CITY OF ASHLAND, OREGON

WASTEWATER FACILITIES PLAN

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0.0 EXECUTIVE SUMMARY

This section summarizes the major findings of the wastewater facilities plan, including brief discussions of alternatives considered and final recommendations.

0.1 DESIGN CONDITIONS

0.1.1 Demographics

Populations projections were coordinated with the Ashland Department of Community Development. The study area was selected to match the Urban Growth Boundary (UGB), with its associated land use and zoning. Land use densities from the 2011 Buildable Lands Inventory (BLI) were utilized in this study for identifying growth areas and developing future flows from those areas for use in the model for analysis of collection system components.

0.1.2 Wastewater Flows

Data on daily and monthly treatment plant flows from 2004 thru 2012, and limited hourly flow data from 2008 and 2012 was used to determine design flows. Design flows were calculated in accordance with Oregon DEQ guidelines, and include average and peak flows for both wet and dry weather periods as summarized in Table ES.1.

TABLE ES.1: Summary of Historical and Projected Ashland Flow Rates

	2005-2012 Avg	Design 2012	Projected Unit Flow	2015	2030	2060
Population[1]	-	20,542	-	21,238	24,716	30,326
Units	MGD	MGD	gpcd[2]	MGD	MGD	MGD
Average Day Dry-Weather[3] (ADWF)	2.11	2.1	102	2.17	2.53	3.10
Max Month Dry-Weather ($MMDWF_{10}$)	2.33	2.7	131	2.79	3.25	3.99
Annual Average Day (AADF)	2.17	2.2	107	2.27	2.65	3.25
Average Day Wet-Weather[4] (AWWF)	2.22	2.3	112	2.38	2.77	3.40
Max Month Wet-Weather ($MMWWF_5$)	2.74	3.6	175	3.72	4.33	5.31
Peak Week (PWkF)	3.53	5.0	200	5.14	5.83	6.96
Peak Day ($PDAF_5$)	5.17	7.1	250	7.27	8.14	9.55
Peak Instantaneous (Hour) (PIF_5)	8.00	10.5	350	10.74	11.96	13.92

[1] Populations from City of Ashland
[2] gpcd = gallons per capita per day
[3] Dry-Weather = May – October
[4] Wet-Weather = November – April

Flows increase with precipitation, typically rising in December with peak flows in January before falling off in February. Winter months have more significant peak day events, and maximum monthly totals are typically 125% of average summer flows. Analysis of hourly data revealed instantaneous flows in excess of 10 MGD, with the largest peak events corresponding to rain events. These observations are indicative of significant infiltration and inflow within the collection system.

In addition to WWTP influent flows, flow meters were also placed at selected sites throughout the collection system to measure flows from the various sewer shed basins. These flows were utilized to calibrate the collection system model.

0.2 COLLECTION SYSTEM EVALUATION & RECOMMENDATIONS

0.2.1 Lift Station Evaluation

Each lift station has a unique set of deficiencies in accordance with its inventoried condition. Those requiring repair and targeted within the Capital Improvements Plan (CIP) include:

Priority 1 (2012-2020)

- Replace Grandview Lift Station
- Abandon Nevada Lift Station – new Oak Street gravity pipeline (under design)
- Add valve vault drain at Windburn Lift Station
- Maintenance Management Software and programming upgrades
- Add SCADA to all lift stations (in process)

Priority 2 (2021-2030)

- Grandview Lift Station force main upgrade
- Convert Shamrock Lift Station to submersible pumps
- Upgrade North Mountain Lift Station to design standards

0.2.2 Pipeline Condition and Capacity Evaluation

Keller Associates utilized the City's GIS record to conduct an inventory of pipe size and material for the City's 110 miles of gravity sewer. This inventory revealed approximately half of the collection system is made up of pipelines smaller than the current minimum pipe diameter standard of 8 inches. Clay and concrete pipes (generally the oldest and most susceptible to disrepair) constitute approximately 17% and 50%, respectively, of the total system. Pipes smaller than 8 inches and all clay and concrete pipes eventually should be replaced.

During an evaluation of the City's inspection process, about 16 hours of video and accompanying TV monitoring logs were reviewed by Keller Associates. The review also provided a glimpse into system conditions. Typical problems identified include cracks, roots, pipe sags, offset joints, and broken pipe, with over 400 pipeline segments currently identified for either spot repairs or pipeline replacement/rehabilitation. In addition, infiltration and inflow is encountered in many of the City's manholes; rehabilitation of these manholes is recommended. Replacement and/or rehabilitation of other manholes should be evaluated in connection with adjacent pipeline rehabilitation/replacement projects.

A GIS-based computer model (InfoSewer 7.0) of the collection system was built and exercised to evaluate capacities of the system's trunklines (generally 10-inches or larger). The modeling results were used to prioritize improvements recommended in the CIP. Generally, pipelines sufficiently sized for existing flows are also sufficient for City infill, with a few upgrades for system expansion into the UGB.

0.2.3 System Maintenance Evaluation

The City of Ashland has an active collection system maintenance program that includes schedules for jet rod cleaning, TV inspection, smoke testing, root foaming, sewer pipe repairs/replacement, and manhole repair/replacement. The City regularly exceeds their annual goals for jet rod cleaning, CCTV, and root foaming, with about 58% of the annual maintenance budget used on these three activities. Though the City exceeds industry standards, additional efficiencies may be achieved by implementing the following:

- More closely group monthly activities by geographic location
- Increase annual replacement / repair budget (target 7,800 ft/yr @ $100/ft = $780k/yr)
- Keep digital copies of CCTV inspections and photos
- Revise TV log ratings and pipeline ranking system

Adjustments to prioritization based on the judgment of an experienced operator should periodically be made, to account for limitations of any maintenance management system and considerations of overall risk.

0.2.4 Recommended Collection System Improvements

Recommended collection system capital improvements are summarized in the capital improvement plan (CIP) cost table at the end of this chapter and illustrated in Figure 8.1 in Appendix A. The majority of Priority 1 & 2 improvements are replacements of pipe sections to correct size or slope issues identified with the model during the capacity analysis.

0.3 ALTERNATIVES TO MEET TEMPERATURE REQUIREMENTS

0.3.1 Effluent Discharge Options

Since the feasible alternatives for wastewater treatment depend on where the effluent is discharged and associated effluent requirements, effluent discharge alternatives were evaluated before considering treatment options. Eight discharge alternatives were considered, including effluent recycling (maximum or partial recycling on Imperatrice property, or city-wide recycling); relocating the discharge point to Talent Irrigation District system; or continuation of the current practice of discharging to Ashland Creek.

Considerations in the development and evaluation of discharge options included:

- Land available for effluent recycling
- Phosphorus discharge limits in Ashland Creek
- Maintaining sufficient stream flow for fish in Ashland Creek
- Water rights issues
- Public and/or agency concerns
- Anticipated excess thermal load limits in Ashland and Bear Creek

Based on a review of temperature and flow data, there is an existing excess thermal load with the potential to exceed allowable levels during the May through October period. Therefore, the continued discharge options included various technologies to reduce temperatures and thermal loads both before and after discharge. The continued discharge alternatives evaluated included use of a cooling tower/chiller, water quality trading (including shading) with new wetlands and outfall relocation, blending, and a hyporheic (shallow ground water mixing) option to meet anticipated limits.

0.3.2 Effluent Discharge Recommendation

Though effluent requirements for recycling are less stringent than discharge to surface waters, a 100 percent effluent recycling program for Ashland has two major obstacles: 1) some of the water is needed to sustain flow for fish in Ashland Creek, and 2) the existing City-owned property will not be large enough for 100 percent land application in the future. Partial effluent recycling to limit discharge to periods with less restrictive discharge limits (primarily wet-weather, high-flow periods) would minimize the need for additional treatment, but would also require cost-prohibitive storage volumes. Therefore, the most feasible effluent discharge method is continued discharge to the creek, with shading/trading, wetlands, and outfall relocation recommended to deal with thermal loads. Effluent recycling can be pursued as needed to address future potable water supply needs.

0.4 WASTEWATER TREATMENT

0.4.1 Existing Facilities

The Ashland WWTP consists of grit removal and screening, biological treatment in an oxidation ditch system with secondary clarification, UV disinfection, and post aeration. Alum addition and a tertiary membrane system are operated from May 1st to November 30th, to aid in meeting a seasonal phosphorus limit. Waste solids from the biological process are dewatered and hauled to the landfill for disposal. (Equipment for lime stabilization of the waste solids is currently not used.)

The Ashland WWTP currently operates and discharges to Ashland Creek under an NPDES permit. A new permit, expected to be completed in 2015, is anticipated to contain more stringent limits connected to Total Maximum Daily Loads (TMDLs) developed for the Bear Creek watershed. The 2007 TMDL addresses temperature, bacteria, and sedimentation issues, which may require a higher degree of treatment to maintain or improve effluent quality as future growth occurs. Additionally, new limits for toxins will trigger additional monitoring and may have impacts on the nature and timing of capital improvements in the future.

Reported effluent characteristics from January 2004 to December 2010 were analyzed to evaluate plant compliance with existing permit limits, and to evaluate the expected capability of the plant to continue meeting the permit limits with increased flows. Hydraulic capacity, treatment capacity based on typical operating criteria, and physical condition of the treatment plant components were also evaluated.

For CBOD, TSS, ammonia, phosphorus, and E. coli, the existing treatment plant technology should be able to meet the current limits in the future as long as treatment units are operating within the existing design criteria. As flow increases, additional components may be needed to maintain the design criteria and continue meeting the effluent limits, based on hydraulic and treatment capacity.

0.4.2 Recommended Improvements

The treatment process components that will need to be upgraded or replaced are:

Priority 1 (2012-2020)

1A – required for permit/Agency compliance

- Effluent temperature upgrade
- Fish screen for outfall (relocated outfall)
- Add UVT monitor

1B – recommended to address capacity and equipment condition issues

- Additional biological capacity (see treatment alternatives below)

- Option to meet DO limit (unless the limit is revised with the new permit and new outfall location).
- Replace RAS pumps with larger pumps

Priority 2 (2021-2030)

- Replace membranes at end of useful life (2023 upgrade will increase capacity, requiring piping, blower, membrane pump, and chemical treatment equipment upgrades)
- Add UV reactors to increase hydraulic capacity, and upgrade existing panels to allow flow pacing (to save energy).
- Upgrade or replace grit removal system
- Replace mechanical bar screen, clarifier mechanism in clarifier #2, and equipment in existing oxidation ditches

Priority 3 (2030-2060)

- Replace influent lift station pumps
- Replace membranes at end of useful life
- Increase biological treatment capacity
- Increase solids dewatering capacity
- Replace clarifier mechanisms in clarifiers 1 and 3

0.4.3 Treatment Alternatives

Treatment alternatives considered for continued effluent discharge included:

- No Action alternative
- Reduction of peak flows through
  - rehabilitation of collection system to minimize inflow and infiltration (I/I)
  - addition of flow equalization
- Expansion of oxidation ditch plant (third oxidation ditch or fourth clarifier)
- Parallel membrane plant to treat flows in excess of existing oxidation ditch capacity
- Enhanced biological treatment by modification of process in existing oxidation ditch
  - Staged aeration
  - Integrated Fixed Film/Activated Sludge (IFAS)
  - In-ditch membrane plant
- Adding a primary filter to reduce loading to the oxidation ditch

After prescreening with the City's technical review committee, the following three options were evaluated in more detail with cost estimates and environmental impacts considered:

1. Expansion of oxidation ditch plant by constructing an **additional oxidation ditch** (which could be staged by initially using the shell as equalization storage);

2. Converting to enhanced biological treatment in the existing oxidation ditches, through **staged aeration** or **IFAS**

3. Adding a fine mesh sieve (**primary filter**) to reduce loading and thus increase treatment capacity.

All options are similar in that they provide capacity to 2030 and beyond. The recommended alternative is building a new ditch. While this improvement could be phased over time, with the initial phase being construction of the shell for use as an equalization basin, the entire project is recommended at this time for added redundancy and to take advantage of low-interest financing available to the City.

0.4.4 Biosolids Handling Alternatives

The estimated amount of sludge produced is expected to increase 28% by the year 2030. The City of Ashland must have a reliable means of disposal for its sludge, since it is produced on a continuous basis and there is limited existing storage on-site.

Currently the City of Ashland disposes of their unstabilized dewatered sludge in the Dry Creek Landfill, and has adequate sludge storage and treatment facilities to manage their sludge through 2030. If this option should become unavailable or if it is desired to beneficially reuse the biosolids for fertilizer, the City would be required to stabilize their sludge before applying it to agricultural land or providing it to the public as fertilizer.

The evaluation of sludge handling alternatives involved a review of available technologies for thickening, sludge stabilization and dewatering. After consulting with the technical review committee (TRC), the following three options were evaluated in more detail with cost estimates and environmental impacts considered:

1. Dewater sludge using the **existing centrifuges, and haul to the landfill** for disposal.

2. Dewater sludge using the **existing centrifuges, and compost** to produce Class A biosolids for sale to commercial businesses and individuals.

3. Dewater sludge using the **existing centrifuges, and dry using a thermal dryer** to produce Class A biosolids for sale to commercial businesses and individuals.

Continuing to landfill is the least expensive alternative. However, it is recommended that the City consider a backup plan. Both compost and dried biosolids can be sold to generate revenue to offset the cost of sludge treatment. Thermal drying is less expensive than composting, and facilities could be located at the existing wastewater treatment plant.

0.4.5 WWTP Improvement Recommendations

Recommended capital improvements necessary to resolve existing and future deficiencies at the treatment plant are summarized in the CIP cost table and illustrated in Figure 7.2 in Appendix A.

Further improvements were recommended and prioritized through consideration of several treatment planning objectives as outlined below.

- Eliminate NPDES Permit Violations:
  - Dissolved Oxygen - re-evaluate limit and seasons with DEQ
  - Excess Thermal Load – shading (recommended alternative) will be best accomplished by entering into an agreement with an implementation organization, and by relocating existing outfall to Bear Creek to address local plume concerns; local wetland improvements would also be beneficial

- Prevent Plant Deficiencies
  - Eliminate Bottlenecks – pipe from the oxidation ditch to clarifiers reaches capacity around 2030 flows
  - Manage Peak Flows – utilize shell of 3rd oxidation ditch as equalization basin until 2030; I/I reduction in collection system
- Stay Ahead of Growth and Maintain Equipment
  - Ashland Creek LS – provide portable backup pump on-site; replace pumps when pumped flows exceed 8.0 MGD (approx. 12.8 MGD total influent)
  - Screens – reach capacity and life expectancy in 2030
  - Grit removal system – sufficient capacity to 2030, estimated life expectancy near 2025
  - Oxidation Ditch – aerators reach useful life near 2030, new shell/equalization basin will need to be equipped as oxidation ditch #3 in 2030
  - Secondary Clarifiers #1 & #2 – mechanical life expectancy will be reached in 2030 and 2020, respectively; sufficient capacity is provided to 2050 with construction of a 3rd oxidation ditch
  - RAS pumps – replace when peak flows commonly exceed 6.5 MGD
  - UV disinfection – treatment capacity sufficient to 2030, while hydraulic capacity will be reached near 2020
  - Membrane filtration – replacement schedule provided to meet expected capacity increases and revolving life expectancies; based on that schedule, the membrane feed pumps will need to be upsized in 2023.
  - Alum feed – pump capacity will be reached near 2025
- Improve Solids Handling
  - City desires to produce a sellable Class A solids at some point
- Improve SCADA system

Relocating the outfall to Bear Creek, the fish screen, and third oxidation ditch involve construction within or near several Water Resource Protection Zones/Riparian Corridors, Locally Significant Wetlands, and Possible Wetlands. These projects will require environmental evaluations and coordination with Oregon Department of Fish & Wildlife (OWDR), Oregon State Department of Lands, and City Planning & Zoning.

0.5 CAPITAL IMPROVEMENTS PLAN & FINANCING

0.5.1 Summary of Capital Costs

Table ES.2 presents a summary of future costs in order of priority. The basis for the need for each improvement varies, including compliance with the City's discharge permit and anticipated new regulations; achieving capacity necessary to accommodate growth; and replacing worn/old equipment.

Priority 1 improvements target existing deficiencies, and are intended to be completed within the next 5-10 years. Priority 2 improvements correct lower risk deficiencies and/or address impacts due to growth, and are expected to be required from 2020 to 2030. Priority 3 improvements are driven by growth. Flexibility in the schedule for completing many of these improvements is warranted. For example, the City should consider accelerating pipeline projects if they can be coordinated with roadway improvements. Similarly, changes in flows and efforts to reduce infiltration and inflow may allow for some improvements to be postponed.

TABLE ES.2: City of Ashland Wastewater Improvements
Opinion of Probable Cost

ID#	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment		City's Estimated Portion
				%	Cost	
Priority 1 Improvements (2012 - 2020)						
Wastewater Treatment						
1	Wetlands / Outfall Relocation*	Compliance	$ 3,661,000	15%	$ 549,150	$ 3,111,850
2	Riparian Restoration*	Compliance	$ 1,293,000	15%	$ 193,950	$ 1,099,050
3	UVT Monitor	Compliance	$ 20,000	0%	$ -	$ 20,000
4	Backup (Portable) Pump	Capacity	$ 60,000	0%	$ -	$ 60,000
5	Membrane Replacement	Replacement	Completed			
6	Oxidation Ditch	Capacity	$ 6,150,000	60%	$ 3,710,000	$ 2,440,000
7	RAS Pump Replacement	Capacity	$ 90,000	20%	$ 18,000	$ 72,000
8	Wastewater Master Plan Update (~2019)	Update	$ 125,000	100%	$ 125,000	$ -
9	WWTP SCADA Upgrades	Replacement	$ 250,000	0%	$ -	$ 250,000
Wastewater Collection System						
1A	18" and 24" Parallel Trunkline Along Creek	Capacity	$ 1,587,000	70%	$ 1,110,900	$ 476,100
1B	15" Main Along Mountain Ave	Capacity	$ 118,000	25%	$ 29,500	$ 88,500
1D	A St 15" Main	Capacity	$ 522,000	10%	$ 52,200	$ 469,800
1E	12" Main Along Railroad	Capacity	$ 275,000	57%	$ 156,750	$ 118,250
1G	Miscellaneous Upgrades	Various	$ 335,000	10%	$ 33,500	$ 301,500
1H	Portable Flow Meters	Operations	Completed			
1J	Storm Water Inflow Study (2012 - 2013)	Capacity	Completed			
	Total Priority 1 Improvements		**$ 14,486,000**		**$ 5,978,950**	**$ 8,507,050**
Priority 2 Improvements (by 2020 - 2030)						
Wastewater Treatment						
1	Membrane Replacement (Larger Membranes)	Capacity/ Replacement	$ 4,659,000	40%	$ 1,863,600	$ 2,795,400
2	Membrane Feed Pumps & Piping Replacement	Capacity	$ 507,000	80%	$ 405,600	$ 101,400
3	Additional UV Reactors & Upgrade Control Panels	Capacity	$ 351,000	100%	$ 351,000	$ -
4	Mechanical Bar Screen Replacement	Replacement	$ 496,000	20%	$ 99,200	$ 396,800
5	Grit Removal System Replacement	Replacement	$ 801,000	20%	$ 160,200	$ 640,800
6	Existing Oxidation Ditch Equipment Replacement	Replacement	$ 1,551,000	0%	$ -	$ 1,551,000
7	Clarifier Mechanism Replacement	Replacement	$ 324,000	0%	$ -	$ 324,000
8	Replace Ashland Creek Lift Station Pumps with Larger Pumps	Capacity	$ 353,000	80%	$ 282,400	$ 70,600
9	Wastewater Master Plan Update (~2019)	Update	$ 125,000	100%	$ 125,000	$ -
10	Biosolids Disposal (assumes thermal dryer)	Various	$ 4,100,000	20%	$ 820,000	$ 3,280,000
Wastewater Collection System						
2A	12" Pipeline on Nevada Street	Capacity	$ 217,000	38%	$ 82,460	$ 134,540
2B	8" Slope Correction on Walker Ave.	Operations	$ 168,000	28%	$ 47,040	$ 120,960
2D	Miscellaneous Upgrades	Various	$ 739,000	10%	$ 73,900	$ 665,100
	Total Priority 2 Improvements		**$ 14,391,000**		**$ 4,310,400**	**$ 10,080,600**

*All costs came from 2012 CSSMP and are in 2011 dollars. Cost for wetlands/outfall relocation and riparian restoration have been updated to reflect 2014 estimates. Riparian restoration and wetlands/outfall relocation costs excluded operations and maintenance costs, and assume the average of the low and high range of costs.

TABLE ES.2: City of Ashland Wastewater Improvements Opinion of Probable Cost *(Continued)*

ID#	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment		City's Estimated Portion
				%	Cost	
Future Improvements (beyond 2030) or Development Related Improvements						
Wastewater Treatment						
1	Additional Centrifuge	Capacity	$ 817,000	100%	$ 817,000	$ -
2	Clarifier Mechanism Replacement (2)	Replacement	$ 646,000	0%	$ -	$ 646,000
3	Additional Clarifier	Capacity	$ 1,773,000	100%	$ 1,773,000	$ -
Wastewater Collection System						
3A	Rogue Valley Hwy 99 Collection, Lift Station, & Pressure Main (assumes City provides service)	Growth	$ 2,545,000	100%	$ 2,545,000	$ -
3B	Upsize Costs for Future Expansion	Growth	$ 18,000	100%	$ 18,000	$ -
	Total Priority 3 Improvements		**$ 5,799,000**		**$ 5,153,000**	**$ 646,000**
TOTAL WASTEWATER IMPROVEMENTS COSTS (rounded)			**$ 34,676,000**		**$ 15,442,350**	**$ 19,233,650**

*All costs came from 2012 CSSMP and are in 2011 dollars. Cost for wetlands/outfall relocation and riparian restoration have been updated to reflect 2014 estimates. Riparian restoration and wetlands/outfall relocation costs excluded operations and maintenance costs, and assume the average of the low and high range of costs.

0.5.2 Financing / Rates

A detailed financial plan developed by Economic and Financial Analysis (EFA) was prepared previously as part of the Comprehensive Sanitary Sewer Master Plan. The financial forecast assumed financing for three new capital projects (membrane replacement, wetlands/outfall and riparian restoration, and the oxidation ditch shell) financed by the Oregon DEQ State Revolving Fund. The total annual debt obligation for these improvements was estimated in the CSSMP to be approximately $686,000/year. Because of the availability of low interest loans, the City has sought to expand what could be financed to include additional membrane costs (previously anticipated to be paid for from cash reserves), the internal equipment of the oxidation ditch, and additional collection system improvements (Priority 1A-1E projects) that were previously going to be paid for with cash. Funding all of these improvements with DEQ SRF low interest funds (1.5% which includes 0.5% administrative fee, and 20 year term), results in an increase in the annual debt obligation of approximately $983,000/year, or $247,000/year more than assumed in the previous financial analysis documented in the CSSMP ($247,000/year is approximately 8% of the FY 2013 annual operating revenue.)

Sewer rates and forecast rate increases were developed as part of the CSSMP and showed 10% rate increases for 2012 through 2017. Since then, finances and user rates have been reviewed/updated by EFA and the City with each new financing package. Additionally, each fiscal year the City evaluates the utility's financial performance during the previous year and decides whether to follow or modify previously planned rate increases. Changes in the construction schedule, financing costs, operating costs, or revenues from rates and SDCs may require the City to modify the planned rate increases.

1.0 PROJECT PLANNING

The City of Ashland operates and maintains a sanitary sewer collection system and a wastewater treatment plant. A wastewater facilities plan prepared in 1995 described the wastewater system and regulatory requirements at the time, and evaluated alternatives to address needs for a 20-year planning horizon. The facilities plan was amended in July 1997, and again in August 2000. Keller Associates, Inc. was commissioned in 2010 to complete a comprehensive master plan for the City of Ashland sanitary sewer collection system and wastewater treatment plant. The resulting Comprehensive Sanitary Sewer Master Plan (CSSMP) was adopted by the City on April 17, 2012.

The purpose of this wastewater facilities plan is to provide documentation requested by the Oregon Department of Environmental Quality that will address changes since the 1995 Wastewater Facilities Plan, summarize new permit requirements, discuss treatment alternatives, and summarize recommended improvements.

1.1 LOCATION

The City of Ashland is located in the Rogue Valley in southern Oregon (Jackson County) just north of the California border. The study area (Figure 1.1) was selected to match the Urban Growth Boundary (UGB) defined in the 1983 Ashland Comprehensive Plan, with its associated land use and zoning. The UGB/study area boundary closely follows the existing City Limits with slight expansion to the northwest and southeast.

Ashland, in the foothills of the Siskiyou and Cascade ranges, is at about 1930 feet above sea level (with higher elevations in the foothills). The elevation drops about 400 feet from east to west along Siskiyou Blvd. and Main St. Topography of the area is shown in Figure 1.2.

1.2 ENVIRONMENTAL RESOURCES PRESENT

Environmental resources within the UGB are described in the 2005 Ashland Comprehensive Plan. The resources addressed herein comprise the primary resources evaluated in environmental reports to meet federal cross-cutting requirements.

1.2.1 Land Use / Important Farmland

Though there is land in the study area classified as prime farmland, the study area is entirely within the Urban Growth Boundary. The intent of the Farmland Protection Policy Act and State Goal 11 is met as long as no sewer system extensions are proposed outside the UGB. Land use and zoning within the UGB and City limits can be found in the Ashland Comprehensive Plan.

1.2.2 Water Resources

Ashland Creek flows through the city to meet Bear Creek, which runs southeast–northwest along the east side of Ashland. To protect the functions and values of these resources, the City has established Water Resource Protection Zones for Riparian Corridors and Locally Significant Wetlands. The 2011 FEMA flood insurance rate map (FIRM) in Appendix B shows the 100-year floodplains for Ashland and Bear Creeks (updated since the 2005 Comprehensive Plan). There are no wild and scenic rivers in the study area.

Ashland's potable water supply comes primarily from Ashland Creek, supplemented at times with water from the Talent Irrigation District. The City also intends to connect to the Medford water system to provide a back-up source of potable water.

1.2.3 Wetlands

Wetlands designated by the City as Locally Significant Wetlands are shown on the Official Water Resources Map (included in Appendix B).

1.2.4 Historic / Cultural Resources

The National Park Service website has 58 listings on the National Register of Historic Places for Ashland, including 4 historic districts that encompass many of the individual places listed. A tabulation of the listed properties/districts is included in Appendix B, along with maps depicting the location of 30 of the individual listed properties and two of the historic districts.

1.2.5 Biological Resources

Ashland and Bear Creeks are home to several species of fish, including steelhead, coho salmon, chinook salmon, and cutthroat trout.

Threatened and endangered species potentially occurring in Jackson County are shown in Table 1.1, along with their listing and an indication if critical habitat has been designated for the species. A brief description of typical habitat for each listed species follows (from US Fish and Wildlife Service, and Oregon Fish & Wildlife Office websites). Based on the study area characteristics compared to typical habitat, it appears unlikely that many of these species except for coho salmon would be found in the Ashland study area.

TABLE 1.1: Threatened and Endangered Species, Jackson County

Species	Threatened	Endangered	Critical Habitat
Fish: Coho salmon	X		X
Birds: Northern spotted owl	X		X
Invertebrates: Vernal pool fairy shrimp	X		X
Plants: Gentner's fritillary		X	
Large-flowered woolly meadowfoam		X	X
Cook's lomatium		X	X
Kincaid's lupine	X		X

Coho Salmon: Coho salmon spend the first half of their life cycle rearing and feeding in streams and small freshwater tributaries. Spawning habitat consists of small streams with stable gravel substrates.

Northern Spotted Owl: Spotted owls are found in low and mid-elevation mature forests with dense canopy. They prefer forests of Douglas Fir with complex vegetation at multiple levels, and are often found near streams or other water sources. Because Spotted Owls typically do not cross brushy or clearcut areas, they prefer large expanses of undisturbed mature forest.

Vernal Pool Fairy Shrimp: Vernal pool fairy shrimp live in ephemeral freshwater habitat; none are known to occur in running water or other permanent bodies of water.

Gentner's Fritillary: Gentner's fritillary typically grows in or on the edge of open woodlands at elevations from 60 to 450 feet. It can also grow in open chaparral/grassland habitat, often found within or adjacent to mixed hardwood forest, but always where some wind/sun protection is provided by other shrubs. It does not grow on very dry sites.

Large-flowered Woolly Meadowfoam: Woolly meadowfoam occurs at the edge of vernal pools at elevations of 1230 to 1310 feet, generally near the wetter inner edges.

Cook's Lomatium: Cook's lomatium occurs only where soil types have a hardpan or clay layer close to the surface, creating seasonally wet soils and vernal pools.

Kincaid's Lupine: Kincaid's lupine is typically found in dry, native upland fescue prairie. At the southern limit of its range, it occurs on well-developed soils adjacent to outcroppings, often under scattered oaks.

1.2.6 Socio-Economic Conditions

The 2005 Ashland Comprehensive Plan describes socio-economic factors in Ashland. Actual socio-economic conditions have changed since then due to the economic downturn. According the US Census Bureau, the median household income (2007-2011) in Ashland is $41,334 (compared to $49,850 for the entire state). Over one-fifth (21.1%) of the population is below the poverty level.

1.3 POPULATION TRENDS

The 2010 population of the City of Ashland from census data was 21,947. Projections of future populations were developed as part of the Ashland Comprehensive Plan. The projected populations of 26,146 for the year 2030 and 31,633 for the year 2060 from the Comprehensive Plan were utilized for facilities planning. Intermediate populations were interpolated from the census and comprehensive plan values.

1.4 DESIGN FLOWS

A detailed evaluation of wastewater flows was performed for the CSSMP, utilizing historical (2004-2009) influent flow data to calculate 2010 design flows according to the Oregon Department of Environmental Quality (ODEQ) design memo "*Guidelines for Making Wet-Weather and Peak Flow Projections for Sewage Treatment in Western Oregon*". Future flows from residential and commercial/industrial/public growth were calculated by adding the additional wastewater flow of new developments to the existing flows. A copy of this analysis can be found in Appendix C of this report.

As part of this facility planning study update, more recent historical data (2010-2012) was analyzed to determine if any changes in the design flow projections were warranted. Based on the analysis of additional data (Appendix C), projected flows are about 1-2% higher than previously projected in the 2012 CSSMP. Table 1.2 summarizes the projected sewer flows.

In an effort to identify sources of peak flows, the City commissioned an infiltration/inflow study (see Appendix C). Though the study did pinpoint some areas of modest infiltration and some inflow sources, it did not identify large sources of I/I that would account for the majority of flow increases observed at the WWTP following large storm events.

TABLE 1.2: Projected Future Ashland Flow Rates

MGD	Design 2012	2020	2030	2040	2060
Population[1]	22,150	23,845	26,146	28,670	31,633
Average Day Dry-Weather[2] (ADWF)	2.1	2.26	2.48	2.72	3.00
Max Month Dry-Weather ($MMDWF_{10}$)	2.7	2.91	3.19	3.49	3.86
Annual Average Day (AADF)	2.2	2.37	2.60	2.85	3.14
Average Day Wet-Weather[3] (AWWF)	2.3	2.48	2.71	2.98	3.28
Max Month Wet-Weather ($MMWWF_5$)	3.6	3.88	4.25	4.66	5.14
Peak Week (PWkF)	5.0	5.34	5.80	6.30	6.90
Peak Day ($PDAF_5$)	7.1	7.52	8.10	8.73	9.47
Peak Instantaneous (Hour) (PIF_5)	10.5	11.09	11.90	12.78	13.82

[1] Provided by City of Ashland, Department of Community Development
[2] Dry-Weather = May – October
[3] Wet-Weather = November – April

1.5 REGULATORY REQUIREMENTS

Regulatory requirements, existing constraints, and water quality impacts directly affect the basis of design for new improvements. A discussion of regulatory requirements, updated from the 2012 CSSMP, is included in Appendix D. This includes state and federal regulations for collection systems (pump station and pipelines), treatment (NPDES permit and TMDL requirements, plant reliability criteria, biosolids management regulations, GASB-34 requirements, and greenhouse gas policies), and recycled water (reuse), plus City policies and guidelines (phosphate ban, pretreatment, others).

As summarized in Table 1.3, the current discharge permit for the treatment plant includes seasonally varying limits for $CBOD_5$, total suspended solids, E. coli, ammonia, phosphorus, excess thermal load, and dissolved oxygen. Additional limits not shown in the table include E. coli (126/100 mL), pH (6.5-8.5), and $CBOD_5$ and TSS removal efficiency (minimum 85%). The permit also specifies a daily maximum loading of 5.1 pounds per day (ppd) for phosphorus.

TABLE 1.3: Summary of Existing Seasonal NPDES Effluent Limits

Period	Avg. Monthly Limits: mg/L / ppd				Dissolved Oxygen, mg/L	Excess Thermal Load, mil kcal/day
	$CBOD_5$	TSS	Ammonia	P		
Jan thru April	25 / 400	30 / 400	0.80 / -	-		
May thru August	10 / 120	10 / 96	0.52 / -	- / 1.6		
Sept thru October	4 / 77	10 / 96	0.52 / -	- / 1.6		
November	10 / 120	10 / 96	0.52 / -	- / 1.6		
December	25 / 400	30 / 400	0.80 / -	-		
Oct. 15 thru May 15					≥9.0	≤78
May 16 thru Oct. 14					-	≤38

Potential changes to the permit limits, including the possible addition of copper limits, are also discussed in Appendix D.

1.6 COMMUNITY ENGAGEMENT

The City of Ashland has performed extensive public outreach with regard to the wastewater planning process. This process began with the Comprehensive Sanitary Sewer Master Plan (adopted in 2012). In an effort to engage the public during the planning process, the City organized a technical advisory committee comprised of City staff, an elected official, consultants, local agency representatives, and members of the community. Multiple members of the committee also served on the water advisory group which facilitated coordination between water and wastewater master plans. Through a series of seven technical advisory meetings, existing wastewater system conditions were reviewed, alternative solutions were evaluated, and finally, priority improvements and project phasing were recommended.

Public outreach efforts also included City Council presentation updates in March 2011 and April 2012, and a public open house in March 2012. Additionally, an article discussing the water quality trading project (shading) was included in the April 2011 City newsletter. Outreach efforts have also been made to other public agencies, including the Talent Irrigation District and the Ashland Parks Commission. Since the adoption of the master plan, the City has held additional public meetings relative to the implementation of recommended user rates to fund priority system improvements.

Moving forward, the City anticipates continued public outreach and participation as project improvements and financing are implemented. The City intends on working closely with community members and the Ashland Parks Commission as wetland and outfall relocation alternatives are finalized.

2.0 EXISTING FACILITIES

Wastewater facilities for the City of Ashland include a sanitary sewer collection system comprised of 110 miles of gravity sewer and 8 lift stations, and a treatment plant that treats the collected wastewater for discharge to Ashland Creek.

2.1 LOCATION

The collection system and treatment plant locations are illustrated on Figure 2.1 (Appendix A). The treatment plant, located near the Ashland Creek lift station, includes the following processes:

- Preliminary treatment (screening and grit removal)
- Biological treatment process
  - Oxidation ditches
  - Secondary clarification
  - Return activated sludge (RAS) system
- Disinfection (UV)
- Post aeration
- Alum addition and a tertiary membrane system (operated May 1 - November 30, to meet a seasonal phosphorus limit)
- Solids handling processes
  - Waste activated sludge (WAS) system
  - Lime stabilization (not currently in use)
  - Sludge holding tank
  - Dewatering (centrifuge) and disposal at landfill

A plant layout and a flow schematic of the existing WWTP processes are shown in Figure 2.2 and Figure 2.3, respectively. Photographs of existing treatment facilities (screen, oxidation ditch, clarifier, UV disinfection) are included in Appendix A as Figure 2.4. Photographs of the lift stations are included in the CSSMP.

2.2 HISTORY

The Ashland treatment plant is located adjacent to Ashland Creek, near the Ashland dog park. Part of a buffer area to the west of the treatment plant site includes wetlands.

The original treatment plant for Ashland, built in 1936, included a primary clarifier, a trickling filter, a secondary clarifier, and sludge drying beds. The clarifiers were replaced in 1961 and a second trickling filter was added. In 1974, the two trickling filters were converted to activated sludge aeration basins, another (larger) secondary clarifier was added, and a new chlorine contact basin was constructed.

A major overhaul of the plant was accomplished from 1998-2002, converting it to an oxidation ditch facility, and adding grit removal, screening, a third clarifier, hollow fiber membranes for tertiary filtration, and post aeration facilities. The chlorine contact basin was also converted to ultraviolet disinfection, and solids handling processes (lime stabilization equipment, conversion of the aerobic digester to a lime stabilization/sludge storage tank and two centrifuges) were added to replace the sludge drying beds. All the original membranes were replaced from 2008-2013.

The CSSMP included an analysis of effluent data (January 2004 to December 2010) relative to permit compliance. This analysis showed no violations of permit limits for $CBOD_5$, TSS, or E. coli during that period. No violations of the effluent ammonia limits have occurred since plant operations were modified in early 2004. Four violations of phosphorus load limits (three based on monthly average and one on maximum day) occurred in 2005-2007. Excess thermal load limits for October 15 to March 15 were violated once, whereas there were 35 violations of limits for March 16 to October 14. From 2004-2010, there were 53 violations of the October 15 to May 15 minimum DO effluent limit, typically occurring in late October - early November.

2.3 CONDITION AND CAPACITY

2.3.1 Collection System

The condition and capacity of the Ashland lift stations and collection system were reviewed in detail in the CSSMP. Table 2.1 summarizes the pipeline data in the City's GIS system.

TABLE 2.1: Ashland Sewer Pipe Summary

Pipe Diameter (in)	Pipe Material Lengths (ft)								*Total by Diameter (ft)*	*% of Total*
	Steel	HDPE	Ductile Iron	Clay	Concrete	PVC	Orange -burg	Unknown		
Unknown								3,082	*3,082*	*0.5%*
4"				194	184	290		1,749	*2,417*	*0.4%*
6"	142	4,053		72,661	187,565	10,581	979	17,416	*293,397*	*50.4%*
8"			358	16,003	58,402	132,128		633	*207,524*	*35.7%*
10"				7,186	16,092	982		60	*24,320*	*4.2%*
12"				2,224	14,639	8,565		1,924	*27,351*	*4.7%*
14"								1,090	*1,090*	*0.2%*
15"				429	7,624	765		33	*8,851*	*1.5%*
16"			289						*289*	*0.0%*
18"					2,993				*2,993*	*0.5%*
21"				1,517					*1,517*	*0.3%*
24"					1,718	7,075			*8,793*	*1.5%*
30"			86						*86*	*0.0%*
Total by Material (ft)	*142*	*4,053*	*733*	*100,214*	*289,217*	*160,386*	*979*	*25,988*	*581,712*	*100.0%*
% of Total	*0.02%*	*0.7%*	*0.1%*	*17.2%*	*49.7%*	*27.6%*	*0.2%*	*4.5%*	*110*	*MILES*

This inventory of pipe size and material for the City's 110 miles of gravity sewer reveals that approximately half of the collection system (about 57 miles) is made up of pipelines smaller than the current minimum pipe diameter standard of 8 inches. Clay and concrete pipes (generally the oldest and most susceptible to disrepair) constitute approximately 17% and 50%, respectively, of the total system (25% and 63%, respectively of pipes smaller than 8 inches). A review of about 16 hours of video and accompanying TV monitoring logs also provided a glimpse into system conditions. Typical problems identified include cracks, roots, pipe sags, offset joints, and broken pipe, with over 400 pipeline segments currently identified for either spot repairs or pipeline replacement/rehabilitation. In addition, infiltration and inflow is encountered in many of the City's manholes.

The collection system was modeled as part of the CSSMP. The calibrated model was exercised to determine the effects of a 2011 peak day flow event on the system. Figure 2.5 illustrates the available capacity of the existing system (assuming all lines are free from physical obstructions). The figure is color-coded to show utilized capacity of the pipes. Those sections shown in red experience pipeline surcharging under current flow conditions and present the greatest risk for backing up services and possible flooding (no overflows have been observed by City staff). The majority of pipes nearing or at capacity are located at bottlenecks in the system created by changes in pipe size or slope.

The collection system is cleaned and CCTV inspected much more frequently than the 5-year recommended frequency used by many jurisdictions. This has helped reduce the number of Sanitary Sewer Overflows (SSOs) experienced in the collection system. However, eliminating 100% of all overflows is not practical for any jurisdiction, and Ashland typically experiences two per year (see Appendix D for SSO reports for 2011-2013). These overflows are typically a result of localized blockage (usually from grease) in a sewer main.

In addition to the maintenance activities, the City also maintains a defect rating program (using Cartegraph) that is used to prioritize rehabilitation projects and repairs.

2.3.2 Treatment Facilities

The plant was designed to comply with requirements of the 1992 TMDL for Bear Creek that established water concentration targets for total phosphorus, ammonia nitrogen, and biochemical oxygen demand; and the requirements of OAR Chapter 340, Division 93 for disposal of sludge at a landfill.

The treatment facilities are generally in good condition and suitable for continued use. The oldest treatment unit is Clarifier #2. Though the Clarifier #2 mechanism was not replaced as part of the 1998 project, plant staff has not identified any wear or failure issues. The remaining facilities are just over 10 years old and have been well-maintained. Though the chemical system is in good condition overall, the chemical feed pumps have proven to be unreliable and should be replaced.

There were some issues with the condition of the membrane system in the past; all of the original membranes have now been replaced. (Two cassettes in each of trains 1 and 2 were installed in 2008 and the eight remaining cassettes were replaced in July/August 2013; all cassettes in trains 3 and 4 were replaced in 2011 and 2012, respectively). The new modules provide greater surface area than the originals (250-340 sf vs. 220 sf).

The lime stabilization process installed as part of the 1998 improvements was used for a short period of time to stabilize the sludge to Class B standards prior to dewatering, but its use was discontinued since stabilization is not required for landfill disposal of dewatered biosolids. The lime feed equipment is reportedly in good condition and could be returned to operation with minimal preparation efforts.

The size and capacity of the processes is summarized in Table 2.2, along with the projected year when the capacity will be reached (based on the projected flows from Table 1.2).

Design and operating criteria used to evaluate the effective capacity of the oxidation ditches include mean cell residence time (MCRT), mixed liquor suspended solids (MLSS), complete nitrification (in order to meet ammonia limits). Longer MCRTs are needed to achieve nitrification at colder temperatures. The limiting condition for nitrification in the Ashland plant was determined to be a wintertime temperature of 12.5°C. At this temperature, it was estimated that an aerobic MCRT of 14 days was required. The conservative oxidation ditch capacity shown in Table 2.1 is based on the assumption that that the maximum month loadings could occur during minimum temperature conditions. Under "average" conditions with a temperature of 18.5°C, an MCRT of 12 days would be sufficient to maintain sludge quality (although it would be possible to decrease the aerobic MCRT to as little as 7 days and still maintain full nitrification).

TABLE 2.2: Summary of Treatment Capacity by Plant Process

Component	Size	Criteria	Capacity, mgd	When Reached
Influent Pumps	3 ea 3150 gpm	63% pumped[1], 2 pumps peak hour	12.8[2]	Beyond 2030
Bar Screens Mechanical Manual (backup)		- Max V = 5 fps, flow depth 2.5 ft[1]	13.5 8.7	Beyond 2030 Now
Grit Removal	14' square	Particle size removed[3] 0.21 mm (46,300 gpd/sq ft) 0.25 mm (58,000 gpd/sq ft) 0.33 mm (65,500 gpd/sq ft) 0.46 mm (87,000 gpd/sq ft)	 9.1 11.37 12.84 17.05	 Now[4] 2023 Beyond 2030
Oxidation Ditch	2 ea 1.41 MG	MCRT 14 days, winter max month[5]	3.76	2016
Clarifiers (3 ea)	2-80', 1-65' dia	Solids loading 36 ppd/sq ft peak hour	11.87	2029
RAS pumps	3 ea 1350 gpm	36-56% RAS rate, 2 pumps - pk day or - pk week	6.5 6.5	Now Beyond 2030
UV Disinfection (2 trains)	2 ea 4.25 mgd	One train in operation, max month Two trains, not overflow clarifier, pk	4.25 ~11	2028 2018
Membrane Feed Pumps	4 ea 1050 gpm	3 pumps in service, PDDWF	4.54[6]	
Membrane Filtration (May 1 to November 30)	No. cassettes: 24 with 6500 sf each, 16 with 6800 sf each	12 gpd/sq. ft., MMDWF 15 gpd/sq. ft., PDDWF	3.18 3.97	2028
Permeate pumps	4 ea 785 gpm	One per train, PDDWF	4.52[6]	
Alum pumps	0.5 gpm	One pump in service, PDDWF	4[6]	
Sludge Storage Tank Centrifuges	6 ea 56,000 gal 2 ea 175 gpm	Weekend storage (3 days) One unit in service Max 9 hrs 5 days/wk	~4[7] 3.4	

Notes:
1. Estimated from flow records
2. Total influent flow, assuming 63% pumped.
3. Theoretical required overflow rate for removal of particles ≥ sizes shown, WEF MOP#8
4. At peak hour
5. To achieve nitrification (per Biological Process Capacity Evaluation, CSSMP Section 9.3.3)
6. Flow capacity for MBR only; part of flow may be bypassed depending on phosphorus removal performance of clarifiers (per following discussion)
7. Based on WAS production approximately 20,000 gal/mgd max month

A biological process capacity analysis for 2012 annual *average* flow and loadings indicates that the existing biological process has adequate capacity for these operating conditions. The required MLSS concentration in the oxidation ditches, and the required aeration horsepower, provide reserve capacity under average conditions. Reserve capacity is also available in the secondary clarifiers under average conditions, given the low overflow rate and solids loading. However, the maximum month and peak flow conditions and their impact on clarifier operation become the limiting condition in assessing overall capacity.

For 2012 maximum month flow and loading, the MLSS in the oxidation ditches needs to be increased to 2,875 mg/L in order to maintain the MCRT required for nitrification at higher influent loadings and lower temperatures. At this MLSS concentration, the existing clarifiers are adequate for the maximum month flow of 3.6 mgd. The existing return sludge (RAS) pump capacity, as shown in Table 2.1, would be adequate to provide the required RAS flow for flows up to about 6.5 mgd (peak day flows above 6.5 mgd are projected for 2012). If the peak flows occur infrequently, the existing facilities (with all units in service) may be able to handle peak flows by storing excess solids in the existing clarifiers for a short duration.

As flows and loadings increase, the required MLSS to achieve nitrification and the resulting solids loading on the clarifiers would also increase (e.g. the MLSS concentration required for nitrification at projected 2015 maximum month flows and loadings would be approximately 3300 mg/L). This would further strain the capabilities of the biological system.

Another item of concern is system redundancy, particularly the ability to take an oxidation ditch out of service. The limiting factor is the aeration capacity. If one oxidation ditch were taken offline, the plant would be required to operate at 2800 mg/L MLSS to treat 2012 flows (increasing to 3200 mg/l in 2015 and 3600 mg/l in 2030) with an MCRT of 7 days. The existing aeration capacity (200 HP) is not enough to meet the 2012 peak aeration demand of 218 HP (increasing to 249 HP in 2015 and 281 HP in 2030). Though the plant may be able to meet permit limits during the dry season with one ditch offline (even though the peak air demands are not met), it should be noted that the increased loading conditions are already beyond recommended operating parameters with one basin offline.

Based on information from the UV manufacturer, the UV system has sufficient disinfection capacity for the year 2030 maximum month flow of 4.24 with a single train in operation, and for the year 2030 peak day flow of 8.03 mgd with both trains in operation. However, overall system hydraulics may be the limiting factor in determining the useful capacity of the existing UV system. Even with both UV trains in operation, flow would begin to back up in the clarifiers at about 9 mgd and could overflow the clarifier launder at about 11 mgd.

Since the membranes are operated only during the dry weather period, the overall treatment system capacity in terms of phosphorus discharge is based on meeting monthly and daily effluent phosphorus limits with dry weather flows. The existing membranes have sufficient capacity to filter the entire 2028 maximum month dry weather flow of 3.18 mgd, to meet the monthly phosphorus limit of 1.6 ppd. Assuming peak day membrane and clarifier effluent phosphorus levels of 0.08 and 0.3 mg/L, respectively, the peak day limit could be met at a PDWF of 4.95 mgd (3.97 mgd to the membranes and 0.98 mgd to the clarifiers).

For CBOD, TSS, ammonia, phosphorus, and E. coli, the existing treatment plant technology should be able to meet the current limits in the future as long as treatment units are operating within the existing design criteria. As flow increases, additional components (e.g. oxidation ditch, secondary clarifier, UV unit, membranes, or alum pump) may be needed to maintain the design criteria and continue meeting the effluent limits.

Though a major change in the type of treatment plant is not required for the parameters listed above, the existing treatment plant cannot meet the new expected temperature limits in the upcoming NPDES permit. Thus, new components will need to be added to the existing plant or alternative disposal methods used in order to meet the expected limits. Alternatives to address the future temperature limits are discussed in Chapter 4.

2.4 FINANCIAL STATUS

A comprehensive rate analysis was completed as part of the CSSMP by Economic and Financial Analysis (EFA). This analysis was documented in Chapter 14 and Appendix G of the CSSMP. A brief overview of some of the key elements is summarized here (additional financial information is included in Appendix E). User rate increases in 2012 and 2013 are in line with recommendations made in the CSSMP. A copy of the current user rate resolution (effective July 1, 2013) can be found in Appendix E.

July 2013 Residential User Rates

Base = $23.65 (includes 400 CF of water)

Commodity ($/CF) = $0.0338

Assuming a typical monthly water usage of 824 CF of water consumption, the typical resident pays about $36.99/month. This corresponds to approximately 0.85% of the medium household income.

Each year the City reviews expenses, debt obligations, and necessary revenues. A comprehensive rate model is used to evaluate user rates necessary to meet existing and new debt obligations and fund the City’s capital improvement plan. The City’s annual expenses for wastewater treatment and collection were reported for FY 2012 to be $5.65M, of which $0.47M was for capital outlay projects and $1.64M was for debt service. The estimated expenses for FY 2013 were $7.03M of which $1.60M was for capital outlay and $1.64M was for debt. Total expenses for FY 2014 are anticipated to be slightly higher at $7.16M. Refer to Appendix E for a more detailed breakdown of historical and anticipated expenses provided by the City for the period of 2011 through 2015.

The City currently has only one existing debt obligation – a Full Faith and Credit obligation from U.S. Bank, with an annual debt service of approximately $1.63 million. This will be repaid in FY 2022. Interest varies from 3.5% to 4.0% per year, and the City has pledged to use Food and Beverage Tax to pay debt service. When this source is inadequate, other sewer revenues (SDCs, cash reserves) are used to complete the annual debt obligation. In the CSSMP, the Food and Beverage Tax revenues were assumed to grow from $1.70 million in 2012 to approximately $1.89 million in FY 2019. Other operating revenue for July 2012-2013 provided an additional $3.915 million, of which 53% comes from residential accounts, 20% comes from commercial accounts, and 27% comes from what is designated as governmental accounts (the majority of which are multi-family accounts).

In addition to the existing debt, the City has entered into a loan agreement for $4,549,691 with Oregon DEQ for low interest financing of membrane upgrades and the Water Quality Trading project. The City anticipates securing additional DEQ SRF loans for other priority recommended improvements.

2.5 WATER / ENERGY / WASTE AUDITS

The CSSMP recommended that an energy audit be performed on the treatment plant to determine if changes at the plant could result in energy savings. The audit has not yet been conducted.

3.0 PROJECT NEED

3.1 HEALTH, SANITATION, ENVIRONMENT, AND SECURITY

While there are no known issues in the Ashland wastewater system relative to public health, sanitation or security, there are potential water quality issues relative to the discharge of treated effluent into Ashland Creek, which is a tributary of Bear Creek. The designated beneficial uses (OAR 340-41-0271) for the main stem of Bear Creek include industrial water supply, irrigation, livestock watering, fish & aquatic life, wildlife & hunting, fishing, boating, water contact recreation, and aesthetic quality. Designated beneficial uses for tributaries to Bear Creek include all of the above, plus public and private domestic water supply. Fish use designations for these streams includes salmonid spawning, rearing, and migration.

Water quality issues are addressed via TMDLs and NPDES permits. The 1992 Bear Creek TMDL established the following TMDLs (monthly average) for the Ashland wastewater treatment plant:

May 1 - October 31	Total phosphorus	2 pounds per day (ppd) at 3 mgd
May 1 - November 15	CBOD	59-161 ppd at 2 mgd (depending on stream flow)
	Ammonia	45 ppd

The current NPDES permit for Ashland, issued in 2004, reflects the waste load allocations established in the 1992 Bear Creek TMDL.

A second TMDL for Bear Creek, finalized in 2007, addresses temperature, bacteria, and sedimentation issues that will need to be in new permits. According to Oregon's 2012 Integrated Report, a Category 5 status (water quality limited, 303(d) list, TMDL needed) is shown for Ashland Creek relative to dissolved oxygen (spawning and cold water biota), and for Bear Creek relative to arsenic (human health and aquatic life) and dissolved oxygen (cold water biota).

A new permit for Ashland is anticipated to be completed in 2014. While the new limits are not yet known, it is fairly certain that the existing treatment plant will not be able to meet the new expected temperature limits in the upcoming NPDES permit. Thus, new components would need to be added to the existing plant or alternative disposal methods used in order to meet the expected limits. Though it appears that ammonia limits may not be updated until the next permit cycle, there may be limits proposed for copper. (Appendix D includes a discussion of applicable regulatory requirements.)

3.2 AGING INFRASTRUCTURE

3.2.1 Collection System

The CSSMP identified a noticeable trend between precipitation and plant influent flow rates that reflects the influence of infiltration and inflow at the wastewater treatment plant (WWTP). The rapid response between precipitation events and increased flows at the WWTP suggests that a significant component of peak plant flow is from storm water inflow. The sustained increase in flow at the WWTP over several days following a large storm event suggests that groundwater is also infiltrating into the City's wastewater collection system.

Typical problems identified in TV monitoring of the pipelines include cracks, roots, pipe sags, offset joints, and broken pipe, with over 400 pipeline segments currently identified for either spot repairs or pipeline replacement/rehabilitation. Clay and concrete pipes (generally the oldest and most susceptible to disrepair) comprise about 2/3 of the collection system (17%

clay, 50% concrete). City staff has indicated that where the clay pipe is found to be structurally sound, the pipe is still in good condition. Concrete pipe, generally the next oldest pipe, is susceptible to hydrogen sulfide corrosion and eventually should all be replaced. Steel and orangeburg pipe materials are also problematic and should be some of the first pipe sections considered for replacement.

In addition to pipeline replacements, many of the City's manholes are in need of replacement or rehabilitation. Replacement or rehabilitation of manholes should be considered where large amounts of infiltration and inflow are encountered.

Surcharging is currently experienced in sections of the collection system, and will get worse as flows increase with growth. In addition, there are portions of the collection system currently not experiencing problems that may reach capacity. Model simulations were run to analyze the effects of future growth at complete infill of the city limits (11-year horizon) and build-out of the Urban Growth Boundary (UGB, 21-year horizon). Modeling results show that the majority of pipelines with insufficient capacity for future growth flows were the same as those already identified as insufficient for current flow rates. Distributing the growth first to city limit infill areas did not result in any significant additional deficiencies; however, build-out of the urban growth boundary does result in several additional deficiencies. The additional future flows were considered in sizing of improvements required to address existing deficiencies.

3.2.2 Treatment Facilities

During the 2004-2010 period, the treatment plant experienced some exceedances of discharge permit limits for effluent ammonia, phosphorus, excess thermal load, and minimum dissolved oxygen. There were three exceedances of the limits for monthly average ammonia concentrations, and three for maximum daily ammonia concentration. (All of these violations occurred in early 2004, and the City has since modified operations to maintain the plant in compliance with the ammonia limits.) Three violations of the monthly average phosphorus load limit and one of the maximum day phosphorus load limit occurred during the same period. There was one violation of the October 15 to March 15 excess thermal load limit (78 million kilocalories per day), and 35 violations of the March 16 to October 14 excess thermal load limit (38 million kilocalories per day). There were also 53 violations of the October 15 to May 15 minimum dissolved oxygen (DO) effluent limit of 9.0 mg/L, with the lowest dissolved oxygen value at 7.7 mg/L.

For CBOD, TSS, ammonia, phosphorus, and E. coli, the existing treatment plant technology should be able to meet the current limits in the future as long as treatment units are operating within the existing design criteria. As flow increases, additional components (e.g. oxidation ditch, secondary clarifier, UV unit, membranes, or alum pump) may be needed to maintain the design criteria and continue meeting the effluent limits. Additionally, the existing treatment plant cannot meet the new expected temperature limits in the upcoming NPDES permit. Thus, new components will need to be added to the existing plant or alternative disposal methods used in order to meet the expected limits.

As discussed in Chapter 2, the existing biological process (oxidation ditch, clarifiers, RAS pumps) is currently at or near capacity. Though the existing biological process has adequate capacity for current annual *average* flow and loadings, *maximum month and peak* flow conditions and their impact on clarifier operation become the limiting condition in assessing overall capacity. As flows and loadings increase, the required MLSS to achieve nitrification and the resulting solids loading on the clarifiers would also increase, further straining the capabilities of the biological system.

Based on an evaluation in the CSSMP of projected operating conditions under projected flow and loads, there are three conditions that point to a recommendation to increase the plant capacity prior to 2015:

1. Aerobic MCRT would need to be increased in order to achieve nitrification during maximum month flows. With two oxidation ditches available, operators would be required to operate at a mixed liquor concentration of approximately 3300 mg/l in order to obtain the recommended MCRT to achieve nitrification.

2. Another item of concern is system redundancy, particularly the ability to take an oxidation ditch out of service. The limiting factor is the aeration capacity. If one oxidation ditch were taken offline, the plant would be required to operate at 2800 mg/L MLSS to treat 2012 flows (3200 mg/l in 2015 and 3600 mg/l in 2030) with an MCRT of 7 days. The existing aeration capacity (200 HP) is not enough to meet the 2012 peak aeration demand of 218 HP (249 HP in 2015 and 281 HP in 2030). Though the plant may be able to meet permit limits during the dry season with one ditch offline (even though the peak air demands are not met), it should be noted that the increased loading conditions are already beyond recommended operating parameters with one basin offline.

3. The third condition that is driving the need for additional capacity are peak wet weather flows. The 2015 peak flow condition provides challenges for settling in the clarifiers (the design surface overflow rate is exceeded), and for adequate RAS pumping.

Plant improvements are needed to avoid permit violations, eliminate hydraulic bottlenecks, and improve treatment reliability.

3.3 REASONABLE GROWTH

Wastewater facility improvements are needed to stay ahead of growth. The Ashland Comprehensive Plan has defined reasonable growth as reaching a population of 26,146 by the year 2030.

Flow projections calculated in accordance with DEQ guidelines were presented in Table 1.2 for various years from 2012 to 2060. Flow and load projections for year 2030 are summarized below.

TABLE 3.1: Flow and Load Projections

2030 Flow & Loads	Flow, mgd	BOD, ppd	TSS, ppd	TKN, ppd	Ammonia, ppd	Phosphorus, ppd
Population	26,146					
AADF	2.60	4953	5477	891	504	114
$MMWWF_5$	4.25	5191	6846	1159	655	149

The existing treatment plant, which went on line in 2002, was designed to meet the City's growth needs for 20 years (under the permit conditions in effect at the time). As noted above, the design capacity for this planned growth will soon be reached.

4.0 ALTERNATIVES TO MEET TEMPERATURE REQUIREMENTS

4.1 BACKGROUND

During certain periods of the year, the wastewater effluent from the City's treatment plant accounts for a significant portion of the flow in Ashland and Bear Creeks. Higher effluent temperatures can raise the temperature of the creek and negatively impact aquatic habitat and species. In 2007, a TMDL for Bear Creek was finalized, establishing temperature, bacteria, and sediment targets. The TMDL targets as a maximum of 13°C for October 15 to May 15 (spawning season), and 18°C for May 16 to October 14 (rearing and migration). The Ashland wastewater treatment plant (WWTP) is permitted a maximum HUA of 0.1°C above the biologically based numeric criteria. This condition is modeled during instream flow events less than the seven-day rolling average that have the probability of occurring once every 10 years (7Q10) to develop the wasteload allocation for the facility. Reducing the excess thermal load from the Ashland WWTP is important in meeting downstream temperature targets in Bear Creek.

Current effluent temperatures have the potential to exceed allowable levels for the May through October period. Based on an analysis of temperature and flow data for the period of 2005 to 2012, there is an existing excess thermal load of approximately 53 million kcal/day (the critical month with the maximum exceedance is October). This is anticipated to increase to approximately 67 million kcal/day by 2035, as a result of population growth and corresponding increases in wastewater flows (refer to Appendix D for calculations). Smaller exceedances occur throughout the year from March through December. New excess thermal load limits will be imposed when the NPDES permit for the City of Ashland's wastewater treatment plant (WWTP) is renewed to address the waste load allocation given to the City in the TMDL. The permit may also include a temperature limit to address local impacts of the thermal plume on aquatic habitat.

During development of the CSSMP, representatives from DEQ, the City of Ashland, Keller Associates, Oregon Department of Fish and Wildlife (ODFW), and other stakeholders met on several occasions to better define the impacts of Ashland's wastewater discharge. DEQ completed a thermal plume analysis for continued discharge to Ashland Creek as well as discharge to Bear Creek. Due to concerns with near field spawning impairments, thermal shock, and migration blockage, it is unlikely that continued discharge into Ashland Creek will be permitted without first significantly cooling the effluent. Relocating the outfall to Bear Creek would eliminate concerns of thermal shock and greatly mitigate other near field impacts. Based on 3D modeling completed by DEQ, a side bank discharge would allow discharge to Bear Creek without impairing spawning; however, there still remains a potential for migration blockage during the month of September.

An evaluation of wastewater discharge options completed in 2009 identified and evaluated seven strategies or alternatives to address the excess thermal loads. These included reduction or elimination of discharge, effluent cooling, thermal credit trading, flow augmentation, and hyporheic discharge. As part of this planning study update, Keller Associates provided an updated evaluation of the most promising disposal alternatives (which included a combination of thermal credit trading, wetlands construction, and an outfall relocation).

4.2 RECYCLING OPTIONS

Recycling treated wastewater via land application of wastewater effluent during the growing season could reduce or eliminate the discharge of thermal loads to Ashland and Bear Creeks during critical periods. Another benefit of recycling is that the treatment process is likely to be less affected by future changes in regulations requiring increasingly more stringent levels of treatment for discharge. As discussed in the CSSMP, additional items on the horizon that may affect future discharge requirements for the plant include 1) stricter ammonia limits, 2) Oregon Senate Bill 737, which addresses pharmaceuticals, and 3) aquatic life and human health criteria (e.g. potential copper, phthalates, and others). In addition to regulatory benefits, recycling water has the potential to offset potable water demands and make better use of available water resources.
Maintaining stream flows has been a priority for the City in the past. One of the drawbacks with any recycling alternative that involves removing the existing discharge flow from Ashland Creek is that the recycled water would not be available for use for potential downstream users or to create higher flow conditions for aquatic habitat.

From a water rights standpoint, the City of Ashland is not required to keep their effluent discharge in the creek. However, according to ORS 537.132, the following would occur if the City were to move forward with removing their flow for recycle purposes:

- The Department of Water Resources (DWR) would notify affected users if discharge from Ashland WWTP to Ashland Creek were to cease (this because Ashland has discharged for more than 5 years and the WWTP discharge may at times make up 50% or more of the flow).
- An affected downstream water right holder would need to demonstrate to DWR that the "cessation of discharge by the municipality substantially impairs the ability to satisfy a water right. . ." and if this person is successful, they would get preferential use of the recycled water.
- The City is not required to incur additional expenses (beyond a more favorable alternative) to deliver water to the affected person desiring the recycled water.

4.2.1 Option 1: Recycling Water on Imperatrice Ranch Property

The City has property north of I-5 (Imperatrice Ranch) that could be used for crop irrigation using effluent. A conveyance pipeline crossing Ashland Creek was constructed when the City was considering a project in 1997 for biosolids application, effluent storage and irrigation on the property.

Due to steep terrain and other limiting features (Talent Irrigation District canal, wetland swale), portions of the Imperatrice site are not useable for irrigation. Limiting irrigation to slopes less 20% and providing necessary buffer zones for the canal, swale and property lines provides a usable irrigation area of 412 acres for Class C effluent, or 433 acres for Class B effluent (smaller buffer to property lines). Class A effluent could also be used on this property in conjunction with city-wide recycling (see Option 2).

One of the primary benefits the City would realize with recycling water on the Imperatrice Ranch property is that the water rights currently used there could be transferred and used as additional water supply for the potable water system.

Two recycling options are summarized for the Imperatrice Property – Option 1A includes maximizing the total amount of water recycled on the property, and Option 1B includes recycling only the amount necessary to offset the existing water rights. Regardless of the disposal option selected by the City, Keller Associates recommends that the City work with DEQ so that future NPDES permits allow for recycling of treated effluent.

Option 1A: Maximum Recycling on Imperatrice Property

The potential for thermal shock and migration blockage in Ashland Creek would be averted by eliminating discharge from June through October, and potential salmonid spawning impairment from thermal discharges would be prevented by reducing/eliminating discharge during November and March through May. Storage volumes for this option were determined based on irrigating as much land as possible without supplemental water, and discharging excess to the creek only to the extent that impairment of salmonid spawning is avoided. This results in limited discharge during March, April and November, and discharge of stored excess during December, January and February when creek temperatures are low enough to easily accommodate the thermal load.

Alfalfa, pasture grass, and grass seed are potential crops; pasture grass and grass seed use more water than alfalfa and thus have lower storage requirements. Based on average net irrigation requirements and 70% irrigation efficiency, the acreage available on the Imperatrice property is sufficient to use 442 MG or 492 MG if planted to grass seed or pasture grass, respectively. Since the amount applied to crops is less than influent flows to the WWTP, the remainder would be discharged. At year 2030 flows (average 2.59 mgd), storage would be needed to provide sufficient volume during June, July and August. Additional storage volume would allow excess flows to be stored for discharge in the winter.

An irrigated area of 433 acres of pasture grass would handle (without supplemental water) up to 2.77 mgd, with a storage volume of 138 MG (see water balance in Appendix E). A total of 512 MG would be discharged to the creek from November through April. The same acreage in grass seed would handle year 2030 flows with a storage volume of 139 MG and 496 MG discharged (November through April).

The estimated project cost for Option 1A is approximately $10.8 million. Eliminating the need for phosphorus removal required for surface discharge would result in annual savings of $71,000 a year for alum. An estimated additional $100,000 potential annual savings could be realized in energy and chemical (sodium hypochlorite and citric acid) with elimination of the membrane operation. However, it is understood that the public perception may require the continued use of the membranes. If membrane operation were eliminated as part of the recycling option, the combined savings ($171,000) would more than offset the estimated $113,000 annual costs of pumping to storage on the site and from storage to irrigation. Though effluent quality would still need to be monitored with the recycling option, testing requirements (and related costs) are expected to decrease with the elimination of discharge during critical times.

Option 1B: Partial Recycling on Imperatrice Property

Keller Associates also evaluated an alternative that would recycle just enough effluent to offset the existing 424 ac-ft of irrigation rights on the Imperatrice property, and maintain the remaining flow in the stream. This scenario would allow the water right to be transferred to the City's potable water system and would also allow continued discharge to the creek. However, under this scenario, the temperature requirements of the TMDL would have to be met by employing other improvement alternatives.

To offset the 424 ac-ft water right, enough water would need to be supplied to irrigate approximately 136 acres of land. The amount of storage required would depend on how much is discharged during specific periods of time. If minimum storage were provided, then close to half of the existing discharge during July and August would be used for irrigation, while the balance would be discharged to the creek. With additional storage, discharges could be eliminated during specific periods and restricted during others to eliminate the need for additional treatment to reduce thermal and phosphorus loads for discharge. (Existing alum and membrane treatment would still be required.) This approach would require close monitoring to consistently meet the discharge limits.

If the City's primary objective is to maximize the discharge available during critical periods for aquatic habitat while offsetting the water right, this alternative could be adjusted to include increased storage during high stream flow periods and continued effluent discharge during low flow and spawning periods.

The estimated project cost for Option 1B, not including a cooling component, is approximately $5.3-8.9 million (includes 6.5-168 MG storage). Since discharge to the creek would continue, all the costs for phosphorus removal discussed above would be included in the annual operation and maintenance cost of this option. In addition, there would be the added costs (estimated $35,000/year) of pumping to storage on the site and from storage to irrigation.

4.2.2 Option 2: City-Wide Recycling

The scope of this study did not include an evaluation of city-wide recycling of treated effluent. City-wide effluent recycling of Class A effluent on parks, golf courses and other public spaces was evaluated as part of the water master plan as an alternative to reduce potable water use. From an implementation standpoint, it is envisioned that this would be phased in over many years. Recycling on City property could be phased with agricultural recycling on the Imperatrice property. Since the distribution system for city-wide recycling of effluent may be extensive, the cost for implementation will exceed that of the option to apply all effluent to the Imperatrice property. In addition, storage during shoulder seasons would still be required for temperature TMDL compliance (storage location could be at Imperatrice property). For the purposes of this study, this option was not investigated further.

4.3 RELOCATED DISCHARGE OPTIONS

4.3.1 Option 3: Discharge to Talent Irrigation District (TID)

This alternative would involve discharging the City's effluent into the TID irrigation system. The likely discharge location would be Talent Canal, which has a capacity of 35 to 45 cfs, and services approximately 3500-4000 acres. One of the benefits of this alternative would be the reduced chemical requirements needed to remove phosphorous, because most of the water would be recycled or land applied downstream. This alternative would mitigate concerns about near field impacts to aquatic habitat, and would reduce the thermal load requirements to the extent that the effluent is reused downstream.

On October 5, 2010, representatives from Keller Associates and the City met with TID board members to further discuss this alternative. The following concerns would need to be addressed before approval could be obtained for this option:

- Real and Perceived Concerns relative to receiving effluent – The TID currently does not receive any treated effluent. The district has a number of patrons who have already expressed deep concerns about receiving Ashland's effluent.
- Concern about Additional Chemicals – Downstream farmers have already fought with the district to eliminate other chemical additives for moss control in the district's canals. This concern is heightened by the number of organic farmers getting irrigation water from TID.
- Approval of Patrons – Because of the controversial nature of this alternative, the board indicated that they would want their patrons to weigh in on the matter, possibly even having a vote of the patrons. Educating the public, addressing their concerns, and obtaining approval at this time would require a great deal of effort with an uncertain outcome. This would also require many months to do.
- Removal of flow from Ashland Creek – ODFW has expressed a desire to keep as much flow in Ashland and Bear Creek as possible. There may also be other downstream water right impacts that would need to be addressed, as discussed in Section 4.2.
- Other Potential Additional Regulatory Requirements
- Additional Maintenance Requirements:
  - The district's water chemistry is very sensitive to temperature. Even a small increase in temperature or phosphorous is believed to increase the potential for moss growth in their system.
  - Receiving water during the shoulder seasons – particularly October and November – would adversely affect district operational practices. The City would need to plan on being able to store their effluent during these periods.
  - Additional fish screening may be required by ODFW. If these screens are required at outfalls, this could result in more maintenance to the district.

In addition to needing to address the above concerns, this option would also require that Ashland quantify and then mitigate excess thermal loads corresponding to the portion of flow that is not reused downstream. Additionally, this option would require an evaluation of the beneficial uses of the TID Canal (which is considered waters of the State) and whether or not the effluent would meet the water quality standards to protect the beneficial uses. Given the number of issues and potential road blocks, Keller Associates recommends that this alternative not be pursued at this time. However, it may be that in the future as public perception changes and if drought conditions make the water resources more valuable, it may be beneficial to reevaluate this alternative.

4.4 OPTIONS FOR CONTINUED DISCHARGE TO ASHLAND / BEAR CREEK

4.4.1 Option 4: Cooling Tower / Heat Exchanger / Chiller

Background

A cooling tower could be used to reduce the temperature of the effluent through evaporation to reduce the effluent temperature. In a cooling tower, air is simultaneously drawn up through the tower in the opposite direction from the water flow. A small portion of the water is evaporated, which removes the heat from the rest of the water. Warm, moist air is discharged to the atmosphere and cooled plant effluent is discharged to the creek.

The primary benefit of the cooling tower alternative is it addresses the temperature requirements without concern for off-site improvements, water rights, potential reduced flows in the stream, or potential compliance schedules. However, this alternative would be an energy-consuming option because the effluent would have to be pumped to the top of the cooling tower and a large fan would be operated continuously. This option was determined to be a viable alternative by Carollo in an evaluation of disposal alternatives completed in 2009. However, as noted in the Carollo report, a cooling tower could not meet the limits all the time and a chiller would have to be added to reduce the temperature of the effluent to meet the limits during some days.

There are two types of cooling towers that would be considered for Ashland: open loop and closed loop, both using plastic media. In the open loop design, the plant effluent would be pumped to the water distribution system at the top of the cooling tower for distribution evenly across the top of the media. In the closed loop design, the plant water is kept separate from the cooling water. The advantage to the closed loop system is that the cooling water is separate from the wastewater, and anti-scaling chemicals could be added to prevent scaling in the tower without affecting the effluent water quality.

