CITY OF FERNDALE

DRAFT
COMPREHENSIVE
SEWER PLAN

Prepared for:

By:

Wilson Engineering, LLC

February 2011

CITY OF FERNDALE

Public Works Department
2095 Main Street
Ferndale, Washington
98248

DRAFT COMPREHENSIVE SEWER PLAN

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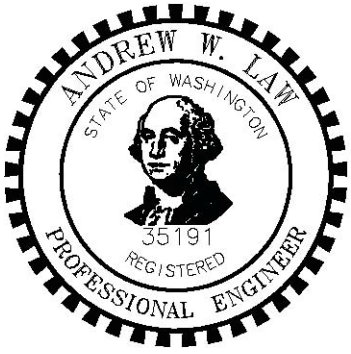

February 2011

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I. BACKGROUND

This updated Comprehensive Sewer Plan for the City of Ferndale (City) has been prepared at the request of the Director of Public Works and in accordance with the Washington State Department of Ecology (DOE) requirements as presented in WAC 173-240-050, and city sewer planning requirements as presented in RCW 35.67.020. The WAC regulations are attached as Exhibit W. This comprehensive plan includes a schedule for the City to provide adequate sewer collection and treatment capacity in accordance with Washington DOE requirements. In addition, this comprehensive plan is intended to be used to apply for and receive either grants or loans from the Department of Ecology or other funding sources for Capital Improvement Projects. Finally, this comprehensive plan is intended to satisfy the requirements of the Washington State Growth Management Act (GMA – RCW 36.70A.070 (3)).

A Glossary of Terms is included in the back of this document.

A. Scope and Objective of Update

1. General

This plan supersedes the 1996 Comprehensive Wastewater Facilities Plan and Addendum #1 with respect to the sewer collection system. This plan does not reassess proposed improvements for the Wastewater Treatment Plant (WWTP) presented in the 1996 Plan. This Plan only updates the predicted wastewater flows and the associated schedule for the WWTP Phase III improvements outlined previously (Phase I and II have been completed). Given the City's current wastewater flows and predicted growth, the WWTP improvements are scheduled to be reassessed in a future Plan update (2016).

This plan will identify needed capital facility improvements to the City's sewer collection system infrastructure based on existing and future capacity needs, and ongoing replacement of aging infrastructure. These needed improvements then become Capital Projects with a preliminary scope, cost estimate and proposed schedule.

After the adoption of this Plan, the next step is to conduct an assessment of the sewer rates and charges to ensure that the City has sufficient funding available to meet the capital needs. The City has various funding sources available for sewer capital projects including (but not limited to) sewer rates and connection fees, bonds, loans, grants, utility local improvement districts (ULIDs), and developer extension contracts.

2. Scope and Objective

The purpose of this Comprehensive Sewer Plan is to provide a comprehensive overview of the existing sewage collection and treatment facilities currently operated and maintained by City of Ferndale. In addition, this report addresses proposed future facilities development and population growth within the City and its unincorporated Urban Growth Area (UGA). The report evaluates the City's wastewater facility needs based on projected residential population growth and commercial and industrial demands on the collection and treatment system through 2034. The plan is based on population projections developed as part of the City's population allocation as determined by Whatcom County, pursuant to policies and procedures described in the GMA.

This report will cover the following topics:

- system owner/operator information,
- sewer system layout including a description of the existing system boundaries,
- description of existing collection and treatment facilities including recently completed improvements,
- discussion of development trends within City sewer boundaries,
- discussion of existing and future collection and treatment issues such as current and future sewer flows, and infiltration and inflow (I & I),
- discussion of sewer rate structure and revenue planning,
- discussion of present and future development alternatives within the City boundaries,
- outline of future improvement projects within the City

3. Overview of Growth Management Implications on this Comprehensive Sewer Plan Update

This update of the Comprehensive Sewer Plan for the City of Ferndale seeks to comply with its own Comprehensive Plan, the Whatcom County Comprehensive Plan and the requirements of the Growth Management Act. The primary reasons for the City of Ferndale to update its plan at this time are:

- to ensure compliance with regulations requiring regular updates,
- to incorporate capital improvements made in the last several years,
- to reflect changes to the City's Urban Growth Area boundaries over the last several years,
- to model and analyze the collection system's capacity to meet existing and future needs, and identify capital projects where necessary to meet those needs,
- to outline and update the City's Capital Improvement Plan for the sewer system, and
- to ensure the City's ability to set and collect appropriate connection charges and sewer service charges for all City facilities.

4. Documents Incorporated by Reference

The City maintains several documents that are relevant to this Comprehensive Sewer Plan that are hereby incorporated by reference. Since the nature of these documents require them to be updated separately from the Comprehensive Sewer Plan, they have not been integrated into this Plan. Some of these documents have been attached as Exhibits for convenience and are current as of the Plan publication date, but are subject to change and should not be considered the official version of the document.

The documents incorporated by reference include:

- City of Ferndale Municipal Code
- 1996 Comprehensive Wastewater Facilities Plan and Addendum #1
- City of Ferndale Design and Construction Standards
- Developer Extension Agreement - Master Form
- Water System Comprehensive Plan
- City of Ferndale Zoning and Comprehensive Plan Maps (Exhibit A)
- City of Ferndale Sewer Rates and Fee Schedule (Exhibit F)

B. System Owner/Operator Information

1. Office Location and Governing Information

The sewer collection facilities covered in this report are owned and operated by:

City of Ferndale – Public Works Department
2095 Main Street
Ferndale, Washington 98248
(360) 384-4006 – Office Telephone
(360) 384-5189 – Office Fax

The City is administered by the Mayor and a seven-person City Council who are each elected at large for four (4) year overlapping terms. The Mayor and City Council meet at least twice monthly and holds special sessions as the need arises.

2. Operations Information

The City Public Works Department is responsible for planning, construction, and operation/maintenance of all public sewer facilities within the City's boundaries. The operation and maintenance of the City's facilities is overseen by the Public Works Director who works with a support staff consisting of office administrative staff, and operations and maintenance crew. The City contracts for legal counsel and consulting engineers. The City Public Works Department operates out of their City Hall office at 2095 Main Street, their Public Works Department Shop Facility at 5735 Legoe Avenue, and the WWTP at 5405 Ferndale Rd, Ferndale, WA.

C. City Boundaries and Sewer Service Areas

1. General City Boundary Information

The City of Ferndale boundary includes areas in northwestern Whatcom County along the Nooksack River and Interstate-5. The extents of the City's existing boundaries are shown on Exhibit A. The City boundaries encompass a total area of approximately 4,300 acres. An additional 1,200 acres are identified as Urban Growth Area (UGA). The City's current population is estimated at 11,210 (2010). Urban growth over the next 24 years is expected to increase the City's population to approximately 26,500. Whatcom County has allocated 8,367 people to the City by 2031, for a total population of approximately 20,000 people by 2031. Projecting out, the City population would to be approximately 21,500 by 2034. However, the City has decided to base this sewer plan and its transportation plan on slightly higher population projections in order to plan for a slight reserve capacity. These population numbers are based on those incorporated into the City's Transportation Element of the Comprehensive Plan, and will be further updated (as necessary) during the City's scheduled update to the full Comprehensive Plan in 2014. The community consists of a mix of residential, commercial and industrial land uses.

The City Comprehensive Plan land use and zoning maps that are presented in Exhibit A are up-to-date as of the publication of this plan and are included in this plan for convenience only. The official Comprehensive Plan Map and the official City of Ferndale Zoning Map

are maintained by the City's Community Development Department and current versions are available from them.

2. Existing Sewer Service Areas

The City of Ferndale's sewer service area includes the area located within the City limits and two small areas outside of the City limits. The areas outside of the City limits are the Bellaire Estates subdivision located on the north side of Smith Road, and the area at the intersection of Smith Road and Northwest Avenue. These areas were connected to the City's sewer system in 1985 and 1994, prior to the establishment of the final Urban Growth Area boundaries in 1997. As the two areas are outside the current limits of the Ferndale Urban Growth Area and Urban Reserve, the City has no plans to expand sewer service beyond the areas already served.

3. Proposed Sewer Service Areas

The City of Ferndale's policy no longer allows sewer service to be extended outside of the City limits. Areas must complete the annexation process before they can be served by City sewer. The areas anticipated for future sewer service have been identified and included in the City's Urban Growth Areas. These areas are identified in the City Comprehensive Plan land use and zoning maps in place at the time of adoption of this plan are shown in Exhibit A.

II. EXISTING SEWER SYSTEM FACILITIES AND LOCATIONS

A. Wastewater Collection and Delivery System

This section describes and analyzes the existing City facilities, which consist of gravity main and force main collection and delivery system piping that convey wastewater directly to the City Wastewater Treatment Plant. Analysis of the current and future projected wastewater flows for the system, as well as a discussion of the system inflow and infiltration, is included.

1. System Description

Ferndale's existing collection system contains more than 308,000 lineal feet of sewer piping (gravity and forcemain). It is made up of piping 4 to 48 inches in diameter. Approximately 64% of the system consists of 8-inch gravity sewers. There are also 17 pumping stations currently used for transmission of wastewater flows, which are described in more detail in Section II.B. Table 1 summarizes the collection and delivery system piping components for the City collection system.

