APPENDIX 2: CHAPTER 2 APPENDICES

2A: Tech Memo - Population Projections for the General Sewer Plan

2B: 2011 Annual Infiltration/Inflow Report

2C: Wastewater Characterization Sampling and Analysis Plan

2A: Tech Memo - Population Projections for the General Sewer Plan

Brown AND Caldwell

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Technical Memorandum

Development

Prepared for: City of Yelm

Project Title: 2011 General Sewer Plan

Project No: 141043

Technical Memorandum

Subject: Population Projections for the General Sewer Plan

Date: July 20, 2011

To: Stephanie Ray, Project Manager, City of Yelm

From: Jeff Morgan

Copy to: Kate Green

Prepared by: Kate Green, Project Engineer

Reviewed by: Jeff Morgan, Project Manager

Limitations:

This document was prepared solely for City of Yelm in accordance with professional standards at the time the services were performed and in accordance with the contract between City of Yelm and Brown and Caldwell dated 3-4-2011. This document is governed by the specific scope of work authorized by City of Yelm; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by City of Yelm and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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1. Introduction

Historical population estimates and future population projections for the City of Yelm are discussed in this Technical Memorandum (tech memo). These population projections will be used in the City's General Sewer Plan (GSP) for forecasting future flows and loading within the collection system and at the Water Reclamation Facility (WRF), and also future reclaimed water flow rates.

2. Historic Population Growth

Historic population estimates for population living within Yelm city limits were obtained from the Washington State Office of Financial Management (OFM) for 1930 – 2010. The OFM population estimate for 2000 was adjusted to match the United States Census Bureau population count once it was released; however, in 2010, the US completed a new census which determined the population for Yelm to be 6,848. The census tally is substantially higher than the OFM estimate of 5,900. Because the census data are more accurate than OFM estimates, this discrepancy indicates that OFM apparently underestimated the growth rates in Yelm for the period from 2000 to 2010.

Table 1 presents Yelm's historic population growth as documented by the US Census and as estimated by OFM. US Census data show that between 2000 and 2010 the population in Yelm increased at an annual rate of 7.6%.

Table 1. Historic Population Growth in Yelm City Limits[1,2]

Year	US Census Population Estimates for City Limits [3]	City Population Estimates by OFM	Average Annual Growth (based on OFM estimates)[4]
1930		384	-
1940		378	-0.2%
1950		470	2.2%
1960		479	0.2%
1970		628	2.7%
1980		1,294	7.5%
1990		1,337	0.3%
2000	3,289	3,289	9.4%
2001		3,420	4.0%
2002		3,485	1.9%
2003		3,830	9.9%
2004		4,150	8.4%
2005		4,455	7.3%
2006		4,565	2.5%
2007		4,845	6.1%
2008		5,150	6.3%
2009		5,625	9.2%
2010	6,848	5,900	4.9%

[1] *Provided by Washington Office of Financial Management, includes only population within Yelm city limits.*
[2] *Reference: http://www.ofm.wa.gov/pop/april1/finalpop2007.pdf and http://www.ofm.wa.gov/pop/decseries/historicalpop.xls*
[3] *Annual compounded growth rate between census years for 2000 and 2010 is 7.6%.*
[4] *Linear growth rate between dates shown.*

The OFM does not provide annual estimates for population within Yelm's Urban Growth Area (UGA). The US Census estimated the 2010 population within the UGA to be 1,353. Compared to the 2000 census estimate of 1,095, this represents a 2.1% annually compounded growth rate.

Based on the US Census tally, the total population living within Yelm city limits and the UGA is 8,201.

3. Existing Service Area Population

The 2010 US Census population estimate will be used as the existing population for the City of Yelm and its UGA. However, when evaluating the existing population for the purposes of estimating flows and loads, the GSP will consider only the population served by the City sewer system rather than the entire population within city limits and the entire UGA. The existing service population consists of the following elements:

1. Population within city limits served by City sewer. Based on mapping data provided by the City of Yelm, there may be parcels within City limits that are served by privately owned septic tanks rather than the City's Septic Tank Effluent Pumping (STEP) collection system. In order to estimate the population within City limits that is served by private septic tanks, the following methodology was used:
   - A map of parcels with STEP tanks was created. The results of this mapping are included in Appendix A. This was compared to aerial photos and parcel information provided by the Thurston County GIS department. Any parcel that appeared to be developed but did not appear to be served by a City STEP tank was assumed to contain a septic tank. A total of 157 parcels were determined to contain septic tanks.
   - In order to estimate the population for the parcels that had septic tanks, GIS mapping data provided by the 2010 US census were analyzed to determine population density and vacancy rates for each of the 157 parcels. Taking into account the parcel size, this provided an estimate of the number of people on each parcel served by a septic tank. The total population served by septic tanks within City limits was determined to be 508.
2. Population outside city limits served by City sewer. City mapping data shows that there are three STEP tanks in service outside City limits and within the UGA. These include a residential home, a duplex, and a church. The residential population estimated for the single family home and the duplex are included in the estimated service population outside the city limits. This estimate was based on a household size of 2.5 people. The City does not provide sewer service to any parcels outside the UGA.

The existing service area population, including the population served by City sewer within city limits and the UGA, is summarized in Table 2. Developed parcels within the existing service area that are served by City sewer are shown on Figure 1. Also shown are the parcels that were determined to be served by septic tanks (not on City sewer).

Table 2. Existing Service Area Population

Year	(1)	(2)	(3)= (1) - (2)	(4)	(5) = (3) + (4)
	Total Population within City Limits[1]	Projection within City Limits not served by City Sewer[2]	Population within City Limits Served by City Sewer	Population outside City Limits Served by City Sewer[3]	Total Population served by City Sewer
2010	6,848	508	6,340	8	6,348

1. *Source: 2010 US Census*
2. *Based on City STEP tank mapping data and Thurston County GIS data, there are approximately 157 parcels on septic tanks Population is based on land density for the census tract each parcel is located on.*
3. *Based on City STEP tank mapping, there are two residential STEP tanks outside City limits: a single family home and a duplex. Population is based on 2.5 persons per dwelling unit. Residents of the UGA that are not served by City sewer are not included in the existing service area population calculation.*

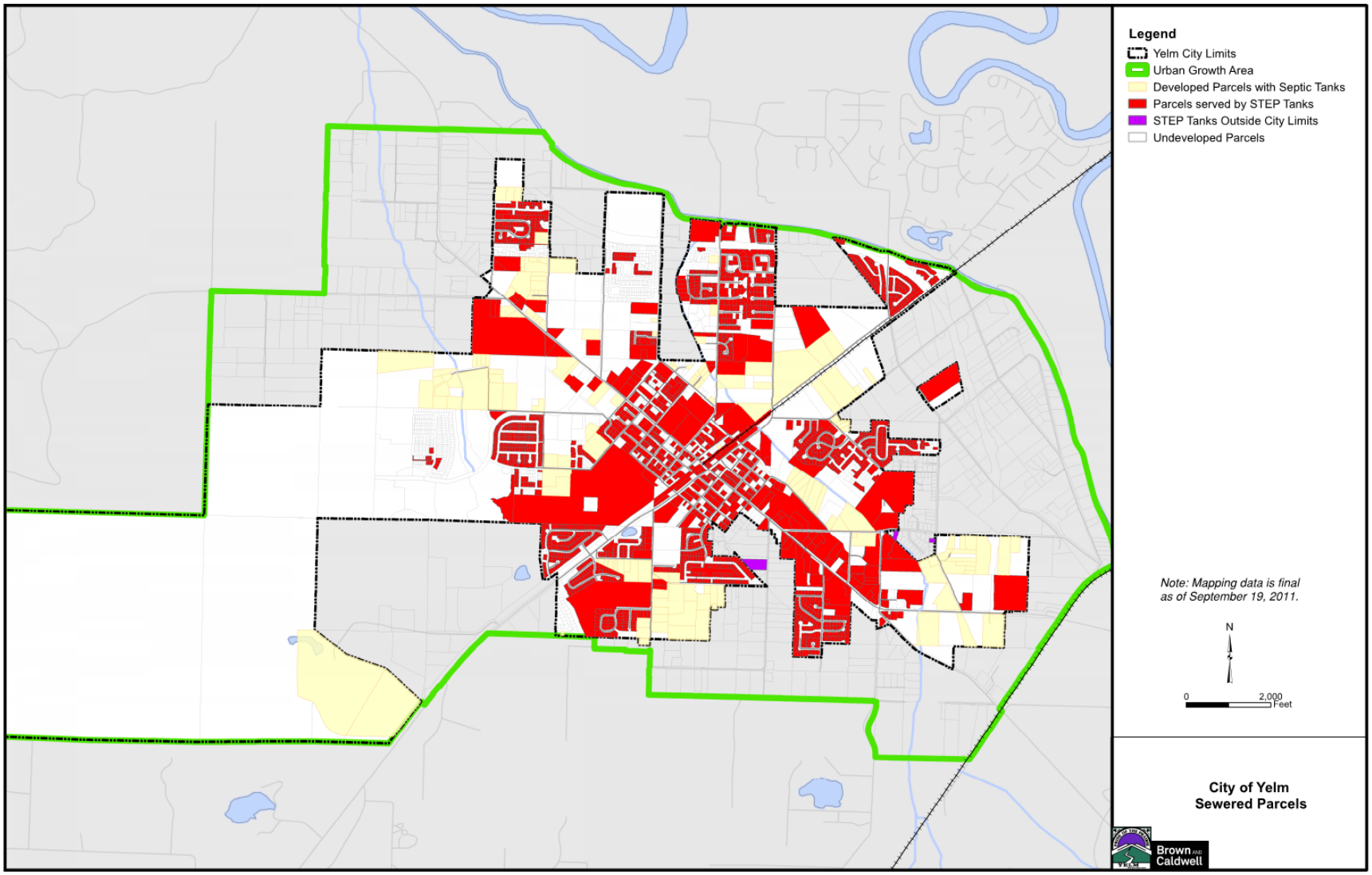


Figure 1. Sewered Parcels

4. Service Population Projections

4.1 Previous Population Forecasts

The Thurston Regional Planning Council (TRPC) develops official population forecasts every three to five years for communities across Thurston County. The most recent small area (city and rural) TRPC forecast was released in July 2005 and adopted in 2006. Updates to the forecasts were released in 2007, which included projections for two large Master Planned Communities (MPCs) proposed for development on the west side of Yelm, within city limits. Figure 2 shows the areas proposed for the MPC developments. Portions of the most recent TRPC forecast for Yelm are included in Appendix B. TRPC is not scheduled to release revised population forecasts until 2012.

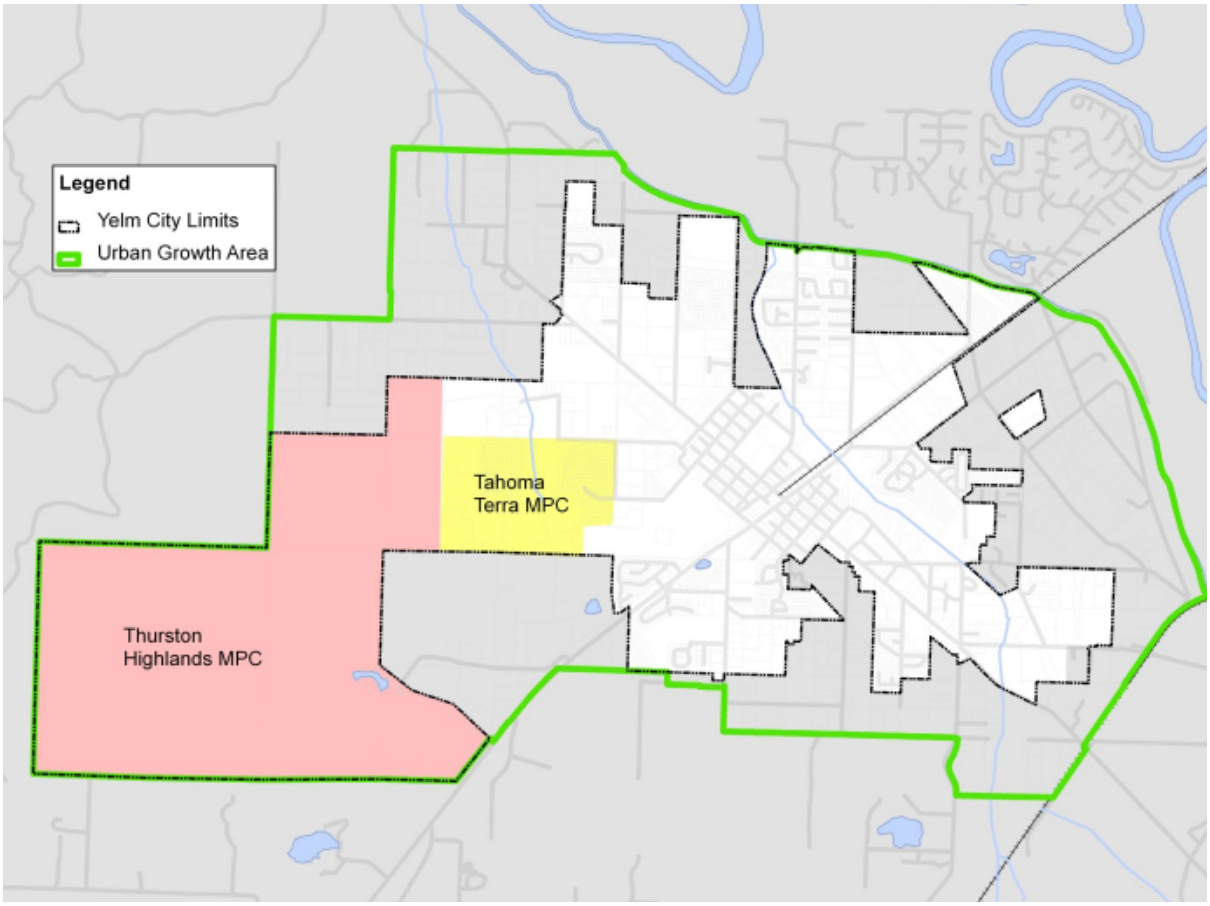


Figure 2. Master Planned Communities

TRPC forecasts were used in the most recent Yelm Comprehensive Plan, published in 2006, and the Yelm Water System Plan which was approved by the Washington State Department of Health (DOH) and adopted by the City in 2010. However, when comparing the TRPC projections for Yelm to the present-day situation, there are two main deviations from the TRPC forecasts:

1. When compared to the recent census data, the population forecast by TRPC underestimates the actual population. For 2010, the TRPC estimate for the City and Urban Growth Area was 6,480; this is 21 percent less than the official census tally of 8,201.
2. Development of one of the MPCs has been delayed. Initially, the TRPC buildable lands report estimated that development of both MPCs would begin in 2007, and that by 2027 full build-out of Tahoma Terra and two-thirds build-out of the Thurston Highlands would occur. The 2010 Water System Plan assumed development for the Highlands would occur beginning in 2010. Currently, some portions of the Tahoma Terra MPC have been developed. According to the US Census population estimate, the population living within the developed portion of Tahoma Terra is 656. However, development of the Thurston Highlands is not yet underway.

Due to these deviations the population projections developed by TRPC will be revised for the GSP.

4.2 Population Projections

Because the MPCs represent such a significant percentage of the total population growth projected for Yelm, when completing the 2010 Water System Plan the City elected to develop population projections based on two scenarios: with and without development of the MPCs. Similarly, the City has elected to consider two separate development scenarios for the sewer planning process: the "without MPCs" scenario and "with MPCs" scenario. Considering these scenarios separately will allow the City to:

- Create a reliable improvement plan, independent of the timing for MPCs development. The final planning and permitting for the MPC are not finalized. The level of uncertainty with this potentially large portion of the City's population makes developing accurate projections difficult.
- Determine which improvements are necessary to serve existing customers and which are necessary to serve the MPCs. Based on this, the GSP will develop improvement plans and rate structures in accordance with the City's "growth pays for growth" philosophy.

Population forecasts for the two development scenarios are summarized in the following sections.

4.2.1 Assumptions

Assumptions used when developing population projections for both development scenarios are summarized below.

1. Projections for the sewered area within City limits assume that:
   - All new growth within City limits will be served by City sewer.
   - Parcels that appear to be developed (based on Thurston County GIS data and aerial photos), but that do not appear to contain STEP tanks (based on City mapping data) are assumed to contain private septic tanks. City policy requires that septic tanks must connect to the City sewer system as sewer service becomes available to the premises (YMC 13.08.020 D). Therefore, projections for the area within the City limits assume that all customers within City limits that are currently served by private septic tanks will be connected to the City sewer system by 2020.
2. Projections for the sewered population within the UGA assume that:
   - All new growth within the UGA will be served by City sewer.
   - It is assumed that the existing population in the UGA will be connected to the City sewer system as development in the UGA occurs. Projections in this tech memo assume that the entire existing population in the UGA will be connected to City sewer by 2030. This equates to connecting 5% of the existing UGA population that is currently served by private septic tanks each year. Policies regarding annexation requirements associated with sewer service will be described in Chapter 1 of the GSP.