The cooling tower would not have to be operated year-round. Its months of operation would be spring to fall. Effluent temperature limits are a daily maximum of 13 ^{o}C from October 15 to May 15, and a daily maximum of 18 ^{o}C from May 16 to October 14. The Oregon Administrative Rules (OAR 340-041-0028(12)(c)) allow for exceedence of the effluent limits when the daily maximum temperature exceeds the 90th percentile of the last ten years of the maximum daily temperature 7-day average. Based on the last 10 years of temperature data from the Medford Airport (closest weather station to Ashland), the 90th percentile maximum daily temperature is 93.3^{o} F.

When the cooling tower cannot meet the effluent limit, a chiller would also need to be used to reduce the temperature of the effluent lower than can be done by evaporation alone. A chiller uses condensers and electrical energy to obtain the additional cooling required similar to a refrigerator.

Analysis

<u>Continuous Discharge</u>

A cooling tower can continuously cool the effluent wastewater to approximately 5^{o}F above the atmospheric wet bulb temperature. During each day the wet bulb temperature increases and decreases with the air temperature. The historical climate data for the Medford airport provided daily minimum, maximum, and average wet bulb temperature. Using this historical climate data from January 1, 1999 to August 30, 2010, the plant effluent temperatures can be calculated for the minimum, maximum, and mean wet bulb temperatures. Plots showing the estimated cooled WWTP effluent temperature at the mean, minimum and maximum wet bulb temperatures, respectively, are shown in Charts 4.1, 4.2, and 4.3.

The mean wet bulb temperature graph is based on the average effluent temperature, while the maximum wet bulb temperature graph shows the maximum daily effluent temperature, and the minimum wet bulb temperature graph shows the lowest daily effluent temperature achievable using a cooling tower. These charts show that, using only a cooling tower and continuous discharge, there would have been a significant number of temperature violations over the last 11 years. When the temperature exclusion discussed above is considered, there still would have been more the 40 violations over the last 11 years.

CHART 4.1: Calculated WWTP Effluent Temperature at the Mean Wet Bulb Temperature

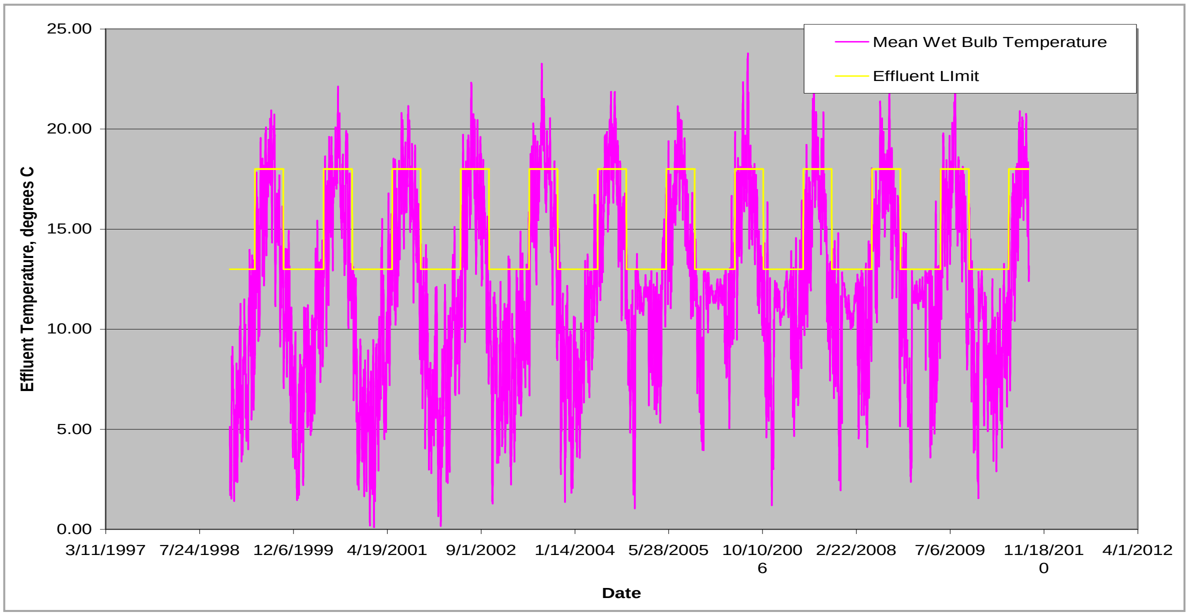


CHART 4.2: Calculated WWTP Effluent Temperature at the Minimum Wet Bulb Temperature

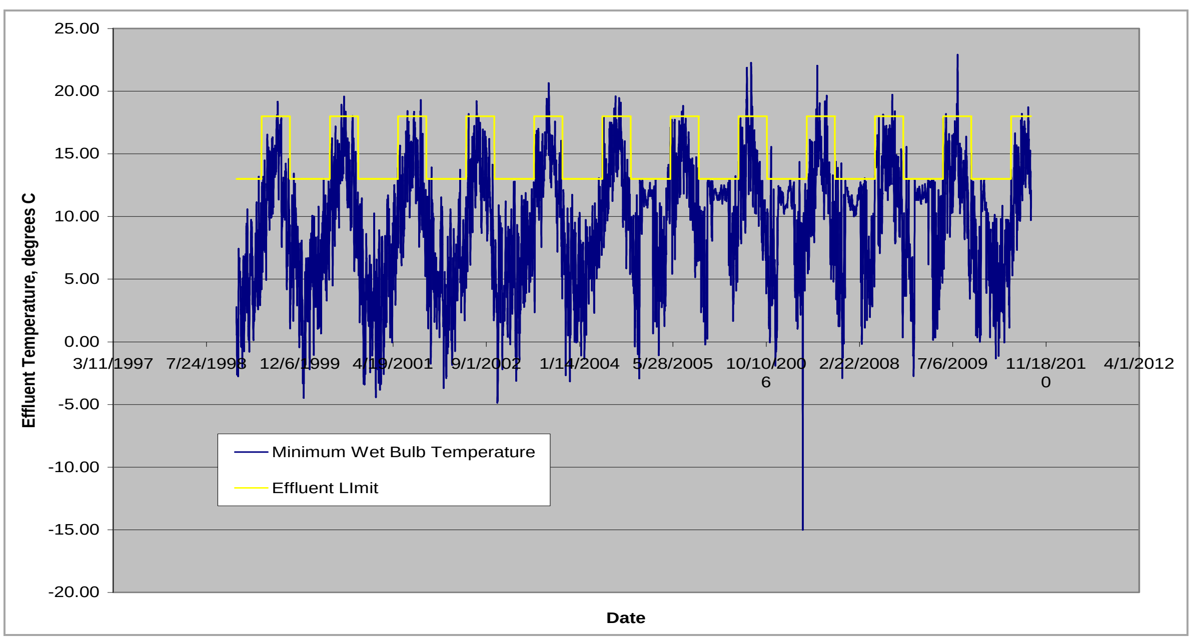
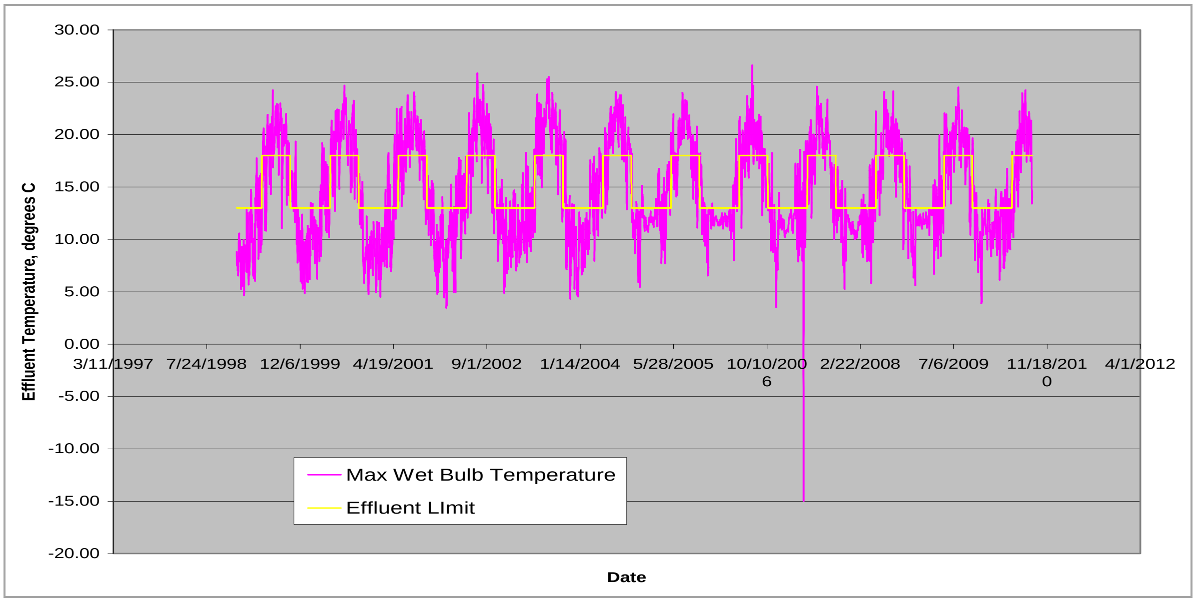


CHART 4.3: Calculated WWTP Effluent Temperature at the Maximum Wet Bulb Temperature



Storage

In order to meet effluent temperature limits with a cooling tower, Keller Associates looked at using storage to cool plant effluent only during the night when the air temperatures are lower. A discharge period of 12-hour period was assumed. The storage would be sized for half the peak flow between April and October, as some of the potential violations for continuous treatment are in the shoulder periods. The estimated peak daily flow during this period is 5.5 mgd, and thus the storage tank would be sized at approximately 3.0 million gallons (MG).

The Oregon Department of Fish and Wildlife (ODFW) indicated that they would want the City to continue to provide continuous discharge to maintain more uniform flows in the creeks. This would require the City to store the cooling tower effluent and discharge continuously from this tank. For planning purposes the effluent tank was also assumed to be 3.0 MG.

Since the cooling tower effluent would be stored, the final effluent temperature would be between the effluent at the mean and minimum wet bulb temperatures shown in Charts 4-1 and 4-2. Thus, there would still be several violations of the effluent temperature limit. The cooling tower may not meet the DEQ effluent temperature requirements all the time without additional treatment utilizing chillers to lower the effluent temperature during hot nighttime weather periods.

Chiller

In order to prevent any discharge temperature violations, a chiller would be needed to further reduce the effluent water temperature. A chiller would use condensers and electrical energy to obtain the cooling required. Based on the climate data analysis, the chiller may be required at times to further reduce the effluent temperature by 3^{o} C. To reduce the size of the chiller, it would be installed in the effluent line from the final storage tank and thus be sized for 5.5 mgd or 3800 gpm. The preliminary sizing of the chiller is 1,500 tons. The chiller would also need to be installed in a building.

Cooling Tower and Chiller Alternative

A cooling tower/chiller alternative that would allow the City to meet the effluent temperature limits at all times would consist of the following components:

- Cooling tower inlet storage, sized to hold 12 hours of plant effluent flow from 10 AM to 10 PM during April through October. The tank would hold 3.0 million gallons (50% of the 2030 peak dry weather day). For budgeting purposes, Keller Associates assumed the storage would be a concrete tank (high range) or a lined pond (low range).
- Pumps, sized to pump the daily flow from the storage tank to the cooling tower (assumes permeate pumps or filter pumps can feed the tower).
- Cooling tower, closed loop type, sized for twice the peak dry weather day flow (7,600 gpm) in order to pump the peak day during the 12 coolest hours of the day. For budgeting purposes, Keller Associates assumed that the cooling tower would include a plate heat exchanger for the cooling water and non-chemical water treatment system for the cooling water to prevent scaling.
- Cooling tower effluent storage, sized at 3.0 million gallons; assume continuous gravity discharge at the plant influent flow rate via a motor-controlled valve. For budgeting purposes, Keller Associates assumed the storage would be a concrete tank (high range) or a lagoon (low range).
- A 1,500 ton chiller, sized to cool 3,800 gpm 3 ^{o}C, in a building (approx. 32 feet by 22 feet and 16 feet high).

The estimated capital cost for this option is $ 6,100,000 to $8,100,000, depending on the type of storage. The estimated annual O&M costs for the cooling system are approximately $200,000 (for either storage option).

The O&M challenges are:

- Scale control in tower and chiller.
- Turning cooling tower system on as temperature limit is approached and off as tower is not needed.
- Controlling the pump rates to the tower and chiller and outlet rate from the final effluent equalization tank.
- Operating chiller when needed.

4.4.2 Option 5: Water Quality Trading (Riparian Revegetation, Cooling Wetlands, and Relocated Outfall)

Water quality trading allows for excess thermal loads to be blocked by canopy created by riparian vegetation and other approaches that reduce heat loading such as constructed wetlands, flood plain restoration, and/or restoration of cold water refugia. In recent years, the water quality trading program has been developed more fully in the State of Oregon. In December 2009, DEQ published an internal management directive entitled *Water Quality Trading in NPDES Permits*. With project protocols, verifications, and reporting procedures in place and accepted by DEQ, trading is now a viable solution for cities that face new thermal load limits like Ashland. DEQ allows for thermal offsets in the TMDL area to apply both upstream and downstream of the point discharge so as to avoid certain temperature impacts at a “point of maximum impact” (POMI) in the TMDL watershed. While there are few opportunities for trading in Ashland Creek, there are many opportunities to trade along Bear Creek and within the Bear Creek watershed above the TMDL-identified POMI.

In evaluating this alternative, a nonprofit organization, The Freshwater Trust, assisted in the analysis. To complete the analysis, The Freshwater Trust coordinated with DEQ to use the Heat Source models (including the Shade-A-Lator module) for Bear Creek to determine the extent of opportunities for riparian revegetation with native species to create shade and minimize solar loading in the TMDL area.

The effluent temperature exceeds its limit throughout the year. Moving the discharge outfall from Ashland Creek to Bear Creek may reduce the size of the exceedance in some cases, but does not eliminate it. Thermal credits generated from riparian revegetation must be generated in a quantity that is equal to twice the exceedance covered by riparian revegetation (to account for a 2:1 trading ratio, required by DEQ) at all times of the year. The 2:1 trading ratio is intended to provide a factor of safety, providing more assurance to the regulatory and environmental community that compliance will be obtained. The number of miles required to generate adequate thermal credits will change throughout the year as sun angle and canopy density change the efficiency of riparian restoration in abating thermal loads through shade. Riparian vegetation is most effective from March through October. Thermal load abatement potential through shade generation is reduced at times when leaves are not yet fully opened or once they have dropped from the tree (November - April). During these seasons, while the effluent exceedance is lower, more acres of riparian revegetation would be required to generate enough thermal credits for facility compliance, or this November through April exceedance can be covered by wetlands, as proposed below.

Heat Source analysis showed that revegetation projects on Bear Creek could produce between 13 and 30 million kcal/day (Mkcal) per mile, with a weighted average of approximately 18.85 Mkcal/day per mile in the month of October. In order to meet the projected 2030 excess heat load of 67 Mkcal/day (requiring 134 million thermal credits at 2:1) assuming that riparian revegetation credits are the only available solution, an estimated 8 miles of riparian revegetation would be needed. The actual amount of revegetation completed will depend on the existing conditions at restored sites within the reaches targeted. Thermal credits must be obtained in a quantity that meets compliance requirements at all times of the year. It is not clear that the Bear Creek basin (above the POMI) has enough riparian restoration potential to generate 134 Mkcal/day of thermal credits required to cover compliance in 2035, so thermal credits from riparian restoration should be considered as part of a combined temperature portfolio, as opposed to the single alternative solution.

In-depth analysis of Bear Creek shows approximately 20 miles of available and realistically restorable riparian areas, about half of which is city- and county-owned land. However, due to the fact that small tributaries to Bear Creek do not produce enough temperature benefit to be cost-effective to restore to thermal compliance standards, and based on The Freshwater Trust's experience with site recruitment conversion rates, a significant percentage of this "available" land may not be restorable. The Freshwater Trust therefore supports a multi-faceted approach to thermal load compliance that would result in compliance for the City when thermal credit generating sites have been exhausted, and for the times of year (March, November) where canopy cover is at its lowest. This approach would combine riparian revegetation actions with exploration of outfall relocation options that quantify clear temperature benefits.

Implementation of this alternative would occur over several years and may require a compliance schedule to be incorporated into the City's permit. Such a compliance schedule would require that certain annual milestones be accomplished and that ongoing monitoring and reporting be provided. Existing protocols do not require that the projects fully mature before thermal credits are transferred to the City. The City would then receive thermal offset credits the same year the improvement is completed and verified.

Under this alternative, the temperature of the effluent is not cooled prior to discharge. This creates the potential for near field (local) impacts to aquatic habitat that must be addressed. To address these concerns, Keller Associates has worked closed with regulatory agencies, the City, and other stakeholders to develop a plan that will work. Representatives from DEQ have completed computer modeling and evaluations for potential impacts to Ashland and Bear Creek. The plan presented for this alternative reflects the following improvements intended to address near field concerns:

- Continue to gather data and work with regulatory agencies and stakeholders to define impacts of newly developed treatment standards for toxins, and explore options for how those requirements may be met. (Toxins are regulatorily important in that depending on the jurisdictional determination of wetlands and the final outfall location, the mixing zone requirements and corresponding effluent discharge limits could vary substantially.)
- Relocate the outfall from Ashland Creek to Bear Creek. Based on modeling completed by DEQ, this single improvement would alleviate most of the near field concerns.
- Routing the effluent through constructed wetlands would provide added cooling benefits to assist in complying with near field and far field requirements. While the wetlands could be constructed at the Glendower pond site, this site is not large enough to accommodate the entire flow and public opposition to this location may make alternative sites more attractive for the City. For budgeting purposes, 7-acres of constructed wetland cells that would complement the benefits generated by riparian revegetation projects is assumed; the site would be located on lands in close proximity to the WWTP. While ODFW has expressed a desire for off-channel habitat which could be provided through wetlands, this may not be a practical alternative if permit compliance standards for toxins and other constituents are applied at the point of entry into the wetlands rather than at the discharge to Bear Creek.
- Other improvements that ODFW would like to see near the vicinity of the WWTP (but not necessarily related to the WWTP or its discharge) include: 1) modifying the existing inlet/outlet structures from Glendower pond which allows fish to enter the effluent pipeline of the WWTP (and possibly be trapped); and 2) constructing a fish barrier (i.e., waterfall) in the new discharge from the WWTP. These improvements are not included in the cost estimate for this option.
- It should be noted that the proposed outfall relocation and wetlands improvements should be completed in coordination with other stakeholders including the Parks Commission, the school district (which has invested in the current pond and used the site for educational purposes), and local residents.
- It may be that conditions may change that would reduce the near field treatment requirements for Ashland in the future. For example, there is a potential release of additional flows to Bear Creek from the Talent Irrigation District, which could increase the 7Q10 flows in Bear Creek and lessen the near field and far field mitigation needs to some extent (when Keller and Associates met with TID in September 2010, the board mentioned the District may be required to increase flows in the future to Bear

Creek to meet regulatory requirements). An update on the status of this and other flow augmentation projects should be obtained as part of an outfall relocation study.

Oregon DEQ has expressed support for riparian revegetation, cooling wetlands, and outfall relocation as a means for meeting thermal compliance obligations at WWTPs. Other benefits of this alternative include:

- Low capital and O&M costs. On-going power costs associated with other alternatives such as cooling towers can be avoided. Costs are also spread out over the duration of the project.
- Avoidance of potential stranded capital assets that are tailored to particular exceedance sizes. Given that regulatory standards may fluctuate, shade is a very easy-to-tailor solution that is implemented over a number of years.
- Flows remain in the stream for improved conditions for aquatic habitat during low flow periods.
- Vegetation along the creek also improves aquatic habitat.
- Other aesthetic and environmental benefits associated with trees and wetlands.
- Wetland creation provides an opportunity to create a public amenity within high public use areas.
- Outfall relocation would help to alleviate increasingly stringent future regulatory requirements.
- Riparian revegetation and wetland creation projects provide an opportunity to partner with local residents to enhance local environment and recreation opportunities.

An estimated cost for this alternative was prepared by The Freshwater Trust with input from CH2M Hill on the wetland and outfall relocation costs. Feasibility of recruitment and implementation was considered when determining the size of the riparian revegetation and wetland solution. Based on The Freshwater Trust's recruitment experiences, roughly two-thirds of the City's projected exceedances are expected to be addressed through riparian revegetation projects (the remainder would be addressed through a combination of other actions, including a potential near field wetland associated with the outfall relocation). Actual costs of riparian restoration will vary depending on the final sections of river that are targeted for shading.

Costs for the wetland/outfall relocation component will be refined through the ongoing wetland and outfall relocation study. The total area of wetlands needed will further be a function of whether existing jurisdictional wetlands could be used and the outcome of the ongoing study. The cooling wetlands and outfall relocation are conceptually illustrated in Figure 4.1 found in Appendix A. Refer to Appendix F for a more breakdown of projected costs for this alternative.

4.4.3 Option 6: Blending / Flow Augmentation

The concept of blending or flow augmentation involves releasing cold water upstream of the Ashland WWTP. The source of this water would be flow from either TID sources (ideally from lower depths of the Emigrant Dam) or from Ashland Creek. The City of Ashland is currently in the process of permanently securing an additional 600 ac-ft of additional water rights formerly belonging to the City of Talent. The purpose of this right would be to augment existing flows in Ashland Creek and/or provide additional potable water supply. One of the benefits of this alternative is that increased stream flows could improve stream conditions in Ashland and Bear Creeks.

For flow augmentation to work, the water quality and temperature conditions of the supplemental water need to be considered. This study does not include a comprehensive evaluation of these parameters. However, the City did install a temperature monitoring device in the TID system for about a week in August of 2010. Based on this temperature data, flow in the TID system already exceeded the target temperature thermal limits (18ºC) and therefore would not be able to cool Ashland's effluent to levels that met the TMDL standard. Also, it should be noted that if flow augmentation were used, DEQ has indicated that they want to see information on presence of parameters in the source water for which Ashland and Bear Creeks are water quality limited (see 1992 and 2007 TMDLs), and additional parameters may be needed depending on origin of source water.

Given the need for additional potable water rights and the preference of the City to use Ashland Creek water over TID-supplied water, it is unlikely that any additional Ashland Creek water rights supplied would be used for flow augmentation during critical low flow conditions when they would be needed the most. While flow augmentation may help mitigate thermal impacts during certain times of the year, Keller Associates does not recommend this as a sole solution to address excess thermal loads.

4.4.4 Option 7: Hyporheic (Shallow Groundwater Mixing)

The hyporheic zone is the region where shallow ground water interacts with the surface water in a stream or river. Depending on numerous conditions (e.g., channel geometry, soil characteristics, diurnal variations, season, etc.), the hyporheic exchange can act as a buffer for river temperatures and/or as a mechanism to cool/warm river temperatures. Using a hyporheic discharge was previously recommended for future study as a disposal option for temperature control.

Implementing this process can take several forms, which can be divided into either a direct or indirect injection into the water table. Each application must satisfy the following requirements:

1. Definition and maintenance of a Waste-Management Area (WMA), which defines the confines of the infiltrate influence (Chart 4.4, from Oregon DEQ 2007 Internal Management Directive *Disposal of Municipal Wastewater Treatment Plant Effluent by Indirect Discharge to Surface Water via Groundwater or Hyporheic Water*). The WMA must be situated so that the infiltrate remains within the confines of the property and does not affect existing wells. Also, it needs to be shown that the infiltration will not contaminate the groundwater/aquifer.

2. Site/soil suitability, primarily that the hydrology of the site would permit the injection of the proposed quantity of effluent.

3. Public acceptance of the practice.

While the effluent temperature could conceivably be reduced through dispersion and conduction with ground water, this relationship cannot be adequately described without sufficient site data. A rough, preliminary design can be completed using semi-conservative values, which can be used as a basis to formulate site parameter investigations.

CHART 4.4: Waste-Management Area

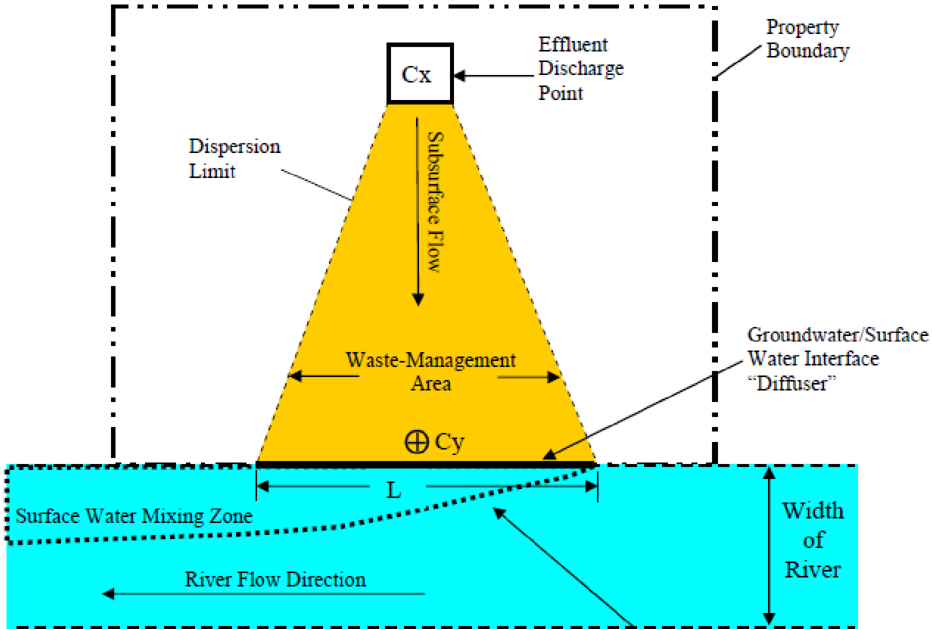


Figure 1
Plan View Schematic
Indirect Discharge Model
To Surface Water

Notes:
1. At L, provide groundwater volume, velocity and concentration of key water quality parameters for mixing zone model. These typically will be estimates based on calculations or modeling.
2. L functions as a surface water diffuser.
3. Effluent discharge in the Waste-Management Area can be in groundwater, hyporheic water, or both.
4. Limits of Waste-Management Area are determined by horizontal dispersion of the effluent in groundwater, hyporheic water or both.

Symbols:

⊕	Verification monitoring well location (i.e., *detection monitoring* well)
Cx	Concentration of key wastewater effluent parameters.
Cy	Concentration of key effluent parameters in groundwater or hyporheic water at transition to surface water for mixing zone analysis, e.g. concentration for diffuser at L.
L	Length of Waste-Management Area at receiving water body.

A planning level evaluation of this alternative was completed for Ashland as part of the CSSMP. This section includes summary information. A preliminary evaluation of the Imperatrice property was considered. However, due to the low permeability of the Imperatice property's soil, potentially shallow soil depth, significant slope, and incomplete WMA control, the site would likely not be well suited for effluent infiltration and hyporheic exchange.

The hyporheic option could be implemented at other sites in close proximity, assuming property acquisition was a possibility. Soil maps from the National Wetland Inventory indicate substantial soil type differences in the valley, namely the presence of sandy characteristics in some areas. Sandy soils typically have a higher permeability rate, with typical values ranging from 0.13 to 12.96 in hr^{-1} (a factor of 100) for clayey sand. Over this range of values, the foot print for each MGD of effluent would be between 780 and 8 acres (assuming 15 ft of head and about a 1,000-foot spacing between the river and the infiltration basin). These areas only include that needed for the WMA; due to plot dimensions, considerable additional property would likely be needed as well.

If this option were pursued, it should be completed in stages to obtain increasingly detailed estimates of the site characteristics while minimizing potentially unwarranted expenditures. Initial sample planning should be based on the aforementioned design, first assessing if the City owns property that could be isolated enough to satisfy the groundwater protection requirements while providing an adequate footprint for the above design. Behind each stage is a progressively more accurate model of the ground/hyporheic water flow and the river mixing, which determines the viability of the design and directs subsequent investigations. We would recommend the following approach, which could be conducted in stages; likely over the course of 3 to 5 years.

Phase 1 – Initial Site Assessment and Monitoring Well Installations

A preliminary assessment of the site suitability can be completed by installing ground water monitoring wells throughout the site, as directed by the preliminary design. Placing the wells near the creek's edge as well as toward the site's boundaries will allow the wells to be used in the future for compliance testing, assuming the site is suitable. Recording soil properties and water levels in the drilling processes of the wells should provide a rough approximation of the site's geology and ground/hyporheic water state, which could be used to estimate the site's infiltration capacity and subsurface conductivity. A preliminary design of the infiltration basins could then be completed, balancing the need to minimize the waste-management area while maximizing the distance between the infiltration basin and the creek.

Phase 2 – Single and Multiple Well Aquifer Tests, Mixing Model Precursors

Assuming that the preliminary design appears viable, a more refined estimate of the site hydrology should be completed. To accomplish this task, wells should be drilled according to the predicted design, with locations in the infiltration area(s). Single well aquifer tests should then be performed to obtain actual conductivity information for the site, using the previously installed monitoring wells to observe the site's response. Using the results from these tests, the actual distribution of site conductivities can be more accurately estimated. These values can then be used to refine the previously developed model to reassess the site's viability. Tracer studies could also be used to determine ground water flow and dispersion.

The Oregon DEQ requires a mixing model analysis to be performed to determine the impact of the hyporheic exchange on the creek temperature profile. To estimate the mixing effects, the creek profile should be approximated over the range of available property, determining cross section profiles, depth, and velocity. An estimate of the hyporheic mixing capacity would also be helpful. As indicated by 2005 research of Lancaster et al., the injected heat if properly distanced from the creek should not substantially impact the creek temperature.

Phase 3 –Long Term Monitoring

Provided that the refined design was still viable, the behavior of the groundwater should be observed to determine seasonal variation and response to rainfall and creek flows. These observations would provide additional insight into the actual response of the site to real infiltration, allowing further calibration of the model and verification of the groundwater flow direction and velocity.

Phase 4 – Scaled Infiltration Test

Using a full scale design based on the estimated infiltration capacity and ground water response as a guide, a large scale infiltration test would provide a final model verification prior to full construction. With this approach, the capital investment required for an accurate model (which is expected for permitting) could be expended in stages, each of which would allow for the overall evaluation of the process to determine if further investment is warranted.

Other Hyporheic Considerations

It should be noted that hyporheic activity can also occur through leaky wetlands. Thus some hyporheic activity could occur if the City's existing effluent outfall were relocated from Ashland Creek to Bear Creek via a channel and possible downstream wetlands.

4.5 SUMMARY

Table 4.1 on the following page summarizes the disposal alternatives, benefits, drawbacks, and costs. The recommended alternative is summarized in Section 7.2.1.

TABLE 4.1: Temperature Reduction Option Comparison Chart

	Option	Description / Project Elements	Benefits	Drawbacks	Capital Cost	Annual Cost	Net Present Value	Comments
1A	Maximum Recycling on Imperatrice Property	- Irrigate 433 acres with treated effluent. - Pipeline to site, 138-166 MG storage. Shoulder season storage required / winter discharge.	- Beneficial use of water. - Existing water right could be used to augment potable water supply. - Potential for membrane and chemical savings. - Mitigate concerns of "future" more stringent regulations.	- High Cost. - Lower stream flows.	$10.8M	$(58,000)	$10.1M	Savings assume that membranes are not used.
1B	Partial Recycling on Imperatrice Property -- 424 ac*ft/yr	- Cost assumes more storage, and periods of no discharge.	- Similar to Option 1A. - Improvement could be completed later if Option 3 or 4 is pursued.	- High Cost. - Introduces complexities in monitoring and wastewater management. - Higher O&M costs than Option 1A. - Reduced stream flows available for aquatic habitat.	$8.9M	$35,000	$9.4M	
2	City-Wide Recycling	- Extend reuse water to green spaces within the city.	- Helps with City water rights and water consumption needs. - Beneficially uses water.	- Reduced stream flows available for aquatic habitat. - High capital cost and maintenance. - Infrastructure and distribution improvements would be extensive. - Potential public opposition to implement.	Not Evaluated	Not Evaluated	Not Evaluated	Evaluated as part of Water Master Plan.
3	Discharge to TID	- Pipeline to Talent Canal.	- Mitigate "near field" concerns. Reduction in chemical costs.	- Not a standalone solution -- still need to offset excess thermal loads. - High opposition from downstream users anticipated. - District concerns about chemicals. - Storage for shoulder seasons likely required. - Schedule and approval outside of City control.	Not Evaluated	Not Evaluated	Not Evaluated	Presently not viable alternative.
4	Cooling Tower	- Mechanical cooling tower. - Storage facilities.	- Addresses temperature concerns. - Allows continued discharge. - Maximum control in terms of compliance schedule.	- Chillers required for hottest periods. - Upstream / downstream storage also required for night-time operation	$6.1 - 8.1M	$200,000	$8.6 - 11.6M	Cost range reflects use of ponds versus concrete storage reservoirs.
5	WQ Trading (Riparian Revegetation, Wetlands, and Outfall Relocation)	- 8 miles of shading. - Outfall relocation to Bear Creek. - Constructed cooling wetland.	- Lowest cost alternative. - Allows continued discharge. - Improved aquatic habitat and other environmental and community benefits.	- Some uncertainty -- participating property owners to be identified.	$4.2 - 5.7M	Varies	$6.7 - 8.2M	Recommend proceeding with further study and definition of this option.
6	Blending / Flow Augmentation	- Blend additional water discharges from Ashland Creek or TID.	- Additional stream flow.	- Cannot meet temperature targets by itself. - Uses water that could be used for potable water usage. - Additional water quality testing may show additional water quality concerns.	Not Evaluated	Not Evaluated	Not Evaluated	Not a viable alternative.
7	Hyporheic (shallow groundwater)	- Subsurface disposal of treated wastewater to shallow ground water.	- Low operations costs. - Simple technology.	- Difficulty in locating site with suitable soils. - Significant additional effort required to determine feasibility. - Potential large land requirement.	Not Evaluated	Not Evaluated	Not Evaluated	Likely not viable alternative.

5.0 COLLECTION AND TREATMENT IMPROVEMENT ALTERNATIVES

5.1 COLLECTION SYSTEM

In addition to lift station upgrades, alternative improvements to correct identified deficiencies in the collection system were evaluated in the CSSMP where applicable. Alternatives to address existing and/or projected surcharging were considered at several locations. The alternatives discussed below use the same priority labels as those listed in the Capital Improvement Plan and are illustrated in Figure 7.1 in Appendix A.

5.1.1 Bear Creek Trunklines – Priority 1A

One approach to relieve current surcharging involves installing parallel pipelines, including a 24-inch pipeline parallel to the existing 12-inch line between N. Wightman Street and N. Walker Avenue and an 18-inch parallel pipeline to the east of N. Walker Avenue. An alternative approach is to replace the existing 12-inch pipeline between N. Wightman Street and N. Walker Avenue with a single 30-inch pipe to sufficiently convey projected future flows from build-out of the UGB area. Demolition, removal, and bypass pumping costs would all be involved for this alternative.

5.1.2 Diversion 3 / Mountain Avenue Improvements – Priority 1B

Current flows surcharge the 10-inch pipeline along N. Mountain Avenue immediately upstream of the Bear Creek trunklines. One alternative involves replacement of this line with a larger (15-inch) pipeline at an increased slope. The slope can be adjusted 10 inches, which would eliminate surcharging from future buildout flows. A second alternative involves diverting part of the flow at the diversion manhole located directly upstream of this section. Due to the shallow slope of the surcharged pipe, 75% flow diversion to the east at Diversion 3 is required to prevent surcharging at projected future peak flows. To prevent surcharging from the diverted flows, multiple existing 6, 8, and 10-inch sections between N. Mountain Avenue and Oak Street would need to be replaced with 10-inch and 12-inch pipelines.

5.1.3 Diversion 4 / A Street Improvements – Priority 1D

Current flows are surcharging the existing 12-inch pipeline along A Street. One alternative is replacement of this line with a larger (15-inch) pipeline, will accommodate projected future flows even with the upstream diversion sending 100% of flows north to this pipeline. During pre-design of this alternative, pipe bursting should be evaluated as a trenchless construction technique that could minimize traffic disruption and potentially lower construction costs.

Another alternative investigated was using Diversion 4 to divert 50-100% of the flows west toward N. Mountain Drive. Diversion of 50% could be considered as a short-term solution for current flows, but is inadequate at projected future peak flows. Forcing diversion of 100% of flow entering Diversion #4 effectively relieves all current and future surcharging in the A Street pipeline. However, there are significant impacts to downstream pipelines along N. Mountain Drive. The entire downstream 10-inch pipeline along Mountain Avenue would need to be replaced with a 15-inch pipeline, significantly increasing the cost of this option.

5.1.4 West Nevada Street Relief Interceptor – Priority 2A

Future projected flows result in surcharging in several sections of the 12-inch pipeline west of the Ashland Creek Lift Station. Flow could be intercepted at manhole BRS-08 and redirected to manhole 5AD-010 via a 12-inch interceptor along Nevada Street. A downstream 8-inch pipeline along Nevada Street would also need to be upsized. This alternative would effectively address surcharging occurring in the 12-inch pipeline west of the Ashland Creek Lift Station and reduce the flow entering the lift station, thereby extending the capacity life of the pumps. Alternately, the surcharged sections could be replaced with a larger (15-inch) pipeline. This alternative would require installation of a significantly greater length of pipe than the interceptor/diversion approach above, and thus would be more expensive. The pumping capacity of the lift station would also need to be increased to accommodate the increased flows, which would increase power costs.

5.2 TREATMENT FACILITIES

The feasible alternatives for treatment process improvements depend on the selected thermal reduction method (Chapter 4) and associated effluent requirements. Requirements for agricultural recycling of effluent are much less stringent than for discharge to Ashland or Bear Creek. Alternatives without recycling would need to provide treatment that would meet all expected discharge limits year-round.

Biosolids management is also an important part of the evaluation of treatment plant improvement alternatives. While the quantity and characteristics of biosolids generated are somewhat dependent on the treatment processes utilized, the ultimate disposal method is the controlling factor in evaluating the feasibility of various biosolids handling methods. Alternates for sludge stabilization, dewatering and disposal are evaluated that may reduce the quantity of biosolids produced, improve the quality of the final end product, reduce disposal costs, and provide a more environmentally friendly alternative to landfilling.

5.3 RECYCLING AND CONTROLLED DISCHARGE

Recycling options include agricultural use and landscape irrigation of public spaces. Depending on the proposed use, effluent reuse on public spaces would potentially require a higher level of treatment than agricultural recycling. Class C recycled water can be used on golf courses, cemeteries, medians, and industrial or business campus, as long as the public is restricted from direct contact with the recycled water during irrigation and appropriate setbacks are maintained. Recycling on parks, playgrounds, and other public spaces accessible to the public requires Class A recycled water.

With the extensive distribution system required, city-wide recycling on public spaces is not considered a feasible alternative for addressing immediate wastewater treatment and disposal needs. However, reducing potable water use by effluent recycling on public land remains a long-term goal that the City plans to pursue in the future.

A 100 percent land application program has two major obstacles: 1) some of the water is needed to sustain flow for fish in Ashland Creek, and 2) the existing City-owned property (Imperatrice Ranch) will not be large enough for 100 percent land application in the future. However, land application could be used as a strategy to limit discharge to periods with less restrictive discharge limits. If sufficient storage were provided to optimize discharge during specific periods without restrictive discharge limits (primarily wet weather high flow periods), the need for additional treatment to reduce future phosphorus loads and to reduce near field thermal loads could be minimized. As noted in Chapter 4, recycling would require significant amounts of land.

5.4 TREATMENT ALTERNATIVES FOR YEAR-ROUND DISCHARGE

5.4.1 No Action Alternative

As discussed in Chapter 2, the existing treatment facilities have capacity limitations that will make it increasingly difficult to meet discharge permit limits as flows increase. Since the No Action alternative has the potential for periodic violations of the discharge permit, it does not represent a practical approach.

5.4.2 Reduction of Peak Flows

Reducing peak flows to the plant could delay the need for additional capacity in some of the units. Peak flows could be reduced by collection system improvements (rehabilitation) that eliminate inflow, or by adding flow equalization before or at the treatment plant (after grit removal). Collection system improvements have the advantage of decreasing wastewater flows before they reach the treatment plant, thus reducing the required capacities of influent pumping, screening and grit removal in addition to the remaining treatment components. However, it is often difficult to accurately estimate flow reductions expected from collection system rehabilitation particularly when major I/I sources have not been identified. While ongoing rehabilitation efforts are recommended, assuming large scale flow reductions from these efforts is not advised.

Flow equalization, though not technically a treatment process, can increase the effective capacity of downstream process units by reducing extreme flow fluctuations. The equalization basin would hold peak flows and discharge at a constant (lower) rate as a way of managing flows that may exceed the design capacity of the treatment plant. Table 5.1 summarizes the benefits and drawbacks of this alternative.

TABLE 5.1: Flow Equalization

Pros	Cons
▪ Increases effective capacity of existing facilities; delays need for expansion	▪ Very large size for large flows (space requirements)
▪ Equalizes influent quality in addition to flow	▪ Aeration and mixing required
▪ May be used with any treatment alternative to minimize size of new facilities	▪ Pumping required if sufficient head unavailable for gravity flow

5.4.3 Expansion of Existing Oxidation Ditch Plant

As discussed in Chapter 9 of the CSSMP, the existing oxidation ditch system could be expanded by adding a third oxidation ditch or a fourth clarifier. Though the clarifier would take less space and would be less costly than a third oxidation ditch, it would not provide the same benefits in terms of reliability and redundancy. Therefore, expansion of the oxidation ditch plant alternative assumes construction of another oxidation ditch. With a third ditch, the existing clarifiers would be adequate beyond 2030.

The most cost-effective approach is to construct the additional ditch immediately adjacent to the existing ditches to utilize an existing wall; however, this would require expanding west into a buffer/wetlands area. City staff has commented that in order to avoid a scattered plant footprint, they would prefer that if a new oxidation ditch is constructed that it is next to the existing ditches. Therefore, wetlands mitigation would be an issue. The only other area with sufficient space for the third ditch is east of the existing facilities. The splitter boxes ahead of the oxidation ditches would need to be modified to route part of the flow to the new ditch, and additional piping would be needed to carry mixed flow to the new ditch and back to the clarifiers. Table 5.2 summarizes the benefits and drawbacks of this alternative.

TABLE 5.2: Expansion of Existing Oxidation Ditch Plant

Pros	Cons
▪ Operator familiarity with process operation	▪ Large space requirements
▪ Allows operation at lower MLSS (activated sludge process easier to maintain, lower RAS flow required, avoids clarifier overload)	▪ Additional complexities in operations if adjacent site to west is not used
▪ Provides redundancy for aerator out of service	

5.4.4 Parallel Membrane Plant

A separate parallel membrane bioreactor (MBR) plant could be installed to treat a portion of the flows. The MBR should be sized to treat a base flow; the oxidation ditch/clarifier would handle base plus peak flows. MBR plants eliminate the need for clarifiers and operate at much higher mixed liquor suspended solids (MLSS) than a conventional plant, thus reducing the size of the required footprint compared to an equivalent capacity oxidation ditch.

The MBR plant would consist of two trains for flexibility. The splitter boxes ahead of the oxidation ditches would be modified to route part of the flow to the MBR. In addition to the membrane cells, each MBR train would include an anaerobic cell, an anoxic cell, aeration cells, and post anoxic cell. Recycle pumps would be provided for each MBR train, and recycle flows would be combined with the influent flow before entering the membrane cells. Each membrane tank would have separate permeate pumps, and a single chemical treatment system would be utilized to maintain the membranes. Table 5.3 summarizes the benefits and drawbacks of this alternative. This alternative is further illustrated in Figure 5.1 in Appendix A.

TABLE 5.3: Parallel MBR Plant

Pros	Cons
▪ Reliably low effluent solids independent of sludge settleability	▪ Finer screening (1-2 mm) required; will increase screenings for disposal
▪ Small footprint reduces space requirements	▪ Additional blowers required; significant energy usage (high MLSS)
▪ No additional clarifiers or tertiary filters needed	▪ O&M more complicated - dual plant with significantly different processes
▪ Has least impact on existing plant during construction	
▪ Increased treatment efficiency to potentially meet present and future water quality and technology-based standards	

5.4.5 Process Modifications in Existing Tankage

As discussed in Chapter 2, nitrification needed to meet year-round ammonia discharge limits is the controlling factor in evaluating the capacity of the biological process at the Ashland WWTP. Since nitrification is a function of the mean cell residence time (MCRT) or MLSS inventory in the process, process modifications that reduce the MCRT required for nitrification or increase the MLSS concentration are possible alternatives for Ashland. There are several alternatives that would utilize the existing oxidation ditch basins with modifications to accommodate increased loadings without adding tankage. These include conversion to staged aeration, an integrated fixed film/activated sludge system, or an in-ditch MBR.

Any of these process modifications would require routing all flow to one of the oxidation ditches while modifications to the other are completed. Meeting permit limits during construction could be difficult under these conditions; the addition of alum and polymer to enhance settleability might be needed when a single ditch is in use. All of these alternatives would also require conversion of the aeration system to diffused air, necessitating the addition of blowers and a blower building, aeration piping and diffusers. Other modifications specific to a particular process are summarized in the following descriptions.

Staged Aeration

It has been demonstrated that the MCRT required for nitrification can be significantly reduced by the use of an aerobic bioreactor “with significant plug flow character”. Optimizing the plug flow character can be accomplished by increasing the number of treatment cells in series to provide staged aeration. Providing nine or more basins in series can reduce the MCRT required for nitrification by up to 30-50%, effectively almost doubling the capacity of the biological process. Even with a more conservative MCRT reduction, staged aeration should provide 50% additional biological process capacity.

This alternative would require construction of interior concrete walls in the oxidation ditch to form the numerous zones used for staged aeration. Bioselectors would also be incorporated to enhance settling of the mixed liquor and reduce oxygen requirements; some of the multiple cells would be anaerobic, some anoxic and some aerobic. (The ditches currently include a separate anoxic zone and an aerobic zone.) The anaerobic and anoxic cells would have mixers (submersible or vertical) only, and while the aerobic reactors would have both mixers and fine bubble diffused aeration. Table 5.4 summarizes the benefits and drawbacks of this alternative.

TABLE 5.4: Staged Aeration

Pros	Cons
▪ Good treatment efficiency for removal of nitrogen, phosphorus and BOD	▪ Significant pumping for process recirculation requirements
▪ Operationally stable process	▪ Aeration system will need to be replaced (diffused air)
▪ Relatively low maintenance requirements	▪ Operation with single ditch during construction – possible permit violations
▪ No additional tankage needed	

Integrated Fixed Film/Activated Sludge (IFAS)

Placing fixed film media into activated sludge basins can be used to increase plant capacity at a given treatment level and/or improve treatment performance. Since additional biomass can be maintained on the fixed film, IFAS systems can increase the effective MLSS concentration in an aeration basin by as much as 3000 mg/L [2]. This would effectively increase the MCRT.

Bioselectors would also be incorporated in the IFAS alternative to enhance settling of the mixed liquor and reduce oxygen requirements. In addition to conversion to diffused aeration, this alternative would require fine screening and construction of interior concrete walls to form selector zones and the IFAS basins. Additional walls may need to be constructed to modify the oxidation ditches in order to improve flow characteristics.

Two types of systems were explored for converting the Ashland WWTP: a fixed media system and a floating media system. Costs for both systems are comparable. The in-basin equipment cost is $2.2 million for the fixed system and $1.7 million for the floating media system. The floating system requires more structural modifications to the existing tankage (removal of the center wall and construction of baffle walls). The cost used for comparison is based on the fixed system (higher equipment costs, lower structural modification costs). Table 5.5 summarizes the benefits and drawbacks of this alternative.

TABLE 5.5: IFAS System

Pros	Cons
▪ Provides stability of fixed film system with flexibility and treatment capability of activated sludge	▪ Fine screening required; will increase screenings for disposal
▪ Biomass on fixed film does not proportionately increase load to clarifier	▪ Aeration system will need to be replaced (diffused air)
▪ Fixed media biomass improves cold weather nitrification	▪ Operation with single ditch during construction – possible permit violations
▪ Reportedly generates less waste sludge than conventional systems	
▪ No additional tankage needed	

In-Ditch MBR Plant

With operation at significantly higher MLSS concentrations than a conventional plant, a MBR facility utilizes less volume to provide the same level of treatment. The membranes provide solids separation, eliminating the need for secondary clarifiers. The MBR plant would include multiple trains for flexibility and redundancy. Recycle pumps would be provided for each MBR train; recycle flows would be combined with the influent flow ahead of the membranes. Each membrane tank would have separate permeate pumps, and a single chemical feed system would be used to maintain the membranes. In addition to the membrane cells, each MBR train would include an anaerobic cell, an anoxic cell, aeration cells, and post-anoxic cell.

This alternative would require construction of interior concrete walls in the ditches to form the selector zones and the membrane basins in multiple trains. In addition to the conversion to diffused aeration, an MBR plant would require fine screening.

Since the total volume of the two oxidation ditches (3.52 MG) would provide more than needed for an MBR plant sized for 4.33 MGD (year 2030 MMWWF), only a portion of the volume would be required for the in-ditch MBR plant. In terms of volume, a single ditch could be modified to provide two trains although it is likely that a minimum of three membrane trains would be necessary from a process operation standpoint. The secondary clarifiers, no longer be needed for clarification, could be converted to other uses. The tertiary membrane would also no longer be needed, and the space could be utilized for other purposes. Table 5.6 summarizes the benefits and drawbacks of this alternative.

TABLE 5.6: In-Ditch MBR Plant

Pros	Cons
▪ Reliably low effluent solids independent of sludge settleability	▪ Fine screening (2-3 mm) required; will increase screenings for disposal
▪ Has the potential to generate less waste sludge than conventional systems	▪ Energy usage typically 1.5-3 times conventional activated sludge
▪ Second ditch and existing clarifier tankage available for other uses	▪ Aeration system will need to be replaced (diffused air)
▪ Tertiary membrane no longer needed	▪ Operation with single ditch during construction – meeting permit limits would be a challenge
▪ Increased treatment efficiency to potentially meet present and future water quality and technology-based standards	
▪ No additional tankage needed	

5.4.6 Primary Filter Options

Evaluation of the addition of primary treatment (in the form of a fine mesh sieve) was requested by the City. Fine mesh sieves have long been used for pretreatment in Norway, and one (Salsnes Filter™) has been developed that is capable of providing primary treatment by removing 40-70% suspended solids and 20-35% BOD. Solids removed as the wastewater flows through a fine mesh wire cloth are dewatered in the unit to 25-35% dry solids. This type of primary filter is currently installed in five plants in the United States, ranging from 0.3 to 3.0 MGD. A primary filter was installed in eastern Idaho (Heyburn) in 2009 as part of a conversion to a Biological Nutrient Removal (BNR) plant, and a pilot project has been carried out in north Idaho (Hayden).

Advantages and disadvantages of a primary filter are listed in Table 5.7. One other drawback to this technology is the amount of primary solids that would be produced (approximately 3.5 cubic yards per MG). This alternative is further illustrated in Figure 5.2 in Appendix A.

TABLE 5.7: Primary Filter for All Flows

Pros	Cons
▪ Very small footprint	▪ Space required for pumping and odor control (possibly covered truck loading area)
▪ Low energy usage	▪ Adds operational complexity (additional pumping and addition of primary solids)
▪ Would reduce biological sludge production	▪ Would reduce amount of food source for BNR operation
	▪ Higher Sludge Volume Index resulting in reduced clarifier performance
	▪ Possible blinding from grease increases maintenance requirements
	▪ Limited track record in North America; most performance data from pilot studies

Temporary Peak Flow Treatment

Use of the primary filter was also considered for dealing only with wet weather peak flows, providing primary treatment followed by disinfection. A portion of the flow would bypass the secondary treatment, thus reducing peak flows through the secondary process. The wet weather peak hour flow is 10.8 MGD. Biological spreadsheet modeling of the Ashland WWTP shows that the plant has the potential to treat about 9 MGD for a limited duration. Therefore a minimum reduction of about 2 MGD would be necessary to resolve the capacity issues associated with peak wet weather flows.

There are other communities, including some in Oregon, that deal with wet weather flows in this manner. This wet weather diversion is part of EPA's draft wet weather policy. It should be noted that this draft policy "strongly discourages reliance on peak wet weather flow diversions around secondary treatment units as a long-term wet weather management approach…" Of the three conditions mentioned that will lead to a need for increased plant capacity in 2015 (increased MCRT for maximum month flows, increased aeration for taking a unit offline, and peak wet weather flows), only peak wet weather flow would be addressed by this option. For these reasons, use of the primary filter for peak wet weather flow diversions is considered at best a short-term solution. Pros and cons of this option are listed in Table 5.8.

TABLE 5.8: Primary Treatment for Wet Weather Bypass

Pros	Cons
▪ Very small footprint	▪ Adds operational complexity (additional pumping and additional treatment process)
▪ Low cost alternative	▪ Some risk since EPA's wet weather policy is only in a draft version.
	▪ Long-term solution would still be needed
	▪ Additional measures to reduce I/I would be required
	▪ Does not address need for increased MCRT during max month flows and need for more aeration capacity when taking one ditch offline

5.4.7 Prescreening of Liquid Treatment Alternatives

Of the treatment alternatives presented, the top three options recommended for further evaluation by Keller Associates include reduction of peak flows by equalization, expansion of existing oxidation ditch plant, and process modifications in existing tankage using staged aeration or IFAS. A technical review committee involved in the project also expressed an interest in evaluating the addition of primary treatment in the form of a fine mesh sieve. Based on this input, the following three options were evaluated in more detail with cost estimates and environmental impacts considered:

1. Constructing an additional oxidation ditch (which could be staged by initially using the shell as equalization storage);
2. Converting the existing oxidation ditches to enhanced biological treatment, through staged aeration or IFAS;
3. Adding a fine mesh sieve (primary filter) to reduce loading and thus increase treatment capacity.

5.4.8 Cost Estimates

Planning level estimates for capital and operation and maintenance costs for alternatives can be found in Appendix F. The engineer's opinion of probable cost for the alternatives selected for further evaluation is summarized in Table 5.9, including operation and maintenance costs based on 2030 flows as well as capital costs. All options in Table 5.9 are similar in that they provide capacity to 2030 and beyond. Staged aeration and IFAS were evaluated separately, and using a new oxidation ditch as an equalization basin was also evaluated.

TABLE 5.9: Opinion of Costs for Selected Treatment Alternatives

	Costs				
Supplier	Additional Ditch	Additional Ditch (equalization)	Staged Aeration	IFAS	Primary Filter
Total Capital Cost (2011 dollars)	**$ 6,150,000**	**$ 4,000,000**	**$ 5,210,000**	**$ 6,540,000**	**$ 5,400,000**
With Odor Control	$ -	$ -	$ -	$ -	$ 300,000
Power Cost*	$ 35,000	$ 1,000	$ 27,000	$ 27,000	$ 24,000
Chemical Cost*	$ -	$ -	$ -	$ -	$ -
Labor Cost*	$ 5,000	$ 1,000	$ 9,000	$ 12,000	$ 20,000
Maintenance Cost*	$ 14,000	$ 3,000	$ 24,000	$ 21,000	$ 37,000
Water Usage Cost*	$ -	$ -	$ -	$ -	$ 4,000
Annual O & M Cost*	**$ 54,000**	**$ 5,000**	**$ 60,000**	**$ 60,000**	**$ 85,000**

*Additional cost for 2030 operation as compared to current operation costs

5.5 OPTIONS TO ADDRESS POTENTIAL COPPER LIMITS

5.5.1 Evaluation of Effluent Copper Levels

As part of this facilities plan update, copper levels in the plant effluent were also evaluated relative to potential permit limits. Though copper in the Ashland drinking water system has reportedly measured over 600 µg/L (due to copper pipe corrosion), total copper levels in the wastewater treatment plant effluent have typically been less than 10 µg/L. The treatment plant appears to very effective at removing copper based on copper levels measured in the water supply.

Table 5.10 shows historical copper levels at the treatment plant plus the calculated acute and chronic dissolved copper limits that correspond to the water sample hardness, using the criteria discussed in Appendix D. Since the historical *total* copper levels are very close to or lower than the calculated *dissolved* copper aquatic life criteria, DEQ is unable to determine if copper is an issue without further sampling and analysis. Thus, DEQ is requesting in the future that the City measure dissolved copper in the plant effluent in lieu of total copper. (It is also recommended that the City collect composite samples for the influent, secondary effluent, and permeate effluent and analyze for total and dissolved copper to establish the percentage of removal by the secondary treatment process and the membranes on a seasonal basis. This data will provide a basis for design of any improvements required to consistently meet future NPDES permit limits should copper exceed aquatic life criteria.)

TABLE 5.10: Ashland WWTP Total Copper Levels (2010-2013)

Sample Date	Location	Total Copper, µg/L	Hardness, mg/L	Dissolved Copper Freshwater Acute (CMC), µg/L	Dissolved Copper Freshwater Chronic (CCC), µg/L
2.3.10	Secondary	7.27	-		
7.12.10	Effluent	2	-		
8.27.10	Permeate	8.38	-		
11.01.10	Effluent	3.9	-		
3.30.11	Secondary	13.9	108	14.4	9.6
7.07.11	Permeate	7.03	68	9.3	6.4
12.05.11	Secondary	9.92	71.6	9.8	6.7
3.20.12	Secondary	7.35	107	14.3	9.5
7.29.12	Permeate	3.44	60.9	8.4	5.9
9.27.12	Permeate	1.21	67	9.2	6.4
4.22.13	Secondary	6.49	87.6	11.0	7.4

5.5.2 Water Hardness and Copper Corrosion

Copper Corrosion

The City is required to sample for copper in their drinking water distribution system every three years. The 2008 sampling results, provided by DEQ, showed copper levels measured at 30 sites in the distribution system. Test results ranged from 11 µg/L – 642 µg/L, with most results greater than 100 µg/L. While these levels are considerably lower than the drinking water maximum contaminant level of 1.3 mg/L, they exceed the aquatic life criteria if not reduced by the wastewater treatment plant processes. The copper concentration in the WWTP influent is not known.

Though evaluation of the water system and possible methods to minimize copper pipe corrosion are not part of the scope of this study, the City should consider addressing copper corrosion in the water distribution system should further treatment to reduce effluent copper levels be necessary. Assuming copper levels in the water system can be reduced without violating other drinking water regulations, this may be a more cost-effective approach than removal of copper in the wastewater system.

Water Hardness

As shown in Table 5.10, the hardness directly impacts the toxic effects of dissolved copper on aquatic life. Water hardness for the plant effluent generally ranges between 50 µg/L – 100 µg/L. If required, one method of coming into compliance with copper limits would be to increase the hardness in the final effluent. Alkalinity can be adjusted using chemicals, such as lime, sodium bicarbonate, and sodium hydroxide. Bench scale testing would be required to determine the effectiveness of these chemicals, dosages required, and their impact on the final pH of the effluent. This is a relatively low capital cost potential solution at the WWTP, and should be the first thing to investigate should further treatment to remove copper be necessary.

5.5.3 Copper Removal Methods for Wastewater

Review of historical data appears to suggest that the existing phosphorus removal process with tertiary membrane filtration could be used to meet dissolved copper limits. However, dissolved copper data is not available at this time to support this observation. It is recommended that the City obtain additional total and dissolved copper test data before and after the membrane filters.

Other treatment methods such as reverse osmosis, ion exchange, and chemical precipitants, can be used to remove copper from wastewater to meet water quality limits for aquatic life. Reverse osmosis and ion exchange are not recommended due to their high capital cost, ongoing maintenance issues, and waste streams requiring further treatment or disposal. There are a number of proprietary chemical precipitants available from various companies that would require bench testing (similar to that suggested for alkalinity adjustment) to determine if they are compatible with the membrane filtration process. Implementation of modified chemical precipitation would involve minimal capital costs. Should further treatment to remove copper be required, Keller Associates recommends that chemical precipitants be piloted along with chemicals for alkalinity adjustment.

5.6 BIOSOLIDS HANDLING

The City of Ashland must have a reliable means of disposal for its sludge, since it is produced on a continuous basis and there is limited existing storage on-site. The estimated amount of sludge produced is shown in Table 5.11.

TABLE 5.11: Estimated Average Annual Biosolids Produced

Description	Year	
	2010	2030
Avg. wet tons per day	10.0	12.8
Avg. dry tons per day*	2.0	2.6

*Based on avg. 19% TS from centrifuges.

Depending on the level of treatment, biosolids may be sold or given to the public as fertilizer, applied to agricultural land, or hauled to a landfill. Currently the City of Ashland disposes of their unstabilized dewatered sludge in the Dry Creek Landfill, and has adequate sludge storage and treatment facilities to manage their sludge through 2030 if this practice continues. If this option should become unavailable or if it is desired to beneficially reuse the biosolids for fertilizer, the City would be required to treat their sludge to produce Class A or B biosolids. Therefore, it is important that a backup disposal plan be identified.

5.6.1 Biosolids Disposal Options

Class B biosolids can be applied to agricultural land. There are two potential alternatives for land application: agreement with a local farmer to take the biosolids, or City purchase of farm land for a disposal site. It is anticipated the City should be able to locate a farmer within 25 miles of the wastewater treatment plant to take their biosolids. A long-term agreement with the farmer would be needed, and the City would need to work around the farmer's planting and harvesting schedule. If land is purchased for biosolids disposal, the City could grow whatever crop they desired with higher total nitrogen uptake levels and could lease the land to a farmer who would handle farming operations and assist in spreading biosolids in exchange for crop profits. For either land application alternative, biosolids would need to be stored from approximately November through April (non-growing season) and DEQ would have to issue site authorization letters for the selected site(s).

The City owns over 800 acres north of I-5 (Imperatrice Ranch) that was at one time envisioned for irrigation, effluent storage, and biosolids application (a pipeline crossing Ashland Creek was constructed in 1997 as part of the planned project). It is our understanding that the project was abandoned due to public opposition.

Class A biosolids may be used on City property, given away to farmers and citizens, or potentially sold. Though Class A biosolids have fewer use restrictions than Class B, there may be some application restrictions with Class A biosolids depending on the method selected for stabilization.

If the City chooses a biosolids disposal option other than landfill disposal, DEQ will require an approved Biosolids Management Plan that will need public notice for public comment prior to disposing of any solids. Monitoring and reporting of biosolids characteristics and disposal will be required.

5.6.2 Biosolids Process Alternatives

Biosolids management may include thickening, stabilization and dewatering processes. Thickening is often used prior to stabilization to increase waste activated sludge (WAS) solids concentrations and reduce volume, which can in turn reduce the volume of digester tanks and related equipment, chemical requirements, and operation and maintenance costs. Stabilization is provided to address EPA's 503 Rule requirements for pathogen reduction and vector attraction reduction (VAR); the Part 503 Rule offers different stabilization options to obtain Class A or B biosolids. Dewatering is used to increase the solids content and reduce the final volume of biosolids for disposal.

Table 5.12 summarizes equipment commonly used in the various steps of biosolids treatment. The biosolids treatment steps and options are discussed in following sections.

TABLE 5.12: Technologies Commonly Used in Treating Biosolids

	Thicken	Stabilize	Condition/Dewater
Equipment	Dissolved Air Flotation Tank	Aerobic Digestion	Belt Press
	Membranes	Chemical Treatment	Centrifuge
	Centrifuge	Composting	Screw Press
	Gravity Thickener	Anaerobic Digestion	Drying Bed
	Gravity-Belt Thickener	Dryers	Dryers
	Rotary Drum	Alkaline Stabilization	

Thickening

Thickening can be achieved through a variety of methods, as shown in Table 5.12. Currently, the City does not have a means of thickening WAS prior to lime stabilization. Due to space limitations on the site and the lack of existing tankage which could be converted to aerobic digesters, thickening does not provide any real benefits to improve the current sludge handling program and is not recommended for future implementation.

Sludge Stabilization

Sludge stabilization processes considered for use at the Ashland WWTP include:

Patented Processes
Several patented processes, including the Cannibal™ digestion process, the Neutralizer® and Clean B™ processes, were reviewed as part of the CSSMP. There is insufficient successful operating experience with these processes to recommend them as viable sludge management alternatives.

Composting
Composting can be done in windrows, aerated static piles or contained vessels. Windrow composting is not recommended for the City of Ashland since the process is more difficult to control and the City would be composting unstabilized sludge with a higher potential for odors. In-vessel composting is typically the most expensive, requires the most maintenance, can only treat a fixed volume of compost at a time, and does not provide the flexibility to easily expand the composting area, and thus is not recommended for further consideration. The aerated static pile process is a viable sludge treatment method for the City of Ashland.

Digestion
Digestion can be accomplished in anaerobic or aerobic processes. Compared to aerobic digestion, anaerobic processes require a smaller reactor volume, have lower energy requirements, and produce less digested sludge with better dewatering characteristics. However, the Ashland plant only produces WAS which is less compatible with anaerobic than aerobic digestion. In addition, anaerobic digestion has higher capital costs, more complex operations, and a high potential for offensive odors. Aerobic digestion is also not recommended for further consideration in Ashland due to space requirements for the basins, and high operation and maintenance costs.

Dryer
A dryer can produce Class A biosolids from unstabilized, dewatered biosolids in a small footprint. Dryers typically have high energy costs, but they significantly reduce the volume of solids produced. The final end product is well stabilized, and not subject to bacterial regrowth odors when stored in a dry environment before land application. The Ashland plant could

continue to store WAS in the existing sludge holding tank, and then dewater the sludge to 18%-20% solids prior to conveying the solids to the dryer to produce biosolids with a minimum 90% solids content. A covered storage area would be required to store the biosolids prior to land application.

Alkaline Stabilization

The City of Ashland has an existing lime stabilization process (currently not in use) designed to stabilize the sludge to Class B standards prior to dewatering. This would allow agricultural land application of the sludge. A major disadvantage of the alkaline stabilization process, when compared to dryers, digestion and chemical treatment, is the increased solids production (due to lime addition) that will require storage during the months when land application is not possible.

The need for storage would be eliminated if landfill disposal were continued during the wet season and lime stabilization were only utilized during the dry season. This would involve operation of a part-time stabilization process and two separate disposal systems, including land application of Class B biosolids. Based on public opposition to biosolids application on the Imperatrice property, the City does not want to pursue land application of Class B biosolids at this time. Therefore, alkaline stabilization is not considered further.

Dewatering

Mechanical Dewatering

Biosolids dewatering and conditioning (typically polymer addition) make up the final operation in managing biosolids prior to disposal. Equipment often used to dewater stabilized biosolids includes belt filter press, centrifuge, or screw press. Advantages and disadvantages of the belt filter press, the centrifuge, and the screw press are compared in Table 5.13.

The City of Ashland currently uses centrifuges for dewatering WAS. Since maintenance has been minimal and the equipment is working well, it is recommended that the City continue to use their centrifuges until they reach the end of their useful life.

TABLE 5.13: Dewatering Equipment Comparison

	Belt Press Filter	Centrifuge	Screw Press
Advantages	▪ Low energy requirements ▪ lower capital and operating costs ▪ Dry cake	▪ Good odor control ▪ Lower capital cost ▪ High capacity to building area ratio ▪ Dryer Cake	▪ Good odor control ▪ Minimal operator attendance ▪ Low polymer and wash water use
Disadvantages	▪ Potential odor problems ▪ Sensitive to incoming sludge feed characteristics ▪ Automatic operation generally not advised	▪ Potentially more maintenance issues ▪ Sensitive to grit ▪ Higher suspended solids content in concentrate	▪ Sensitive to incoming sludge feed characteristics

Dryers

A thermal dryer was evaluated to produce Class A biosolids from dewatered, undigested sludge. Dewatering prior to drying significantly reduces energy usage and drying time, so a dryer should not be considered a substitute for other means of dewatering previously discussed.

A solar dryer was also investigated as an environmentally friendly method of dewatering. However, this technology was found to be unsuitable for undigested sludge due to large space requirements, high capital costs, the inability to regulate the drying process which is dependent on weather conditions, and the inability to produce 90% solids on a consistent basis (required to meet the vector reduction requirements in the EPA 503 regulations).

Sludge Drying Beds

Drying beds could be used to dewater the biosolids up to 90% dry solids, assuming extended warm temperatures and minimal precipitation. The downside to a drying bed is the space requirement, sensitivity to climate, and potential odor problems. This technology was not evaluated further, since the City elected to not proceed with a drying bed project in the 1990s due to negative public perception.

5.6.3 Pre-Screening of Biosolids Options

The three options recommended for comparison by Keller Associates included continuing the current approach, thermal drying to produce Class A biosolids, and composting to produce Class A biosolids. (The City wanted to focus on Class A biosolids that could be used as a marketable product, and further evaluation of Class B biosolids was not considered). The City requested that the composting alternative be modeled around the City of Grants Pass, Oregon co-composting site that accepts green waste from the community for composting with biosolids. Based on this input, the following three options were evaluated in more detail with cost estimates and environmental impacts considered:

1. Dewater sludge using the existing centrifuges, and haul to the landfill for disposal.
2. Dewater sludge using the existing centrifuges, and compost to produce Class A biosolids for sale to commercial businesses and individuals.
3. Dewater sludge using the existing centrifuges, and dry using a thermal dryer to produce Class A biosolids for sale to commercial businesses and individuals.

Status Quo Alternative (Dewater and Landfill Sludge)

The City currently provides centrifuge dewatering with two units for redundancy and additional space for a third unit. Under this alternative it is recommended that the existing equipment continue to be utilized until it needs to be replaced, at which time a pilot study is recommended to determine if other types of dewatering equipment would provide more efficient dewatering. The City currently utilizes approximately 45 lbs of polymer per ton of dry solids produced.

Dewatered sludge is hauled to the Dry Creek Landfill for final disposal. According to Dry Creek Landfill personnel, they perform a TCLP (toxicity characteristic leaching procedure) to verify that the material is classified as municipal solid waste, and occasionally test for metals. The landfill reportedly has a remaining life of 70 to 100 years, so this appears to be a viable disposal option unless prohibited in the future if solid waste regulations are modified.

Dewater and Compost to Produce Class A Biosolids

Dewatering would be done as in the previous option. The Dry Creek Landfill and Recology Ashland were contacted regarding interest in composting biosolids. The Dry Creek Landfill can currently accept only Class A biosolids. Though the Dry Creek Landfill currently composts yard waste and food wastes at their site, they are not interested in accepting biosolids for composting since they currently have a certified organic product and are concerned that biosolids compost may not meet the organic certification requirements. Recology Ashland currently has no composting sites near Ashland, and has not composted biosolids to date due to concerns with metals, medications, and residues from personal care products. They have expressed an interest in discussing partnering with the City on a new biosolids composting site.

Oregon cities can compost biosolids under their water quality permit. The City of Grants Pass uses an extended aerated static pile process ("JO-GRO™) for co-composting. Wood waste and yard debris are shredded and mixed with biosolids (approximately 3 parts yard waste to 1 part sludge), placed on 12" of bulking agent to aid the aeration process, and then covered with a layer of finished compost or screenings. The temperature in the pile must be maintained at 55 °C or higher for three days to produce Class A biosolids, and at temperatures higher than 40°C for 14 days or longer to meet vector attraction reduction requirements. After the active composting period (typically 21 to 28 days), the material is moved to the curing building where it is aerated and allowed to cure for an additional month. The cured compost material is screened to recover bulking agent and stored prior to sale.

Actual construction costs were not provided for the Grants Pass composting facility. However, the estimated construction cost in 2000 was approximately $2,000,000. Operation and maintenance costs for the site in FY2010 were $502,000. Reportedly, all of the compost is sold for $15 for the first 2 cubic yards and $18 for each additional cubic yard. Yard waste can be recycled by the public at a cost of $1.00 per cubic yard, and wood waste is accepted at a cost of $2.00 per cubic yard. This income is used to defray operating costs, with the rest of the budget subsidized by the Wastewater Department.

Composting facilities for Grants Pass consist of a green waste drop-off site with trailer, a wood waste drop-off area, a co-compost building with a biofilter, a curing building, and a storm water pond. Drainage from the composting area drains to a holding pond which is periodically pumped out and hauled to the wastewater plant for treatment. The curing building was an existing building used by the previous composting program. There would be additional capital costs for Ashland associated with obtaining a site and providing building since there are no existing buildings to be reused. However, the buildings could be smaller since sludge production is about 30% lower than the City of Grants Pass.

Dewater and Use Thermal Dryer to Produce Class A Biosolids

A thermal dryer using indirect heat to dry a continuous flow of sludge was used to evaluate this sludge management alternative. Unstabilized sludge must be dried to a minimum solids concentration of 90% to meet VAR requirements. Class A requirements are met by achieving a certain temperature for a specified length of time. Use of a thermal dryer would require that sludge be dewatered using the centrifuges to a minimum solids concentration of 12%; higher solids concentrations would increase the processing capacity of the unit.

The dryer system includes an odor control system. A new building would need to be constructed to house the thermal dryer and associated equipment (the existing dewatering building does not have enough space), and to provide a covered storage area for the dried biosolids. The dryer discharges approximately 150 gallons per minute of cooling water at a temperature of 170°F - 180°F. A cooling tower has also been included in the cost analysis should this water increase the plant discharge above acceptable limits.

5.6.4 Cost Estimates

Table 5.14 presents the engineer's opinion of probable costs for the alternatives selected for further evaluation. This includes operation and maintenance costs as well as capital costs. Landfill disposal costs are based on current tipping fees applied to estimated 2030 sludge volumes. Revenues generated through the sale of Class A biosolids have not been included in the cost analysis since the local market is unknown.