Table 1: City of Ferndale Collection System - Component Listing

System Component	Approximate Quantity
Sewer Manholes	1,400
Sewer Pump Stations	17
4-inch Force Main	6,762 LF
6-inch Force Main	6,240 LF
8-inch Force Main	8,025 LF
10-inch Force Main	1,650 LF
12-inch Force Main	1,530 LF
6-inch Gravity Sewer	3,227 LF
8-inch Gravity Sewer	198,329 LF
10-inch Gravity Sewer	22,001 LF
12-inch Gravity Sewer	15,860 LF
15-inch Gravity Sewer	13,128 LF
16-inch Gravity Sewer	2,078 LF
18-inch Gravity Sewer	10,961 LF
21-inch Gravity Sewer	8,148 LF
24-inch Gravity Sewer	736 LF
27-inch Gravity Sewer	3,698 LF
30-inch Gravity Sewer	694 LF
32-inch Gravity Sewer	351 LF
36-inch Gravity Sewer	500 LF
42-inch Gravity Sewer	2,243 LF
48-inch Gravity Sewer	431 LF
8-inch Siphon Sewer	1,085 LF
12-inch Siphon Sewer	1,085 LF

The City has completed a significant mapping project of their sewer collection system which began with a field survey of its 1,400 manholes to obtain x-y coordinates and rim elevations. Public Works staff then inspected every manhole and recorded the inlet and outlet pipe information – size, material, and depth. This data was integrated into the City's GIS database in 2010. Exhibit B is based on this GIS database and shows the sewer pipe and pump station locations and flow directions.

The City has also completed several capital projects that improved the operation of the sewer collection system. The most recent of these projects are listed below.

Cascade Peak Sewer Bypass (2010)
For this project, approximately 400 lineal feet of 8 inch sanitary sewer main was installed on Malloy Avenue from approximately 100 feet south of Oxford Court to Willow Court. This new pipe allows the flows from PS#19 – Malloy Village to no longer be re-pumped by PS #11 – Cascade Peaks, but to continue in a gravity main in Malloy Road.

Second Avenue Extension Project (2010)
This project called for several street improvements in the area of Second Avenue, and the Portal Way/I-5 Interchange. Work also included installation of 3,400 lineal feet of 18-inch sanitary sewer line, 5,500 lineal feet of storm drain line, and 4,500 lineal feet of water main.

Southwest Sewer Interceptor Project (2006)
This project provided for the installation of approximately 7,100 lineal feet of new 18-inch to 27-inch sanitary sewer main on Main Street and along Imhoff Road to Ferndale's wastewater treatment plant facility.

Third Avenue Street and Sewer Improvement Project (2006)
This project included installation of approximately 900 lineal feet of roadway (curb, gutter and sidewalk), plus waterline and storm sewer improvements on 3rd Avenue. A new 15-inch sanitary sewer main was installed along Third Avenue, Washington Street and Shuksan Avenue, near Ferndale High School.

2. Inflow and Infiltration (I & I)

Statistical evaluations of the City's I & I indicates an approximate 3% or less annual increase in I & I, which is less than or equal to the population increase. The City's National Pollution Discharge Permit (NPDES) permit for discharging to the Nooksack River requires that a remedial action program take place if I & I increased by more than 15% over a one year period. In June 1996, Ferndale conducted an infiltration and inflow inspection and evaluation on 6,130 lineal feet of piping and 28 manholes. A 1998 report entitled, "Phase I Investigation and Sewer System Improvements Report", summarized the results of the inspection and provided an analysis of needs and recommended improvements. The City made major improvements to the system in 1998, including a 3,200-lineal foot primary interceptor (30-inch to 48-inch), as well as 500 lineal feet of secondary interceptor (24-inch to 30-inch). The City later completed the Phase I rehabilitation program including replacement of 2,700 LF of 8"-10" pipe and manholes on sewer main on 3rd Street and between Malloy Road and the railroad and replacement of 800 LF of 10" pipe and manholes on Vista Drive. The City also repaired immediately critical sections of the collection system to a functioning condition.

The 1998 made several other recommendations, most of which have been implemented. The sewer system was recently inventoried (including surveying of manhole coordinates and inside manhole measurements) and a GIS database and map created. The recommendation for sewer system flow modeling and calibration has been implemented during the completion of this Comprehensive Sewer Plan. One of the recommendations -

implementation of a regular program of sewer line video inspection has yet to be implemented

The most recent I & I report prepared in September 2008 shows that I & I is seasonal (during wet months), and is increasing at only 2% per annum, which is less than the annual growth rate. EPA's criteria for non-excessive infiltration is defined as flow less than an average of 120 gallons per capita during dry periods. Non-excessive inflow is defined by EPA as a wet weather flow of less than 275 gallons per capita. Even with the 2% increase the City is still within the listed EPA guidelines according to the September 2008 I & I assessment.

City sewer flow monitoring was conducted from April 27 – May 26, 2010 at six locations. The time frame (May) of the flow monitoring was representative of the average flow conditions for the year. The sewer flow monitoring was repeated again from January 12 – February 7, 2010 at same six locations. The time frame (January) of the flow monitoring is representative of the seasonal peak flow conditions for the year. The six locations monitored are listed in Exhibit I - Hydraulic Analysis. Preliminary results of the sewer flow monitoring give more inference into the volume of infiltration and inflow. During January the night time flow rate ranged from 500 GPM to 700 GPM during periods of limited rain and up to 1600 GPM during heavy rain. This indicates that seasonal peak infiltration rate is about 600 GPM (equivalent to 77 gpcd) and that peak infiltration and inflow is about 1600 GPM (equivalent to 200 gpcd).

As part of the manhole and infrastructure data collection, the manholes were visibly inspected and any condition issues were noted. This data collection has led to qualitatively and often quantitatively identifying manholes with significant infiltration, so that rehabilitation can be included in the Capital Improvement Plan (e.g., CIP: annual Sewer I&I Projects starting in 2013; Annual Sewer Slipline Project starting in 2015; specific pipe replacement projects).

3. Existing Wastewater Flows

All service connections in the City's sewer system are un-metered. Wastewater flow through the City WWTP is measured at the effluent side of the system and includes all leachate and all other wastewater contributions (Cedarville Landfill and Olivine Corporation) in addition to domestic sewage. In 1998, the WWTP headworks were constructed and included two Parshall flumes for influent flow measurement. However, the Parshall flumes did not function correctly and the City deemed the influent flow measurement data as unusable. Replacement of the Parshall flumes with V-notch weirs (completed January 2011) now provides accurate influent flow data. The data presented in this Sewer Comprehensive Plan are as recorded at the WWTP effluent V-notch weir. As a result, measured peak flows are attenuated by retention in the lagoons.

Annual Average

Table 2 presents the annual average wastewater flows as recorded at the City WWTP effluent during the years 2006 through October 2010. Also presented in Table 2 are estimated population and the calculated annual average per capita flow rates.

Table 2. Ferndale WWTP Annual Average Flow

Year	Flow (MGD)	Population	Per Capita (gpcd)
2006	1.50	10,280	146
2007	1.53	10,540	145
2008	1.49	10,800	138
2009	1.58	11,080	143
2010	1.60	11,210	143
Average =	1.54		143

Monthly Average

Table 3 presents monthly average flow measured at the WWTP effluent for the years 2006 through October 2010. The monthly average wastewater flows vary from 0.96 MGD to 2.72 MGD.

Table 3. Ferndale WWTP Monthly Average Flow

	Flow (MGD)				
Month/ Year	2006	2007	2008	2009	2010
Jan	2.72	2.41	1.83	2.57	2.08
Feb	1.92	1.95	1.78	1.57	1.75
Mar	1.56	2.45	1.63	1.77	1.71
Apr	1.45	1.57	1.53	1.67	1.79
May	1.22	1.33	1.40	1.58	1.51
Jun	1.14	1.16	1.27	1.14	1.57
Jul	1.02	1.07	1.06	1.05	1.14
Aug	0.96	1.03	1.18	1.06	1.06
Sep	1.05	1.02	1.15	1.12	1.43
Oct	1.06	1.25	1.18	1.42	1.37
Nov	1.89	1.26	1.90	2.22	1.66
Dec	2.06	1.88	1.91	1.83	2.18
Annual Average =	1.50	1.53	1.49	1.58	1.60

Peak Month, Peak Day and Peak Hour

Table 4 summarizes peak month and peak day flows as recorded at the WWTP effluent for the years 2006 through October 2010. The average peak month flow for the period is 2.37 MGD and the average peak day flow is 4.59 MGD. There is no apparent temporal trend to the peak month and peak day flows over the period of data presented.

Table 4. Ferndale WWTP Peak Month and Peak Day Flows

Year	Peak Month Flow (MGD)	Month	Peak Day Flow (MGD)	Month
2006	2.72	Jan	4.56	Jan
2007	2.45	Mar	4.33	Mar
2008	1.91	Dec	3.22	Nov
2009	2.57	Jan	7.27	Jan
2010	2.18	Dec	6.64	Dec
Average =	2.37		5.20	
Permit Limit =	3.23		---	

Peak hour influent flows cannot be estimated form the existing data at the WWTP effluent. They would not be representative because of the attenuating effect of the treatment lagoons.