3. Because the Tahoma Terra development is already planned and permitted, this community will be included in the "without MPCs" scenario rather than the "with MPCs" scenario. This approach will allow the City to differentiate between growth that is already planned in Tahoma Terra versus growth with an uncertain development year in the Thurston Highlands. As described above, the existing population in Tahoma Terra is estimated to be 656 people. This population is included in the existing service area.
4. State of Washington regulations require that, when developing projections and analyzing the capacity of a water system, utilities use 6- and 20- year planning horizons. However, these guidelines do not apply to the sewer planning process. For the GSP, 10-year planning increments are proposed, beginning with a current population of 6,848 in 2010.

4.2.2 Population Forecast: "Without MPCs" Scenario

The GSP will use the population described in Section 3 as the existing service population. The future service area for the "without MPCs" scenario, shown in Figure 3, is defined as the UGA boundary, minus the area that would be served by the Thurston Highlands MPC.

When developing near-term future projections, the growth rate in the census was evaluated. Between the census years of 2000 – 2010, the annual compounded growth rate was 7.6% within City limits and 2.1% within the UGA. The population forecast developed in this tech memo will apply this growth rate from 2010 until 2015. After 2015, it is assumed that growth will stabilize and occur at the lower growth rates projected in the 2007 TRPC forecasts. This approach accounts for the increase in recent growth, but also develops a plan that is consistent with TRPC's long-term planning for Thurston County.

Table 3 shows the projected service population that is proposed as the basis for the current sewer system planning effort. Table 3 also shows the projected total population within the Yelm Urban Growth Area (UGA) through 2030. Figure 4 compares the future sewered population within City limits to the future sewered population within the UGA.

The population projections show that, compared to the 2010 sewered population, the population will more than double by 2020 (120% increase) and more than triple by 2030 (217% increase). As a comparison, the population in Yelm increased by 146% by 2030.

Table 3. Future Service Area Sewered Population: "without MPCs" scenario								
Year	(1)	(2)	(3)=(1)+(2)	(4)	(5) = (3)-(4)	(6)	(7)	(8) = (5) + (7)
	Population within City Limits, not including Tahoma Terra	Population within Tahoma Terra development [1]	Total Population within City Limits[2]	Population within City Limits not Served by City Sewer[3]	Total Population within City Limits served by City Sewer	Total UGA Population	UGA Population Served by City Sewer[4]	Total Population Served by City Sewer
2000	3,289	0	3,289	NA	NA	1,095	NA	NA
2010	6,192	656	6,848	508	6,340	1,353	8	6,348
2011	6,663	769	7,432	457	6,975	1,382	104	7,079
2012	7,170	882	8,052	406	7,646	1,411	201	7,847
2013	7,716	995	8,711	356	8,355	1,442	298	8,653
2014	8,303	1,108	9,411	305	9,106	1,472	396	9,502
2015	8,935	1,221	10,155	254	9,901	1,504	495	10,396
2016	9,294	1,333	10,628	203	10,424	1,589	648	11,072
2017	9,668	1,446	11,114	152	10,962	1,679	805	11,767
2018	10,057	1,559	11,616	102	11,515	1,774	967	12,482
2019	10,462	1,672	12,134	51	12,083	1,874	1,135	13,218
2020	10,883	1,785	12,668	0	12,668	1,981	1,308	13,976
2021	11,167	1,898	13,065		13,065	2,061	1,455	14,520
2022	11,458	2,011	13,469		13,469	2,144	1,606	15,075
2023	11,757	2,124	13,881		13,881	2,231	1,760	15,641
2024	12,064	2,237	14,301		14,301	2,321	1,917	16,218
2025	12,379	2,350	14,728		14,728	2,415	2,079	16,807
2026	12,741	2,462	15,203		15,203	2,558	2,289	17,492
2027	13,114	2,575	15,689		15,689	2,709	2,508	18,197
2028	13,497	2,575	16,073		16,073	2,870	2,735	18,808
2029	13,892	2,575	16,467		16,467	3,040	2,972	19,440
2030	14,298	2,575	16,874		16,874	3,220	3,220	20,094

1. *Tahoma Terra population is estimated based on a population of 656 in 2010 and a complete build-out by 2027.*
2. *2010 Population Data based on 2010 US Census Information. Growth rate for the future population within Tahoma Terra is based on full build-out by 2027.*
3. *Assumes that all existing customers served by septic tanks will be served by City sewer by 2020. All development within Tahoma Terra will be served by City sewer.*
4. *Assumes that the entire existing population within the UGA will be connected to City sewer by 2030 as the City expands into the UGA and that there are 8 residential customers currently served.*

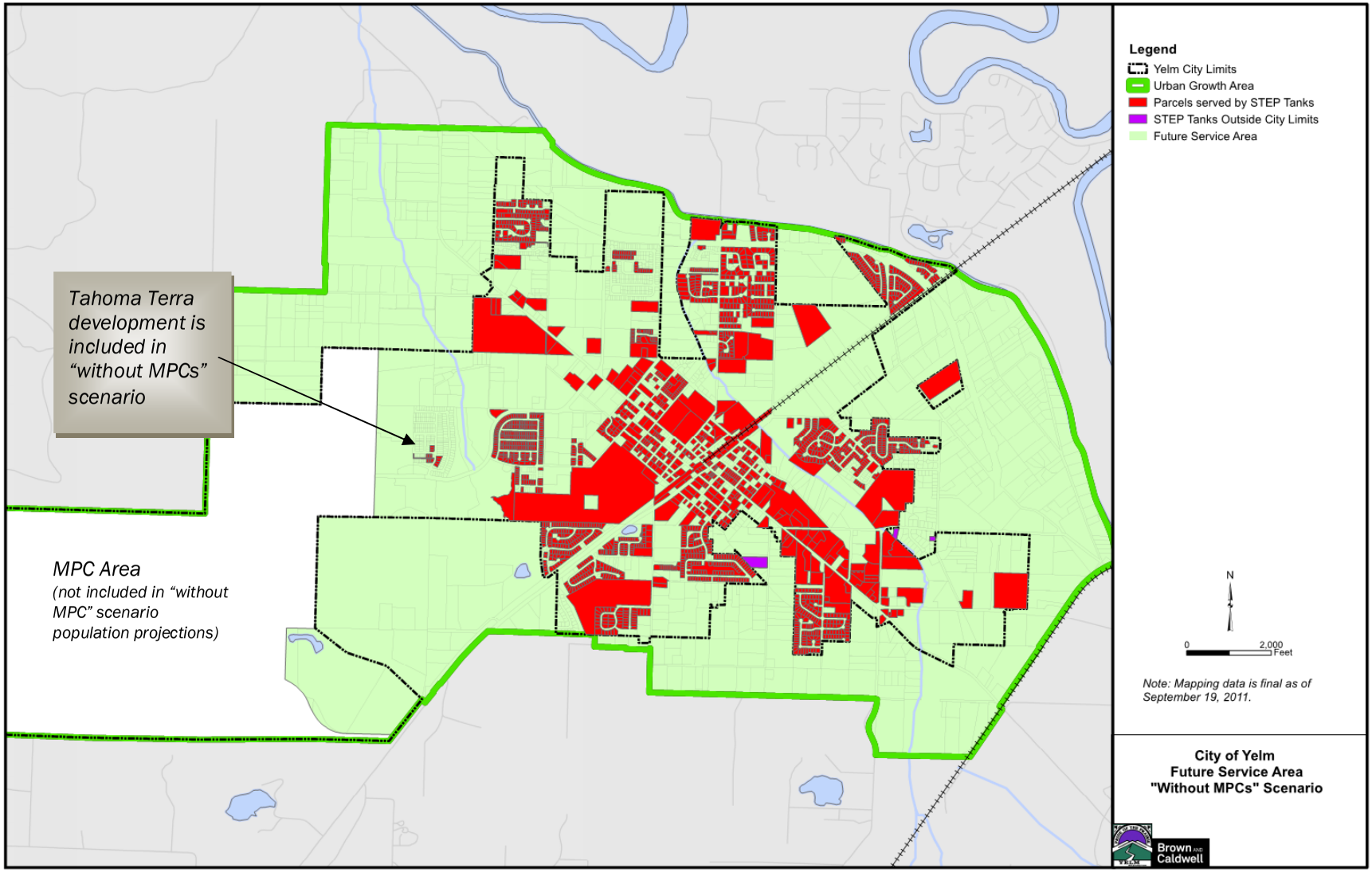


Figure 3. Future Service Area, "Without MPCs" Scenario

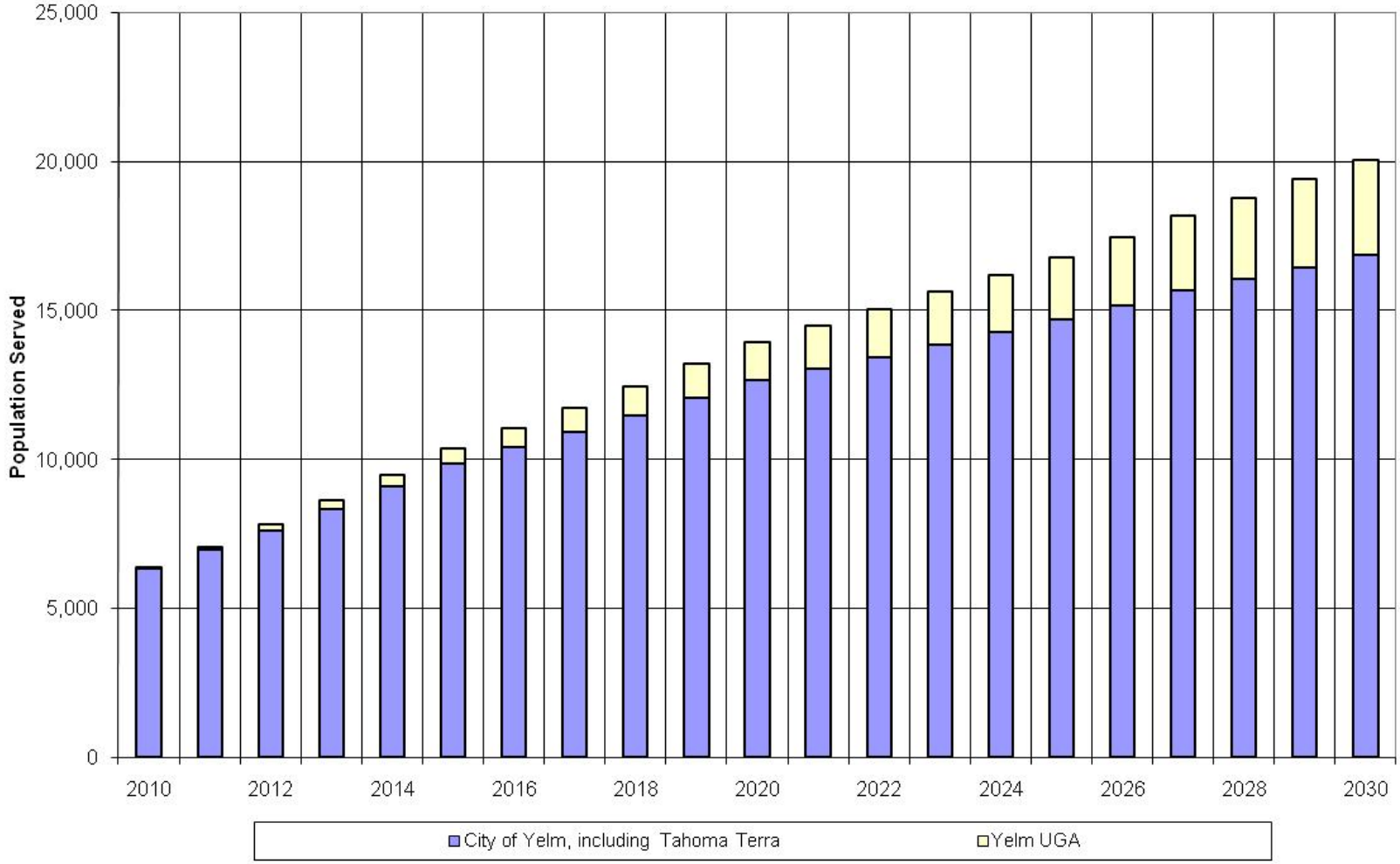


Figure 4. Population Served by City Sewer System: "without MPCs" Scenario

4.2.3 Population Forecast: "With MPCs" Scenario

The population within the Thurston Highlands MPC is projected to develop at the same rate predicted in the 2007 TRPC Buildable Lands Report and the Water System Plan forecast; however, the initial year of development is assumed to be delayed until 2015. As summarized in Section 4.1, population associated with the Tahoma Terra development is included in the "without MPCs" scenario.

Forecasts show that, by 2020, the population for the "with MPCs" scenario is projected to be approximately 3,239 more than the "without MPCs" scenario. This equates to a 171% increase in sewered population compared to 2010. By 2030, population is calculated to increase by 321%.

The Future Service Area for the "with MPCs" scenario is shown in Figure 5. Table 4 and Figure 6 show the projected sewer service population for the "with MPCs" scenario.

Table 4. Future Service Area Sewered Population: "with MPCs" scenario

Year	(1)	(2)	(3) = (1) + (2)
	Total Residential Population served by City Sewer, not including Thurston Highlands MPC[1]	Future Thurston Highlands MPC Population[2]	Total Residential Population served by City Sewer
2000	NA	NA	NA
2010	6,348	0	6,348
2011	7,079	0	7,079
2012	7,847	0	7,847
2013	8,653	0	8,653
2014	9,502	0	9,502
2015	10,396	1,244	11,640
2016	11,072	1,643	12,715
2017	11,767	2,042	13,809
2018	12,482	2,441	14,923
2019	13,218	2,840	16,058
2020	13,976	3,239	17,215
2021	14,520	3,631	18,151
2022	15,075	4,022	19,097
2023	15,641	4,413	20,054
2024	16,218	4,804	21,022
2025	16,807	5,195	22,002
2026	17,492	5,476	22,968
2027	18,197	5,757	23,954
2028	18,808	6,038	24,846
2029	19,440	6,319	25,759
2030	20,094	6,600	26,694

1. *See Table 3.*
2. *Based on the TRPC 2007 Buildable Lands Report and the 2010 Water System Plan Projections; development year delayed until 2015.*
3. *Population of 6,600 for Thurston Highlands represents approximately 62% of build-out population.*