For cost comparison purposes, the construction cost for composting is based on the opinion of cost for the JO-GRO™ facilities and JO-GRO™ operation and maintenance costs pro-rated based on sludge production. The costs for the thermal dryer alternative include one thermal dryer with a capacity of 4500 pounds per hour for sludge with a 19% solids concentration. The dryer would operate a minimum of 40 hours per week. If repairs were required on the unit, the City would need to temporarily landfill sludge as an alternate method of disposal.

TABLE 5.14: Opinion of Costs for Selected Sludge Management Alternatives

	Dewater / Landfill	Dewater / Co-Compost	Dewater / Thermal Drying
Total Capital Cost (2011 dollars)	**NA**	**$ 2,000,000**	**$ 4,100,000**
Electric/Natural Gas Cost			$ 66,000
Chemical Cost (polymer for dewatering)	$ 44,000	$ 44,000	$ 44,000
Startup Cost			$ 6,000
Labor Cost (dewatering, hauling off-site to landfill or compost site, etc.)	$ 84,000	$ 84,000	$ 146,000
Maintenance Cost (existing centrifuge maintenance included)	$ 4,000	$ 4,000	$ 9,000
Landfill Disposal	$ 220,000		
Composting O&M[1]		$ 293,000	
Annual O & M Cost	**$ 352,000**	**$ 425,000**	**$ 271,000**
Potential Revenue from Sales of Class A Product	NA	$0 - $18/CY[2]	Unknown[3]

1 Composting O&M is based on 52% of the FY 2011 JO-GRO budget and includes wages and benefits, supplies, contractual services, machinery and equipment necessary to operate the composting facility.

2 JO-GRO sells their product for $15 - $18/CY.

3 Markets were not identified for dried biosolids. The City would need to develop a marketing strategy and identify customers for the end-product.

6.0 ALTERNATIVE SELECTION

6.1 COLLECTION SYSTEM

This section summarizes the selected improvement alternatives. The location of these improvements is illustrated in Figure 7.1. The priority labels are included here and are consistent with the labels used in the figure and capital improvement plan presented later in this report. The prioritization criteria are summarized in Section 7 of this report.

Bear Creek Trunklines – Priority 1A

Parallel lines are preferred over a single upsized pipeline for the following reasons:

- Significant increase in total capacity at a lower cost than a single larger pipeline
- Continued service during construction
- Increased flexibility for future improvements (when dual capacity is exceeded or pipe conditions dictate replacement, the smaller or older pipeline can be replaced with a larger pipe)

Keller Associates would recommend a single upsized pipeline if the condition of the existing 12-inch line is such that it would need to be replaced or rehabilitated within the 20-year planning period or if easement and rock constraints make a single pipeline more practical. These conditions should be assessed as part of the pre-design.

Diversion 3/ Mountain Avenue Improvements – Priority 1B

Replacement of the existing 10-inch line with a larger (15-inch) pipeline at an increased slope is the preferred alternative. This approach is less expensive than the alternative of diverting more flow to the east, since the diverted flows would surcharge multiple sections between N. Mountain Avenue and Oak Street unless these sections were replaced with larger pipelines.

Diversion 4/ A Street Improvements – Priority 1D

The selected alternative is replacement of the 12-inch line along A Street with a larger (15-inch) pipeline. Flow diversion alternatives would require replacement of downstream pipelines along N. Mountain Drive, at a greater cost than replacing the A Street line.

West Nevada Street Relief Interceptor – Priority 2A

The interceptor/new diversion alternative is the preferred alternative. In addition to addressing surcharging in the 12-inch pipeline west of the Ashland Creek Lift Station, it would reduce the flow entering the lift station thereby extending the capacity life of the pumps. It would be less expensive to construct and operate than upsizing the trunkline and increasing pumping capacities, and has less potential for environmental issues in the event of a pipe failure since less flow would be conveyed in pipelines along the creek.

6.2 THERMAL REDUCTION

Based on the information provided in Chapter 4, Keller Associates recommends that the City proceed with Option 5, Water Quality Trading (Riparian Revegetation). This alternative is illustrated in Figure 4.1 (Appendix A) and includes relocation of the outfall from Ashland Creek to Bear Creek with an open channel arrangement (and potential wetlands) that would convey treated wastewater to Bear Creek (via a side bank discharge with a fish screen). In addition to providing a means for meeting thermal compliance at the WWTP, other benefits of this alternative include:

- Low capital and O&M costs. Ongoing power costs associated with other alternatives such as cooling towers can be avoided, and costs are spread out over the duration of the project.
- Improved aquatic habitat conditions during low flow periods due to flows remaining in the stream.
- Improves aquatic habitat from shading along the creek.
- Other aesthetic and environmental benefits associated with trees.

It should be noted that relocating the outfall (with fish screen) to Bear Creek will involve work in Water Resource Protection Zones as shown on the City's Official Water Resources Map, including Ashland Creek and a section of Bear Creek north of the Bear Creek Greenway, both designated as Riparian Corridors. This work has potential temporary impacts to water quality and fish, and will require permits from the US Army Corps of Engineers and the Oregon Division of State Lands before work is started. Additionally, the new outfall would constitute a new discharge to a new receiving stream and would have to satisfy the requirements of Antidegradation under OAR 340-041-00004 to protect the beneficial uses of the receiving stream. Use of BMPs would be required to prevent adverse impacts to the creek water quality, and coordination with ODFW would be necessary to appropriately schedule the outfall construction in order to minimize adverse impacts to the fish population.

Concurrent with pursuing Option 5, Keller Associates recommends that the City pursue recycling as needed to address future potable water supply needs.

6.3 TREATMENT FACILITIES

6.3.1 Life Cycle Cost Analysis

Table 6.1 presents the life cycle cost analysis of the alternatives selected for further evaluation (based on the costs shown in Table 5.9). The table shows the alternative that is estimated to be the least expensive is to build a new ditch for initial use as an equalization basin. To provide optimum conditions for nitrification at minimum winter temperatures, the equalization basin should be equipped to function as a third oxidation ditch by 2016; this could be delayed if I/I reduction efforts reduce maximum monthly flow, or if a less conservative temperature assumption at maximum month flow is considered acceptable. (All options require a fourth secondary clarifier by the year 2060.)

TABLE 6.1: Life Cycle Costs of Treatment Alternatives

Supplier	Additional Ditch	Additional Ditch (equalization)	Staged Aeration	IFAS	Primary Filter
Total Capital Cost (2011 dollars)	$ 6,150,000	$ 4,000,000	$ 5,210,000	$ 6,540,000	$ 5,400,000
With Odor Control	$ -	$ -	$ -	$ -	$ 300,000
Annual Operations & Maintenance Cost[1]	*$ 54,000*	*$ 5,000*	*$ 60,000*	*$ 60,000*	*$ 85,000*
Present Worth of Operations & Maintenance Cost[2]	$ 826,000	$ 76,000	$ 918,000	$ 918,000	$ 1,300,000
Salvage Value[3]	$ 1,080,000	$ 810,000	$ 710,000	$ 280,000	$ 305,000
Net Present Worth	$ 5,896,000	$ 3,266,000	$ 5,418,000	$ 7,178,000	$ 6,395,000

[1] Additional cost for 2030 operation as compared to current operation costs
[2] 20 yrs, 2.7% (FY 2013 OMB Circular A-94 discount rate)
[3] Based on assumed useful life of 40 years for structures, 20 years for equipment

6.3.2 Non-Monetary Factors

Environmental Impacts

Excluding the future secondary clarifier (required for all alternatives), most of the improvements proposed for any of the alternatives would be constructed within the existing plant site, and thus would have minimal environmental impacts since all the ground on the site has previously been disturbed. However, the additional ditch alternatives would involve construction next to the existing ditches. This location would require expansion to the west outside the current property boundaries, and would encroach on a designated Locally Significant Wetlands area. This would trigger the need for a permit and mitigation process. Compensatory mitigation based on project impacts on wetland acreage and functions would be needed in order to allow placement of fill or excavation in the wetland. At a minimum, one acre of replacement wetlands would be needed to offset the loss of each acre of wetlands.

Land Availability

The wastewater treatment plant site is space constrained. Proceeding with the recommended option of constructing the outer shell of a third oxidation ditch is dependent on being able to obtain land adjacent to the existing oxidation ditches from the Parks Commission. (If land cannot be obtained from the Parks Commission, it is recommended that the City proceed with staged aeration as the next best option.)

Potential Construction Problems

Since staged aeration and IFAS would utilize the existing oxidation ditch basins without adding tankage, these alternatives would require routing all flow to one of the oxidation ditches while modifications to the other are completed. Meeting permit limits during construction could be difficult under these conditions, though it might be possible to minimize the impacts by adding alum and polymer to enhance settleability when a single ditch is in use.

Construction of another ditch or a primary filter would have minimal impact on existing treatment processes.

Sustainability Considerations

As reflected in the power costs shown in Table 5.9, the lowest energy usage is for the oxidation ditch used as an equalization basin (about 4% of the other alternatives). Once the ditch shell is equipped to function as an oxidation ditch process, the energy usage would be 30-45% greater than the other alternatives.

Operations

The alternative of adding a third oxidation ditch has the advantage of operator familiarity with the process. A third ditch would also add the biological process redundancy that is currently lacking with the existing system, as well as provide maximum flexibility for future conversion to staged aeration or IFAS to further increase plant capacity. It should also be noted that the *overall* operating cost of the oxidation ditch alternative is less than all the other alternatives except the ditch as equalization basin.

6.4 POTENTIAL COPPER REMOVAL

Since DEQ does not currently have adequate data to determine if dissolved copper in the Ashland WWTP effluent is exceeding aquatic life water quality criteria, it is not recommended that any specific treatment processes be added for copper removal. However, the City should begin testing plant effluent for dissolved copper in lieu of total copper, and it is also recommended that the City conduct additional sampling and testing for total and dissolved copper on the plant influent, secondary effluent, and permeate effluent to determine the percent removal using the existing treatment processes. This information would be invaluable should copper limits be added to the NPDES permit when reissued.

The EPA is proposing that states adopt the Biotic Ligand Model (BLM) to determine dissolved copper levels for discharge limits. The BLM requires that 10 parameters be used to determine the bioavailability of copper - including temperature, pH, dissolved organic carbon, calcium, magnesium, sodium, potassium, dissolved inorganic carbon, chlorides and sulfate to determine. This method of determining copper levels is complex, and is currently being evaluated by DEQ.

DEQ has recommended that the City implement a method to reduce copper corrosion in the drinking water distribution system in order to reduce copper levels at the source and avoid additional wastewater treatment costs. Corrosion inhibitors and their impact on water and wastewater quality have not been evaluated by Keller Associates, and are not within the scope of this project. If DEQ determines that Ashland is out of compliance with their copper limits, pilot testing of adjustments to alkalinity and use of chemical precipitation should be completed to quantify the potential O&M costs and develop the recommended treatment solution.

6.5 BIOSOLIDS HANDLING

6.5.1 Life Cycle Cost Analysis

Table 6.2 presents the life cycle cost analysis of the alternatives selected for further evaluation, based on the costs shown in Table 5.16. Revenues generated from the sale of Class A biosolids have not been included in the cost analysis since the local market is unknown.

Based on the net present worth, continuing to landfill dewatered unstabilized sludge is the least expensive biosolids alternative (though the annual O&M cost is more than thermal drying). Thermal drying and co-composting have approximately the same net present worth. Producing Class A biosolids would cost more than handling the unstabilized sludge.

TABLE 6.2: Life Cycle Costs of Sludge Management Alternatives

	Dewater / Landfill	Dewater / Co-Compost	Dewater / Thermal Drying
Total Capital Cost (2011 dollars)	NA	$ 2,000,000	$ 4,100,000
Annual Operations & Maintenance Cost[1]	$ 352,000	$ 425,000	$ 271,000
Present Worth of Operations & Maintenance Cost[2]	$ 5,385,000	$ 6,502,000	$ 4,146,000
Salvage Value[3]	-	$ 365,500	$ 177,100
Net Present Worth	**$ 5,385,000**	**$ 8,136,500**	**$ 8,068,900**

[1] Total cost for 2030 operation
[2] 20 yrs, 2.7% (FY 2013 OMB Circular A-94 discount rate)
[3] Based on assumed useful life of 40 years for structures, 20 years for equipment

Both compost and dried biosolids could potentially be sold to generate revenue to offset the cost of sludge treatment. Ashland's residents are able to recycle yard waste through the Dry Creek Landfill which already produces a compost product for sale to the public. Recology Ashland sells the Dry Creek compost at their transfer station. The City would need to investigate the market for biosolids compost or dried biosolids prior to implementing a program. Oak leaf compost sells for $4 per bag (1.5 cubic feet), but there is no facility that utilizes municipal biosolids in their compost. The City of Grants Pass sells their compost at a much lower price, which may appeal to commercial businesses and residents.

6.5.2 Non-Monetary Factors

The viability of disposal at the landfill is dependent on the continued willingness of the landfill operators to accept dewatered sludge. There is always a risk that future regulations could change conditions such that the landfill would no longer accept the sludge.

Unlike landfilling, both composting and drying of biosolids create a product for direct beneficial reuse. However, sludge disposal by landfilling does provide indirect beneficial reuse by increasing methane production in the landfill for potential energy recovery.

Compared to sludge drying, composting produces more sellable product - but this also represents more volume that must be hauled and stored. (Composted biosolids contain more moisture and are similar in texture to soil, whereas dried biosolids have a granular appearance like fertilizer.) Co-composting represents potential competition with Dry Creek for yard waste. Acquisition of land would be required for a compost site; selection of a site would need to carefully consider the potential for odors and neighbor complaints as well as transportation distance from the treatment plant and yard waste source.

Thermal drying facilities could be located at the existing wastewater treatment plant. Visual impacts of a cooling tower and potential odors in the cooling water would need to be addressed. As was shown in Table 5.13 (electric/natural gas cost), thermal drying involves significant energy usage.

7.0 RECOMMENDED IMPROVEMENTS

System improvements are prioritized on the basis of need. Priority 1 improvements address existing deficiencies, and are intended to be completed within the next 10 years. Priority 2 improvements address future deficiencies, and are intended to be completed within the 10-20 year period. Recommended collection system and wastewater treatment improvements are illustrated in Figure 7.1 and 7.2, respectively (located in Appendix A).

7.1 COLLECTION SYSTEM

7.1.1 Priority 1 – Address Existing Deficiencies

18-inch and 24-inch Parallel Trunkline along Bear Creek – Priority 1A

These improvements involve installing 18-inch and 24-inch trunklines parallel to the existing 12-inch and 15-inch pipeline sections along Bear Creek. The 18-inch pipeline will extend approximately 4000 feet from manhole 11BC-006 to manhole 10AB-004. The 24-inch parallel line will need to be constructed at two separate locations along Bear Creek (approximately 1700 feet from manhole 10AB-004 to manhole 10BA-004, and 800 feet from manhole 4DD-027 to manhole 4DD-008). These improvements will be capable of conveying the entire upstream projected build-out wastewater flows. The proposed grade of these trunklines is slightly greater than the minimum slopes of the existing 12-inch and 15-inch pipeline within this reach.

As part of the pre-design, Keller Associates recommends that as an alternative to constructing a parallel pipeline, that the existing pipeline be replaced with a larger pipeline. This has the potential of reducing the amount of rock excavation required, reducing the overall project cost. Additionally, the City may choose to complete extended flow monitoring (during wet weather events) to better define existing flows and refine final pipe design flows prior to final design. In reassessing design flows, care should be taken to properly reflect the 5-year wet weather design storm event.

Mountain Avenue Interceptor – Priority 1B

Model results show that the current 10-inch pipeline is installed with little or no slope, resulting in surcharging under design peak flow conditions. This improvement includes replacing the pipe with a 15-inch pipeline with a steeper slope. The existing topography allows for only a slight slope adjustment (approximately 10 inches on the upstream side of the pipe), but the 15-inch pipe at the adjusted slope will be able to convey projected build-out flows. During pre-design, the City could look at potentially increasing the pipe slope and reducing the pipe size.

Priority 1C – Not Used

A Street Interceptor – Priority 1D

This improvement consists of replacing the existing 12-inch pipeline with a 15-inch pipeline along A Street from manhole 9AB-015 to manhole 9BA-011. The pipeline can be installed at the same slope as the current pipeline. Future flow can be diverted through this line at diversion 4 (manhole 9AC-041) to relieve surcharging in other downstream lines to the north on Mountain Avenue. An alternative to excavating and installing the new pipeline would be pipe bursting, since the current pipeline is at the correct slope to convey future flows.

Railroad Relief Interceptor – Priority 1E

To accommodate current and future flows, the 8-inch pipeline needs to be upsized to a 12-inch pipeline. The existing line is at an adequate slope; thus, pipe bursting should be considered as an alternative to open trench installation. The City could experiment with upstream flow splitting and complete additional flow monitoring in an effort to postpone this improvement. However, ultimately it is recommended to be replaced.

Priority 1F – Not Used

Miscellaneous Lift Station Upgrades – Priority 1G

The following lift station upgrades outlined in the CSSMP are recommended as Priority 1 improvements:

- Replace pumps in Creek Drive lift station with chopper pumps and provide three phase power
- Replace Grandview Lift Station and inspect force main condition.
- Construct gravity line to displace Nevada Street Lift Station
- Add drain from valve vault to wet well at Winburn Lift Station
- Add SCADA to lift stations

Purchase Portable Flow Meters – Priority 1H – Completed in 2012

Storm Water Inflow Study – Priority 1J – Completed in 2013

7.1.2 Priority 2 – Address Future Deficiencies

West Nevada Street Relief Interceptor – Priority 2A

This improvement consists of installing a new 12-inch pipeline on West Nevada Street. As the City begins to build out to the northwest along Highway 99, the flow can be rerouted directly to the wastewater treatment plant instead of flowing to the Ashland Creek pump station to be pumped to the plant.

Walker Avenue Relief Interceptor – Priority 2B

This improvement includes adjusting the slope of a section of pipe near the intersection of Walker Avenue and Main Street. The section of pipe is essentially flat, and surcharging will occur as flows increase. The topography at the location is suitable to make the necessary slope change to allow for flows to be effectively conveyed.

Priority 2C – Not Used

Ashland Creek Lift Station Upgrade – Priority 2D

This improvement consists of upgrading the pumping capacity at the lift station. At peak day build-out flows the wastewater in the wet well reaches an elevation that surcharges the lines coming into the lift station. As the pumps are replaced in the future they should be sized accordingly to eliminate the surcharging issues. The 18-inch pipeline is adequately sized to convey the increased flow. Sizing of the pumps should take into consideration the reduction in flows due to implementation of Priority 2A. Monitoring of actual flows after Priority 2A construction and prior to lift station redesign is recommended.

Miscellaneous Lift Station Upgrades

The following lift station upgrades outlined in the CSSMP are recommended as Priority 2 improvements:

- Replace Grandview Lift Station force main.
- Replace North Main Lift Station force main. This upgrade should be coordinated with growth and construction of a new lift station to the northwest, which would allow the existing North Main lift station and force main to be abandoned.
- Convert Shamrock Lift Station to a submersible type pump station. Flood proof lift station as required.
- Upgrade North Mountain Lift Station to reflect a more standardized lift station

7.1.3 Future Pipelines and Lift Stations

As the city builds out to the northwest along the I-5 corridor, a new 12-inch trunkline may be required to convey the flow. A future lift station is also proposed to pump the flow back to West Nevada Street where it can gravity flow to the treatment plant. Discussions with Rogue Valley Sewer (RVS) revealed a portion of this area is already serviced by RVS collection lines and two lift stations. Expansion of the City's system into this area of the UGB should consider location and sizing of existing components and must be coordinated with RVS.

Another area south of Main Street has been designated as developable land for Southern Oregon University (SOU). To convey the expected future flows into the system, a 12-inch pipeline will need to be installed. The last area of expected growth is to the southeast of the City along Highway 66. The existing 10-inch pipeline can be extended along the highway as the City builds out the UGB. Figure 7.1 shows the proposed future pipelines and lift stations needed to service the UGB.

7.2 TREATMENT IMPROVEMENTS

7.2.1 Water Quality Trading (Riparian Revegetation, Cooling Wetlands, and Relocated Outfall)

As discussed in Chapter 4, water quality trading (riparian revegetation and wetlands) is recommended as the alternative for complying with the temperature limit. Water quality trading/riparian revegetation can be best accomplished by entering into an agreement with an implementation organization. To address local plume concerns, the City will also need to relocate their existing outfall to Bear Creek and potentially construct some local wetland improvements. An outfall relocation and wetlands study is recommended to better quantify the needs, explore alternatives, and develop consensus among stakeholders. It is also recommended to pursue reuse where feasible as a beneficial means of supplementing potable water demands while also lowering the thermal load output from Ashland WWTP.

7.2.2 Plant Upgrade and Expansion

Ashland Creek Lift Station

Though the existing pumps are fairly new, current peak hour flows are at 82% of their design capacity. The City plans to have a portable pump on-site as a backup during peak flow conditions (collection system *Priority 1G*). The existing pumps should be replaced with larger pumps by the year 2025.

Grit Removal

The grit removal system has sufficient capacity to 2030**.** Its useful life will likely expire around 2025; replacing the grit system with a larger grit system is recommended at that time.

Oxidation Ditch

As discussed in Chapter 5, the apparent cost-effective alternative is to construct the shell of a new oxidation ditch to serve in the immediate future as an equalization basin during high flow events. However, the City has decided to proceed with the full oxidation ditch alternative now in order to provide process redundancy as soon as possible and also to take advantage of low interest loans available at this time (the City has already submitted a request to DEQ for CWSRF funding, with a potential sponsorship option).

Replacing the aerators in the existing ditch at the end of their useful life should be budgeted for the year 2030.

Secondary Clarifiers

Provided that a new oxidation ditch is constructed that allows plant operation at a mixed liquor concentration less than 3000 mg/L, current clarifier capacity is adequate to 2050. The clarifier internals (clarifier mechanism, feedwell, scum box and skimmer, walkway, weir plates) for Clarifiers 1 and 3 were installed around 2000. Assuming a life expectancy of 30 years, replacement would be recommended in 2030. Since the mechanism in Clarifier 2 was not replaced as part of the 1998 project, replacement as part of a 2020 improvements project would be recommended unless only minimal wear is detected.

Bottlenecks

The pipe from the oxidation ditch to the clarifiers has a 16 MGD capacity. This pipe reaches capacity around 2030 flows (at which point there is a projected peak flow of 12 MGD plus RAS flow of 5.5 MGD). The pipe can either be replaced with a larger pipe, or a second pipe can be added when a third oxidation ditch is constructed.

RAS Pumps

The existing RAS pumps should be replaced with larger pumps once peak flows are commonly above 6.5 MGD. (The existing peak day flow is 7.1 MGD, and the existing peak week flow is 5.5 MGD.) If consecutive days above 6.5 MGD were experienced, plant operations would be challenged to recycle enough flow to remove solids buildup and prevent carryover. Based on this, larger RAS pumps should be planned for by 2020.

UV Disinfection

There is sufficient UV treatment capacity to 2030; however, by 2020 additional UV hydraulic capacity will be necessary to accommodate the projected flow increases. This will include additional UV reactors and upgrading existing panels. A UVT monitor will also be added so the system can be flow paced to save energy.

Membrane Filtration

The City will need to continue to expand membrane surface area to keep up with expected increased capacity needs, and will also need to replace membranes as they wear out. This will require the City to inspect the membranes each year, and observe the membrane data to assess their condition and determine if cassettes should be replaced. Though the expected life of the membranes is between 10 and 15 years, some cassettes could last longer.

When larger membranes are installed, the header piping, valves, and permeate pumps will have to be replaced as well. The membrane feed pumps will also need to be upsized by 2023.

Alum Feed Pump

By 2025 it is projected that additional alum feed pump capacity will be required.

Solids Handling

Though the City has expressed a desire to eventually produce Class A biosolids, the costs associated with this venture make the existing landfill disposal option better for the short term. Due to uncertainties regarding tipping fees and the ability to continue to dispose biosolids at the landfill, the City will continue to explore partnering opportunities with Recology and other composting ventures where a third party would manage the composting facility. If these opportunities prove viable, co-composting should be reconsidered.

As a contingency plan, it is recommended that the City prepare to implement a thermal dryer to produce Class A biosolids within the next 10 to 20 years. The City could also explore options such as solar panels to offset energy cost associated with the thermal dryer.

SCADA System Improvements

Improving the existing plant SCADA system to more operator-friendly windows and automatic data logging is recommended to aid plant staff in better tracking plant operation parameters. A preliminary design report which provides specific design guidelines should be performed prior to implementing the improvements.

7.3 PRELIMINARY PROJECT DESIGN

The improvements summarized above are depicted in Figure 7.2, along with recommended timing (priorities). The major improvement in the short term is the construction of a third oxidation ditch. This option is developed in the figure at a concept level. The new ditch will be patterned after the existing ditches, with a volume of 1.41 MG.

Operation

If the full oxidation ditch alternative is constructed, plant operation will be similar to the current plant. If funding is not sufficient for the full ditch alternative, initially only the outer shell of the third oxidation ditch would be constructed, and the ditch would be used as an equalization basin for large flow events (5-year storm). The existing flow splitting structure ahead of the anoxic basins would be modified to automatically send peak flows to the equalization basin, and the water stored in the equalization basin would be pumped back to the splitter box once the peak event has passed.

Also, if it were necessary to take a ditch offline for maintenance, the equalization basin could be used during low flow summer months to equalize the flow to the remaining online ditch.

Staffing

Additional manhours will be required for operation and maintenance of the additional treatment units proposed for the recommended alternative. Based on the evaluation in the CSSMP, the total wastewater treatment staff needed for the recommended treatment alternative is 6.8 full-time employees (FTE). Current staffing is 6.0 FTE (increased from 5.4 since completion of the CSSMP). It is recommended that staffing be increased by 0.5 person in the next 5 years, with an additional 1.0 FTE (for the collection system) added within the next 20 years.

7.4 PROJECT SCHEDULE

The items outlined in this chapter are intended to provide a plan that allows the City to meet its wastewater treatment goals and objectives. General timelines are summarized in the master plan figures and CIP table. A more detailed schedule for Priority 1 improvements follows:

- Riparian Restoration, cooling wetlands, and outfall relocation – a pre-design study began in 2014. Final design and implementation are anticipated to begin in 2015. Implementation and subsequent monitoring will continue throughout the planning horizon.
- Oxidation Ditch – the City intends to complete design during 2015 and construction in 2016.
- Other miscellaneous WWTP and Lift Station improvements – these will be completed over the next few years. The next wastewater facility plan update should be completed in 2019.
- Wastewater collection system pipeline and lift station upgrades – Projects 1A, 1B, 1D, and 1E are anticipated to be completed with the same financing and on the same schedule as the oxidation ditch.

7.5 PERMIT REQUIREMENTS

Wetlands encroachment will require a 404 permit from the US Army Corps of Engineers (ACOE) and a Removal-Fill Permit or General Authorization from the Oregon Division of State Lands (DSL). A mitigation plan would need to be developed as part of the permit. This involves evaluation of project impacts on wetlands acreage, functions, and values, and selection of mitigation that will best offset those impacts.

Work in Ashland and Bear Creeks will also require permits from ACOE and DSL. Coordination with the Oregon Department of Fish and Wildlife would be necessary to appropriately schedule the outfall construction in order to minimize adverse impacts to the fish population.

7.6 TOTAL PROJECT COST

7.6.1 Cost Basis

Total project costs include construction costs; non-construction costs (engineering, legal and administrative), and contingencies. Construction costs include a 15% allowance for mobilization/demobilization, overhead and profit. Cost contingencies have been assumed at 30% of construction costs for this report. Engineering costs have been assumed at 18% of construction costs, and legal/administrative costs have been assumed at 2% of construction costs.

Estimates of costs presented in this report are based on 2011 regional (Northwest) cost data, and reflect Keller Associates' opinion of probable costs at the time the CSSMP was prepared. It should also be noted that these are conceptual level cost estimates, which are subject to change as the project design progresses. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies, and thus cannot and does not warrant or guarantee that actual construction costs will not vary from the costs presented herein. In a conceptual level report such as this, costs can normally vary by -30%/+50% or more depending on the material shortages, bidding climate, and economic conditions.

7.6.2 Summary of Costs

Table 7.1 presents a summary of future costs in order of priority. The primary purpose of each improvement is also shown, based on complying with the City's discharge permit and new regulations, achieving capacity necessary to accommodate growth, or replacing worn/old equipment. Priority 1 improvements are expected to be required from 2012 to 2020, Priority 2 from 2020 to 2030, and Priority 3 are projected requirements beyond 2030. However, the City should recognize that flexibility in the completion of many of these improvements may be warranted. For example, the City should consider accelerating pipeline projects if they can be coordinated with roadway improvements. Similarly, changes in flows and efforts to reduce infiltration and inflow may allow for some improvements to be postponed.

TABLE 7.1: City of Ashland Wastewater Improvements
Opinion of Probable Cost

ID#	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment		City's Estimated Portion
				%	Cost	
Priority 1 Improvements (2012 - 2020)						
Wastewater Treatment						
1	Wetlands / Outfall Relocation*	Compliance	$ 3,661,000	15%	$ 549,150	$ 3,111,850
2	Riparian Restoration*	Compliance	$ 1,293,000	15%	$ 193,950	$ 1,099,050
3	UVT Monitor	Compliance	$ 20,000	0%	$ -	$ 20,000
4	Backup (Portable) Pump	Capacity	$ 60,000	0%	$ -	$ 60,000
5	Membrane Replacement	Replacement	Completed			
6	Oxidation Ditch	Capacity	$ 6,150,000	60%	$ 3,710,000	$ 2,440,000
7	RAS Pump Replacement	Capacity	$ 90,000	20%	$ 18,000	$ 72,000
8	Wastewater Master Plan Update (~2019)	Update	$ 125,000	100%	$ 125,000	$ -
9	WWTP SCADA Upgrades	Replacement	$ 250,000	0%	$ -	$ 250,000
Wastewater Collection System						
1A	18" and 24" Parallel Trunkline Along Creek	Capacity	$ 1,587,000	70%	$ 1,110,900	$ 476,100
1B	15" Main Along Mountain Ave	Capacity	$ 118,000	25%	$ 29,500	$ 88,500
1D	A St 15" Main	Capacity	$ 522,000	10%	$ 52,200	$ 469,800
1E	12" Main Along Railroad	Capacity	$ 275,000	57%	$ 156,750	$ 118,250
1G	Miscellaneous Upgrades	Various	$ 335,000	10%	$ 33,500	$ 301,500
1H	Portable Flow Meters	Operations	Completed			
1J	Storm Water Inflow Study (2012 - 2013)	Capacity	Completed			
	Total Priority 1 Improvements		**$ 14,486,000**		**$ 5,978,950**	**$ 8,507,050**
Priority 2 Improvements (by 2020 - 2030)						
Wastewater Treatment						
1	Membrane Replacement (Larger Membranes)	Capacity/ Replacement	$ 4,659,000	40%	$ 1,863,600	$ 2,795,400
2	Membrane Feed Pumps & Piping Replacement	Capacity	$ 507,000	80%	$ 405,600	$ 101,400
3	Additional UV Reactors & Upgrade Control Panels	Capacity	$ 351,000	100%	$ 351,000	$ -
4	Mechanical Bar Screen Replacement	Replacement	$ 496,000	20%	$ 99,200	$ 396,800
5	Grit Removal System Replacement	Replacement	$ 801,000	20%	$ 160,200	$ 640,800
6	Existing Oxidation Ditch Equipment Replacement	Replacement	$ 1,551,000	0%	$ -	$ 1,551,000
7	Clarifier Mechanism Replacement	Replacement	$ 324,000	0%	$ -	$ 324,000
8	Replace Ashland Creek Lift Station Pumps with Larger Pumps	Capacity	$ 353,000	80%	$ 282,400	$ 70,600
9	Wastewater Master Plan Update (~2019)	Update	$ 125,000	100%	$ 125,000	$ -
10	Biosolids Disposal (assumes thermal dryer)	Various	$ 4,100,000	20%	$ 820,000	$ 3,280,000
Wastewater Collection System						
2A	12" Pipeline on Nevada Street	Capacity	$ 217,000	38%	$ 82,460	$ 134,540
2B	8" Slope Correction on Walker Ave.	Operations	$ 168,000	28%	$ 47,040	$ 120,960
2D	Miscellaneous Upgrades	Various	$ 739,000	10%	$ 73,900	$ 665,100
	Total Priority 2 Improvements		**$ 14,391,000**		**$ 4,310,400**	**$ 10,080,600**

*All costs came from 2012 CSSMP and are in 2011 dollars. Cost for wetlands/outfall relocation and riparian restoration have been updated to reflect 2014 estimates. Riparian restoration and wetlands/outfall relocation costs excluded operations and maintenance costs, and assume the average of the low and high range of costs.

TABLE 7.1: City of Ashland Wastewater Improvements
Opinion of Probable Cost *(Continued)*

ID#	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment		City's Estimated Portion
				%	Cost	
Future Improvements (beyond 2030) or Development Related Improvements						
Wastewater Treatment						
1	Additional Centrifuge	Capacity	$ 817,000	100%	$ 817,000	$ -
2	Clarifier Mechanism Replacement (2)	Replacement	$ 646,000	0%	$ -	$ 646,000
3	Additional Clarifier	Capacity	$ 1,773,000	100%	$ 1,773,000	$ -
Wastewater Collection System						
3A	Rogue Valley Hwy 99 Collection, Lift Station, & Pressure Main (assumes City provides service)	Growth	$ 2,545,000	100%	$ 2,545,000	$ -
3B	Upsize Costs for Future Expansion	Growth	$ 18,000	100%	$ 18,000	$ -
	Total Priority 3 Improvements		**$ 5,799,000**		**$ 5,153,000**	**$ 646,000**
TOTAL WASTEWATER IMPROVEMENTS COSTS (rounded)			**$ 34,676,000**		**$ 15,442,350**	**$ 19,233,650**

*All costs came from 2012 CSSMP and are in 2011 dollars. Cost for wetlands/outfall relocation and riparian restoration have been updated to reflect 2014 estimates. Riparian restoration and wetlands/outfall relocation costs excluded operations and maintenance costs, and assume the average of the low and high range of costs.

7.7 ANNUAL OPERATING BUDGET

7.7.1 Components

In addition to the capital improvement costs presented in the previous section, Keller Associates recommends the following be accounted for in setting annual budgets:

- Additional staffing needs (refer to CSSMP Sections 8.2.3 and 9.5.1): additional $195,000/year for additional full time equivalent employees (collection system lead foreman, treatment plant operator, and 0.5 FTE for regulatory compliance).
- Additional collection system replacement / rehabilitation needs (refer to CSSMP Section 3.4.1): City should eventually budget an additional $637,000/year (to be either contracted out or completed using City crews). To minimize rate impacts, this program may not fully be funded until after 2022 when the existing wastewater loans are retired.
- Additional annual operations and maintenance costs to maintain the riparian vegetation and wetlands projects (approximately $130,000 per year).
- Other additional annual operation and maintenance costs associated with Priority 1 improvements (larger RAS pumps, backup lift station pump, and oxidation ditch): anticipated at close to $54,000/year, most of which is associated with increased power usage of the additional ditch and the RAS pumps.
- Short-lived assets (pumps, equipment, etc. – reference CSSMP Appendix F): equates to an average of approximately $93,500/year, of which approximately $29,700/year is attributed to future facilities that will be added over the 20-year planning period.

7.7.2 Financial Plan

The detailed financial plan developed by Economic and Financial Analysis (EFA) can be found the CSSMP (Appendix G and Chapter 14). The financial forecast assumed financing for three new capital projects (membrane replacement, wetlands/outfall and riparian restoration, and the oxidation ditch shell) financed by the Oregon DEQ State Revolving Fund. The total annual debt obligation for these improvements was estimated in the CSSMP to be approximately $686,000/year. Because of the availability of low interest loans, the City has sought to expand what could be financed to include additional membrane costs (previously anticipated to be paid for from cash reserves), the internal equipment of the oxidation ditch, and additional collection system improvements (Priority 1A-1E projects) that were previously going to be paid for with cash. Funding all of these improvements with DEQ SRF low interest funds (1.5% which includes 0.5% administrative fee, and 20 year term), results in an increase in the annual debt obligation of approximately $983,000/year, or $297,000/year more than assumed in the previous financial analysis documented in the CSSMP ($297,000/year is approximately 8% of the FY 2013 annual operating revenue.)

Sewer rates and forecast rate increases were developed as part of the CSSMP and showed 10% rate increases for 2012 through 2017. Since then, finances and user rates have been reviewed/updated by EFA and the City with each new financing package. Additionally, each fiscal year the City evaluates the utility's financial performance during the previous year and decides whether to follow or modify previously planned rate increases. Changes in the construction schedule, financing costs, operating costs, or revenues from rates and SDCs may require the City to modify the planned rate increases.

The rate structure in place as of May 2014 results in a typical residential user rate of approximately $37/month. This equates to approximately 0.85% of the medium household income. Assuming continued rate 10% rate increases for the next four years, the user rate would be approximately $54/month, which is approaching 1.25% of the current medium household income. Actual rates may vary and should be refined based on actual and projected expenses, phasing of improvements, actual sources of financing, and rate modeling by the City's financial consultant.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 SPECIAL COORDINATION

Coordination with all the stakeholders is important to optimize the benefits of the planned improvements, particularly as it relates to disposal of the plant effluent. It is recommended that the City:

- Move forward with implementation of a thermal credit trading program.
- Conduct an outfall relocation and wetlands study, working with affected stakeholders (e.g. the Parks Commission, school district, and local residents).
- Coordinate with the Talent Irrigation District on the potential release of additional flows to Bear Creek, which would reduce the near field treatment requirements for Ashland in the future. In addition, phasing of "near field" improvements could allow for additional flow and temperature data to be gathered and could determine the impacts of shallow ground water interaction prior to investing in construction of wetlands.
- Continue to gather data and work with regulatory agencies and stakeholders to define impacts of newly developed treatment standards, and explore options for how those requirements may be met.

8.2 ADDITIONAL EFFORTS

Further activities that DEQ is requiring as part of the NPDES permit renewal process for the City of Ashland that are outside the scope of this report include: 1) conducting an industrial pretreatment survey, 2) completing an outfall relocation study, and 3) preparing an emergency response and public notification plan.

8.2.1 Industrial Pretreatment Survey

At the time this study was completed, neither the City nor DEQ had any records of a recent survey being completed to identify significant industrial users. DEQ requires that the City submit an industrial user survey as described in 40 CFR 403.8(f)(2)(i-iii) "suitable to make a determination as to the need for development of a pretreatment program." In the event that significant industrial users are identified, the City would be required to make modifications to their ordinances that would provide the City with the regulatory authority required to monitor and enforce EPA pretreatment requirements. Additionally, the City may need to enter into separate agreements or develop industry-specific permits with these users.

8.2.2 Outfall Relocation Study

The recommended improvements include relocation of the treatment plant outfall from Ashland Creek to Bear Creek via an open channel conveyance (Section 4.4.2). DEQ has indicated that they will need additional information in order to approve this project as part of the overall temperature solution, including further details on the project and a summary of all approvals needed from other agencies (e.g. Oregon Division of State Lands, US Army Corps of Engineers, Oregon Department of Land Conservation and Development). This study could be coupled with a wetlands evaluation as a means to better ascertain the thermal load compliance benefits.

8.2.3 Emergency Response Plan

The City can expect that their new discharge permit will also include requirements for an Emergency Notification and Response Plan to reduce the likelihood of sanitary sewer overflow (SSO) events. This plan will replace the existing Contingency Plan for the Prevention and Handling of Sewer Spills and Unplanned Discharges. DEQ has developed an SSO Enforcement Internal Management Directive that provides guidance for preventing, reporting, and responding to sewer system overflows. The directive outlines six elements to be included in the plans, as follows:

1. Ensure that the permittee is aware of such events.
2. Ensure notification of appropriate personnel and ensure that they are immediately dispatched for investigation and response.
3. Ensure immediate notification to the public, health agencies, and other affected public entities. (Reporting requirements include notice within 24 hours and written reports within 5 days.)
4. Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained.
5. Provide emergency operations.
6. Ensure that DEQ is notified of the public notification steps taken.

APPENDIX A

FIGURES

- FIGURE 1.1: STUDY AREA
- FIGURE 1.2: AREA TOPOGRAPHY
- FIGURE 2.1: EXISTING WASTEWATER FACILITIES
- FIGURE 2.2: PLANT LAYOUT
- FIGURE 2.3: FLOW SCHEMATIC
- FIGURE 2.4: PLANT PHOTOGRAPHS
- FIGURE 2.5: EXISTING SYSTEM CAPACITY
- FIGURE 4.1: WETLANDS OUTFALL RELOCATION OPTIONS
- FIGURE 5.1: PARALLEL MBR ALTERNATIVE
- FIGURE 5.2: PRIMARY FILTER ALTERNATIVE
- FIGURE 7.1: MASTER PLAN
- FIGURE 7.2: FUTURE WWTP EXPANSION

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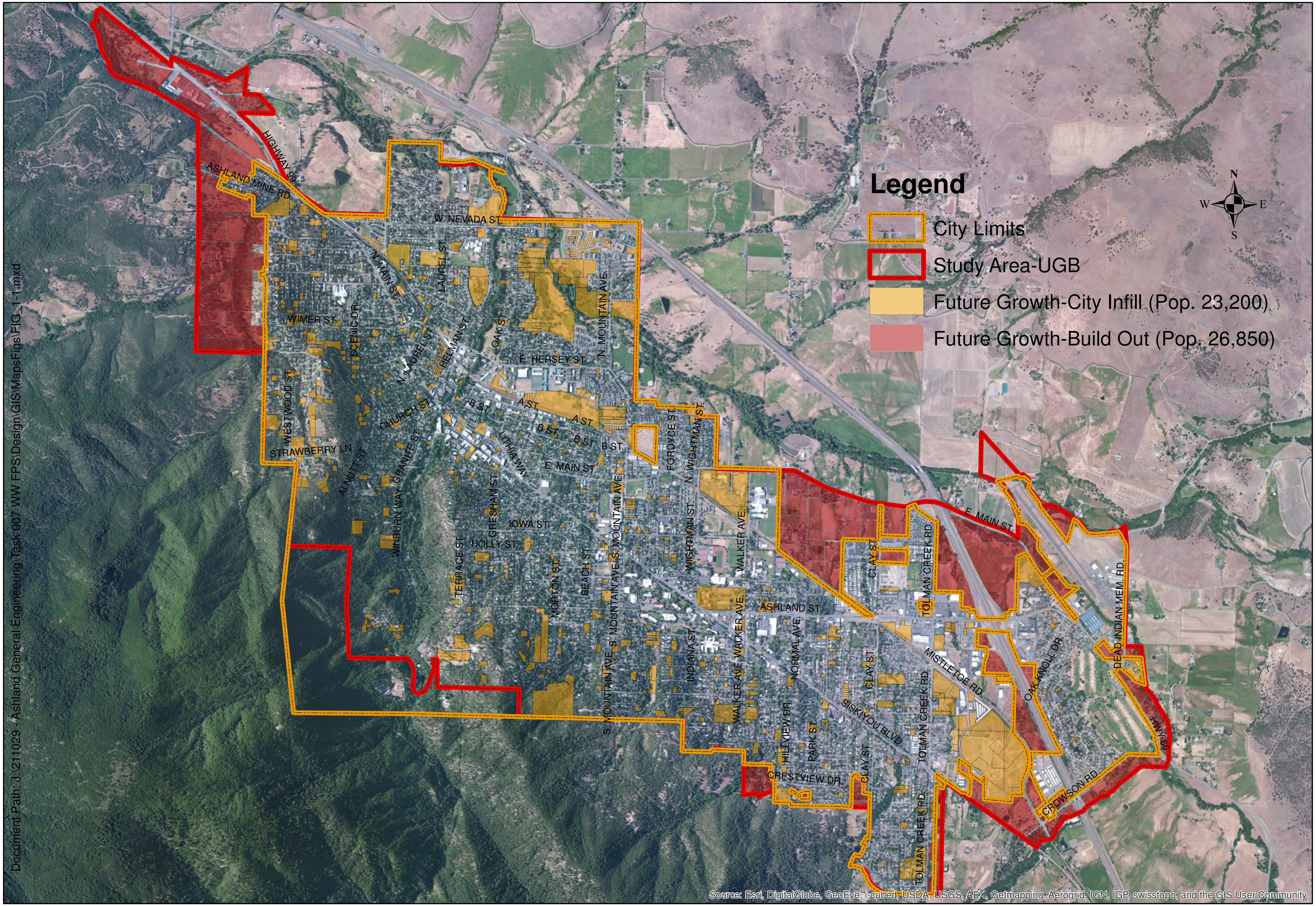


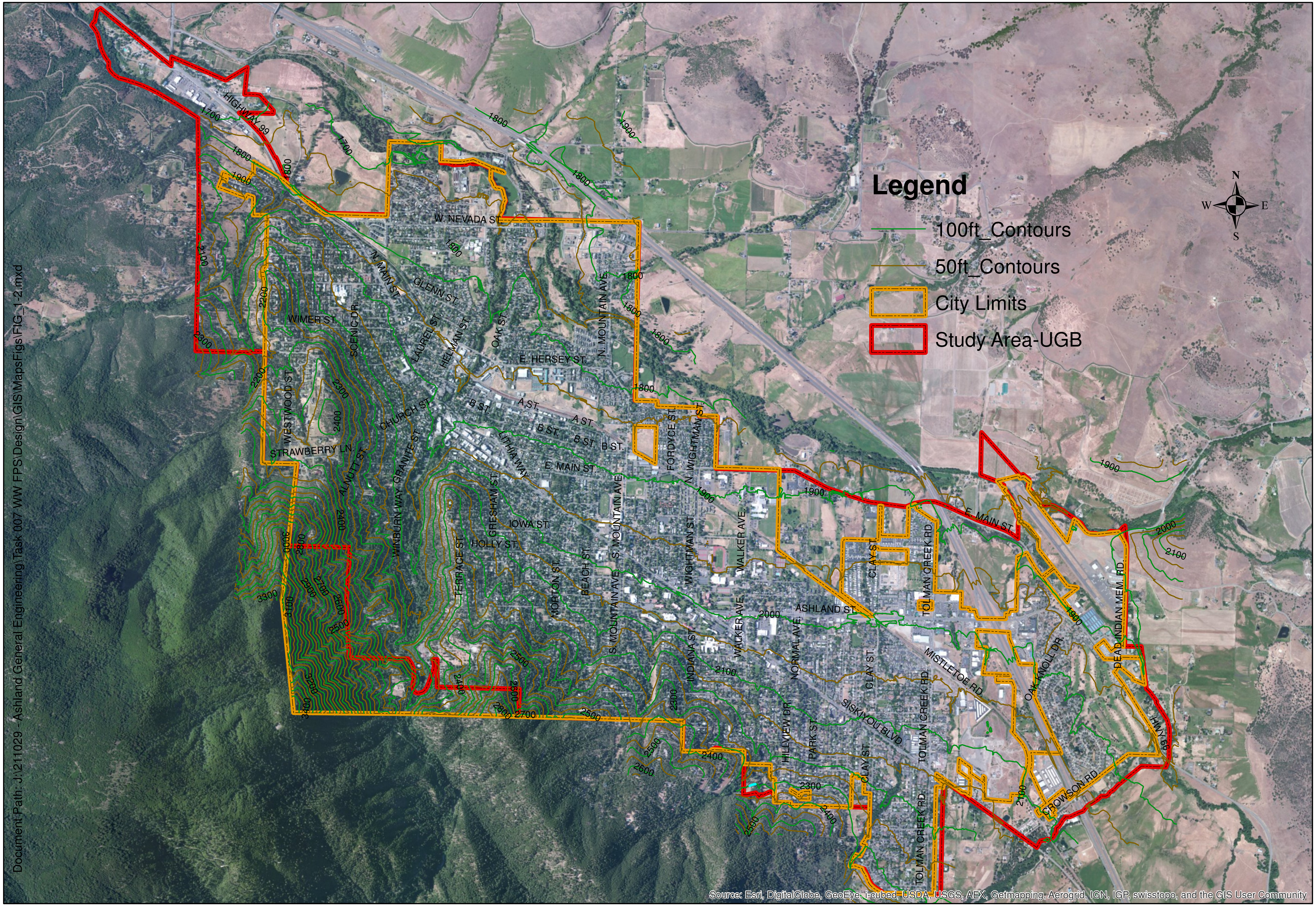
KELLER associates

Prepared for:
CITY of ASHLAND, OREGON

WASTEWATER FPS

Title:
STUDY AREA

Figure:
1.1



KELLER associates

CITY OF ASHLAND

Prepared for:

CITY of ASHLAND, OREGON

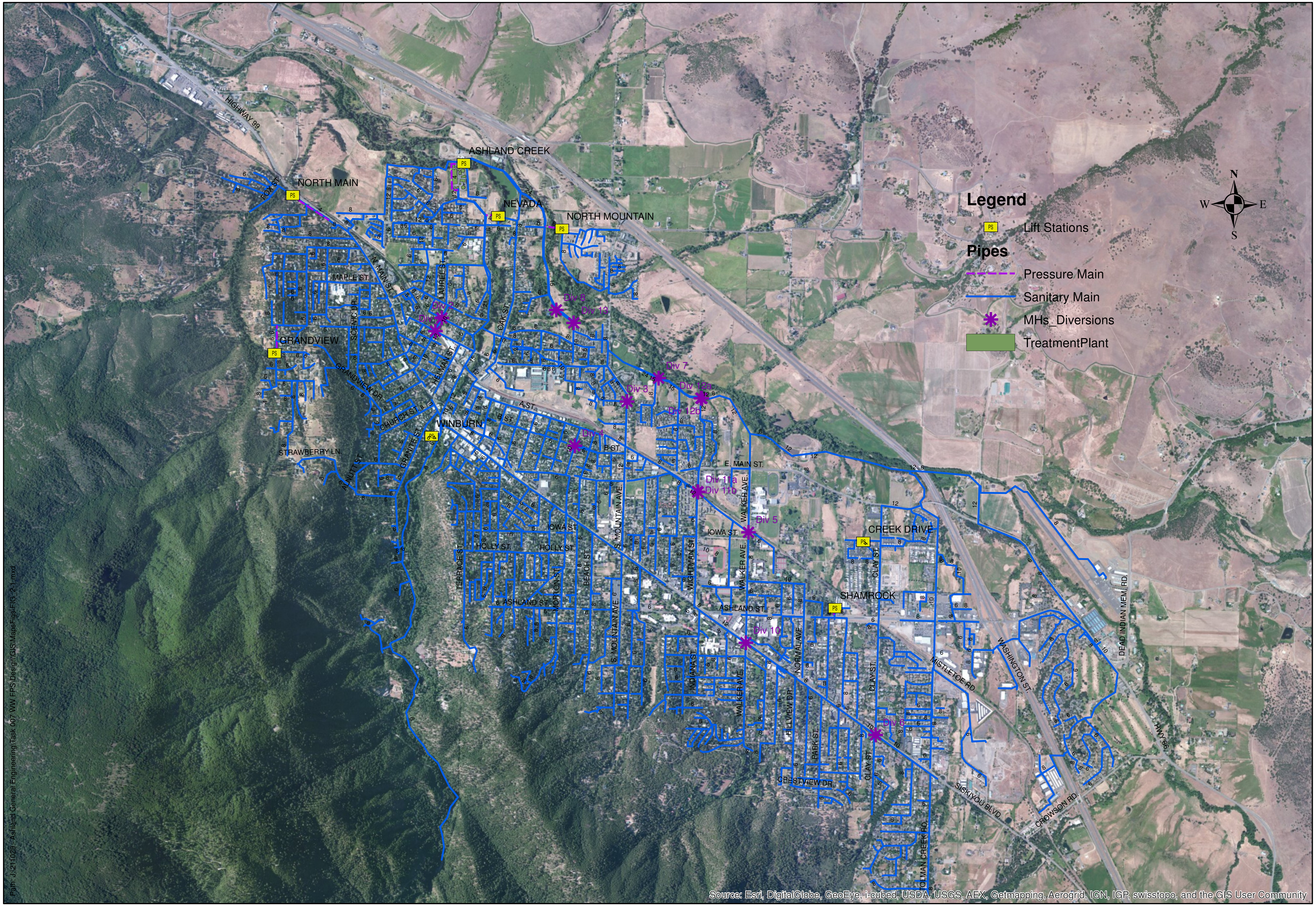
WASTEWATER FPS

Title:

TOPO

Figure:

1.2



KELLER associates

CITY OF ASHLAND

Prepared for: CITY of ASHLAND, OREGON

WASTEWATER FPS

Title: EXISTING WASTEWATER FACILITIES

Figure: 2.1

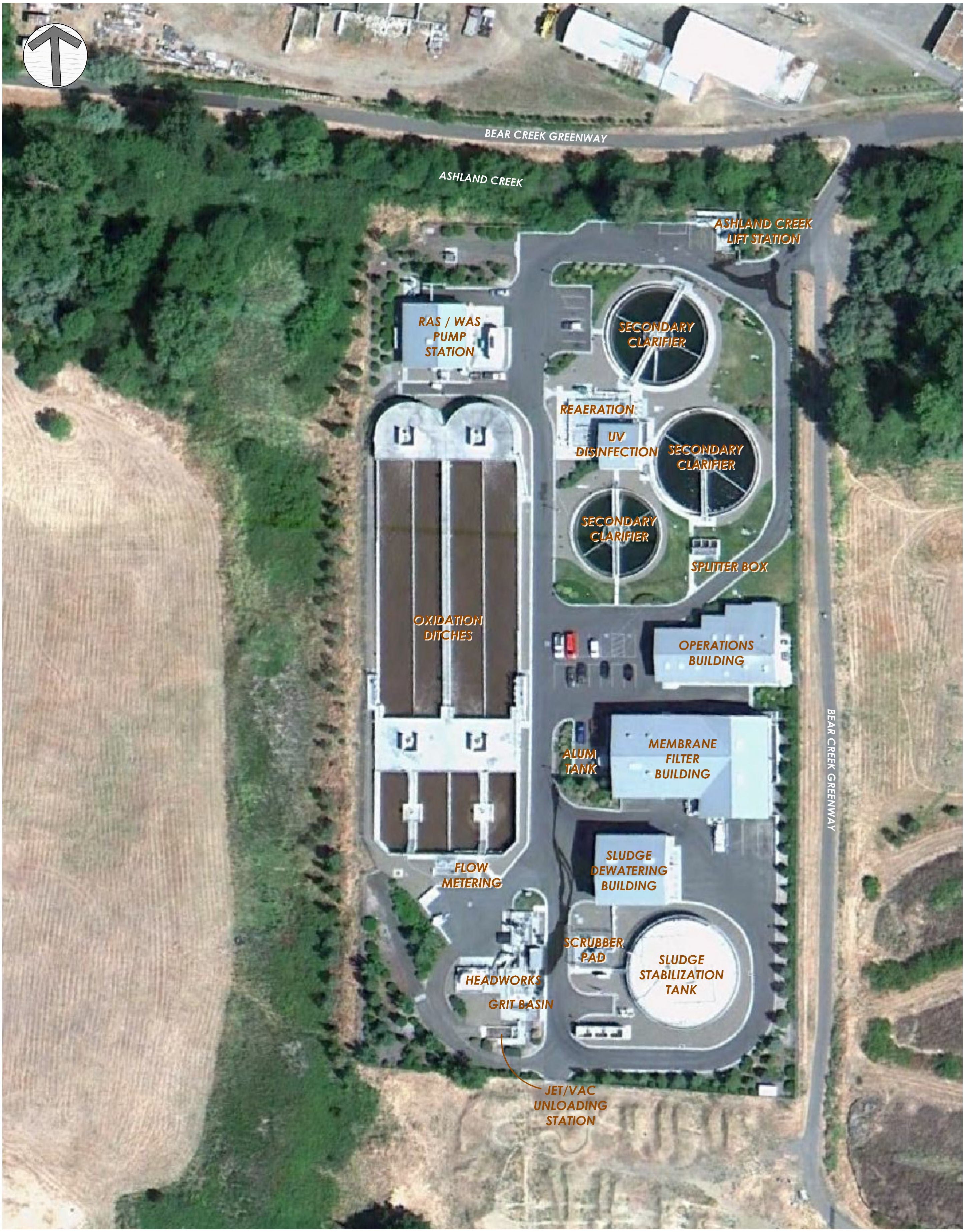
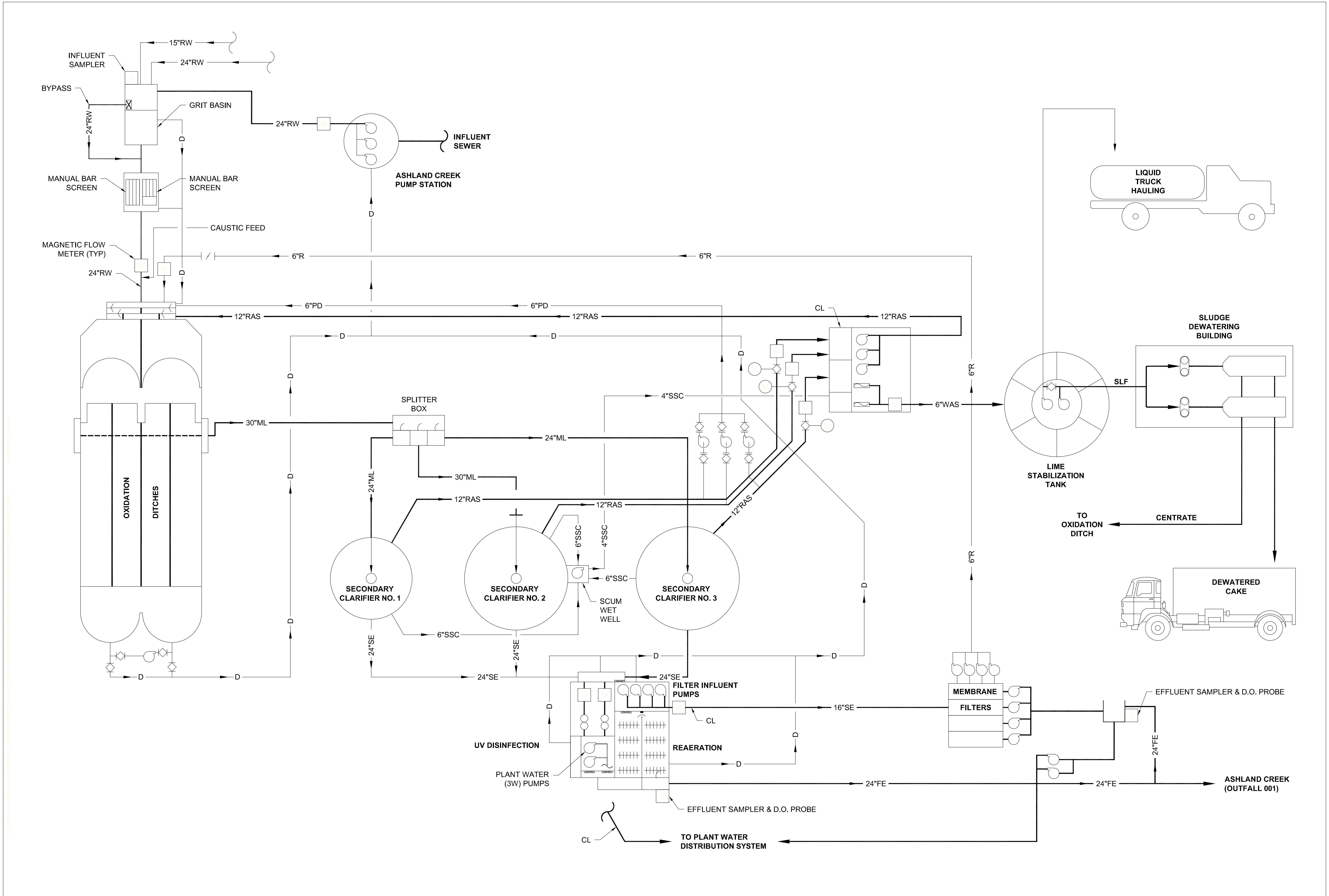


Figure:	Title:		Prepared for:
2.2	PLANT LAYOUT	WASTEWATER FPS	CITY of ASHLAND, OREGON

J:\211029 - Ashland General Engineering\Task 007 WW FPS\Design\CAD\00 Report Figures\Figure2-2.dwg DATE: 05/08/2014 TIME: 10:18:48 AM



KELLER associates

CITY of ASHLAND

Prepared for: CITY of ASHLAND, OREGON

Title: WASTEWATER FPS FLOW SCHEMATIC

Figure: 2.3

Figure: 2.4

Title: PLANT PHOTOGRAPHS

WASTEWATER FPS

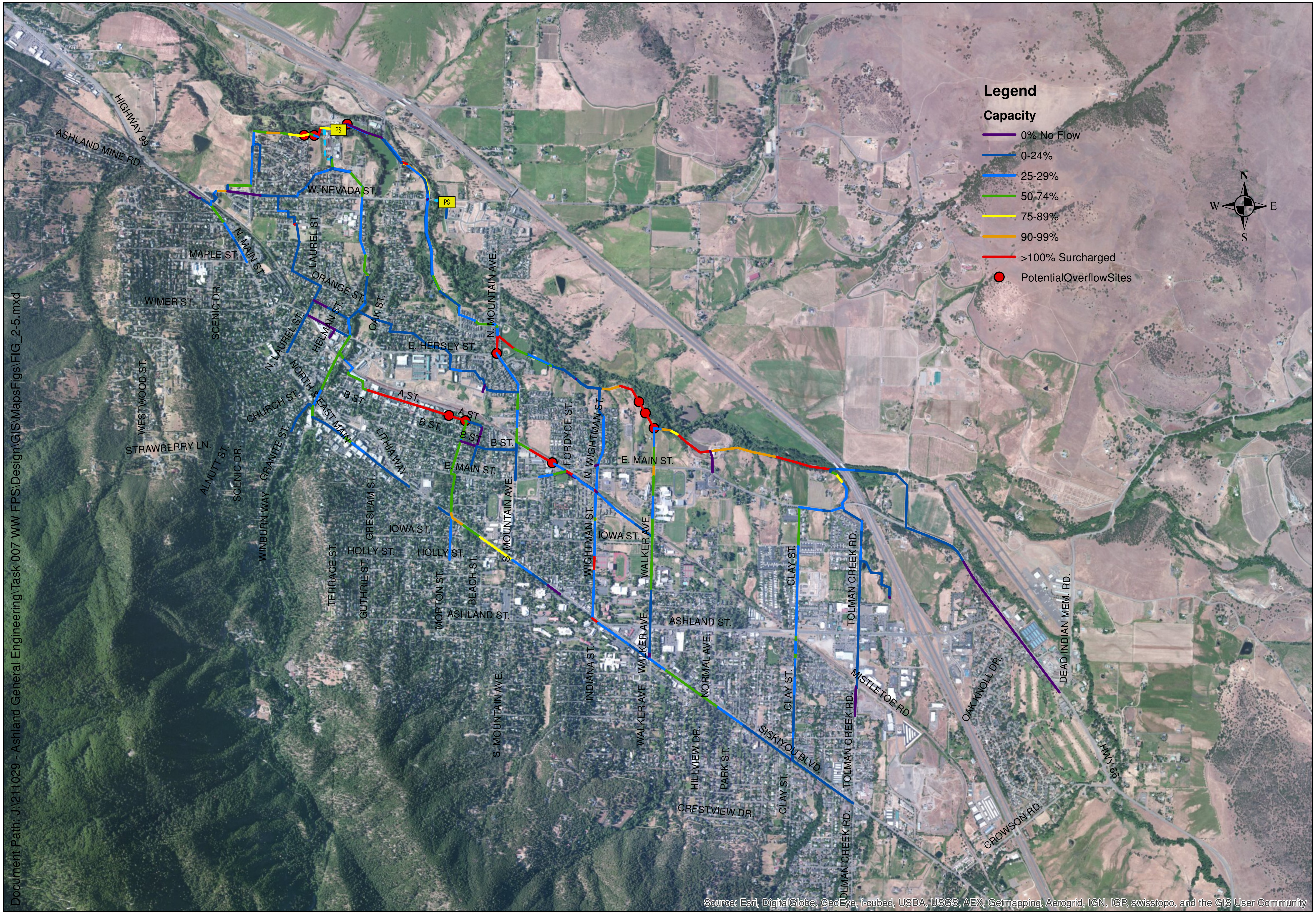
Prepared for: CITY of ASHLAND, OREGON

SCREEN

OXIDATION DITCH

CLARIFIER

UV DISINFECTION



KELLER associates

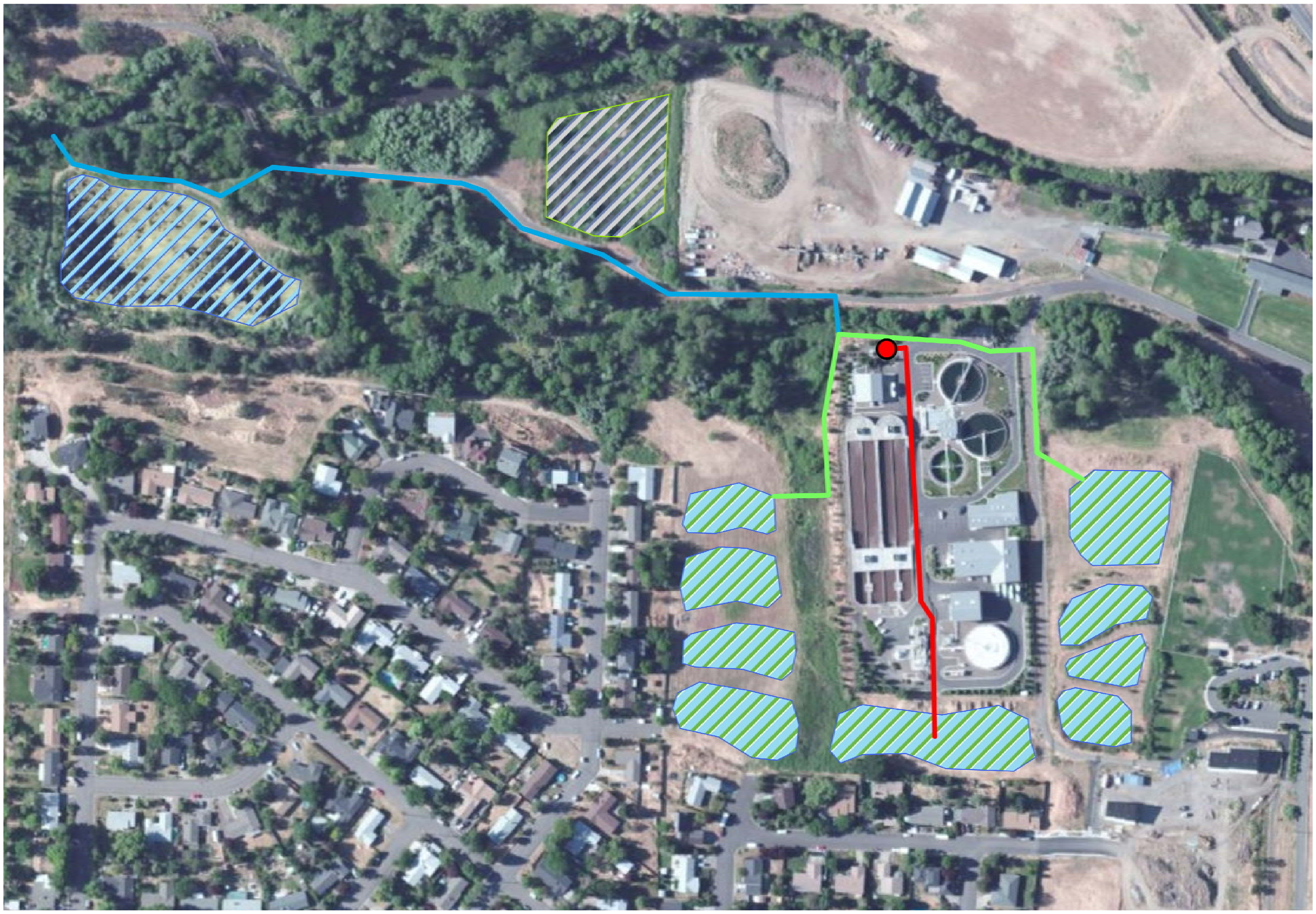
CITY of ASHLAND

Prepared for:
CITY of ASHLAND, OREGON

WASTEWATER FPS

Title:
EXISTING SYSTEM CAPACITY

Figure:
2.5



LEGEND

- Pump Station
- Outfall Pipeline
- Wetland Return Line
- Wetland Supply Line
- Constructed Wetland
- Existing Wetland
- Glendower Pond

Figure:	Title:		Prepared for:		
4.1	**Wetlands Outfall Relocation Options**	**WASTEWATER FPS**	**CITY of ASHLAND, OREGON**	CITY OF ASHLAND	CH2MHILL

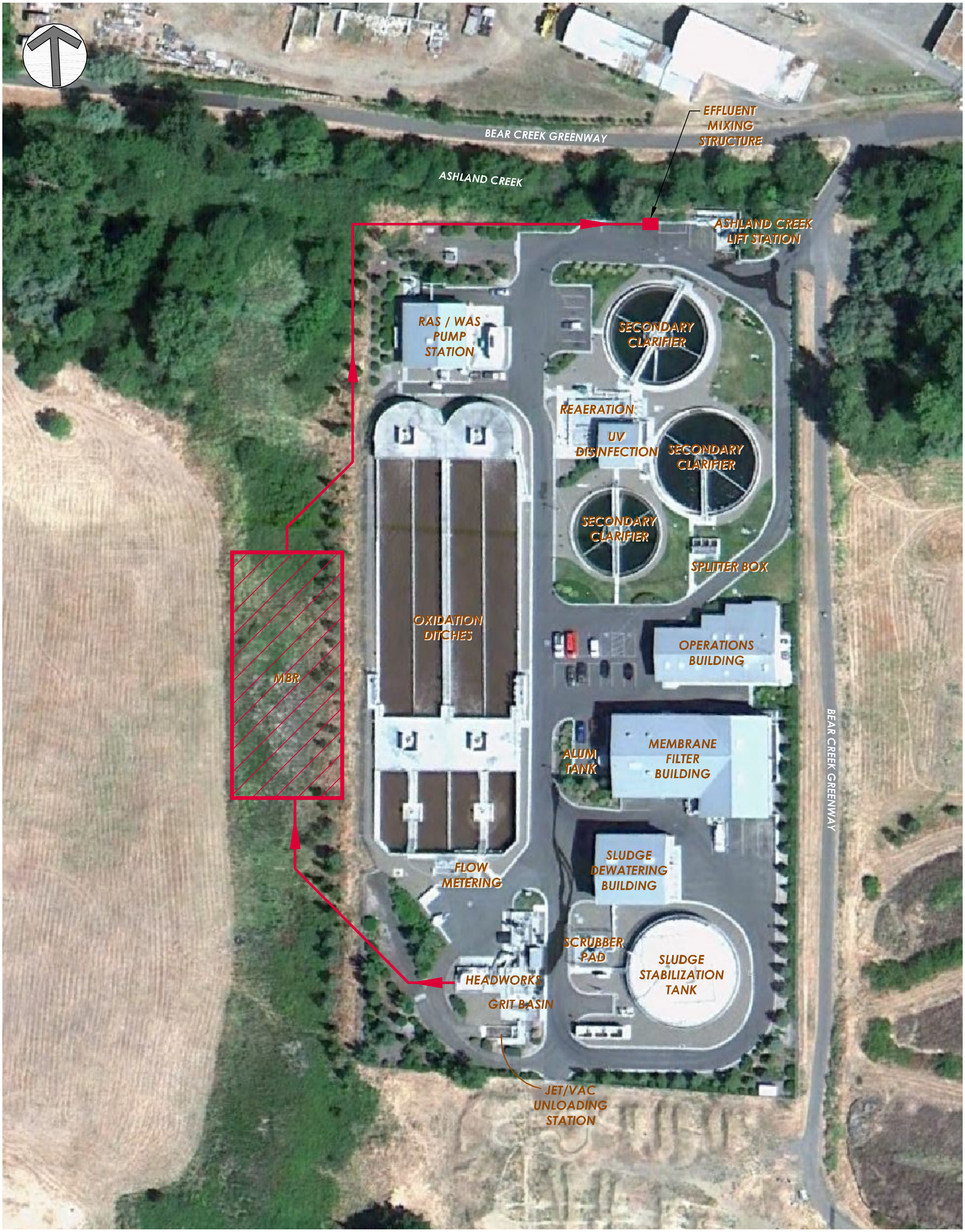
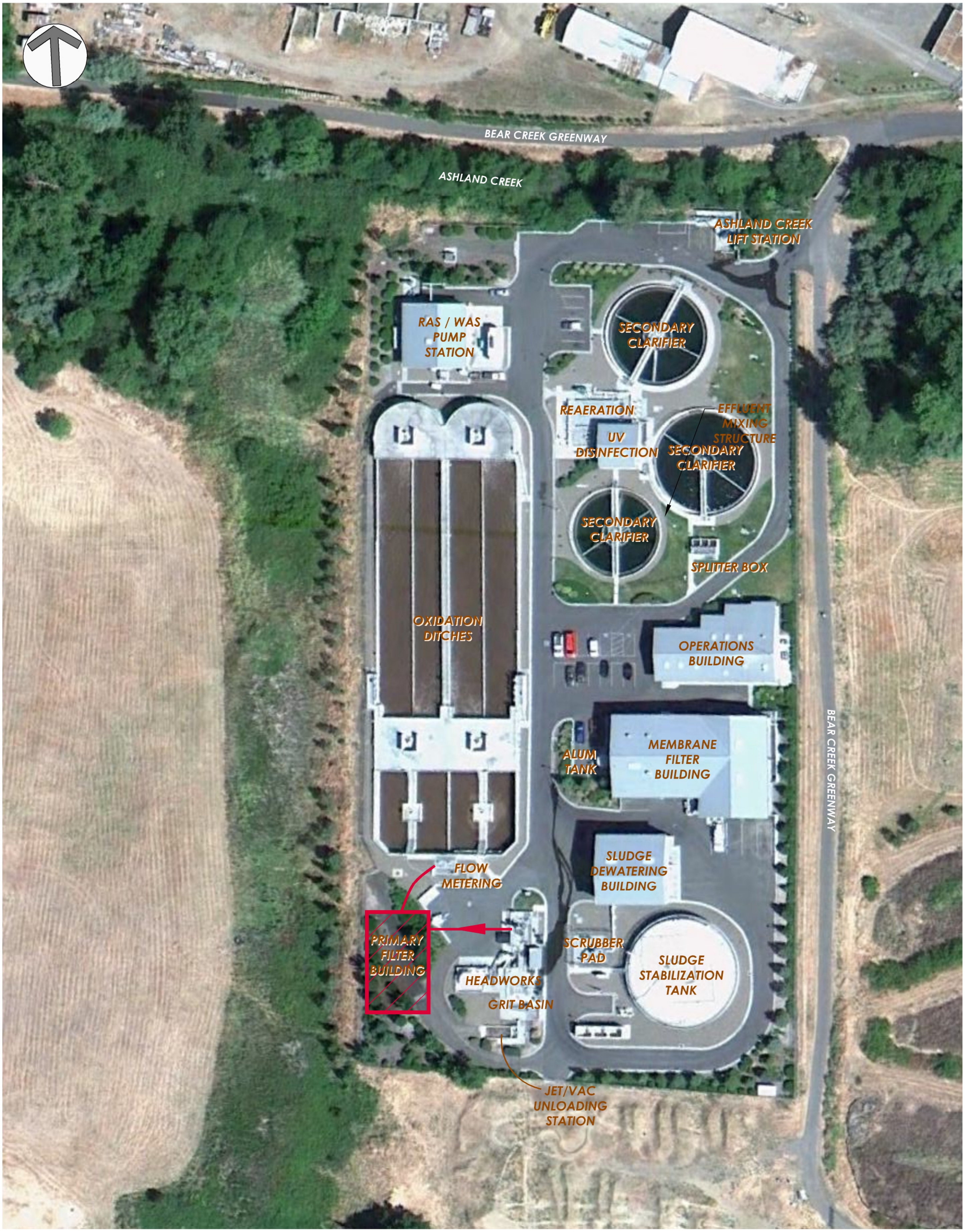