4. Existing Wastewater Loadings (CBOD, TSS, TKN, Ammonia)

For the immediate purpose of this analysis, the City WWTP's existing wastewater quality will be characterized in terms of 5-day Carbonaceous Biochemical Oxygen Demand (CBOD) and Total Suspended Solids (TSS) only. CBOD and TSS are of primary concern due to their influence on sizing and selection of wastewater treatment facilities. Additional wastewater quality characteristics discussed briefly are Fats, Oils, and Grease (FOG), Total Kjeldahl Nitrogen (TKN) and Ammonia.

Table 5. Ferndale WWTP CBOD and TSS Loading

Year	Average Daily CBOD (lb/day)	Peak Month CBOD (lb/day)	Average Daily TSS (lb/day)	Peak Month TSS (lb/day)
2006	2,874	3,246	2,360	2,790
2007	2,693	3,356	2,652	4,115
2008	2,734	3,695	2,564	3,414
2009	3,003	3,917	2,864	3,812
2010	2,992	3,432	3,446	4,591
Average =	2,859	3,529	2,777	3,744
Percent of Limit =	--	79%	--	69%
Permit Limit =	--	4,490	--	5,388

Peak month influent CBOD loading is currently 3,529 lb/day or about 79% of the permit limit. Peak month influent TSS loading is currently 3,744 lb/day or about 69% of the permit limit.

Fats, Oils and grease (FOG) loadings are controlled by ordinance and are not problematic, except for infrequent slug loads.

TKN and ammonia influent loadings are monitored three times per five years. The data suggest that loadings are typical for municipal wastewater. Peak month influent TKN and ammonia loading are currently about 800 lb/day and 600 lb/day, respectively. The WWTP oxidizes virtually all ammonia during May – October via nitrification. However, the WWTP cannot remove ammonia during the cooler months. During the remaining months of the year, nitrification ceases and ammonia is removed only partially by uptake, settling, and volatilization. A seasonal ammonia effluent limit is in effect during June – October. During the cooler months, the outfall mixing zone is sufficient to meet receiving water quality standards at the current design flow. If ammonia removal is ever to be required, then either an additional treatment process will need to be added or the treatment process changed to activated sludge. In addition, if the WWTP capacity is upgraded in the future to a higher flow capacity, then the ammonia limit would be tightened (due to a reduced mixing zone dilution factor) and the limit would likely apply year round. Additional ammonia removal would be required in this event as well.

5. Future Projected Wastewater Flows

Wastewater flow is projected to increase at 3 percent per year. This is a conservative estimate (conservative being high in this case) based on conservative estimates of population growth and assuming that per capita rates of water consumption and I & I will not decrease. Table 6 displays the projected average and peak flows to the WWTP from the collection system.

Peak month flow is projected to increase to the permit limit of 3.23 MGD by the year 2021. Therefore, per the permit requirement, planning for increasing WWTP capacity or rerating capacity for flow would need to begin in 2016. Of course, this point could be reached sooner or later depending on many factors (I & I control being a major factor).

Table 6. Ferndale WWTP Projected Flow

	Existing 2010	10 years 2020	20 years 2030	24 years 2034
ERUs	5,183	6,966	9,361	10,536
Projected Population	11,280	15,159	20,373	22,930
Projected Average Daily Flow (MGD)	1.54	2.07	2.78	3.13
Projected Peak Month Flow (MGD)	2.35	3.16	4.24	4.78
Projected Peak Day Flow (MGD)	4.59	6.17	8.29	9.33
Projected Peak Hour Flow (MGD)	6.16	8.28	11.13	12.52

ERUs (equivalent residential units) are calculated as shown in the example below for 2009. An equivalent residential unit is equal to the average flow from a single family residence. For other connection types, the number of ERUs is calculated by multiplying the ratio of flow from that type to the flow from the average single family residence. The ratio for apartment units is 0.66. The ratio for all other connection types averages 3.17, although the actual number of ERUs per connection is calculated based on metered volume.

Connection Type	No. of Connections	ERU per Connection	ERUs
Full time single family residential	3,448	1.00	3,448
Full time residential apartment	911	0.66	601
Commercial/Institutional	337	3.17	1,068
Total	4,696		5,117

6. Future Projected Wastewater Loadings (CBOD, TSS)

Influent loading of CBOD and TSS are expected to increase proportionally with flow increase (i.e., 3 percent annually). Table 7 displays the projected loadings to the WWTP compared to the permit limits. Peak month CBOD is projected to increase to the permit limit of 4,690 lb/day by the year 2020. Therefore, per the permit requirement, planning for increasing WWTP capacity or rerating capacity for CBOD will need to begin in 2016. Annual review of projected flows and loads should be undertaken to reevaluate this projection. It should also be noted that certain new industrial sources (e.g., food processing) could increase load substantially in a short time and thereby trigger the need for immediate planning for capacity increase.

Table 7. Ferndale WWTP Projected Loadings

	Permit Limits	Existing 2010	10 years 2020	20 years 2030	24 years 2034
Connections (ERUs)	--	5,183	6,966	9,361	10,536
Population Estimate	--	11,280	15,159	20,373	22,930
Projected Average CBOD (lb/day)	--	2,859	3,842	5,164	5,812
Projected Peak Month CBOD (lb/day)	4,490	3,529	4,743	6,374	7,174
Projected Average TSS (lb/day)	--	2,777	3,732	5,016	5,645
Projected Peak Month TSS (lb/day)	5,388	3,744	5,032	6,762	7,611

B. Pumping Facilities

The City of Ferndale collection system is equipped with seventeen (17) sewer pump stations which lift and transport wastewater collected from various sewer service zones of the City to the City WWTP. Exhibit D shows the City sewer zones and their flow path. Exhibit J includes the pump curves and system information for each station. The City pump stations and their characteristics are as follows:

PUMP STATION & LOCATION	SERVICE AREA (Contributing Sewer Zones & Pump Stations)	Capacity (gpm)
PS # 2 - Main St N Side Pioneer Bridge	E1 (PS#3, PS#4)	1,247
PS # 3 - Barrett Rd South of Main St	E2 (PS#15)	1,260
PS # 4 - Smith Rd / North of Ready Mix	E3 (PS#17)	604
PS # 5 - Northwest Rd / County Planning	E6	197
PS # 6 - Correll Park / Flair	W4	118
PS # 7 - Main St / 7-11 / Post Office	W12	375
PS # 9 - Portal Way North	Portion of W3	280
PS # 10 - Aquarius / Apollo Dr	W6 (PS#18)	236
PS # 11 - Oxford / Unrein Dr (Cascade Peaks)	W8 (PS#19)	158
PS # 15 - Smith Rd / Bellaire Estates	E5 (PS#5)	435
PS #16 - Portal Way South near I-5	Portion of W3 (PS#9, PS#22)	566
PS # 17 - Slater Rd / Silver Ck Ind Park	E4	471
PS # 18 - Nicholas Dr / Ryan's Glen	W7	135
PS # 19 - Malloy Village	W9	142
PS # 20 - Church Rd / South Church LLC	W10	118
PS # 21 Ariel Court	Portion of W5	210
PS #22 - Whiskey Creek	Portion of W3	226

Notes: All listed capacities are design capacities as predicted by the hydraulic model. Multiple pump operation could provide higher flows for short durations.

Each pump station installation is comprised of a wet well, dry-pit or top-mounted pumping equipment, and local pump station controls. Six (6) pump stations have telemetry communication systems. Four pump stations are connected to emergency backup generators to insure normal pump station operation in the event of a power outage. Ten (10) of the remaining lift stations are equipped with onsite generator receptacle outlets for connection to the City's portable generators

in the event of a power outage. There are three pumps stations that do not have generators or the ability to connect a portable generator to; PS #7 Main St/7-11/Post Office, PS #11 Oxford/Unrein Dr. (Cascade Peaks), and PS #21 Ariel Court.

The proposed capital improvement plan includes an ongoing program for pump station upgrades, improvements and replacement of aging equipment. The table below lists some of the recent pump station projects.

Table 8: Sewer Pump Station Projects Completed

PS # 2 - Main St N Side Pioneer Bridge	Pumps replaced in 2006
PS # 5 - Northwest Rd / County Planning	Pumps being replaced in 2010-2011
PS # 10 - Aquarius / Apollo Dr	Pumps replaced in 2008
PS # 19 - Malloy Village	New pump station installed (2005)
PS # 20 - Church Rd / South Church	New pump station installed (2007)
PS # 22 - Whiskey Creek	New pump station installed (2007)

C. Wastewater Treatment Plant

The City of Ferndale WWTP serves a population of approximately 11,210 (2010, State of Washington Office of Financial Management). The wastewater flow to the WWTP is primarily domestic sewage from residential, institutional, and commercial businesses. There are also some small sources of industrial wastewater and the City accepts some trucked landfill leachate. The WWTP does not accept septage.