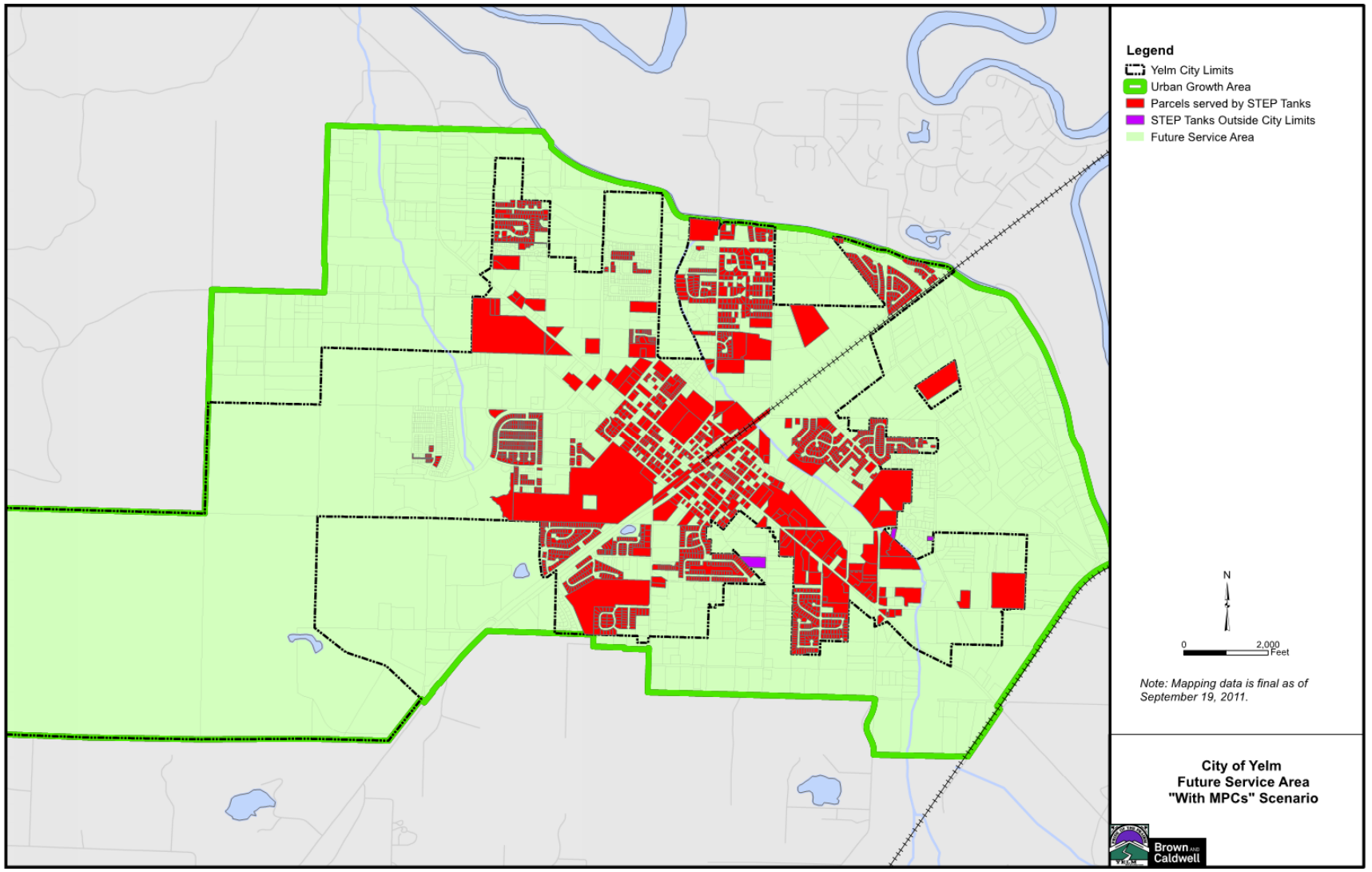


Figure 5. Future Service Area, "with MPCs" scenario

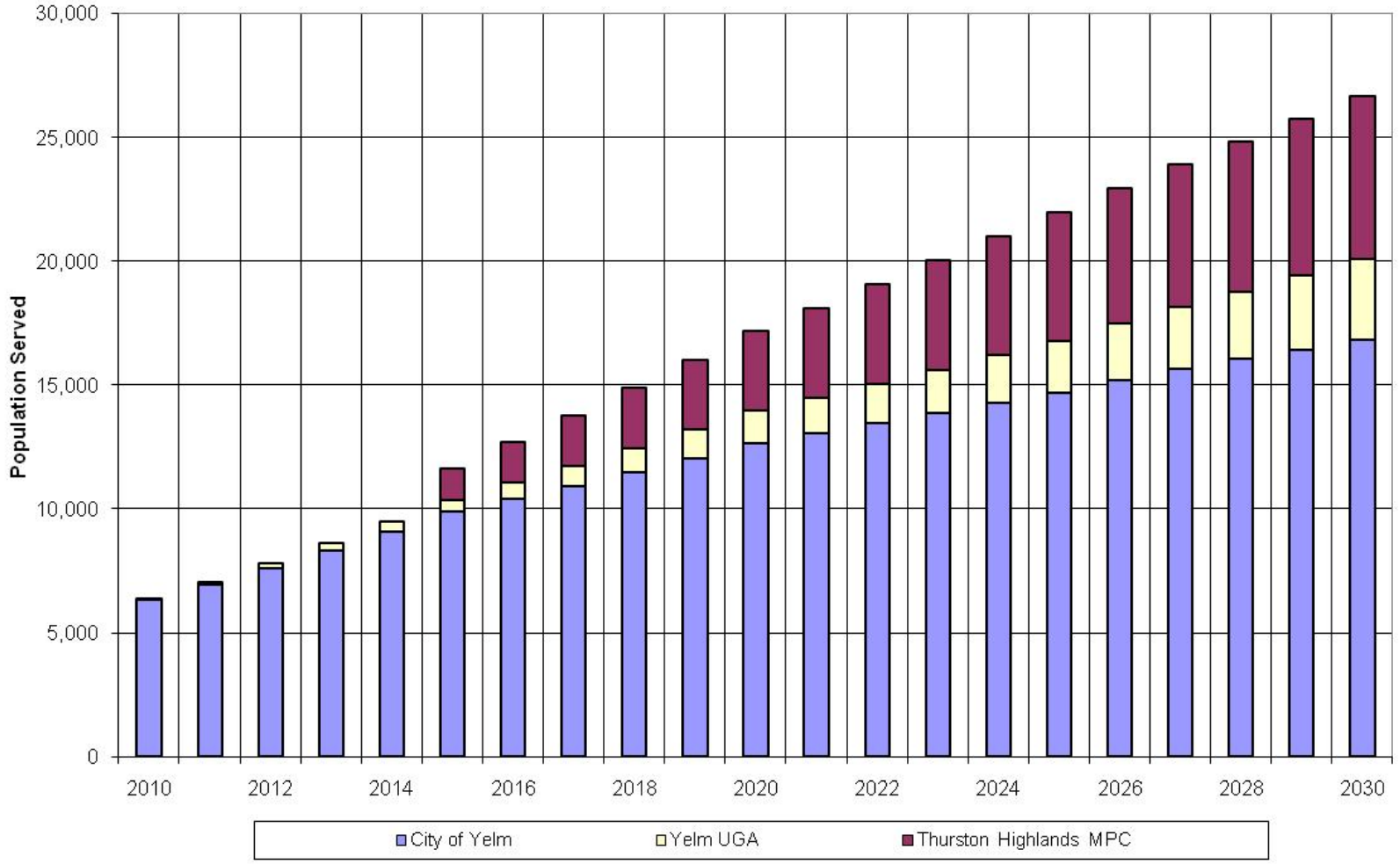


Figure 6. Population Served by City Sewer System: "with MPCs" Scenario

5. Summary

The maximum population that Yelm and the UGA could support, not including the MPC area, was evaluated based on future land use, zoning densities, and the existing vacancy rate. This evaluation indicated that by 2030, the area within the existing Yelm city limits and the Yelm UGA limits will be approaching build-out conditions.

The population projections presented in this tech memo will serve as the basis for the General Sewer Plan flow and loading projections. These flow and loading projections will be calculated by analyzing existing flows and loads, as measured at the WRF, compared to the existing service population, in order to determine the current flows and loads per capita. Projections will then be developed, increasing loading at a rate consistent with population projections for each development scenario. The final flow and loading projections will be used in the capacity analysis of the WRF and during hydraulic modeling to determine the capacity of the collection system.

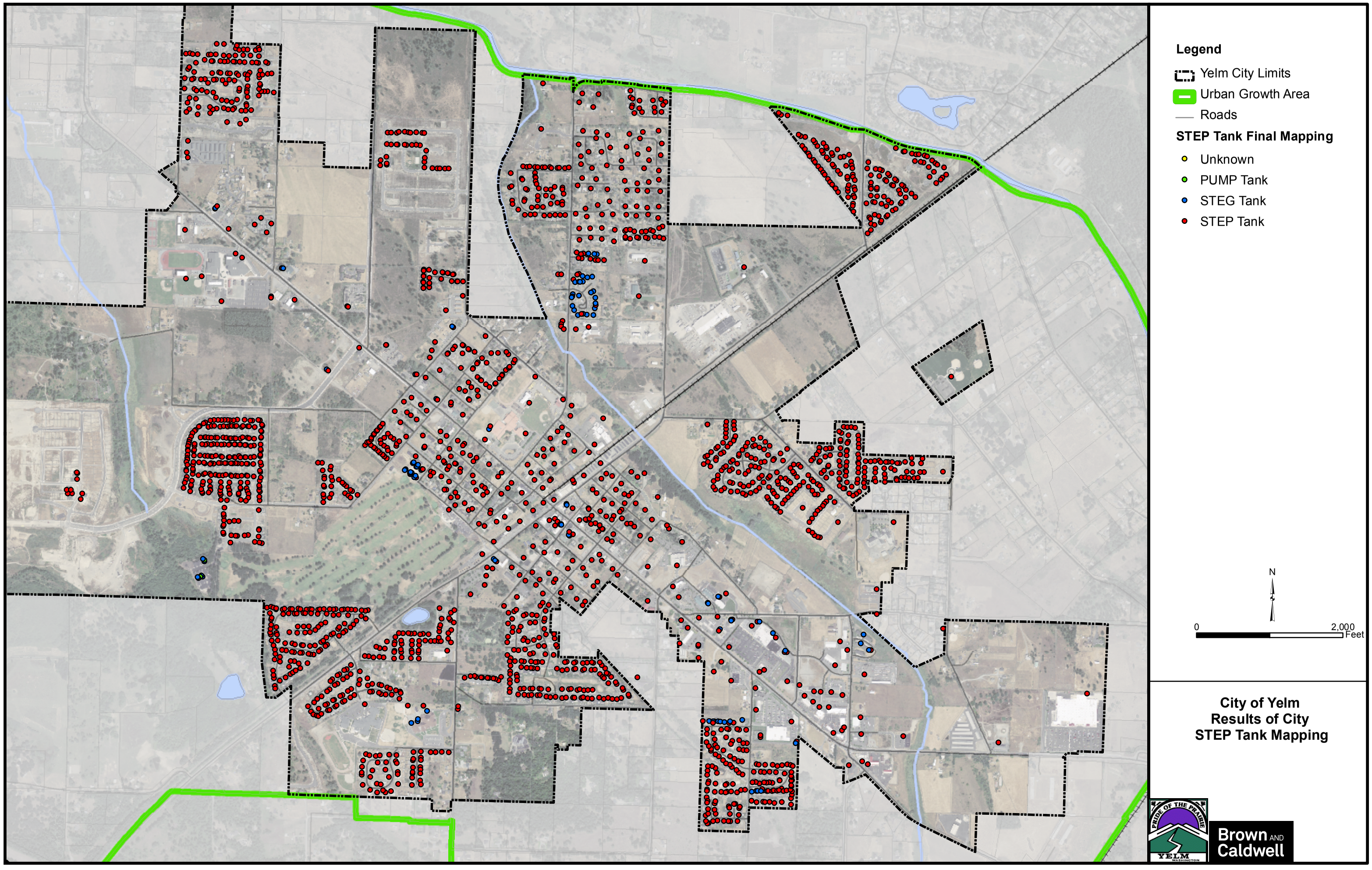
References

Buildable Lands Report for Thurston County, TRPC, October 2007.

City of Yelm Water System Plan, Brown and Caldwell, 2010.

Census Block GIS data, "Census 2010 data, http://www.ofm.wa.gov/pop/census2010/data.asp#data, accessed 7/12/2011.

Attachment A: City STEP Tank Mapping Results


Legend
Yelm City Limits
Urban Growth Area
Roads
STEP Tank Final Mapping
Unknown
PUMP Tank
STEG Tank
STEP Tank
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0
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Feet
City of Yelm
Results of City
STEP Tank Mapping
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YELM
WASHINGTON
Brown AND Caldwell

Attachment B: 2007 TRPC Population Projections for Yelm

APPENDIX 11:
POPULATION FORECAST ADJUSTMENTS - OCTOBER 2007

TRPC

Thurston Regional Planning Council

AGENDA ITEM #7

MEMBERS:
City of Lacey
City of Olympia
City of Rainier
City of Tenino
City of Tumwater
City of Yelm
Town of Bucoda
Thurston County
Intercity Transit
LOTT Alliance
Thurston County PUD No. 1
Griffin School District
North Thurston Public Schools
Olympia School District
Confederated Tribes of the Chehalis Reservation
Nisqually Indian Tribe

Associate Members:
Economic Development Council of Thurston County
Puget Sound Regional Council
Timberland Regional Library

Charter Member Emeritus:
The Evergreen State College

1967 - 2007
40 years of
VISIONARY LEADERSHIP

Lon D. Wyrick
Executive Director

2424 Heritage Court SW Suite A
Olympia, WA 98502-6031

(360) 956-7575
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MEMORANDUM

TO: Thurston Regional Planning Council

FROM: Veena Tabbutt

DATE: September 28, 2007

SUBJECT: Population Forecast Adjustments

PURPOSE

Approve Adjustments to the Population Forecast allocations for Thurston County Jurisdictions.

Summary:
- Staff has updated the Population Forecast Allocations for Thurston County Jurisdictions.
- These adjustments take into account recently adopted changes to Thurston County's rural zoning.
- The changes in zoning have resulted in a reallocation of growth from rural areas to urban areas.
- The County-wide forecast has not changed.

REQUESTED ACTION

Approve October 2007 Population Forecast Allocations for Thurston County Jurisdictions.

MEMORANDUM
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September 28, 2007

BACKGROUND

TRPC develops updated population and employment forecasts every three to five years. These forecasts are used for transportation, sewer, water, land use, school, and other local governmental planning purposes. They are also used by the private sector for business planning. TRPC has been preparing these forecasts periodically since the late 1960s.

These adjustments take into account recently adopted changes to Thurston County's rural zoning.

Table 1: Comparison of new TRPC Population Forecast Allocations with the previous allocations.

Population

Jurisdiction	Forecast	2010	2015	2020	2025	2030
Lacey & UGA	October 2007	74,000	82,900	92,200	99,900	106,700
	July 2007	*74,000*	*82,900*	*92,200*	*99,900*	*106,700*
Olympia & UGA	October 2007	60,700	67,000	73,000	77,900	82,100
	July 2007	*60,700*	*67,000*	*72,900*	*77,900*	*82,200*
Tumwater & UGA	October 2007	24,300	27,100	32,500	37,400	42,000
	July 2007	*24,300*	*27,100*	*32,200*	*37,100*	*41,600*
Bucoda	October 2007	680	710	800	900	1,050
	July 2007	*680*	*710*	*800*	*900*	*1,050*
Rainier & UGA	October 2007	1,950	2,170	2,480	2,680	2,900
	July 2007	*1,950*	*2,170*	*2,480*	*2,680*	*2,900*
Tenino & UGA	October 2007	1,960	2,480	2,890	3,310	3,590
	July 2007	*1,960*	*2,480*	*2,900*	*3,310*	*3,590*
Yelm & UGA	October 2007	8,380	12,210	16,560	20,010	24,060
	July 2007	*8,380*	*12,090*	*15,660*	*18,600*	*22,230*
Grand Mound UGA	October 2007	1,160	1,530	1,900	2,340	2,690
	July 2007	*1,150*	*1,530*	*1,900*	*2,340*	*2,690*
Chehalis Reservation	October 2007	60	80	110	140	180
	July 2007	*60*	*80*	*110*	*140*	*170*
Nisqually Reservation	October 2007	640	710	790	870	940
	July 2007	*630*	*710*	*790*	*870*	*940*
Rural	October 2007	81,000	88,000	96,000	103,000	107,000
	July 2007	81,000	88,000	97,000	104,000	109,000
County Total	**No Change**	**255,000**	**285,000**	**319,000**	**348,000**	**373,000**
Urban Areas	October 2007	174,000	197,000	223,000	245,000	266,000
	July 2007	*174,000*	*197,000*	*222,000*	*244,000*	*264,000*
Percents	October 2007	*68%*	*69%*	*70%*	*70%*	*71%*
	July 2007	*68%*	*69%*	*70%*	*70%*	*71%*
Rural Areas	October 2007	81,000	88,000	96,000	103,000	107,000
	July 2007	81,000	88,000	97,000	104,000	109,000
Percents	October 2007	*32%*	*31%*	*30%*	*30%*	*29%*
	July 2007	*32%*	*31%*	*30%*	*30%*	*29%*

MEMORANDUM
Page 2
May 21, 2007

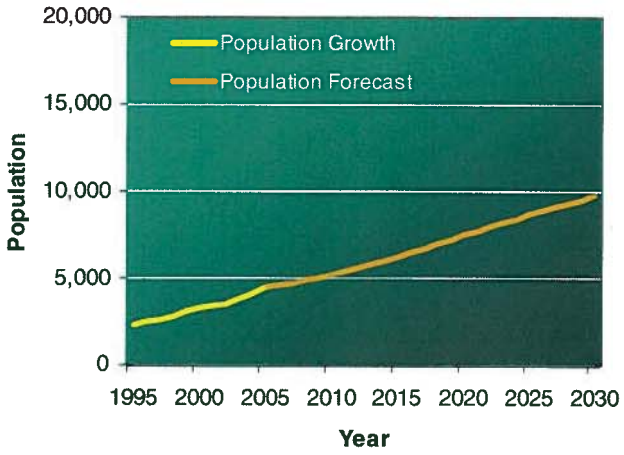
BACKGROUND

Yelm Urban Growth Area

Background

In July 2005 a population forecast was adopted for all jurisdictions in Thurston County. The population forecast for Yelm was based on Yelm receiving an increased share of growth in the County – and continuing to have a robust growth rate. The projected growth rate was in line with what had occurred in the City over the last ten years – since the sewer service was built. During that time Yelm was the fastest growing community in Thurston County.