Figure:	Title:		Prepared for:
5.1	PARALLEL MBR ALTERNATIVE	WASTEWATER FPS	CITY of ASHLAND, OREGON

J:\211029 - Ashland General Engineering\Task 007 WW FPS\Design\CAD\00 Report Figures\Figure5-1.dwg DATE: 05/09/2014 TIME: 11:41:44 AM

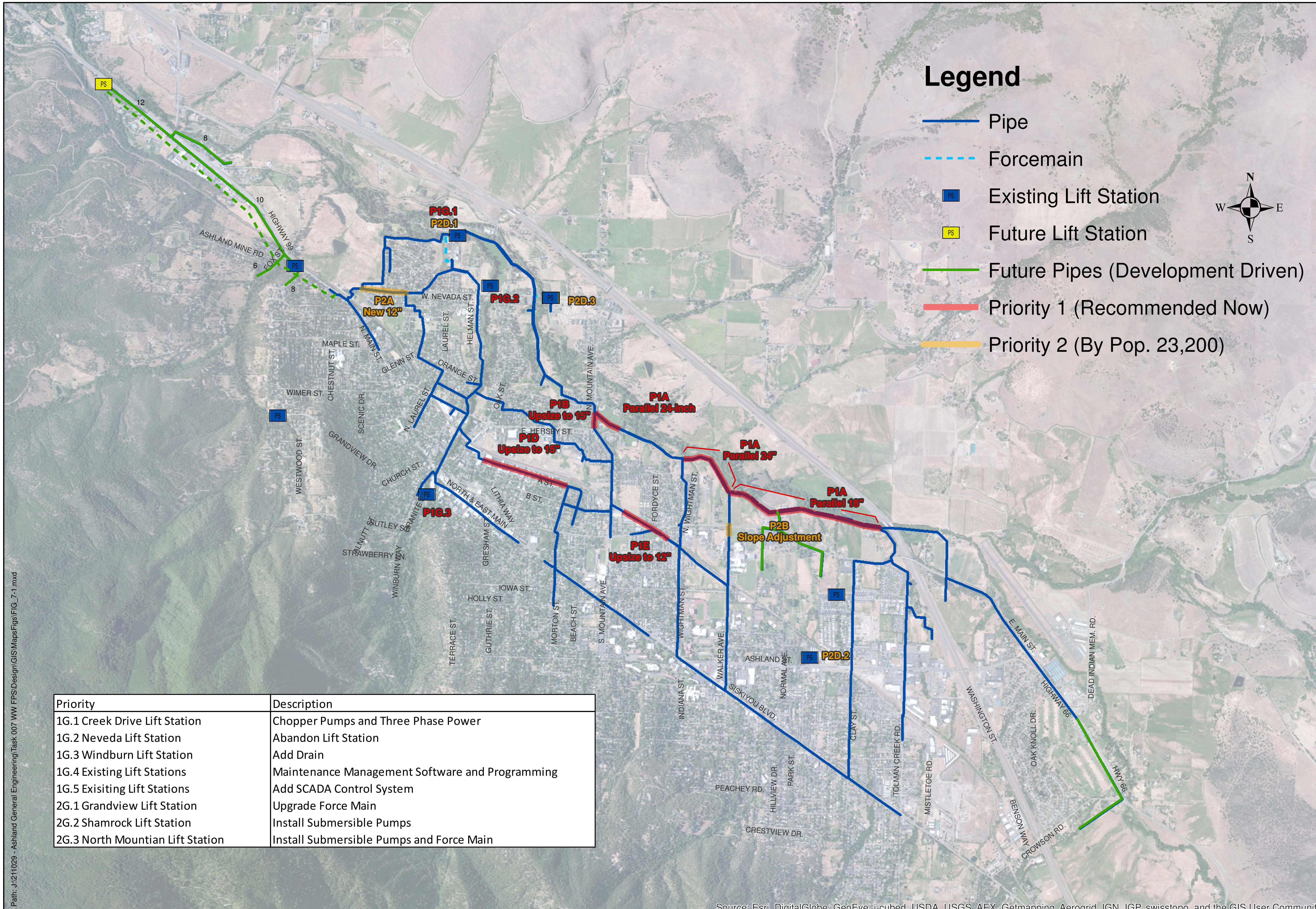


J:\211029 - Ashland Genera Engineering\Task 007 WW FPS\Design\CAD\00 Report Figures\Figure5-2.dwg DATE: 05/09/2014 TIME: 01:26:01 PM

Figure:	Title:		Prepared for:
5.2	PRIMARY FILTER ALTERNATIVE	WASTEWATER FPS	CITY of ASHLAND, OREGON

CITY OF ASHLAND

KELLER associates



Priority	Description
1G.1 Creek Drive Lift Station	Chopper Pumps and Three Phase Power
1G.2 Neveda Lift Station	Abandon Lift Station
1G.3 Windburn Lift Station	Add Drain
1G.4 Existing Lift Stations	Maintenance Management Software and Programming
1G.5 Exisiting Lift Stations	Add SCADA Control System
2G.1 Grandview Lift Station	Upgrade Force Main
2G.2 Shamrock Lift Station	Install Submersible Pumps
2G.3 North Mountian Lift Station	Install Submersible Pumps and Force Main

KELLER associates

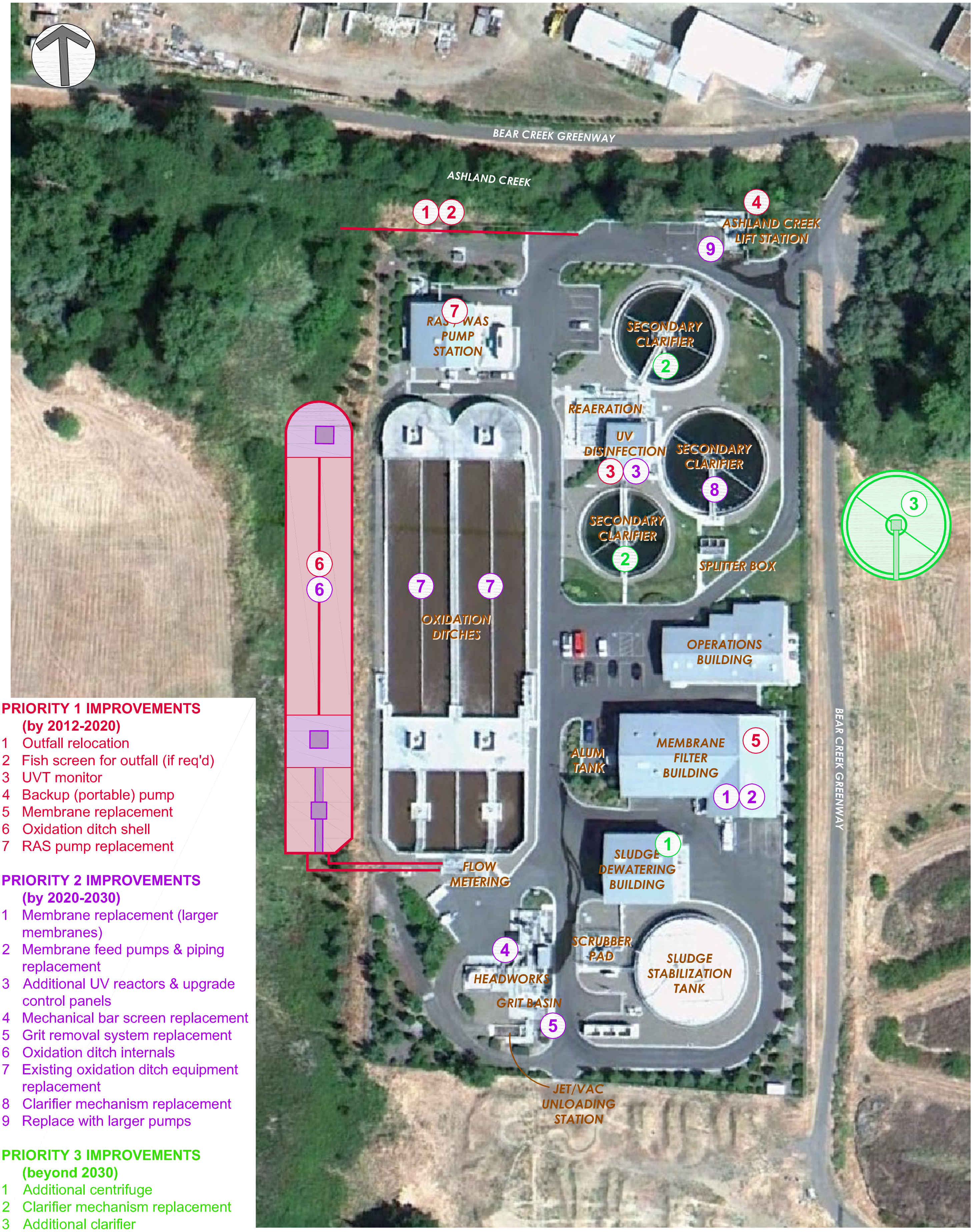
CITY of ASHLAND

Prepared for: CITY of ASHLAND, OREGON

WASTEWATER FPS

Title: MASTER PLAN

Figure: 7.1



PRIORITY 1 IMPROVEMENTS (by 2012-2020)

1 Outfall relocation
2 Fish screen for outfall (if req'd)
3 UVT monitor
4 Backup (portable) pump
5 Membrane replacement
6 Oxidation ditch shell
7 RAS pump replacement

PRIORITY 2 IMPROVEMENTS (by 2020-2030)

1 Membrane replacement (larger membranes)
2 Membrane feed pumps & piping replacement
3 Additional UV reactors & upgrade control panels
4 Mechanical bar screen replacement
5 Grit removal system replacement
6 Oxidation ditch internals
7 Existing oxidation ditch equipment replacement
8 Clarifier mechanism replacement
9 Replace with larger pumps

PRIORITY 3 IMPROVEMENTS (beyond 2030)

1 Additional centrifuge
2 Clarifier mechanism replacement
3 Additional clarifier

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Figure:	Title:		Prepared for:
7.2	FUTURE WWTP EXPANSION	WASTEWATER FPS	CITY of ASHLAND, OREGON

CITY OF ASHLAND

KELLER associates

APPENDIX B

Environmental Resources

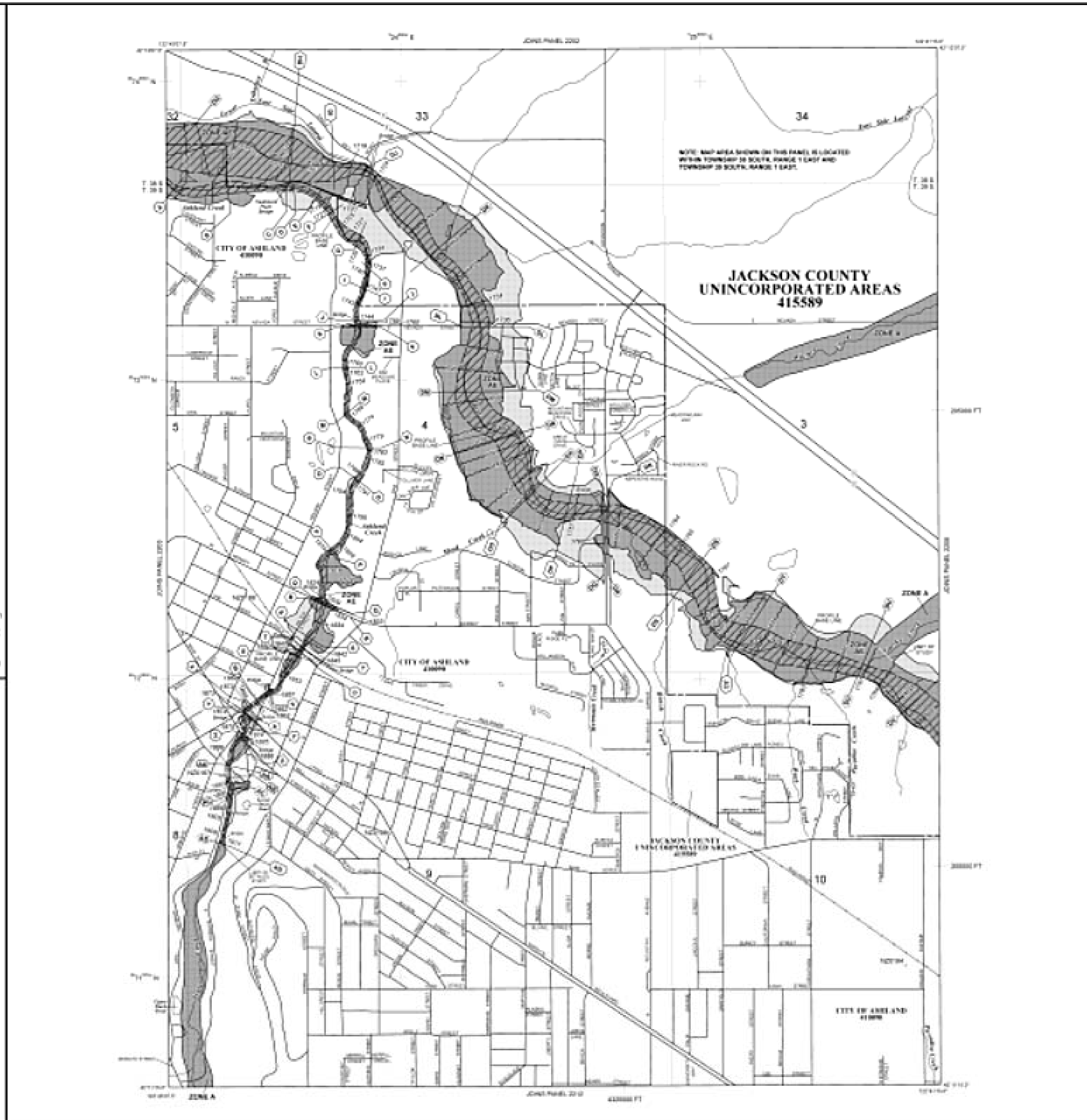
- FIRM for Ashland & Bear Creeks
- Official Water Resources Map
- Historic Resources

Keller associates

FIRM for Ashland & Bear Creeks

NOTES TO USERS

LEGEND



PANEL 2204F

FIRM
FLOOD INSURANCE RATE MAP

JACKSON COUNTY, OREGON

AND INCORPORATED AREAS

PANEL 2204 OF 2327

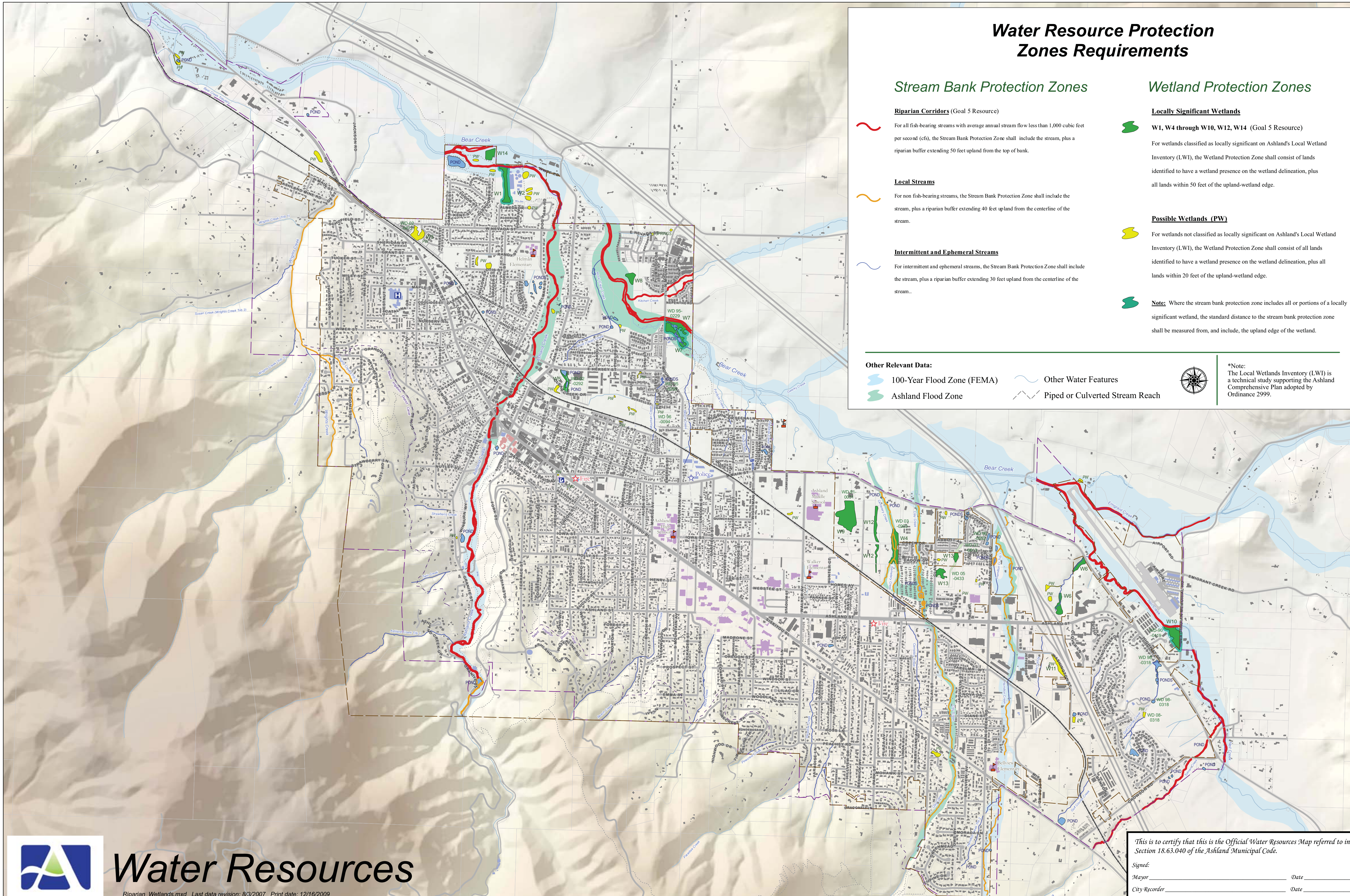
NATIONAL FLOOD INSURANCE PROGRAM

MAP NUMBER
41029C2204F

EFFECTIVE DATE
MAY 3, 2011

Federal Emergency Management Agency

OFFICIAL WATER RESOURCES MAP


Water Resource Protection
Zones Requirements
Stream Bank Protection Zones
Riparian Corridors (Goal 5 Resource)
For all fish-bearing streams with average annual stream flow less than 1,000 cubic feet per second (cfs), the Stream Bank Protection Zone shall include the stream, plus a riparian buffer extending 50 feet upland from the top of bank.
Local Streams
For non fish-bearing streams, the Stream Bank Protection Zone shall include the stream, plus a riparian buffer extending 40 feet upland from the centerline of the stream.
Intermittent and Ephemeral Streams
For intermittent and ephemeral streams, the Stream Bank Protection Zone shall include the stream, plus a riparian buffer extending 30 feet upland from the centerline of the stream..
Wetland Protection Zones
Locally Significant Wetlands
W1, W4 through W10, W12, W14 (Goal 5 Resource)
For wetlands classified as locally significant on Ashland's Local Wetland Inventory (LWI), the Wetland Protection Zone shall consist of lands identified to have a wetland presence on the wetland delineation, plus all lands within 50 feet of the upland-wetland edge.
Possible Wetlands (PW)
For wetlands not classified as locally significant on Ashland's Local Wetland Inventory (LWI), the Wetland Protection Zone shall consist of all lands identified to have a wetland presence on the wetland delineation, plus all lands within 20 feet of the upland-wetland edge.
Note: Where the stream bank protection zone includes all or portions of a locally significant wetland, the standard distance to the stream bank protection zone shall be measured from, and include, the upland edge of the wetland.
Other Relevant Data:
100-Year Flood Zone (FEMA)
Ashland Flood Zone
Other Water Features
Piped or Culverted Stream Reach
*Note:
The Local Wetlands Inventory (LWI) is a technical study supporting the Ashland Comprehensive Plan adopted by Ordinance 2999.
Bear Creek
This is to certify that this is the Official Water Resources Map referred to in Section 18.63.040 of the Ashland Municipal Code.
Signed:
Mayor ____________ Date ____________
City Recorder ____________ Date ____________
Water Resources
Riparian_Wetlands.mxd Last data revision: 8/3/2007 Print date: 12/16/2009

HISTORIC RESOURCES

ASHLAND, OR PROPERTIES ON NATIONAL HISTORIC REGISTER

	Ref. No.	**Resource Name**	**Address**	**Multiple Property Name**
1	80003315	Ahlstrom, Nils, House	248 5th St.	
2	95000687	Ashland Cemetery	Jct. of E. Main and Morton Sts.	Historic Cemeteries of Ashland MPS
3	91000047	Ashland Depot Hotel, South Wing	624 A St.	
4	00000446	Ashland Downtown Historic District	Roughly bounded by Lithia Way/C St., Church, Lithia Park/Hargadine, and Gresham Sts.	
5	92000663	Ashland Masonic Lodge Building	25 N. Main St.	
6	87001563	Ashland Municipal Powerhouse	Ashland Creek Canyon	
7	87001564	Ashland Oregon National Guard Armory	208 Oak St.	
8	99000533	Ashland Railroad Addition Historic District	Roughly bounded by Lithia Way, East Main, Oak St., A St. and 8th Sts.	
9	79002063	Atkinson, W. H., House	125 N. Main St.	
10	90000835	Barclay--Klum House	102 E. Main St.	
11	79002064	Beach, Baldwin, House	348 Hargadine St.	
12	00000462	Big Elk Guard Station	FS Rd. 3706 approx. 5 mi. N. of Dead Indian Memorial Rd.	US Forest Service Historic Structures on the Rogue River National Forest MPS
13	81000486	Boslough-Claycomb House	1 Hillcrest St.	
14	89000064	Buckhorn Mineral Springs Resort	2200 Buckhorn Springs Rd.	
15	80003316	Campbell, Richard Posey, House	94 Bush St.	
16	79002065	Carter, E. V., House	505 Siskiyou Blvd.	
17	77001101	Carter, H. B., House	91 Gresham St.	
18	81000487	Carter-Fortmiller House	514 Siskiyou Blvd.	
19	82001503	Chappell-Swedenburg House	990 Siskiyou Blvd.	
20	85000364	Citizen's Banking & Trust Co. Building	232--242 E. Main St.	
21	80003317	Coolidge, Orlando, House	137 N. Main St.	
22	78002287	Dunn, Patrick, Ranch	SE of Ashland on OR 66	
23	00000509	Dutchman Peak Lookout	FS Rd. 20 approx. 25 mi. SW of Ashland	US Forest Service Historic Structures on the Rogue River National Forest MPS
24	80003318	Eddings-Provost House	364 Vista St.	
25	86002902	Enders Building	250--300 E. Main St.	
26	79002066	First Baptist Church	241 Hargadine St.	
27	80003319	First National Bank, Vaupel Store and Oregon Hotel Buildings	15 S. Pioneer St. and 70 E. Main St.	
28	00000503	Fish Lake Shelter	South of OR 140 approx. 25 mi. NE of Ashland	US Forest Service Historic Structures on the Rogue River National Forest MPS
29	90000289	Grainger, G. M. and Kate, House	35 Granite St.	
30	98000627	Hargadine Cemetery	Sheridan and Walnut Sts.	Historic Cemeteries of Ashland MPS
31	78002288	IOOF Building	49--57 N. Main St.	
32	86002964	Kane, E. C., House	386 B St.	
33	82001505	Lithia Park	59 Winburn Way	
34	78002289	Lithia Springs Hotel	212 E. Main St.	
35	88001115	Lucas, Robert and Ruth, House and Mary E. Rose House	59, 77 Sixth St.	
36	81000488	McCall, John, House	153 Oak St.	
37	03001479	Mountain House	1148 Old Highway 99 South	
38	95000688	Mountain View Cemetery	Jct. of Normal Ave. and OR 66	Historic Cemeteries of Ashland MPS
39	82001506	Nininger, Amos and Vera, House	80 Hargadine St.	
40	97000588	Parsons, Reginald, Dead Indian Lodge	Hyatt Prairie Rd. 21 mi. E of Ashland	
41	92000063	Pedigrift, S. and Sarah J., House	407 Scenic Ave.	
42	92001328	Peerless Rooms Building	243--249 Fourth St.	
43	92000062	Peil, Emil and Alice Applegate, House	52 Granite St.	
44	93000922	Pelton, John and Charlotte, House	228 B St.	
45	80003320	Perozzi, Domingo, House	88 Granite St.	
46	81000489	Pracht, Humboldt, House	234 Vista St.	
47	85003075	Roper, Fordyce, House--Southern Oregon Hospital	35 S. Second St.	
48	85000365	Silsby, Col. William H., House	111 3rd St.	
49	02001008	Siskiyou--Hargandine Historic District	Roughly bounded by East Main, Morse, Beach, Iowa, and Pioneer Sts.	
50	01000832	Skidmore Academy Historic District	Roughly bounded by the RR R-O-W, Granite, Scenic, and Maple Sts.	
51	78002290	Taverner, George, House	912 Siskiyou Blvd.	
52	84003015	Trinity Episcopal Church	44 N. 2nd St.	
53	78002291	Walker, John P., House	1521 E. Main St.	
54	98000626	Whited, Harry L., House	321 N. Main	
55	97000142	Whittle Garage Building	101 Oak St.	
56	89000513	Women's Civic Improvement Clubhouse	59 Winburn Way	
57	79002067	Woolen, Isaac, House	131 N. Main St.	
58	00000505	Wrangle Gap Shelter	FS Rd. 20 approx. 25 mi. SW of Ashland	US Forest Service Historic Structures on the Rogue River National Forest MPS

Key to Numbered Sites:

1. Hargadine Cemetery
2. John P.Walker House
3. George Taverner House
4. Chappell-Swedenburg House
5. Mountain View Cemetery
6. Ashland Municipal Powerhouse

Key to Numbered Sites:

7. Orlando Coolidge House
8. Isaac Woolen House
9. GW. H. Atkinson House
10. G. M. and Kate Grainger House
11. Emil and Alice Applegate Peil House
12. Domingo Perozzi House
13. Women's Civic Improvement Clubhouse
14. Lithia Park
15. Ashland Downtown Historic District
16. IOOF Building
17. Whittle Garage Building
18. First National Bank, Vaupel Store and Oregon Hotel Buildings
19. Mark Antony Motor Hotel (Ashland Springs Hotel)
20. Citizen's Banking & Trust Co. Building
21. Enders Building
22. Fordyce Roper House-Southern Oregon Hospital
23. First Baptist Church
24. Trinity Episcopal Church
25. Ashland Railroad Addition Historic District
26. John McCall House
27. Ashland Oregon National Guard Armory
28. John and Charlotte Pelton House
29. Peerless Rooms Building
30. Ashland Depot Hotel, South Wing
31. Nils Ahlstrom House
32. Ashland Cemetery

APPENDIX C

FLOW DATA

- UPDATED FLOW ANALYSIS
- SANITARY SEWER INFILTRATION AND INFLOW STUDY
- DESIGN FLOW CALCULATIONS FROM 2012 COMPREHENSIVE SANITARY SEWER MASTER PLAN

KELLER associates

Updated Flow Analysis

Flow Analysis - City of Ashland Wastewater Facilities Planning Update

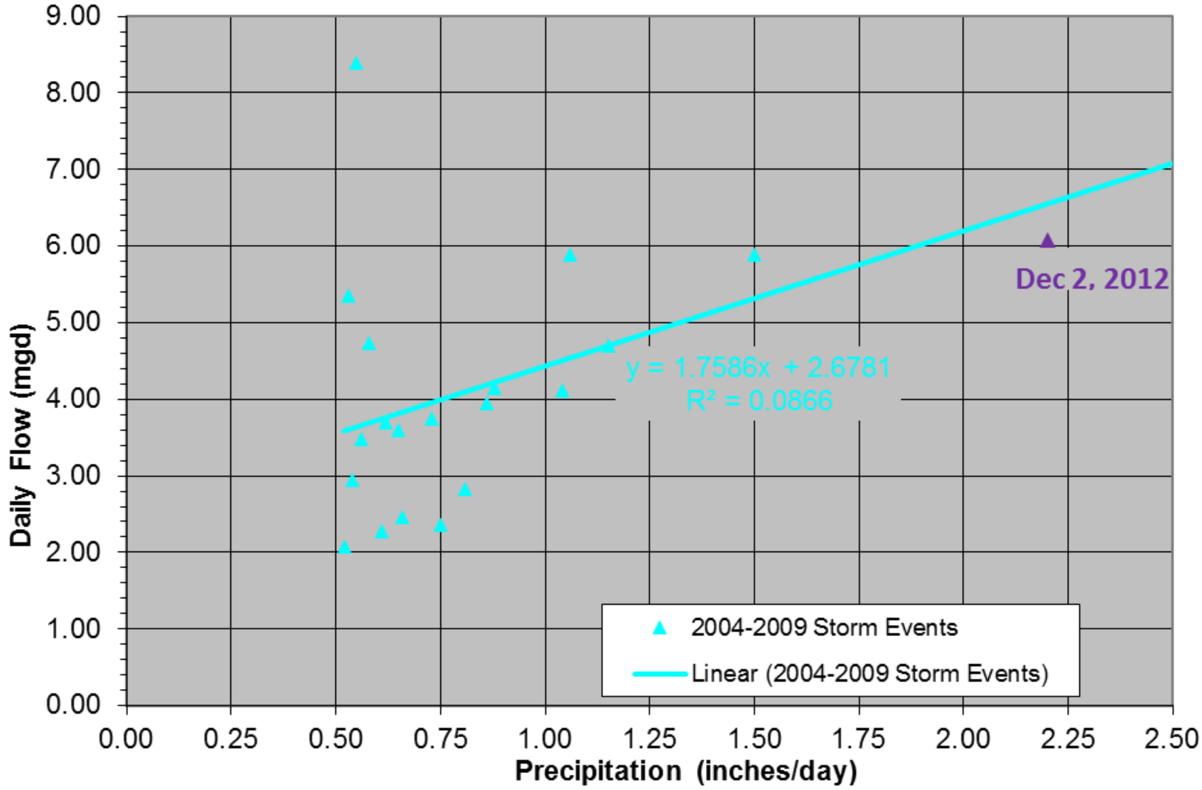
Keller Associates completed a detailed evaluation of the wastewater flows as part of the 2012 Comprehensive Sanitary Sewer Master Plan (CSSMP). The analysis followed the DEQ document *Guidelines for Making Wet-Weather and Peak Flow Projections for Sewer Treatment in Western Oregon* and utilized is analysis was based on data for the period of 2005-2009. (A copy of this analysis and supporting information can be found in Appendix C of this report.) As part of this facilities plan, the 2010-2012 data was analyzed to determine if any changes in the design flow projections were warranted.

Table C.1 summarizes the historical sewer flows at the WWTP. In terms of peak day and peak hour flows, it should be noted that there was a large 2.20-inch rain event that produced a peak daily flow of 6.07 MGD on December 2, 2012. During this same event the peak instantaneous flow exceeded 10 MGD. These peak flows are consistent with previous estimates developed in the CSSMP. Chart C.1 shows the previously developed peak day flow chart with a more recent 2012 peak flow event superimposed.

TABLE C.1: Historical Sewer Flows at WWTP, MGD (2005-2012)

	2005	2006	2007	2008	2009	2010	2011	2012	2005-2012 Avg	Existing Design 2012
Measurement	MGD	MGD	MGD	MGD	MGD	MGD	MGD	MGD	MGD	**MGD**
Average Day Dry Weather (ADWF)	2.14	2.15	2.08	1.95	1.96	2.16	2.04	2.39	2.11	**2.1**
Max Month Dry-Weather ($MMDWF_{10}$)	2.41 May 4 - Jun 2	2.23 May 16 - Jun 14	2.15 Sep 30 - Oct 29	2.09 May 27 - Jun 25	2.15 May 2 - May 31	2.39 Jul 23 - Aug 21	2.62 Apr 2 - May 1	2.58 Jul 1 - Jul 30	2.33	**2.7**
Annual Average Day (AADF)	2.12	2.41	2.27	2.08	1.95	2.04	2.18	2.27	2.17	**2.2**
Average Day Wet-Weather (AWWF)	2.09	.268	2.45	2.21	1.94	1.93	2.32	2.15	2.22	**2.3**
Max Month Wet-Weather ($MMWWF_5$)	2.41 Dec 6, 2004- Jan 4, 2005	3.64 Dec 28, 2005 - Jan 26, 2006	2.96 Dec 13, 2006 - Jan 11, 2007	2.70 Jan 4 2009- Feb 2, 2009	2.13 Dec 20, 2008 - Jan 18, 2009	2.26 Apr 1, 2010 - Apr 30, 2010	2.88 Mar 9, 2011 - Apr 7, 2011	2.97 Dec 1, 2012 - Dec 30, 2012	2.74	**3.6**
Peak Week (PWkF)	3.27 Dec 6, 2004- Dec 12, 2004	5.02 Dec28, 2005- Jan3, 2006	3.98 Feb 21, 2007 – Feb 27, 2007	3.51 Jan 4, 2008- Jan 10, 2008	2.41 Jan 1, 2008- Jan 7, 2009	2.59 Apr 27, 2010 - May 3, 2010	3.14 Mar 5, 2011- Mar 11, 2011	4.33 Dec 1, 2012 - Dec 7, 2012	3.53	**5.0**
Peak Day ($PDAF_5$)	5.48 Dec 4, 2004	8.39 Dec 30, 2005	4.86 Feb 24, 2007	5.88 Jan 4, 2008	3.01 May 4, 2009	3.26 Oct 24, 2010	4.37 Apr 5, 2011	6.07 Dec 2, 2012	5.17	**7.1**
Peak Instantaneous (Hour) (PIF_5)	-	-	-	10.00 Jan 4, 2008	6.00 May 4, 2009	-	-	10.00 Dec 2, 2012	8.00	**10.5**

CHART C.1: Daily WWTP Flow and Precipitation, Dec – May (2005-2009), with 2012 Peak Flow Event



Based on the additional data, projected flows at buildout (2060) are within 1-2% of those previously projected in the 2012 CSSMP. Table C.2 summarizes the projected sewer flows.

TABLE C.2: Projected Future Ashland Flow Rates

MGD	Design 2012	Projected Unit Flow*	2015	2020	2030	2040	2060
Population	22,150	-	22,771	23,845	26,146	28,670	31,633
		gpcd					
Average Day Dry Weather (ADWF)	**2.1**	95	2.16	2.26	2.48	2.72	3.00
Max Month Dry-Weather ($MMDWF_{10}$)	**2.7**	122	2.78	2.91	3.19	3.49	3.86
Annual Average Day (AADF)	**2.2**	99	2.26	2.37	2.60	2.85	3.14
Average Day Wet-Weather (AWWF)	**2.3**	104	2.36	2.48	2.71	2.98	3.28
Max Month Wet-Weather ($MMWWF_5$)	**3.6**	163	3.70	3.88	4.25	4.66	5.14
Peak Week (PWkF)	**5.0**	200	5.12	5.34	5.80	6.30	6.90
Peak Day ($PDAF_5$)	**7.1**	250	7.26	7.52	8.10	8.73	9.47
Peak Instantaneous (Hour) (PIF_5)	**10.5**	350	10.72	11.09	11.90	12.78	13.82

*Flow per capita for peak week, peak day, and peak hour assumed to be lower than existing conditions due to better materials and construction practices that result in lower infiltration and inflow in new developments.

Infiltration and Inflow Study

Extensive review of precipitation and inflow data was completed as part of the 2012 CSSMP. Existing peak sewer flows are considered "excessive" as defined by EPA. High flows are primarily a result of stormwater inflow and shallow groundwater infiltration immediately following storm events. Since the completion of the 2012 CSSMP, Keller Associates completed an Infiltration and Inflow (I/I) study to assist in locating and eliminating sources of I/I. This study involved smoke testing and flow monitoring for one of the downtown basins where previous flow monitoring identified a disproportionally high level of I/I. A copy of this study is also included in this Appendix, and includes a cost-benefit analysis for the identified sources of inflow.

Overall, Keller Associates was able to identify some areas of I/I, but no large sources of I/I that would account for the large flow increases observed at the WWTP following large storm events. While ongoing efforts are encouraged to continue to reduce I/I and associated operations and maintenance expenses, it is our professional opinion that the impacts of I/I reduction efforts will have little impact on the Capital Improvement Plan identified for the 20-year plan. This is especially true for Priority 1 wastewater treatment plant improvements which include oxidation ditch and shading improvements, which are driven in part by factors other than peak flow (e.g. redundancy during dry weather conditions for oxidation ditch, and excess thermal loads). Ongoing efforts to identify and reduce I/I should be continued and the success at maintaining or reducing flows at the wastewater treatment plant should be reevaluated every few years.

Sanitary Sewer Infiltration and Inflow Study

KELLER associates

Technical Memo

REGISTERED PROFESSIONAL ENGINEER
76347PE
OREGON
March 09, 2010
ANDREY R. CHERNISHOV
RENEWS: 12/31/13

TO: City of Ashland Public Works

FROM: Andrey Chernishov, P.E.
Natalie Jennings, E.I.

DATE: April 24, 2013

SUBJECT: Sanitary Sewer Infiltration and Inflow Study

The City of Ashland operates and maintains a wastewater collection system comprised of 110 miles of gravity sewer and eight lift stations. Infiltration and inflow (I&I) represent extraneous groundwater and storm runoff that enters the sanitary sewer system. Infiltration refers to groundwater that enters the wastewater collection system through leaky pipes and manholes. Inflow refers to storm water that enters the wastewater collection system through direct connections such as roof drains and catch basins, or through holes in manhole lids.

The 2012 Comprehensive Sanitary Sewer Master Plan identified a noticeable trend between average daily precipitation and average influent flow rates that reflects the influence of I&I at the wastewater treatment plant (WWTP). The rapid response between precipitation events and increased flows at the WWTP suggests that a significant component of peak plant flow is from storm water inflow. The sustained increase in flow at the WWTP over several days following a large storm event suggests that groundwater is also infiltrating into the City's wastewater collection system.

The City of Ashland has approached Keller Associates to provide support in investigating the problem areas in the collection system. Oregon DEQ has indicated that an I&I study would be required before state revolving loan funds could be used for plant expansion projects. The study's purpose is to help prioritize collection system rehabilitation work, reduce flows to the treatment plant, and potentially delay some capital improvements.

As recommended in the 2012 master plan prepared by Keller Associates, the City should continue their program to identify and eliminate excess I&I. With assistance from Keller Associates, the City has utilized a multi-pronged approach to identify excess I&I via the following methods: smoke testing, night-time monitoring, pump station run time analysis, and continuous flow monitoring. This technical memorandum provides an update to the I&I section in the 2012 master plan and recommends where the City should focus their efforts.

Smoke Testing

Keller Associates prioritized areas for smoke testing based on available flow data, age of collection system, pipe type, land use, and input from City staff. The average recorded wet weather flows were compared to dry weather flows from all eight of the flow monitored basins for the 2012 master plan. The basin with the highest average wet weather/dry weather flow ratio has the largest amount of infiltration and inflow (I&I). Basin 7 (sub-basins G and L) had the highest average wet weather/dry weather flow ratio, with wet weather flows 2.66 times higher than dry weather flows (refer to Figure 1 in Appendix A for basin location). Basin 7 is also part of the older section of town that has a large amount of old pipe, including approximately 12,300 feet of clay pipe and 31,600 feet of concrete pipe. In addition, approximately 16,000 feet of PVC pipe is within Basin 7. Approximately 12,000 feet of main line pipe within Basin 7 is known to have been constructed prior to 1950 (see Figure 1 in Appendix A). Due to all these factors, Basin 7 was chosen for smoke testing.

The City of Ashland notified all property owners within Basin 7 approximately one week prior to smoke testing. They were notified via a mailed informational packet. Keller Associates worked with City staff to smoke test all the sanitary sewer pipelines in Basin 7 during the week of September 17-21, 2012. Keller Associates provided the smoke testing equipment, consisting of a motorized smoke blower and liquid smoke. The City posted street signs in the vicinity of where smoke testing was occurring during the week. Working downstream, smoke was blown into about every other manhole along a main pipeline. Smoke introduced into the sanitary sewer system should only be released from nearby manhole and cleanount pick holes, and plumbing vents on buildings. Smoke was found to be emitting from many other locations, which means that water may be entering the sanitary sewer system in these locations. The major problem areas located via smoke testing are summarized in Appendix A along with photographs for each identified problem area. All defects found during smoke testing are summarized in Table 1.

The majority of the problems found were related to broken or missing cleanout caps located on sanitary service laterals. Some cleanouts are located near low points, which could be collecting localized stormwater runoff. Several stormwater cross connections were also found, including direct connections to roof drains and stormwater catch basins. One homeowner was found to be pumping water from the basement into the sanitary sewer service lateral cleanout. City staff informed the homeowner that discharging groundwater into the sanitary sewer system is not allowed per City policy.

Smoke testing from this stormwater catch basin near 645 Glenwood Drive revealed a cross connection to the City's sanitary sewer system.

Table 1 – Sanitary Sewer System Defects found by Smoke Testing

Defect Location/MH #	Defect	Remedy	Photo
Between MH 10CC-024 and 10CC-023	Clogged pipeline	Clean pipeline	Yes
Vacant lot west of 759 Prospect Street	Broken service lateral near clean out	Repair lateral near cleanout	Yes
100' north of MH 16AD-003	Broken concrete sanitary main line	Repair sanitary main	No
1047 Wildwood Way	Missing cleanout cap?	Replace cleanout cap	Yes
671 Mountain Avenue	Missing cleanout cap	Replace cleanout cap	Yes
580 Mountain Avenue	Missing cleanout cap	Replace cleanout cap	Yes
954 Siskiyou Boulevard	Broken plumbing in crawl space	Repair sanitary plumbing	Yes
1038 Henry Street	Missing cleanout cap	Replace cleanout cap	Yes
602 Glenwood Drive	Yard drain cross connection?	Remove cross connection	Yes
1090 Pleasant Way	Missing cleanout cap?	Replace cleanout cap	Yes
645 Glenwood Drive	Catch basin cross connection	Remove cross connection	Yes
804 Beach Street	Missing cleanout cap	Replace cleanout cap	Yes
Between MH 16AA-040 and 16AA-009	Clogged pipeline	Clean pipeline	Yes
501 Beach Street	Broken service lateral near cleanout	Repair lateral near cleanout	Yes
MH 09DD-005	Cracked manhole	Replace adjustment ring and seal joints	Yes
776 Forest Street	Broken plumbing in crawl space	Repair sanitary plumbing	No
429 Beach Street	Broken service lateral near curb	Repair lateral	Yes
430 Beach Street	Broken sanitary plumbing inside residence	Repair sanitary plumbing	No
801 Clarence Way	Missing cleanout cap	Replace cleanout cap	Yes
570 Weller Lane	Roof drain cross connection	Remove cross connection	Yes
542 Morton Street	Broken service lateral near fence	Repair lateral	Yes
354 Liberty Street	Missing cleanout cap	Replace cleanout cap	Yes
354 Liberty Street	Missing cleanout cap	Replace cleanout cap	Yes
328 Liberty Street	Missing cleanout cap	Replace cleanout cap	Yes
279 Liberty Street	Broken plumbing in crawl space	Repair sanitary plumbing	No
Liberty Street & Alaska Street	Clogged pipeline	Clean pipeline	No
715 Pracht Street	Missing cleanout cap	Replace cleanout cap	Yes
399 Morton Street	Broken sanitary plumbing inside residence	Repair sanitary plumbing	No
339 Morton Street	Broken plumbing in crawl space	Repair sanitary plumbing	No
449 Morton Street	Broken service lateral in driveway	Repair lateral	Yes
Morton Street and Iowa Street Intersection	Water PRV MH cross connection	Remove cross connection	Yes
CO 09DC-102	Cracked cleanout	Replace cleanout collar	Yes

Table 1 cont'd – Sanitary Sewer System Defects found by Smoke Testing

Defect Location/MH #	Defect	Remedy	Photo
NE corner of Euclid Avenue and Pracht Street	Catch basin cross connection	Remove cross connection	Yes
411 Euclid Avenue	Broken service lateral in backyard	Repair lateral	Yes
SW corner of Holly and Harrison	Broken cleanout cap	Replace cleanout cap	Yes
435 Ashland Street	Missing two cleanout caps in backyard	Replace cleanout caps	No
450 Ashland Street	Broken sanitary plumbing inside residence	Repair sanitary plumbing	No
453 Taylor Street	Yard drain cross connection?	Remove cross connection	Yes
431 Courtney Street	Broken sanitary plumbing inside residence	Repair sanitary plumbing	No
502 Herbert Street	Broken sanitary plumbing inside residence	Repair sanitary plumbing	No
495 Jennifer Street	Clothes dryer connected to storm curb weep hole?	Remove cross connection	Yes
SE corner of Iowa Street and Gresham Street	Abandoned storm line cross connection	Remove cross connection	Yes
162 Harrison Street	Crawl space/basement sump pump discharging into sanitary sewer cleanout	Remove cross connection	Yes
199 Sherman Street	Broken service lateral in front yard	Repair lateral	Yes
125 Sherman Street	Front yard roof drain cross connection	Remove cross connection	Yes
125 Sherman Street	Broken service lateral in front yard	Repair lateral	Yes
582 Allison Street	Broken cleanout cap	Replace cleanout cap	Yes
550 Allison Street	Broken service lateral near curb	Repair lateral	Yes
565 Allison Street, Unit 3	Broken service lateral in front yard	Repair lateral	Yes
549 E. Main Street	Broken plumbing in crawl space	Repair sanitary plumbing	Yes
550 E. Main Street	Broken service lateral near clean out	Repair lateral near cleanout	Yes
140 7th Street	Broken cleanout cap	Replace cleanout cap	Yes
CO 15BB-105	Missing cleanout cap	Replace cleanout cap	Yes
NW corner of Central Hall on SOU Campus	Broken cleanout cap	Replace cleanout cap	Yes
Upstream of MH 10CC-025	Broken cleanout cap	Replace cleanout cap	Yes
980 Morton Street	Broken cleanout cap	Replace cleanout cap	Yes
898 Morton Street	Missing cleanout cap	Replace cleanout cap	Yes
748 Lisa Lane	Broken service lateral in front yard	Repair lateral	Yes

Night-Time Field Investigations

Visual night-time field investigations were also performed in order to better identify sources of I&I in Basin 7. The two field visits were carried out by City staff during the lowest periods of flow, between 2 am – 5 am, on January 2013. Figure 2 in Appendix B illustrates the manholes that were inspected for flow levels, velocities, and sources of I&I. The week prior to field investigation, rainfall had been light, which produced very small amounts of I&I. Subsequent attempts to find suitable conditions for additional night time field investigations were unsuccessful. Due to the limited amounts of I&I recorded during the night-time investigations, an analysis of the data was not performed.

Keller Associates recommends that the City carry out night-time I&I field investigations in the future when wet weather conditions result in higher levels of I&I. Night-time monitoring should be performed when base sanitary sewer flows are the lowest, which is typically between 2 am – 5 am. For best results, night-time monitoring should be carried out following several consecutive days of precipitation, which will maximize the shallow groundwater levels.

When completing night-time monitoring, a two-person City crew should collect velocity and flow depth data in select sanitary sewer manholes identified in Figure 2 found in Appendix B. The manholes are color coded in four groups (magenta, white, yellow, and orange). The City crew should be able to collect data for one group of manholes in one night. The data should be recorded in the log found in Appendix B.

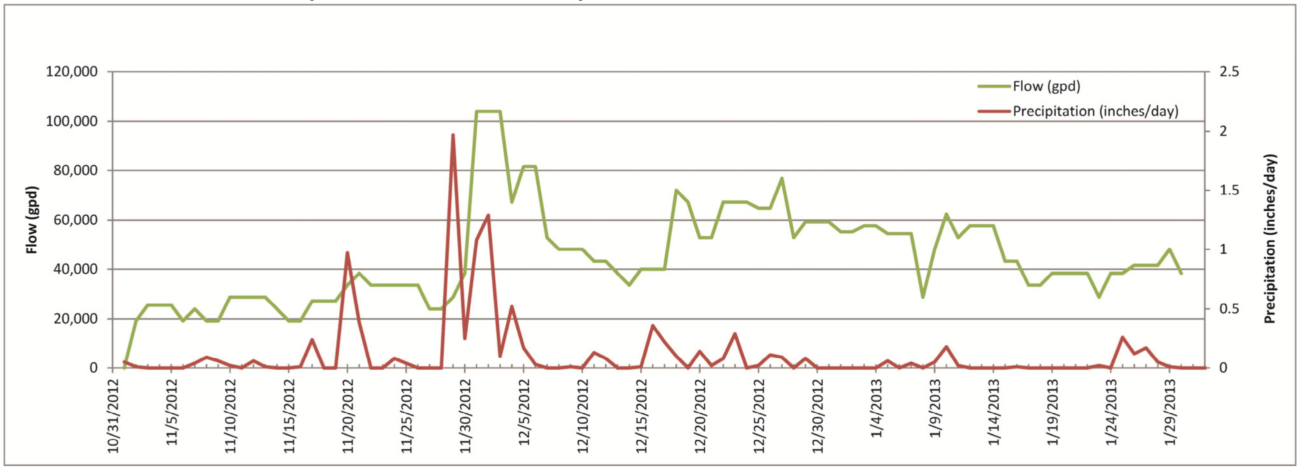
The information should be gathered beginning from the farthest downstream manhole in a pipeline system. As the crew moves upstream from manhole to manhole, data should be collected until the I&I flow is essentially zero. When a significant decrease in flow is observed between two manholes identified for data collection, additional velocity and flow depth data should be collected for other manholes that may exist between the two identified manholes. Other key forms of I&I witnessed by the crew, such as groundwater flow into a manhole through a crack/pinhole or direct stormwater inflow through the manhole lid, should be noted. Photos should be taken of manholes with significant inflow or infiltration during night-time monitoring.

Pump Station Run Time Analysis

As part of the 2012 master plan, Keller Associates analyzed weekly pump station run times for all City pump stations. Based on this previous analysis, the following pump stations were chosen to have daily pump run times collected from November 2012 through January 2013: Grandview, North Main, North Mountain, and Ashland Creek Pump Stations (refer to Figure 1 in Appendix A for locations). None of these pump stations are located within Basin 7.

Keller Associates analyzed the daily pump station run times for the four pump stations. Pump station flows were calculated by multiplying daily pump run times by their associated pumping rates. When the flows are compared with rainfall events (see Chart 1 and Appendix C for all pump station flow graphs), a close correlation between rainfall events and prolonged increases in flows is seen. This correlation indicates that shallow groundwater infiltration is the likely cause of increased flows.

Chart 1 - Grandview Pump Station Flow & Precipitation vs. Time



In order to compare high daily pump station flows caused by I&I against average daily flows, a peak day factor was calculated. The peak day factor was calculated by dividing the maximum daily flow by the average daily flow for November 2012 – January 2013. Peak day factors for the pump stations are listed in Table 2. Of the four pump stations, Grandview Pump Station had the highest amount of I&I in its service basin. The highest daily flow at the Grandview Pump Station was 2.32 times the daily flow for the three months.

It should be noted that the peak day factor for the pump stations correspond to an exceptionally high flow event in December when it rained almost 2 inches. While there is evidence of I&I in each of the basins contributing to the pump stations, the relative amount of I&I was lower in these basins than in other basins where flow monitoring was completed. The peak day factor at Grandview Pump Station for the period continuous flow monitoring was performed (Jan. 16-31, 2013) was 1.20.

Table 2 – Peaking Factors for Selected Pump Stations

Pump Station	Peak Day Factor*
Grandview P.S.	2.32
North Main P.S.	1.95
North Mountain P.S.	1.93
Ashland Creek P.S.	1.52

*Peak day divided by average day for Nov. 2012-Jan 2013 period.

Keller Associates recommends that additional monitoring be completed in the service area upstream of the Grandview Pump Station, and that collection system improvements focus on areas contributing the largest amounts of I&I. Keller Associates also recommends that pump run time data be reviewed every couple of years to establish trends and prioritize rehabilitation efforts.

Continuous Flow Monitoring

Keller Associates installed the majority of flow monitors in the old sections of town that have an aged sanitary sewer collection system. A few flow monitors were also installed along major trunklines near Bear Creek. Figure 3 in Appendix D illustrates the flow monitoring locations. Flow was continuously monitored (5-minute intervals) at seven locations between January and February 2013.

The estimated I&I flow rates for the monitored locations are shown in Table 3, based on flow monitoring data for each sub-basin. The estimated I&I flow rates were calculated by subtracting the lowest night-time flow from the highest night-time flow within the monitoring period. The lowest night-time flows are typically considered to be between 2 am – 5 am; this same time period was used to select the highest night-time flows. Flow generated in sub-basin L passed through flow monitoring Site G, which eventually flows through Site F. To account for this, the flow for the upstream sub-basin was subtracted from the downstream sub-basin to establish the I&I flow generated in a particular sub-basin. Sub-basins G and L make up Basin 7, as illustrated on Figure 1 in Appendix A.

Table 3 – Relative I&I by Sub-basin for Period of Jan. 16 – Feb. 28, 2013

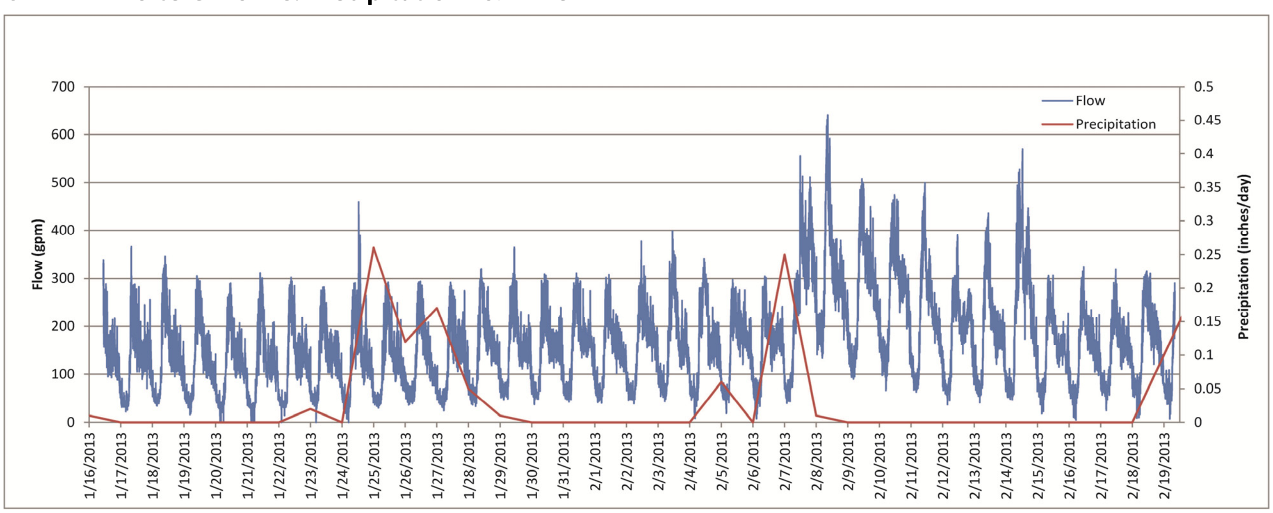
Sub-basin	Lowest Night-Time Flow (gpm)	Highest Night-Time Flow (gpm)	Estimated I&I Flow (gpm)	High/Low Flow Ratio
E	5	23	18	4.6
F*	66	405	339	6.1
G**	10	201	191	20.1
H	55	167	112	3.0
I	20	140	120	7.0
K	181	422	241	2.3
L	7	36	29	5.1

*Flows in sub-basin F exclude upstream flows from sub-basins G and L.

**Flows in sub-basin G exclude upstream flows from sub-basin L.

As shown in Table 3, sub-basin G has the highest ratio of high/low flow, which signifies it has the worst I&I problems of the seven sub-basins. Also, a strong correlation between precipitation and flow is evident at Site G (Chart 2). The estimated I&I flow amounts will vary based on the size of storm events. For this study, the highest recorded 24-hour precipitation amount was 0.25 inches. DEQ requires a 5-year storm event (3.5 inches in 24-hours) to be considered for design purposes. It is likely that the high/low flow ratios could change for larger storm events.

CHART 2 – Site G Flow & Precipitation vs. Time



Flow data for each of the seven sites have been graphed (see Appendix D) with corresponding precipitation data. The rapid response between precipitation events for a short period of time and increased flows at sites E, G, and I suggest possible stormwater inflow to the sanitary sewer collection system. Some old parts of town make up a portion of sub-basin G. Sub-basin G has approximately 11,000 feet of clay pipe, 13,000 feet of concrete pipe, and 3,700 feet of PVC pipe. Approximately 20% of all the main line pipes in sub-basin G were installed prior to 1950.

Keller Associates recommends that additional flow monitoring and CCTV work be completed within sub-basin G and that rehabilitation efforts be focused in this area.

Cost-Benefit Analysis

Planning level costs to repair several sources of inflow into the sanitary sewer collection system, and the potential reduction of flow, have been estimated. The rational method was used to calculate the approximate rate of inflow for roofs and catch basins cross-connected with the sanitary sewer collection system. The City should notify property owners that have roof drains connected to the sanitary sewer system and require them to disconnect their stormwater piping from the public sanitary sewer system. There should be minimal cost for the City to require property owners to disconnect their storm piping from the City's sanitary sewer collection system. In addition, broken sanitary sewer laterals should be repaired by the property owner, as required by City Municipal Code Section 14.09.020.

Catch basins that are potentially cross-connected with the sanitary sewer system should be disconnected. In some cases, cross-connections could be through the substrate where leaky pipe joints exist in both the storm and sanitary systems. If the City desires, potential cross-connections could be further verified via tracer dye tests prior to making improvements. Estimated costs to remove some of the inflow sources found by smoke testing are listed in Table 4. According to City field staff, areas with a potential cross-connection have an existing storm main is in close proximity to which a connection can be made. Surveying and design costs are included in the estimated improvement costs.

Table 4 – Cross Connection Inflow Rates from 5-year Storm and Estimated Improvement Cost

Inflow Location	Type of Inflow	Area of Inflow (Ac.)	Runoff Coefficient (C.)	Rainfall Intensity (i)	Inflow Q (cfs)	Inflow (gpm)	Estimated Improvement City Cost	Cost per GPM
645 Glenwood Dr.	Catch Basin	0.10	0.6	1.7	0.11	47	$10,000	$210
570 Weller Ln.	Roof	0.05	0.9	2.2	0.09	41	$300	$7
NE Corner of Euclid Ave. & Pracht St.	Catch Basin	0.07	0.6	1.7	0.07	32	$10,000	$310
125 Sherman St.	Roof	0.02	0.9	2.2	0.05	20	$300	$15
162 Harrison St.	Sump Pump	-	-	-	-	45	$300	$7
Morton St. & Iowa St. Intersection	PRV Manhole Drain	-	-	-	-	10	$5,000	$500

Keller Associates also looked at the cost of conveying and treating water. Assuming an I&I flow of 1 gpm during six months out of the year, the 10-year cost to convey and treat I&I is approximately $5,000. Using this rule of thumb, if a repair can eliminate 1 gpm of I&I (average winter flows) for less than $5,000, it is generally worth the investment. However, the City should consider that eliminating infiltration at one location may result in higher groundwater levels and increased infiltration at other levels. Because of this the City may want to focus efforts on improvements that have the lowest cost per gpm of reduced flow.

Conclusions/Recommendations

Overall, Keller Associates was able to identify some areas of modest infiltration and some sources of inflow, but no large sources of I&I that would account for the majority of flow increases observed at the WWTP following large storm events. One of the challenges with this study was that there were no large storm events during the continuous flow monitoring and night-time monitoring periods. Extensive monitoring and field observations during future large events will be some of the most effective activities in identifying and eliminating sources of stormwater inflow. The City should continue to monitor, identify, and eliminate sources of direct inflow.

Infiltration of groundwater into the sanitary sewer collection system is difficult to pinpoint without information collected by CCTV or night-time field investigations. The City should perform additional flow monitoring, night-time field investigations (during storm events), and CCTV work in sub-basin G to further prioritize rehabilitation efforts. Regular flow monitoring at Site G beginning now and continuing into the future (post-improvements) could help quantify the benefits resulting from improvement activities. In addition, flow monitoring should be performed in the future at other recommended sites (refer to Figure 3 in Appendix D) to identify other potential problem areas.

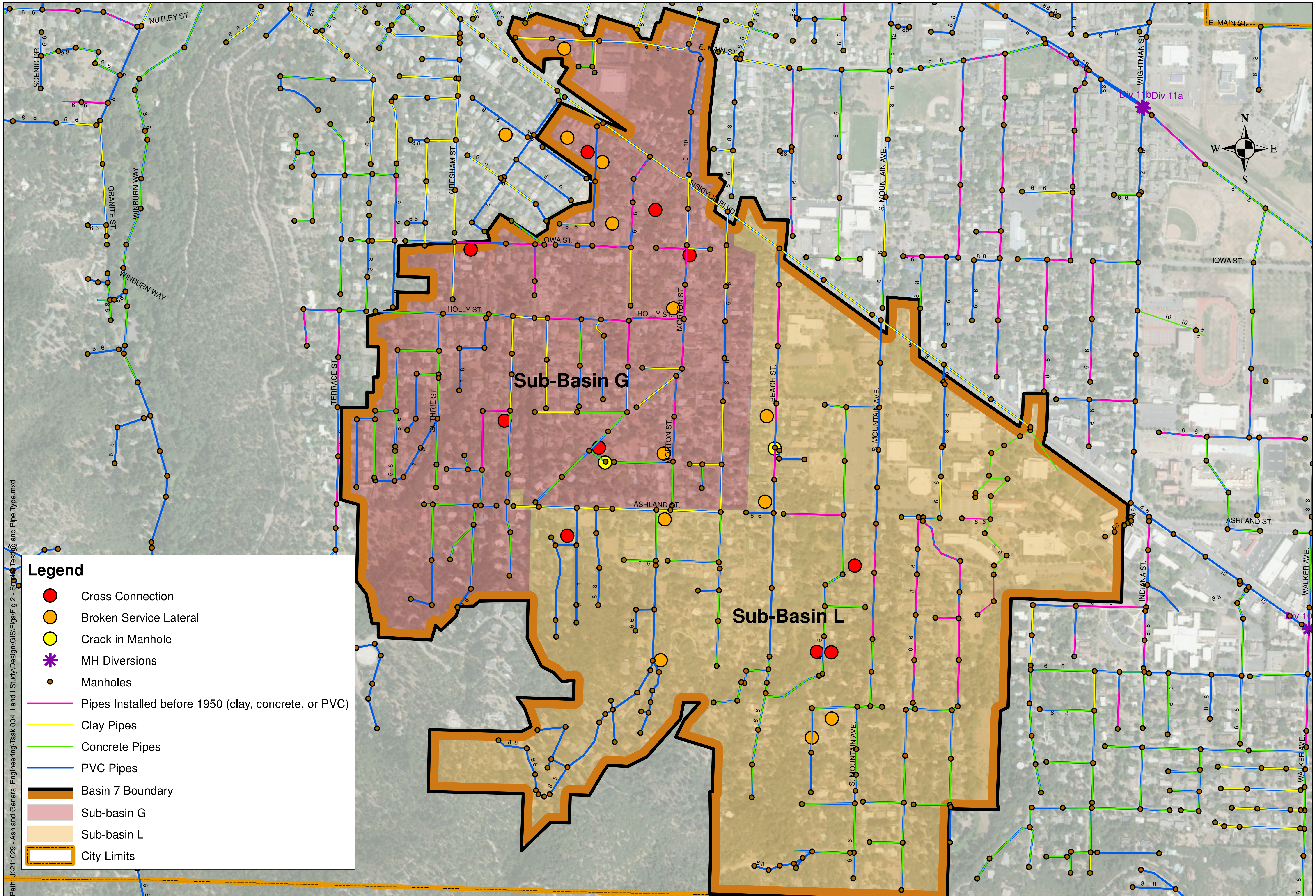
Under most circumstances, the cost to remove direct sources of inflow is usually worth the investment. For sources of infiltration, Keller Associates recommends the City focus on improvements that cost less than $1,000 per gpm of reduction in infiltration (correspond to a 2-year payback).

Based on available data, rehabilitation efforts should focus on correcting the sources of inflow identified by smoke testing and rehabilitation of older, leaky pipelines in sub-basin G.