The WWTP was originally constructed in 1969 with a design capacity of 0.50 MGD. It was subsequently expanded in 1984 and 1992 to accommodate a design flow of 1.72 MGD. The WWTP was upgraded with the Phase I and Phase II Improvements during 1996 and 1998 respectively. These upgrades increased the capacity to the currently permitted peak month flow of 3.23 MGD. In the 1996 Sewer Plan, this capacity was projected to be adequate through 2003, when the population would have reached 12,400 (based on 7% annual growth) and all industrial areas built out. Growth in population and in industrial development has been less than half of the projected amount. The 3.23 MGD capacity is still adequate in 2011. Phase III as planned will effectively double the WWTP capacity to 6.37 MGD. In the 1996 Sewer Plan, this capacity was was projected to be adequate through 2015, when the population would have reached 27,800 (based on 7% annual growth for 20 years). These growth rates have been borne out (the population growth has been about 3 percent since the last upgrade and industrial flows have not increased substantially).

Prior to the Phase I improvements, the WWTP consisted of four partial-mix aerated lagoons, the first two operating in series and the final two operating in parallel, followed by a polishing pond and chlorination facilities. Partial-mix lagoons provide both treatment and settling in the same basin.

A small aerated pretreatment lagoon was constructed to receive leachate hauled from the Cedarville landfill and other sources. The leachate is aerated and then mingled with the main waste stream for full treatment.

In the Phase I upgrade, the largest lagoon (West Lagoon) was lined and converted to the current dual-power multi-cellular (DPMC) aerated lagoon system, which increased treatment capacity of the WWTP to approximately 3.23 MGD (peak month). The lagoon upgrade and other new facilities (filter system, chlorination/dechlorination, effluent pump station, pipeline and outfall) were included in Phase I of the WWTP upgrade and expansion improvements. Phase II improvements included the headworks facilities and additional effluent pumping capacity. Phase III improvements will involve the addition of a second parallel DPMC system modified from the existing partially-mixed aerated lagoons, along with capacity increase for the mechanical screen, filter system, chlorination system, and effluent pump station.

When the City upgraded its wastewater plant in 1996, completing construction in 1998, the treatment process "Dual Power Aerated Lagoon" was considered developmental technology by DOE. A dual power aerated lagoon process is a multi-cell lagoon system with a single completely mixed first cell followed by a series of equal volume partially mixed cells. The first lagoon or cell has high powered aeration to keep solids fully mixed in suspension. Subsequent cells have lower powered aeration and are partially mixed to allow settling of sludge.

Treatment Process:
A schematic diagram of the existing WWTP process is included in Exhibit K. For reference, the proposed Phase III WWTP upgrade layout (1996 Facility Plan) is also included in Exhibit K. Wastewater influent enters the facility and lifted to the top of the headworks by Archimedes screw pumps (3 total). In the headworks, the raw wastewater flows through a mechanical screen (or alternately through a manual bar screen) and through a V-notch weir to gauge influent flow rate. Wastewater then flows by gravity to the dual-powered aerated lagoon (DPAL). The first cell (Cell 1) has 10 15-HP mechanical surface aerators, which completely mix the wastewater and provide complete oxidation of the organic load (i.e., the influent BOD). The oxidized wastewater then flows in series through three partial-mix cells (separated by hydraulic curtains) where suspended solids settle out and oxidize.

The DPAL can be temporarily bypassed for maintenance (during the dry season), if necessary, by directing flow to other three partial-mix lagoons for treatment (Middle and South/North Lagoons).

By design clarified wastewater flows out of the DPAL via an adjustable circular weir and through a 30-inch pipe to either the filter structure for further suspended solids removal or directly to disinfection via the filter bypass structure. In actual operation, DPAL treated wastewater is discharged to the Middle Lagoon and then to the North/South Lagoons for additional treatment prior to either filtering or disinfection. The DPAL does not consistently remove enough TSS to prevent overloading of the filter system, thus necessitating use of the Middle and South/North Lagoons.

All or some of the flow can be routed through the chemical addition vaults, where alum and/or polymer can be added, and then to the filter system. The filter system consists of 11 submerged cloth disk filters which provide a nominal 10-micron filtration. Filter backwash flow (equal to approximately 2 percent of filter influent flow) is pumped back to the headworks for treatment. The last treatment step consists of disinfection. The clarified and filtered water flows through the chlorine-mixing vault for addition of chlorine (chlorine from gas cylinders). The chlorinated wastewater flows through the chlorine contact basin, which has a design peak month flow contact time of 119 minutes. Disinfected effluent is dechlorinated with sulfur dioxide, which is added using inline oxidation reduction potential (ORP) as the feedback control parameter. Effluent flow

rate is continuously gauged at the V-notch weir in the chlorine contact basin. Effluent normally discharges via gravity to the Nooksack River. A lift station boosts the effluent head in the event of either high WWTP flows or high river level. Effluent discharges through a 1500-lineal foot, 30-inch pipeline to the Nooksack River. The outfall consists of a single 30-inch diameter pipe, which is submerged and located at the toe of the riverbank.

Operator:
The WWTP is staffed from 7 AM to 4 PM seven days a week with 24-hour call-out with one of three certified operators. The lead operator is Group III, and the other operators are Group II and Group I. The WWTP must have at least a Group II operator in reasonable charge of daily operation.

Discharge Outfall:
Secondary treated and disinfected effluent is discharged from the facility via a submerged single port outfall into the Nooksack River. The permitted mixing zone extends 300 feet downstream from the outfall. The permitted mixing zone allows for the following dilution factors (DF) when calculating effluent limits:

Acute Aquatic Life Criteria: DF = 4
Chronic Aquatic Life Criteria: DF = 29

Solid Wastes:
The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum, and screenings are drained and disposed of as solid waste at the local landfill. Class B biosolids are treated by aerobic and anaerobic digestion within the partial-mix cells. Biosolids are land applied under a permit from the Whatcom County Health Department and per the General Permit for Biosolids Management (DOE). Ferndale removes Class B biosolids from the partial-mix cells on an annual basis and disposes of the majority of the biosolids by subsurface injection into a nearby field owned by the City. Biosolids in excess of the field's agronomic capacity are hauled to a privately owned and permitted land application site.

Design Criteria:
Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria.

Table 9: Design Criteria for Ferndale Wastewater Treatment Plant.

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	3.23 MGD
Monthly Average Dry Weather Flow	1.95 MGD
Peak Hour Design Flow (PHDF)	28.0 MGD
Carbonaceous Biochemical Oxygen Demand (CBOD)	4,490 lb/day
Biochemical Oxygen Demand (BOD)*	5,388 lb/day*
Total Suspended Solids (TSS)	5,388 lb/day

* Not a Permit Criteria

Wastewater flows to the treatment plant have increased to approximately 1.53 MGD (annual average over the last 4 years) or 2.72 MGD (peak month, 2006). Consequently, the treatment plant is currently operating below design capacity.

The WWTP operates under a National Pollution Discharge Elimination System (NPDES) permit. Ecology issued the current permit for the WWTP effective on May 1, 2009 (see Exhibit L). The permit places effluent limits on CBOD, TSS, pH, fecal coliform bacteria, total residual chlorine and total ammonia. Ammonia limits are seasonal (June 1 – October 31).

1. Existing Wastewater Flows

   Existing wastewater flows through the City WWTP are presented and discussed in Section II.A.3 above.

2. Projected 20-Year Wastewater Flows

   Projected WWTP wastewater flows were presented and discusses in Section II.A.5 above.

D. Industrial Wastewater Producing Facilities within the City System

The WWTP receives wastewater from three permitted industrial contributors: RECOMP, Cedarville Landfill, and Olivine Corporation municipal solid waste incinerator. The flow from the three sources is considered relatively minor in quantity and quality and is not discussed in detail and does not require special analysis. There are many other small industrial dischargers in the service area, but none are classified as Significant Industrial Users (i.e., discharging over 25,000 GPD).

RECOMP of Washington is a twenty-acre site located along Slater Road in the southern portion of the City sewer service area and east of the Nooksack River. RECOMP of Washington is a municipal solid waste transfer and recycling station and also discharges leachate to the sewer from a closed ash monofill (from past solid waste incineration). RECOMP currently is a municipal solid waste transfer station. In the past it operated as an incinerator and resource recovery facility. The leachate is held briefly in a lined, aerated lagoon before it is pumped to the City's sewer system. The WWTP also receives landfill leachate trucked to the plant from the closed Cedarville landfill and Olivine Corporation's closed ash monofill. No other industrial sources are are regulated by discharge permits.

Landfill leachate from Cedarville Landfill and Olivine Corporation is periodically hauled via tanker to the WWTP for disposal. The Cedarville Landfill is a closed unlined municipal landfill. Olivine Corporation is the owner of a closed municipal solid waste incinerator ash monofill.

III. FUTURE SEWER SERVICE REQUIREMENTS

The City will only provide sewer service where it is legally possible to do so considering applicable zoning and development regulations. Details for potential developer extension/ULID facilities that are included this section are conceptual; their infrastructure improvement projects are highly dependent on the nature of the development.

A. Potential Growth in the Sewer Collection System within the City limits

The City plans to extend the sewer collection system within the City limits as the opportunity arises, such as in conjunction with a road reconstruction project or a new development project. At this time, there are several known potential areas for expansion within the City's service area.