Population Growth Projections Adopted for Yelm UGA in 2005



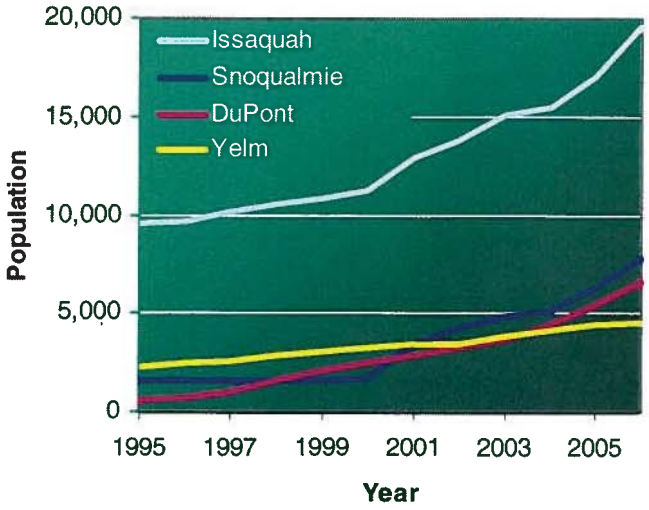
Since that time, Yelm has continued to grow at a rapid pace. In addition, two Master-Planned communities have been proposed for the west side of town – proposing to add over 7,200 dwelling units by the time they are fully built-out. Tahoma Terra has an estimated build-out of 1,200 units, and is currently under construction. Thurston Highlands has an estimated build-out of 5,000 units.

To understand the magnitude of these projects, the Census 2000 counted Yelm's total dwelling units at around 1,300 in 2000. TRPC estimates that there were around 2,300 dwellings within the city limits by 2005.

Will the Master Planned Communities attract this sort of growth?

Planned communities typically are a very successful consumer niche – providing a unique lifestyle. They have been successful in other parts of the state, and Yelm offers affordability that will draw from Pierce County as well as other parts of Thurston County. Planned communities in Issaquah, Snoqualmie, and DuPont have seen rapid growth.

Population Growth in Cities with Planned Communities in Washington State Compared to Yelm's Growth



MEMORANDUM
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May 21, 2007

How could Growth Projections for Yelm be modified?

Staff recommends that we consider Yelm as two distinct markets, the Master Planned Communities (west of Town), and the remainder of the City (existing City Center and surrounding area. In the previous forecast the growth in the master planned community area was around 1,570 units, with 950 units allocated to the remainder of the city.

	Existing Dwellings (2005)	Projected Dwellings (end 2027)	Projected Growth (2005-2027)
Master Planned Community Area	30	1,600	1,570
Remainder of City	2,280	3,230	950

Assuming a full build-out of Tahoma Terrace (1,200 units) and two-thirds build-out of Thurston Highlands (3,330 units out of a total of 5,000 planned units) by 2027, the projection for the Master Planned Community area would increase to 4,530 units.

In the remainder of the city there are approximately 770 units in various application stages of the development pipeline. Assuming that is approximately a 10 year supply of growth (comparable to what is in the development pipeline for Lacey, Olympia, and Tumwater), that would put the projection at around 1,540 units.

Suggested Dwelling Unit Projections for Yelm

	Existing Dwellings (2005)	Projected Dwellings (end 2027)	Projected Growth
Master Planned Community Area	30	4,560	4,530
Remainder of City	2,280	3,820	1,540

What would happen if the Planned Communities did not Build-out as expected?

If the Master Planned Communities didn't build-out according to the assumptions, then the land would remain vacant. Under current zoning regulations, any projects on those pieces of land are required to be master planned communities.

What will happen if the County was to adopt a Rural Downzone?

The suggested modification to the forecast reflects conditions as of April 2007. If there were to be a substantial downzone of land in the rural County, it would likely push increased growth into the urban areas. At that time the projected forecasts all of Thurston County would require adjustment.

Population Forecast by Planning Areas
Thurston County, WA

Source: Thurston Regional Planning Council, Population & Employment Forecast Work Program, 2004-2005, 2007.
Note: Numbers may not add due to rounding.

Type of Area	Planning Area	2006	2010	2015	2020	2025	2030
Lacey							
City	Central Lacey	10,910	11,100	11,190	11,510	11,650	11,620
City	Hawks Prairie	3,010	6,620	8,730	10,440	11,810	12,720
UGA	Hawks Prairie	1,750	1,750	2,160	2,850	3,340	3,700
City	Horizons	8,420	10,610	11,790	12,700	13,120	13,370
UGA	Horizons	1,620	1,600	1,640	1,650	1,670	1,700
City	Lakes	9,200	9,360	9,610	9,830	10,020	10,130
UGA	Lakes	6,710	6,770	7,300	7,760	8,350	8,890
City	Meadows	740	790	910	970	1,160	1,310
UGA	Meadows	10,130	10,380	11,320	12,190	13,100	13,750
City	Pleasant Glade	850	920	1,050	1,110	1,260	1,370
UGA	Pleasant Glade	1,180	1,480	2,680	3,810	4,820	5,500
UGA	Seasons	3,450	3,720	4,930	7,110	8,670	10,570
City	Tanglewilde-Thompson	930	1,050	1,040	1,030	1,080	1,130
UGA	Tanglewilde-Thompson	7,990	7,810	8,570	9,270	9,860	10,910
Lacey & UGA Total		**66,900**	**74,000**	**82,900**	**92,200**	**99,900**	**106,700**

Type of Area	Planning Area	2006	2010	2015	2020	2025	2030
Olympia							
City	Downtown	1,770	1,780	2,130	2,540	2,830	2,920
City	High Density Corridor - Eastside	2,030	2,060	2,150	2,270	2,420	2,490
City	High Density Corridor - Westside	580	570	570	560	600	620
City	Northside	10,940	11,200	11,720	12,210	12,750	13,120
UGA	Northside	1,890	1,910	2,270	2,810	3,150	3,440
City	Southside	12,800	13,960	16,380	18,220	19,390	20,770
UGA	Southside	6,660	7,830	8,780	9,680	10,290	10,750
City	Westside	15,640	17,790	18,640	19,640	20,470	21,260
UGA	Northwest	2,450	2,700	2,940	3,190	3,640	4,040
UGA	Southwest	420	920	1,380	1,850	2,320	2,680
Olympia & UGA Total		**55,200**	**60,700**	**67,000**	**73,000**	**77,900**	**82,100**

Population Forecast by Planning Areas
Thurston County, WA

Source: Thurston Regional Planning Council, Population & Employment Forecast Work Program, 2004-2005, 2007.
Note: Numbers may not add due to rounding.

Type of Area	Planning Area	2006	2010	2015	2020	2025	2030
Tumwater							
City	Airport	110	370	370	610	1,440	2,050
City	Deschutes	2,210	2,860	2,920	3,210	3,700	4,030
UGA	Deschutes	10	10	10	10	10	10
City	Littlerock	250	270	280	460	570	640
City	Mottman-Black Lake	170	190	220	230	350	430
City	Southeast Capital Blvd.	2,840	3,050	3,200	3,310	3,710	3,940
UGA	Southeast Capital Blvd.	10	10	10	10	10	10
City	Trosper	2,010	2,260	2,550	2,940	3,670	3,830
UGA	Trosper	340	360	380	410	440	490
City	Tumwater Hill	4,770	5,340	5,620	6,000	6,290	7,140
UGA	Tumwater Hill	100	100	120	120	120	240
City	New Market	740	760	770	790	800	810
UGA	Eastside	2,400	2,680	3,490	3,990	4,230	4,660
UGA	Southside	1,520	1,520	2,090	3,010	3,330	3,520
UGA	Westside	4,230	4,520	5,090	7,380	8,790	10,180
Tumwater & UGA Total		**21,700**	**24,300**	**27,100**	**32,500**	**37,500**	**42,000**

Type of Area	Planning Area	2006	2010	2015	2020	2025	2030
City	Bucoda	650	670	700	800	900	1,050
UGA	Bucoda UGA	-	-	-	-	-	-
Bucoda & UGA Total		**650**	**670**	**700**	**800**	**900**	**1,050**
City	Rainier	1,670	1,830	2,030	2,200	2,300	2,460
UGA	Rainier UGA	120	120	140	280	380	430
Rainier & UGA Total		**1,790**	**1,950**	**2,170**	**2,480**	**2,680**	**2,890**
City	Tenino	1,510	1,760	1,890	1,940	2,020	2,030
UGA	Tenino UGA	30	210	590	960	1,290	1,560
Tenino & UGA Total		**1,540**	**1,970**	**2,480**	**2,900**	**3,310**	**3,590**
City	Yelm	4,560	5,170	6,330	7,710	8,770	10,130
City	Yelm - Master Planned Community	-	1,900	4,460	6,980	8,950	10,880
UGA	Yelm UGA	1,340	1,310	1,420	1,870	2,280	3,040
Yelm & UGA Total		**5,900**	**8,380**	**12,210**	**16,560**	**20,000**	**24,050**
UGA	Grand Mound	840	1,150	1,530	1,900	2,340	2,690
Rural	Rochester Sub-Area	8,050	8,180	8,330	8,470	8,710	9,070
Grand Mound & Rochester Total		**8,890**	**9,330**	**9,860**	**10,370**	**11,050**	**11,760**
Chehalis Reservation		**40**	**60**	**80**	**110**	**140**	**180**
Nisqually Reservation		**630**	**640**	**710**	**790**	**870**	**940**

Population Forecast by Planning Areas
Thurston County, WA

Source: Thurston Regional Planning Council, Population & Employment Forecast Work Program, 2004-2005, 2007.
Note: Numbers may not add due to rounding.

Type of Area	Planning Area	2006	2010	2015	2020	2025	2030
Rural Thurston County							
Rural	Budd/Deschutes Northeast	3,080	3,190	3,330	3,480	3,570	3,620
Rural	Henderson Inlet North	6,870	7,310	7,800	8,150	8,480	8,580
Rural	Eld Inlet Cooper Point	3,480	3,720	3,910	4,140	4,360	4,570
Rural	Budd/Deschutes Cooper Point	1,420	1,410	1,430	1,470	1,540	1,600
Rural	Eld Inlet Steamboat Island	3,000	3,180	3,300	3,470	3,600	3,660
Rural	Totten Inlet Steamboat Island	2,030	2,220	2,460	2,620	2,740	2,800
Rural	Black River North	2,350	2,670	2,930	3,210	3,370	3,450
Rural	Budd/Deschutes Southwest	2,070	2,150	2,200	2,260	2,350	2,340
Rural	Eld Inlet South	1,680	1,940	2,140	2,300	2,420	2,500
Rural	Totten Inlet West	1,120	1,200	1,330	1,500	1,610	1,700
Rural	Capitol Forest West	20	20	20	20	20	20
Rural	Black River West	1,330	1,460	1,590	1,710	1,860	2,000
Rural	Black River South	1,240	1,310	1,440	1,670	1,780	1,910
Rural	Chehalis West	1,070	1,250	1,680	2,240	2,780	3,220
Rural	Black River East	6,690	7,310	7,970	8,950	9,630	10,210
Rural	Chehalis North Rochester	340	360	390	450	540	540
Rural	ChehalisEast	2,340	2,610	3,210	4,010	4,840	5,570
Rural	Skookumchuck River	1,430	1,550	1,730	2,010	2,320	2,590
Rural	Deshcutes Middle	1,630	2,100	2,330	2,600	2,830	2,980
Rural	Deschutes North Fort Lewis	5,780	6,290	6,790	7,300	7,720	7,870
Rural	Deschutes South	2,860	3,040	3,210	3,330	3,600	3,720
Rural	Nisqually South	2,830	2,960	3,810	4,480	4,870	5,050
Rural	Nisqually Rural Yelm	7,530	7,880	8,550	9,260	10,020	10,180
Rural	Henderson Inlet South	490	530	570	630	660	680
Rural	Nisqually North Fort Lewis	2,660	2,700	2,820	3,020	3,150	3,220
Rural	Nisqually Sub-Area	2,600	2,680	2,850	3,050	3,180	3,230
Rural (minus Rochester sub-area)		**67,900**	**73,000**	**79,800**	**87,300**	**93,800**	**97,800**
Thurston County Total		**231,000**	**255,000**	**285,000**	**319,000**	**348,000**	**373,000**

2B: 2011 Annual Infiltration/Inflow Report

Annual Infiltration/Inflow Report

Yelm Water Reclamation Facility

January 1, 2011 to December 31, 2011

	Average Monthly Flow (MGD)			Total Monthly Rainfall (Inches)			Population Served		
	Year			Year			Year		
Month	1995		2011	1995		2011	1995		2011
Jan.	0.139		0.372	4.5		5.11	1131		6848
Feb.	0.144		0.369	4.58		3.32	1263		6848
Mar.	0.146		0.370	3.95		6.32	1355		6848
Apr.	0.140		0.358	2.81		3.97	1355		6848
May	0.139		0.365	1.42		4.15	1358		6848
Jun.	0.138		0.357	1.57		0.84	1358		6848
Jul.	0.132		0.342	1.84		0.93	1358		6848
Aug.	0.146		0.341	1.41		0.15	1383		6848
Sept.	0.147		0.366	1.76		1.09	1442		6848
Oct.	0.146		0.359	3.57		2.85	1501		6848
Nov.	0.146		0.358	8.51		6.61	1540		6848
Dec.	0.150		0.352	7.24		3.27	1560		6848
Low Month	0.132		0.341	I/I = High month - Low month					
High Month	0.150		0.372						
Yearly Average	0.143		0.359						

	Additional Sewer Lines Added (Ft.)		
	Year		
			2011
Jan			
Feb			
Mar			
Apr			
May			
Jun			
Jul			
Aug			
Sep			
Oct			
Nov			
Dec			
Total (Feet)			615
Total (Miles)			0.12

Comments: This report shows a 72% increase in I/I over base levels. This is explaned by the fact that at the time that the Sewer System was created and installed in 1995, there were only two schools connected to the sewer system. Currently we have 6 schools connected to the system, one of which is the High School which draws from throughout the district which is rural in nature. Many of the kids attending live outside the boundary of the sewer service area. During the summer the schools shut down and there is a noticeable difference in the influent flow while school is out. We are a STEP System with pressure mains. If the mains were compromised, sewage would leak out rather than have infiltration. The graphs also show that influent flow is unaffected by precipitation.

Plant Design Capacity

Peak Design Flow:	**2.5 MGD**
Average Design Flow:	**1 MGD**
Population Equivalents:	**1999**

Infiltration Inflow Summary

Year	I/I	% over Base I/I	% of Aver. Design
1995	0.018	Base Year	6.00%
2011	0.031	72.40%	3.10%