Summary of recommendations:

- *Perform night-time field investigations in sub-basin G between 2 am and 5 am during or immediately after a rainfall event that accumulates 0.5 inches within a 48-hr time period.*
- *Carry out CCTV work in sub-basin G in December/January when groundwater levels are highest after large storm events.*
- *Perform regular flow monitoring at Site G beginning now and continuing into the future (post-improvements).*
- *Perform flow monitoring in December/January as well as July/August at recommended sites illustrated in Figure 3 in Appendix D.*
- *Complete improvements that cost less than $1,000 per gpm of reduction in infiltration.*

Appendix A – Smoke Testing Problem Areas



KELLER associates

Prepared for:

CITY of ASHLAND, OREGON

Title:

SMOKE TESTING AREA AND PIPE TYPE

INFILTRATION AND INFLOW STUDY

Figure:

1

SOU Campus between MH 10CC-024 and 10CC-023: No smoke traveling between manholes, pipeline could be clogged

Vacant lot west of 759 Prospect Street: Service lateral stub smoking from ground

1047 Wildwood Way: Smoke emitting from under back patio staircase

671 Mountain Avenue: Stones used in place of cleanout cap

580 Mountain Avenue: Stone used in place of cleanout cap

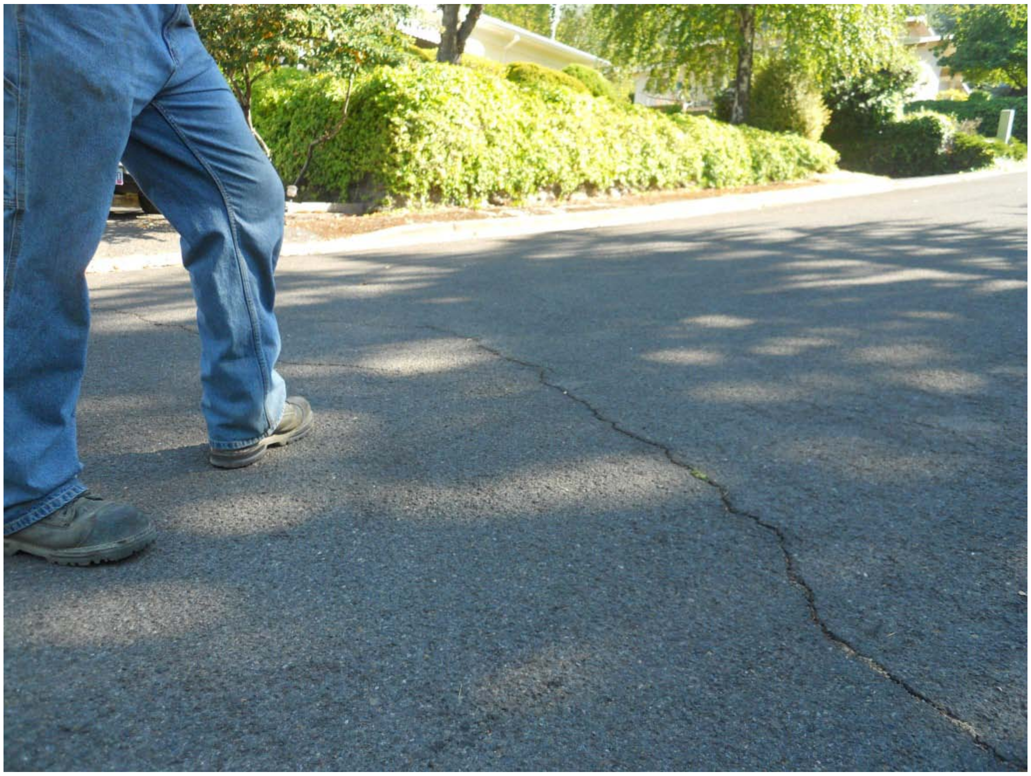
954 Siskiyou Boulevard: Smoke emitting from crawl space/basement vents

1038 Henry Street: Cleanout cap missing

602 Glenwood Drive: Smoke emitting from 3” drain pipe in front yard

1090 Pleasant Way: Smoke emitting from beneath new front yard staircase

Catch basin in front of 645 Glenwood Drive: Smoke emitting from catch basin



Crack in Glenwood Drive in front of 645 Glenwood Drive: Smoke emitting from pavement crack

804 Beach Street: Smoke emitting from old sanitary sewer pipe lateral without cap

Between MH 16AA-040 and 16AA-009: Very little smoke passing through this stretch of sewer main, pipeline may be clogged

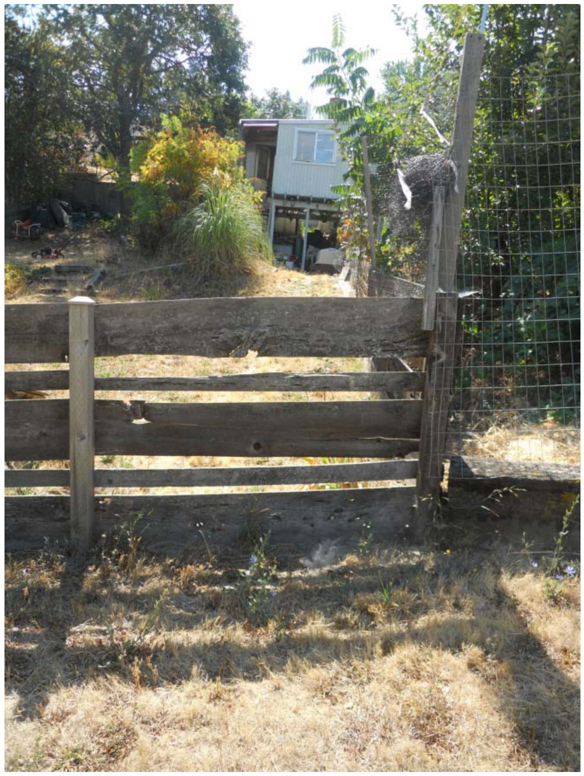
501 Beach Street: Smoke seeping from ground around cleanout near downspout splash block

MH 09DD-005: Smoke seeping from crack in sidewalk and along edges of sidewalk near manhole

429 Beach Street: Smoke emitting from crack in curb and gutter

801 Clarence Way Driveway: Smoke emitting from cleanout missing cleanout cap

570 Weller Lane: Smoke emitting from gutters and downspouts



542 Morton Street: Smoke seeping from ground near fence

354 Liberty Street: Smoke emitting from cleanout with missing cap

354 Liberty Street: Smoke emitting from cleanout with missing cap

328 Liberty Street: Smoke emitting from unscrewed cleanout cap

715 Pracht Street: Smoke emitting from cleanout missing cap

449 Morton Street: Smoke emitting from crack in driveway from tree roots

Smoke emitting from water PRV manhole located near Morton Street and Iowa Street Intersection

SE of Euclid Avenue and Pracht Street intersection: Smoke emitting from around the cleanout collar

NE corner of Euclid Avenue and Pracht Street: Smoke emitting from catch basin

411 Euclid Avenue: Smoke emitting from crack in backyard concrete patio

SW corner of Holly and Harrison: Smoke pouring out of broken cleanout cap

453 Taylor Street: Smoke emitting from 1” PVC pipe near foundation

495 Jennifer Street: Laundry residue appears to be coming out of curb weep hole, clothes dryer could be connected to storm drain

SE corner of Iowa Street and Gresham Street: Smoke emitting from abandoned storm pipe

162 Harrison Street: Crawl space/basement sump pump discharging into sanitary sewer cleanout

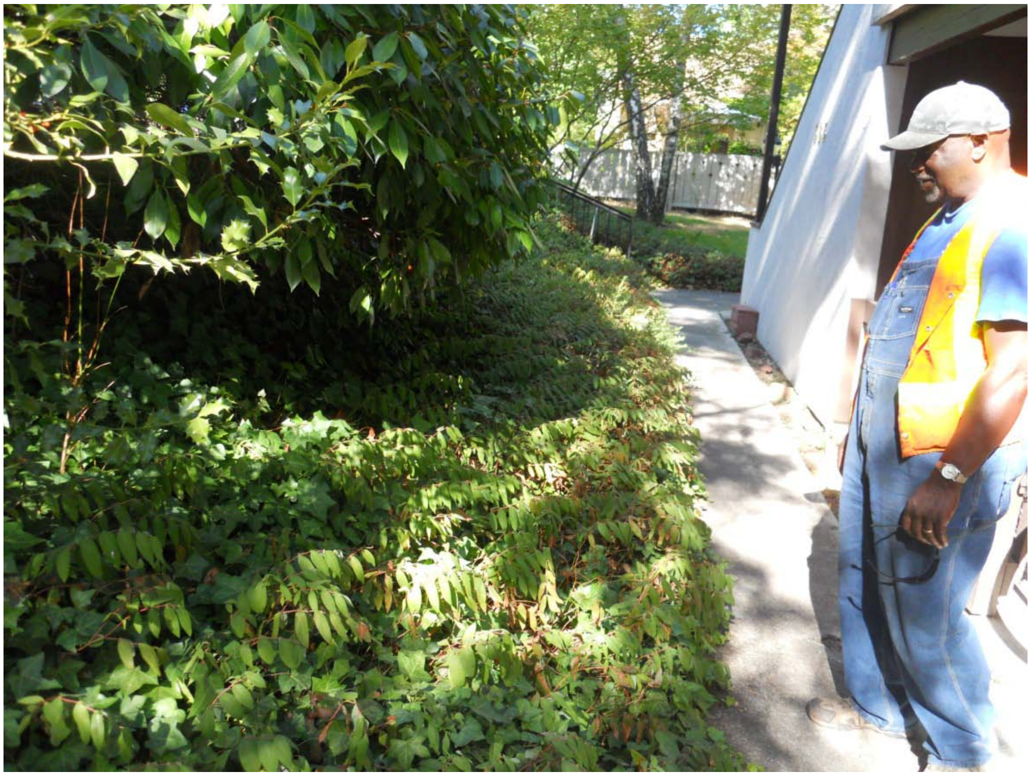
199 Sherman Street: Smoke emitting from ground near base of bush in front yard

125 Sherman Street: Smoking emitting from front yard downspout

125 Sherman Street: Smoke emitting from around new concrete

582 Allison Street: Smoke emitting from broken cleanout cap

550 Allison Street: Smoke emitting from broken curb near abandoned sewer lateral



565 Allison Street, Unit 3: Smoke emitting from ground in ferns

549 E. Main Street: Smoke emitting from crawl space/basement vent

550 E. Main Street: Smoke seeping from ground around cleanout

140 7th Street: Smoke emitting from broken cleanout cap

Southern most end of SOU: Smoke emitting from missing cleanout cap

NW corner of Central Hall of SOU Campus: Smoke emitting from broken cleanout cap

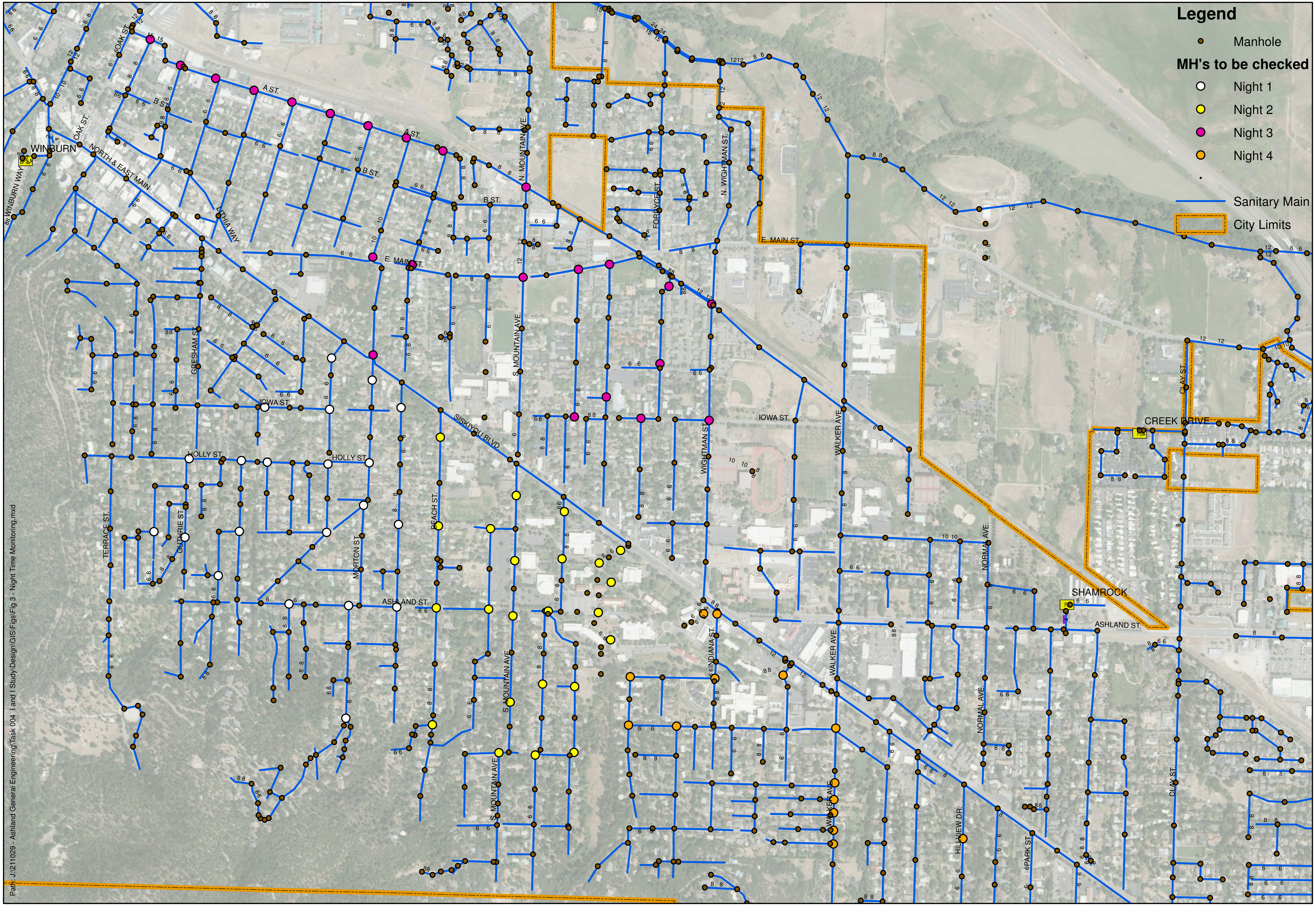
Upstream of MH 10CC-025 on SOU Campus: Smoke emitting from broken cleanout cap

980 Morton St: Smoke emitting from broken cleanout cap

898 Morton St: Smoke emitting from missing cleanout cap

748 Lisa Ln: Smoke emitting from broken service lateral

Appendix B – Night-Time Field Investigations



KELLER associates

Prepared for:

CITY of ASHLAND, OREGON

INFILTRATION AND INFLOW STUDY

Title:

NIGHT TIME MONITORING

Figure:

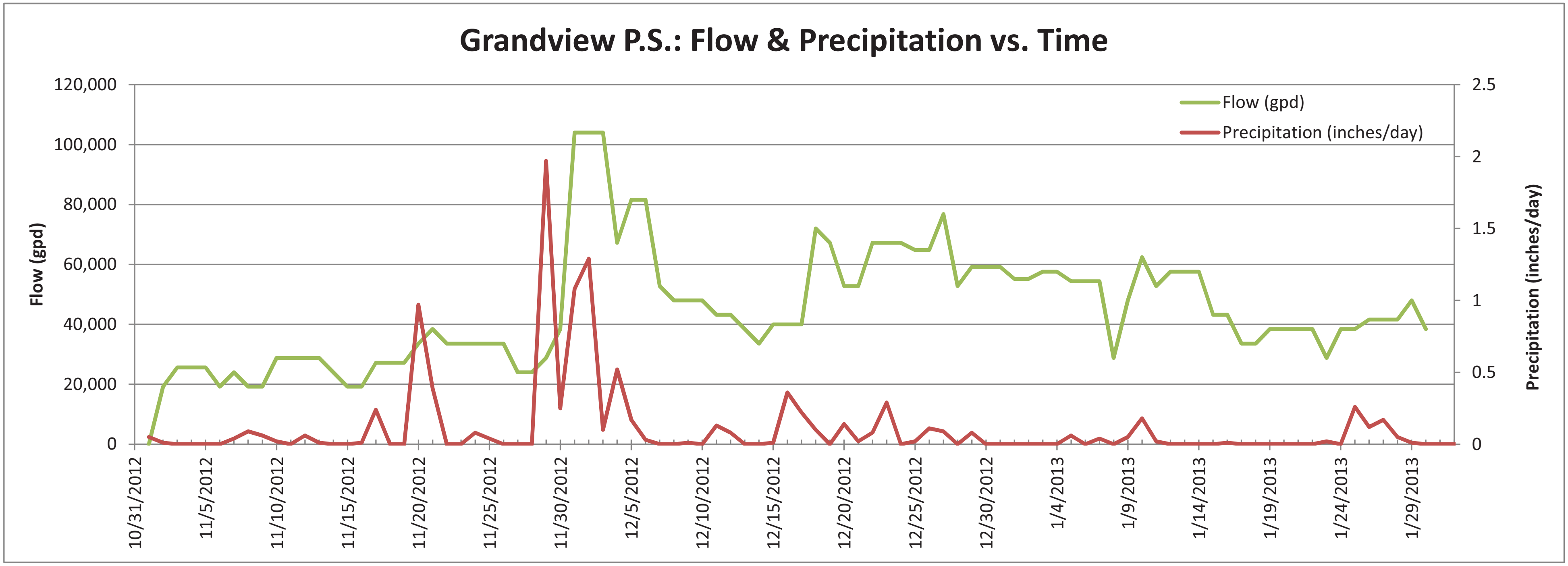
2

Night Time Monitoring Log

City: ________________ Date: ______________

Time	MH #	Upstream MH #	Flow Depth (in.)	Flow Velocity (ft/sec)	Pipe Size (in.)	Comments

Appendix C – Pump Station Flow Charts



Grandview P.S.: Flow & Precipitation vs. Time
Flow (gpd)
Precipitation (inches/day)
120,000
100,000
80,000
60,000
40,000
20,000
0
2.5
2
1.5
1
0.5
0
Flow (gpd)
Precipitation (inches/day)
10/31/2012
11/5/2012
11/10/2012
11/15/2012
11/20/2012
11/25/2012
11/30/2012
12/5/2012
12/10/2012
12/15/2012
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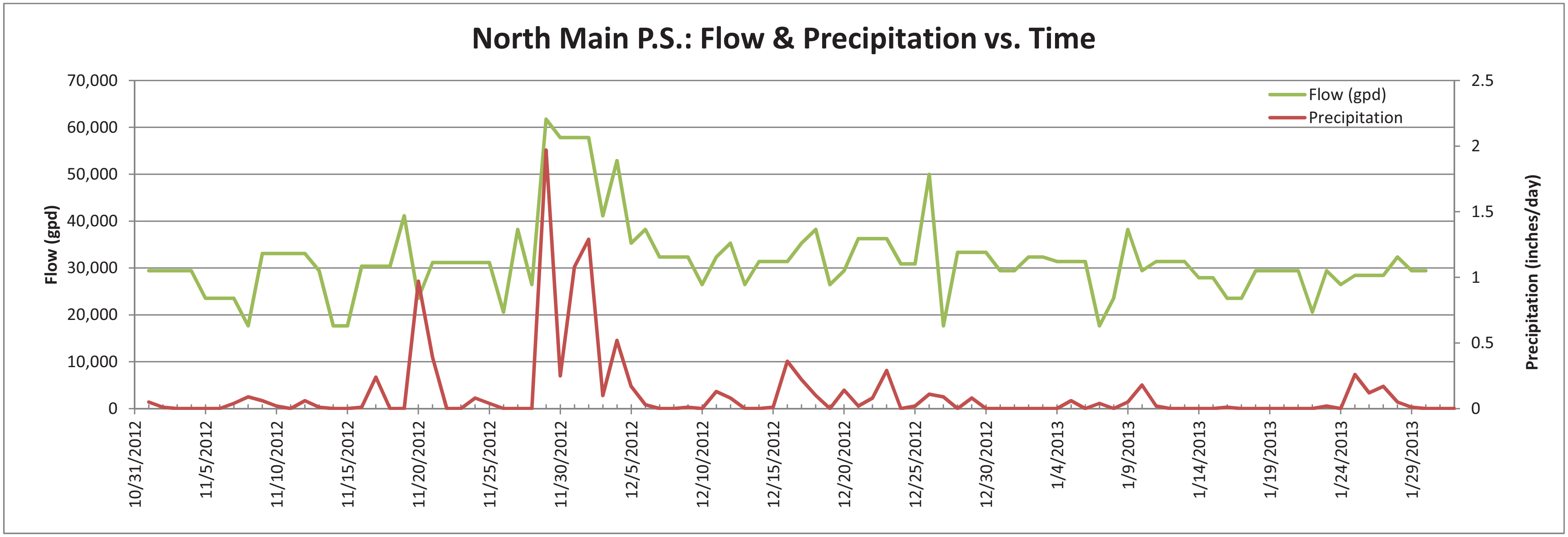
1/24/2013
1/29/2013


North Main P.S.: Flow & Precipitation vs. Time
Flow (gpd)
Precipitation (inches/day)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2.5
2
1.5
1
0.5
0
Flow (gpd)
Precipitation
10/31/2012
11/5/2012
11/10/2012
11/15/2012
11/20/2012
11/25/2012
11/30/2012
12/5/2012
12/10/2012
12/15/2012
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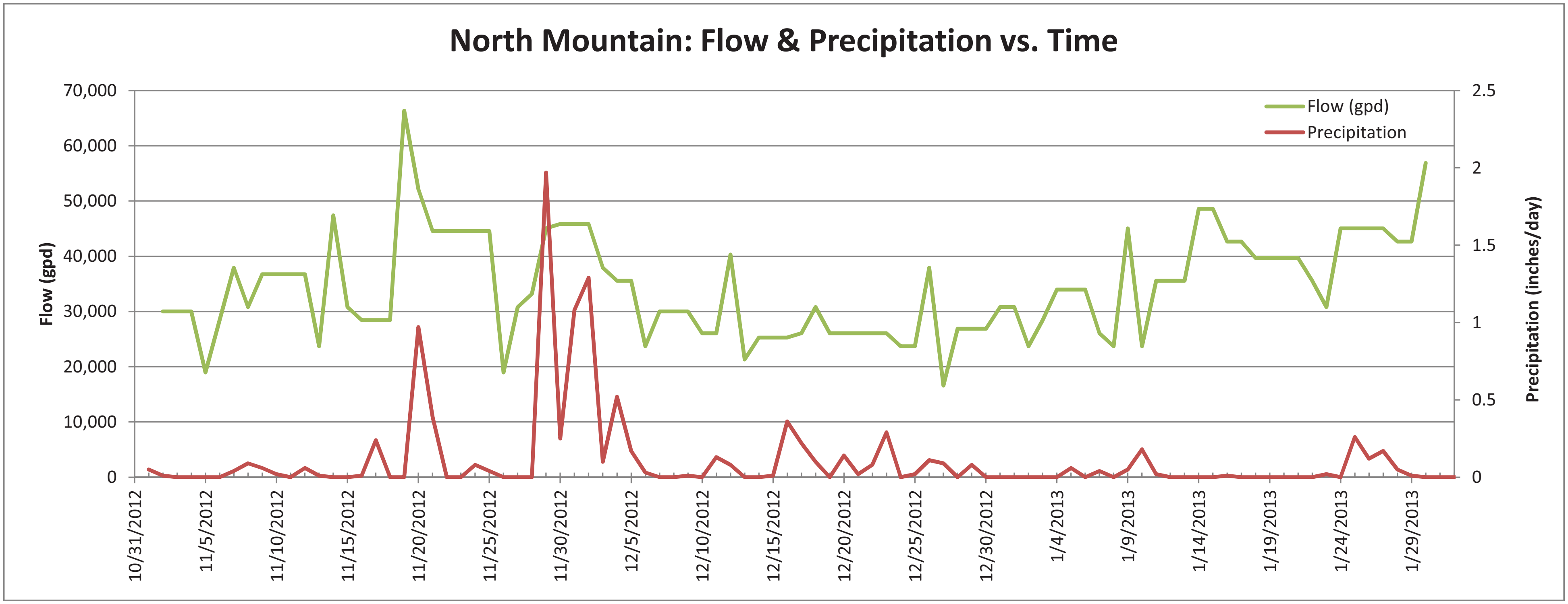
1/19/2013
1/24/2013
1/29/2013



North Mountain: Flow & Precipitation vs. Time
Flow (gpd)
Precipitation
Precipitation (inches/day)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2.5
2
1.5
1
0.5
0
10/31/2012
11/5/2012
11/10/2012
11/15/2012
11/20/2012
11/25/2012
11/30/2012
12/5/2012
12/10/2012
12/15/2012
12/20/2012
12/25/2012
12/30/2012
1/4/2013
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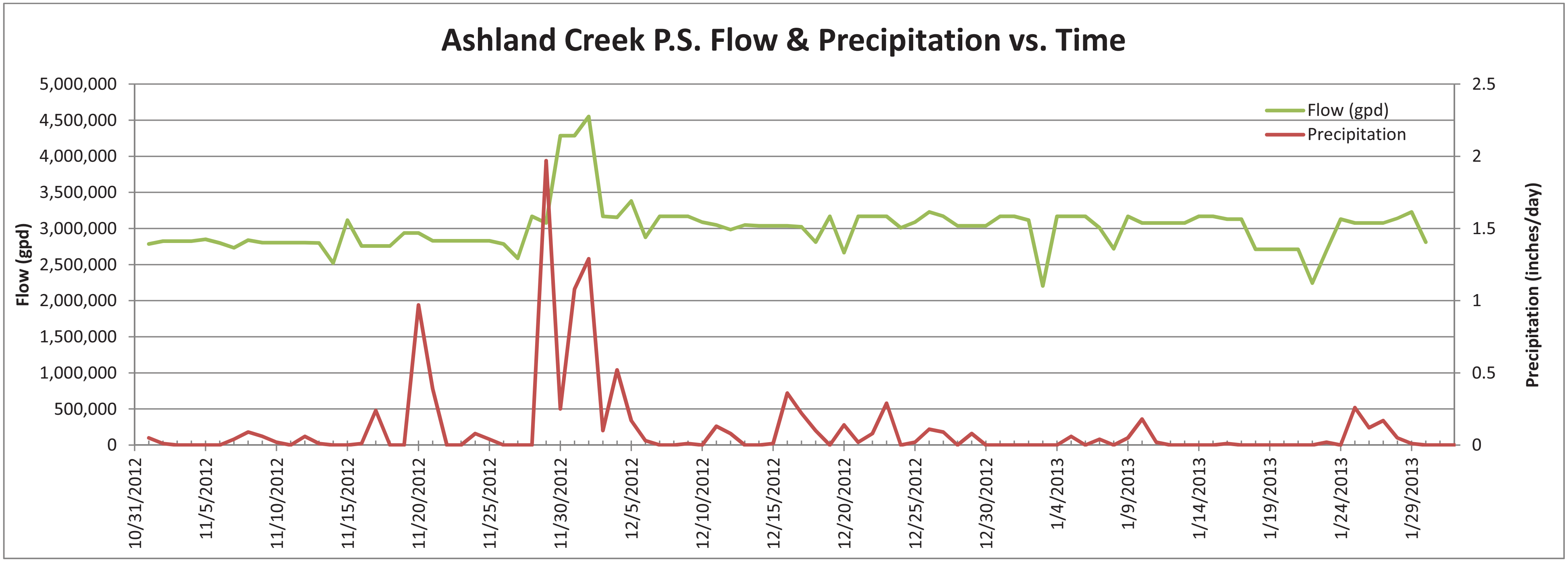
1/14/2013
1/19/2013
1/24/2013
1/29/2013



Ashland Creek P.S. Flow & Precipitation vs. Time
Flow (gpd)
Precipitation (inches/day)
Flow (gpd)
Precipitation
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
2.5
2
1.5
1
0.5
0
10/31/2012
11/5/2012
11/10/2012
11/15/2012
11/20/2012
11/25/2012
11/30/2012
12/5/2012
12/10/2012
12/15/2012
12/20/2012
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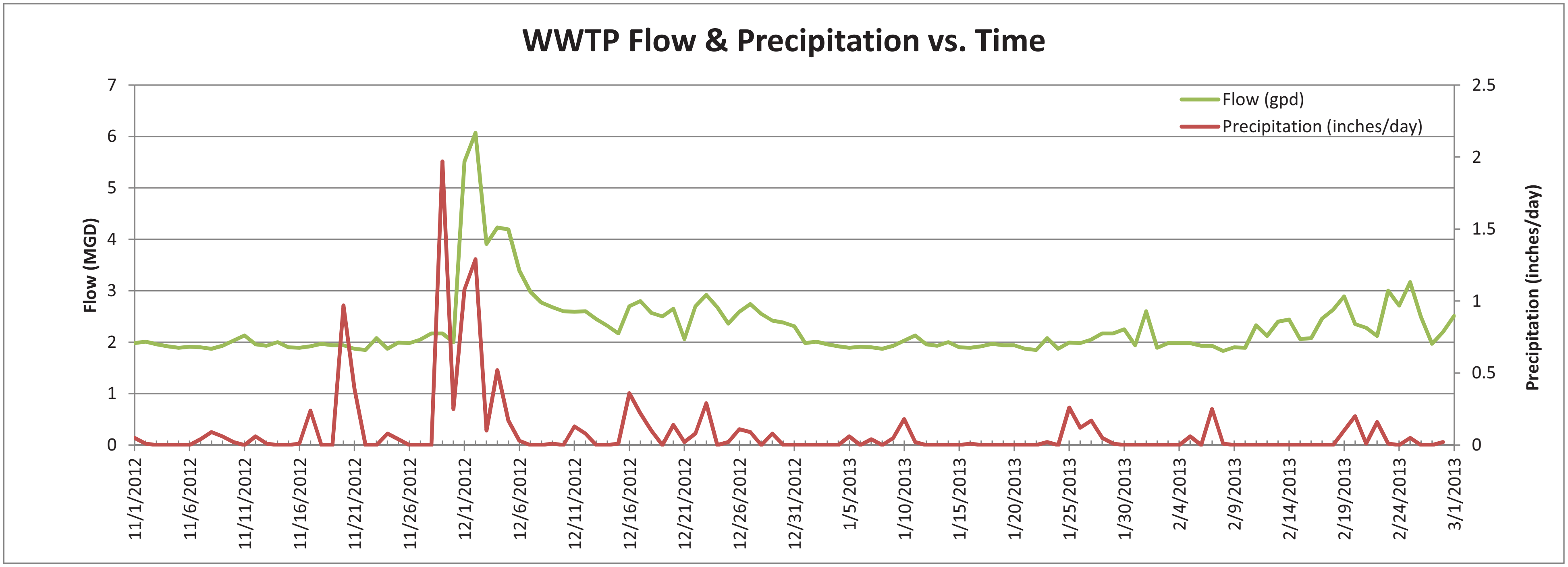
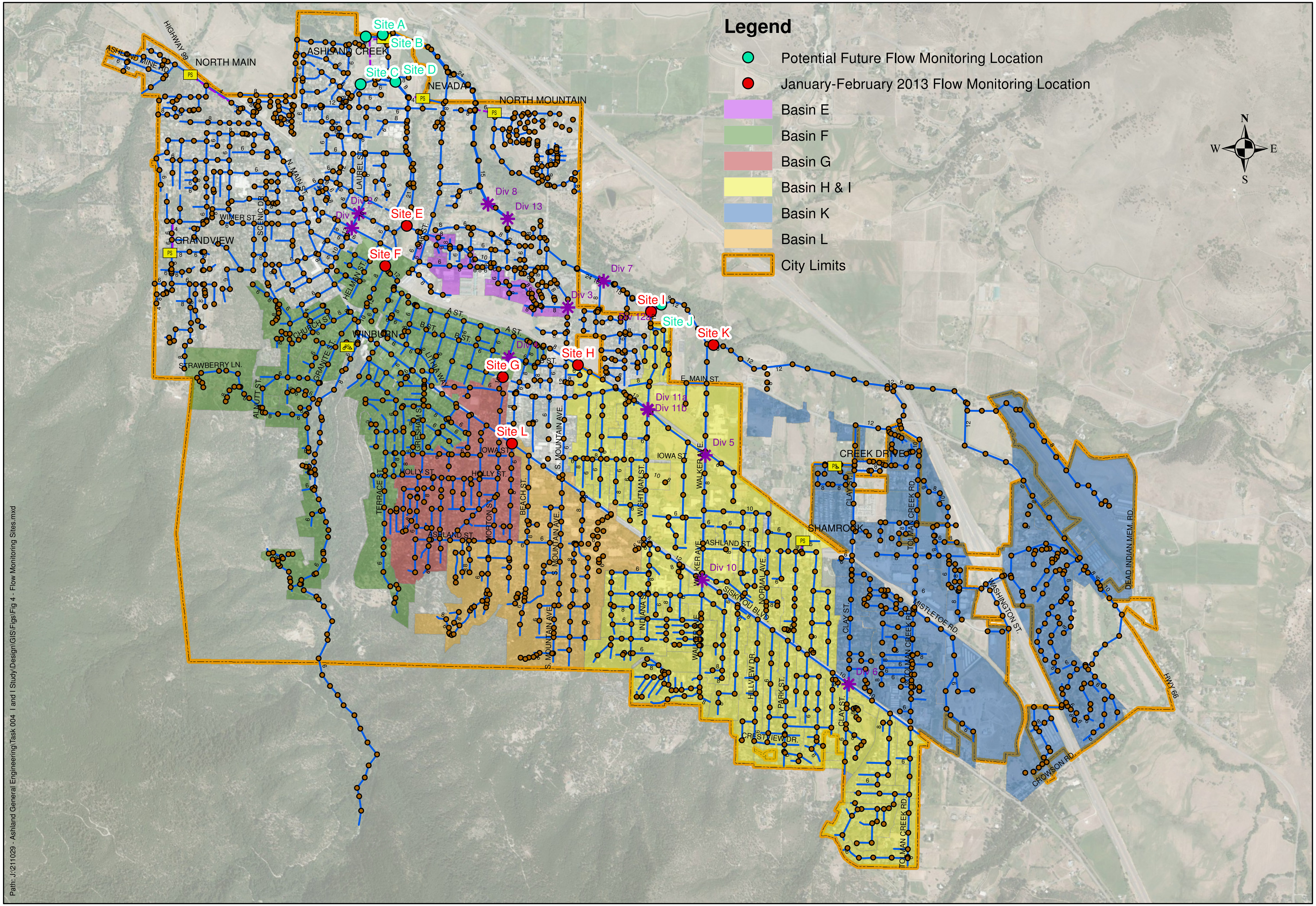
12/30/2012
1/4/2013
1/9/2013
1/14/2013
1/19/2013
1/24/2013
1/29/2013



WWTP Flow & Precipitation vs. Time
Flow (gpd)
Precipitation (inches/day)
Flow (MGD)
Precipitation (inches/day)
0
1
2
3
4
5
6
7
0
0.5
1
1.5
2
2.5
11/1/2012
11/6/2012
11/11/2012
11/16/2012
11/21/2012
11/26/2012
12/1/2012
12/6/2012
12/11/2012
12/16/2012
12/21/2012
12/26/2012
12/31/2012
1/5/2013
1/10/2013
1/15/2013
1/20/2013
1/25/2013
1/30/2013
2/4/2013
2/9/2013
2/14/2013
2/19/2013
2/24/2013
3/1/2013

Appendix D – Continuous Flow Monitoring



KELLER associates

Prepared for:

CITY of ASHLAND, OREGON

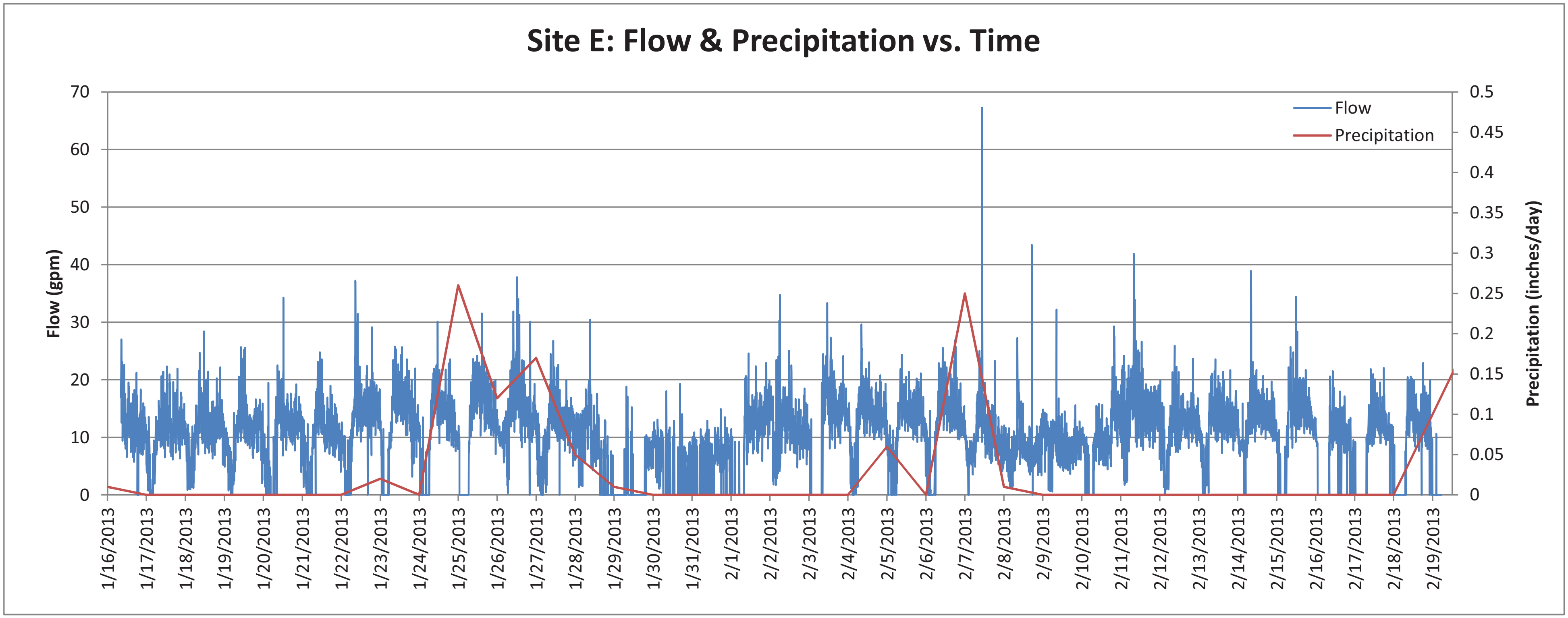
INFILTRATION AND INFLOW STUDY

Title:

FLOW MONITORING SITES

Figure:

3


Site E: Flow & Precipitation vs. Time
Flow (gpm)
Precipitation (inches/day)
Flow
Precipitation
0
10
20
30
40
50
60
70
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
1/16/2013
1/17/2013
1/18/2013
1/19/2013
1/20/2013
1/21/2013
1/22/2013
1/23/2013
1/24/2013
1/25/2013
1/26/2013
1/27/2013
1/28/2013
1/29/2013
1/30/2013
1/31/2013
2/1/2013
2/2/2013
2/3/2013
2/4/2013
2/5/2013
2/6/2013
2/7/2013
2/8/2013
2/9/2013
2/10/2013
2/11/2013
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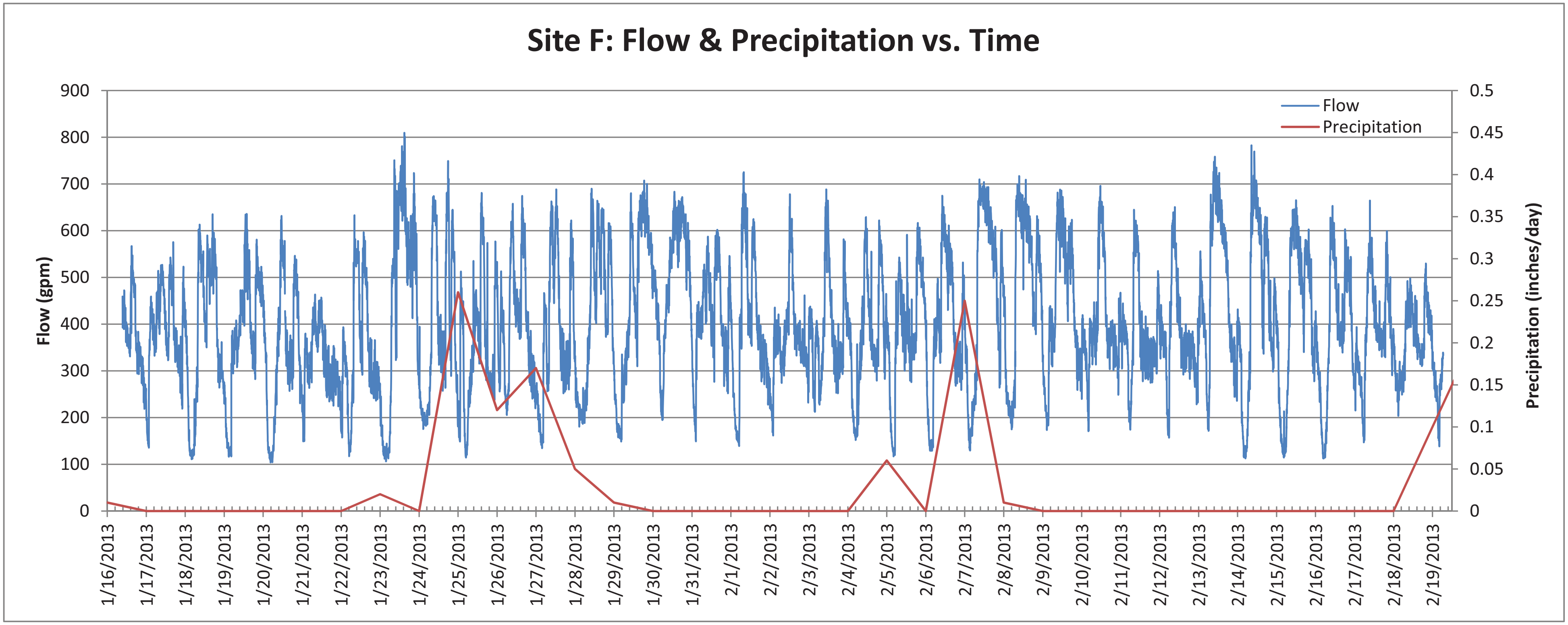
2/16/2013
2/17/2013
2/18/2013
2/19/2013


Site F: Flow & Precipitation vs. Time
Flow (gpm)
Precipitation (inches/day)
Flow
Precipitation
900
800
700
600
500
400
300
200
100
0
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1/16/2013
1/17/2013
1/18/2013
1/19/2013
1/20/2013
1/21/2013
1/22/2013
1/23/2013
1/24/2013
1/25/2013
1/26/2013
1/27/2013
1/28/2013
1/29/2013
1/30/2013
1/31/2013
2/1/2013
2/2/2013
2/3/2013
2/4/2013
2/5/2013
2/6/2013
2/7/2013
2/8/2013
2/9/2013
2/10/2013
2/11/2013
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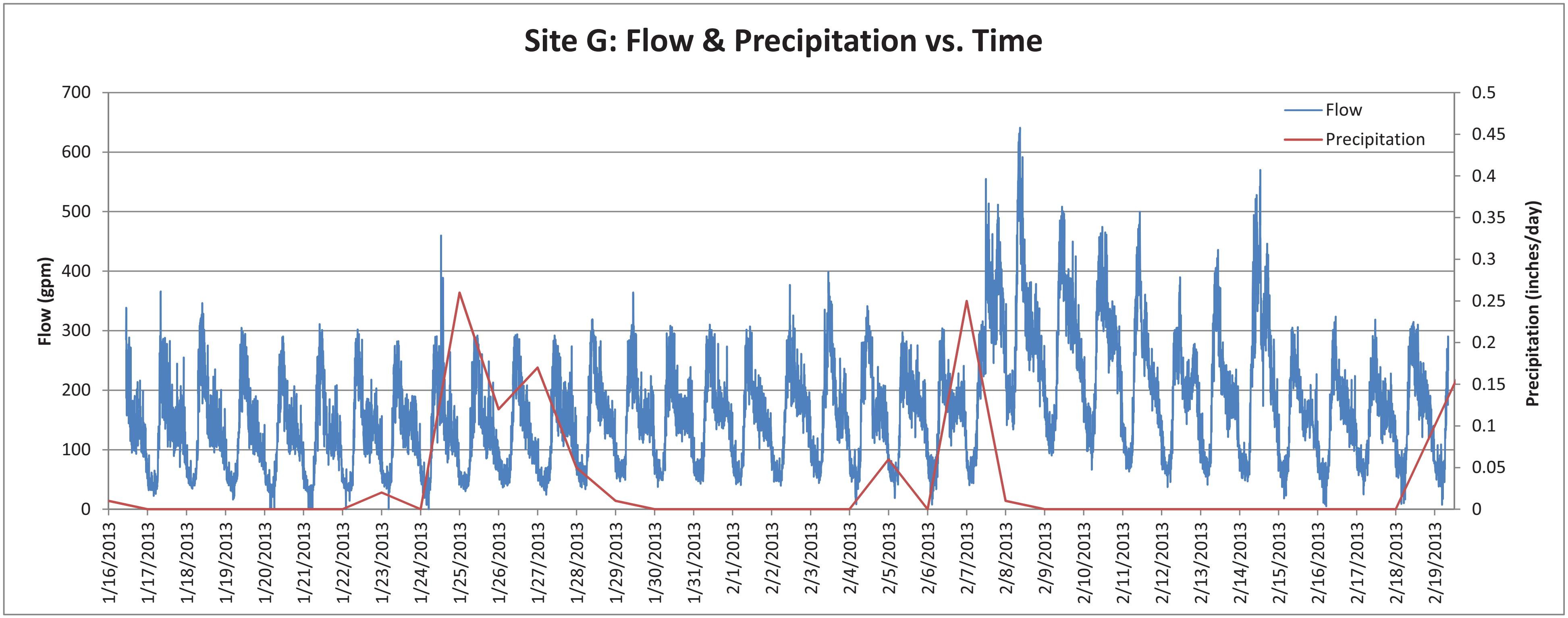
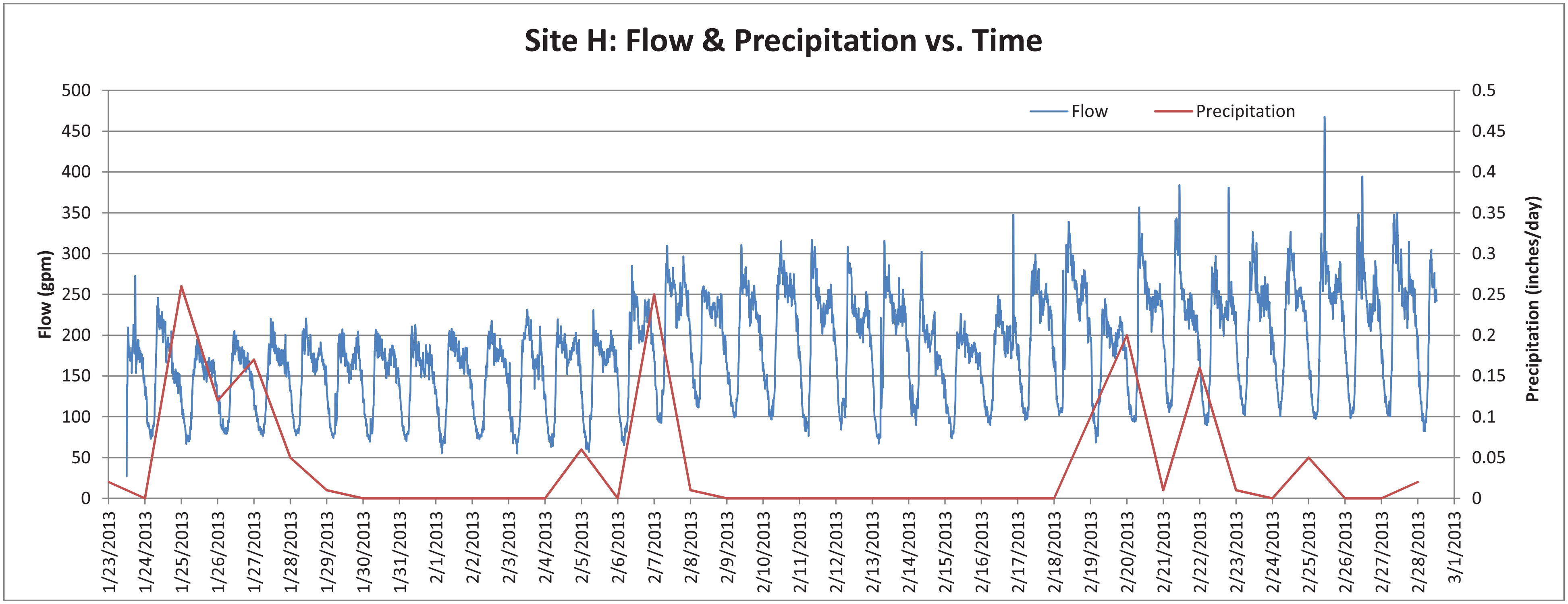
2/16/2013
2/17/2013
2/18/2013
2/19/2013



Site G: Flow & Precipitation vs. Time
Flow (gpm)
Precipitation (inches/day)
Flow
Precipitation
700
600
500
400
300
200
100
0
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1/16/2013
1/17/2013
1/18/2013
1/19/2013
1/20/2013
1/21/2013
1/22/2013
1/23/2013
1/24/2013
1/25/2013
1/26/2013
1/27/2013
1/28/2013
1/29/2013
1/30/2013
1/31/2013
2/1/2013
2/2/2013
2/3/2013
2/4/2013
2/5/2013
2/6/2013
2/7/2013
2/8/2013
2/9/2013
2/10/2013
2/11/2013
2/12/2013
2/13/2013
2/14/2013
2/15/2013
2/16/2013
2/17/2013
2/18/2013
2/19/2013



Site H: Flow & Precipitation vs. Time
Flow
Precipitation
Flow (gpm)
Precipitation (inches/day)
500
450
400
350
300
250
200
150
100
50
0
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1/23/2013
1/24/2013
1/25/2013
1/26/2013
1/27/2013
1/28/2013
1/29/2013
1/30/2013
1/31/2013
2/1/2013
2/2/2013
2/3/2013
2/4/2013
2/5/2013
2/6/2013
2/7/2013
2/8/2013
2/9/2013
2/10/2013
2/11/2013
2/12/2013
2/13/2013
2/14/2013
2/15/2013
2/16/2013
2/17/2013
2/18/2013
2/19/2013
2/20/2013
2/21/2013
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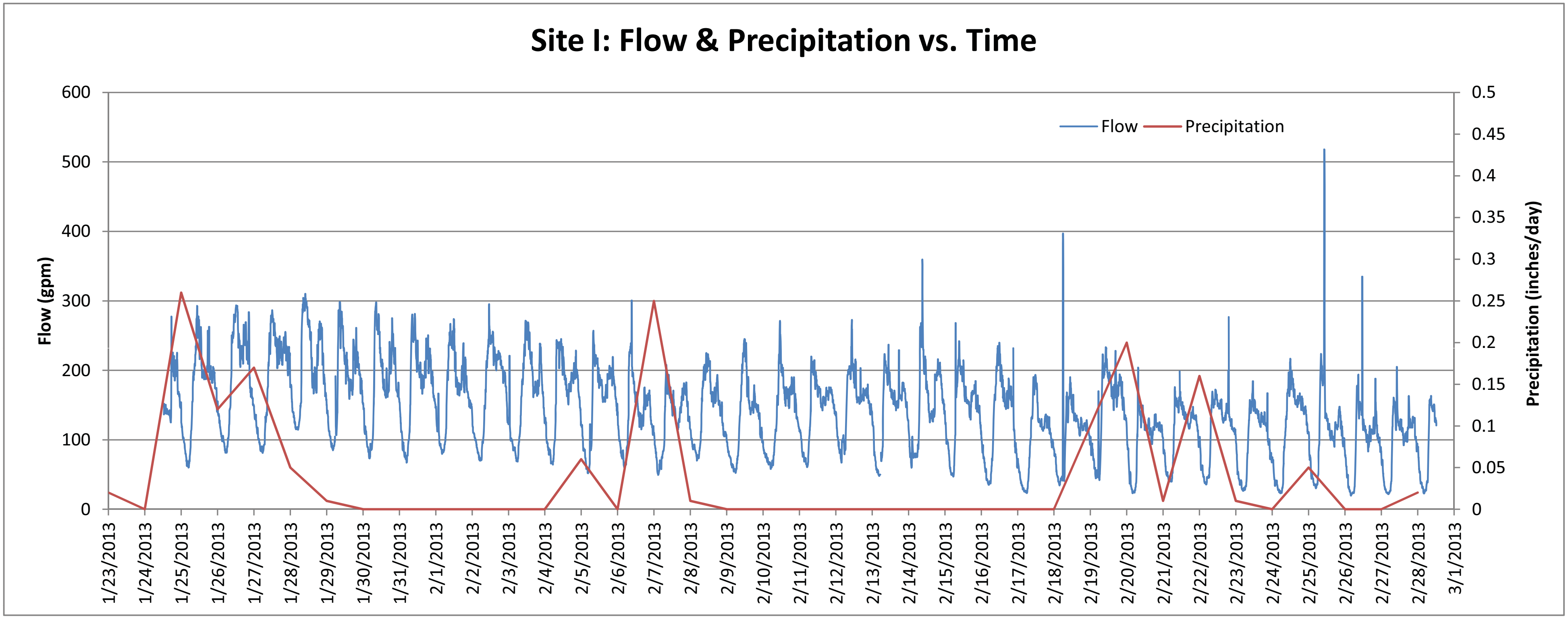
2/26/2013
2/27/2013
2/28/2013
3/1/2013


Site I: Flow & Precipitation vs. Time
Flow
Precipitation
Flow (gpm)
Precipitation (inches/day)
0
100
200
300
400
500
600
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
1/23/2013
1/24/2013
1/25/2013
1/26/2013
1/27/2013
1/28/2013
1/29/2013
1/30/2013
1/31/2013
2/1/2013
2/2/2013
2/3/2013
2/4/2013
2/5/2013
2/6/2013
2/7/2013
2/8/2013
2/9/2013
2/10/2013
2/11/2013
2/12/2013
2/13/2013
2/14/2013
2/15/2013
2/16/2013
2/17/2013
2/18/2013
2/19/2013
2/20/2013
2/21/2013
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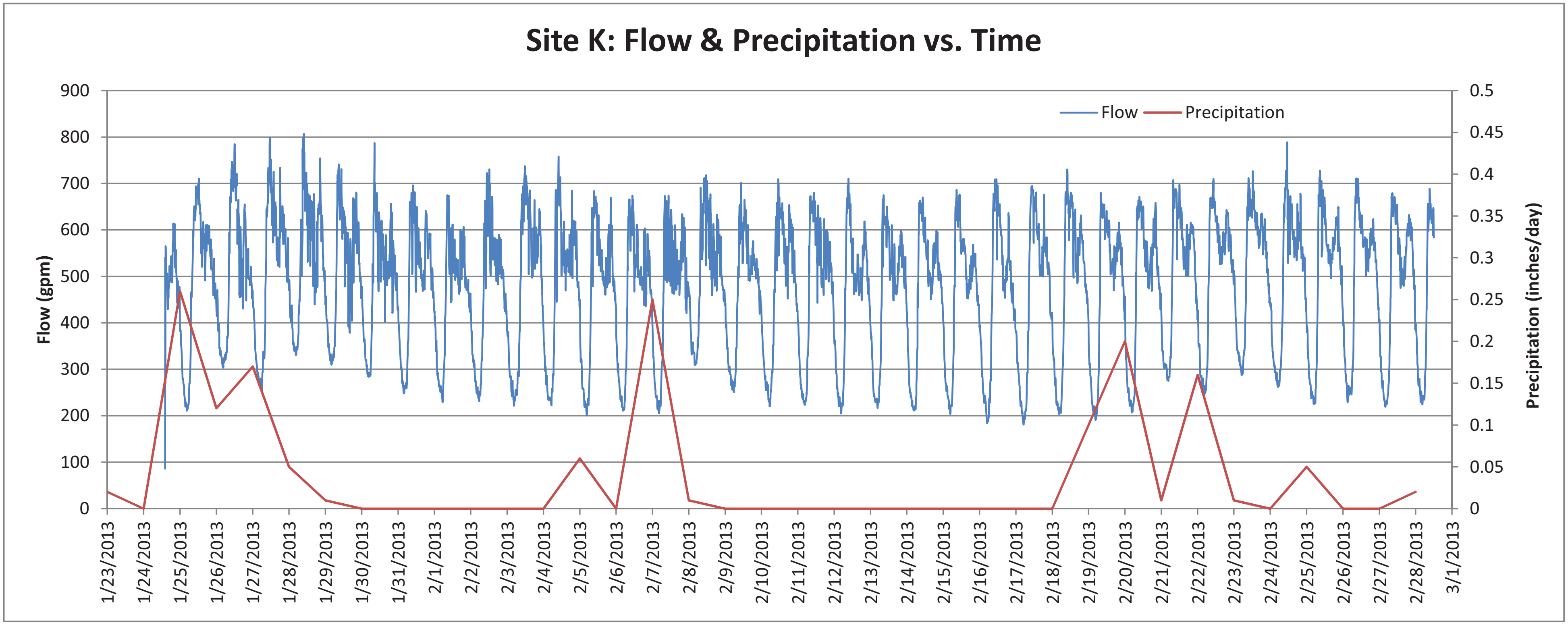
2/27/2013
2/28/2013
3/1/2013



Site K: Flow & Precipitation vs. Time
Flow
Precipitation
Flow (gpm)
Precipitation (inches/day)
900
800
700
600
500
400
300
200
100
0
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1/23/2013
1/24/2013
1/25/2013
1/26/2013
1/27/2013
1/28/2013
1/29/2013
1/30/2013
1/31/2013
2/1/2013
2/2/2013
2/3/2013
2/4/2013
2/5/2013
2/6/2013
2/7/2013
2/8/2013
2/9/2013
2/10/2013
2/11/2013
2/12/2013
2/13/2013
2/14/2013
2/15/2013
2/16/2013
2/17/2013
2/18/2013
2/19/2013
2/20/2013
2/21/2013
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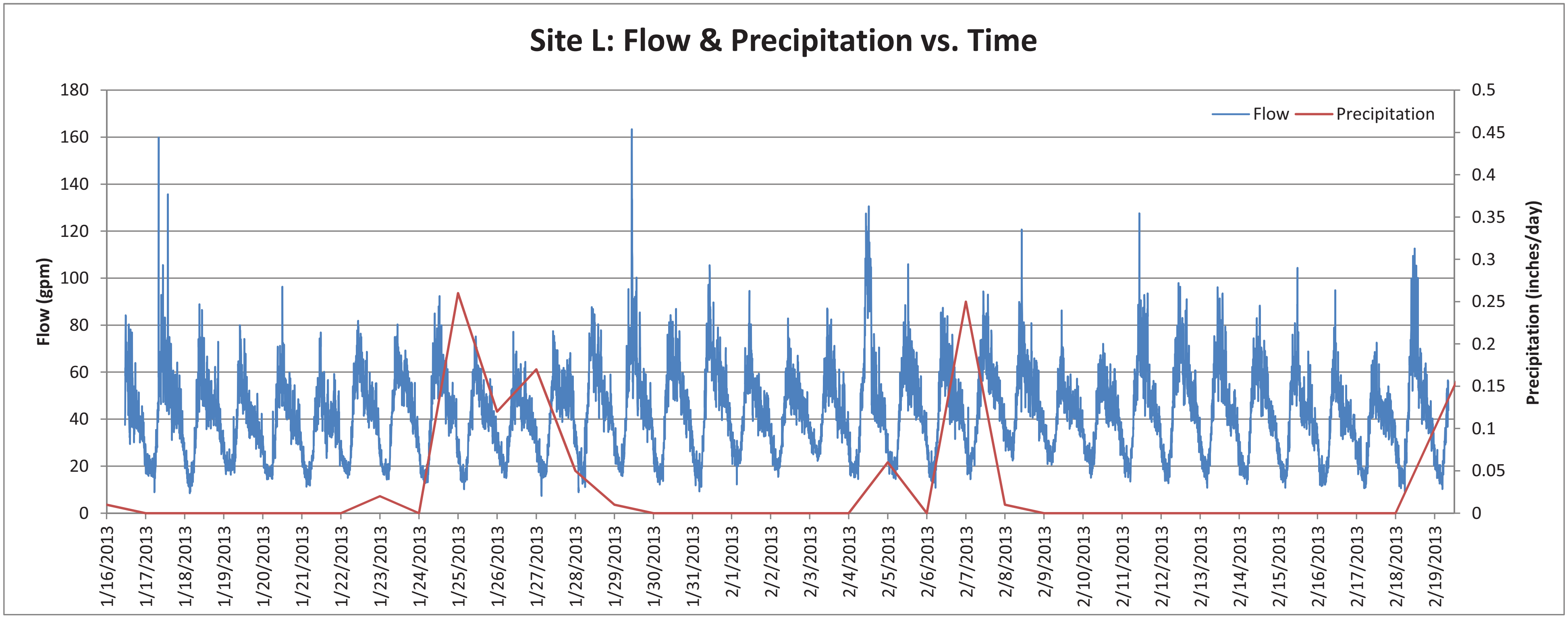
2/26/2013
2/27/2013
2/28/2013
3/1/2013



Site L: Flow & Precipitation vs. Time
Flow
Precipitation
Flow (gpm)
Precipitation (inches/day)
180
160
140
120
100
80
60
40
20
0
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1/16/2013
1/17/2013
1/18/2013
1/19/2013
1/20/2013
1/21/2013
1/22/2013
1/23/2013
1/24/2013
1/25/2013
1/26/2013
1/27/2013
1/28/2013
1/29/2013
1/30/2013
1/31/2013
2/1/2013
2/2/2013
2/3/2013
2/4/2013
2/5/2013
2/6/2013
2/7/2013
2/8/2013
2/9/2013
2/10/2013
2/11/2013
2/12/2013
2/13/2013
2/14/2013
2/15/2013
2/16/2013
2/17/2013
2/18/2013
2/19/2013

Design Flow Calculations from 2012 Comprehensive Sanitary Sewer Master Plan

CURRENT DESIGN FLOWS

In calculating current design flows, Keller Associates used the Oregon DEQ method described in "Guidelines for Making Wet-Weather and Peak Flow Projections for Sewage Treatment in Western Oregon MMDWF, MMWWF, PDAF, and PDIF." Design Flows were calculated from daily total WWTP flows and precipitation from 2005-2009. Brief discussions on how this method was applied for each parameter are given below.

Average Dry-Weather Flow (ADWF)
ADWF is the average daily flow for the period of May – October. An ADWF was calculated for each year of data and the year 2007 result selected as the design flow to coincide with other design points selected for reasons discussed below in the MMDWF subsection.

Max Month Dry-Weather Flow (MMDWF10)
Oregon DEQ outlines that May is typically the max month for the dry-weather period of May – October. The DEQ method for calculating MMDWF is to graph the Jan-May average daily flows of the most recent year against total precipitation for the month. A trend line is fitted to the data and then MMDWF read from the trend line at a precipitation equal to the May 90% precipitation probability value (3.16) published in "Climatology of the United States No. 20, 1971-2000" (CLIM20).

When graphs of the Jan-May values for each year of data were compared it was observed that the most recent year (2009) was the driest (lowest flows) and had the lowest correlation factor. Years 2007 and 2006 were the wettest (highest flows) and the year 2007 trend line was nearest the trend line of all data points 2005-2009 combined (see Figure C-1). Therefore, year 2007 was selected as the most representative year for the data available.

Average Wet-Weather Flow (AWWF)
Calculations for AWWF are not outlined by DEQ; however AWWF was calculated as the average daily flow for the period of January – April for each year of data. The year 2007 result was selected as design flow to coincide with other design points selected for reasons discussed above in the MMDWF subsection.

Max Month Wet-Weather Flow (MMWWF5)
Oregon DEQ outlines that January is typically the max month for the wet-weather period of January – April. The DEQ method for calculating MMWWF is to enter the graph of Jan-May average daily flows vs. monthly precipitation and read MMWWF from the trend line at a precipitation equal to the January 80% precipitation probability value (3.72) published in CLIM20 (see Figure C-2).

Peak Daily Average Flow (PDAF5)
Oregon DEQ outlines that the PDAF typically corresponds to the 5-year storm event and, therefore, is calculated as the flow resulting from a 5-year storm during a period of high groundwater (Jan-April). The DEQ method for determining PDAF is to plot daily plant

flow against daily precipitation for large storm events over several years only using data during wet-weather seasons when ground water is high. A trend line is fitted to the points and then PDAF read from the trend line at the 5-year, 24-hour storm event level. For the Ashland calculation, storm events were selected based on a precipitation greater than 0.50 inches and WWTP flow greater than 2.0 MGD for the period Jan-April, 2005-2009 (see Figure C-3 and Table C-1). Several "fringe" storm events (4 total) from late December and early May were included because these events were part of multiple days of wet weather and/or corresponded to high flow events at the plant (>4.0 MGD). The 5-year, 24-hour storm value for Ashland was selected from NOAA isopluvial maps for the state (Atlas 2, Volume X, Figure 26) and equaled 2.5 inches.

Peak Week Flow (PWkF)

Calculations for Peak Week Flow are not outlined by DEQ, however, are useful in some design calculations. A 7-day average flow was calculated for every day using the 7 previous days of data (rolling average). PWkF was then calculated as the max of all weekly (7-day) rolling averages. Except for 2005, the PWkF always occurred during the Wet Weather Season and, typically, in January. The year 2007 result was selected as the design flow to coincide with other design points selected for reasons discussed above in the MMDWF subsection.

Peak Instantaneous Flow (PIF)

Oregon DEQ allows several options in calculating PIF. The first is to examine flow charts recorded during high-flow days, preferably during a 5-year storm event if available, and select the peaking factor applied to the AWWF to calculate the PIF. The second option is extrapolation utilizing the other Design Flow values. This includes plotting Annual Average Daily Flow (AADF), PDAF, and MMWWF on a logarithmic probability graph, plotting a trend line, and reading the PIF off the trend line at the given probability of a PIF event (0.011%). Utilizing this method for Ashland results in a PIF = 11.0 MGD (see Figure C-4). This is a relatively high value when compared to recent flow data and was initially considered unrepresentative. Therefore, the first method of selecting a peaking factor from available hourly data was also utilized.

Hourly SCADA data for the plant was analyzed for selected dates in 2008 & 2009. The dates, flows, peaking factors, and precipitation are listed in Table 4.4 in the Wastewater Master Plan. The dates were selected based on days with a correlation between peak WWTP flow and peak precipitation events as observed from graphs of daily flow & precipitation data (see Figures C-5 through C-9). Hourly SCADA data was not available prior to September 2007.

Upon reviewing the data, it was observed that a Peak Instantaneous flow of at least 10 MGD was sustained on January 4, 2008. With this information, and considering that a 5-year storm event was not experienced within the available data, the extrapolated value of 10.5 MGD was determined plausible and accepted as the PIF. Select days of hourly data is included in Figures C-10 through C-14.

PROJECTED DESIGN FLOWS

The calculated current design flows were projected forward utilizing population numbers developed in the Ashland Comprehensive Plan. Specifically, for Average and Max Month parameters the current flow was divided by the current estimated 2010 population to derive a gallon per capita per day (gpcd). The gpcd was then multiplied by the projected population in each year to yield the projected design flow. For Peak Week, Peak Day, and Peak Hour a slightly lower gpcd was applied to growth beyond the calculated 2010 values. This accounts for newer, more water tight components of new installations, and reduction of I/I through continuing reduction efforts by the City.

Graph #1a

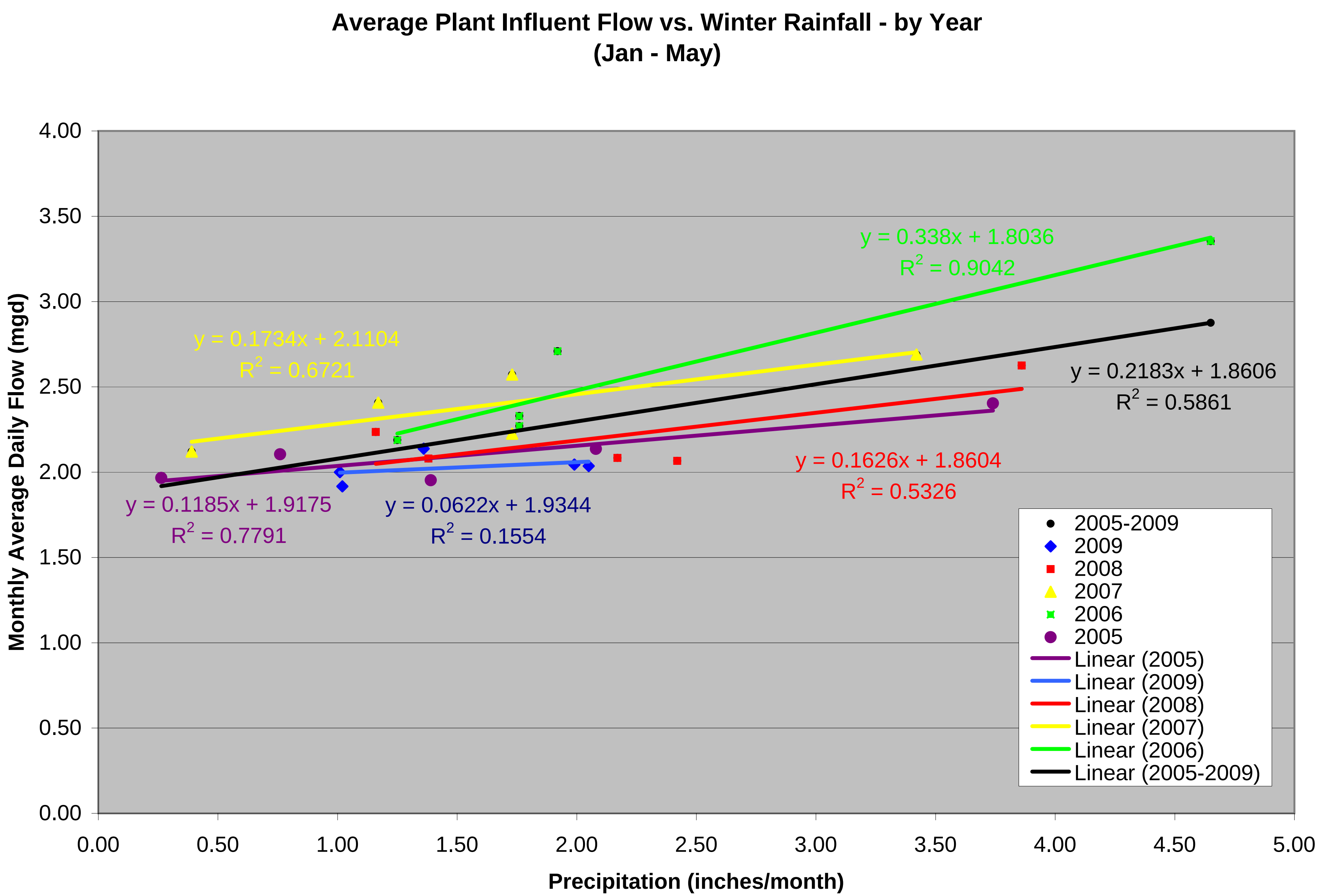


Figure C-1

P:\210055\Design\Spreadsheets\Flow Analysis 2004-2009_DMRwPrecip.xls

Ashland WW

9/2/2010

Table C-1
Monthly Precipitation vs. Flows

Graph #1a

Mo/Yr	Precipitation (in)	Flow MGD
Jan-05	0.76	2.10
Feb-05	0.26	1.97
Mar-05	1.39	1.95
Apr-05	2.08	2.14
May-05	3.74	2.40
Jan-06	4.65	3.35
Feb-06	1.92	2.71
Mar-06	1.76	2.27
Apr-06	1.76	2.33
May-06	1.25	2.19
Jan-07	1.73	2.57
Feb-07	3.42	2.69
Mar-07	1.17	2.41
Apr-07	1.73	2.23
May-07	0.39	2.12
Jan-08	3.86	2.62
Feb-08	1.16	2.24
Mar-08	2.42	2.07
Apr-08	1.38	2.08
May-08	2.17	2.08
Jan-09	1.99	2.04
Feb-09	1.02	1.92
Mar-09	2.05	2.04
Apr-09	1.01	2.00
May-09	1.36	2.14

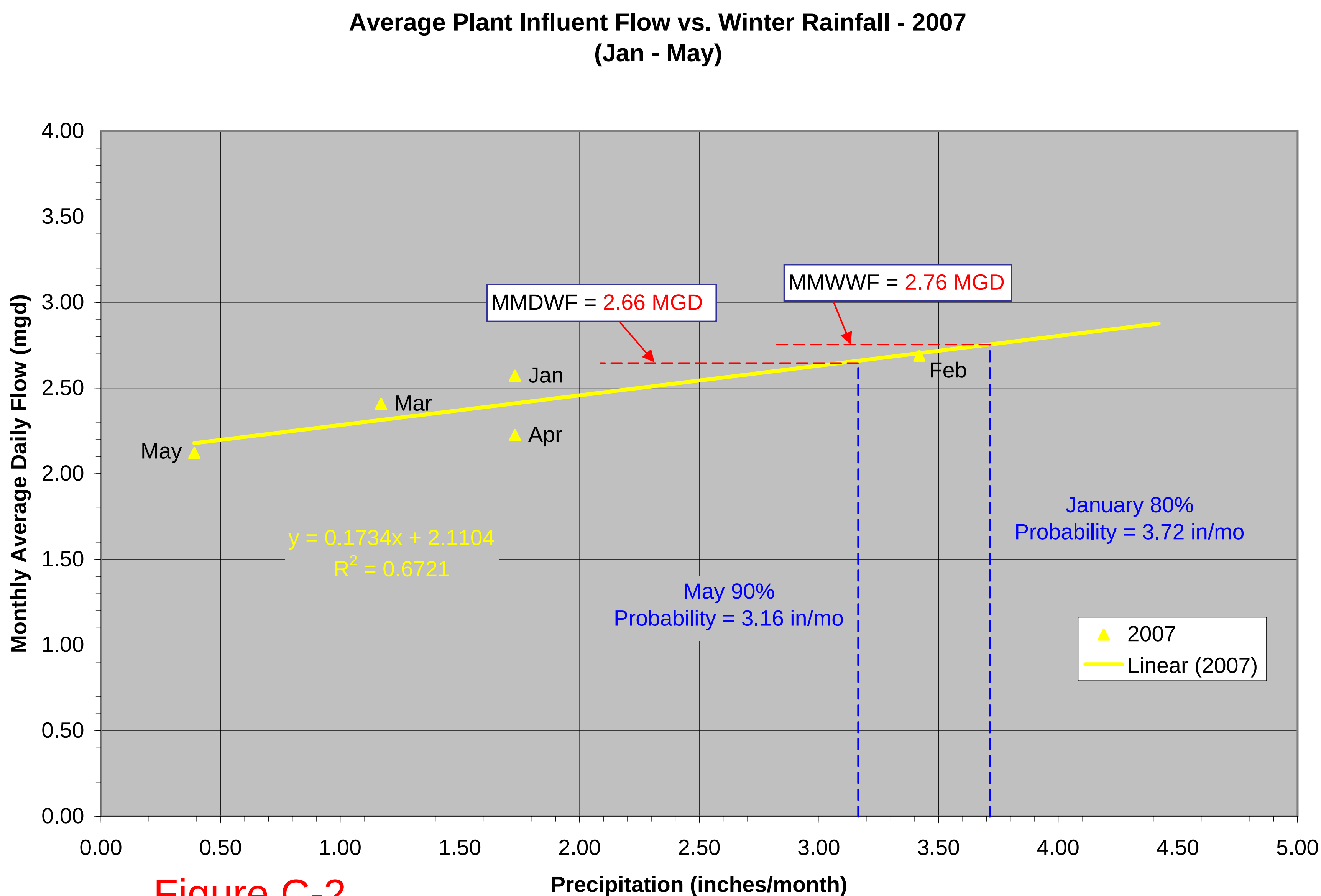

Average Plant Influent Flow vs. Winter Rainfall - 2007
(Jan - May)
Monthly Average Daily Flow (mgd)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
Precipitation (inches/month)
MMDWF = 2.66 MGD
MMWWF = 2.76 MGD
Jan
Mar
Apr
May
Feb
y = 0.1734x + 2.1104
R2 = 0.6721
May 90%
Probability = 3.16 in/mo
January 80%
Probability = 3.72 in/mo
2007
Linear (2007)

Figure C-2

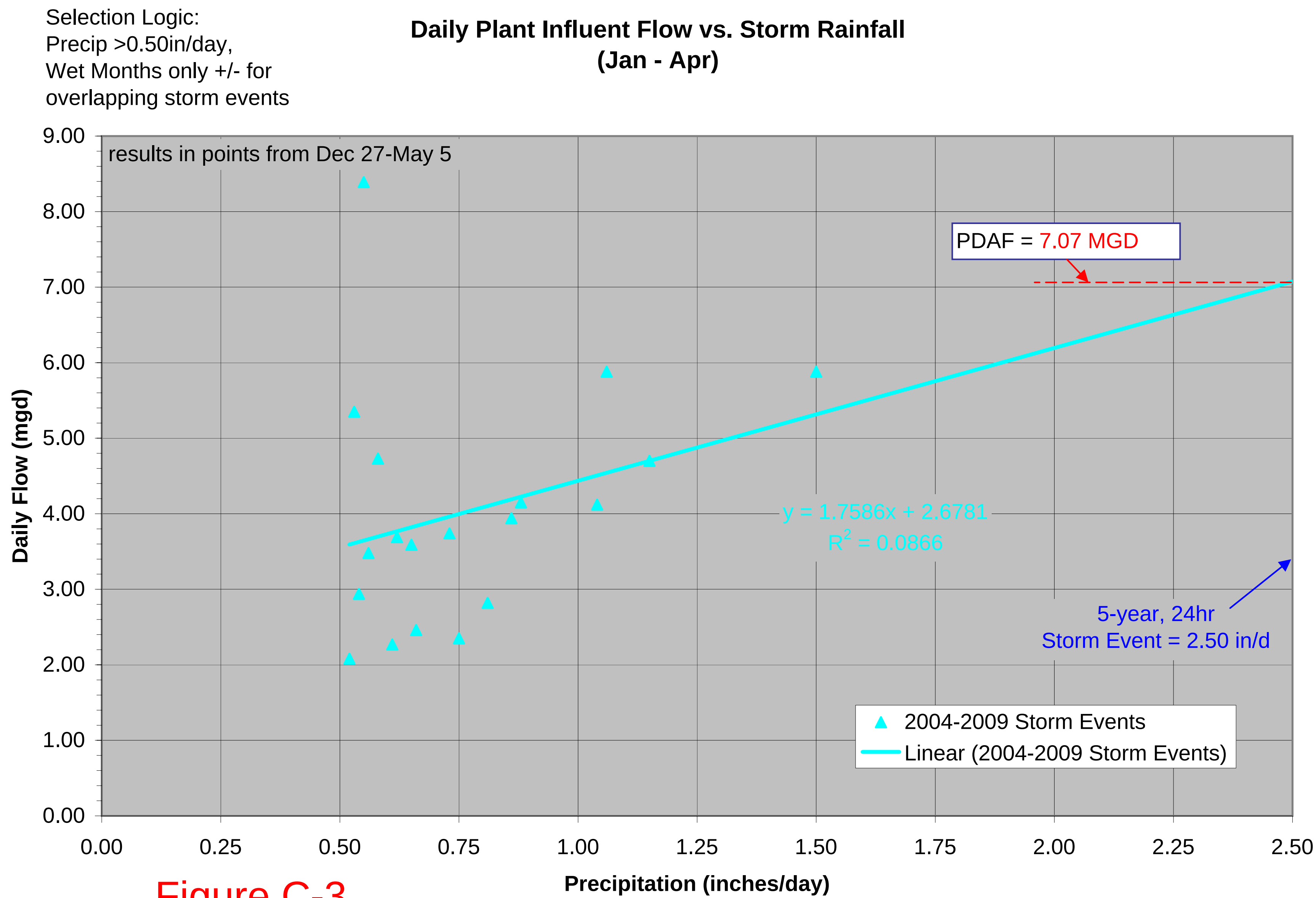

Selection Logic:
Precip >0.50in/day,
Wet Months only +/- for
overlapping storm events
Daily Plant Influent Flow vs. Storm Rainfall
(Jan - Apr)
results in points from Dec 27-May 5
PDAF = 7.07 MGD
y = 1.7586x + 2.6781
R^2 = 0.0866
5-year, 24hr
Storm Event = 2.50 in/d
2004-2009 Storm Events
Linear (2004-2009 Storm Events)
Daily Flow (mgd)
Precipitation (inches/day)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50

