpublic entities may be approved if the department determines the ownership in the public interest. To date, Ecology has not been presented with a case in which private ownership would be clearly in the public interest and therefore has not approved private ownership of grinder pumps. Ecology's mission is to protect water quality. History has shown that many homeowners do not take the initiative to properly maintain their on-property sewage systems. Any repair that is negleted by the homeowner can result in a significant health hazard and potential water quality deterioration. In addition, private facilities are not eligible for financial assistance from state or federal funding agencies. It is recommended that the District provide for public ownership and maintenance of the individual grinder pump stations so that Ecology can approve the Sewer Plan.	Ecology (Eleuterio)	The City owns and maintains 12 lift stations, numbers extend to 13 because LS-10 was abandoned. On page 2-9, the first sentence has been changed to read "The City currently owns, operates, and maintains 12 wastewater lift stations numbered 1 through 13, excluding 10." Later in Section 2.8.3, a 4th level header was added to clarify that the Cedar Stump lift station (#10) was abandoned in 2001. The City does not permit private sewage facilities except in unusual circumstances with specific limitations. Arlington Municipal Code 20.60 Part II A appears consistent with WAC 173-240-104 in this regard--see the link to the AMC below. Text for LS #13 under 2.8.3 has been revised to clarify the City's response during power outages. See also response to Comments #4 and 9 below. Link to: AMC 20.60 Part II A	MW	JXK	29-Sep	MW
3	2-9	Chapter 2, Wastewater System Description	Please, indicate whether Lift Station # 1 has or does not have backup power. If not, how will the City address this issue?	Ecology (Eleuterio)	LS #1 is served by the same backup generator as the entire WRF. This has been clarified in the text on about page 2-11. Also, the source areas to LS#1 are further described as: "...stormwater runoff from the site, associated public works' offices, ...".	MW	JXK	29-Sep	MW
4	2-11	Chapter 2, Wastewater System Description	On Table 2-3, please add a column "Standby Power" and describe for each lift station whether it is equipped with Portable Generator or On-site Generator.	Ecology (Eleuterio)	Table 2-3 has been modified to a landscape format to include a Stand-by Power description. (~page 2-10).	MW	JXK	29-Sep	MW

No.	Page No.	Section Paragraph No.	Comment	Reviewer (Last Name, First Name)	Response (text revisions in red font)	Responder	Reviewer Check Off	Implementation Date	 Initials
5	2-14	Chapter 2, Wastewater System Description	Please add a brief discussion to the plan on the following topic: **Bypass:** State whether or not any of the 12 lift stations have a bypass to waters of the State. If so, list the strategies to eliminate any bypass due to power outage, mechanical failure, or unusual flow regime. For instance, bypass will be eliminated by flow storage, standby generator, or a combination of both.	Ecology (Eleuterio)	The first paragraph under 2.8.3 on page 2-9 has been revised to include the following sentence: "A description of each lift station, the telemetry system, pump control logic, and potential for sewage overflows or bypass at lift stations follows." A 4th level header "Risk of Bypasses..." has been added at the end of Section 2.8.3 (approximately page 2-15) to address Overflow and Bypass Potential. Briefly, there is no potential (or extremely small potential) for sewage releases at lift stations to reach waters of the State. Table 2-3 has also been modified to include a Risk of Bypass description for each lift station.	MW	JXK	29-Sep	MW
6	2-14	Chapter 2, Section 2-3 Existing Sewer Facilities	Please, add a brief discussion to the plan on pump station operations, including level control and pumping strategies. For example, how do the pumps turn on and off? Is the water level in the wet well that dictates the pump operation runs?	Ecology (Eleuterio)	The section under 4th level header Telemetry and Supervisory Control has been revised to specifically address the logic controlling pump station operations. It has been moved to before the discussion of the individual lift stations within the same subsection (2.8.3) on about page 2-11.	MW	JXK	29-Sep	MW
7		Chapter 2, Wastewater System Description	Please, list all industrial wastewater sources, quantity, periods of production, and their characteristics. If no industrial wastewater has been not identified in the last months, please state that on the report.	Ecology (Eleuterio)	A brief source characterization section has been added as subsection 2.2.4. It distinguishes residential from commercial and industrial customers, and identifies the several industrial customers targeted in the City's pretreatment program.	MW	JXK	29-Sep	MW
8	7-6	Chapter 7, Sewer System Improvements	Chapter 2 does not describe whether Lift Station (LS) # 1 has backup power, and Chapter 7 does not describe any improvements to LS # 1. How will the City address power failure at this lift station?	Ecology (Eleuterio)	As described in the response to comment No. 3, LS#1 is served by the same back up generator as the WRF. No improvement is necessary & no changes have been made.	MW	JXK	29-Sep	MW