2011 Daily Influent Flows

DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*
1/1/2011	0.386	2/1/2011	0.354	3/1/2011	0.361	4/1/2011	0.334	5/1/2011	0.408	6/1/2011	0.357	7/1/2011	0.328	8/1/2011	0.335	9/1/2011	0.348	10/1/2011	0.345	11/1/2011	0.353	12/1/2011	0.346
1/2/2011	0.441	2/2/2011	0.362	3/2/2011	0.367	4/2/2011	0.335	5/2/2011	0.368	6/2/2011	0.362	7/2/2011	0.342	8/2/2011	0.348	9/2/2011	0.339	10/2/2011	0.388	11/2/2011	0.352	12/2/2011	0.332
1/3/2011	0.383	2/3/2011	0.355	3/3/2011	0.357	4/3/2011	0.383	5/3/2011	0.364	6/3/2011	0.341	7/3/2011	0.332	8/3/2011	0.337	9/3/2011	0.35	10/3/2011	0.384	11/3/2011	0.356	12/3/2011	0.361
1/4/2011	0.365	2/4/2011	0.334	3/4/2011	0.333	4/4/2011	0.355	5/4/2011	0.36	6/4/2011	0.349	7/4/2011	0.359	8/4/2011	0.337	9/4/2011	0.336	10/4/2011	0.356	11/4/2011	0.314	12/4/2011	0.417
1/5/2011	0.366	2/5/2011	0.37	3/5/2011	0.362	4/5/2011	0.345	5/5/2011	0.366	6/5/2011	0.417	7/5/2011	0.353	8/5/2011	0.327	9/5/2011	0.417	10/5/2011	0.352	11/5/2011	0.342	12/5/2011	0.354
1/6/2011	0.362	2/6/2011	0.413	3/6/2011	0.423	4/6/2011	0.338	5/6/2011	0.333	6/6/2011	0.369	7/6/2011	0.325	8/6/2011	0.345	9/6/2011	0.351	10/6/2011	0.335	11/6/2011	0.411	12/6/2011	0.352
1/7/2011	0.335	2/7/2011	0.37	3/7/2011	0.371	4/7/2011	0.347	5/7/2011	0.371	6/7/2011	0.356	7/7/2011	0.331	8/7/2011	0.369	9/7/2011	0.352	10/7/2011	0.332	11/7/2011	0.357	12/7/2011	0.35
1/8/2011	0.365	2/8/2011	0.359	3/8/2011	0.358	4/8/2011	0.338	5/8/2011	0.411	6/8/2011	0.363	7/8/2011	0.336	8/8/2011	0.347	9/8/2011	0.342	10/8/2011	0.351	11/8/2011	0.35	12/8/2011	0.353
1/9/2011	0.424	2/9/2011	0.374	3/9/2011	0.391	4/9/2011	0.358	5/9/2011	0.357	6/9/2011	0.353	7/9/2011	0.346	8/9/2011	0.324	9/9/2011	0.32	10/9/2011	0.407	11/9/2011	0.356	12/9/2011	0.325
1/10/2011	0.365	2/10/2011	0.368	3/10/2011	0.36	4/10/2011	0.417	5/10/2011	0.357	6/10/2011	0.334	7/10/2011	0.38	8/10/2011	0.338	9/10/2011	0.323	10/10/2011	0.394	11/10/2011	0.317	12/10/2011	0.342
1/11/2011	0.356	2/11/2011	0.334	3/11/2011	0.328	4/11/2011	0.366	5/11/2011	0.368	6/11/2011	0.373	7/11/2011	0.343	8/11/2011	0.33	9/11/2011	0.403	10/11/2011	0.358	11/11/2011	0.351	12/11/2011	0.41
1/12/2011	0.382	2/12/2011	0.373	3/12/2011	0.372	4/12/2011	0.36	5/12/2011	0.358	6/12/2011	0.389	7/12/2011	0.347	8/12/2011	0.322	9/12/2011	0.362	10/12/2011	0.353	11/12/2011	0.351	12/12/2011	0.356
1/13/2011	0.355	2/13/2011	0.421	3/13/2011	0.425	4/13/2011	0.362	5/13/2011	0.314	6/13/2011	0.365	7/13/2011	0.335	8/13/2011	0.336	9/13/2011	0.351	10/13/2011	0.344	11/13/2011	0.396	12/13/2011	0.352
1/14/2011	0.34	2/14/2011	0.368	3/14/2011	0.363	4/14/2011	0.356	5/14/2011	0.354	6/14/2011	0.35	7/14/2011	0.339	8/14/2011	0.369	9/14/2011	0.346	10/14/2011	0.317	11/14/2011	0.371	12/14/2011	0.357
1/15/2011	0.388	2/15/2011	0.357	3/15/2011	0.366	4/15/2011	0.331	5/15/2011	0.431	6/15/2011	0.361	7/15/2011	0.325	8/15/2011	0.345	9/15/2011	0.328	10/15/2011	0.347	11/15/2011	0.353	12/15/2011	0.347
1/16/2011	0.384	2/16/2011	0.361	3/16/2011	0.367	4/16/2011	0.352	5/16/2011	0.362	6/16/2011	0.359	7/16/2011	0.359	8/16/2011	0.341	9/16/2011	0.316	10/16/2011	0.408	11/16/2011	0.349	12/16/2011	0.333
1/17/2011	0.425	2/17/2011	0.365	3/17/2011	0.365	4/17/2011	0.416	5/17/2011	0.349	6/17/2011	0.339	7/17/2011	0.387	8/17/2011	0.334	9/17/2011	0.314	10/17/2011	0.356	11/17/2011	0.352	12/17/2011	0.357
1/18/2011	0.353	2/18/2011	0.336	3/18/2011	0.324	4/18/2011	0.368	5/18/2011	0.347	6/18/2011	0.353	7/18/2011	0.345	8/18/2011	0.318	9/18/2011	0.411	10/18/2011	0.353	11/18/2011	0.323	12/18/2011	0.385
1/19/2011	0.372	2/19/2011	0.364	3/19/2011	0.372	4/19/2011	0.366	5/19/2011	0.355	6/19/2011	0.401	7/19/2011	0.343	8/19/2011	0.327	9/19/2011	0.358	10/19/2011	0.357	11/19/2011	0.35	12/19/2011	0.347
1/20/2011	0.355	2/20/2011	0.367	3/20/2011	0.438	4/20/2011	0.362	5/20/2011	0.327	6/20/2011	0.35	7/20/2011	0.334	8/20/2011	0.329	9/20/2011	0.349	10/20/2011	0.352	11/20/2011	0.415	12/20/2011	0.34
1/21/2011	0.323	2/21/2011	0.43	3/21/2011	0.371	4/21/2011	0.349	5/21/2011	0.371	6/21/2011	0.349	7/21/2011	0.332	8/21/2011	0.364	9/21/2011	0.344	10/21/2011	0.328	11/21/2011	0.371	12/21/2011	0.341
1/22/2011	0.382	2/22/2011	0.37	3/22/2011	0.363	4/22/2011	0.341	5/22/2011	0.429	6/22/2011	0.341	7/22/2011	0.319	8/22/2011	0.341	9/22/2011	0.352	10/22/2011	0.359	11/22/2011	0.385	12/22/2011	0.331
1/23/2011	0.42	2/23/2011	0.349	3/23/2011	0.364	4/23/2011	0.354	5/23/2011	0.362	6/23/2011	0.337	7/23/2011	0.338	8/23/2011	0.351	9/23/2011	0.315	10/23/2011	0.406	11/23/2011	0.356	12/23/2011	0.344
1/24/2011	0.364	2/24/2011	0.358	3/24/2011	0.373	4/24/2011	0.398	5/24/2011	0.355	6/24/2011	0.339	7/24/2011	0.356	8/24/2011	0.342	9/24/2011	0.349	10/24/2011	0.358	11/24/2011	0.353	12/24/2011	0.358
1/25/2011	0.347	2/25/2011	0.342	3/25/2011	0.342	4/25/2011	0.381	5/25/2011	0.36	6/25/2011	0.351	7/25/2011	0.337	8/25/2011	0.335	9/25/2011	0.422	10/25/2011	0.36	11/25/2011	0.337	12/25/2011	0.31
1/26/2011	0.367	2/26/2011	0.377	3/26/2011	0.367	4/26/2011	0.349	5/26/2011	0.358	6/26/2011	0.369	7/26/2011	0.329	8/26/2011	0.33	9/26/2011	0.359	10/26/2011	0.364	11/26/2011	0.35	12/26/2011	0.366
1/27/2011	0.36	2/27/2011	0.44	3/27/2011	0.428	4/27/2011	0.35	5/27/2011	0.345	6/27/2011	0.346	7/27/2011	0.332	8/27/2011	0.326	9/27/2011	0.349	10/27/2011	0.357	11/27/2011	0.41	12/27/2011	0.355
1/28/2011	0.332	2/28/2011	0.368	3/28/2011	0.361	4/28/2011	0.349	5/28/2011	0.349	6/28/2011	0.35	7/28/2011	0.338	8/28/2011	0.371	9/28/2011	0.356	10/28/2011	0.322	11/28/2011	0.356	12/28/2011	0.348
1/29/2011	0.355			3/29/2011	0.367	4/29/2011	0.325	5/29/2011	0.343	6/29/2011	0.349	7/29/2011	0.328	8/29/2011	0.352	9/29/2011	0.353	10/29/2011	0.351	11/29/2011	0.351	12/29/2011	0.339
1/30/2011	0.418			3/30/2011	0.367	4/30/2011	0.356	5/30/2011	0.433	6/30/2011	0.347	7/30/2011	0.326	8/30/2011	0.349	9/30/2011	0.323	10/30/2011	0.402	11/30/2011	0.348	12/30/2011	0.341
1/31/2011	0.366			3/31/2011	0.361			5/31/2011	0.362			7/31/2011	0.379	8/31/2011	0.355			10/31/2011	0.347			12/31/2011	0.361
Month Avg.	0.372	**Month Avg.**	0.369	**Month Avg.**	0.370	**Month Avg.**	0.358	**Month Avg.**	0.365	**Month Avg.**	0.357	**Month Avg.**	0.342	**Month Avg.**	0.341	**Month Avg.**	0.351	**Month Avg.**	0.359	**Month Avg.**	0.358	**Month Avg.**	0.352