Figure C-3

Table C-2
Peak Precipitation/Flow Events

Precip >0.50 in Wet Months	Precipitation	Flow
Mo/Yr	(in)	MGD
January 1, 2004	0.65	3.59
February 17, 2004	1.15	4.70
February 18, 2004	0.62	3.69
April 28, 2005	0.81	2.82
May 5, 2005	0.66	2.46
December 30, 2005	0.55	8.39
December 31, 2005	1.50	5.88
January 1, 2006	0.53	5.35
January 21, 2006	0.56	3.48
February 1, 2006	0.58	4.73
December 27, 2006	1.04	4.12
January 4, 2007	0.88	4.15
February 22, 2007	0.86	3.94
January 4, 2008	1.06	5.88
January 5, 2008	0.73	3.74
January 28, 2008	0.75	2.35
January 2, 2009	0.54	2.94
January 25, 2009	0.61	2.27
April 10, 2009	0.52	2.08

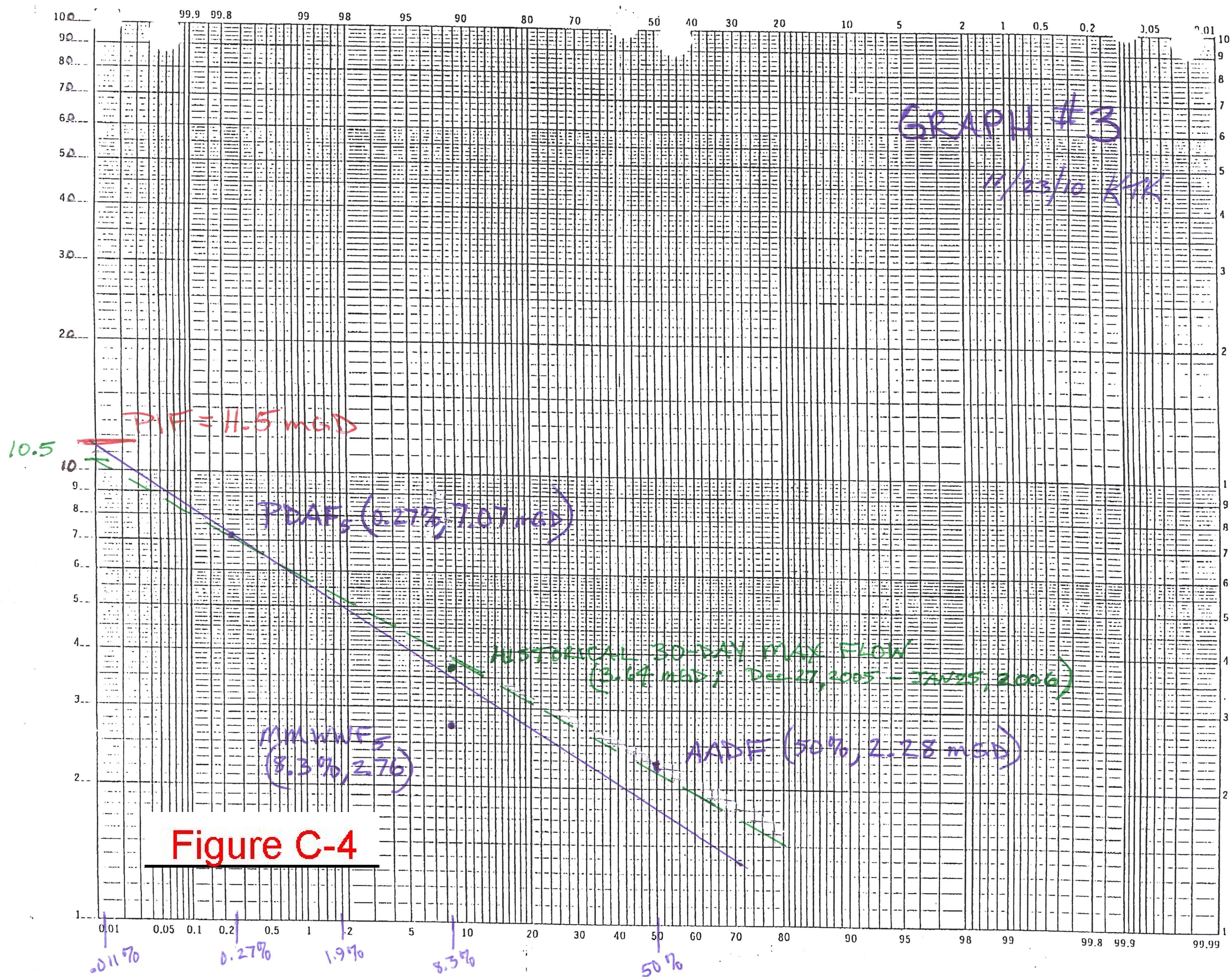

GRAPH #3
11/23/10 KTK
PIF = 11.5 mGD
10.5
PDAF5 (0.27%, 7.07 mGD)
HISTORICAL 30-DAY MAX FLOW
(3.64 mGD; Dec 27, 2005 - JAN 25, 2006)
MMWWF5
(8.3%, 2.76)
AADF (50%, 2.28 mGD)
.011%
0.27%
1.9%
8.3%
50%

Figure C-4

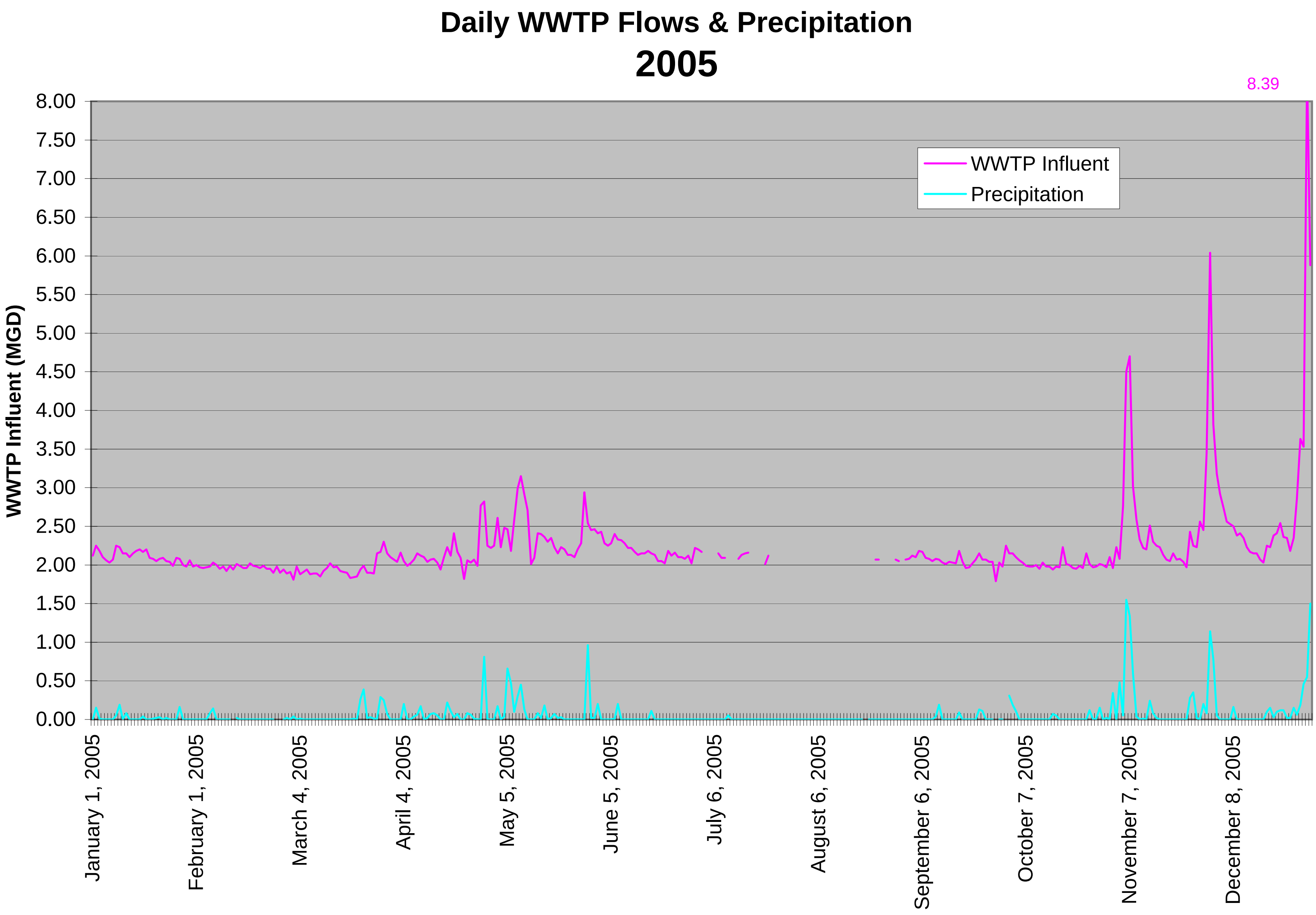

Daily WWTP Flows & Precipitation
2005
8.39
WWTP Influent
Precipitation
WWTP Influent (MGD)
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
January 1, 2005
February 1, 2005
March 4, 2005
April 4, 2005
May 5, 2005
June 5, 2005
July 6, 2005
August 6, 2005
September 6, 2005
October 7, 2005
November 7, 2005
December 8, 2005

Figure C-5

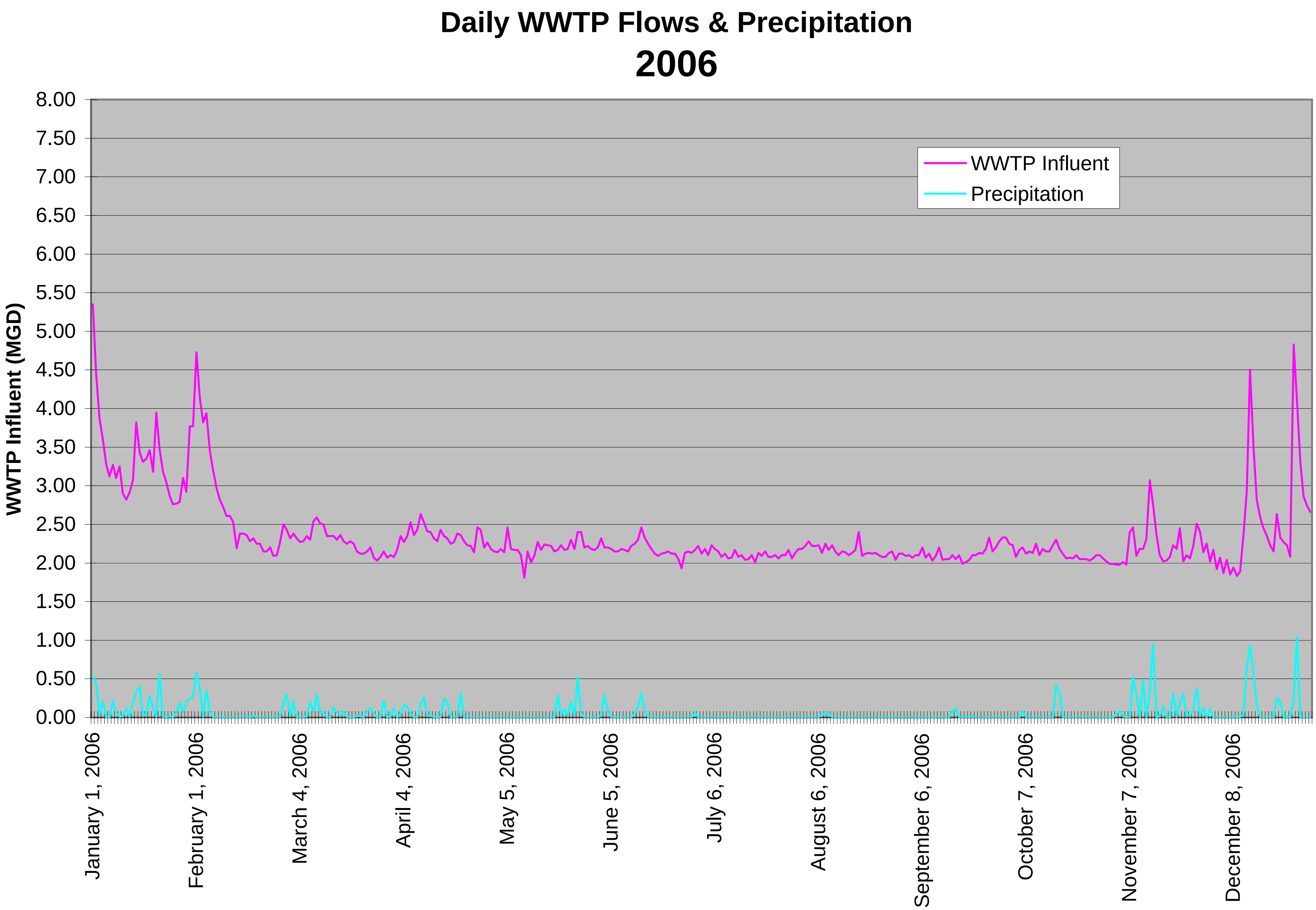

Daily WWTP Flows & Precipitation
2006
WWTP Influent (MGD)
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
WWTP Influent
Precipitation
January 1, 2006
February 1, 2006
March 4, 2006
April 4, 2006
May 5, 2006
June 5, 2006
July 6, 2006
August 6, 2006
September 6, 2006
October 7, 2006
November 7, 2006
December 8, 2006

Figure C-6

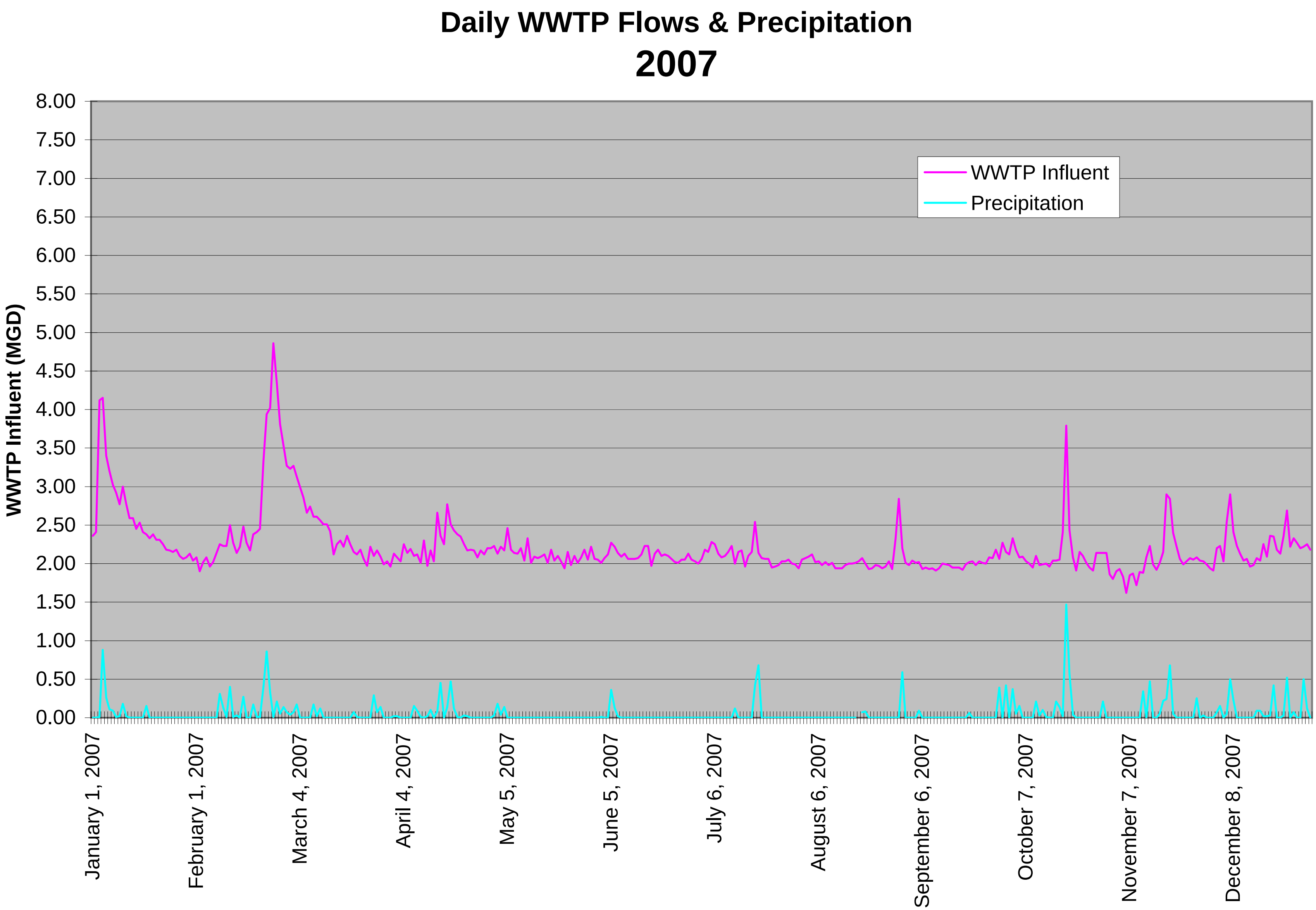
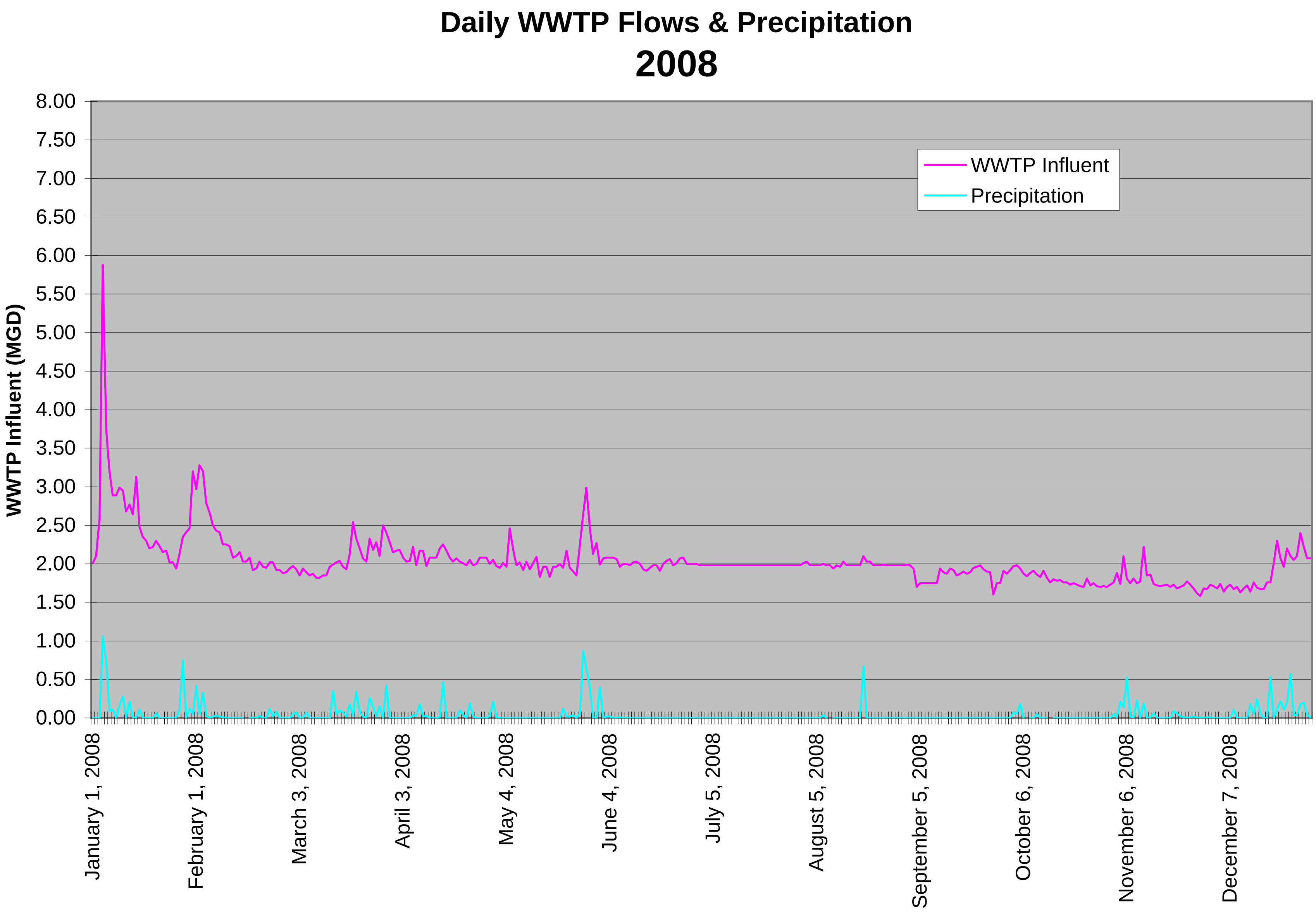

Daily WWTP Flows & Precipitation
2007
WWTP Influent (MGD)
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
WWTP Influent
Precipitation
January 1, 2007
February 1, 2007
March 4, 2007
April 4, 2007
May 5, 2007
June 5, 2007
July 6, 2007
August 6, 2007
September 6, 2007
October 7, 2007
November 7, 2007
December 8, 2007

Figure C-7



Daily WWTP Flows & Precipitation
2008
WWTP Influent (MGD)
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
WWTP Influent
Precipitation
January 1, 2008
February 1, 2008
March 3, 2008
April 3, 2008
May 4, 2008
June 4, 2008
July 5, 2008
August 5, 2008
September 5, 2008
October 6, 2008
November 6, 2008
December 7, 2008

Figure C-8

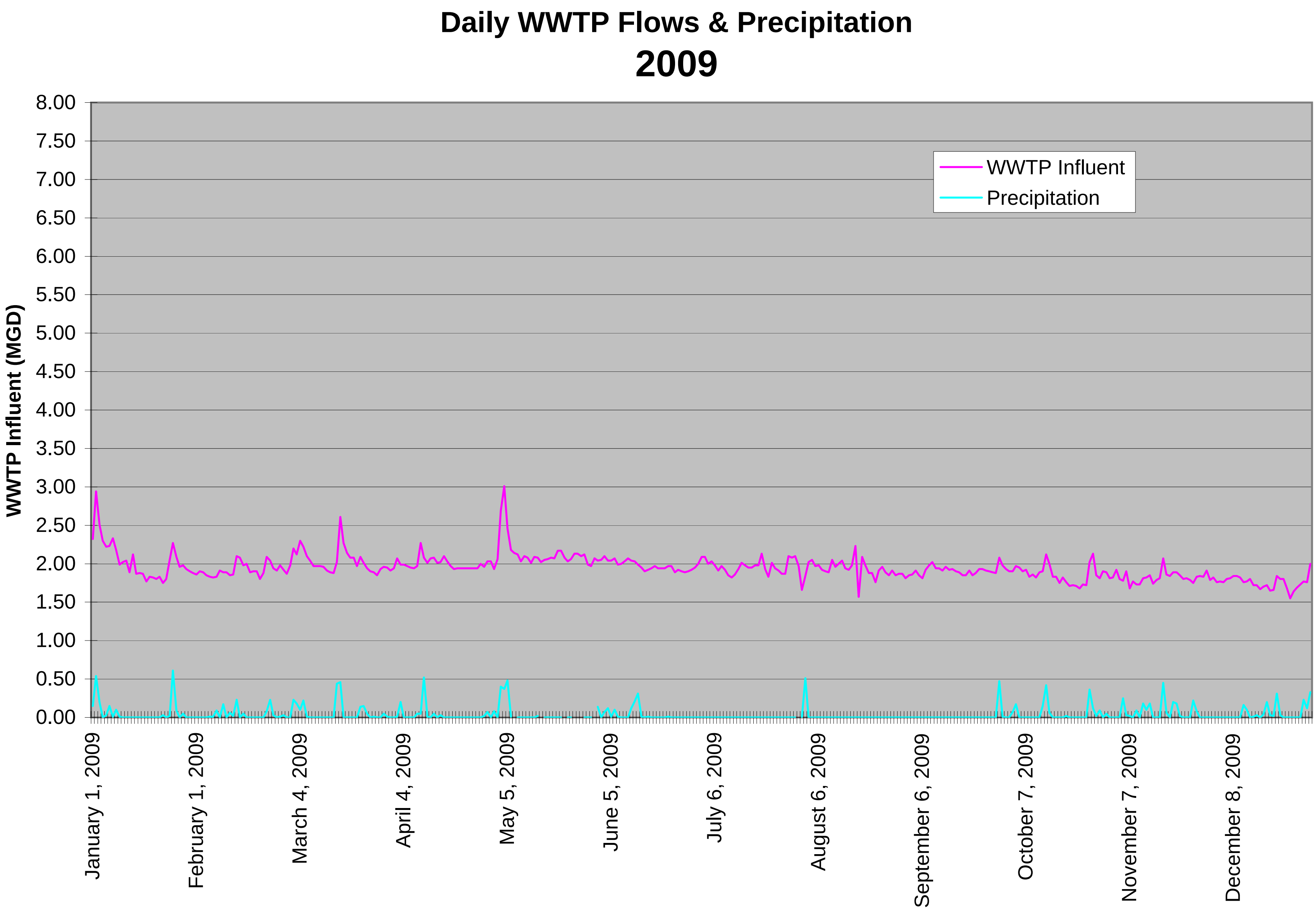

Daily WWTP Flows & Precipitation
2009
WWTP Influent (MGD)
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
WWTP Influent
Precipitation
January 1, 2009
February 1, 2009
March 4, 2009
April 4, 2009
May 5, 2009
June 5, 2009
July 6, 2009
August 6, 2009
September 6, 2009
October 7, 2009
November 7, 2009
December 8, 2009

Figure C-9

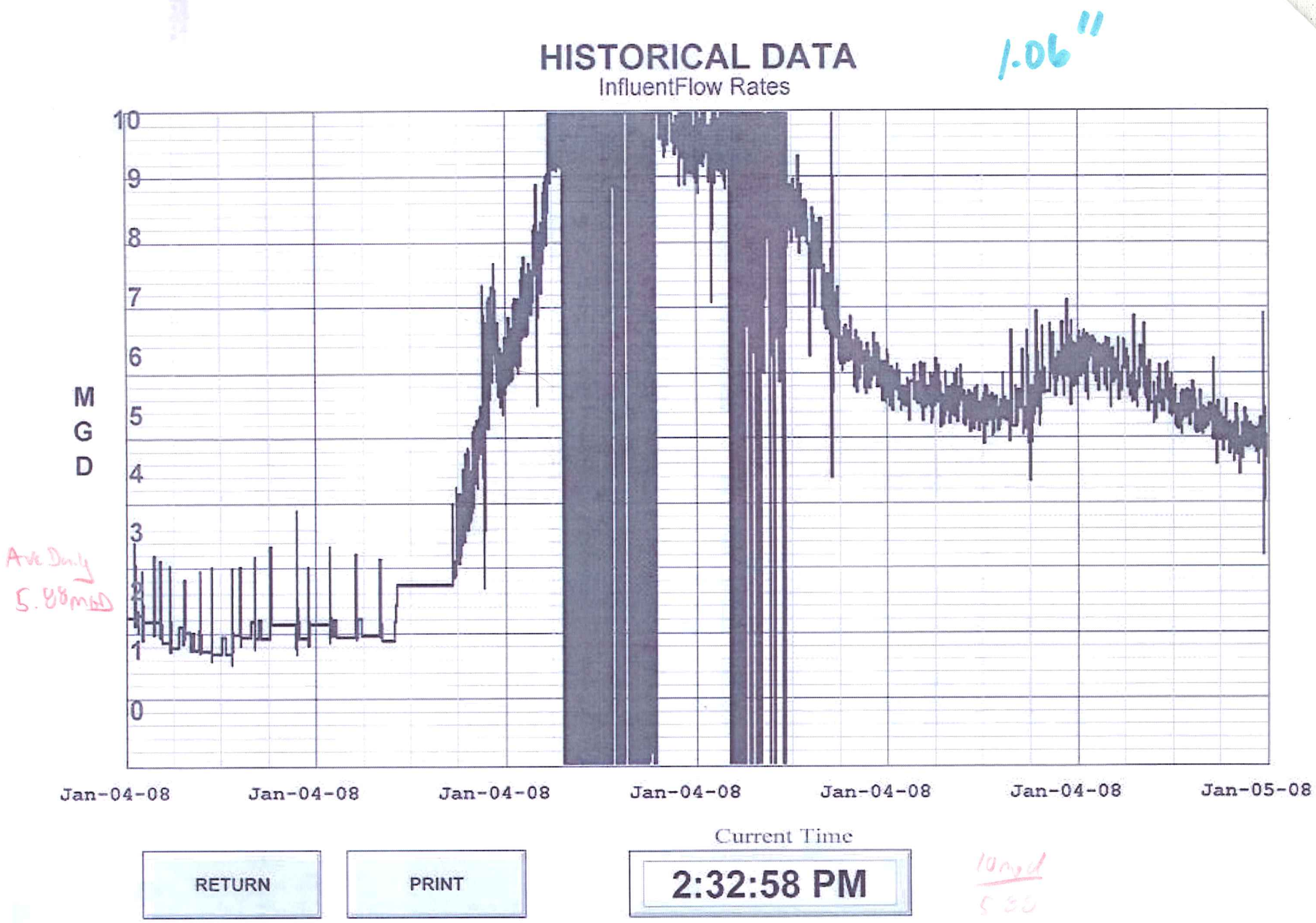

HISTORICAL DATA
InfluentFlow Rates
1.06"
M G D
10
9
8
7
6
5
4
3
2
1
0
Ave Daily
5.88 MGD
Jan-04-08
Jan-04-08
Jan-04-08
Jan-04-08
Jan-04-08
Jan-04-08
Jan-05-08
Current Time
RETURN
PRINT
2:32:58 PM
10 mgd
= 1.7

Figure C-10

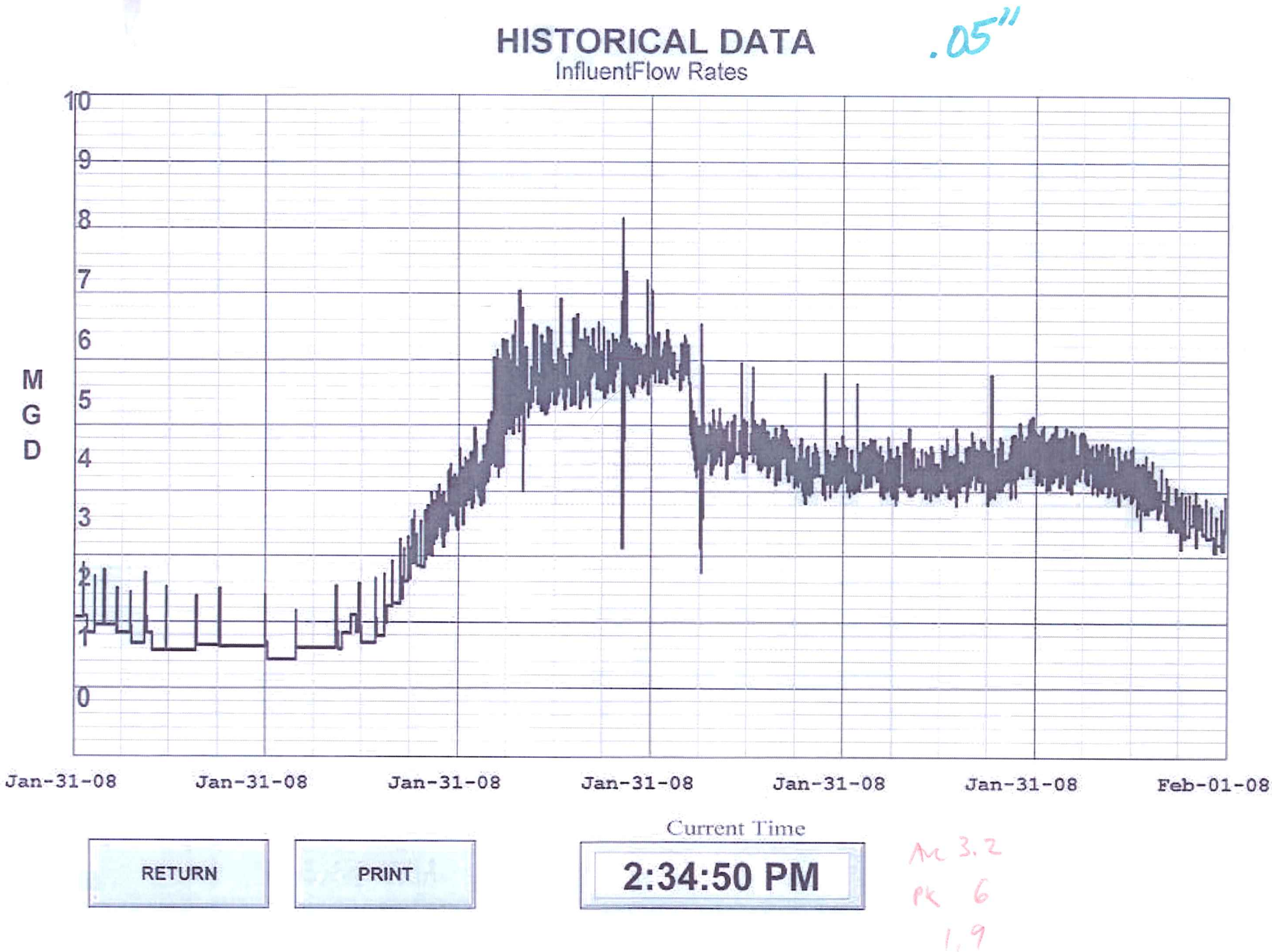
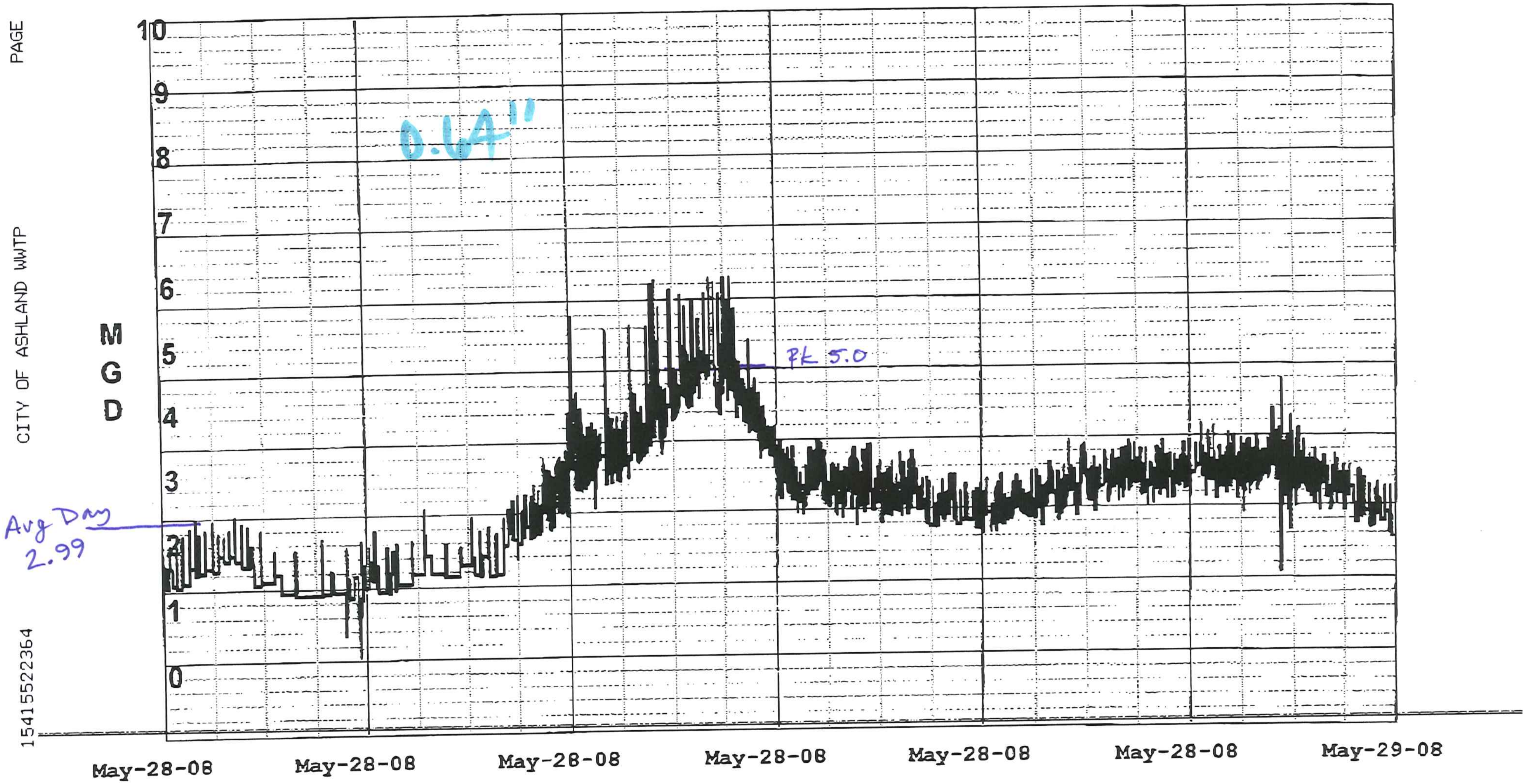

.05"
HISTORICAL DATA
InfluentFlow Rates
10
9
8
7
6
5
4
3
2
1
0
M
G
D
Jan-31-08
Jan-31-08
Jan-31-08
Jan-31-08
Jan-31-08
Jan-31-08
Feb-01-08
Current Time
RETURN
PRINT
2:34:50 PM
Av 3.2
Pk 6
1.9

Figure C-11

HISTORICAL DATA
InfluentFlow Rates



RETURN

PRINT

Current Time

9:54:01 AM

Factor = $\frac{5.0}{2.99}$ = 1.67

Figure C-12

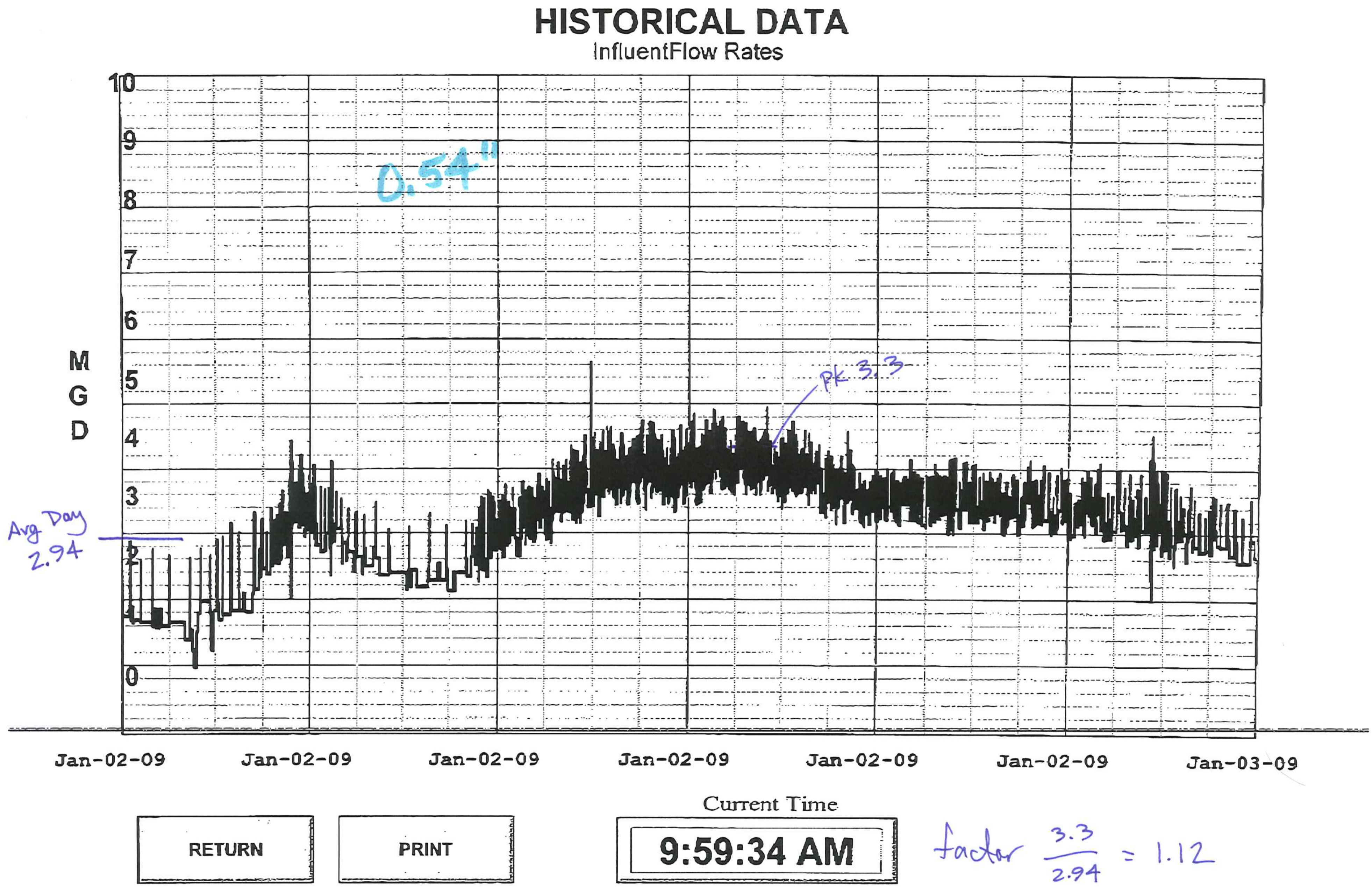

HISTORICAL DATA
InfluentFlow Rates
MGD
10
9
8
7
6
5
4
3
2
0
0.54"
PK 3.3
Avg Day 2.94
Jan-02-09
Jan-02-09
Jan-02-09
Jan-02-09
Jan-02-09
Jan-02-09
Jan-03-09
RETURN
PRINT
Current Time
9:59:34 AM
factor 3.3 / 2.94 = 1.12

Figure C-13

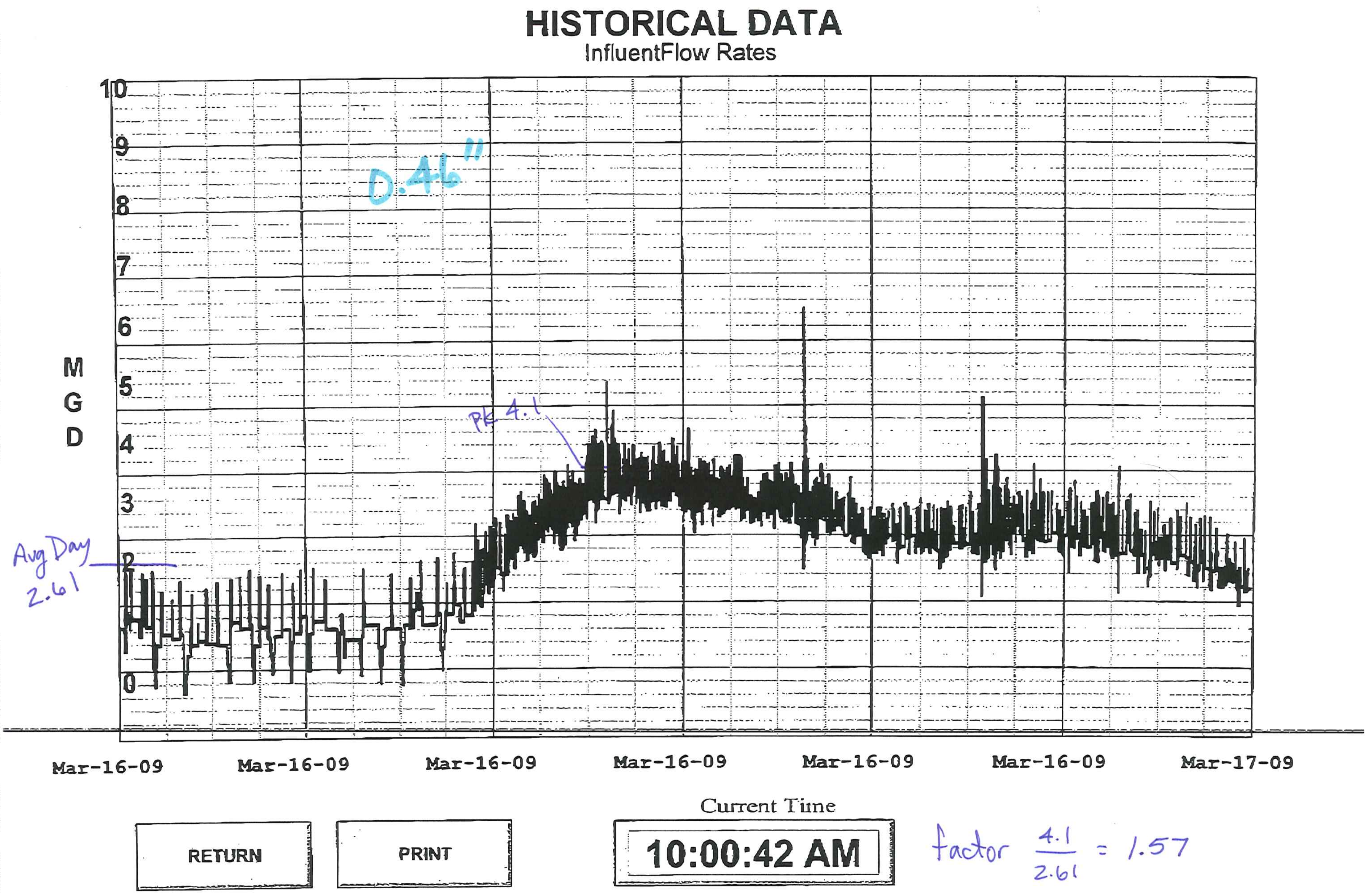
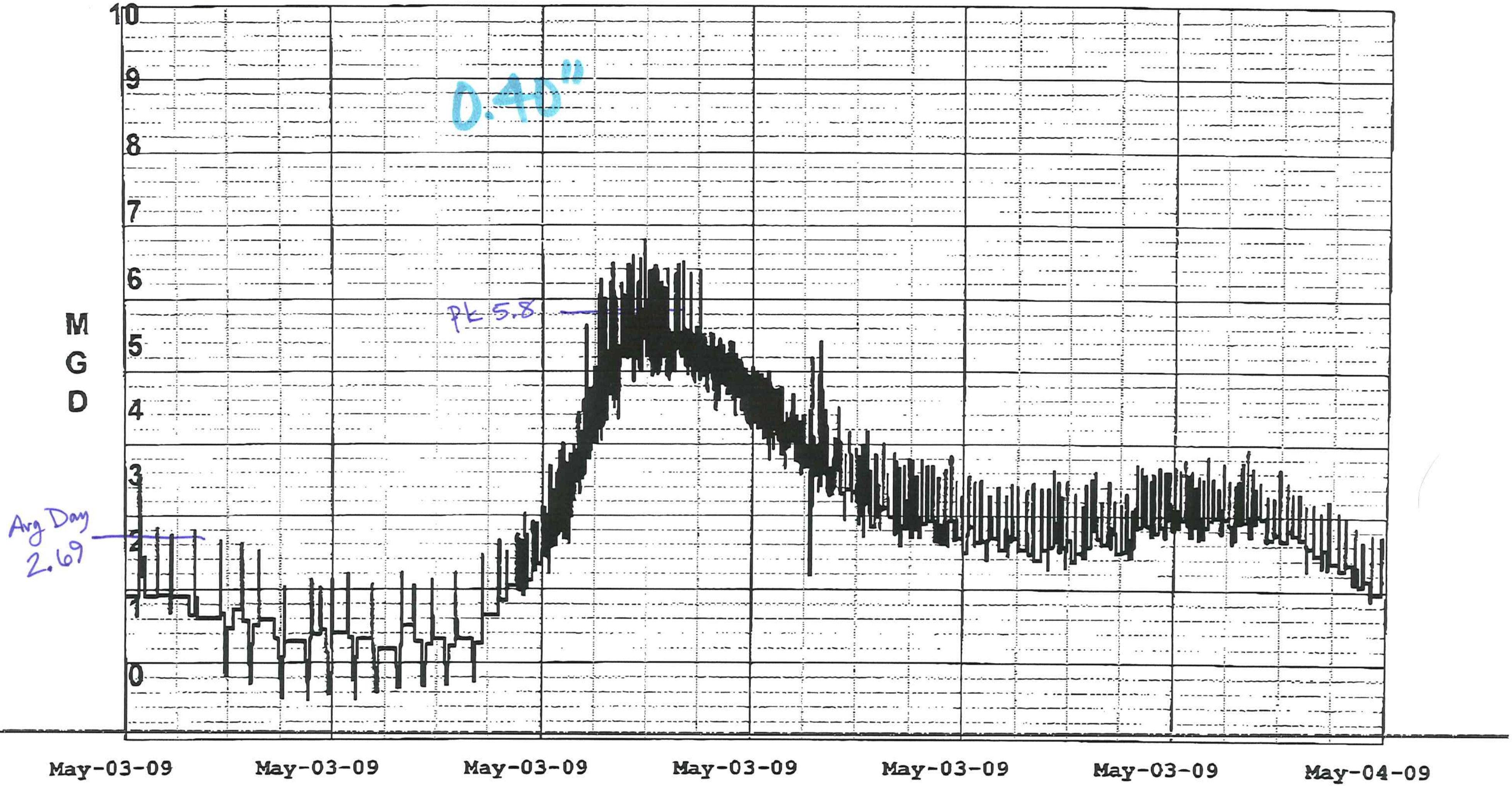

HISTORICAL DATA
InfluentFlow Rates
MGD
10
9
8
7
6
5
4
3
2
0
0.46"
Pk 4.1
Avg Day 2.61
Mar-16-09
Mar-16-09
Mar-16-09
Mar-16-09
Mar-16-09
Mar-16-09
Mar-17-09
Current Time
10:00:42 AM
RETURN
PRINT
factor 4.1/2.61 = 1.57

Figure C-14

HISTORICAL DATA

InfluentFlow Rates



RETURN

PRINT

Current Time

9:56:31 AM

factor $\frac{5.8}{2.69} = 2.16$

Figure C-15

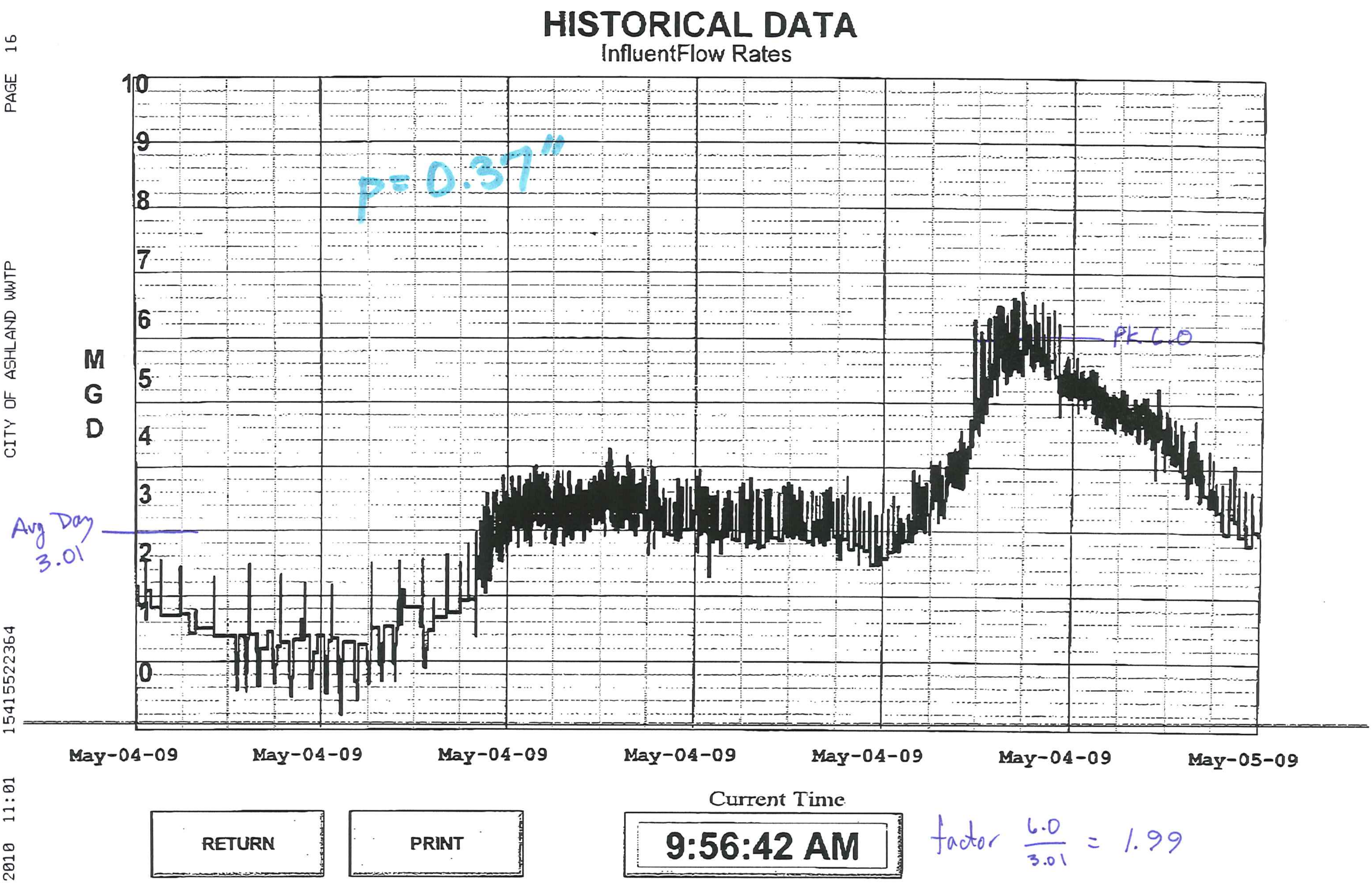

HISTORICAL DATA
InfluentFlow Rates
MGD
10
9
8
7
6
5
4
3
2
0
P=0.37"
Pk 6.0
Avg Day 3.01
May-04-09
May-04-09
May-04-09
May-04-09
May-04-09
May-04-09
May-05-09
RETURN
PRINT
Current Time
9:56:42 AM
factor 6.0/3.01 = 1.99

Figure C-16

APPENDIX D

Regulatory Requirements

- Regulatory Requirements
    - Collection System Regulations
    - Treatment Plant Regulations
    - Recycled Water (Reuse) Regulations
    - City Policies & Guidelines
- Existing NPDES Permit
- Sanitary Sewer Overflows
- Excess Thermal Load Calculations

KELLER associates

Regulatory Requirements

Collection System Regulations

Treatment Plant Regulations

Recycled Water (Reuse) Regulations

City Policies & Guidelines

REGULATORY REQUIREMENTS

COLLECTION SYSTEM REGULATIONS

DEQ has established a set of design guidelines for gravity collection system and pump stations (refer to http://www.deq.state.or.us/wq/rules/div052guides.htm).

Pump Station Design Regulatory Requirements

Pump stations are generally used to lift wastewater from a lower elevation and convey it to a high location where it is discharged. Pump stations must meet requirements of DEQ guidelines, including:

- Redundant pumping capacity – pump stations must be capable of conveying the 5-year 24-hour storm peak hourly flow with the largest pump out of service.
- Provisions for hydrogen sulfide removal, if required - where septic conditions are believed to occur, provisions for addressing hydrogen sulfide should be in place to reduce the potential for corrosion and odor.
- Alarms – alarm system should include high level overflow, power, pump fail conditions, and loss of redundancy (when all pumps are called on to keep up with the inflow into the pump station; this is an indicator that the pump station capacity is exceeded).
- Standby power - provisions for standby power are required for every pump station. Mobile generators or portable trash pumps may be acceptable, depending on the risk of overflow, available storage in the wet well and pipelines, alarms and response time.

Pipeline Regulatory Rules

cMOM Rules

cMOM refers to Capacity Management, Operation, and Maintenance of the entire wastewater conveyance system.

The vast majority of all sanitary sewer overflows originate from three sources – infiltration and inflow, roots, and fats, oil and grease (FOG). Infiltration and inflow problems are best addressed through a program of regular flow monitoring, TV monitoring and pipeline rehabilitation and replacement. Blockages from roots or FOG are also addressed via a routine cleaning and monitoring program. A FOG control program may also involve public education, and city regulations (i.e. requirements for installation and regular maintenance of grease interceptors). All new facilities believed to contribute FOGs should be equipped with grease interceptors.

All SSOs are prohibited by EPA. The Oregon Sanitary Sewer Overflow (SSO) rules include both wet weather and dry weather design criteria. DEQ has indicated that they have enforcement discretion, and that fines will not occur for overflows that result from storm events that exceed the Oregon DEQ design criteria (i.e. greater than winter 5-year storm event and a summer 10-year storm event).

In December 2009, DEQ developed a SSO Enforcement Internal Management Directive [1] that provides guidance for preventing, reporting, and responding to SSOs. This document was later updated in November 2010. Municipalities are encouraged to adopt programs that reduce the likelihood of overflow events. Reporting requirements include notice within 24 hours and written reports within 5 days. The City can expect that their new discharge permit will also include requirements for an Emergency Notification and Response Plan. This plan will replace the existing Contingency Plan for the Prevention and Handling of Sewer Spills and Unplanned Discharges. The DEQ directive outlines six elements to be included in the plans, as summarized below.

1. Ensure that the permittee is aware of such events.
2. Ensure notification of appropriate personnel and ensure that they are immediately dispatched for investigation and response.
3. Ensure immediate notification to the public, health agencies, and other affected public entities.
4. Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained.
5. Provide emergency operations.
6. Ensure that DEQ is notified of the public notification steps taken.

Excessive Infiltration and Inflow

EPA defines excessive infiltration and inflow (I/I) as the quantity of I/I that can be economically eliminated from a sewer system by rehabilitation. Some guidelines for determining excessive infiltration and inflow were developed in 1985 by EPA based on a survey of 270 standard metropolitan statistical area cities [2]. Numeric criteria for non-excessive infiltration and inflow, respectively, were defined as average daily dry weather flows below 120 gallons per capita per day (gpcd) and average wet weather flows below 275 gpcd for inflow. Based on the values in Table C.2 in Appendix C, daily dry weather flow in Ashland averages 95 gpcd and wet weather flows average 104 gpcd (163 for the maximum month).

Pipeline Surcharging

Pipeline surcharging occurs as flows exceed the capacity of a full pipe, causing wastewater to backup into manholes and services. Surcharging of gravity pipelines is generally discouraged because of 1) the increased potential for backing up into people's homes; and 2) the increased potential of exfiltration (escape of raw wastewater into the groundwater); and 3) health risks associated with Sanitary Sewer Overflows (SSOs).

Illicit Cross Connections

Any illicit cross connections from the City's storm water system should be removed.

TREATMENT PLANT REGULATIONS

NPDES Permit Requirements

The National Pollutant Discharge Elimination System (NPDES) permit limits are important as the plant must be capable of meeting existing permit limits, as well as anticipated future limits. The City's current permit [3] has expired, but remains in effect until a new permit is issued. Monthly permit limits for $CBOD_5$, total suspended solids (TSS), ammonia, phosphorus (P), dissolved oxygen, and thermal load are summarized in the following table. Additional limits not shown in the table include E. coli (126/100 mL), pH (6.5-8.5), and $CBOD_5$ and TSS removal efficiency (minimum 85%). The permit also specifies a daily maximum loading of 5.1 pounds per day (ppd) for phosphorus.

Note that mass load limits (in ppd) are the controlling factor; at plant design flow, the mass load limits may require a lower concentration than specified in the permit. For example, a load of 120 ppd $CBOD_5$ at a flow of 2.3 mgd represents a concentration of 6.25 mg/L (vs. the 10 mg/L limit in the permit). Similarly, mass loads of 96 and 400 ppd at 2.3 mgd represent concentrations of 5 mg/L and 21 mg/L, respectively.

TABLE D.1: Summary of Existing NPDES Effluent Limits

Period	Avg. Monthly Limits: mg/L / ppd				Dissolved Oxygen, mg/L	Excess Thermal Load, mil kcal/day
	$CBOD_5$	TSS	Ammonia	P		
Jan thru April	25 / 400	30 / 400	0.80 / -	-		
May thru August	10 / 120	10 / 96	0.52 / -	- / 1.6		
Sept thru October	4 / 77	10 / 96	0.52 / -	- / 1.6		
November	10 / 120	10 / 96	0.52 / -	- / 1.6		
December	25 / 400	30 / 400	0.80 / -	-		
Oct. 15 thru May 15					≥9.0	≤78
May 16 thru Oct. 14					-	≤38

A new permit is anticipated to be completed by 2015. New permit limits may impact future plant operation and facility improvements. Since Total Maximum Daily Loads (TMDLs) have been developed for the Bear Creek watershed (see following section), limits in future permits are expected to be no less (and possibly more) stringent than the current permit. Thus, a higher degree of treatment may be necessary to maintain and even improve effluent quality as future growth occurs.

TMDL Requirements

In 1992, DEQ developed a TMDL for Bear Creek that established water concentration targets for total phosphorus, ammonia nitrogen, and biochemical oxygen demand. The current NPDES permit for Ashland, issued in 2004, reflects the waste load allocations of the 1992 Bear Creek TMDL.

A second TMDL for Bear Creek [4] finalized in 2007, addresses temperature, bacteria, and sedimentation issues. Thermal load discharge, which can raise the temperature of the creek (and adversely affect aquatic life by impacting spawning and/or migration) is the main concern for point sources such as the Ashland wastewater treatment plant. The 2007 Bear Creek TMDL targets as a maximum of 13°C for October 15 to May 15 (spawning season), and 18°C for May 16 to October 14 (rearing and migration). Cumulative anthropogenic impacts are allowed to exceed these criteria by at most 0.3°C (termed the Human Use Allowance, HUA), with specific sources on the creek receiving portions of that total thermal load allocation.

Temperature Loads per TMDL

The Ashland wastewater treatment plant (WWTP) is permitted a maximum HUA of 0.1°C above the biologically based numeric criteria. This condition is modeled during instream flow events less than the seven-day rolling average that have the probability of occurring once every 10 years (7Q10) to develop the wasteload allocation for the facility. Currently, the Ashland WWTP exceeds this allocation during the months of March through December. The current highest estimated exceedance is 53 Mkcals/day in October.

TMDLs are established on a watershed basis. When meeting target TMDLs, excess thermal loads can be mitigated with thermal offsets above the point of maximum impact (for Bear Creek this is four miles upstream of the confluence of Rogue River). Watershed requirements are referred to as "far-field". In addition to meeting far-field impacts within the watershed, DEQ has developed guidelines for addressing local, or "near-field" impacts. High temperature discharges can create migration barriers, impact spawning areas, create thermal shock conditions, and in some cases, can be lethal to fish. DEQ has evaluated the near-field impacts and determined that thermal loads from the existing discharge presents concerns for spawning, thermal shock, and migration blockage [5].

Relocating the Ashland WWTP outfall may have little impact on the total excess thermal loads (far-field) impacts, depending on the type of relocation action chosen. However, with any relocation action there will be clear near-field benefits to removing the discharge point from Ashland Creek. DEQ has also evaluated the near field impacts of discharging directly to Bear Creek below the confluence with Ashland Creek [5]. This analysis showed that the increased stream flows at this point would significantly reduce the near field impacts, eliminating concerns of thermal shock and spawning, and significantly reducing the potential of migration blockage. The removal of near-field impacts allows for the development of thermal credits to mitigate the remaining excess thermal load exceedances through water quality trading.

Anticipated Additional Future Permit Requirements

Ammonia [6]

In December 2009, EPA announced a draft national recommended water quality criterion for ammonia for the protection of aquatic life entitled "*Draft 2009 Update Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater*". This is an update of the 1999 ammonia criteria as required by the Clean Water Act. EPA accepted comments to the draft through April 1, 2010. EPA has not taken any further action on the water quality criteria for ammonia in freshwater discharges, but it is likely that new criteria will be developed using the draft criteria and comments received.

Existing criteria for ammonia developed in the 1999 Ammonia Criteria are (at pH 8 and 25°C):

Acute	5.6 mg NH_4-N/L if salmon are present.
Chronic	1.2 mg NH_4-N/L if fish in early life stages are present.

If the 2009 ammonia criteria in the draft report are accepted as published in 2009, then the criteria (at pH 8 and 25°C) would change to:

Acute	2.9 mg NH_4-N/L if freshwater mussels are present. 5.0 mg NH_4-N/L if freshwater mussels are absent.
Chronic	0.26 mg NH_4-N/L if freshwater mussels are present. 1.8 mg NH_4-N/L if freshwater mussels are absent.

Note that the criteria will vary with pH and temperature, increasing with decreasing temperature and decreasing with increasing pH. For example, at pH 8 with mussels present, the ammonia criterion varies from 0.186 mg/L at 30°C to 0.817 at 0°C. Ammonia levels in Ashland's effluent from 2004-2009 ranged from 0.01 to 1.90 mg/L, with a mean effluent concentration of 0.24 mg/L.

Assuming that freshwater mussels are present (in accordance with DEQ guidelines), the limits if EPA adopts the new criteria will be based on the worst case scenario for temperature and pH with mussels present. The worst case scenario would be during the summer. For the summer months, the 95% confidence range for temperature is 14.16°C to 25.74°C, and for pH is 7.07 to 8.16. Based on the ammonia guidance document referenced above, the chronic ammonia limit with mussels present at these conditions would range from 0.218 to 1.22 mg/L NH_4-N/L. The plant may start having problems meeting this limit consistently, particularly when the temperature rises above 18°C at times when the pH is above 7.5 (Ashland's maximum daily effluent ammonia from 2010-2012 averaged 0.37 mg/L, with a range from 0.12 to 2.66 mg/L.)

Though new ammonia regulations are anticipated, the timing is in question. Since EPA is still in the process of completing an Endangered Species Act consultation for the 2004 criteria, the 2009 criteria are not expected to be adopted in the near future.

Priority Persistent Pollutants – Senate Bill 737 [7]

The 2007 Oregon Legislature passed Senate Bill 737, which requires DEQ to consult with all interested parties to develop a list of priority persistent bioaccumulative toxics (Priority Persistent Pollutant List) that have a documented effect on human health, wildlife and aquatic life. In order to develop the Priority Persistent Pollutant List, DEQ assembled a technical workgroup, representing expertise in various scientific sectors, to provide advice and comment. A subsequent report to the legislature identified potential local, regional, and global sources of persistent priority pollutants (PPP) that may contribute to water pollution in Oregon. It also outlined measures that state agencies, local governments, businesses, manufacturers and individuals could implement to reduce the presence of these pollutants in Oregon waters.

Senate Bill 737 requires Oregon's 52 largest municipal wastewater treatment plants to prepare reduction plans for persistent pollutants in their wastewater that exceed drinking water Maximum Contaminant Levels. For priority persistent pollutants for which a Maximum Contaminant Level has not been established, Senate Bill 737 authorizes the Environmental Quality Commission to determine by rule which pollutants must be addressed in persistent pollutant reduction plans. In 2010 DEQ established the levels of persistent pollutants in municipal permittees' wastewater which, if exceeded, will initiate the requirement for the permittee to prepare a persistent pollutant reduction plan. These levels are called the Plan Initiation Level (PIL).

The City conducted one round of monitoring of the Ashland WWTP effluent for PPP, in 2011. The only constituent that exceeded the PIL in the Ashland effluent is cholesterol, with an effluent concentration of 189 ng/L (nanograms per liter, or parts per trillion) and the PIL is 60 ng/L. Coprostanol was measured at 36 ng/L just under the PIL of 40 ng/L. All other constituents were either nondectable or well under the PIL.

Aquatic Life and Human Health Criteria

In October 2011, DEQ published Human Health Water Quality Criteria for Toxic Pollutants. Based on the limited data available for Ashland, there may be some toxins of concern (e.g. copper and phthalates). In 2012, the City began additional testing to determine which constituents may be of concern. The potential impacts on Ashland's future permit are yet to be determined. Some of these toxins currently have no known treatment technologies and others will best be addressed by treating the water supply or regulating what is disposed of in the wastewater collection system.

Temperature Criteria

The existing temperature criteria used by the Oregon DEQ is currently being challenged. However, the ongoing Oregon temperature standard litigation will likely have no direct impact on the City as its projected exceedance is already based on the numeric standard, and not the “natural conditions criteria” (NCC) implicated in the lawsuit (in contrast, Medford’s thermal waste load allocation was based on the NCC). The numeric criteria are the most restrictive and protective water quality standard in Oregon, and are unlikely to change at any point in the foreseeable future. If the criteria are lowered, then additional treatment measures may be required in the future to further remove excess thermal loads.

It should also be noted that the Oregon DEQ allows for site specific criteria to be developed for waterways. Though no site specific criteria has ever been successfully implemented in Oregon, it is possible, with substantial additional technical analysis and input from fish biologists, that a site specific criteria could be developed that allows for higher thermal loads in the future.

Copper

The Oregon DEQ notified the City in June 2011 that a “reasonable potential analysis” (based on their NPDES permit application) suggested that effluent limits would need to be added for copper. Further DEQ correspondence in April 2012 indicated that, for the scheduled permit renewal, the City needed to complete all of the copper-related items in Attachment B of the June 2011 correspondence. (To date, Keller Associates has not received a copy of this attachment.) The April 2012 correspondence also required monitoring for effluent toxics characterization, including copper, in September 2012, and also in February and September 2013.

Keller Associates also contacted DEQ (Jon Gasik) in July and September 2013 regarding proposed copper permit limits for the City of Ashland. As the process of determining copper limits is still in progress, DEQ could not provide proposed limits for this evaluation. However, DEQ has indicated that limits will be for dissolved copper (as a more accurate indication of aquatic toxicity than total copper); they also recommended that the City test for dissolved rather than total copper as was previously requested. Preliminary DEQ calculations based on available total copper results do not definitively answer whether dissolved copper in Ashland’s effluent will exceed fish toxicity limits; additional test data will be required in order to determine if the plant is exceeding aquatic life water quality limits for copper.

Aquatic life criteria for copper have yet to be established. The Oregon DEQ submitted proposed aquatic life toxics criteria to the EPA in 2004 for approval, and these criteria were adopted by the Oregon Environmental Quality Commission (EQC) that same year. However, on January 31, 2013, the EPA ruled that the levels calculated using the proposed hardness-based criteria may not be sufficiently protective of endangered and threatened aquatic life. The EPA is proposing that states adopt the Biotic Ligand Model (BLM) to determine dissolved copper levels for discharge limits. The BLM requires that 10 parameters be used to determine the bioavailability of copper - including temperature, pH, dissolved organic carbon, calcium, magnesium, sodium, potassium, dissolved inorganic carbon, chlorides and sulfate. This method of determining copper levels is complex, and is currently being evaluated by DEQ before they respond to EPA.

In the absence of any other criteria, Mr. Gasik suggested that the method adopted by the EQC in 2004 be used to calculate dissolved copper levels based on the hardness of the plant effluent. He also suggested that the evaluation for this study be based on meeting aquatic health criteria at the plant outfall without consideration of a mixing zone (worst case scenario). Current Oregon aquatic life criteria and EPA dissolved copper limits for the protection of aquatic life will be used to evaluate the need for copper removal and proposed alternatives to be considered for implementation. Table D.2 shows the acute and chronic aquatic toxicity limits for dissolved copper calculated for various levels of water hardness. Freshwater acute levels (criterion maximum concentration CMC) are an average concentration that should not be exceeded for more than one hour once every three years. Freshwater chronic levels (criterion continuous concentration CCC) are an average concentration that should not be exceeded for more than 96 hours once every three years.