1. Sewer Extensions with Road Reconstruction (TIP project)

   Of the road projects identified on the City's 2011-2016 Six-Year Transportation Improvement Program (TIP), there are three that are candidates for installing new sewers in conjunction with the road reconstruction projects. These are Main Street (Douglas to Church), Church Road (Main to Heather), and Labounty Drive (Seahawk to Sunset). Each of these roads has a section that currently does not have a gravity sewer main. The extensions will consist of an 8-inch to 12-inch gravity sewer lines and side sewers to service the existing properties currently on septic systems. (See Exhibit H for maps of these potential extension locations).

   Additional sewer extensions with road projects in the City's 2010-2034 transportation improvement projects will also be possible, and will be evaluated during periodic updates to both plans.

2. Sewer Extension Inquiry for Smith Road

   The City has recently received an inquiry regarding the possibility of extending sewer service to a residential property with a failing septic system on West Smith Road. The property is within the City limits and is zoned for general business, and the nearby area is zoned light industrial. The extension is expected to consist of about 600 LF of 8-inch sewer main and two new manholes. One construction challenge for this extension is that it crosses under the I-5/Smith Road interchange and will therefore require the pipe to be installed in a casing that is bored under the road, adding expense to the project. A developer extension contract will be the most expeditious funding mechanism for this project. However, given the benefit the surrounding properties would gain from having the bore already completed when the sewer is further extended, the developer could be eligible for a latecomer reimbursement agreement.

3. North Malloy (inside City Limits).

   This area was previously annexed by the City and includes approximately 170 acres that are between Malloy Road and I-5, south of Brown Road (see Exhibit B-3). The land use designations for this area are Industrial and Low Density Residential. The topography of this area generally slopes to the east. The portion north of Aldergrove Road was included in the Grandview feasibility study (see #1 above). This area could gravity flow to the

Grandview collection system, and would then be pumped along Portal Way, over I-5, and discharge into a 15-inch gravity system on the east side of I-5.

Due to the topography of the south portion of this area, the trunk sewer will need to run parallel to the railroad tracks. This trunk will connect to the existing 18-inch gravity sewer at Second Street, south of the I-5/Portal Way Interchange.

A sewer extension to this area is anticipated to be funded by a developer extension contract or a ULID encompassing the benefitted properties.

4. Thornton South (inside City Limits).

   This area was previously annexed by the City and includes approximately 95 acres that are south of Thornton Road. The land use designation for this area is Low Density Residential. The topography of this area has some steep slopes that culminate in a low spot near the northwest corner of the area. There are existing sewer collection systems to the northwest and east. The sewer collection system will probably gravity to a pump station at the low spot near Thornton Road and the sewer will then need to be pumped east to the existing collection system in Thornton Road. (See also Thornton North UGA, below).

   A sewer extension to this area is anticipated to be funded by a developer extension contract or a ULID encompassing the benefitted properties.

5. West Slater (inside City Limits).

   This area was recently annexed by the City and includes approximately 25 acres that are south of Slater Road (see Exhibit B-3). The land use designation for this area is Industrial. The topography of this area has several flat benches with steep slopes in between. The existing developments appear to be able to be served be gravity connections to the existing 8-inch sewer main in Slater Road.

6. Other Developer Extensions / Local Improvement Districts

   There are several properties remaining within the City limits that could be subdivided or grouped to create a development. For any new development that would require extension of sewer mains, the property owner will be required to enter into a developer extension agreement with the City whereby the owner becomes responsible for all design, construction, and inspection costs associated with the new branch sewer line. Design and construction will be required to meet City development standards. At the time the new line goes into operation, the City will be granted ownership of, and operation and maintenance responsibilities for all new sewer facilities associated with the development.

   A local improvement district or utility local improvement district (LID/ ULID) can be a funding alternative for areas with multiple owners and where significant infrastructure improvements are needed. The process involves a vote of those who will be assessed, but also allows the assessment to be paid off over a period of time (up to twenty years).

B. Potential Growth in the Sewer Collection System within the Unincorporated Urban Growth Area

The City of Ferndale has established policies prohibiting the extension of public sewer connections outside of the City limits of Ferndale, including the unincorporated Urban Growth Area. The City will only expand the sewer collection system into the UGA once an area has been annexed into the City.

The City may, however, extend sewer infrastructure outside of the incorporated City limits in order to efficiently serve areas that are within the City limits. An example of this is the Southwest Sewer Interceptor which included a section of sewer main installed in the unincorporated area of Imhoff Road that lies outside and between the City limits.

The hydraulic analysis performed in support of this plan has confirmed that the City of Ferndale maintains a sewer capacity sufficient to serve projected growth to 2034. While specific conveyance projects to individual parcels have not been included in the plan, the City has determined that the unincorporated UGA areas can be adequately served with the construction of projects as described below. The cost of such improvements will be borne by development unless or until the City adds the project as a capital facility improvement.

Exhibit B-3 shows the future areas to be served by City sewer. The areas are grouped by how they were incorporated into the hydraulic model. Below is a summary description of the areas and the projects required to provide sewer service.

1. Grandview Area Sewer (East and West)

   At this time, the Grandview area is the only active inquiry regarding a developer extension for sewer within the UGA. The 144 acres around Interstate 5 and Grandview was recently approved for annexation by the City of Ferndale. A representative for this area has requested information from the City regarding providing sewer service to this area for commercial development. The options for extending sewer service to this area are outlined in a feasibility study provided to the City, and included here as Exhibit G. In summary, the Grandview East area sewer extension will include over 10,000 LF of 8 and 12-inch gravity main, over 5,000 LF of 4-inch force main and a new sewer lift station.

   Several alternatives were reviewed for providing sewer to the Grandview West area. The alternative most likely to be implemented has the main interceptor and force main alignment along Portal Way and uses the Portal Way overpass to cross Interstate 5. This project will require include over 12,000 LF of 8 and 15-inch gravity main, over 8,700 LF of 12-inch force main and a new sewer lift station.

   The property owner will be required to enter into a developer extension agreement with the City whereby the owner becomes responsible for all design, construction, and inspection costs associated with the new branch sewer line. At the time the new line goes into operation, the City will be granted ownership of, and operation and maintenance responsibilities for all new sewer facilities associated with the development.

2. Brown Urban Growth Area.

   This area includes approximately 315 acres that are south of Brown Road, north of Aldergrove Road west of Malloy Road and east of Church Road. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential, and is expected to be annexed in the 16-20 year timeframe. The topography of the area shows it sloping to the east, and as a result, the City anticipates that the area could be served by an 8- to 10-inch gravity sewer down to a trunk sewer in Malloy Road.

3. Aldergrove Urban Growth Areas (West, Central, and East).

   These areas include approximately 460 acres that are south of Aldergrove Road, north of Road west of Malloy Road and east of Church Road. The City of Ferndale Comprehensive Plan land use designation for these areas is Low Density Residential. The central area plus the area east of Church Road in the west area are expected to be annexed in the 0-5 year timeframe. The remaining West Area is expected to be annexed in the 11-15 year timeframe. The topography of these areas is sloping to the south-east so one would anticipate the area could be served by an 8- to 10-inch gravity sewer connection to the existing sewer collection system. The actual point of connection will depend on topography and the development layout.

   The East Aldergrove Area is expected to be annexed in the 11-15 year timeframe. The topography of this area is generally sloping to the east so one would anticipate the area could be served by an 8- to 10-inch gravity sewer connection to a trunk sewer in Malloy Road.

4. Mid-Church Urban Growth Area (at Stoneyfield).

   This area includes approximately 35 acres that are west of Church Road. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential. This area is expected to be annexed in the 6-10 year timeframe. The topography of these areas is sloping to the south-east so one would anticipate the area could be served by an 8- to 10-inch gravity sewer connection to the existing sewer collection system. The actual point of connection will depend on topography and the development layout.

5. Thornton North Urban Growth Area.

   This area includes approximately 120 acres that mostly are north of Thornton Road. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential. This area is expected to be annexed in the 11-15 year timeframe. The topography of these areas is sloping to the south-west so one would anticipate the area could be served by an 8- to 10-inch gravity sewer collection system., which will probably gravity to a pump station at the low spot near Thornton Road and the sewer will then need to be pumped east to the existing collection system in Thornton Road. It is expected that this area could share a pump station with the Thornton South area, described above.

6. Riverbend Urban Growth Area.

   This area includes approximately 13 acres that south of Newkirk Road on the east side of the City. The City of Ferndale Comprehensive Plan land use designation for this area is High Density Residential. This area is expected to be annexed in the 0-5 year timeframe. The topography of this area is relatively flat and the obvious alignment down Newkirk Road may not provide a sufficient drop in elevation to provide enough slope for a typical 8- to 10-inch gravity sewer. A larger diameter pipe does not need as much slope, or a small pump station could be installed to address the flat topography. Another alternative that could be explored is to obtain easements as needed across one or more properties to the west of Riverbend UGA that would enable the sewer to connect to a deeper manhole on Portal Way, if the elevations don't work for a gravity sewer along the Newkirk alignment.

7. Mountain View Urban Growth Area.

   This area includes approximately 172 acres that are north of Mountain View Road. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential. About 22 acres in the north-east area is expected to be annexed in the 6-10 year timeframe. The topography of this area is relatively steep and sloping to the south. A portion of the 22 acres could be served by a gravity sewer to the west.