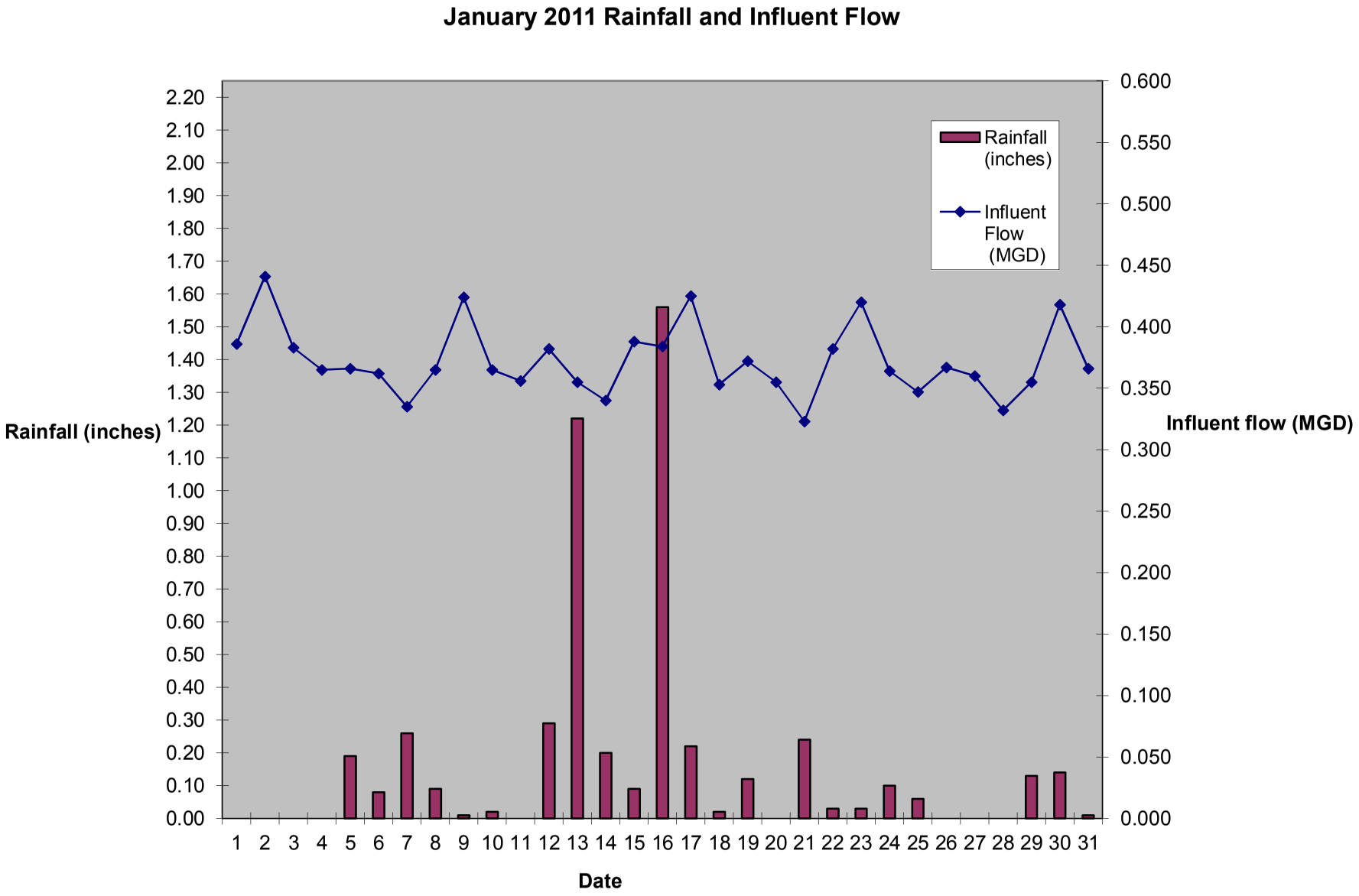
City of Yelm Wastewater Treatment Plant

2011 Precipitation Data **TOTAL RAINFALL FOR 2011 = 38.61**

*** 24 hour total read at 8:00 AM daily**

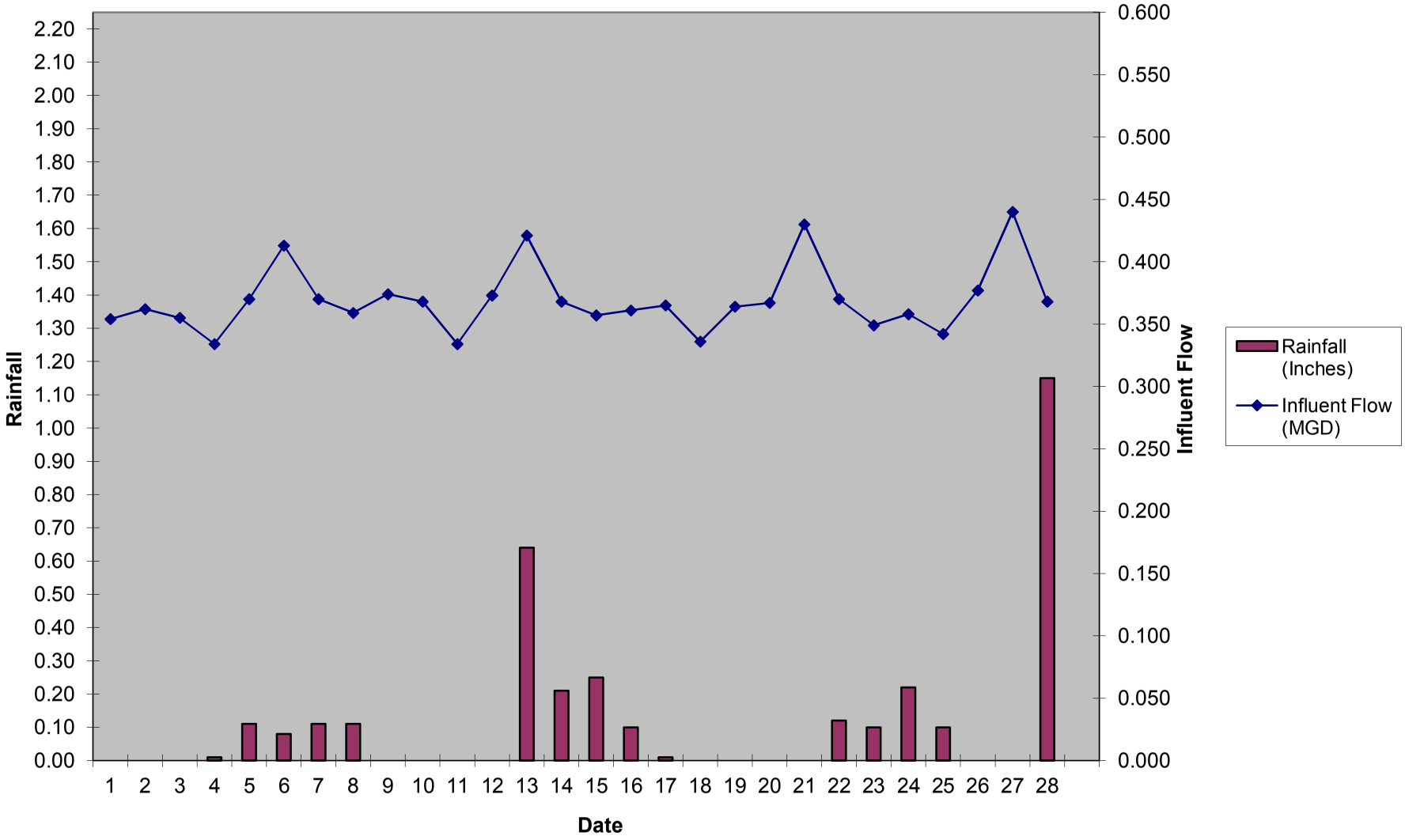
DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*	DATE	24 total*
1/1/2011	0.00	2/1/2011	0.00	3/1/2011	0.25	4/1/2011	0.01	5/1/2011	0.00	6/1/2011	0.12	7/1/2011	0.00	8/1/2011	0.00	9/1/2011	0.00	10/1/2011	0.01	11/1/2011	0.00	12/1/2011	0.00
1/2/2011	0.00	2/2/2011	0.00	3/2/2011	0.28	4/2/2011	0.42	5/2/2011	0.00	6/2/2011	0.08	7/2/2011	0.00	8/2/2011	0.00	9/2/2011	0.00	10/2/2011	0.00	11/2/2011	0.00	12/2/2011	0.00
1/3/2011	0.00	2/3/2011	0.00	3/3/2011	0.11	4/3/2011	0.00	5/3/2011	0.08	6/3/2011	0.21	7/3/2011	0.00	8/3/2011	0.00	9/3/2011	0.00	10/3/2011	0.04	11/3/2011	0.63	12/3/2011	0.00
1/4/2011	0.00	2/4/2011	0.01	3/4/2011	0.16	4/4/2011	0.07	5/4/2011	0.00	6/4/2011	0.00	7/4/2011	0.00	8/4/2011	0.00	9/4/2011	0.00	10/4/2011	0.08	11/4/2011	0.20	12/4/2011	0.00
1/5/2011	0.19	2/5/2011	0.11	3/5/2011	0.18	4/5/2011	0.37	5/5/2011	0.04	6/5/2011	0.00	7/5/2011	0.00	8/5/2011	0.00	9/5/2011	0.00	10/5/2011	0.06	11/5/2011	0.02	12/5/2011	0.00
1/6/2011	0.08	2/6/2011	0.08	3/6/2011	0.03	4/6/2011	0.44	5/6/2011	0.01	6/6/2011	0.00	7/6/2011	0.00	8/6/2011	0.00	9/6/2011	0.00	10/6/2011	0.16	11/6/2011	0.00	12/6/2011	0.00
1/7/2011	0.26	2/7/2011	0.11	3/7/2011	0.00	4/7/2011	0.17	5/7/2011	0.31	6/7/2011	0.00	7/7/2011	0.00	8/7/2011	0.00	9/7/2011	0.00	10/7/2011	0.01	11/7/2011	0.00	12/7/2011	0.02
1/8/2011	0.09	2/8/2011	0.11	3/8/2011	0.05	4/8/2011	0.02	5/8/2011	0.24	6/8/2011	0.01	7/8/2011	0.00	8/8/2011	0.00	9/8/2011	0.00	10/8/2011	0.01	11/8/2011	0.01	12/8/2011	0.00
1/9/2011	0.01	2/9/2011	0.00	3/9/2011	0.18	4/9/2011	0.00	5/9/2011	0.02	6/9/2011	0.00	7/9/2011	0.00	8/9/2011	0.00	9/9/2011	0.00	10/9/2011	0.06	11/9/2011	0.02	12/9/2011	0.00
1/10/2011	0.02	2/10/2011	0.00	3/10/2011	1.22	4/10/2011	0.00	5/10/2011	0.00	6/10/2011	0.00	7/10/2011	0.00	8/10/2011	0.00	9/10/2011	0.00	10/10/2011	0.11	11/10/2011	0.00	12/10/2011	0.00
1/11/2011	0.00	2/11/2011	0.00	3/11/2011	0.19	4/11/2011	0.16	5/11/2011	0.02	6/11/2011	0.00	7/11/2011	0.00	8/11/2011	0.00	9/11/2011	0.00	10/11/2011	0.73	11/11/2011	0.01	12/11/2011	0.05
1/12/2011	0.29	2/12/2011	0.00	3/12/2011	0.14	4/12/2011	0.01	5/12/2011	0.50	6/12/2011	0.00	7/12/2011	0.00	8/12/2011	0.00	9/12/2011	0.00	10/12/2011	0.41	11/12/2011	0.30	12/12/2011	0.02
1/13/2011	1.22	2/13/2011	0.64	3/13/2011	0.06	4/13/2011	0.01	5/13/2011	0.00	6/13/2011	0.02	7/13/2011	0.16	8/13/2011	0.00	9/13/2011	0.00	10/13/2011	0.01	11/13/2011	0.22	12/13/2011	0.00
1/14/2011	0.20	2/14/2011	0.21	3/14/2011	0.46	4/14/2011	0.06	5/14/2011	0.00	6/14/2011	0.03	7/14/2011	0.02	8/14/2011	0.00	9/14/2011	0.00	10/14/2011	0.02	11/14/2011	0.34	12/14/2011	0.00
1/15/2011	0.09	2/15/2011	0.25	3/15/2011	0.12	4/15/2011	0.44	5/15/2011	1.72	6/15/2011	0.00	7/15/2011	0.03	8/15/2011	0.00	9/15/2011	0.00	10/15/2011	0.00	11/15/2011	0.00	12/15/2011	0.11
1/16/2011	1.56	2/16/2011	0.10	3/16/2011	0.57	4/16/2011	0.15	5/16/2011	0.27	6/16/2011	0.00	7/16/2011	0.51	8/16/2011	0.00	9/16/2011	0.00	10/16/2011	0.00	11/16/2011	0.00	12/16/2011	0.03
1/17/2011	0.22	2/17/2011	0.01	3/17/2011	0.04	4/17/2011	0.00	5/17/2011	0.00	6/17/2011	0.00	7/17/2011	0.01	8/17/2011	0.00	9/17/2011	0.00	10/17/2011	0.00	11/17/2011	0.54	12/17/2011	0.00
1/18/2011	0.02	2/18/2011	0.00	3/18/2011	0.00	4/18/2011	0.00	5/18/2011	0.00	6/18/2011	0.26	7/18/2011	0.06	8/18/2011	0.00	9/18/2011	0.48	10/18/2011	0.00	11/18/2011	0.44	12/18/2011	0.06
1/19/2011	0.12	2/19/2011	0.00	3/19/2011	0.15	4/19/2011	0.01	5/19/2011	0.00	6/19/2011	0.00	7/19/2011	0.00	8/19/2011	0.00	9/19/2011	0.05	10/19/2011	0.00	11/19/2011	0.20	12/19/2011	0.03
1/20/2011	0.00	2/20/2011	0.00	3/20/2011	0.04	4/20/2011	0.00	5/20/2011	0.00	6/20/2011	0.00	7/20/2011	0.00	8/20/2011	0.00	9/20/2011	0.00	10/20/2011	0.01	11/20/2011	0.00	12/20/2011	0.00
1/21/2011	0.24	2/21/2011	0.00	3/21/2011	0.03	4/21/2011	0.00	5/21/2011	0.04	6/21/2011	0.00	7/21/2011	0.00	8/21/2011	0.00	9/21/2011	0.00	10/21/2011	0.00	11/21/2011	0.11	12/21/2011	0.03
1/22/2011	0.03	2/22/2011	0.12	3/22/2011	0.08	4/22/2011	0.00	5/22/2011	0.15	6/22/2011	0.00	7/22/2011	0.00	8/22/2011	0.00	9/22/2011	0.00	10/22/2011	0.25	11/22/2011	0.25	12/22/2011	0.00
1/23/2011	0.03	2/23/2011	0.10	3/23/2011	0.00	4/23/2011	0.00	5/23/2011	0.00	6/23/2011	0.00	7/23/2011	0.00	8/23/2011	0.15	9/23/2011	0.00	10/23/2011	0.42	11/23/2011	2.16	12/23/2011	0.00
1/24/2011	0.10	2/24/2011	0.22	3/24/2011	0.00	4/24/2011	0.00	5/24/2011	0.00	6/24/2011	0.00	7/24/2011	0.00	8/24/2011	0.00	9/24/2011	0.00	10/24/2011	0.01	11/24/2011	0.14	12/24/2011	0.02
1/25/2011	0.06	2/25/2011	0.10	3/25/2011	0.18	4/25/2011	0.43	5/25/2011	0.00	6/25/2011	0.02	7/25/2011	0.00	8/25/2011	0.00	9/25/2011	0.11	10/25/2011	0.00	11/25/2011	0.35	12/25/2011	0.00
1/26/2011	0.00	2/26/2011	0.00	3/26/2011	0.03	4/26/2011	0.35	5/26/2011	0.13	6/26/2011	0.00	7/26/2011	0.14	8/26/2011	0.00	9/26/2011	0.17	10/26/2011	0.00	11/26/2011	0.04	12/26/2011	0.32
1/27/2011	0.00	2/27/2011	0.00	3/27/2011	0.11	4/27/2011	0.22	5/27/2011	0.04	6/27/2011	0.00	7/27/2011	0.00	8/27/2011	0.00	9/27/2011	0.15	10/27/2011	0.00	11/27/2011	0.02	12/27/2011	0.08
1/28/2011	0.00	2/28/2011	1.15	3/28/2011	0.30	4/28/2011	0.61	5/28/2011	0.57	6/28/2011	0.02	7/28/2011	0.00	8/28/2011	0.00	9/28/2011	0.13	10/28/2011	0.00	11/28/2011	0.52	12/28/2011	0.64
1/29/2011	0.13			3/29/2011	0.18	4/29/2011	0.02	5/29/2011	0.01	6/29/2011	0.00	7/29/2011	0.00	8/29/2011	0.00	9/29/2011	0.00	10/29/2011	0.24	11/29/2011	0.00	12/29/2011	0.75
1/30/2011	0.14			3/30/2011	0.47	4/30/2011	0.00	5/30/2011	0.00	6/30/2011	0.07	7/30/2011	0.00	8/30/2011	0.00	9/30/2011	0.00	10/30/2011	0.11	11/30/2011	0.09	12/30/2011	1.07
1/31/2011	0.01			3/31/2011	0.71			5/31/2011	0.00			7/31/2011	0.00	8/31/2011	0.00			10/31/2011	0.10			12/31/2011	0.04
Monthly																							
Total	5.11		3.32		6.32		3.97		4.15		0.84		0.93		0.15		1.09		2.85		6.61		3.27
max day	1.56		1.15		1.22		0.61		1.72		0.26		0.51		0.15		0.48		0.73		2.16		1.07
Max for Yr.	2.16																						

January	Rainfall (inches)	Influent Flow (MGD)
1	0.00	0.386
2	0.00	0.441
3	0.00	0.383
4	0.00	0.365
5	0.19	0.366
6	0.08	0.362
7	0.26	0.335
8	0.09	0.365
9	0.01	0.424
10	0.02	0.365
11	0.00	0.356
12	0.29	0.382
13	1.22	0.355
14	0.20	0.340
15	0.09	0.388
16	1.56	0.384
17	0.22	0.425
18	0.02	0.353
19	0.12	0.372
20	0.00	0.355
21	0.24	0.323
22	0.03	0.382
23	0.03	0.420
24	0.10	0.364
25	0.06	0.347
26	0.00	0.367
27	0.00	0.360
28	0.00	0.332
29	0.13	0.355
30	0.14	0.418
31	0.01	0.366


January 2011 Rainfall and Influent Flow
Rainfall (inches)
Influent flow (MGD)
Date
Rainfall (inches)
Influent Flow (MGD)
2.20
2.10
2.00
1.90
1.80
1.70
1.60
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.600
0.550
0.500
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

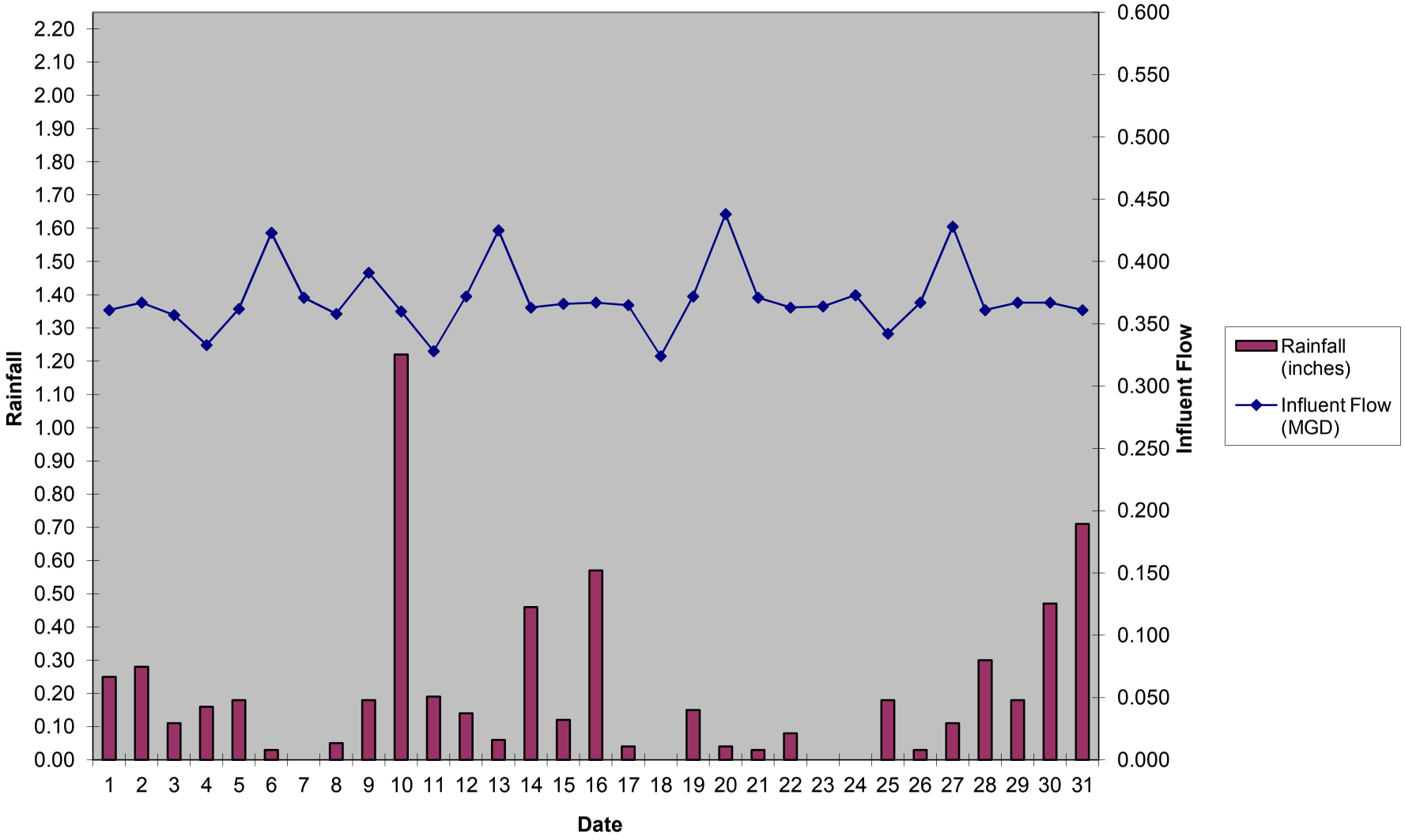
February	Rainfall (Inches)	Influent Flow (MGD)
1	0.00	0.354
2	0.00	0.362
3	0.00	0.355
4	0.01	0.334
5	0.11	0.370
6	0.08	0.413
7	0.11	0.370
8	0.11	0.359
9	0.00	0.374
10	0.00	0.368
11	0.00	0.334
12	0.00	0.373
13	0.64	0.421
14	0.21	0.368
15	0.25	0.357
16	0.10	0.361
17	0.01	0.365
18	0.00	0.336
19	0.00	0.364
20	0.00	0.367
21	0.00	0.430
22	0.12	0.370
23	0.10	0.349
24	0.22	0.358
25	0.10	0.342
26	0.00	0.377
27	0.00	0.440
28	1.15	0.368

February 2011 Rainfall and Influent Totals



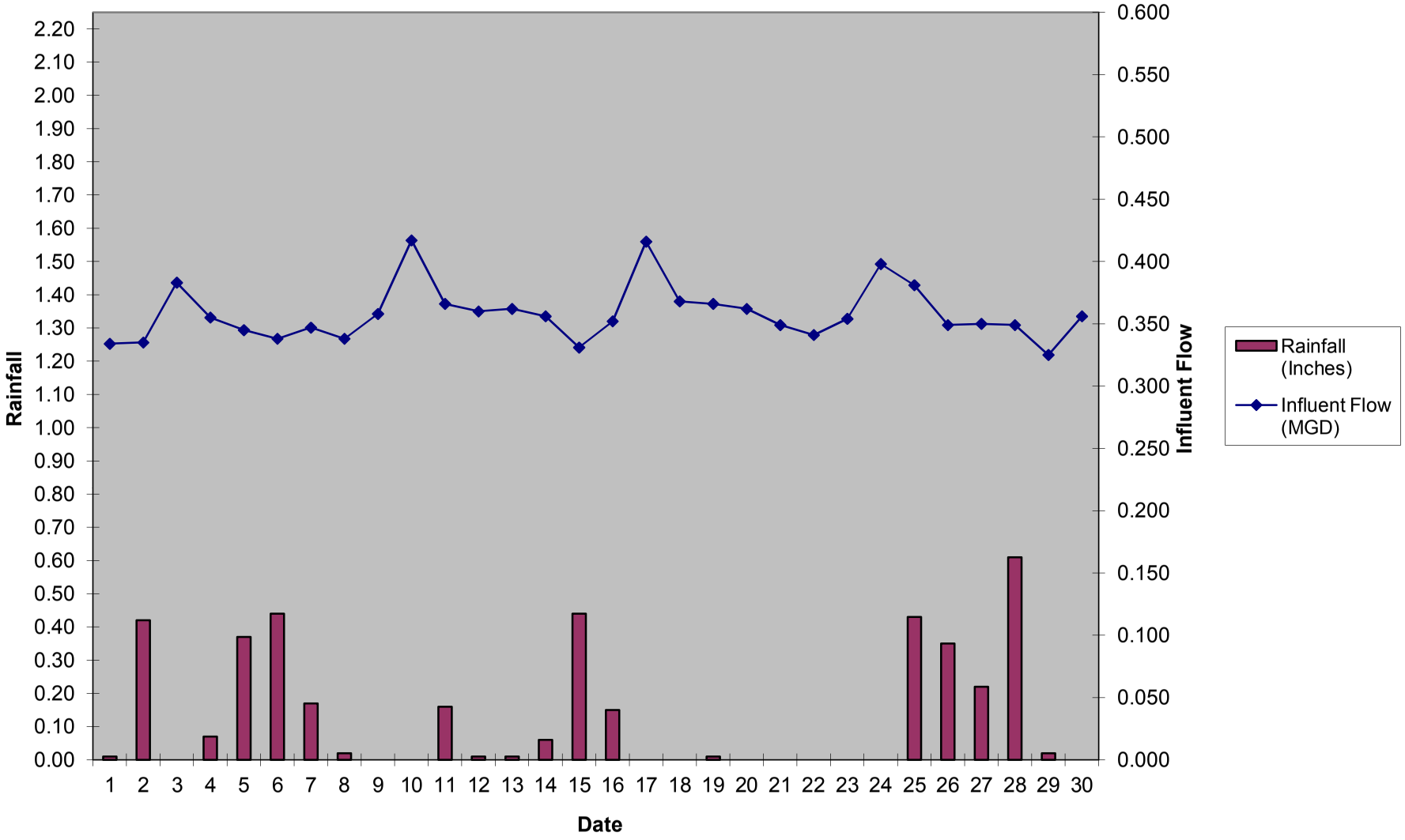
March	Rainfall (inches)	Influent Flow (MGD)
1	0.25	0.361
2	0.28	0.367
3	0.11	0.357
4	0.16	0.333
5	0.18	0.362
6	0.03	0.423
7	0.00	0.371
8	0.05	0.358
9	0.18	0.391
10	1.22	0.360
11	0.19	0.328
12	0.14	0.372
13	0.06	0.425
14	0.46	0.363
15	0.12	0.366
16	0.57	0.367
17	0.04	0.365
18	0.00	0.324
19	0.15	0.372
20	0.04	0.438
21	0.03	0.371
22	0.08	0.363
23	0.00	0.364
24	0.00	0.373
25	0.18	0.342
26	0.03	0.367
27	0.11	0.428
28	0.30	0.361
29	0.18	0.367
30	0.47	0.367
31	0.71	0.361