TABLE D.2: Aquatic Life Water Quality Criteria for Dissolved Copper

Effluent Hardness, mg/L	Freshwater Acute (CMC), µg/L	Freshwater Chronic (CCC), µg/L
50	7.0	5.0
75	10.2	7.0
100	13.4	9.0
125	16.6	10.8
150	19.7	12.7

Table D.3 shows the measured total copper levels for 2010 through 2013 provided by the WWTP operators; also shown are calculated acute and chronic dissolved copper limits corresponding to the water sample hardness. Total copper levels are very close or lower than the calculated dissolved copper aquatic life criteria. Therefore, the ODEQ is unable to determine if copper is an issue without further sampling and analysis. The ODEQ is requesting that the City measure dissolved copper in the plant effluent in lieu of total copper when analyzing effluent for priority pollutants.

TABLE D.3: Historical Ashland Effluent Copper Levels

Sample Date	Sample Location	Total Copper, µg/L	Hardness, mg/L	*Calculated* Dissolved Copper CMC, µg/L	*Calculated* Dissolved Copper CCC, µg/L
2.3.10	Secondary	7.27	NP		
7.12.10	Effluent	2	NP		
8.27.10	Permeate	8.38	NP		
11.01.10	Effluent	3.9	NP		
3.30.11	Secondary	13.9	108	14.4	9.6
7.07.11	Permeate	7.03	68	9.3	6.4
12.05.11	Secondary	9.92	71.6	9.8	6.7
3.20.12	Secondary	7.35	107	14.3	9.5
7.29.12	Permeate	3.44	60.9	8.4	5.9
9.27.12	Permeate	1.21	67	9.2	6.4
4.22.13	Secondary	6.49	80.6	11.0	7.4

NP = Not Provided

As shown in Table D.3, total copper levels in the plant effluent have typically been less than 10 µg/L. Copper in the Ashland drinking water system has measured over 600 µg/L, reportedly due to corrosion of copper pipes in the distribution system. Thus, the WWTP appears to be very effective at removing copper based on copper levels measured in the water supply. It is recommended that the City collect composite samples for the influent, secondary effluent, and permeate effluent and analyze for total and dissolved copper to establish the percentage of removal by the secondary treatment process and the membranes on a seasonal basis. This data will provide a basis for design of any improvements required to consistently meet future NPDES permit limits should copper exceed aquatic life criteria.

Whole Effluent Toxicity

In addition to analyzing the effluent for individual pollutants, the City of Ashland also tests the effluent to determine its aggregate effect on aquatic organisms. These tests are known as whole effluent toxicity (WET) tests. Effluent samples are collected and aquatic organisms are subjected to various effluent concentrations in controlled laboratory experiments.

WET tests are used to determine the percentage of effluent that produces an adverse effect on a group of test organisms. The measured effect may be fertilization, growth, reproduction, or survival. EPA's methodology includes both an acute test and a chronic test. An acute WET test is considered to show toxicity if significant mortality occurs at effluent concentrations less than that which is found at the edge of the zone of immediate dilution (ZID). A chronic WET test is considered to show toxicity if significant adverse affects occur at effluent concentration less than that which is known to occur at the edge of the mixing zone.

EPA has developed WET test protocols using freshwater, marine, and estuarine test species. EPA recommends running tests using an invertebrate, vertebrate, and a plant test organism. Organisms used in WET tests are indicators or surrogates for the aquatic community to be protected, and a measure of the real biological impact from exposure to the effluent. To protect water quality, EPA recommends that WET tests be used in NPDES permits together with requirements based on chemical-specific monitoring.

Ashland conducted WET tests in 2006, 2007, 2008, 2010, 2011, 2012, 2013, and 2014. The test organisms for all tests were Ceriodaphnia dubia (water flea) and Pimephales promelas (fathead minnow). For test from 2011 to 2014 the test also included algae (Raphidocelis subcapitata, formerly known as Selenastrum capricornutum). All tests showed no acute toxicity (24-hour) in any of the tests using 100% effluent. The water flea and fathead minnow chronic bioassays resulted in no observed effect concentration (NOEC) in 100 percent effluent. For the chronic toxicity test for algae the 25% inhibited concentration had results below 100% indicating some toxicity for some of the sampling periods.

Plant Reliability Criteria

The plant should have sufficient redundancy to continue operating when primary equipment units are in need of repair, when maintenance is required, and under emergency conditions.

Oregon's Regulations for Biosolids Management

Waste Activated Sludge (WAS) is the term used for biomass removed from wastewater during treatment. Once WAS is separated from the wastewater treatment process and stabilized, it is termed a biosolid. Biosolids can be used for beneficial purposes such as domestic and commercial fertilizers. To ensure safe use of the nutrient-rich biosolids, regulations have been developed regarding the generation, handling, and ultimate disposal of biosolids.

State Regulations

While EPA has not officially delegated enforcement of Federal biosolids regulations to the State of Oregon, the Oregon DEQ administers the biosolids management program through their Water Quality Program. The State of Oregon first adopted regulations regarding land disposal of biosolids in 1983. In 1995, the rules were revised to comply with the new Federal biosolids regulations (i.e. 40 CFR Part 503) and can be found in *Oregon Administrative Rules (OAR) Chapter 340, Division 50 – Land Application of Domestic Wastewater Treatment Facility Biosolids, Biosolids Derived Products, and Domestic Septage*. OAR Chapter 340, Division 50 includes regulations for land application criteria, monitoring and reporting, and best management practices specific to the State of Oregon.

Biosolids are regulated by the Oregon Department of Environmental Quality [8] as part of their Water Quality Program. A treatment plant's NPDES permit is used to describe specific sludge handling practices which are approved for each individual facility. Each facility must have a current sludge management plan and site authorization letters which detail how sludge is stabilized and ultimately disposed on a specific land application site. These documents also include monitoring and reporting requirements. The permit, sludge management plan, and the site authorization letters can be used in enforcement actions by the Agency.

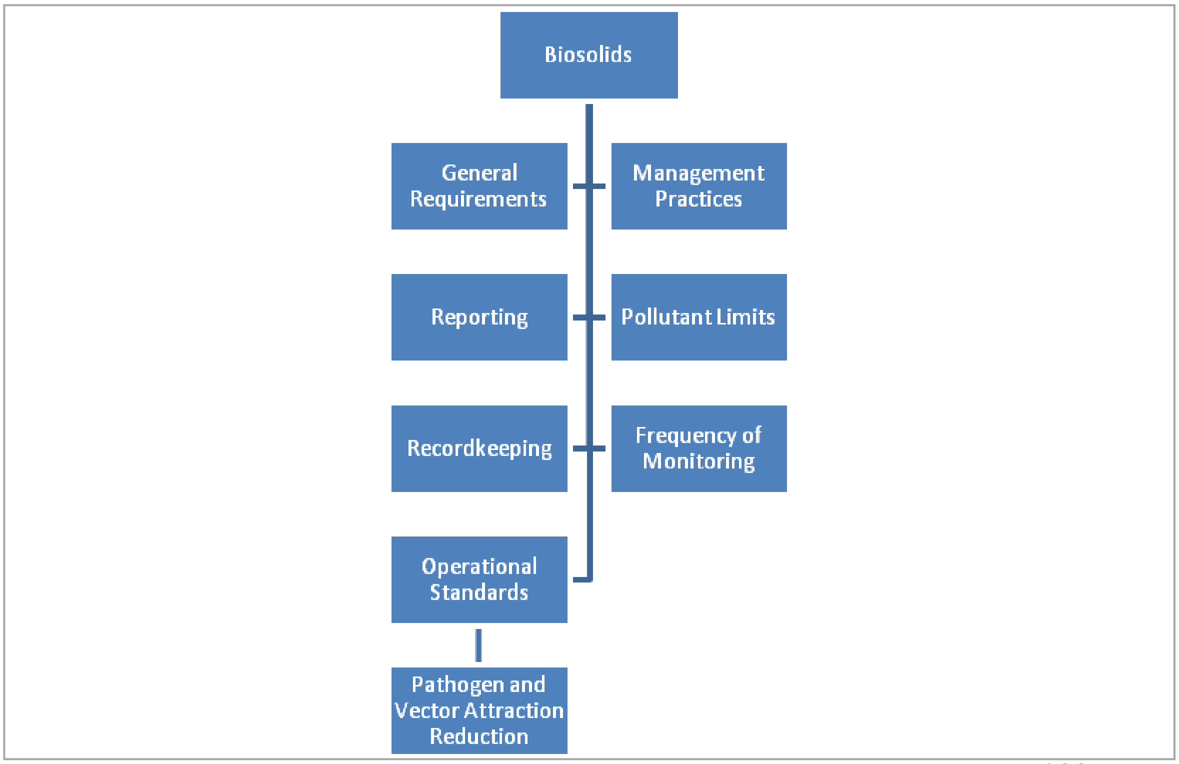
The City of Ashland currently dewaters their waste activated sludge using centrifuges, and landfills the dewatered sludge without stabilization. The City's NPDES permit [3] states that the City is exempt from requirements to have a sludge management plan since they landfill their sludge in a State-approved facility. Landfilled sludge is regulated as a solid waste under OAR Chapter 340, Division 93.

Federal Regulations

The OARs for biosolids management are based on EPA biosolids regulations and contain detailed requirements regarding facility permits, responsibility for proper handling, limitations on the use of biosolids, agronomic rate application, land application site selection and approval, and biosolids management plans. The OARs also describe the State requirements for monitoring, recordkeeping, and reporting for land application sites [8].

In selecting the appropriate methods of solids processing, reuse, and disposal, consideration must be given to the established EPA biosolids regulations which are referenced in the OARs. In the United States, biosolid regulations are contained in *The Standards for the Use or Disposal of Sewage Sludge* (Title 40 of the Code of Federal Regulations, Part 503). This standard was published on February 19, 1993 and is commonly referred to as the Part 503 Rule. These regulations are all encompassing, and include requirements for monitoring, record-keeping, transporting, and disposing biosolids (See Chart D.1). Biosolids management agencies apply for a permit covering biosolids use or disposal if they own or operate a treatment works treating domestic sewage [9].

CHART D.1: Regulation Subparts Applicable to Ashland WWTP



Source: Ref. [9]

Pathogen Reduction [9]

Under the Part 503 Rule, biosolids are designated Class A or Class B in regard to the level of pathogen reduction achieved through treatment. These classifications indicate the density (numbers/unit mass) of pathogens in biosolids where applicable. Class A designations require greater reduction, but offer more disposal options than Class B or solids without pathogen reduction treatment.

Exceptional Quality (EQ) or Class A biosolids are considered to be the highest quality biosolid characterized by low pollutants, pathogens below detectable limits (including enteric viruses, pathogenic bacteria, and viable helminth ova) and reduced levels of degradable compounds that attract vectors. Once steps have been taken to generate a Class A biosolid, it is considered a product that is virtually unregulated and can be given away to the general public for use in home gardens as a compost or fertilizer.

Pollutant Concentration (PC) or Class B biosolids meet the same low pollutant concentration limits as EQ or Class A biosolids. However, they do not have similar pathogen reductions and are therefore, subject to site management practices. It should be noted that pathogens are reduced to levels that are unlikely to pose a threat to public health and the environment under specific use conditions. Class B biosolids cannot be sold or given away in bags or other containers to the general public, but may be applied to crops as fertilizer.

The Part 503 Rule lists six alternatives for treating biosolids to Class A standards (the treatment must address pathogen and vector reduction):

- Alternative 1: Thermally Treated Biosolids – Biosolids must be subjected to one of four time-temperature regimes.

- Alternative 2: Biosolids Treated in a High pH-High Temperature Process – Biosolids must meet specific pH, temperature, and air-drying requirements.
- Alternative 3: Biosolids Treated in Other Processes – The applicant must demonstrate that the process can reduce enteric viruses and viable helminth ova and then maintain operating conditions used in the demonstration after the pathogen reduction demonstration is completed.
- Alternative 4: Biosolids Treated in Unknown Processes – In lieu of demonstrating a treatment process to be maintained, biosolids are tested for several pathogens which include Salmonella sp. or fecal coliform bacteria, enteric viruses, and viable helminth ova at the time the biosolids are used or disposed, or, in certain situations, prepared for use or disposal.
- Alternative 5: Biosolids Treated in a Process to Further Reduce Pathogens (PFRP) - Biosolids must be treated using one of the listed PFRP options below:
    - Composting
    - Heat Drying
    - Heat Treatment
    - Thermophilic Aerobic Digestion
    - Beta Ray Irradiation
    - Gamma Ray Irradiation
    - Pasteurization
- Alternative 6: Biosolids Treated in a Process Equivalent to a PFRP -The regulatory agency can approve a process that is shown to be equivalent to the PFRPs listed under Alternative 5.

Chart D.2 lists the specific pathogen requirements that must be satisfied by the selected treatment alternative in order for a biosolid to be considered Class A.

CHART D.2: Class A Pathogen Reduction Requirements

The following requirements must be met for ***all*** six Class A pathogen alternatives.

Either:

the density of fecal coliform in the biosolids must be less than 1,000 most probable numbers (MPN) per gram total solids (dry-weight basis),

or

the density of *Salmonella* sp. bacteria in the biosolids must be less than 3 MPN per 4 grams of total solids (dry-weight basis).

Either of these requirements must be met at one of the following times:

— when the biosolids are used or disposed;

— when the biosolids are prepared for sale or give-away in a bag or other container for land application; or

— when the biosolids or derived materials are prepared to meet the requirements for EQ biosolids (see Chapter 2).

Pathogen reduction must take place before or at the same time as vector attraction reduction, except when the pH adjustment, percent solids vector attraction, injection, or incorporation options are met.

The Part 503 Rule lists three alternatives for treating biosolids to meet Class B standards:

- Alternative 1: The Monitoring of Indicator Organisms – Testing for fecal coliform density is used as an indicator for all pathogens. The geometric mean of seven samples must be less than 2 million MPN per gram per total solids or less than 2 million CFU's per gram of total solids at the time of use or disposal.
- Alternative 2: Biosolids Treated in a Process to Significantly Reduce Pathogens (PSRP) – Biosolids must be treated using one of the listed PFRP options below:
  - Aerobic Digestion Air Drying
  - Anaerobic Digestion
  - Composting
  - Lime Stabilization
- Alternative 3: Biosolids Treated in a Process Equivalent to a PSRP – Biosolids are treated using a process that has been determined to be equivalent to a listed PSRP by the regulatory agency.

Vector Attraction Reduction [9]

In addition to pathogen reduction, biosolids have different disposal options according to the level of Vector Attraction Reduction (VAR) achieved through treatment. The pathogens in biosolids pose a disease risk to humans via vector transmission. Vectors of concern include flies, mosquitoes, fleas, rodents, and birds. The Part 503 Rule contains 12 options, which are summarized in Chart D.3, for demonstrating VAR.

CHART D.3: Vector Attraction Reduction Options

Option 1:	Meet 38 percent reduction in volatile solids content.
Option 2:	Demonstrate vector attraction reduction with additional anaerobic digestion in a bench-scale unit.
Option 3:	Demonstrate vector attraction reduction with additional aerobic digestion in a bench-scale unit.
Option 4:	Meet a specific oxygen uptake rate for aerobically digested biosolids.
Option 5:	Use aerobic processes at greater than 40°C for 14 days or longer.
Option 6:	Alkali addition under specified conditions.
Option 7:	Dry biosolids with no unstabilized solids to at least 75 percent solids.
Option 8:	Dry biosolids with unstabilized solids to at least 90 percent solids.
Option 9:	Inject biosolids beneath the soil surface.
Option 10:	Incorporate biosolids into the soil within 6 hours of application to or placement on the land.
Option 11:	Cover biosolids placed on a surface disposal site with soil or other material at the end of each operating day. (Note: Only for surface disposal.)
Option 12:	Alkaline treatment of domestic septage to pH 12 or above for 30 minutes without adding more alkaline material.

Current sludge handling and disposal practices used by the City of Ashland will be evaluated based on these regulations and additional alternatives developed for consideration. Further discussion is included in Chapter 11 of this report.

GASB-34 Requirements

GASB-34 is short for Governmental Accounting Standards Board Statement 34: *Basic Financial Statements and Management's Discussion and Analysis for State and Local Governments*. This 1999 document requires state and local governments to switch from cash-based accounting to accrual-based accounting, which is considered to have less room for distortion.

The City of Ashland has implemented GASB 34 accounting practices since 2005, and was awarded the "Certificate of Achievement for Excellence in Financial Reporting" by the Government Finance Officers Association. The City uses modified accrual, and it has set up sound criteria for capitalizing any fixed assets acquired whether for maintenance or for new acquisitions.

Greenhouse Gas Policies [10]

The Oregon legislature passed a bill in 2007 to curb the state's greenhouse gas (GHG) emissions. Using 1990 emission levels as a benchmark, the bill established goals for GHG emissions of 10% below 1990 levels by the year 2020 and 75% below 1990 levels by the year 2050. In 2010 the Oregon Global Warming Commission began a "*Roadmap to 2020*" Project to offer recommendations for how to meet those goals. No policies or guidance relative to wastewater treatment plants have been developed at this point, and reporting of GHG emissions from wastewater treatment facilities has temporarily been deferred by DEQ pending adoption of a quantification protocol (GHG reporting is required for other facilities emitting 2,500 metric tons or more of carbon dioxide equivalent).

RECYCLED WATER (REUSE) REGULATIONS

Recycled water use in Oregon typically requires an NPDES or WPCF permit and a Recycled Water Use Plan (RWUP). Reuse of wastewater effluent is governed by recycled water regulations as outlined in Oregon Administrative Rules (OAR) 340-55. The April 2008 revisions to Oregon's Recycled Water Use Rules allow the use of recycled water for beneficial purposes if the use provides a resource value and protects public health and the environment. Replacing another water source that would be used under the same circumstances or supplying nutrients to a growing crop, are considered as resource values and beneficial purposes.

OAR 340-55 defines five categories of effluent, identifies allowable uses for each category, and provides requirements for treatment, monitoring, public access, and setback distances. Irrigation of fodder, fiber, and seed crops not for human consumption is allowed for any class of effluent. Fewer restrictions are imposed for higher quality effluent, as shown in the following table.

TABLE D.4: Requirements for Reuse of Effluent by Category [11]

	Class A	Class B	Class C	Class D	Non-disinfected
Treatment[1]	O,D,F	O,D	O,D	O,D	O
Effluent coliform, #/100 mL	2.2	2.2	23	126 ecoli	Per permit
Public access[2]		Limited	Limited	Controlled	Prevented
Setback to property line[3]		10 ft.	70 ft.	100 ft.	Per RWUP
Setback to water supply source		50 ft.	100 ft.	100 ft.	150 ft.

1. O = oxidized, D = disinfection, F = filtration
2. Limited public access: no direct contact during irrigation cycle
3. Sprinkler irrigation assumed

For recycled water use, groundwater must be protected in accordance with the requirements of OAR 340-40. For agricultural use, this typically translates to irrigating at agronomic rates to match the net irrigation requirements of the crops.

Reuse in treatment plant processes or for landscape irrigation at the plant is exempt from the rules of OAR 340-055 if the water is oxidized and disinfected, there is no off-site spray drift, and public access is restricted.

CITY POLICIES & GUIDELINES

Phosphate Ban

The City Council, in recognition of water quality issues in the Bear Creek sub-basin, instituted a phosphate ban in 1991 (City Ordinance 2623; Municipal Code 14.09.10 Phosphate Ban). The ordinance prohibits the sale or distribution within the City of Ashland city limits of any cleaning agents containing more than 0.5 percent phosphorus by weight, except cleaning agents used in automatic dishwashing machines shall not exceed 8.7 percent phosphorus by weight.

Pretreatment Ordinance

The City of Ashland is not aware of any significant industrial users that would require development of an industrial pretreatment program. DEQ has indicated that they will require that the City complete a industrial user survey to see if any existing facilities met current criteria. In the event that significant industrial users are identified, the City would be required to make modifications to their ordinances that would provide the City with the regulatory authority required to monitor and enforce EPA pretreatment requirements. Additionally, the City may need to enter into separate agreements or develop industry-specific permits with these users.

The City also has a significant number of food service establishments that generate fats, oils and grease (FOG) with the potential to cause sewer blockages that can lead to SSOs. Further discussion of pretreatment in this document will refer only to FOG issues.

The City conducted a FOG survey in spring 2010, with 35 food service establishments filling out questionnaires. (This represents about 35% of the food service establishments listed in the Ashland yellow pages.) Facilities in existence prior to the City's adoption of the plumbing code were not required to install grease traps, and there is currently no ordinance that would require existing facilities to install grease control devices.

Regulations for controlling FOG were drafted in 2005, but the ordinance proposing addition of the regulations to the Municipal Code has not been adopted. The draft regulations are quite extensive (40 pages), and include requirements for an industrial wastewater discharge permit from the City in addition to FOG pretreatment. The ordinance would require all *existing* Food Service Establishments to install grease control devices within three years of adoption of the regulations.

Though there is no formal FOG ordinance in place, the City has taken several steps to address the issue of FOG entering the sewer system through their draft FOG pretreatment program. A public education program has also been instituted. Flyers and brochures have been prepared for customers, and a guide (*Clean Drains for food service establishments*) has been made available to assist food service personnel in developing Best Management Practices (BMPs) that will reduce FOG discharged to the sewer system. These include BMPs for clean kitchen practices, recycling FOG, grease interceptor operation, grease trap operation, and vent hood and filters.

If the results of the educational effort do not prove sufficient to address FOG issues, the City should consider a more comprehensive enforcement-based program in addition to public education. Establishing legal authority over food service discharges can be accomplished by modifying the sewer use ordinance to specifically address oil and grease sources, writing a stand-alone sewer use ordinance, or directly permitting the sources (would require the most time and resources to implement). The FOG ordinance drafted in 2005 is a stand-alone use ordinance that also requires source permitting. A simpler ordinance could be developed that would achieve the City's goals, and should include the following components:

- Declaration of policy (objectives and authorization to adopt rules)
- Installation requirement
  - New food service facility, including addition of food service facility in existing building
  - Existing food service facility being remodeled
  - Existing food service facility that has contributed to grease problems or blockages in the sanitary sewer
  - Existing food service facility with change of ownership
- Sizing: Reference State Plumbing Code
- Maintenance requirement: Required cleaning frequency could be a constant for all sources (e.g. monthly for outside units, 1-2 weeks for inside units); specific to types of sources based on amount of grease generated and history of sewer blockages; or specific to individual sources based on capacity of grease control device, amount of grease generated by the source, BMPs implemented, and history of sewer blockages
- Recordkeeping: Facility to maintain pumping reports to document compliance with maintenance schedule
- Compliance: Based on enforcement of grease control device installation requirements and established maintenance schedules, with possible submittal of pumping reports and/or periodic inspections
- Established penalties for violations (so facilities know consequences of noncompliance beforehand), based on the severity and impact of the violation and the number of successive occurrences of the violation

Other Policies and Procedures

The City currently has many great collection and facility sewer policies and procedures that are not currently written or codified. These include the following:

1. The City encourages training and certification of their operators, and is in the process of developing internal minimum number of hours required for operations staff to train in various categories at the treatment plant.
2. Another practice that the City follows is regular TV and cleaning. The city has proactive procedures relating to the maintenance program that include adjusting frequency of cleaning and TVing of collection system, and frequent maintenance activities.
3. The treatment plant has a number of safety plans and procedures for separate components that should be incorporated into a coordinated safety program. Public works staff are regularly trained in safety practices (e.g. first aid, fall protection, confined space entry, etc.) by a third party entity that has been hired to provide this service.

References

1. Oregon Department of Environmental Quality: *Internal Management Directive -Sanitary Sewer Overflows*, November 2010.

2. U.S. Environmental Protection Agency: *Infiltration / Inflow, I/I Analysis and Project Certification*. Ecology Publication No. 97-03, May 1985.

3. Oregon Department of Environmental Quality, Western Region, Salem Office: *National Pollutant Discharge Elimination System Waste Discharge Permit No. 101609* (issued to City of Ashland, OR)*,* May 27, 2004.

4. Oregon Department of Environmental Quality: *Bear Creek Watershed TMDL*, July 2007.

5. Jon Gasik: *City of Ashland Excess Thermal Load Limits*, WQ File No. 3780, ODEQ Memorandum, February 16, 2011.

6. http://water.epa.gov/scitech/swguidance/waterquality/standards/criteria/aqlife/pollutants/ammonia/upload/2009_12_23_criteria_ammonia_2009update.pdf)

7. http://www.deq.state.or.us/wq/SB737/index.htm

8. Oregon Department of Environmental Quality: *Biosolids Management Program;* http://www.deq.state.or.us/wq/biosolids, January 2011.

9. U.S. Environmental Protection Agency, Office of Wastewater Management: *A Plain English Guide to the EPA Part 503 Biosolids Rule;* EPA/832/R-93/003, Washington, DC, 1994

10. http://www.deq.state.or.us/aq/climate/reporting.htm

11. http://metolian.com/assets/Exhibit%2031%20Effluent%20DEQ%20(Comp).pdf

12. Carollo Engineers: *City of Ashland Water Conservation & Reuse Study (WCRS) & Comprehensive Water Master Plan (CWMP), Technical Memorandum No. 7 – Recycled Water Regulations*, September 2010.

13. Metcalf & Eddy, Inc.: *Wastewater Engineering: Treatment and Reuse, 4th ed.,* McGraw-Hill, New York, 2003.

14. North Carolina Dept. of Environment and Natural Resources: *Considerations in Establishing a Municipal Oil and Grease Program,* November 1999.

EXISTING NPDES PERMIT

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT

Department of Environmental Quality
Western Region – Salem Office
750 Front Street NE, Suite 120, Salem, OR 97301-1039
Telephone: (503) 378-8240

Issued pursuant to ORS 468B.050 and The Federal Clean Water Act

ISSUED TO:
Ashland, City of
20 East Main Street
Ashland, Oregon 97520

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Wastewater	001	R.M. 0.25
Reclaimed Water Reuse	002	

FACILITY TYPE AND LOCATION:
Oxidation Ditch
Ashland STP
1/4 Mile NW of Nevada St. & Oak St.
Ashland

Treatment System Class: Level IV
Collection System Class: Level III
EPA REFERENCE NO: OR-002073-7

RECEIVING STREAM INFORMATION:
Basin: Southern Oregon Coastal
Sub-Basin: Middle Rogue

Receiving Stream: Ashland Creek
LLID: 1227202422154 - 0.25 - D
County: Jackson

Issued in response to Application Nos. 988564 received 10/02/2000 and 985027 received 12/06/2002. This permit is issued based on the land use findings in the permit record.

Michael H. Kortenhof, Water Quality Manager
Western Region

May 27, 2004
Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system and discharge to public waters adequately treated wastewaters only from the authorized discharge point or points established in Schedule A and only in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

Page

Unless specifically authorized by this permit, by another NPDES or WPCF permit, or by Oregon Administrative Rule, any other direct or indirect discharge to waters of the state is prohibited, including discharge to an underground injection control system.

SCHEDULE A

1. **Waste Discharge Limitations not to be exceeded after permit issuance.**

a. Treated Effluent Outfall 001

(1) May 1 - August 31 and November 1 – November 30:

Parameter	Average Effluent Concentrations (mg/L) Monthly	Weekly	Daily	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
$CBOD_5$	10	15		120	210	380
TSS	10	15		96	180	480
Ammonia (see note 2)	0.52		1.2			
Phosphorus				1.6		5.1

(2) September 1 – October 31:

Parameter	Average Effluent Concentrations (mg/L) Monthly	Weekly	Daily	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
$CBOD_5$	4	5		77	120	250
TSS	10	15		96	180	480
Ammonia (see note 2)	0.52		1.2			
Phosphorus				1.6		5.1

(3) December 1 - April 30:

Parameter	Average Effluent Concentrations (mg/L) Monthly	Weekly	Daily	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
$CBOD_5$	25	40		400	920	1500
TSS	30	45		400	920	1500
Ammonia (See note 2)	0.80		1.8			

* Average dry weather design flow to the facility equals 2.3 MGD. Mass load limits have been individually assigned.

(4)

Other parameters (year-round except as noted)	Limitations
E. coli Bacteria	Shall not exceed 126 organisms per 100 mL monthly geometric mean. No single sample shall exceed 406 organisms per 100 mL. (See Note 1)
pH	Shall be within the range of 6.5 - 8.5
$CBOD_5$ and TSS Removal Efficiency	Shall not be less than 85% monthly average for $CBOD_5$ and 85% monthly for TSS.
Dissolved Oxygen (Oct 15 though May 15)	Shall not be less than 9.0 mg/L
Excess Thermal Load (Oct 15 though May 15)	Shall not exceed 78 million kcals/day (See Note 3)
Excess Thermal Load (May 16 though Oct 14)	Shall not exceed 38 million kcals/day (See Note 3)

(5) Except as provided for in OAR 340-045-0080, no wastes shall be discharged and no activities shall be conducted which violate Water Quality Standards as adopted in OAR 340-041-0365, except in the following defined temperature mixing zone:

The allowable temperature mixing zone is that portion of Ashland Creek which allows for mixing of the treated effluent with 25 percent of the stream flow.

(6) Raw sewage discharges are prohibited to waters of the State from November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm, and from May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm.

(7) If an overflow occurs between May 22 and June 1, and if the permittee demonstrates to the Department's satisfaction that no increase in risk to beneficial uses occurred because of the overflow, no violation shall be triggered if the storm associated with the overflow was greater than the one-in-five-year, 24-hour duration storm.

(8) Chlorine and chlorine compounds shall not be used as a disinfecting agent of the treated effluent and no chlorine residual shall be allowed in the discharged effluent due to chlorine used for maintenance purposes.

b. Reclaimed Wastewater Outfall 002

(1) No discharge to state waters is permitted. All reclaimed water shall be distributed on land, for dissipation by evapotranspiration and controlled seepage by following sound irrigation practices so as to prevent:

a. Prolonged ponding of treated reclaimed water on the ground surface;

b. Surface runoff or subsurface drainage through drainage tile;

c. The creation of odors, fly and mosquito breeding or other nuisance conditions;

d. The overloading of land with nutrients, organics, or other pollutant parameters; and,

e. Impairment of existing or potential beneficial uses of groundwater.

(2) Prior to land application of the reclaimed water, it shall receive at least level IV treatment as defined in OAR 340-055 to:

(a) Reduce Total Coliform to a seven-day median of 2.2 organisms per 100 mL and a maximum of 23 organisms per 100 mL.

(b) Reduce turbidity to a 24-hour mean of 2 Nephelometric Turbidity Units (NTUs) with no more than five percent of the samples during a 24-hour period exceeding 5 NTUs.

(3) Irrigation shall conform to the reclaimed water use plan once approved by the Department. The plan shall contain a description of the design of the proposed reclamation system and shall clearly indicate the means for compliance with OAR 340-041-0055.

c. No activities shall be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater and process related residuals shall be managed and disposed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040)

NOTES:

1. If a single sample exceeds 406 organisms per 100 mL, then five consecutive re-samples may be taken at four-hour intervals beginning within 28 hours after the original sample was taken. If the log mean of the five re-samples is less than or equal to 126 organisms per 100 mL, a violation shall not be triggered.

2. The ammonia limits were calculated using the EPA Gold Book Criteria and are considered interim limits. DEQ is in the process of adopting the EPA 1999 ammonia criteria. Upon approval by the EPA, the following limits will automatically be applied to the discharge without a permit modification:

Parameter	Average Effluent Concentrations (mg/L)		
	Monthly	Weekly	Daily
Ammonia (May 1 - November 30)	1.2		2.4
Ammonia (December 1 – April 30)	2.0		3.3

3. The Excess Thermal Load limits are interim limits that were calculated using the average dry weather design flow and an estimated maximum weekly effluent temperature. The Department also calculated water quality based Excess Thermal Limits using projected estimations of the worst case conditions. These water quality based Excess Thermal Limits will become effective 55 months after permit issuance, unless modified as described below:

Other parameters	Limitations
Excess Thermal Load (Oct 15 though May 15)	Shall not exceed 2.8 million kcals/day
Excess Thermal Load (May 16 though Oct 14)	Shall not exceed 21 million kcals/day

The Department recognizes that the estimation of critical stream flow conditions are based on minimal information and that additional stream flow information is needed to provide a more accurate estimate. Schedule B, condition 1.d. requires the Permittee to collect this additional stream flow information. Schedule C, condition 1 also allows time to implement thermal reduction activities and requires the Permittee to provide better estimates of the critical low flow conditions. Upon receipt of this additional information, the Department intends to recalculate the Excess Thermal Loads, re-open this permit, and modify the allowable thermal load.

The Permittee has chosen riparian improvements as a portion of their thermal reduction program. This permit may be re-opened, and the maximum allowable thermal load modified, when more accurate effluent temperature data becomes available or when a water quality credit trading plan is authorized by the Department.

In addition, upon approval of a Total Maximum Daily Load for temperature for this sub-basin, this permit may be re-opened and new temperature and/or thermal load limits assigned.

SCHEDULE B

1. **Minimum Monitoring and Reporting Requirements** (unless otherwise approved in writing by the Department).
The permittee shall monitor the parameters as specified below at the locations indicated. The laboratory used by the permittee to analyze samples shall have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results shall be included in the report, but not used in calculations required by this permit. When possible, the permittee shall re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

a. Influent

Influent samples and measurements are taken just before the grit basin. All samples for toxics are taken in the same location.

Item or Parameter	Minimum Frequency	Type of Sample
$CBOD_5$	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab

b. Treated Effluent Outfall 001

The facility effluent sampling locations are the following:

- When using the membrane filtration system, effluent samples and measurements are taken from membrane building effluent well.
- When the membrane filtration system is not in use, effluent samples and measurements are taken from the re-aeration chamber just downstream of the UV disinfection system.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Semi-Annual	Verification
$CBOD_5$	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab
E. coli	2/Week	Grab (See Note 1)
UV Radiation Intensity	Daily	Reading (See Note 3)
Pounds Discharged ($CBOD_5$ and TSS)	2/Week	Calculation
Average Percent Removed ($CBOD_5$ and TSS)	Monthly	Calculation
Ammonia (NH3-N)	2/Week	Composite
Nutrients		
TKN, NO2+NO3-N, Total Phosphorus, ortho phosphorus	2/Week (May 1- Nov 30) Monthly (Dec 1 – Apr 30)	24-hour Composite
Toxics:		
Whole Effluent Toxicity (WET) test (See Note 2)	Semi-annually	See Schedule D condition 3
Priority Pollutant Scan	3 per year	See Schedule D condition 4

b. Treated Effluent Outfall 001 (continued)

Item or Parameter	Minimum Frequency	Type of Sample
Other Parameters:		
Dissolved Oxygen	2/Week (Oct 15 – May 15)	Grab
Temperature, Daily Max	Daily	Monitor (See Note 4)
Effluent Temperature, Average of Daily Maximums (See Note 4)	Weekly	Calculation
Excess Thermal Load (See Note 4)	Weekly	Calculation (See Note 5)

c. Reclaimed Wastewater Outfall 002

The reclaimed water sampling locations shall be as specified in the Department approved reclaimed water use plan.

Item or Parameter	Minimum Frequency	Type of Sample
Quantity Irrigated (inches/acre)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
Quantity Chlorine Used	Daily	Measurement
Chlorine Residual	Daily	Grab
pH	2/Week	Grab
Total Coliform	Daily	Grab
Turbidity	Hourly	Measurement
Nutrients (TKN, NO_2+NO_3-N, NH_3, Total Phosphorus)	Quarterly	Grab

d. Ashland Creek Monitoring

Item or Parameter	Minimum Frequency	Type of Sample
Flow (upstream)	Daily	Measurement
Dissolved Oxygen (surface water)	2/month	Grab
Intergravel Dissolved Oxygen	1/year (See note 6)	Study

e. Sludge Management

Item or Parameter	Minimum Frequency	Type of Sample
Quantity of sludge disposed	Daily	Pounds of sludge disposed

2. **Reporting Procedures**

a. Monitoring results shall be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the Department's Western Region - Medford office by the 15th day of the following month.

b. State monitoring reports shall identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports shall also identify each system classification as found on page one of this permit.

c. Monitoring reports shall also include a record of the quantity and method of use of all sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

3. **Report Submittals**

a. The permittee shall have in place a program to identify and reduce inflow and infiltration into the sewage collection system. An annual report shall be submitted to the Department by February 1 each year which details sewer collection maintenance activities that reduce inflow and infiltration. The report shall state those activities that have been done in the previous year and those activities planned for the following year.

b. For any year in which biosolids are land applied or used as land fill cover, a report shall be submitted to the Department by February 19 of the following year that describes solids handling activities for the previous year and includes, but is not limited to, the required information outlined in OAR 340-050-0035(6)(a)-(e).

c. By no later than January 15 of each year, the permittee shall submit to the Department an annual report describing the effectiveness of the reclaimed water system to comply with approved reclaimed water use plan, the rules of Division 55, and the limitations and conditions of this permit applicable to reuse of reclaimed water.

NOTES:

1. *E. coli* monitoring must be conducted according to any of the following test procedures as specified in **Standard Methods for the Examination of Water and Wastewater, 19th Edition**, or according to any test procedure that has been authorized and approved in writing by the Director or an authorized representative:

Method	Reference	Page	Method Number
mTEC agar, MF	Standard Methods, 18th Edition	9-29	9213 D
NA-MUG, MF	Standard Methods, 19th Edition	9-63	9222 G
Chromogenic Substrate, MPN	Standard Methods, 19th Edition	9-65	9223 B
Colilert QT	Idexx Laboratories, Inc.		

2. Beginning no later than January 1, 2005, the permittee shall conduct Whole Effluent Toxicity (WET) testing for a period of one (1) year in accordance with the frequency specified above. If the WET tests show that the effluent samples are not toxic at the dilutions determined to occur at the Zone of Immediate Dilution and the Mixing Zone, no further WET testing will be required during this permit cycle. Note that WET test results will be required along with the next NPDES permit renewal application.

3. The intensity of UV radiation passing through the water column will affect the systems ability to kill organisms. To track the reduction in intensity, the UV disinfection system must include a UV intensity meter with a sensor located in the water column at a specified distance from the UV bulbs. This meter will measure the intensity of UV radiation in mWatts-seconds/cm2. The daily UV radiation intensity shall be determined by reading the meter each day. If more than one meter is used, the daily recording will be an average of all meter readings each day.

4. Temperature shall be continuously monitored with a maximum of 20 minute increments. The maximum value recorded during a 24 hour period shall be reported on the monthly reports. In the event the continuous temperature recorder malfunctions, Permittee shall record grab measurements at one-hour intervals. Instrumentation malfunctions shall be noted on the monthly reports.

5. Calculated as follows:
(Weekly average of daily maximum effluent temperatures in °C - applicable stream temperature standard) X (Weekly average of daily flow in MGD) X 3.785 = Excess Thermal Load, in Million Kcals/day.

6. The City is not required to perform the IGDO studies in condition 1.d. until the Department has provided the City with a written procedure that has been reviewed and accepted by the National Marine Fisheries Service and the Oregon Department of Fish and Wildlife.

SCHEDULE C

Compliance Schedules and Conditions

1. By May 27, 2006, the permittee shall complete the thermal reduction measures recommended in the Wastewater Treatment Plant Temperature Management Plan (April 2002). These measures are as follows:

   MP-1: The City will develop a market evaluation and water recycling plan. The planning process will include a public education component about the water quality of Ashland's effluent, a market survey, opportunities to increase stream flow by offsetting existing irrigation demand, and the development of infrastructure needs and costs to meet existing and future market demand for recycled water.

   MP-4: The City will develop and implement a riparian corridor improvement plan for Ashland Creek. The plan would include temperature modeling to predict the benefits of modifying the riparian corridor, identification of stream reaches that need improvement, and the development of effective and needed modifications. In addition to improving temperature, the planning would focus on improving both in-stream and riparian habitat, reducing flooding, and improving aesthetics.

   Bay May 27, 2007, the permittee shall submit a report detailing the effectiveness of measures MP-1 and MP-4. The report shall include information collected on Ashland Creek, including daily stream flow and temperatures. The report shall also provide estimates of critical low flows. If the water quality based excess thermal limits in Schedule A, Note 3 are not achieved, the report shall include an evaluation of the cost effectiveness of additional temperature reduction measures and a selected preferred alternative. Upon Department review and approval, the permittee shall implement the preferred alternative.

2. The permittee is expected to meet the compliance dates which have been established in this schedule. Either prior to or no later than fourteen days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director may revise a schedule of compliance if he/she determines good and valid cause resulting from events over which the permittee has little or no control.

SCHEDULE D

Special Conditions

1. Prior to increasing thermal load (flow or temperature) beyond the current permit limitations, the Permittee shall notify the Department and apply for and be issued a permit modification allowing the increase.

2. The facility's sludge is currently disposed of in a Department approved landfill as a solid waste (either in a landfill cell or is used as interim cover). Disposal must be in accordance with OAR Chapter 340, Division 93. Proper waste monitoring would be prescribed by the landfill in accordance with that rule. Monitoring and reporting as biosolids is not required under this permit.

3. **Whole Effluent Toxicity (WET) Testing**

   a. The permittee shall conduct whole effluent toxicity tests as specified in Schedule B of this permit.

   b. WET tests may be dual end-point tests, only for the fish tests, in which both acute and chronic end-points can be determined from the results of a single chronic test (the acute end-point shall be based upon a 48-hour time period).

   c. Acute Toxicity Testing - Organisms and Protocols

      (1) The permittee shall conduct 48-hour static renewal tests with the *Ceriodaphnia dubia* (water flea) and the *Pimephales promelas* (fathead minnow).

      (2) The presence of acute toxicity will be determined as specified in **Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms**, Fourth Edition, EPA/600/4-90/027F, August 1993.

      (3) An acute WET test shall be considered to show toxicity if there is a statistically significant difference in survival between the control and 100 percent effluent, unless the permit specifically provides for a Zone of Immediate Dilution (ZID) for biotoxicity. If the permit specifies such a ZID, acute toxicity shall be indicated when a statistically significant difference in survival occurs at dilutions greater than that which is found to occur at the edge of the ZID.

   d. Chronic Toxicity Testing - Organisms and Protocols

      (1) The permittee shall conduct tests with: *Ceriodaphnia dubia* (water flea) for reproduction and survival test endpoint, *Pimephales promelas* (fathead minnow) for growth and survival test endpoint, and *Raphidocelis subcapitata* (green alga formerly known as *Selanastrum capricornutum*) for growth test endpoint.

      (2) The presence of chronic toxicity shall be estimated as specified in **Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms**, Third Edition, EPA/600/4-91/002, July 1994.

      (3) A chronic WET test shall be considered to show toxicity if a statistically significant difference in survival, growth, or reproduction occurs at dilutions greater than that which is known to occur at the edge of the mixing zone. If there is no dilution data for the edge of the mixing zone, any chronic WET test that shows a statistically significant effect in 100 percent effluent as compared to the control shall be considered to show toxicity.

e. Quality Assurance

(1) Quality assurance criteria, statistical analyses and data reporting for the WET tests shall be in accordance with the EPA documents stated in this condition and the Department's **Whole Effluent Toxicity Testing Guidance Document**, January 1993.

f. Evaluation of Causes and Exceedances

(1) If toxicity is shown, as defined in sections c.(3) or d.(3) of this permit condition, another toxicity test using the same species and Department approved methodology shall be conducted within two weeks, unless otherwise approved by the Department. If the second test also indicates toxicity, the permittee shall follow the procedure described in section f.(2) of this permit condition.

(2) If two consecutive WET test results indicate acute and/or chronic toxicity, as defined in sections c.(3) or d.(3) of this permit condition, the permittee shall evaluate the source of the toxicity and submit a plan and time schedule for demonstrating compliance with water quality standards. Upon approval by the Department, the permittee shall implement the plan until compliance has been achieved. Evaluations shall be completed and plans submitted to the Department within six months unless otherwise approved in writing by the Department.

g. Reporting

(1) Along with the test results, the permittee shall include: 1. The dates of sample collection and initiation of each toxicity test; 2. The type of production; and 3. The flow rate at the time of sample collection. Effluent at the time of sampling for WET testing should include samples of required parameters stated under Schedule B, condition 1. of this permit.

(2) The permittee shall make available to the Department, on request, the written standard operating procedures they, or the laboratory performing the WET test, are using for all toxicity tests required by the Department.

h. Reopener

(1) If WET testing indicates acute and/or chronic toxicity, the Department may reopen and modify this permit to include new limitations and/or conditions as determined by the Department to be appropriate, and in accordance with procedures outlined in Oregon Administrative Rules, Chapter 340, Division 45.

4. The permittee shall perform chemical analysis of its effluent for the specific toxic pollutants listed in Appendix J, Table 2 of 40 CFR Part 122. The effluent samples shall be 24-hour daily composites, except where sampling volatile compounds. For volatile compounds, six (6) discrete samples (not less than 100 mL) collected over the operating day are acceptable. The permittee shall take special precautions in compositing the individual grab samples for the volatile organics to insure sample integrity (i.e. no exposure to the outside air). Alternately, the discrete samples collected for volatiles may be analyzed separately and averaged.

5. The permittee shall meet the requirements for use of reclaimed water under Division 55, including the following:

a. All reclaimed water shall be managed in accordance with the approved Reclaimed Water Use Plan. No substantial changes shall be made in the approved plan without written approval of the Department.

b. No reclaimed water shall be released by the permittee to another person, as defined in Oregon Revised Statute (ORS) 468.005, for use unless there is a valid contract between the permittee and that person that meets the requirements of OAR 340-055-0015(9).

c. The permittee shall notify the Department within 24 hours if it is determined that the treated effluent is being used in a manner not in compliance with OAR 340-055. When the Department offices are not open, the permittee shall report the incident of noncompliance to the Oregon Emergency Response System (Telephone Number 1-800-452-0311).

d. No reclaimed water shall be made available to a person proposing to recycle unless that person certifies in writing that they have read and understand the provisions in these rules. This written certification shall be kept on file by the sewage treatment system owner and be made available to the Department for inspection.

6. The permittee shall comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

a. The permittee shall have its wastewater system supervised by one or more operators who are certified in a classification and grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised as specified on page one of this permit.

Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.

b. The permittee's wastewater system may not be without supervision (as required by Special Condition 7.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee must make available another person who is certified at no less than one grade lower then the system classification.

c. If the wastewater system has more than one daily shift, the permittee shall have the shift supervisor, if any, certified at no less than one grade lower than the system classification.

d. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

e. The permittee shall notify the Department of Environmental Quality in writing within thirty (30) days of replacement or redesignation of certified operators responsible for supervising wastewater system operation. The notice shall be filed with the Water Quality Division, Operator Certification Program, 811 SW 6th Ave, Portland, OR 97204. This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

f. Upon written request, the Department may grant the permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request must include justification for the time needed, a schedule for recruiting and hiring, the date the system supervisor availability ceased and the name of the alternate system supervisor(s) as required by 7.b. above.

7. The permittee shall notify the DEQ Western Region - Medford Office (phone: (541) 776-6010) in accordance with the response times noted in the General Conditions of this permit, of any malfunction so that corrective action can be coordinated between the permittee and the Department.

8. The permittee shall not be required to perform a hydrogeologic characterization or groundwater monitoring during the term of this permit provided:

   a. The facilities are operated in accordance with the permit conditions, and;

   b. There are no adverse groundwater quality impacts (complaints or other indirect evidence) resulting from the facility's operation.

   If warranted, at permit renewal the Department may evaluate the need for a full assessment of the facilities impact on groundwater quality.

9. Permittee shall not accept septage without written approval from the Department.

NPDES GENERAL CONDITIONS (SCHEDULE F)

SECTION A. STANDARD CONDITIONS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of Oregon Revised Statutes (ORS) 468B.025 and is grounds for enforcement action; for permit termination, suspension, or modification; or for denial of a permit renewal application.

2. Penalties for Water Pollution and Permit Condition Violations

Oregon Law (ORS 468.140) allows the Director to impose civil penalties up to $10,000 per day for violation of a term, condition, or requirement of a permit.

In addition, a person who unlawfully pollutes water as specified in ORS 468.943 or ORS 468.946 is subject to criminal prosecution.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. In addition, upon request of the Department, the permittee shall correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

4. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application shall be submitted at least 180 days before the expiration date of this permit.

The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

5. Permit Actions

This permit may be modified, suspended, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any term, condition, or requirement of this permit, a rule, or a statute;

b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

The filing of a request by the permittee for a permit modification or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

6. Toxic Pollutants

The permittee shall comply with any applicable 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 the permit has not yet been modified to incorporate the requirement.

7. Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege.

8. Permit References

Except for effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and standards for sewage sludge use or disposal established under Section 405(d) of the Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls, and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Duty to Halt or Reduce Activity

For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Bypass of Treatment Facilities

a. Definitions

(1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The term "bypass" does not include nonuse of singular or multiple units or processes of a treatment works when the nonuse is insignificant to the quality and/or quantity of the effluent produced by the treatment works. The term "bypass" does not apply if the diversion does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation.

(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities or treatment processes which causes 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. Severe property damage does not mean economic loss caused by delays in production.

b. Prohibition of bypass.

(1) Bypass is prohibited unless:

(a) Bypass was necessary to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and

(c) The permittee submitted notices and requests as required under General Condition B.3.c.

(2) The Director may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, when the Director determines that it will meet the three conditions listed above in General Condition B.3.b.(1).

c. Notice and request for bypass.

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior written notice, if possible at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in General Condition D.5.

4. Upset

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of General Condition B.4.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the causes(s) of the upset;

(2) The permitted facility was at the time being properly operated;

(3) The permittee submitted notice of the upset as required in General Condition D.5, hereof (24-hour notice); and

(4) The permittee complied with any remedial measures required under General Condition A.3 hereof.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

5. Treatment of Single Operational Event

For purposes of this permit, A Single Operational Event which leads to simultaneous violations of more than one pollutant parameter shall be treated as a single violation. A single operational event is an exceptional incident which causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one Clean Water Act effluent discharge pollutant parameter. A single operational event does not include Clean Water Act violations involving discharge without a NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational event is a violation.

6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations

a. Definitions

(1) "Overflow" means the diversion and discharge of waste streams from any portion of the wastewater conveyance system including pump stations, through a designed overflow device or structure, other than discharges to the wastewater treatment facility.

(2) "Severe property damage" means substantial physical damage to property, damage to the conveyance system or pump station which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of an overflow.

(3) "Uncontrolled overflow" means the diversion of waste streams other than through a designed overflow device or structure, for example to overflowing manholes or overflowing into residences, commercial establishments, or industries that may be connected to a conveyance system.

b. Prohibition of overflows. Overflows are prohibited unless:

(1) Overflows were unavoidable to prevent an uncontrolled overflow, loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the overflows, such as the use of auxiliary pumping or conveyance systems, or maximization of conveyance system storage; and

(3) The overflows are the result of an upset as defined in General Condition B.4. and meeting all requirements of this condition.

c. Uncontrolled overflows are prohibited where wastewater is likely to escape or be carried into the waters of the State by any means.

d. Reporting required. Unless otherwise specified in writing by the Department, all overflows and uncontrolled overflows must be reported orally to the Department within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in General Condition D.5.

7. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs, upon request by the Department, the permittee shall take such steps as are necessary to alert the public about the extent and nature of the discharge. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

8. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in such a manner as to prevent any pollutant from such materials from entering public waters, causing nuisance conditions, or creating a public health hazard.

SECTION C. MONITORING AND RECORDS

1. Representative Sampling

Sampling and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and shall be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

4. Penalties of 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 years, or by both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years or both.

5. Reporting of Monitoring Results

Monitoring results shall be summarized each month on a Discharge Monitoring Report form approved by the Department. The reports shall be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

6. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated. For a pollutant parameter that may be sampled more than once per day (e.g., Total Chlorine Residual), only the average daily value shall be recorded unless otherwise specified in this permit.

7. Averaging of Measurements

Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean, except for bacteria which shall be averaged as specified in this permit.

8. Retention of Records

Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records of all original strip chart 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, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

9. Records Contents

Records of monitoring information shall include:

a. The date, exact place, time and methods of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

10. Inspection and Entry

The permittee shall allow the Director, or an authorized representative upon the presentation of credentials to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, and

d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

SECTION D. REPORTING REQUIREMENTS

1. Planned Changes

The permittee shall comply with Oregon Administrative Rules (OAR) 340, Division 52, "Review of Plans and Specifications". Except where exempted under OAR 340-52, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers shall be commenced until the plans and specifications are submitted to and approved by the Department. The permittee shall give notice to the Department as soon as possible of any planned physical alternations or additions to the permitted facility.

2. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. Transfers

This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and the rules of the Commission. No permit shall be transferred to a third party without prior written approval from the Director. The permittee shall notify the Department when a transfer of property interest takes place.

4. Compliance Schedule

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

5. Twenty-Four Hour Reporting

The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally (by telephone) within 24 hours, unless otherwise specified in this permit, from the time the permittee becomes aware of the circumstances. During normal business hours, the Department's Regional office shall be called. Outside of normal business hours, the Department shall be contacted at 1-800-452-0311 (Oregon Emergency Response System).

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. If the permittee is establishing an affirmative defense of upset or bypass to any offense under ORS 468.922 to 468.946, and in which case if the original reporting notice was oral, delivered written notice must be made to the Department or other agency with regulatory jurisdiction within 4 (four) calendar days. The written submission shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected;

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and

e. Public notification steps taken, pursuant to General Condition B.7.

The following shall be included as information which must be reported within 24 hours under this paragraph:

a. Any unanticipated bypass which exceeds any effluent limitation in this permit.

b. Any upset which exceeds any effluent limitation in this permit.

c. Violation of maximum daily discharge limitation for any of the pollutants listed by the Director in this permit.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

6. Other Noncompliance

The permittee shall report all instances of noncompliance not reported under General Condition D.4 or D.5, at the time monitoring reports are submitted. The reports shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

7. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Other Information: When 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 any report to the Department, it shall promptly submit such facts or information.

8. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified in accordance with 40 CFR 122.22.

9. Falsification of Information

A person who supplies the Department with false information, or omits material or required information, as specified in ORS 468.953 is subject to criminal prosecution.

10. Changes to Indirect Dischargers - **[Applicable to Publicly Owned Treatment Works (POTW) only]**

The permittee must provide adequate notice to the Department of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants and;

b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For the purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

11. Changes to Discharges of Toxic Pollutant - **[Applicable to existing manufacturing, commercial, mining, and silvicultural dischargers only]**

The permittee must notify the Department as soon as they know or have reason to believe of the following:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:

(1) One hundred micrograms per liter (100 μg/L);

(2) Two hundred micrograms per liter (200 μg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 μg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

(3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Department in accordance with 40 CFR 122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) Five hundred micrograms per liter (500 μg/L);

(2) One milligram per liter (1 mg/L) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Department in accordance with 40 CFR 122.44(f).

SECTION E. DEFINITIONS

1. BOD means five-day biochemical oxygen demand.

2. TSS means total suspended solids.

3. mg/L means milligrams per liter.

4. kg means kilograms.

5. m^3/d means cubic meters per day.

6. MGD means million gallons per day.

7. Composite sample means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow.

8. FC means fecal coliform bacteria.

9. Technology based permit effluent limitations means technology-based treatment requirements as defined in 40 CFR 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR 340-41.

10. CBOD means five day carbonaceous biochemical oxygen demand.

11. Grab sample means an individual discrete sample collected over a period of time not to exceed 15 minutes.

12. Quarter means January through March, April through June, July through September, or October through December.

13. Month means calendar month.

14. Week means a calendar week of Sunday through Saturday.

15. Total residual chlorine means combined chlorine forms plus free residual chlorine.

16. The term "bacteria" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.

17. POTW means a publicly owned treatment works.

Sanitary Sewer Overflows

DEQ State of Oregon Department of Environmental Quality

Oregon Department of Environmental Quality

SSO Reporting Form

SSO

This information must be submitted within 5 days of becoming aware of the overflow.
Please complete online and print for signature. Be sure to fill out all fields.

FACILITY/CONTACT INFORMATION		
Name of Permittee: City of Ashland		
Contact Name: David Gies		
Phone:	Email:	County:
541-552-2335	giesd@ashland.or.us	Jackson
DEQ Permit # (see permit face page): 101609	DEQ File #: 3780	
OERS Incident #: 2011-2543	Date Reported to OERS: 10-17-11	
Date Reported To DEQ: 10-18-11	Today's Date: 10-18-11	
Date SSO Started (if known): 10-14-11	Time Started (if known): 2:25 PM	
Date SSO Stopped (if known): 10-14-11	Time Stopped (if known): 2:30 PM	
SSO Location: Cleanout		
SSO Nearest Address: 190 "B" Street		
City: Ashland	Zip Code: 97520	
SSO Latitude (if known):	Longitude (if known):	
Estimate of Quantity Overflowed: 15	(Gallons) Link to estimation method	
Did the SSO discharge to surface water? No		
Name of waterbody: Ashland Creek		

PUBLIC NOTIFICATION
Notified downstream drinking water sources (List Below)? No
Name of drinking water facility: City of Ashland
Signs Posted? No
Media contacted? No
Who? N/A
List any other steps taken to notify the public or state/federal agencies: None

CAUSES

Cause or suspected cause of the overflow: Blockage – other

If needed, attach additional sheets Rags were removed from the system

Rainfall in the 24 hours prior to SSO (for storm-related overflows): 0 (inches)

Source of rainfall data:

If needed, attach additional sheets

1-in-5 year 24 hour rainfall for the sewerage system area (if known): (in/24hr)

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OCT 21 2011
DEQ-SALEM OFFICE

EMERGENCY RESPONSE AND MITIGATION

List actions taken to stop and mitigate the impact of the SSO.

For overland flow:	Taped off affected area?	No
	Cleaned up affected area?	Yes
For SSO to surface water:	Bacteria samples taken to confirm impact?	No
	Follow up bacteria samples taken to confirm end of impact?	No

Describe monitoring and results:

Area was hosed and all water was vacuumed into city vactor truck for disposal at WWTP. Area were the public could walk was then sprayed with a diluted bleach solution to kill any pathogens and allowed to dry.

For SSOs that impact buildings:	Pumped out flooded buildings?	N/A
	Disinfected?	N/A

Other measures taken (describe):

Steps taken or planned to reduce, eliminate, and prevent the reoccurrence of the overflow and schedule for those steps:

COMMENTS

Signature: David Sies (signature)

Date: 10-18-11

*You may attach additional information to this report before sending to DEQ as needed to explain the circumstances of the overflow. This information may include but is not limited to: maintenance records and bacteria monitoring results.

Upon completion, print out this form and send to the appropriate DEQ Address:

Portland-Permit Coordinator
2020 SW 4th Avenue, Suite 400
Portland, OR 97201

Salem-Permit Coordinator
750 Front St NE, #120
Salem, OR 97301-1039

Pendleton-Permit Coordinator
700 SE Emigrant, #330
Pendleton, OR 97801

DEQ
State of Oregon Department of Environmental Quality

Oregon Department of Environmental Quality

SSO Reporting Form

SSO

This information must be submitted within 5 days of becoming aware of the overflow.
Please complete online and print for signature. Be sure to fill out all fields.

FACILITY/CONTACT INFORMATION		
Name of Permittee: City of Ashland, Oregon		
Contact Name: *David Gies*		
Phone:	Email:	County:
541-552-2335	giesd@ashland.or.us	Jackson
DEQ Permit # (see permit face page): 101609		DEQ File #: 3780
OERS Incident #: 2011-2803	Date Reported to OERS: 11-18-11	
Date Reported To DEQ: 11-18-11	Today's Date: 11-18-11	
Date SSO Started (if known): 11-17-11	Time Started (if known): Unknown	
Date SSO Stopped (if known): 11-17-11	Time Stopped (if known): Unknown	
SSO Location: Cleanout On "B" Street at corner of "B" St. and Pioneer		
SSO Nearest Address: 185 North Pioneer		
City: Ashland	Zip Code: 97520	
SSO Latitude (if known):	Longitude (if known):	
Estimate of Quantity Overflowed: less than 5 (Gallons) Link to estimation method		
Did the SSO discharge to surface water? No		
Name of waterbody: Ashland Creek		

PUBLIC NOTIFICATION
Notified downstream drinking water sources (List Below)?
Name of drinking water facility:
Signs Posted?
Media contacted?
Who?
List any other steps taken to notify the public or state/federal agencies:

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DEQ - MEDFORD

CAUSES

Cause or suspected cause of the overflow: Other (explain):

If needed, attach additional sheets No observant reason. Nothing in sewer line when it was cleaned.

Rainfall in the 24 hours prior to SSO (for storm-related overflows): (inches)

Source of rainfall data:

If needed, attach additional sheets

NOV 21 2011
DEQ SALEM OFFICE

1-in-5 year 24 hour rainfall for the sewerage system area (if known): (in/24hr)

EMERGENCY RESPONSE AND MITIGATION

List actions taken to stop and mitigate the impact of the SSO.

For overland flow:	Taped off affected area?	No
	Cleaned up affected area?	Yes
For SSO to surface water:	Bacteria samples taken to confirm impact?	No
	Follow up bacteria samples taken to confirm end of impact?	No

Describe monitoring and results:

Area was disinfected with a mild bleach solution and then all water, leaves and debris was vacuumed up.

For SSOs that impact buildings:	Pumped out flooded buildings?
	Disinfected?

Other measures taken (describe):

Steps taken or planned to reduce, eliminate, and prevent the reoccurrence of the overflow and schedule for those steps:

No visible obstructions in sewer line.

COMMENTS

Message was left on WWTP phone at 11:59 a.m. on 11-17-11. Message was not retrieved until 7:15 a.m. 11-18-11. I was notified around 7:20 a.m. I notified collection crew around 7:40 to check out the area and clean up any mess. Collection crew arrived on site at 8:00 a.m. and had everything cleaned up by 8:20 a.m.

Signature: David [signature]   Date: 11-18-11

*You may attach additional information to this report before sending to DEQ as needed to explain the circumstances of the overflow. This information may include but is not limited to: maintenance records and bacteria monitoring results.

Upon completion, print out this form and send to the appropriate DEQ Address:

Portland-Permit Coordinator
2020 SW 4th Avenue, Suite 400
Portland, OR 97201

Salem-Permit Coordinator
750 Front St NE, #120
Salem, OR 97301-1039

Pendleton-Permit Coordinator
700 SE Emigrant, #330
Pendleton, OR 97801

DEQ
State of Oregon Department of Environmental Quality

Oregon Department of Environmental Quality

SSO Reporting Form

SSO

This information must be submitted within 5 days of becoming aware of the overflow.
Please complete online and print for signature. Be sure to fill out all fields.

FACILITY/CONTACT INFORMATION		
Name of Permittee: City of Ashland, OR		
Contact Name: David Gies		
Phone:	Email:	County:
541-552-2335	GiesD@Ashland.or.us	Jackson
DEQ Permit # (see permit face page): 101609	DEQ File #: 3780	
OERS Incident #: 2012-0989	Date Reported to OERS: 4-9-12	
Date Reported To DEQ: 4-9-12	Today's Date: 4-9-12	
Date SSO Started (if known): 4-9-12	Time Started (if known): 1:00 pm	
Date SSO Stopped (if known): 4-9-12	Time Stopped (if known): 1:30 pm	
SSO Location: Manhole		
SSO Nearest Address: 112 Lithia Way		
City: Ashland	Zip Code: 97520	
SSO Latitude (if known):	Longitude (if known):	
Estimate of Quantity Overflowed: 60	(Gallons)	Link to estimation method
Did the SSO discharge to surface water? No		
Name of waterbody:		

PUBLIC NOTIFICATION
Notified downstream drinking water sources (List Below)? N/A
Name of drinking water facility:
Signs Posted?
Media contacted?
Who?
List any other steps taken to notify the public or state/federal agencies: None

CAUSES

Cause or suspected cause of the overflow: Grease Blockage

If needed, attach additional sheets

Rainfall in the 24 hours prior to SSO (for storm-related overflows): (inches)

Source of rainfall data:

If needed, attach additional sheets

1-in-5 year 24 hour rainfall for the sewerage system area (if known): (in/24hr)

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MAY 15 2012
DEQ - MEDFORD

EMERGENCY RESPONSE AND MITIGATION

List actions taken to stop and mitigate the impact of the SSO.

For overland flow:	Taped off affected area?	No
	Cleaned up affected area?	Yes
For SSO to surface water:	Bacteria samples taken to confirm impact?	N/A
	Follow up bacteria samples taken to confirm end of impact?	N/A

Describe monitoring and results:

For SSOs that impact buildings:	Pumped out flooded buildings? N/A
	Disinfected? N/A

Other measures taken (describe):

Steps taken or planned to reduce, eliminate, and prevent the reoccurrence of the overflow and schedule for those steps:

Cleaning schedule of SS-2301 is to be reviewed. This is the line that the blockage occurred in.

COMMENTS

Vactor truck was parked down stream of spill area. Contaminated area was hosed down and all contaminated water was vacuumed up before reaching any storm drains. Contaminated area was then dosed with a diluted bleach solution to kill any pathogens. Remaining water/bleach solution evaporated within 20 minutes.

Signature: David Gua

Date: 4-9-12

*You may attach additional information to this report before sending to DEQ as needed to explain the circumstances of the overflow. This information may include but is not limited to: maintenance records and bacteria monitoring results.

Upon completion, print out this form and send to the appropriate DEQ Address:

Portland-Permit Coordinator
2020 SW 4th Avenue, Suite 400
Portland, OR 97201

Salem-Permit Coordinator
750 Front St NE, #120
Salem, OR 97301-1039

Pendleton-Permit Coordinator
700 SE Emigrant, #330
Pendleton, OR 97801

DEQ
State of Oregon Department of Environmental Quality

SSO

Oregon Department of Environmental Quality
SSO Reporting Form

This information must be submitted within 5 days of becoming aware of the overflow.
Please complete online and print for signature. Be sure to fill out all fields.

FACILITY/CONTACT INFORMATION		
Name of Permittee: City of Ashland, Oregon		
Contact Name: David Gies		
Phone:	Email:	County:
541-552-2335	giesd@ashland.or.us	Jackson
DEQ Permit # (see permit face page): 101609	DEQ File #: 3780	
OERS Incident #: 2012-2741	Date Reported to OERS: 11-19-12	
Date Reported To DEQ: 11-19-12	Today's Date: 11-19-12	
Date SSO Started (if known): 11-19-12	Time Started (if known): 9 :30 a.m.	
Date SSO Stopped (if known): 11-19-12	Time Stopped (if known): 9:40 a.m.	
SSO Location: Manhole 09BD-016		
SSO Nearest Address: 31 S. Second St.		
City: Ashland	Zip Code: 97520	
SSO Latitude (if known):	Longitude (if known):	
Estimate of Quantity Overflowed: 5 (Gallons) Link to estimation method		
Did the SSO discharge to surface water? No		
Name of waterbody: N/A		

PUBLIC NOTIFICATION
Notified downstream drinking water sources (List Below)? N/A
Name of drinking water facility: N/A
Signs Posted? N/A
Media contacted? N/A
Who? N/A
List any other steps taken to notify the public or state/federal agencies:

CAUSES

Cause or suspected cause of the overflow: Grease Blockage

If needed, attach additional sheets

Rainfall in the 24 hours prior to SSO (for storm-related overflows): 0 (inches)

Source of rainfall data:

If needed, attach additional sheets

1-in-5 year 24 hour rainfall for the sewerage system area (if known): (in/24hr)

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NOV 26 2012
DEQ-SALEM OFFICE

EMERGENCY RESPONSE AND MITIGATION

List actions taken to stop and mitigate the impact of the SSO.

For overland flow:	Taped off affected area?	No
	Cleaned up affected area?	Yes
For SSO to surface water:	Bacteria samples taken to confirm impact?	No
	Follow up bacteria samples taken to confirm end of impact?	No

Describe monitoring and results:

N/A

For SSOs that impact buildings:	Pumped out flooded buildings?	N/A
	Disinfected?	N/A

Other measures taken (describe):

N/A

Steps taken or planned to reduce, eliminate, and prevent the reoccurrence of the overflow and schedule for those steps:

Cleaning schedule will be adjusted to clean this line more often.

COMMENTS

This line, SS-2437 is a 6" concrete line located downstream from a restaurant. This line has a long history of grease issues. The present cleaning schedule will be adjusted to clean this line on a more frequent basis. The city building inspector is also being notified of the grease problem associated with this restaurant and what can be done to prevent this from happening in the future.

Signature: David [signature] Date: 11-19-12

*You may attach additional information to this report before sending to DEQ as needed to explain the circumstances of the overflow. This information may include but is not limited to: maintenance records and bacteria monitoring results.

Upon completion, print out this form and send to the appropriate DEQ Address:

Portland-Permit Coordinator
2020 SW 4th Avenue, Suite 400
Portland, OR 97201

Salem-Permit Coordinator
750 Front St NE, #120
Salem, OR 97301-1039

Pendleton-Permit Coordinator
700 SE Emigrant, #330
Pendleton, OR 97801

DEQ
State of Oregon Department of Environmental Quality

Oregon Department of Environmental Quality

SSO Reporting Form

SSO

This information must be submitted within 5 days of becoming aware of the overflow.
Please complete online and print for signature. Be sure to fill out all fields.

FACILITY/CONTACT INFORMATION

Name of Permittee: CITY OF ASHLAND	
Contact Name: jason robustelli	
Phone: 541 552 2335	Email: robustelj@ashland.or.us
County: Jackson	
DEQ Permit # (see permit face page): 101609	DEQ File #: 3780
OERS Incident #: 2013-1162	Date Reported to OERS: Jun 15, 2013
Date Reported To DEQ: 12/24/2012	Today's Date: Jun 15, 2013
Date SSO Started (if known): Jun 15, 2013	Time Started (if known): 12:30pm
Date SSO Stopped (if known): Jun 15, 2013	Time Stopped (if known): 1:45 pm
SSO Location: Manhole intersection of barbara & jacquelynn	
SSO Nearest Address: 915 jacquelynn.	
City: ASHLAND	Zip Code: 97520
SSO Latitude (if known):	Longitude (if known):
Estimate of Quantity Overflowed: 5 gals. (Gallons)	Link to estimation method
Did the SSO discharge to surface water? No	
Name of waterbody:	

PUBLIC NOTIFICATION

Notified downstream drinking water sources (List Below)?

Name of drinking water facility:

Signs Posted?

Media contacted?

Who?

List any other steps taken to notify the public or state/federal agencies:

CAUSES

Cause or suspected cause of the overflow: Blockage – other

If needed, attach additional sheets

Rainfall in the 24 hours prior to SSO (for storm-related overflows): 0 (inches)

Source of rainfall data: Other(explain):

If needed, attach additional sheets

1-in-5 year 24 hour rainfall for the sewerage system area (if known): 0 (in/24hr)

EMERGENCY RESPONSE AND MITIGATION

List actions taken to stop and mitigate the impact of the SSO.

For overland flow:	Taped off affected area?	N/A
	Cleaned up affected area?	Yes
For SSO to surface water:	Bacteria samples taken to confirm impact?	N/A
	Follow up bacteria samples taken to confirm end of impact?	N/A
Describe monitoring and results:		
For SSOs that impact buildings:	Pumped out flooded buildings? N/A	
	Disinfected?	

Other measures taken (describe):

Chlorine solution disinfection applied

Steps taken or planned to reduce, eliminate, and prevent the reoccurrence of the overflow and schedule for those steps:

Jet rodder cleaning, cctv inspection

COMMENTS

Line was cleaned (6-22-12) & CCTV (6-11-12). Soft plug due to long 630' line that is very flat and has grease and fine Roots. Line has now been put on the trouble list.

Signature: [signature]

Date: 6/17/2013

*You may attach additional information to this report before sending to DEQ as needed to explain the circumstances of the overflow. This information may include but is not limited to: maintenance records and bacteria monitoring results.

Upon completion, print out this form and send to the appropriate DEQ Address:

Portland-Permit Coordinator
2020 SW 4th Avenue, Suite 400
Portland, OR 97201

Salem-Permit Coordinator
750 Front St NE, #120
Salem, OR 97301-1039

Pendleton-Permit Coordinator
700 SE Emigrant, #330
Pendleton, OR 97801

DEQ
State of Oregon Department of Environmental Quality

Oregon Department of Environmental Quality

SSO Reporting Form

SSO

This information must be submitted within 5 days of becoming aware of the overflow.
Please complete online and print for signature. Be sure to fill out all fields.

FACILITY/CONTACT INFORMATION

Name of Permittee: City of Ashland

Contact Name: Jason Robustelli

Phone:	Email:	County:
541.552.2339	robustelj@ashland.us.or	Jackson

DEQ Permit # (see permit face page): 101609	DEQ File #: 3780
OERS Incident #: 20131585	Date Reported to OERS: 8/6/2013
Date Reported To DEQ: 8/6/2013	Today's Date: 8/6/2013
Date SSO Started (if known): 8/6/2013	Time Started (if known): 2:00pm
Date SSO Stopped (if known): 8/6/2013	Time Stopped (if known): 2:45pm

SSO Location: Manhole Water Treatment Plant Road

SSO Nearest Address:

City: Ashland	Zip Code: 97520
SSO Latitude (if known):	Longitude (if known):

Estimate of Quantity Overflowed: 500 gal (Gallons) Link to estimation method

Did the SSO discharge to surface water? Yes

Name of waterbody: Ashland Creek

PUBLIC NOTIFICATION

Notified downstream drinking water sources (List Below)? N/A

Name of drinking water facility: NA

Signs Posted? Yes

Media contacted? No

Who? NA

List any other steps taken to notify the public or state/federal agencies:

Called Jon Gasik with DEQ and explained the situation.