   The remaining area includes 110 acres that are expected to be annexed in 11-15 years and 40 acres that are expected to be annexed in 16-20 years. These areas also slope to the south and one would anticipate they could be served by an 8- to 10-inch gravity sewer connection to a 12-inch trunk sewer in Mountain View Road. This trunk would continue east and connect to the existing sewer system in Main Street.

8. Douglas Urban Growth Area.

   This area includes approximately 63 acres that are north of Douglas Road and south of Main Street. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential and it is expected to be annexed in the 6-10 year timeframe. The topography of the north portion of this area is relatively steep and sloping strongly to the south-east. The south portion of this area has a more gradual slope to the south-east. For the model, we assumed that the area would be served by an 8- to 10-inch gravity sewer connection to a trunk sewer in Douglas Road. However, depending on how the area develops, a portion of the north area may connect to a trunk sewer in Church Road. This alternative does not impact the model results.

9. Schell Creek Urban Growth Area.

   This area includes approximately 88 acres that are east of Imhoff Road and northwest of the WWTP. Schell Creek runs through the area. The City of Ferndale Comprehensive Plan land use designation zoning for this area is Residential-Unspecified and it is expected to be annexed in the 6-10 year timeframe. The topography of the north portion of this area is relatively flat. The majority of this area also has a critical area designation of "wetland". The existing developments in this area can be served by the Southwest Sewer Interceptor in Imhoff Road. The remaining area is unlikely to be developed but the City may use the area for future wetland mitigation programs.

10. East Slater Urban Growth Area.

    This area includes approximately 130 acres that are east of I-5 and includes the I-5/Slater Interchange. The land use designation for this area is Urban Reserve, with the exception of Department of Transportation-owned properties within the interchange itself. The WSDOT-controlled properties are within the Ferndale UGA, and may be annexed in the 0-5 year timeframe, and does not include any land that can be developed. The remaining area is outside of the Urban Growth Area, and cannot be annexed or included in the UGA until adequate study, land use need, and other requirements are met. The topography of this area slopes moderately to the northwest and may be able to be served by a gravity sewer crossing under I-5. Since the flow from this area will gravity to Pump Station #17, the capacity of this station, and the other downstream stations that re-pump the flow (Pump Stations #2 and #4) will need to be analyzed, and the pump stations upgraded if necessary.

IV. SEWER RATE STRUCTURE AND REVENUE PLANNING

A. Requirements for Connection to the City Sewer System

The requirements for connecting to the City sewer system are listed in the City's municipal Code Chapter 13.20.085. Developed properties that lie within the City limits are required to connect to the sewer.

There are existing septic systems within the City limits that were allowed to be installed in areas that did not have sewer collection mains. When public sewer becomes available, the properties served by septic systems must connect to the public sewer either when the on-site system fails, or when certain repairs, reconstruction, or improvements are made (see Code for details).

The City is considering additional conditions under which connection to the public sewer will be required when new sewers are installed, and possibly adding an incentive program to encourage septic system owners to connect in a timely manner.

B. Revenue Planning

The City performs a review of the sewer rate schedule regularly to determine that these charges are sufficient to generate revenue to offset the cost of all necessary operation and maintenance of the City sewer system. In the event that this review indicates a necessary revision of user charges, the City amends the rates by formal ordinance of the City council.

With the substantial updating of the Capital Improvement Plan for this Comprehensive Sewer Plan, the City will incorporate the revised projected capital expenditures into its rate calculations. The result will be recommendations regarding sewer rate adjustments aimed at bringing revenues in line with annual operating and current and future capital obligations.

Additionally, recommendations regarding the connection charge for new customers connecting to the system will be prepared and reviewed by the Council before implementation.

The City will also investigate grants, loans and possibly bonds to fund the Capital Improvement Projects in the near term. The City intends to procure a bond in 2012 for major capital improvements and again for the Phase III upgrade circa 2019.

C. Sewer Rate Structure

The City sewer service rates and charges outlined below shall be subject to change by ordinance of the City council as conditions warrant.

1. Sewer Service Rates

The City bills bi-monthly for sewer service. The calculation of bi-monthly sewer charges is based on water meter usage for metered customers, and is a flat rate for non-metered customers. The current Water and Sewer Rates and Fees for the City are attached as Exhibit F, which includes the details for the sewer rates.

2. Sewer Connection Fee

The City currently assesses $6,655 per Single Family Equivalent (SFE) for the base Sewer Connection Fee. Additional fees may also apply. The City also charges fees for inspection in accordance with the current Fee Code and Fee Summary (Ordinance #1605).

The Fee Code and Fee Summary Schedule, and Water and Sewer Rates and Fees are incorporated here by reference. The current schedules are included in Exhibit F.

3. Cost per Service

The City's cost per service currently is $515.46 per year in terms of debt service and operation and maintenance costs. This cost includes $267.96 per year in operation and maintenance costs. Debt service costs are $247.50 per year.

Yearly Cost Per Sewer Service		
Debt Service	$	247.50
O & M	$	267.96
Total	$	515.46

It should be noted that of the above debt service cost, about 75% is to repay the 2005 Sewer Revenue Bonds used to fund/refinance the WWTP upgrades.

D. Funding Capacity

The City is anticipated to have sufficient revenue to fund the City's sewer system operations and maintenance, debt payment, and future capital improvement projects.

The City's wastewater fund total revenue is conservatively anticipated to be in the range of $51,000,000 to $61,000,000 over the next 12 years (2011 – 2022). This timeframe includes the Phase III WWTP capacity upgrade. The equivalent annual amount in 2011 dollars is about $3,600,000 to $4,100,000 per annum.

Sewer service fees are projected to increase at a 3% per year due to inflation and another 3% per year due to growth. Connection fee revenue is projected to increase at 3% per year due to growth.

During this same time period expenses are anticipated to be in the range of $44,000,000 to $54,000,000. The equivalent annual amount in 2011 dollars is about $3,000,000 to $3,800,000 per annum.

Operations and maintenance expenditures are currently about $1,400,000 per annum. Operations and maintenance costs are projected to increase at a 3% per year due to inflation. Total operations and maintenance costs are anticipated to be in the range of $22,500,000 to $27,500,000 over the next 12 years (2011 – 2022).

Planned capital expenditures are anticipated to be in the range of $18,000,000 to $22,000,000 over the next 12 years (2011 – 2022). The equivalent annual amount in 2011 dollars is about $1,230,000 to $1,500,000 per annum.

The remaining expenses include existing debt repayment.

A summary of the anticipated revenues and expenditures for the City's wastewater system is shown below.

Revenue and Expenses Summary 2011-2022			
	Low Estimate	Mean Estimate	High Estimate
Revenue	$ 51,000,000	$ 56,000,000	$ 61,000,000
Expenses			
O & M	$ 15,000,000	$ 17,000,000	$ 19,000,000
Capital Plan	$ 18,000,000	$ 20,000,000	$ 22,000,000
Debt Service	$ 12,000,000	$ 12,500,000	$ 13,000,000
Total Expenses	$ 45,000,000	$ 49,500,000	$ 54,000,000

The City therefore has a sufficient revenue stream to fund operations and maintenance, debt service, and capital improvements, with additional funds that can be allocated to emergency projects, unanticipated projects, and/or sewer extensions. However, it is the City's stated policy that developers fund sewer extensions to unserved areas. The City's existing sewer collection and treatment systems have sufficient capacity (with planned improvements) to provide sewer service to growth within the City limits and UGA for the next twenty years.

V. FUTURE IMPROVEMENT PROJECTS

This section describes the main improvement projects that are scheduled for the next six years. The City has developed 6-year and 20-year capital improvement plans which are included in Exhibit H. The Exhibit includes the anticipated project schedule and estimated project costs.

A. Future Maintenance and Operational Improvements

1. Sewer Inspection Program

   The City has an ongoing sewer inspection program. As a part of the regular maintenance program for their facilities, the City will continue to video portions of the collector system annually in an effort to identify possible points of I & I into the system. Areas to video are targeted based on pump run times (as an indication of I & I severity) and the majority of the work will be performed during the wet season in order to see active leaks. The City is also able to inspect manholes with the camera as they pass through them. If repair work is deemed necessary, the City will perform the work as part of their regular maintenance program.

2. Smoke Testing Program

   The City plans to embark on a systematic smoke testing program within its collection systems to aid in identifying potential sources of I & I as a part of the ongoing maintenance program for their facilities. In the event that a significant, potential I & I source is identified through the smoke testing program, the City will follow-up with a CCTV camera inspection of the subject area to determine if repair work is required. If repair work is deemed necessary, the City will perform the work as part of their regular maintenance program.

   The smoke testing program may also identify locations where there are stormwater or drainage connections such as roof drains or foundation drains to sewer mains. If such connections are identified, the City will notify the property owner, and require the connection be removed.

3. Sewer I & I Projects - Miscellaneous Sewer Line Replacement and Repair

   The age of City's sewer collection and force main systems range from new to over forty years old and approaching the end of their expected design life. As a part of ongoing regular maintenance on the system, the City monitors the existing underground sewer lines for signs of leakage and/or failure. As a part of this project, the City will perform sewer repair and/or replacement work as necessary to ensure a functional and environmentally safe system. The line repairs include both trenchless spot repairs as well as repairs that require excavation.