Mar. 2011 Rainfall and Influent Flows



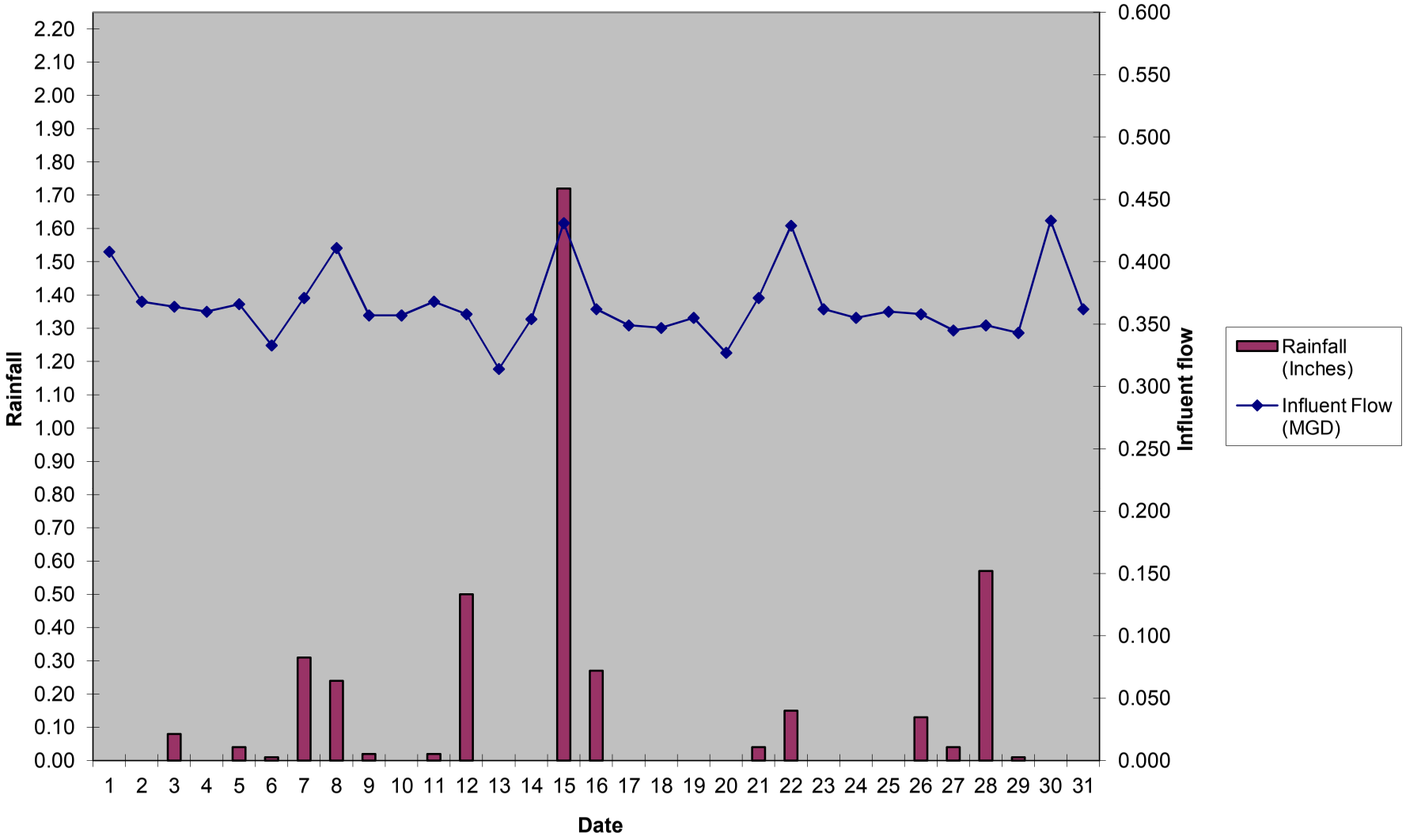
April	Rainfall (Inches)	Influent Flow (MGD)
1	0.01	0.334
2	0.42	0.335
3	0.00	0.383
4	0.07	0.355
5	0.37	0.345
6	0.44	0.338
7	0.17	0.347
8	0.02	0.338
9	0.00	0.358
10	0.00	0.417
11	0.16	0.366
12	0.01	0.360
13	0.01	0.362
14	0.06	0.356
15	0.44	0.331
16	0.15	0.352
17	0.00	0.416
18	0.00	0.368
19	0.01	0.366
20	0.00	0.362
21	0.00	0.349
22	0.00	0.341
23	0.00	0.354
24	0.00	0.398
25	0.43	0.381
26	0.35	0.349
27	0.22	0.350
28	0.61	0.349
29	0.02	0.325
30	0.00	0.356

April 2011 Rainfall and Influent Flow

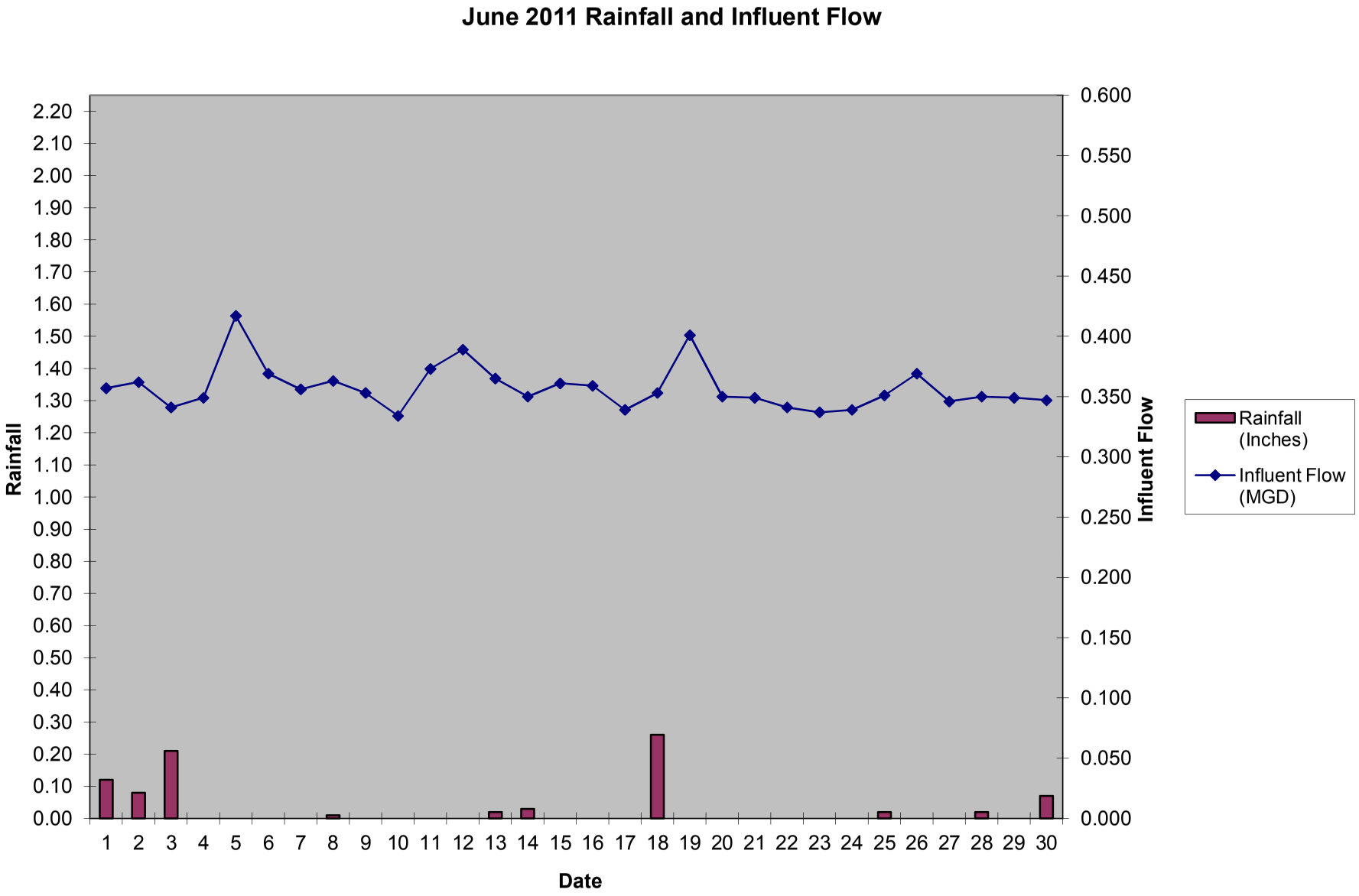


May	Rainfall (Inches)	Influent Flow (MGD)
1	0.00	0.408
2	0.00	0.368
3	0.08	0.364
4	0.00	0.360
5	0.04	0.366
6	0.01	0.333
7	0.31	0.371
8	0.24	0.411
9	0.02	0.357
10	0.00	0.357
11	0.02	0.368
12	0.50	0.358
13	0.00	0.314
14	0.00	0.354
15	1.72	0.431
16	0.27	0.362
17	0.00	0.349
18	0.00	0.347
19	0.00	0.355
20	0.00	0.327
21	0.04	0.371
22	0.15	0.429
23	0.00	0.362
24	0.00	0.355
25	0.00	0.360
26	0.13	0.358
27	0.04	0.345
28	0.57	0.349
29	0.01	0.343
30	0.00	0.433
31	0.00	0.362

May 2011 Rainfall and Influent Flow

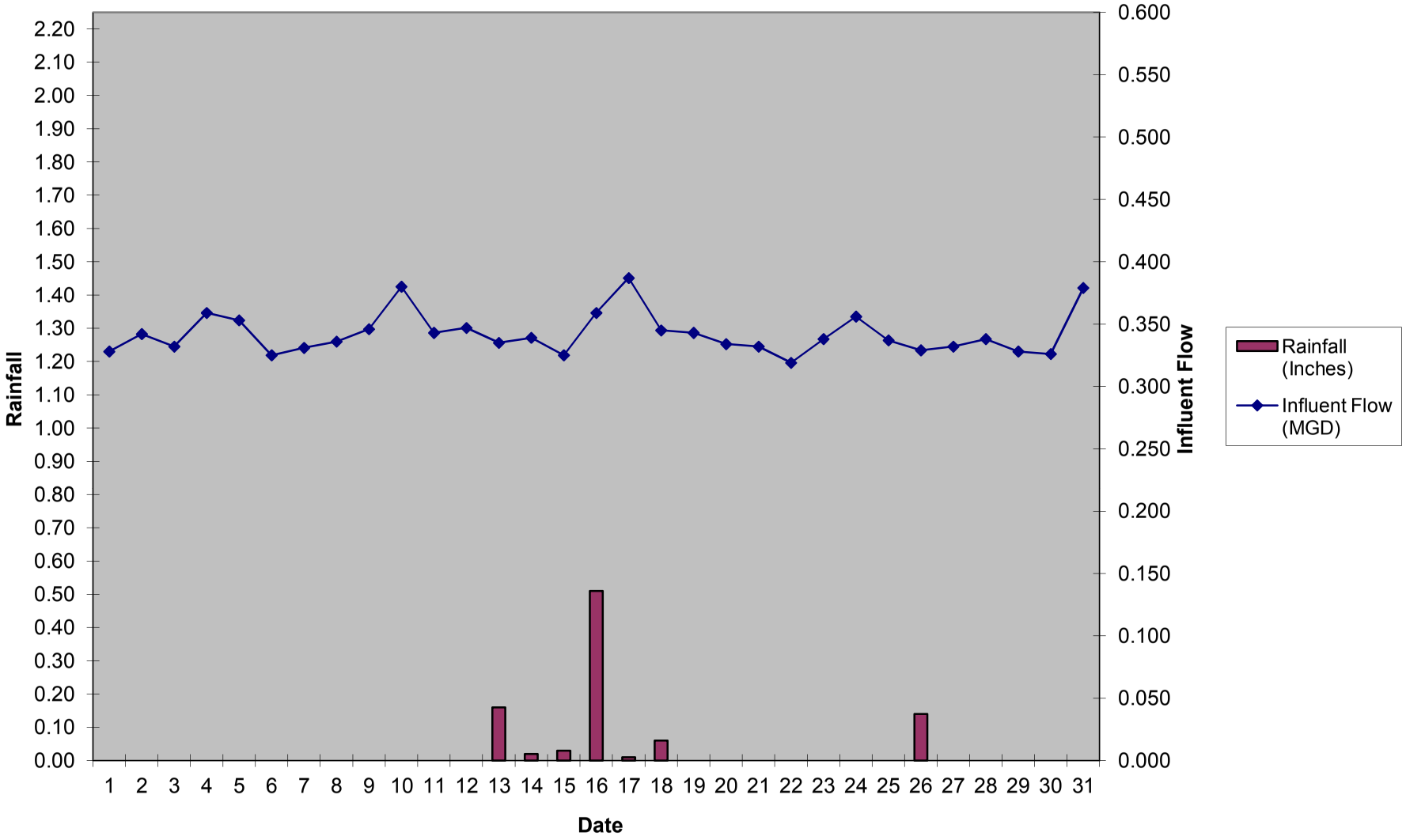


June	Rainfall (Inches)	Influent Flow (MGD)
1	0.12	0.357
2	0.08	0.362
3	0.21	0.341
4	0.00	0.349
5	0.00	0.417
6	0.00	0.369
7	0.00	0.356
8	0.01	0.363
9	0.00	0.353
10	0.00	0.334
11	0.00	0.373
12	0.00	0.389
13	0.02	0.365
14	0.03	0.350
15	0.00	0.361
16	0.00	0.359
17	0.00	0.339
18	0.26	0.353
19	0.00	0.401
20	0.00	0.350
21	0.00	0.349
22	0.00	0.341
23	0.00	0.337
24	0.00	0.339
25	0.02	0.351
26	0.00	0.369
27	0.00	0.346
28	0.02	0.350
29	0.00	0.349
30	0.07	0.347


June 2011 Rainfall and Influent Flow
Rainfall
2.20
2.10
2.00
1.90
1.80
1.70
1.60
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Influent Flow
0.600
0.550
0.500
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Date
Rainfall (Inches)
Influent Flow (MGD)