No.	Page No.	Section Paragraph No.	Comment	Reviewer (Last Name, First Name)	Response (text revisions in red font)	Responder	Reviewer Check Off	Implementation Date	Implementation Initials
9	7-7	Chapter 7, Sewer System Improvements	Chapter 2 indicates that Lift Station # 13 is not equipped with a backup generator. How will the City address power failure at this lift station?	Ecology (Eleuterio)	No improvements are proposed for this "mild" deficiency (see response to Comment 2 above), & no changes have been made. Text for LS #13 under 2.8.3 has been revised to clarify the City's response during power outages as follows. During power outages, staff check all facilities, then re-check on a defined schedule. LS #13 would be serviced at an interval no greater than 48 hours. For extended outages, the City has three alternatives to assure successful backup operations. The simplest (and the one used the only time an extended outage required it) is the use of the utility's trash pump to pump the LS reservoir's contents to the adjacent manhole on the gravity line just 6 feet away. Two other alternatives are the use of either a portable generator or the vactor truck.	MW	JXK	29-Sep	MW
10	7-11	Chapter 7, Sewer System Improvements	Are both Interim and Permanent Improvement costs included in the Facilities Improvement costs? If so, would it be possible to show both costs before adding up?	Ecology (Eleuterio)	Yes. Although interim improvements were primarily identified for Project F2 at LS#4 and Project F3 at LS#7, where smaller single-year "early investments" were adequate to delay larger single-year expenditures by 3 to 5 years. These totals are easy to see without the need for a subtotals column. Where other projects include multi-year expenditures over the course of 2 or more consecutive years, this reflects the City's cost-basis (annual) accounting cycle, and a construction strategy to distribute funding requirements over more than one year. Totals for these permanent projects are already provided. *continued*	MW	JXK	29-Sep	MW
					In summary, it seems unnecessary to provide two additional columns (Perm. and Int. subtotals) for the two projects, especially when the table size is already 11x17". To help convey the above explanation, the text under 7.3.2 for projects F2 and F3 is revised to specify the years when the interim and permanent components of the projects are implemented. The reader will be able to track the scheduling and costs in Table 7-2.		JXK	29-Sep	MW

No.	Page No.	Section Paragraph No.	Comment	Reviewer (Last Name, First Name)	Response (text revisions in red font)	Responder	Reviewer Check Off	Implementation Date	 Initials
In addition to responses and revisions initiated by Ecology's comments above, the Final CWP also includes the following revisions to the Agency Review Draft CWP. All necessary replacement pages will be provided to recipients of the Agency Review Draft.									
11	Cover	Top center Lower right	Change "Agency Review Draft" to "Final"; Change "July 2015" to "October 2015"	COA	Done	MW	JXK	5-Oct	MW
12	Behind Cover	Bottom Citation	Change "Agency Review Draft" to "Final"; Change "July 2015" to "October 2015"	COA	Done	MW	JXK	5-Oct	MW
13	iii to iv	Signatures	Create "Approvals" page in front of engineering certifications	COA	Done	MW	JXK	2-Oct	MW
14	v to vi	Signatures	James Kelly signature and stamp	COA	Done. Replace page into final pdf document.	MW	JXK	29-Sep	MW
15	vii to xiii	Signatures	Three RH2 signatures and stamps	COA	Done. Replace page into final pdf document.	MW	JXK	29-Sep	MW
16	xi to end	TOC	Regenerate Tables of Contents, etc.	COA	Done	MW	JXK	5-Oct	MW
17	ES1 to ES6	Executive Summary	Correct headers confirmed for all sections of document	COA	Done	MW	JXK	5-Oct	MW
18	All	Footers	Regenerate the final file name in all footers (does not require reprinting for currently circulating copies)	COA	Done	MW	JXK	5-Oct	MW
19	3-12	below last paragraph near bottom of page	Extraneous sentence regarding formatting	COA	Deleted "This page blank...."	MW	JXK	6-Oct	MW
20	8-3	8.2.2	Inaccurate description of duties.	COA	Delete "Enters side sewer permit data in the sewer database." from under Utilities Administrative Specialist.	MW	JXK	6-Oct	MW
21	8-12	8.5	Position name inconsistent with org chart.	COA	Insert Administrative to read "Utilities Administrative Specialist".	MW	JXK	6-Oct	MW
22	Chapt 9	Financial Plan	Based on a request from the City's Executive Department, the City will not be instituting a **Rate Stabilization Fund.** The chapter has been edited and fund balance spreadsheets adjusted to reflect this change. As stated earlier in this chapter, a rate stabilization fund is a tool that is primarily used to show security to loan or bonding agencies. The City already sets up separate bond reserve funds for each debt secured and will continue to do so in the future.	COA Executive Dept	Revisions made. Chapter 9 has been edited and fund balance spreadsheets adjusted to remove references to a Rate Stabilization Fund. Inserted into Final.	JXK	JXK	5-Oct	MW, FCS
23	After G-2	SEPA DNS	Added signed DNS (2 pages) to completed SEPA checklist	COA	Inserted DNS (one sheet; 2 pgs)	MW	JXK	6-Oct	MW
24	J-1	Apdx J cover	Reprint without placeholder notes	COA	Deleted "Empty until...." Created placeholder for Ecology approval letter.	MW	JXK	6-Oct	MW
25	After J-2	Comments/responses	Missing from Agency Review Version	COA	Inserted comment/response spreadsheet and email correspondence.	MW	JXK	6-Oct	MW