4. Sewer I & I Projects - Manhole Rehabilitation

   The City staff have observed I & I that originates in the sewer manholes. The City is inspecting manholes for deterioration and leaks as part of their ongoing sewer videoing program and will develop a priority list of manholes in need of rehabilitation.

B. Future Administrative, Financial and Planning Improvements

1. Hazard Mitigation Plan for City Wastewater Facilities

   Since 2000, the Federal government has required local communities to have an approved mitigation plan in place to be eligible for the Hazard Mitigation Grant Program (HMGP) funds (44CFR201.6). Jurisdictions without an approved plan will not be eligible for future mitigation financial assistance. One strategy for the plan development is for local communities to work together to create a Multi-jurisdictional Hazard Mitigation Plan. This approach is advantageous and efficient in that a single, comprehensive plan would then address the concerns of all jurisdictions with the same countywide hazards. To that end, the City will work, in conjunction with Whatcom County Division of Emergency Management to develop a hazard mitigation plan in compliance with federal requirements.

   Preparation and adoption of this hazard mitigation plan will ensure compliance with federal regulations. In addition, the development and adoption of an approved hazard mitigation plan will ensure that the City is eligible for future mitigation financial assistance under the Hazard Mitigation Grant Program.

2. Emergency Response Plan

   Currently, the City has an existing Emergency Response Plan which outlines City priorities and activities in response to an emergency event such as; natural disasters, vandalism, catastrophic equipment failures, etc. The City will update the existing Emergency Response Plan, as necessary, to ensure compliance with applicable federal regulations and the requirements of the Department of Homeland Security. The City will continue to conduct emergency response training exercises and drills with staff to enhance emergency preparedness.

3. Geographic Information System (GIS) Development / Maintenance

   In 2010 the City began development of a sewer system GIS to aid in planning, administration, and operation and maintenance record keeping for the City's sewer facilities. To date, the GIS includes surveyed manhole and pump station locations, most pipe locations, and some data on pipe size and material, in addition to the general City information including topography, property parcel, roads, zoning, and land use planning. As part of the ongoing development of this program, the City will continue to augment and update the GIS to include additional information on the sewer facilities.

4. Sewer Service Rate Increases

   The City will implement recommended incremental rate increases resulting from the City's in-house financial rate study. The rate increases will assure that the City is adequately recovering the true costs of running the system, including paying back all existing and anticipated loan funds. By adequately recovering the true costs for system operation and maintenance, the City staff will be able to perform adequate, routine maintenance activities which will add to the service life of the system. Additionally,

implementing the recommended rate increases outlined in the rate study will allow the City to maintain the appropriate reserves required for emergencies, if revenues meet regular expenses.

5. Develop a Capacity, Management, Operations and Maintenance (CMOM) Program

As part of this activity, the City will prepare a CMOM Program in accordance with the requirements of any future CMOM and/or sanitary sewer overflow (SSO) regulations. The finished plan will include all of the performance components for municipal sanitary sewer collection systems as well as address the documentation requirements for the CMOM permit. At this time, implementation of the both the CMOM and SSO regulations are pending. Preparation of the formal CMOM program will begin upon adoption of these regulations by the applicable governing bodies.

C. Future Capital Improvement Projects

1. Pump Station Upgrades – Ongoing

The City has completed several pump replacements and upgrades in the last six years. The City plans to continue replacing and/or upgrading their aging pump stations. The proposed schedule for these replacements / upgrades is included in the City's Capital Improvement Plan (see Exhibit H).

Each pump station will be evaluated to determine the specific upgrades required but at least will normally include new pumps and new controls. Flow monitoring may be performed at some pump stations to verify capacity requirements in relation to predicted needs. Replacement of the aged pump and control equipment will result in increased reliability, reduced emergency call-outs, and reduced equipment operation costs.

2. Telemetry System Upgrades

This project includes the addition of new telemetry equipment and instrumentation at most of the City's pump stations. The telemetry upgrades will allow the pump stations to fully integrate with the City's upgraded telemetry and SCADA control network and will improve monitoring capabilities and system reliability. The initial phase of this project will be an evaluation of the City's existing hardware and software, resulting in a report with recommendations for system improvements and implementation schedule.

3. Miscellaneous Sewer Line Replacement and Repair

It is the City's policy to review the underground utility needs when it prepares to do any major work on City streets. As part of this planning process, we have evaluated the projects on the current 2011-2016 Six-Year Transportation Improvement Program (TIP) to determine the associated sewer collection system needs.

TIP: Main Street – Douglas to Church Road	Extend 12-in pipe 350 ft; replace 200 ft of 12-in pipe
TIP: Church Road - Main to Heather Dr	New pipe: 1,400 ft of 8-in PVC
TIP: Thornton Road - Vista to Malloy	Replace 300 ft with 15-in RCP; slipline 1,100 ft of 8-in RCP
TIP: Legoe Avenue	Capacity is adequate; 10-in RCP is sliplining candidate
TIP: LaBounty Drive Seahawk to Sunset	New pipe: 1,570 ft of 8-in PVC
TIP: Ferndale Terrace	Capacity is adequate; 8-in PVC should be inspected

The results of the hydraulic model highlighted several areas where the sewer collection system is under capacity or nearing capacity (flow is 85% or more of maximum capacity). Details on the analysis and results are included in Exhibit I. The model also showed several areas with pipes that are adversely sloped. This is based on the best available information from the City's sewer survey and should be confirmed before proceeding to the project level. The major projects generated by the model were also identified by staff as problem areas.

Malloy Ave from Golden Eagle to Thornton	3,700 ft; increase to 15 inch diameter
LaBounty Drive between I-5 and Nordic Way	750 ft; increase to 24 inch diameter
Malloy Ave from Thornton to Oxford	900 ft; increase to 15 inch diameter

The City has identified several sewer line replacement projects from their ongoing sewer collection system video inspections. The projects below represent areas with poor flows, separated joints, and/or excessive gravel getting into the pipes.

Vista Ave from Washington to Third	Replace 1,570 ft; 8-10 inch
Eaton/Somerset/Willard/ Washington	2,040 ft; 8 inch
Pipe Bellies (several locations)	700 ft; 8 inch

3. Pump Station Decommissioning

The City has identified two pump stations where the flow can be redirected via a gravity sewer main and the pump station can be removed and decommissioned. These pump stations are PS #10 Aquarius/ Apollo and PS #21 Ariel Court.

PS #21 Ariel Court serves a new, small subdivision that was designed / constructed prior to the installation of the sewer main in Imhoff Road. With the Imhoff Road sewer available, 450 feet of 8-inch gravity line can be installed from PS #21 to Imhoff Road and the pump station can be decommissioned. An easement for the proposed gravity sewer line alignment was recorded with the final subdivision plat.

PS #10 Aquarius/ Apollo serves a larger area, and will need new easements for the gravity line from the pump station location to the gravity collection system in Parkland Drive. There are capacity issues in the downstream collection system that must be addressed before this pump station can be decommissioned. These include:

- Malloy Avenue from Golden Eagle to Thornton (3,700 feet)
- Thornton at Malloy Avenue (300 feet)

- Malloy Avenue from Thornton Oxford (900 feet)
- Miscellaneous upgrades in residential areas (1,070 feet; increase pipe diameter on minimum slope sections to increased capacity)

As mentioned above, the first three collection system projects are already required for existing and future projected needs, and the additional flow from the PS #10 service area does not significantly increase the needed improvements. The fourth project includes the pipes between the pump station and Malloy Avenue identified by the hydraulic model as having insufficient capacity for the future predicted flows. These are primarily 8-inch pipes installed at their minimum slope of 0.4%. Those segments can be replaced with 10-inch pipes to achieve sufficient capacity.

It should be noted that the hydraulic model also showed insufficient future capacity in an equivalent section of Shannon Avenue if PS #10 was not re-routed and decommissioned. The projected cost for collection system improvements would be nearly the same for either option, but decommissioning the pump station has the added benefit of reducing ongoing maintenance and operational costs.

4. Sewer Sliplining Project

Many of the older sewer mains in Ferndale are reinforced concrete pipe or vitreous clay pipe with joints every 10 feet. These pipe materials are more susceptible to the corrosive effects of sewer gasses. In addition, the two sewer siphons and some of the pump station force mains are cast iron or ductile iron, which is also susceptible to corrosion if the pipe is not cement-lined, or the lining is compromised.

Sliplining the pipe involves inserting a pliable liner into a cleaned sewer pipe, and then expanding it with water or steam to conform to the inside of the pipe and cure (it is also known as cure-in-place pipe-CIPP). The City has identified numerous pipes that would be candidates for sliplining instead of complete pipe replacement. This project would provide an annual budget to address the repair and rehabilitation of the oldest pipes in the City's system, starting in 2015.

The first potential candidates for this technique are the two parallel sewer siphons (8-inch and 12-inch ductile iron) on Main Street. During recent road construction work, a hole was discovered in the 8-inch pipe and repaired. The City will obtain a sonar condition assessment for both pipes before proceeding with lining one or both of the siphons.

5. Developer Extension Projects

The City regularly reviews applications by Developers to extend City sewer facilities. The City requires the Developer to provide engineered plans prepared in accordance with the City Standards, and requires regular inspections to ensure installation is according to the approved plans.