CAUSES

Cause or suspected cause of the overflow: Other (explain):

WaterTreatmentPlant flushed Backwash Pond and a large amount of sand and small twigs was introduced into the sanitary system.

Rainfall in the 24 hours prior to SSO (for storm-related overflows): 0 (inches)

Source of rainfall data:

If needed, attach additional sheets

RECEIVED
AUG 1 2 2013
DEQ-SALEM OFFICE

1-in-5 year 24 hour rainfall for the sewerage system area (if known): (in/24hr)

EMERGENCY RESPONSE AND MITIGATION

List actions taken to stop and mitigate the impact of the SSO.

For overland flow:	Taped off affected area?	N/A
	Cleaned up affected area?	Yes
For SSO to surface water:	Bacteria samples taken to confirm impact?	Yes
	Follow up bacteria samples taken to confirm end of impact?	N/A

Describe monitoring and results:

Samples were taken and sent to Neilson Research Corporation labs (541.770.5678).

For SSOs that impact buildings:	Pumped out flooded buildings?	N/A
	Disinfected?	N/A

Other measures taken (describe):

Area was cleaned and disinfected. Ashland Creek was posted that there was a sanitary over flow and not to get into the Creek till further notice.

Steps taken or planned to reduce, eliminate, and prevent the reoccurrence of the overflow and schedule for those steps:

1) Discontinue flushing of the backwash ponds into the sanitary system. This will eliminate the sand from entering the sanitary system. No flushing pond as of (8/7/2013)

COMMENTS

Manhole 16CB-002 and Line segment 6911 was last cleaned 4/17/2012. It is a 6" PVC line. Water Treatment Plant is only customer on line.

Signature: [signature] Date: 8/7/2013

*You may attach additional information to this report before sending to DEQ as needed to explain the circumstances of the overflow. This information may include but is not limited to: maintenance records and bacteria monitoring results.

Upon completion, print out this form and send to the appropriate DEQ Address:

Portland-Permit Coordinator
2020 SW 4th Avenue, Suite 400
Portland, OR 97201

Salem-Permit Coordinator
750 Front St NE, #120
Salem, OR 97301-1039

Pendleton-Permit Coordinator
700 SE Emigrant, #330
Pendleton, OR 97801

EXCESS THERMAL LOAD CALCULATIONS

The following information was prepared by The Freshwater Trust (TFT) for the City of Ashland:

Potential Current and Projected Excess Thermal Loads Under the TMDL

The temperature TMDL written by DEQ for the Bear Creek watershed gives the Ashland Wastewater Treatment Facility (Ashland WWTF) a thermal wasteload allocation of no more than 0.1°C above the applicable criteria, which was determined to be the biologically-based numeric criteria at this location in both Ashland Creek and Bear Creek. Accordingly, the treatment plant must not cause a temperature increase of more than 0.1°C at the river's downstream point of maximum impact. That impact is calculated using the following equation:

Temperature Increase = (Qe/(Qe+Qr))*(Te-Tc)

Where:

Qe = effluent flow in CFS
Qr = 7Q10 receiving stream flow in CFS
Te = effluent temperature in °C
Tc = biologically-based spawning criterion of 13°C (October 15 to May 15) and biologically-based migration criterion of 18°C (May 16 to October 14)

For practical use in the permit, DEQ uses excess thermal load limits in permits. This is typically expressed in kilocalories per day. For determining the amount of thermal reduction and/or offset needed, the excess thermal load is conservatively calculated using average plant flow and the 7Q10 river flow (the seven-day average low flow with a 10 year return frequency).

The Ashland WWTF has a permitted design dry weather flow of 2.1 million gallons per day. Because the discharged thermal load is based on plant flow, the thermal discharge increases proportionately as population growth causes flows to increase. Over time, this will increase the amount of Thermal Credits that need to be generated in order to comply with the TMDL.
The following equations were used to calculate the facility's potential current and projected future excess thermal load:

$$ETL = 2446665 \times Q_{eff} \times (T_{eff} - T_{cr})$$

ETL = Excess Thermal Load, kilocalories/day
Q_{eff} = Effluent flow, cubic feet per second
T_{eff} = Effluent temperature, ^{o}C
T_{cr} = Applicable river temperature criterion at the point of discharge for the time of year, ^{o}C
2446665 = Unit conversation factor, (kcal · sec)/(^{o}C · ft^3 · day)

$$WLA = 2446665 \times \Delta T \times (Q_{eff} + Q_r)$$

WLA = Wasteload Allocation, kilocalories/day
Q_{eff} = Effluent flow, cubic feet per second
Q_r = River flow, cubic feet per second
ΔT = Allowable temperature increase, ^{o}C (0.1^{o}C for the Ashland WWTF)
2446665 = Unit conversation factor, (kcal · sec)/(^{o}C · ft^3 · day)

$$Thermal\ Exceedance = ETL - WLA$$

Thermal Exceedance = Thermal Exceedance, kilocalories/day
ETL = Excess Thermal Load, kilocalories/day
WLA = Wasteload allocation, kilocalories/day

Using observed daily maximum temperatures (2005 to 2012), current facility design flow (2.1 mgd), the allowable 0.1^{o}C increase, and Bear Creek 7Q10 river flows, it is possible that the Ashland WWTF could have a 53 million kcal/day thermal exceedance in October.[1]

As the City grows, the plant flow is projected to increase to 2.29 mgd in 2020, 2.53 mgd in 2030, and 2.72 mgd in 2040. If the Ashland WWTF were to discharge at 2.63 mgd in 2035 (and assuming similar effluent temperatures), it is possible that the Ashland WWTF would have a 67 million kcal/day thermal exceedance in October 2035 if 7Q10 river flows occurred in Bear Creek.[2]

[1] The observed 7-day average daily maximum effluent temperature was 19.90^{o}C on October 16th, 2010. The October Bear Creek 7Q10 flow is 4.19 cfs (Bear Creek Temperature TMDL, Appendix A, p.35). The permitted design dry weather flow is 2.1 mgd (3.27 cfs). In mid-October, the applicable temperature criterion for Bear Creek is 13^{o}C.

[2] The observed 7-day average daily maximum effluent temperature was 19.90^{o}C on October 16th, 2010. The October Bear Creek 7Q10 flow is 4.19 cfs (Bear Creek Temperature TMDL, Appendix A, p.35). The future design dry weather flow is 2.63 mgd (4.06 cfs). In mid-October, the applicable temperature criterion for Bear Creek is 13^{o}C.

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APPENDIX E
FINANCIAL DATA

- 2014 FINANCING UPDATE
- WASTEWATER BUDGET
- REVENUE BREAKDOWN
- WWTP ELECTRIC EXPENSES
- 2013 WASTEWATER RATES

KELLER associates

Ashland - FPS
Financing Update

Financing Assumed in 2012 CSSMP

Project	Amount	Term (yr)	Interest	Payment	Begin FY
Membrane Replacement	$ 1,248,000	12	2.72%	($123,290)	2012
Outfall Relocation & Shading	$ 2,752,000	20	1.00%	($152,503)	2012
Oxidation Ditch (shell) & Other	$ 5,750,000	25	5.00%	($407,977)	2016
Total	$ 9,750,000			$ (683,770)	

Financing Assumed in 2014 FPS

Project	Amount	Term (yr)	Interest	Payment	Begin Yr	
Membrane Replacement	$ 1,645,280	15	1.50%	($123,304)	2015	Membrane &Outfall relocation projects will be administered through one loan (already existing loan agreement signed by City 5/22/13)
Wetlands, Outfall Relocation & Shading	$ 4,991,359	15	1.50%	($374,074)	2015	Assumes that current loan amount can be increased, otherwise limited to about $2.85M)
Oxidation Ditch & Pipelines (1A-1F)	$ 10,063,206	25	1.50%	($485,685)	2015	Inflated costs from 2011 dollars to 2015; Updated costs include the internals for the oxidation ditch. Excludes $1.3M for TID piping to be paid from water funds
Total	$ 16,699,845			$ (983,064)		

WASTEWATER FUND
PUBLIC WORKS DEPARTMENT
TREATMENT

Description	2011 Actual	2012 Actual	2013 Amended	6 Month Actual	2013 Year End Estimate	Year 1 2013-14	Year 2 2014-15	Total 2013-15
Fund# 675								
Personnel Services								
510 Salaries and Wages	$ 285,661	$ 337,090	$ 347,330	$ 166,470	$ 341,360	$ 400,970	$ 405,960	$ 806,930
520 Fringe Benefits	115,015	174,353	164,560	86,948	173,896	232,760	234,400	467,160
Total Personnel Services	**400,676**	**511,443**	**511,890**	**253,418**	**515,256**	**633,730**	**640,360**	**1,274,090**
Materials and Services								
601 Supplies	158,335	164,376	192,600	82,969	189,494	194,150	194,150	388,300
602 Rental, Repair, Maintenance	749,384	731,609	792,300	389,902	793,908	845,550	867,600	1,713,150
603 Communications	246	154	2,790	130	1,810	2,780	2,730	5,510
604 Contractual Services	87,812	28,126	14,800	11,525	23,408	21,000	23,000	44,000
605 Misc. Charges and Fees	450,478	431,765	490,535	226,218	486,800	496,520	503,370	999,890
606 Other Purchased Services	62,862	44,304	85,266	25,176	83,211	81,325	86,650	167,975
610 Programs	-	-	100	-	50	100	100	200
Total Materials and Services	**1,509,117**	**1,400,334**	**1,578,391**	**735,920**	**1,578,681**	**1,641,425**	**1,677,600**	**3,319,025**
Capital Outlay								
704 Improvements Other Than Bldgs.	44,325	441,596	1,273,234	233,732	934,000	969,060	965,210	1,934,270
Total Capital Outlay	**44,325**	**441,596**	**1,273,234**	**233,732**	**934,000**	**969,060**	**965,210**	**1,934,270**
Debt Service								
801 Debt Service - Principal	1,374,394	1,140,000	1,160,000	-	1,160,000	1,185,000	1,215,000	2,400,000
802 Debt Service - Interest	545,841	501,874	479,200	239,550	479,200	444,400	438,850	883,250
Total Debt Service	**1,920,235**	**1,641,874**	**1,639,200**	**239,550**	**1,639,200**	**1,629,400**	**1,653,850**	**3,283,250**
	$ 3,874,353	**$ 3,995,247**	**$ 5,002,715**	**$ 1,462,620**	**$ 4,667,137**	**$ 4,873,615**	**$ 4,937,020**	**$ 9,810,635**

WASTEWATER FUND
PUBLIC WORKS DEPARTMENT
COLLECTION DIVISION

Description	2011 Actual	2012 Actual	2013 Amended	6 Month Actual	2013 Year End Estimate	Year 1 2013-14	Year 2 2014-15	Total 2013-15
Fund# 675								
Personnel Services								
510 Salaries and Wages	$ 276,818	$ 283,957	$ 287,270	$ 133,347	$ 286,544	$ 279,980	$ 292,670	$ 572,650
520 Fringe Benefits	148,432	164,101	173,940	76,930	173,940	166,270	170,600	336,870
Total Personnel Services	**425,250**	**448,058**	**461,210**	**210,277**	**460,484**	**446,250**	**463,270**	**909,520**
Materials and Services								
601 Supplies	20,372	46,963	69,550	14,024	58,898	57,400	54,350	111,750
602 Rental, Repair, Maintenance	161,778	190,791	197,160	90,653	181,556	203,310	210,310	413,620
603 Communications	2,249	1,942	3,295	1,869	3,738	4,320	3,320	7,640
604 Contractual Services	655	1,718	1,200	275	332	1,200	1,200	2,400
605 Misc. Charges and Fees	605,382	646,414	679,500	340,104	680,208	721,920	733,110	1,455,030
606 Other Purchased Services	1,889	2,792	7,150	401	5,875	7,200	7,200	14,400
612 Franchises	272,658	289,734	290,000	163,872	310,000	347,397	382,200	729,597
Total Materials and Services	**1,064,983**	**1,180,354**	**1,247,855**	**611,198**	**1,240,607**	**1,342,747**	**1,391,690**	**2,734,437**
Capital Outlay								
704 Improvements Other Than Bldgs.	34,004	26,282	921,449	386,853	662,256	495,364	1,159,300	1,654,664
Total Capital Outlay	**34,004**	**26,282**	**921,449**	**386,853**	**662,256**	**495,364**	**1,159,300**	**1,654,664**
	$ 1,524,237	**$ 1,654,694**	**$ 2,630,514**	**$ 1,208,328**	**$ 2,363,347**	**$ 2,284,361**	**$ 3,014,260**	**$ 5,298,621**

City of Ashland
Wastewater Revenue
July 2012 - June 2013

	Residential	Commercial	Governmental	Total Sewer
Jul-12	$ 168,956.08	$ 78,399.29	$ 83,920.92	$ 331,276.29
Aug-12	174,318.36	85,148.56	87,533.55	$ 347,000.47
Sep-12	173,784.21	88,604.89	88,865.49	$ 351,254.59
Oct-12	174,218.90	78,745.17	91,245.86	$ 344,209.93
Nov-12	174,428.08	66,117.74	91,468.47	$ 332,014.29
Dec-12	174,472.50	54,992.48	86,920.55	$ 316,385.53
Jan-13	174,506.06	50,773.80	82,169.00	$ 307,448.86
Feb-13	174,395.55	49,401.71	90,233.14	$ 314,030.40
Mar-13	173,959.13	50,668.61	88,265.59	$ 312,893.33
Apr-13	168,060.91	59,662.24	86,591.24	$ 314,314.39
May-13	167,432.62	62,595.12	89,337.99	$ 319,365.73
Jun-13	162,807.61	72,391.79	89,699.39	$ 324,898.79
	$ 2,061,340.01	$ 797,501.40	$ 1,056,251.19	$ 3,915,092.60
	53%	20%	27%	

Note: These revenues are in addition to the Food and Beverage Tax revenues

Ashland WWTP - Electrical Billing

Transaction Date	Description	Total	Electric	Service	Rate Code	Tax Code	Fee Code	Detail Code	Amount	Billable Consumption	Period Begin Date	Period End Date	Read Date	Reading	Prior Reading	Consumption	Level	Consumption	Amount
7/1/2013		$24,986.70	$24,986.70																
				Electric	D03OVG			Consumption	$0.00	0.00	6/1/2013	7/1/2013		0.00	0.00	0.00			
				Electric	M03			Consumption	$22,460.70	354,900.00	6/1/2013	7/1/2013	6/10/2013	77,145.00	75,962.00	354,900.00			
																	1	3,000.00	$265.35
																	2	17,000.00	$1,140.19
																	3	334,900.00	$21,055.16
				Electric	M03			Flat	$30.25	0.00	6/1/2013	7/1/2013	6/10/2013	0.00	0.00	0.00			
				Electric	MUNI3P			Consumption	$2,427.65	672.90	6/1/2013	7/1/2013	6/10/2013	2.24	2.36	672.90			
																	0	15.00	$0.00
																	1	657.90	$2,427.65
				Electric	D03OVG			Flat	$68.10	0.00	6/1/2013	7/1/2013		0.00	0.00	0.00			
6/3/2013		$20,736.04	$20,736.04																
				Electric	D03OVG			Consumption	$0.00	0.00	5/1/2013	5/31/2013		0.00	0.00	0.00			
				Electric	M03			Consumption	$18,084.95	285,300.00	5/1/2013	5/31/2013	5/9/2013	75,962.00	75,011.00	285,300.00			
																	1	3,000.00	$265.35
																	2	17,000.00	$1,140.19
																	3	265,300.00	$16,679.41
				Electric	M03			Flat	$30.25	0.00	5/1/2013	5/31/2013	5/9/2013	0.00	0.00	0.00			
				Electric	MUNI3P			Consumption	$2,552.74	706.80	5/1/2013	5/31/2013	5/9/2013	2.36	1.88	706.80			
																	0	15.00	$0.00
																	1	691.80	$2,552.74
				Electric	D03OVG			Flat	$68.10	0.00	5/1/2013	5/31/2013		0.00	0.00	0.00			
4/30/2013		$19,662.14	$19,662.14																
				Electric	D03OVG			Consumption	$0.00	0.00	4/1/2013	4/30/2013		0.00	0.00	0.00			
				Electric	M03			Consumption	$17,537.98	276,600.00	4/1/2013	4/30/2013	4/11/2013	75,011.00	74,089.00	276,600.00			
																	1	3,000.00	$265.35
																	2	17,000.00	$1,140.19
																	3	256,600.00	$16,132.44
				Electric	M03			Flat	$30.25	0.00	4/1/2013	4/30/2013	4/11/2013	0.00	0.00	0.00			
				Electric	MUNI3P			Consumption	$2,025.81	564.00	4/1/2013	4/30/2013	4/11/2013	1.88	1.82	564.00			
																	0	15.00	$0.00
																	1	549.00	$2,025.81
				Electric	D03OVG			Flat	$68.10	0.00	4/1/2013	4/30/2013		0.00	0.00	0.00			
3/28/2013		$20,366.81	$20,366.81																
				Electric	D03OVG			Consumption	$0.00	0.00	3/1/2013	3/31/2013		0.00	0.00	0.00			
				Electric	M03			Consumption	$18,311.28	288,900.00	3/1/2013	3/31/2013	3/11/2013	74,089.00	73,126.00	288,900.00			
																	1	3,000.00	$265.35
																	2	17,000.00	$1,140.19
																	3	268,900.00	$16,905.74
				Electric	M03			Flat	$30.25	0.00	3/1/2013	3/31/2013	3/11/2013	0.00	0.00	0.00			
				Electric	MUNI3P			Consumption	$1,957.18	545.40	3/1/2013	3/31/2013	3/11/2013	1.82	1.94	545.40			
																	0	15.00	$0.00
																	1	530.40	$1,957.18
				Electric	D03OVG			Flat	$68.10	0.00	3/1/2013	3/31/2013		0.00	0.00	0.00			
3/1/2013		$19,143.87	$19,143.87																
				Electric	D03OVG			Consumption	$0.00	0.00	1/28/2013	2/28/2013		0.00	0.00	0.00			
				Electric	M03			Consumption	$16,953.29	267,300.00	1/28/2013	2/28/2013	2/7/2013	73,126.00	72,235.00	267,300.00			
																	1	3,000.00	$265.35
																	2	17,000.00	$1,140.19
																	3	247,300.00	$15,547.75
				Electric	M03			Flat	$30.25	0.00	1/28/2013	2/28/2013	2/7/2013	0.00	0.00	0.00			
				Electric	MUNI3P			Consumption	$2,092.23	582.00	1/28/2013	2/28/2013	2/7/2013	1.94	1.94	582.00			
																	0	15.00	$0.00
																	1	567.00	$2,092.23
				Electric	D03OVG			Flat	$68.10	0.00	1/28/2013	2/28/2013		0.00	0.00	0.00			
2/1/2013		$19,713.44	$19,713.44																
				Electric	D03OVG			Consumption	$0.00	0.00	12/28/2012	1/27/2013		0.00	0.00	0.00			
				Electric	D03OVG			Consumption	$0.00	0.00	12/28/2012	1/27/2013		0.00	0.00	0.00			
				Electric	M03			Flat	$3.71	0.00	12/28/2012	1/27/2013	1/9/2013	0.00	0.00	0.00			
				Electric	D03OVG			Flat	$8.34	0.00	12/28/2012	1/27/2013		0.00	0.00	0.00			
				Electric	M03			Flat	$26.35	0.00	12/28/2012	1/27/2013	1/9/2013	0.00	0.00	0.00			
				Electric	D03OVG			Flat	$59.31	0.00	12/28/2012	1/27/2013		0.00	0.00	0.00			
				Electric	M03			Consumption	$15,373.58	278,400.00	12/28/2012	1/27/2013	1/9/2013	72,235.00	71,307.00	278,400.00			
																	1	3,000.00	$231.11
																	2	17,000.00	$993.07
																	3	258,400.00	$14,149.40
				Electric	M03			Consumption	$2,163.09	278,400.00	12/28/2012	1/27/2013	1/9/2013	72,235.00	71,307.00	278,400.00			
																	1	3,000.00	$32.52
																	2	17,000.00	$139.73
																	3	258,400.00	$1,990.85
				Electric	MUNI3P			Consumption	$1,822.26	582.00	12/28/2012	1/27/2013	1/9/2013	1.94	2.28	582.00			
																	0	15.00	$0.00
																	1	567.00	$1,822.26
				Electric	MUNI3P			Consumption	$256.80	582.00	12/28/2012	1/27/2013	1/9/2013	1.94	2.28	582.00			
																	0	15.00	$0.00
																	1	567.00	$256.80
1/10/2013		$21,099.93	$21,083.76																
				Electric Users Tax		Tax		Tax	$16.17	0.00	11/28/2012	12/27/2012		0.00	0.00	0.00			
				Electric	M03			Consumption	$18,859.79	313,500.00	11/28/2012	12/27/2012	11/8/2012	70,120.00	69,075.00	313,500.00			
																	1	3,000.00	$252.00
																	2	17,000.00	$1,082.90
																	3	293,500.00	$17,524.89
				Electric	M03			Flat	$28.73	0.00	11/28/2012	12/27/2012	11/8/2012	0.00	0.00	0.00			
				Electric	MUNI3P			Consumption	$2,130.57	622.00	11/28/2012	12/27/2012	11/8/2012	2.07	2.07	622.00			
																	0	15.00	$0.00
																	1	607.00	$2,130.57
				Electric	D03OVR			Flat	$64.67	0.00	11/28/2012	12/27/2012		0.00	0.00	0.00			
11/19/2012	Convert Billing	$21,083.76	$21,083.76																
				Electric	MUNI 3				$2,130.57	0.00				0.00	0.00	0.00			
				Electric	M03				$18,953.19	0.00				0.00	0.00	0.00			
10/16/2012	Convert Billing	$19,435.76	$19,435.76																
				Electric	MUNI 3				$2,130.57	0.00				0.00	0.00	0.00			
				Electric	M03				$17,305.19	0.00				0.00	0.00	0.00			
9/19/2012	Convert Billing	$22,491.14	$22,491.14																
				Electric	MUNI 3				$2,158.65	0.00				0.00	0.00	0.00			
				Electric	M03				$20,332.49	0.00				0.00	0.00	0.00			
8/21/2012	Convert Billing	$20,822.81	$20,822.81																
				Electric	MUNI 3				$2,102.49	0.00				0.00	0.00	0.00			
				Electric	M03				$18,720.32	0.00				0.00	0.00	0.00			
7/19/2012	Convert Billing	$21,138.58	$21,138.58																
				Electric	MUNI 3				$2,077.92	0.00				0.00	0.00	0.00			
				Electric	M03				$19,060.66	0.00				0.00	0.00	0.00			

DO3OVG=This is the charge described below the Basic Charge on the rate sheet

MO3=Municipal Phase 3, same rates as Governmental on rate sheet, KWH only

MUNI3P= Municipal Phase 3 Demand, same rates as Governmental on rate sheet

RESOLUTION NO. 2013-12

A RESOLUTION REVISING RATES FOR WASTEWATER (SEWER) SERVICE PURSUANT TO ASHLAND MUNICIPAL CODE SECTION 14.08.035 AND REPEALING RESOLUTION 2012-13

THE CITY OF ASHLAND RESOLVES AS FOLLOWS:

SECTION 1. The wastewater (sewer) rate charges and rates as shown on the wastewater (sewer) rate schedule attached as Exhibit "A" shall be effective for actual or estimated consumption on or after July 1, 2013.

Prorated calculations are permitted for any bills prepared for a partial month or billing period that overlaps the effective date of this Resolution.

Miscellaneous Charges and Connection Fees established by previous resolutions remain in effect until revised by separate Council Action.

SECTION 2. Copies of this resolution shall be maintained in the Office of the City Recorder.

SECTION 3. Classification of the fee. The fees specified in Section 1 and Section 2 of this resolution are classified as not subject to the limits of Section 11b of Article XI of the Oregon Constitution (Ballot Measure 5).

SECTION 4. Resolution 2012-13 is repealed.

This resolution was duly PASSED and ADOPTED this 21 day of May, 2013, and the effective date is July 1, 2013 upon signing by the Mayor.

Barbara Christensen

Barbara Christensen, City Recorder

SIGNED and APPROVED this 21 day of May, 2013.

John Stromberg

John Stromberg, Mayor

Reviewed as to form:

David Lohman

David Lohman, City Attorney

EXHIBIT "A"
CITY OF ASHLAND, OREGON
SEWER RATE SCHEDULE

RESOLUTION NO. 2013-______
EFFECTIVE JULY 1, 2013

All sewer service provided by the City of Ashland will be in accordance with Chapter 14.08 of the Ashland Municipal Code.

1. SEWER RATES WITHIN THE CITY LIMITS

Single Family Residential	June 2012	July 2013
Monthly Service Charge	$20.60	$22.66
Quantity Charge per cf	$0.0308	$0.0338

Quantity Charge is based on average winter water consumption in excess of 400 cubic feet (cf) per month. Winter consumption is defined as the average of water meter readings taken in the months of January, February and March. Annually on April 1 the bill will be adjusted based on the water meter readings taken during the previous three months.

Single family residential water accounts with no consumption during the months of January, February and March will be based on 700 cubic feet.

Multi-Family Residential	June 2012	July 2013
Monthly Service Charge per Unit	$20.60	$22.66
Quantity Charge per cf	$0.0308	$0.0338

Quantity Charge is based on average winter water consumption in excess of 400 cubic feet per month per unit. Winter consumption is defined as the average of the water meter readings taken in the months of January, February and March.

Multi-family residential accounts are all accounts in which more than one residential dwelling is attached to the same water service. Annually on April 1 the bill will be adjusted based on the water readings taken during the previous three months. Multi-family residential water account with no consumption during the months of January, February and March will be based at 500 cubic feet. Two dormitory rooms are equal to one multi-family residential unit.

Commercial, Industrial and Governmental	June 2012	July 2013
Monthly Service Charge	$21.50	$23.65
Quantity Charge per cf	$0.0342	$0.0376

Quantity Charge is based on actual monthly water consumption. Mixed residential and commercial accounts will be billed as commercial.

For commercial, industrial or governmental users where monthly water consumption is not measured through city water meters, the sewer rate will be established as follows: The annual water consumption will be determine by an estimate made by the Director of Finance who shall use water consumption records of similar users or water consumption record of past use, if available. The annual water consumption will be multiplied by the Quantity Charge set forth above and the product divided by twelve. The quotient will be added to the Monthly Service Charge set forth above. The sum shall be the monthly sewer rate for the user. This rate shall be effective beginning in the month after the rate is determined until the rate schedule is amended by resolution of the council. At such time the Director shall redetermine the annual water consumption and compute the monthly sewer rate using the formal asset forth above. Water consumption determined in this manner shall be lowered if the user can demonstrate through the use of a meter approved by the city that the user's actual consumption is less than the estimate.

2. ADJUSTMENTS AND EXEMPTIONS TO COMMERCIAL AND INDUSTRIAL SEWER RATES

A. If a commercial, industrial or governmental user can demonstrate that the volume of sewage discharged by the user is less than 50% of the water consumed, the City Administrator may adjust the sewer user charge accordingly.

<u>Methodology for Special Cases for City Administrator</u>

1. Greenhouses, Churches, and Schools (grades K-12) operating on a nine month school year.

	June 2012	July 2013
Monthly Service Charge	$21.50	$23.65
Quantity Charge per cf	$0.0342	$0.0376

Quantity Charge is based on average winter water consumption. Winter consumption is defined as the average of the meter readings taken in the months of January, February and March. Annually on April 1 the bill will be adjusted based on the water meter readings during the previous three months.

1. Bed and Breakfasts and Ashland Parks Bathroom

	June 2012	July 2013
Monthly Service Charge	$21.50	$23.65
Quantity Charge per cf	$0.0342	$0.0376

Quantity Charge is based on winter water consumption. Winter consumption is defined as the total of water meter readings taken in the months of January, February and March. Annually on April 1 the bill will be adjusted based on the water meter readings during the previous three months.

B. Water sold through an irrigation meter is exempt from sewer user charge.

3. SEWER RATES OUTSIDE THE CITY LIMITS

A. The sewer user charge shall apply to those sewer users permitted under Section 14.08.030 of the Ashland Municipal Code.
B. The sewer rates for outside the City limits shall be two times the sewer charges for inside the City limits. Unmetered residential accounts will be calculated on an average winter usage of 700 cubic feet of water for single family residences, and 500 cubic feet per unit for multi-family residences.

APPENDIX F
COST ESTIMATES

- COLLECTION SYSTEM COSTS
- TREATMENT SYSTEM COSTS
  - o RECOMMENDED IMPROVEMENTS
  - o WQ TRADING/OUTFALL RELOCATION
  - o TREATMENT ALTERNATIVES
- SHORT-LIVED ASSETS

KELLER associates

Collection System Cost Estimates

CITY OF ASHLAND
Wastewater Facility Planning Study
Collection System Capital Improvement Plan

ID#	Item	Est. Project Cost	% Allocated to Growth	$ to Growth
Priority 1 Improvements (2011-2013)				
1A	18" and 24" Parallel Trunkline Along Creek	$ 1,587,000	70%	$ 1,110,900
1B	15" Main Along Mountain Ave	$ 118,000	25%	$ 29,500
1D	A St 15" Main	$ 522,000	10%	$ 52,200
1E	12" Main Along Railroad	$ 275,000	57%	$ 156,750
1G	Miscellaneous Lift Station Upgrades	$ 335,000	10%	$ 33,500
1H	Portable Flow Meters	$ 60,000	0%	$ -
1I	Storm Water Inflow Study	$ 60,000	0%	$ -
	Total Priority 1 Improvements	**$ 2,957,000**	**47%**	**$ 1,382,850**
Priority 2 Improvements (by 2020)				
2A	12" Pipeline on Nevada Street	$ 217,000	38%	$ 82,460
2B	8" Slope Correction on Walker Ave.	$ 168,000	28%	$ 47,040
2C	12" Wightman St.	$ 172,000	66%	$ 113,520
2D	Miscellaneous Lift Station Upgrades	$ 739,000	10%	$ 73,900
	Total Priority 2 Improvements	**$ 1,296,000**	**24%**	**$ 316,920**
Priority 3 IExpansion (by UGB Build-out)				
3A	Rogue Valley Hwy 99 Collection, Lift Station, & Pressure Main	$ 2,545,000	100%	$ 2,545,000
3B	Upsize Costs for Future Expansion	$ 18,000	100%	$ 18,000
	Total Priority 3 Improvements	**$ 2,563,000**	**100%**	**$ 2,563,000**
	TOTAL COLLECTION SYSTEM COSTS (rounded)	**$ 4,253,000**		

* All costs in 2011 Dollars. Costs include engineering and contingencies.
* * Costs assume open cut construction. Alternative technologies (i.e. pipe bursting) should be explored during pre-design phase.

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City of Ashland, OR
WW Collection CIP Unit Price List

ITEM	UNIT	UNIT PRICE*
PVC Pipe (Gravity)		
8" Pipe - Excavation, Backfill	LF	$50
10" Pipe - Excavation, Backfill	LF	$55
12" Pipe - Excavation, Backfill	LF	$60
15" Pipe - Excavation, Backfill	LF	$65
18" Pipe - Excavation, Backfill	LF	$90
21" Pipe - Excavation, Backfill	LF	$100
24" Pipe - Excavation, Backfill	LF	$115
36" Pipe - Excavation, Backfill	LF	$135
PVC Pipe (Pressure)		
4" Pressure Pipe - Excavation, Backfill	LF	$35
6" Pressure Pipe - Excavation, Backfill	LF	$40
8"Pressure Pipe - Excavation, Backfill	LF	$45
PVC Pipe (Gravity) Upsize Costs		
10" Pipe - Excavation, Backfill (upsize from 8")	LF	$5
12" Pipe - Excavation, Backfill (upsize from 8")	LF	$10
Remove Old Pipe - 8" thru 18"	LF	$5
Connect/Reconnect Pipes at Manholes - 8" thru 21"	EA	$1,500
Connect/Reconnect Pipes at Manholes - 24" thru 36"	EA	$3,000
Manhole 48" - 8" thru 18" pipe	EA	$3,000
Manhole 54" - 21" thru 24" pipe	EA	$3,500
Manhole 60" - 30" thru 36" pipe	EA	$4,000
Reconnect Services	LF	$10
Existing Utility Protection	LF	$4
Traffic Control	LS	varies
Rock Excavation	LF	$35
Bore Short Length (<60feet) - incl casing & carrier pipe	LF	$600
Bore Long Length (>100feet) - incl casing & carrier pipe	LF	$450
Canal/Creek Crossing - incl. casing & carrier pipe	LS	$15,000
Easement	LF	$25
Bypass Piping Setup - 8" thru 24" gravity	EA	$5,000
Bypass Pipe and Pump Operation - 8" thru 24" gravity	LF	$10
1/2 Lane Pavement Repair	LF	$30
Full Lane Pavement Repair	LF	$60
Control Density Backfill	LF	$40
Gravel Road Repair	LF	$7
Miscellaneous Surface Repair	LF	$5
6' Chain Link Security Fencing (add $1000 per gate)	LF	$20
Mobilization - Percent of Item Cost Sum	%	5%
Contingency - % of construction costs	%	30%
Engineering and CMS - % of construction costs	%	18%

* Costs in 2011 Dollars

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Item	Unit	Unit Price	Estimated Quantity	Item Cost (Rounded)	Total Cost (Rounded)
Priority 1					
1A: 18" and 24" Parallel Trunkline Along Creek					
18" Pipe - Excavation, Backfill	LF	$85	4,160	$353,600	
24" Pipe - Excavation, Backfill	LF	$110	2,370	$260,700	
Rock Excavation	CY	$120	1,800	$216,000	
Manhole 48" - 8" thru 18" pipe	EA	$3,000	14	$42,000	
Manhole 54" - 21" thru 24" pipe	EA	$3,500	8	$28,000	
Connect/Reconnect Pipes at Manholes - 8" thru 21"	EA	$1,500	4	$6,000	
Connect/Reconnect Pipes at Manholes - 24" thru 36"	EA	$3,000	4	$12,000	
Miscellaneous Surface Repair	LF	$5	1,830	$9,150	
Gravel Road Repair	LF	$7	2,000	$14,000	
Traffic Control	LS	$3,000	1	$3,000	
Easement	LF	$20	4,000	$80,000	
New Gravel Access Road	LF	$10	2,700	$27,000	
Canal/Creek Crossing - incl. casing & carrier pipe	LS	$15,000	4	$60,000	
Subtotal					*$1,111,450*
Mobilization - Percent of Item Cost Sum	%	5%		$55,573	
Total Construction Costs					*$1,167,023*
Contingency - % of construction costs	%	20%		$233,405	
Permitting	LS			$17,000	
Engineering and CMS - % of construction costs	%	14.5%		$169,000	
Total Project Cost (rounded)					***$1,587,000***
1B: 15" Main Along Mountain Ave					
15" Pipe - Excavation, Backfill	LF	$65	395	$25,675	
Connect/Reconnect Pipes at Manholes - 8" thru 21"	EA	$1,500	2	$3,000	
Bypass Piping Setup - 8" thru 24" gravity	EA	$5,000	1	$5,000	
Bypass Pipe and Pump Operation - 8" thru 24" gravity	LF	$10	395	$3,950	
Existing Utility Protection	LF	$4	395	$1,580	
Reconnect Services	LF	$10	395	$3,950	
1/2 Lane Pavement Repair	LF	$30	395	$11,850	
Control Density Backfill	LF	$40	395	$15,800	
Traffic Control	LS	$5,000	1	$5,000	
Subtotal					*$75,805*
Mobilization - Percent of Item Cost Sum	%	5%		$3,790	
Total Construction Costs					*$79,595*
Contingency - % of construction costs	%	30%		$23,879	
Engineering and CMS - % of construction costs	%	18%		$14,327	
Total Project Cost (rounded)					***$118,000***
1C: Not Used					
1D: A St 15" Main					
15" Pipe - Excavation, Backfill	LF	$65	2,200	$143,000	
Manhole 48" - 8" thru 18" pipe	EA	$3,000	7	$21,000	
Connect/Reconnect Pipes at Manholes - 8" thru 21"	EA	$1,500	2	$3,000	
Bypass Piping Setup - 8" thru 24" gravity	EA	$5,000	1	$6,000	
Bypass Pipe and Pump Operation - 8" thru 24" gravity	LF	$10	800	$8,000	
Existing Utility Protection	LF	$4	2,200	$8,800	
Reconnect Services	LF	$10	2,200	$22,000	
1/2 Lane Pavement Repair	LF	$30	2,200	$66,000	
Control Density Backfill	LF	$40	395	$15,800	
Traffic Control	LS	$7,000	1	$7,000	
Rock Excavation	LF	$35	1,000	$35,000	
Subtotal					*$335,600*
Mobilization - Percent of Item Cost Sum	%	5%		$16,780	
Total Construction Costs					*$352,380*
Contingency - % of construction costs	%	30%		$105,714	
Engineering and CMS - % of construction costs	%	18%		$63,428	
Total Project Cost (rounded)					***$522,000***

Item	Unit	Unit Price	Estimated Quantity	Item Cost (Rounded)	Total Cost (Rounded)
1E: 12" Main Along Railroad					
12" Pipe - Excavation, Backfill	LF	$60	1,350	$81,000	
Manhole 48" - 8" thru 18" pipe	EA	$3,000	4	$12,000	
Connect/Reconnect Pipes at Manholes - 8" thru 21"	EA	$1,500	2	$3,000	
Bypass Piping Setup - 8" thru 24" gravity	EA	$5,000	1	$5,000	
Bypass Pipe and Pump Operation - 8" thru 24" gravity	LF	$10	800	$8,000	
Reconnect Services	LF	$10	1,350	$13,500	
Existing Utility Protection	LF	$4	1,350	$5,400	
1/2 Lane Pavement Repair	LF	$30	1,350	$40,500	
Traffic Control	LS	$8,000	1	$8,000	
Subtotal					*$176,400*
Mobilization - Percent of Item Cost Sum	%	5%		$8,820	
Total Construction Costs					*$185,220*
Contingency - % of construction costs	%	30%		$55,566	
Engineering and CMS - % of construction costs	%	18%		$33,340	
Total Project Cost (rounded)					***$275,000***
1F: Not Used					
1G.1: Misc Upgrades - Creek Drive LS Upgrades					
Chopper Pumps	EA	$16,000	2	$32,000	
Three Phase Power	LS	$25,000	1	$25,000	
Subtotal					*$57,000*
1G.2: Misc Upgrades - Abandon Nevada LS & Oak Street Rehabilitation					
Abandon LS and Oak Street Rehab Project (portion of work completed by City)	LS	$95,000	1	$95,000	
Subtotal					*$95,000*
1G: Miscellaneous Upgrades					
1G.1 Creek Drive Lift Station Chopper Pumps and Three Phase Power	LS	$57,000	1	$57,000	
1G.2 Abandon Nevada Lift Station	LS	$95,000	1	$95,000	
1G.3 Add Drain at Windburn Lift Station	LS	$3,500	1	$3,500	
1G.4 Maintenance Management Software & Programming Upgrades	LS	$10,000	1	$10,000	
1G.5 Add SCADA Control System - All Lift Stations	LS	$50,000	1	$50,000	
Subtotal					*$215,500*
Mobilization - Percent of Item Cost Sum	%	5%		$10,775	
Total Construction Costs					*$226,275*
Contingency - % of construction costs	%	30%		$67,883	
Engineering and CMS - % of construction costs	%	18%		$40,730	
Total Project Cost (rounded)					***$335,000***
				Total Priority 1 Cost (rounded)	**$2,837,000**

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Item	Unit	Unit Price	Estimated Quantity	Item Cost (Rounded)	Total Cost (Rounded)
Priority 2					
2A: 12" Pipeline on Nevada St.					
12" Pipe - Excavation, Backfill	LF	$35	1,150	$40,250	
Manhole 48" - 8" thru 18" pipe	EA	$2,000	4	$8,000	
Connect/Reconnect Pipes at Manholes - 8" thru 21'	EA	$1,500	2	$3,000	
Existing Utility Protection	LF	$4	1,150	$4,600	
Reconnect Services	LF	$10	1,150	$11,500	
1/2 Lane Pavement Repair	LF	$20	1,150	$23,000	
Control Density Backfill	LF	$40	1,150	$46,000	
Traffic Control	LS	$3,000	1	$3,000	
Subtotal					*$139,350*
Mobilization - Percent of Item Cost Sum	%	5%		$6,968	
Total Construction Costs					*$146,318*
Contingency - % of construction costs	%	30%		$43,895	
Engineering and CMS - % of construction costs	%	18%		$26,337	
Total Project Cost (rounded)					***$217,000***
2B: 8" Slope Correction on Walker Ave.					
8" Pipe - Excavation, Backfill	LF	$50	670	$33,500	
Connect/Reconnect Pipes at Manholes - 8" thru 21'	EA	$1,500	2	$3,000	
Bypass Piping Setup - 8" thru 24" gravity	EA	$5,000	1	$5,000	
Bypass Pipe and Pump Operation - 8" thru 24" gravity	LF	$10	670	$6,700	
Reconnect Services	LF	$10	670	$6,700	
Existing Utility Protection	LF	$4	670	$2,680	
1/2 Lane Pavement Repair	LF	$30	670	$20,100	
Control Density Backfill	LF	$40	670	$26,800	
Traffic Control	LS	$3,000	1	$3,000	
Subtotal					*$107,480*
Mobilization - Percent of Item Cost Sum	%	5%		$5,374	
Total Construction Costs					*$112,854*
Contingency - % of construction costs	%	30%		$33,856	
Engineering and CMS - % of construction costs	%	18%		$20,314	
Total Project Cost (rounded)					***$168,000***
2C: 12" Main Wightman St.					
12" Pipe - Excavation, Backfill	LF	$35	1,300	$45,500	
Manhole 48" - 8" thru 18" pipe	EA	$2,000	4	$8,000	
Connect/Reconnect Pipes at Manholes - 8" thru 21'	EA	$1,500	2	$3,000	
Bypass Piping Setup - 8" thru 24" gravity	EA	$5,000	1	$5,000	
Bypass Pipe and Pump Operation - 8" thru 24" gravity	LF	$10	800	$8,000	
Reconnect Services	LF	$10	1,300	$13,000	
Existing Utility Protection	LF	$4	1,300	$5,200	
1/2 Lane Pavement Repair	LF	$20	1,300	$26,000	
Control Density Backfill	LF	$40	1,300	$52,000	
Traffic Control	LS	$5,000	1	$5,000	
Subtotal					*$170,700*
Mobilization - Percent of Item Cost Sum	%	5%		$8,535	
Total Construction Costs					*$179,235*
Contingency - % of construction costs	%	30%		$53,771	
Engineering and CMS - % of construction costs	%	18%		$32,262	
Total Project Cost (rounded)					***$172,000***
2D.1: Misc Upgrades - Grandview LS Force Main Replacement					
6" Pressure Pipe - Excavation, Backfill	LF	$40	720	$28,800	
Bypass Piping Setup - 8" thru 24" gravity	EA	$5,000	1	$5,000	
Bypass Pipe and Pump Operation - 8" thru 24" gravity	LF	$10	720	$7,200	
Existing Utility Protection	LF	$4	720	$2,880	
1/2 Lane Pavement Repair	LF	$30	720	$21,600	
Control Density Backfill	LF	$40	720	$28,800	
Traffic Control	LS	$3,000	1	$3,000	
Subtotal					*$97,280*
2D.2: Misc Upgrades - Shamrock LS Upgrades					
Replace with Submersible Pumps	LS	$50,000	1	$50,000	
Bypass Piping Setup - 8" thru 24" gravity	EA	$5,000	1	$5,000	
Bypass Pipe and Pump Operation - 8" thru 24" gravity	LF	$10	220	$2,200	
Subtotal					*$57,200*
2D.3: Misc Upgrades - North Mountain LS Upgrades					
Replace with Submersible Pumps, Standardize	LS	$250,000	1	$250,000	
4" Pressure Pipe - Excavation, Backfill	LF	$35	400	$14,000	
Bypass Piping Setup - 8" thru 24" gravity	EA	$5,000	1	$5,000	
Bypass Pipe and Pump Operation - 8" thru 24" gravity	LF	$10	400	$4,000	
Existing Utility Protection	LF	$4	300	$1,200	
Miscellaneous Surface Repair	LF	$5	300	$1,500	
Bore Long Length (>100feet) - incl casing & carrier pipe	LF	$450	100	$45,000	
Subtotal					*$320,700*

Item	Unit	Unit Price	Estimated Quantity	Item Cost (Rounded)	Total Cost (Rounded)
2D: Miscellaneous Upgrades					
2D.1 Grandview Lift Station Force Main Upgrade	LS	$97,300	1	$97,300	
2D.2 Shamrock Lift Station Upgrades	LS	$57,200	1	$57,200	
2D.3 North Mountain Lift Station & Force Main Upgrades	LS	$320,700	1	$320,700	
Subtotal					*$475,200*
Mobilization - Percent of Item Cost Sum	%	5%		$23,760	
Total Construction Costs					*$498,960*
Contingency - % of construction costs	%	30%		$149,688	
Engineering and CMS - % of construction costs	%	18%		$89,813	
Total Project Cost (rounded)					***$739,000***
Total Priority 2 Cost (rounded)					**$1,296,000**

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Item	Unit	Unit Price	Estimated Quantity	Item Cost (Rounded)	Total Cost (Rounded)
Priority 3					
3A: Rogue Valley Hwy 99 Lift Station					
Abandon N. Main LS - pull pumps, plug pipes, fill wet well, etc	LS	$5,000	1	$5,000	
10" Pipe - Excavation, Backfill (upsize from 8")	LF	$5	4,170	$20,850	
12" Pipe - Excavation, Backfill (upsize from 8")	LF	$10	2,310	$23,100	
New Lift Station - wet well, pumps, elec. etc.	LS	$600,000	1	$600,000	
6" Pressure Pipe - Excavation, Backfill	LF	$40	8,270	$330,800	
1/2 Lane Pavement Repair	LF	$30	8,270	$248,100	
Control Density Backfill	LF	$40	8,270	$330,800	
Traffic Control	LS	$10,000	1	$10,000	
Bore Long Length (>100feet) - incl casing & carrier pipe	LF	$450	120	$54,000	
Canal/Creek Crossing - incl. casing & carrier pipe	LS	$15,000	1	$15,000	
Subtotal					*$1,637,650*
Mobilization - Percent of Item Cost Sum	%	5%		$81,883	
Total Construction Costs					*$1,719,533*
Contingency - % of construction costs	%	30%		$515,860	
Engineering and CMS - % of construction costs	%	18%		$309,516	
Total Project Cost (rounded)					***$2,545,000***
3B: Future System Expansion					
10" Pipe - Excavation, Backfill (upsize from 8")	LF	$5	2,300	$11,500	
Subtotal					*$11,500*
Mobilization - Percent of Item Cost Sum	%	5%		$575	
Total Construction Costs					*$12,075*
Contingency - % of construction costs	%	30%		$3,623	
Engineering and CMS - % of construction costs	%	18%		$2,174	
Total Project Cost (rounded)					***$18,000***
Total Priority 3 Cost (rounded)					**$2,563,000**

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TREATMENT SYSTEM COST ESTIMATES

RECOMMENDED IMPROVEMENTS

WQ TRADING/OUTFALL RELOCATION

TREATMENT ALTERNATIVES

Ashland WWTP Improvements
Additional Oxidation Ditch

Item	Units	Cost Each	Quantity	Unit Total	Subtotal	Item Total
Capital Costs						
Sitework						
Sitework Subtotal						*$ 297,700*
Oxidation Ditches						
Rock Excavation	cy	$ 60	3333	$ 200,000		
					$ 200,000	
Structural						
Foundation Slab	cy	$ 500	716	$ 358,000		
Concrete Walls	cy	$ 850	1560	$ 1,326,189		
Concrete Hanging Slabs	cy	$ 1,200	260	$ 311,731		
Grating	sq ft	$ 10	52	$ 520		
Railing	ft	$ 15	404	$ 6,060		
Stairs	ft	$ 40	24	$ 960		
					$2,003,460	
Mechanical						
Equipment	LS	$ 359,375	1	$ 359,375		
Utility Water	LS	$ 10,000	1	$ 10,000		
Valves	EA	$ 4,000	2	$ 8,000		
Slide Gates	Ea	$ 4,500	2	$ 9,000		
Weir	Ea	$ 1,000	2	$ 2,000		
Equipment Installation	%	$ 388,375	25%	$ 97,094		
Taxes	%	$ 388,375	6%	$ 23,303		
20" ML	ft	$ 110	220	$ 24,200		
Misc Piping	ft	$ 90	230	$ 20,680		
Misc. Concrete	ft	$ 150	900	$ 134,934		
4" UW	ft	$ 65	80	$ 5,200		
Hose Bibbs	ea	$ 250	4	$ 1,000		
					$ 694,785	
Electrical	LS	$ 31,500	1	$ 78,750		
					$ 78,750	
Oxidation Ditches Subtotal						*$ 2,976,995*
Electrical Site Work	LS	$ 25,000	1	$ 25,000		
Electrical Site Subtotal						*$ 25,000*
Controls Site Work						
Instrumentation	LS	$ 12,500	1	$ 12,500		
Ductbank	LS	$ 25,000	1	$ 25,000		
Panels	LS	$ 12,500	1	$ 12,500		
Programming	LS	$ 25,000	1	$ 25,000		
Controls Subtotal						*$ 75,000*
Treatment System Construction Pretotal	---			**$ 3,080,000**		**$ 3,370,000**
Mobilization & Contractor OH&P	---		15%	$ 505,500		
Subtotal						**$ 3,880,000**
Contingency	---		30%	$ 1,164,000		
Subtotal						**$ 5,040,000**
Engineering			18.0%			$ 907,200
Administration and Wetlands Mitigation			2.0%			$ 200,800
Subtotal						**$ 6,150,000**
Total Capital	---					**$ 6,150,000**

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Priority2 - Membrane Replacement

Description	Estimate
Membranes	$2,500,000
Installation	$375,000
Construction Pretotal	$2,875,000
Mobilization, Contractor OH&P (15%)	$431,250
Subtotal	$3,306,250
Contingency (30%)	$991,900
Total Construction Estimate	**$4,299,000**
Engineering, Legal, Administration (20%)	359,800
TOTAL PROJECT COST	**$4,658,800**

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Priority2 - Membrane Permeate Piping and Pumps

Description	Estimate
PermeatePiping Replacement	$120,000
Permeate Pump Replacement	$125,000
Installation	$36,750
Construction Pretotal	$281,750
Mobilization, Contractor OH&P (15%)	$42,263
Subtotal	$324,013
Contingency (30%)	$97,300
Total Construction Estimate	**$422,000**
Engineering, Legal, Administration (20%)	84,400
TOTAL PROJECT COST	**$506,400**

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Priority2 - UV Addition

Description	Estimate
UV Unit	$140,000
Piping	$30,000
Control Panel	$25,000
Installation	$36,750
Construction Pretotal	$195,000
Mobilization, Contractor OH&P (15%)	$29,250
Subtotal	$224,250
Contingency (30%)	$67,300
Total Construction Estimate	**$292,000**
Engineering, Legal, Administration (20%)	58,400
TOTAL PROJECT COST	**$350,400**

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Priority 2 - Mechanical Bar Screen Replacement

Description	Estimate
Screen	$150,000
Washer/Compactor	$40,000
Misc. piping	$7,500
Structural Modifications	$11,800
Electrical / I & C	$38,000
Installation	$28,500
Construction Pretotal	$275,800
Mobilization, Contractor OH&P (15%)	$41,370
Subtotal	$317,170
Contingency (30%)	$95,200
Total Construction Estimate	**$413,000**
Engineering, Legal, Administration (20%)	82,600
TOTAL PROJECT COST	**$495,600**

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Grit Removal Replacement

Description	Estimate
Grit Pumps	$30,000
Grit Chamber	$286,000
Misc. piping	$7,500
Structural Modifications	$11,800
Electrical / I & C	$63,200
Installation	$47,400
Construction Pretotal	$445,900
Mobilization, Contractor OH&P (15%)	$66,885
Subtotal	$512,785
Contingency (30%)	$153,900
Total Construction Estimate	**$667,000**
Engineering, Legal, Administration (20%)	133,400
TOTAL PROJECT COST	**$800,400**

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Priority 2 Clarifier Equipment Replacement

Description	Estimate
Clarifier Equipment	$150,000
Installation	$30,000
Construction Pretotal	$180,000
Mobilization, Contractor OH&P (15%)	$27,000
Subtotal	$207,000
Contingency (30%)	$62,100
Total Construction Estimate	**$270,000**
Engineering, Legal, Administration (20%)	54,000
TOTAL PROJECT COST	**$324,000**

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Priority 2 Ashland Creek Pump Replacement

Description	Estimate
Pumps	$140,000
Electrical Upgrades	$28,000
Installation	$28,000
Construction Pretotal	$196,000
Mobilization, Contractor OH&P (15%)	$29,400
Subtotal	$225,400
Contingency (30%)	$67,700
Total Construction Estimate	**$294,000**
Engineering, Legal, Administration (20%)	58,800
TOTAL PROJECT COST	**$352,800**

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Priority 3 Additional Centrifuge

Description	Estimate
Centrifuge	$350,000
Electrical Upgrades	$35,000
Installation	$70,000
Construction Pretotal	$455,000
Mobilization, Contractor OH&P (15%)	$68,250
Subtotal	$523,250
Contingency (30%)	$157,000
Total Construction Estimate	**$680,250**
Engineering, Legal, Administration (20%)	136,100
TOTAL PROJECT COST	**$816,350**

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Priority 3 Clarifier Equipment Replacement

Description	Estimate
Clarifier Equipment	$300,000
Installation	$60,000
Construction Pretotal	$360,000
Mobilization, Contractor OH&P (15%)	$54,000
Subtotal	$414,000
Contingency (30%)	$124,200
Total Construction Estimate	**$538,200**
Engineering, Legal, Administration (20%)	107,700
TOTAL PROJECT COST	**$645,900**

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Priority 3 Additional Centrifuge

Description	Estimate
Clarifier	$988,000
Construction Pretotal	$988,000
Mobilization, Contractor OH&P (15%)	$148,200
Subtotal	$1,136,200
Contingency (30%)	$340,900
Total Construction Estimate	**$1,477,100**
Engineering, Legal, Administration (20%)	295,500
TOTAL PROJECT COST	**$1,772,600**

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The Freshwater Trust

Water Quality Trading Program Estimate

Contact:
David Primozich
Senior Director of Ecosystem Services
The Freshwater Trust
Phone 503.434.8033
primozich@thefreshwatertrust.org

Prepared for: The City of Ashland

RIPARIAN RESTORATION CREDITS			
Kilocalories/day required @ 2:1 (Riparian Restoration)	**64,000,000**		
NON-NPV RIPARIAN RESTORATION CREDIT PRICE ($ per kcal/day)	**$ 0.06103**		
NPV RIPARIAN RESTORATION CREDIT PRICE ($ per kcal/day)	**$ 0.04897**	**SRF BREAKDOWN (w/o NPV)**	
Riparian Restoration Credit Generation Costs		**SRF Eligible**	**Non-Eligible**
Restoration Direct Project Costs	$ 682,383	$ 682,383	-
Material & Labor Cost Changes (10% of restoration direct project costs)	$ 68,238	$ 68,238	-
Credit Calculation & Project Installation Management	$ 267,761	$ 267,761	-
Certification, Verification & Registration	$ 36,879	-	$ 36,879
Overhead (insurance, occupancy, etc.)	$ 37,531	-	$ 37,531
Project Installation Financing	$ 13,056	$ 13,056	-
SUBTOTAL - CREDIT GENERATION (Capital)	$ 1,105,849		
Riparian Restoration Credit Ongoing Costs			
20 year Maintenance (Y1 - Y3 SRF Eligible)	$ 904,230	$ 298,921	$ 605,308
20 year Monitoring	$ 431,811	-	$ 431,811
20 year Landowner payments	$ 447,552	-	$ 447,552
Ongoing Verification and Registration	$ 381,758	-	$ 381,758
20 year Project Management and Overhead	$ 634,927	-	$ 634,927
SUBTOTAL - ONGOING COSTS (O&M)	$ 2,800,279		
TOTAL RIPARIAN RESTORATION CREDITS	$ 3,906,128		
NPV TOTAL RIPARIAN RESTORATION CREDITS	$ 3,133,928		

WETLAND CREATION				
Kilocalories/day required (Wetland/Outfall)	**35,000,000**		**SRF (Avg. of Range w/o NPV)**	
Wetland & Outfall Relocation - Direct & O/M Costs	**LOW RANGE**	**HIGH RANGE**	**SRF Eligible**	**Non-Eligible**
Outfall Relocation (across Ashland Creek)	$ 845,000	$ 1,290,000	$ 1,067,500	-
Feasibility Study	$ 60,000	$ 100,000	$ 80,000	-
Constructed Wetlands	$ 1,178,000	$ 1,820,000	$ 1,499,000	-
Pump Station	$ 776,000	$ 1,003,000	$ 889,500	-
I & C	$ 86,000	$ 163,000	$ 124,500	-
Operation & Maintenance (20 years)	$ 832,880	$ 1,082,744	-	$ 957,812
TOTAL OUTFALL RELOCATION & WETLAND CREATION (range)	$ 3,777,880	$ 5,458,744		
NPV TOTAL AVERAGE OUTFALL & WETLAND COST	$ 3,327,466	$ 4,869,479		

PROGRAM SET-UP COSTS			**SRF BREAKDOWN (w/o NPV)**	
Research, Analysis & Review	$ 187,494	$ 187,494	$ 187,494	-

GRAND TOTAL - RANGE	**$ 7,871,502**	**$ 9,552,366**	**$ 5,178,367**	**$ 3,533,593**
GRAND TOTAL - RANGE (NPV)	**$ 6,648,888**	**$ 8,190,901**		

A discount rate of 2.7% was used to annualize costs in this estimate.

Item	Units	Cost Each	Quantity	Unit Total	Subtotal	Item Total
Capital Costs						
Sitework						
Sitework Subtotal						*$ 101,760*
Pump Station						$ 340,000
FilterBuilding						$ 420,000
Mechanical						
Filter Equipment	LS	$ 1,020,000	1	$ 1,020,000		
Utility Water	LS	$ 35,000	1	$ 35,000		
Valves	EA	$ 4,000	2	$ 8,000		
Pumps	Ea	$ 25,000	3	$ 75,000		
Conveyance Equipment	LS	$ 160,000	1	$ 160,000		
Equipment Installation	%	$ 1,138,000	25%	$ 284,500		
Taxes	%	$ 1,138,000	6%	$ 68,280		
Piping	ft	$ 110	120	$ 13,200		
Misc. Concrete	ft	$ 150	120	$ 18,000		
					$1,681,980	
Electrical	LS	$ 21,000	1	$ 353,216		
					$ 353,216	
Subtotal						*$ 2,035,196*
Electrical Site Work	LS	$ 25,000	1	$ 25,000		
Electrical Site Subtotal						*$ 25,000*
Controls Site Work						
Instrumentation	LS	$ 5,000	1	$ 5,000		
Ductbank	LS	$ 10,000	1	$ 10,000		
Panels	LS	$ 5,000	1	$ 5,000		
Programming	LS	$ 10,000	1	$ 10,000		
Controls Subtotal						*$ 30,000*
Treatment System Construction Pretotal	---			**$ 2,090,000**		**$ 2,950,000**
Mobilization & Contractor OH&P	---		15%	$ 442,500		
Subtotal						**$ 3,390,000**
Contingency	---		30%	$ 1,017,000		
Subtotal						**$ 4,410,000**
Engineering			18.0%			$ 793,800
Administration and Wetlands Mitigation			2.0%			$ 188,200
Subtotal						**$ 5,400,000**
Total Capital	---					**$ 5,400,000**

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Item	Units	Cost Each	Quantity	Unit Total	Subtotal	Item Total
Capital Costs						
Blower Building						*$ 450,000*
Oxidation Ditches						
Structural						
Concrete Walls	cy	$ 850	780	$ 663,000		
Reinforcing Center Wall	cy	$ 850	180	$ 153,000		
Concrete Hanging Slabs	cy	$ 1,200	62	$ 74,400		
					$ 890,400	
Mechanical						
Aeration Equipment	LS	$ 139,286	1	$ 139,286		
Blowers (5600 SCFM) Turbo	LS	$ 124,000	3	$ 372,000		
Blower Air Piping	EA	$ 150,000	1	$ 150,000		
Valves	Ea	$ 4,500	2	$ 9,000		
Mixers	Ea	$ 7,000	5	$ 35,000		
Equipment Installation	%	$ 705,286	25%	$ 176,321		
Taxes	%	$ 705,286	6%	$ 42,317		
Air Pipe Runs	FT	$ 180	500	$ 90,000		
Misc. Concrete	FT	$ 150	500	$ 75,000		
					$1,088,924	
Electrical	LS	$ 31,500	1	$ 415,658		
					$ 415,658	
Oxidation Ditches Subtotal						*$ 2,394,982*
Electrical Site Work	LS	$ 25,000	1	$ 25,000		
Electrical Site Subtotal						*$ 25,000*
Controls Site Work						
Instrumentation	LS	$ 5,000	1	$ 5,000		
Ductbank	LS	$ 10,000	1	$ 10,000		
Panels	LS	$ 5,000	1	$ 5,000		
Programming	LS	$ 10,000	1	$ 10,000		
Controls Subtotal						*$ 30,000*
Treatment System Construction Pretotal	---			**$ 2,450,000**		**$ 2,900,000**
Mobilization & Contractor OH&P	---		15%	$ 435,000		
Subtotal						**$ 3,340,000**
Contingency	---		30%	$ 1,002,000		
Subtotal						**$ 4,340,000**
Engineering			18.0%			$ 781,200
Administration			2.0%			$ 86,800
Subtotal						**$ 5,210,000**
Total Capital	---					**$ 5,210,000**

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Engineer's Estimate

Ashland WWTP Improvements
IFAS in Existing Ditch

Item	Units	Cost Each	Quantity	Unit Total	Subtotal	Item Total
Capital Costs						
Blower Building						*$ 450,000*
Oxidation Ditches						
Structural						
Concrete Walls	cy	$ 850	39	$ 33,150		
					$ 33,150	
Mechanical						
IFAS Equipment	LS	$ 1,088,500	1	$ 1,088,500		
Blowers (8000 SCFM) Turbo	LS	$ 124,000	4	$ 496,000		
Blower Air Piping	LS	$ 150,000	1	$ 150,000		
Valves	Ea	$ 4,500	6	$ 27,000		
Mixers	Ea	$ 7,000	4	$ 28,000		
Chemical Feed System	LS	$ 50,000	1	$ 50,000		
Equipment Installation	%	$ 1,789,500	25%	$ 447,375		
Taxes	%	$ 1,789,500	6%	$ 107,370		
Air Pipe Runs	ft	$ 180	500	$ 90,000		
Misc. Concrete	ft	$ 150	500	$ 75,000		
					$2,559,245	
Electrical/Control	LS	21%	1	$ 544,403		
					$ 544,403	
Oxidation Ditches Subtotal						*$ 3,136,798*
Electrical Site Work	LS	$ 25,000	1	$ 25,000		
Electrical Site Subtotal						*$ 25,000*
Controls Site Work						
Instrumentation	LS	$ 5,000	1	$ 5,000		
Ductbank	LS	$ 10,000	1	$ 10,000		
Panels	LS	$ 5,000	1	$ 5,000		
Programming	LS	$ 10,000	1	$ 10,000		
Controls Subtotal						*$ 30,000*
Treatment System Construction Pretotal	---			**$ 3,190,000**		**$ 3,640,000**
Mobilization & Contractor OH&P	---		15%	$ 546,000		
Subtotal						**$ 4,190,000**
Contingency	---		30%	$ 1,257,000		
Subtotal						**$ 5,450,000**
Engineering			18.0%			$ 981,000
Administration			2.0%			$ 109,000
Subtotal						**$ 6,540,000**
Total Capital	---					**$ 6,540,000**

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Item	Units	Cost Each	Quantity	Unit Total	Subtotal	Item Total
Capital Costs						
Sitework						
Sitework Subtotal						*$ 297,700*
Oxidation Ditches						
Rock Excavation	cy	$ 60	3333	$ 200,000		
					$ 200,000	
Structural						
Foundation Slab	cy	$ 500	716	$ 358,000		
Concrete Walls	cy	$ 850	1560	$ 1,326,189		
Concrete Hanging Slabs	cy	$ 1,200	260	$ 311,731		
Grating	sq ft	$ 10	52	$ 520		
Railing	ft	$ 15	404	$ 6,060		
Stairs	ft	$ 40	24	$ 960		
					$2,003,460	
Mechanical						
Equipment	LS	$ 359,375	1	$ 359,375		
Utility Water	LS	$ 10,000	1	$ 10,000		
Valves	EA	$ 4,000	2	$ 8,000		
Slide Gates	Ea	$ 4,500	2	$ 9,000		
Weir	Ea	$ 1,000	2	$ 2,000		
Equipment Installation	%	$ 388,375	25%	$ 97,094		
Taxes	%	$ 388,375	6%	$ 23,303		
20" ML	ft	$ 110	220	$ 24,200		
Misc Piping	ft	$ 90	230	$ 20,680		
Misc. Concrete	ft	$ 150	900	$ 134,934		
4" UW	ft	$ 65	80	$ 5,200		
Hose Bibbs	ea	$ 250	4	$ 1,000		
					$ 694,785	
Electrical	LS	$ 31,500	1	$ 78,750		
					$ 78,750	
Oxidation Ditches Subtotal						*$ 2,976,995*
Electrical Site Work	LS	$ 25,000	1	$ 25,000		
Electrical Site Subtotal						*$ 25,000*
Controls Site Work						
Instrumentation	LS	$ 12,500	1	$ 12,500		
Ductbank	LS	$ 25,000	1	$ 25,000		
Panels	LS	$ 12,500	1	$ 12,500		
Programming	LS	$ 25,000	1	$ 25,000		
Controls Subtotal						*$ 75,000*
Treatment System Construction Pretotal	---			**$ 3,080,000**		**$ 3,370,000**
Mobilization & Contractor OH&P	---		15%	$ 505,500		
Subtotal						**$ 3,880,000**
Contingency	---		30%	$ 1,164,000		
Subtotal						**$ 5,040,000**
Engineering			18.0%			$ 907,200
Administration and Wetlands Mitigation			2.0%			$ 200,800
Subtotal						**$ 6,150,000**
Total Capital	---					**$ 6,150,000**

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Item	Units	Cost Each	Quantity	Unit Total	Subtotal	Item Total
Capital Costs						
Sitework						
Sitework Subtotal						*$ 195,111*
Oxidation Ditches						
Rock Excavation	cy	$ 60	3333	$ 200,000		
					$ 200,000	
Structural						
Foundation Slab	cy	$ 500	716	$ 358,000		
Concrete Walls	cy	$ 850	1282	$ 1,089,511		
Concrete Hanging Slabs	cy	$ 1,200	0	$ -		
Grating	sq ft	$ 10	52	$ 520		
Railing	ft	$ 15	404	$ 6,060		
Stairs	ft	$ 40	24	$ 960		
					$1,455,051	
Mechanical						
Equipment	LS	$ 359,375		$ 84,000		
Utility Water	LS	$ 10,000		$ -		
Valves	EA	$ 4,000		$ -		
Slide Gates	Ea	$ 4,500		$ -		
Weir	Ea	$ 1,000		$ -		
Equipment Installation	%	$ 84,000	25%	$ 21,000		
Taxes	%	$ 84,000	6%	$ 5,040		
20" ML	ft	$ 110	220	$ 24,200		
Misc Piping	ft	$ 90	230	$ 20,680		
Misc. Concrete	ft	$ 150	900	$ 134,934		
4" UW	ft	$ 65	80	$ 5,200		
Hose Bibbs	ea	$ 250	4	$ 1,000		
					$ 296,054	
Electrical	LS	$ 31,500	0	$ -		
					$ -	
Oxidation Ditches Subtotal						*$ 1,951,105*
Electrical Site Work	LS	$ 25,000	1	$ 25,000		
Electrical Site Subtotal						*$ 25,000*
Controls Site Work						
Instrumentation	LS	$ 12,500	0	$ -		
Ductbank	LS	$ 25,000	0	$ -		
Panels	LS	$ 12,500	0	$ -		
Programming	LS	$ 25,000	0	$ -		
Controls Subtotal						*$ -*
Treatment System Construction Pretotal	---			**$ 1,980,000**		**$ 2,170,000**
Mobilization & Contractor OH&P	---		15%	$ 325,500		
Subtotal						**$ 2,500,000**
Contingency	---		30%	$ 750,000		
Subtotal						**$ 3,250,000**
Engineering			18.0%			$ 585,000
Administration and Wetlands Mitigation			2.0%			$ 165,000
Subtotal						**$ 4,000,000**
Total Capital	---					**$ 4,000,000**

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Item	Units	Cost Each	Quantity	Unit Total	Subtotal	Item Total
Capital Costs						
Sitework						
Sitework Subtotal						*$ 41,413*
Pump Station						$ 170,000
FilterBuilding						$ 420,000
Mechanical						
Filter Equipment	LS	$ 340,000	1	$ 340,000		
Utility Water	LS	$ 35,000	1	$ 35,000		
Valves	EA	$ 4,000	2	$ 8,000		
Pumps	Ea	$ 25,000	3	$ 75,000		
Conveyance Equipment	LS	$ 53,333	1	$ 53,333		
Equipment Installation	%	$ 458,000	25%	$ 114,500		
Taxes	%	$ 458,000	6%	$ 27,480		
Piping	ft	$ 110	120	$ 13,200		
Misc. Concrete	ft	$ 150	120	$ 18,000		
					$ 684,513	
Electrical	LS	$ 21,000	1	$ 143,748		
					$ 143,748	
Subtotal						*$ 828,261*
Electrical Site Work	LS	$ 25,000	1	$ 25,000		
Electrical Site Subtotal						*$ 25,000*
Controls Site Work						
Instrumentation	LS	$ 5,000	1	$ 5,000		
Ductbank	LS	$ 10,000	1	$ 10,000		
Panels	LS	$ 5,000	1	$ 5,000		
Programming	LS	$ 10,000	1	$ 10,000		
Controls Subtotal						*$ 30,000*
Treatment System Construction Pretotal	---			**$ 880,000**		**$ 1,510,000**
Mobilization & Contractor OH&P	---		15%	$ 226,500		
Subtotal						**$ 1,740,000**
Contingency	---		30%	$ 522,000		
Subtotal						**$ 2,260,000**
Engineering			18.0%			$ 406,800
Administration and Wetlands Mitigation			2.0%			$ 145,200
Subtotal						**$ 2,820,000**
Total Capital	---					**$ 2,820,000**

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Short-Lived Assets

UPDATED (11/15/11)

Ashland Wastewater Short Lived Assets (2011)

Equipment Description	Replacement Items	Unit Cost	Frequency (Yr)	Annual Cost
Collection System Pump Stations				
6 Lift Stations	Pumps / SCADA replacement	$ 180,000	15	$ 12,000
(Excludes Ashland Creek and Nevada Lift Stations)				
Wastewater Treatment Plant Facilities				
Ashland Creek Lift Station	Pumps	$ 175,000	15	$ 11,667
Headworks				
	Grit Classifier	$ 30,000	15	$ 2,000
	Grit Pumps	$ 25,000	15	$ 1,667
	Screening Compactor	$ 125,000	15	$ 8,333
	Flowmeter	$ 10,000	15	$ 667
Oxidation Ditch	Aerators	$ 200,000	15	$ 13,333
	Anoxic Mixers	$ 25,000	15	$ 1,667
RAS Pumps		$ 90,000	15	$ 6,000
WAS Pumps		$ 40,000	15	$ 2,667
Membrane Filtration System	Blowers	$ 20,000	15	$ 1,333
	Permeate Pumps	$ 80,000	15	$ 5,333
	Backpulse Pumps	$ 20,000	15	$ 1,333
	Vacuum Pumps	$ 9,000	15	$ 600
	Drain Pump	$ 10,000	15	$ 667
	Reject Pumps	$ 8,000	15	$ 533
	Membrane Feed Pumps	$ 20,000	15	$ 1,333
	Chemical Pumps	$ 18,000	10	$ 1,800
	Air Compressor	$ 6,000	15	$ 400
	Alum Pumps	$ 9,000	10	$ 900
	No. 4 Water Pumps	$ 15,000	15	$ 1,000
Backup Portable Pump		*$ 60,000*	*15*	*$ 4,000*
Scum Pumps		$ 5,000	15	$ 333
UV Lamp Replacement		$ 5,000	10	$ 500
Re-Aeration Blowers		$ 55,000	15	$ 3,667
EQ Basin Improvements	*Submersible Pumps*	*$ 50,000*	*15*	*$ 3,333*
	Check Valve Replacement	*$ 20,000*	*15*	*$ 1,333*
Utility Water System	Utility Water Pumps	$ 15,000	15	$ 1,000
Solids Handling Improvements	Centrifuge Feed Pumps	$ 30,000	15	$ 2,000
	Polymer Feed Pumps	$ 15,000	10	$ 1,500
Electrical/SCADA	PLC / Instrumentation Replacements	$ 200,000	15	$ 13,333
	Biofilter Media	$ 5,000	2	$ 2,500
Total Annual Cost for Short-Lived Assets:				**$ 108,733**

Future Facilities Items Shown in Blue Text (Itallics) *$ 8,667*