6. Utility Local Improvement Projects

The City will review any petition from property owners for extension of sewer service. Two potential areas that could petition for service are the low density rural residential UGA on the west side of the City and the recently annexed area south of Slater Road.

Under certain conditions the City may install new facilities for specific areas under the Utility Local Improvement District (ULID). ULID-funded projects are paid for by the property owners within the ULID, either in a lump sum or over time (with interest).

VI. SUPPLEMENTAL INFORMATION

A. Public Water System Information

The City owns and operates a public water system within its boundaries (ID #24850 M). The City's Water System Comprehensive Plan was approved by DOH in 2010. There are also several small Group A and Group B water systems that operate within and near the City's boundaries. These systems, along with numerous private wells, are shown in Exhibit E.

As shown in Exhibit E, there are no private or public wells near the City wastewater treatment plant (WWTP). There is a substantial distance between the location of City water distribution structures and the City's domestic wastewater treatment facilities.

B. Service Area Physical Characteristics

The City of Ferndale is located on the Interstate 5 corridor, approximately 6 miles north of Bellingham and 13 miles south of the Canadian Border. The City straddles the Nooksack River. More information on the topography, hydrology and soils of the area can be found in Exhibit N – Service Area Physical Characteristics.

C. Water Quality Management Plan Compliance

This Plan is in compliance with the adopted water quality management plan under the Federal Water Pollution Control Act as amended.

D. Environmental Policy Act Compliance

This Plan is in compliance with the State Environmental Policy Act (SEPA). A non-project SEPA checklist was prepared and is attached to this plan. The City released a Notice of Intent to Issue Mitigated Determination of Non-significance on February 9, 2011 (date), and published the notice on February 9, 2011 (date). Comments were accepted until February 23, 2011

VII. GLOSSARY OF TERMS AND ABREVIATIONS

Average dry weather flow	The average non-storm flow over 24 hours during the dry months of the year (May through September). It is composed of the average sewage flow and the average dry weather inflow/infiltration.
Average wet weather flow	The average flow over 24 hours during the wet months of the year (October through April) on days when no rainfall occurred on that or the preceding day.
Biosolids	Any solids that have settled or have been separated from water or wastewater during a treatment process, such as sedimentation, flotation, and agglomeration.
BOD (Biochemical Oxygen Demand)	A measure of the quantity of oxygen used by microorganisms that consume organic substances. The test measures uptake during oxidation of the carbon and nitrogen based substances and is commonly reported as a "five-day" value reflecting the test period.
Clean Water Act (CWA)	Also known as the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.).
Collection main	In collection systems, this is a larger pipe in which smaller branch and submain sewers are connected. The collection main may also be called a main or trunk sewer.
Collection system	In a wastewater system, a collection system is a system of pipes which receives and conveys sewage and/or storm water.
Combined sewers	A sewer that carries both sewage and stormwater runoff.
Complete-Mix Basin	A basin in which the wastewater is rapidly and continuously mixed to create homogeneity throughout the reactor. No settling occurs.
Cost-effective alternative	An alternative control or corrective method identified after analysis as being the best available in terms of reliability, performance, and costs.
Denitrification	The biological conversion of nitrate nitrogen to nitrogen gas in the absence of oxygen (anaerobic conditions).
Detention Time	The period of time that flowing water or wastewater is retained in a tank, lagoon, or basin. It is calculated by dividing the average daily flow rate by the water volume in the tank.

Discharge, direct or indirect	The release of wastewater or contaminants to the environment. A direct discharge of wastewater flows from a land surface directly into surface waters, while an indirect discharge of wastewater flows into surface waters by way of a wastewater treatment system.
Disinfection	The selective destruction of pathogens. A process applied to treated wastewater effluent, reclaimed water and residuals that reduces pathogens to levels established for public health protection.
Dissolved Oxygen (DO)	The oxygen dissolved in water or wastewater. Its concentration is typically measured in milligrams per liter (mg/l) or in percent saturation.
DOE	Washington State Department of Ecology.
Domestic wastewater	Human-generated sewage that flows from homes and businesses.
Effluent	Treated water, wastewater or other liquid flowing out of a treatment facility.
Effluent limits	The maximum concentrations of pollutants in treated wastewater effluent that will not result in an operating permit violation.
EPA	United States Environmental Protection Agency.
Fecal coliform bacteria	A group of organisms common to the intestinal tracts of humans and animals. The presence of fecal coliform bacteria in water, wastewater, or biosolids is an indicator of pollution and possible contamination by pathogens.
Force main	A pipeline leading from a pumping station that transports wastewater under pressure.
GMA	Growth Management Act
GPD	A measurement of flow rate expressed in gallons per day.
HDPE	High-density polyethylene pipe
I & I	Infiltration and inflow
Infiltration	The penetration of water from the land surface into the soil, or the penetration of water from the soil into a sewer system by such means as defective pipes, pipe joints or connections, or manhole walls.

Inflow	Flows of extraneous water into a wastewater conveyance system from sources other than sanitary sewer connections, such as roof leaders, basement drains, manhole covers, and cross-connections from storm sewers.
Influent	Wastewater or other liquid flowing into a reservoir, basin or treatment plant.
Interceptor sewers	The portion of a collection system that connects main and trunk sewers with the wastewater treatment plant, thereby controlling the flow into the plant.
Lateral sewers	Pipes that receive sewage from homes and businesses and transport that sewage to trunks and mains.
Main sewer	This is a larger pipe in which smaller branch and submain sewers are connected. It may also be called a trunk sewer.
MG	Million gallons, a measure of liquid volume.
MGD	A measurement of flow rate expressed in millions of gallons per day.
mg/L	A measurement of concentration in milligrams per liter sometimes expressed as parts per million (ppm).
National Pollutant Discharge Elimination System (NPDES)	Section 402 of the U.S. Clean Water Act, which prohibits discharge of pollutants into navigable waters of the United States unless a special permit is issued by EPA, a state, or (where delegated) a tribal government on an Indian reservation.
Nitrification	The biological conversion (oxidation) of ammonia nitrogen into nitrate nitrogen in the presence of oxygen (aerobic condition).
NPDES	National Pollutant Discharge Elimination
NPDES Permit	Permit issued under the National Pollution Discharge Elimination System, which establishes reporting requirements and other conditions for discharge of pollutants to receiving waters.
On-site treatment system	A DOH permitted facility receiving less than 100,000 gpd of sewage from residential sources.
Outfall	The exit point, usually a pipe or pipes where flow is discharged from the wastewater system into receiving water and which is engineered to ensure dispersion and dilution of the effluent in the receiving waters.

Partial-mix basin	A basin in which wastewater is aerated and mixed but which allows for settling of suspended solids.
Pathogens	Microorganisms that can cause disease in other organisms or humans, animals, and plants. Pathogens include bacteria, viruses, fungi, or parasites found in sewage, in runoff from farms or city streets, and in water used for swimming. Pathogens can be present in municipal, industrial, and nonpoint source discharges.
Peak flow	The maximum flow expected to enter a facility.
Primary treatment	Treatment occurring prior to secondary treatment (e.g., mechanical screening).
Pump station	A pump station is used when sewer trunk lines have conveyed flows to a low-lying area. The pump station lifts the wastewater up to a point where it can flow by gravity to a wastewater treatment plant or another pump station
PVC	polyvinyl chloride pipe
Raw sewage	Untreated wastewater.
RCW	Revised Code of Washington
Regulator	A structure that controls the flow of wastewater from two or more input pipes (trunk lines) to a single output (usually a larger interceptor line). Regulators can be used to restrict or halt flow, thus causing wastewater to be stored in the conveyance system until it can be handled by the treatment plant.
Screen	A mechanical device used to remove solids in a flow stream.
Secondary treatment	The minimum level of wastewater treatment required for WWTPs prior to discharge to the environment. Treatment includes biological oxidation, clarification, and disinfection.
SEPA	State Environmental Policy Act
Sewer Zone	The land area tributary to a collection system point that includes all sources of the wastewater at issue.
Side sewer	A privately owned and maintained sewer which connects the plumbing system of the building to the public sewer pipes.

State Environmental Policy Act (SEPA)	A state law (Chapter 43.21C RCW) that requires state agencies and local governments to consider environmental impacts when making decisions about certain activities, such as development proposals over a certain size, and comprehensive plans. As part of this process, environmental impacts are documented and opportunities for public comment are provided.
Stormwater	Water that is generated by rainfall and is often routed into drain systems in order to prevent flooding.
Telemeter	To transmit to a distant receiving station by radio or other electronic means.
Treatment	Chemical, biological, or mechanical procedures applied to industrial or municipal wastewater or to other sources of contamination to remove, reduce, or neutralize contaminants.
Trunk sewer	This is a larger pipe in which smaller branch and submain sewers are connected. It may also be called a main sewer.
TSS (Total Suspended Solids)	Small particles that either float on the surface or are suspended in water.
WAC	Washington Administrative Code
Wastewater collection system	The piping and pumping system used for the collection and conveyance of domestic, commercial, and industrial wastewater.
Water quality criteria	Standards used to protect of water for drinking, swimming, raising fish, farming or industrial use.
WWTP (Wastewater Treatment Plant)	A DOE permitted water pollution control facility intended to remove pollutants from wastewater and provide disinfection before discharge.