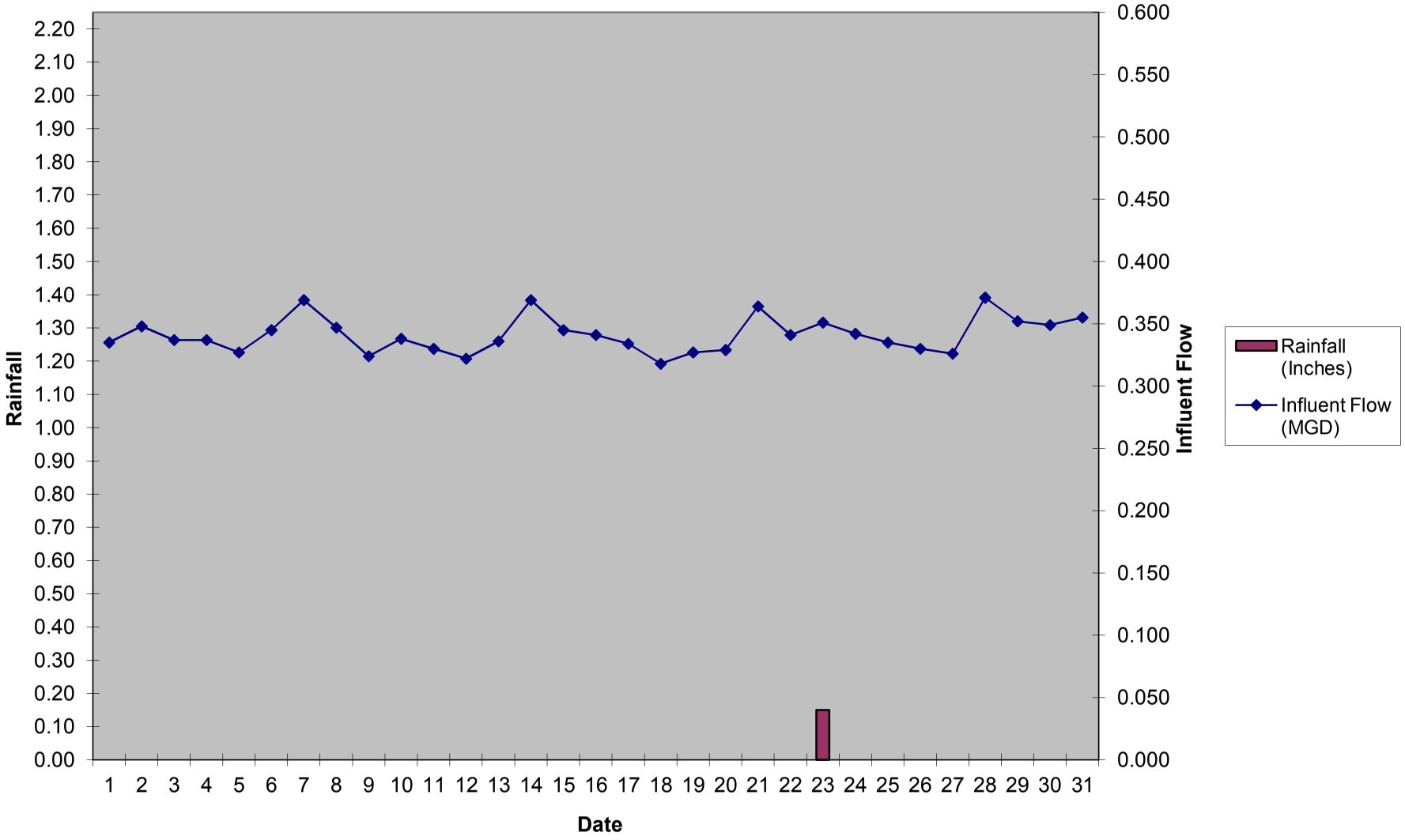
July		Rainfall (Inches)	Influent Flow (MGD)
	1	0.00	0.328
	2	0.00	0.342
	3	0.00	0.332
	4	0.00	0.359
	5	0.00	0.353
	6	0.00	0.325
	7	0.00	0.331
	8	0.00	0.336
	9	0.00	0.346
	10	0.00	0.380
	11	0.00	0.343
	12	0.00	0.347
	13	0.16	0.335
	14	0.02	0.339
	15	0.03	0.325
	16	0.51	0.359
	17	0.01	0.387
	18	0.06	0.345
	19	0.00	0.343
	20	0.00	0.334
	21	0.00	0.332
	22	0.00	0.319
	23	0.00	0.338
	24	0.00	0.356
	25	0.00	0.337
	26	0.14	0.329
	27	0.00	0.332
	28	0.00	0.338
	29	0.00	0.328
	30	0.00	0.326
	31	0.00	0.379

July 2011 Rainfall and Influent Flow



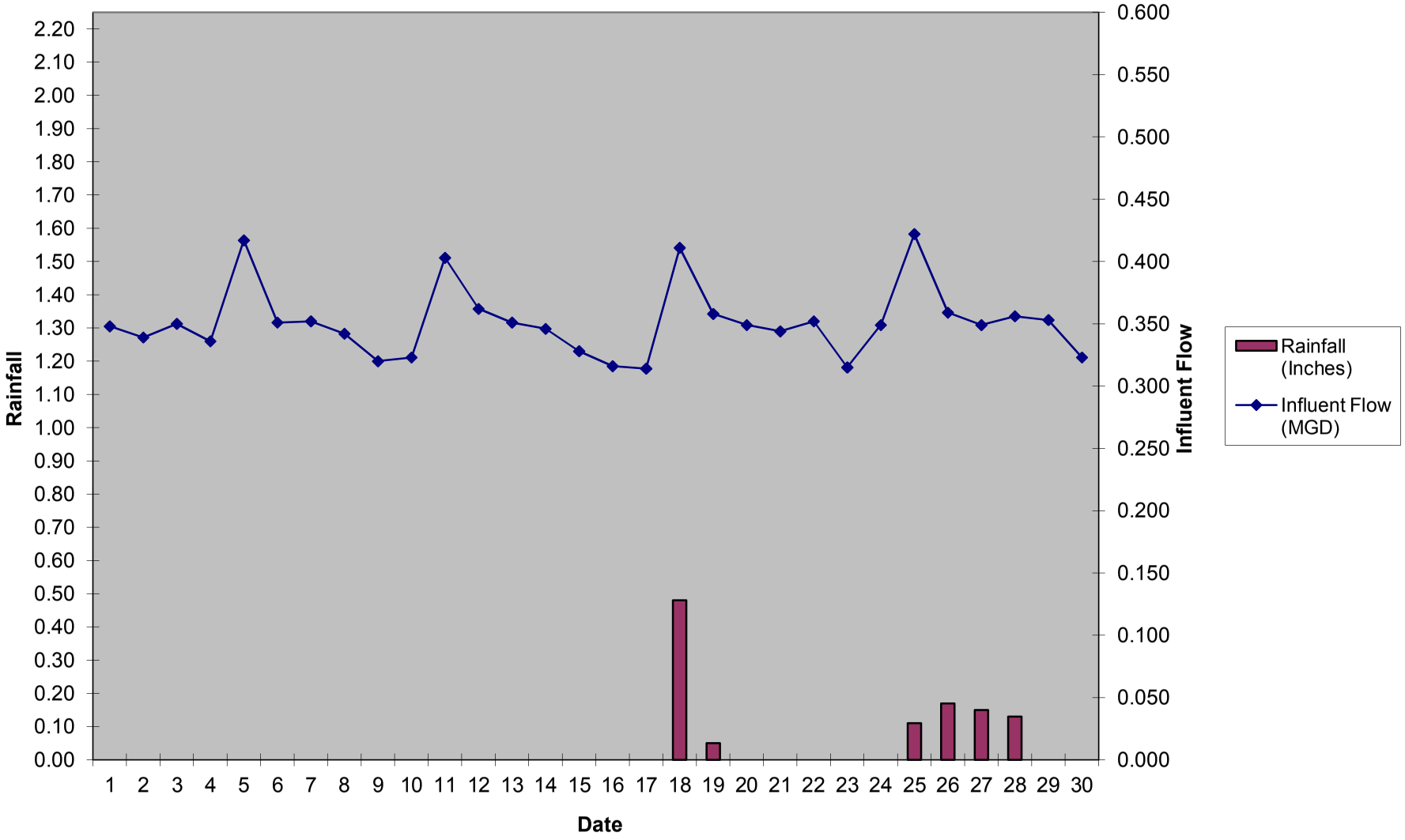
August	Rainfall (Inches)	Influent Flow (MGD)
1	0.00	0.335
2	0.00	0.348
3	0.00	0.337
4	0.00	0.337
5	0.00	0.327
6	0.00	0.345
7	0.00	0.369
8	0.00	0.347
9	0.00	0.324
10	0.00	0.338
11	0.00	0.330
12	0.00	0.322
13	0.00	0.336
14	0.00	0.369
15	0.00	0.345
16	0.00	0.341
17	0.00	0.334
18	0.00	0.318
19	0.00	0.327
20	0.00	0.329
21	0.00	0.364
22	0.00	0.341
23	0.15	0.351
24	0.00	0.342
25	0.00	0.335
26	0.00	0.330
27	0.00	0.326
28	0.00	0.371
29	0.00	0.352
30	0.00	0.349
31	0.00	0.355

August 2011 Rainfall and Influent Flow



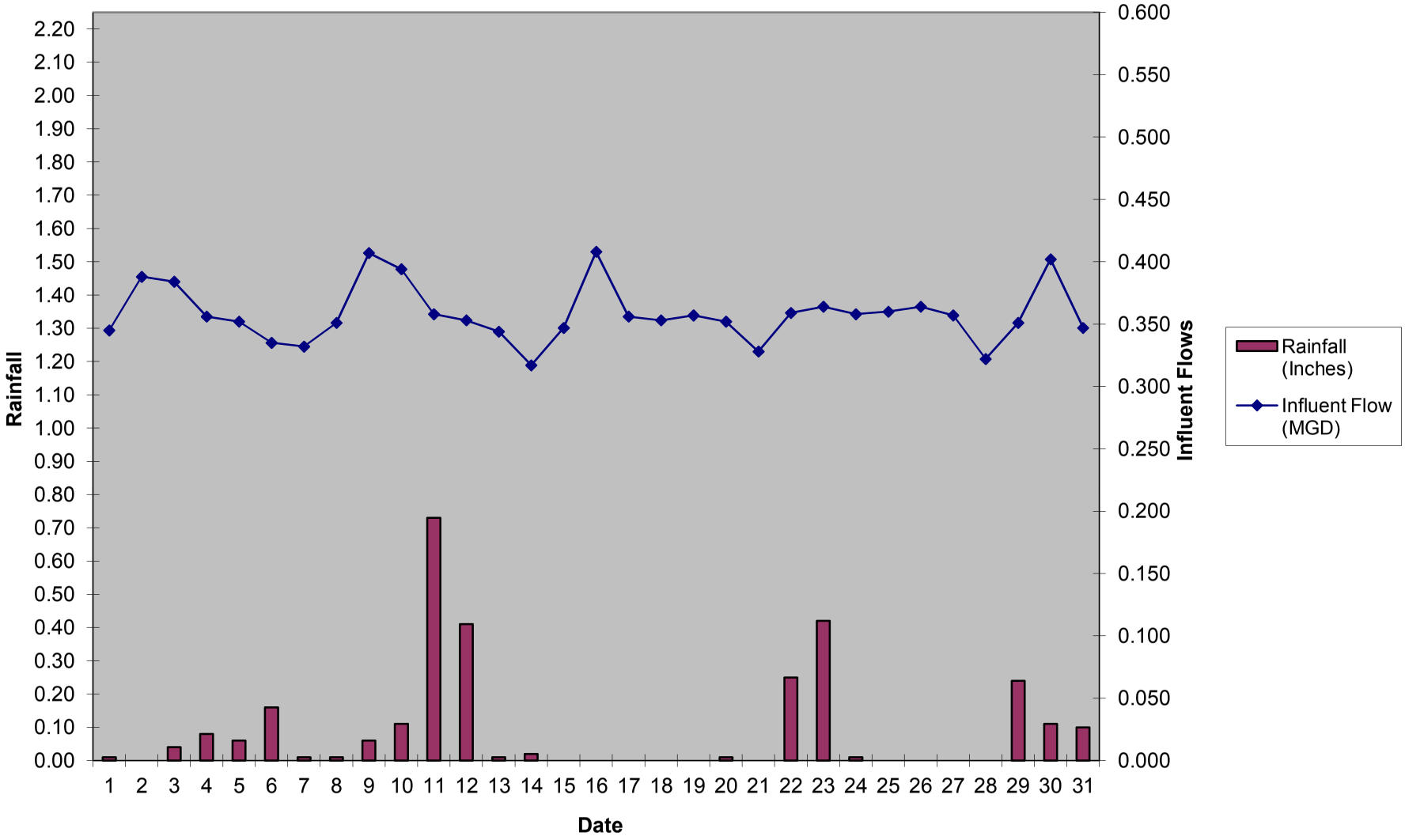
September	Rainfall (Inches)	Influent Flow (MGD)
1	0.00	0.348
2	0.00	0.339
3	0.00	0.350
4	0.00	0.336
5	0.00	0.417
6	0.00	0.351
7	0.00	0.352
8	0.00	0.342
9	0.00	0.320
10	0.00	0.323
11	0.00	0.403
12	0.00	0.362
13	0.00	0.351
14	0.00	0.346
15	0.00	0.328
16	0.00	0.316
17	0.00	0.314
18	0.48	0.411
19	0.05	0.358
20	0.00	0.349
21	0.00	0.344
22	0.00	0.352
23	0.00	0.315
24	0.00	0.349
25	0.11	0.422
26	0.17	0.359
27	0.15	0.349
28	0.13	0.356
29	0.00	0.353
30	0.00	0.323

Sept. 2011 Rainfall and Influent Flow



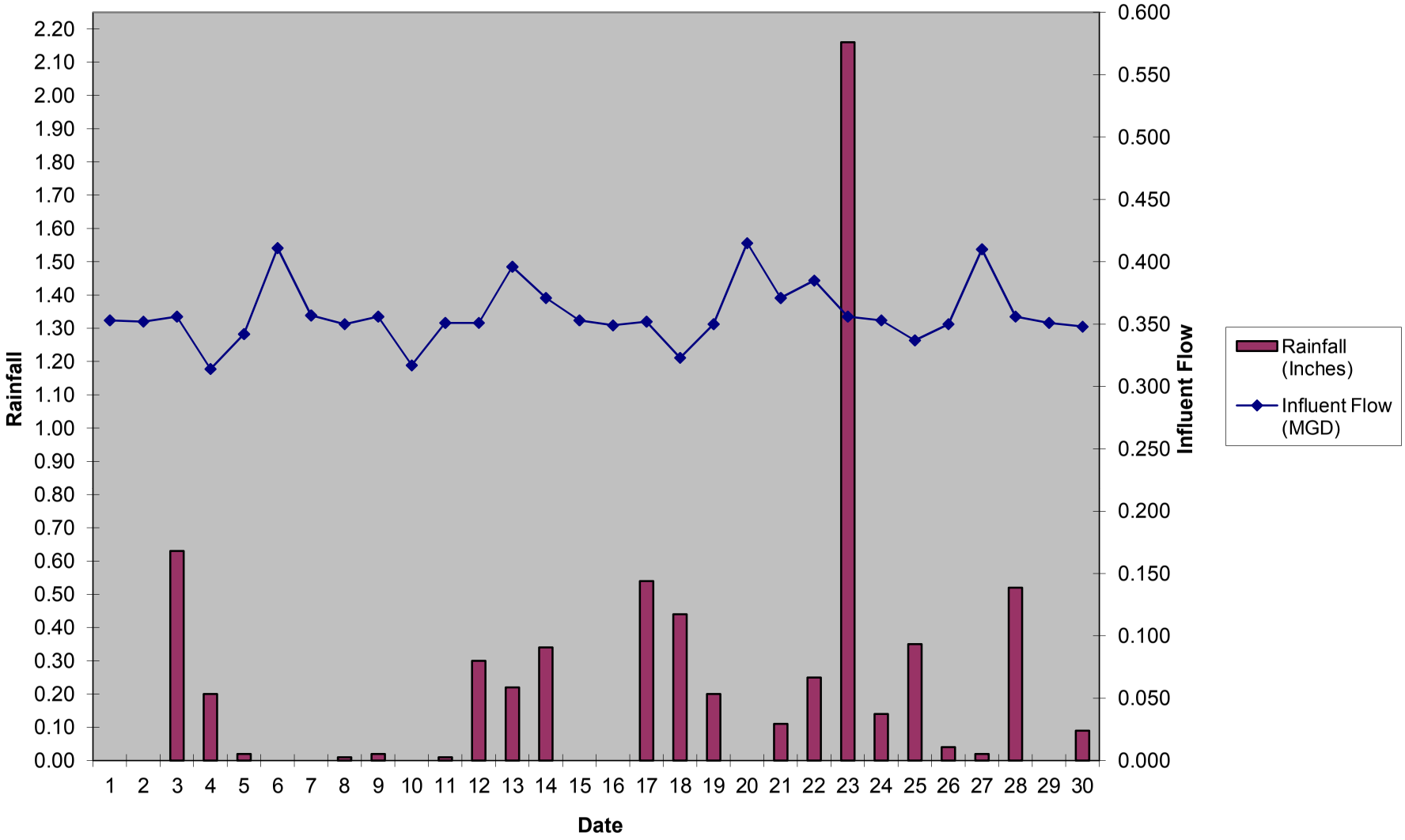
October	Rainfall (Inches)	Influent Flow (MGD)
1	0.01	0.345
2	0.00	0.388
3	0.04	0.384
4	0.08	0.356
5	0.06	0.352
6	0.16	0.335
7	0.01	0.332
8	0.01	0.351
9	0.06	0.407
10	0.11	0.394
11	0.73	0.358
12	0.41	0.353
13	0.01	0.344
14	0.02	0.317
15	0.00	0.347
16	0.00	0.408
17	0.00	0.356
18	0.00	0.353
19	0.00	0.357
20	0.01	0.352
21	0.00	0.328
22	0.25	0.359
23	0.42	0.364
24	0.01	0.358
25	0.00	0.360
26	0.00	0.364
27	0.00	0.357
28	0.00	0.322
29	0.24	0.351
30	0.11	0.402
31	0.10	0.347

October 2011 Rainfall and Influent Flows

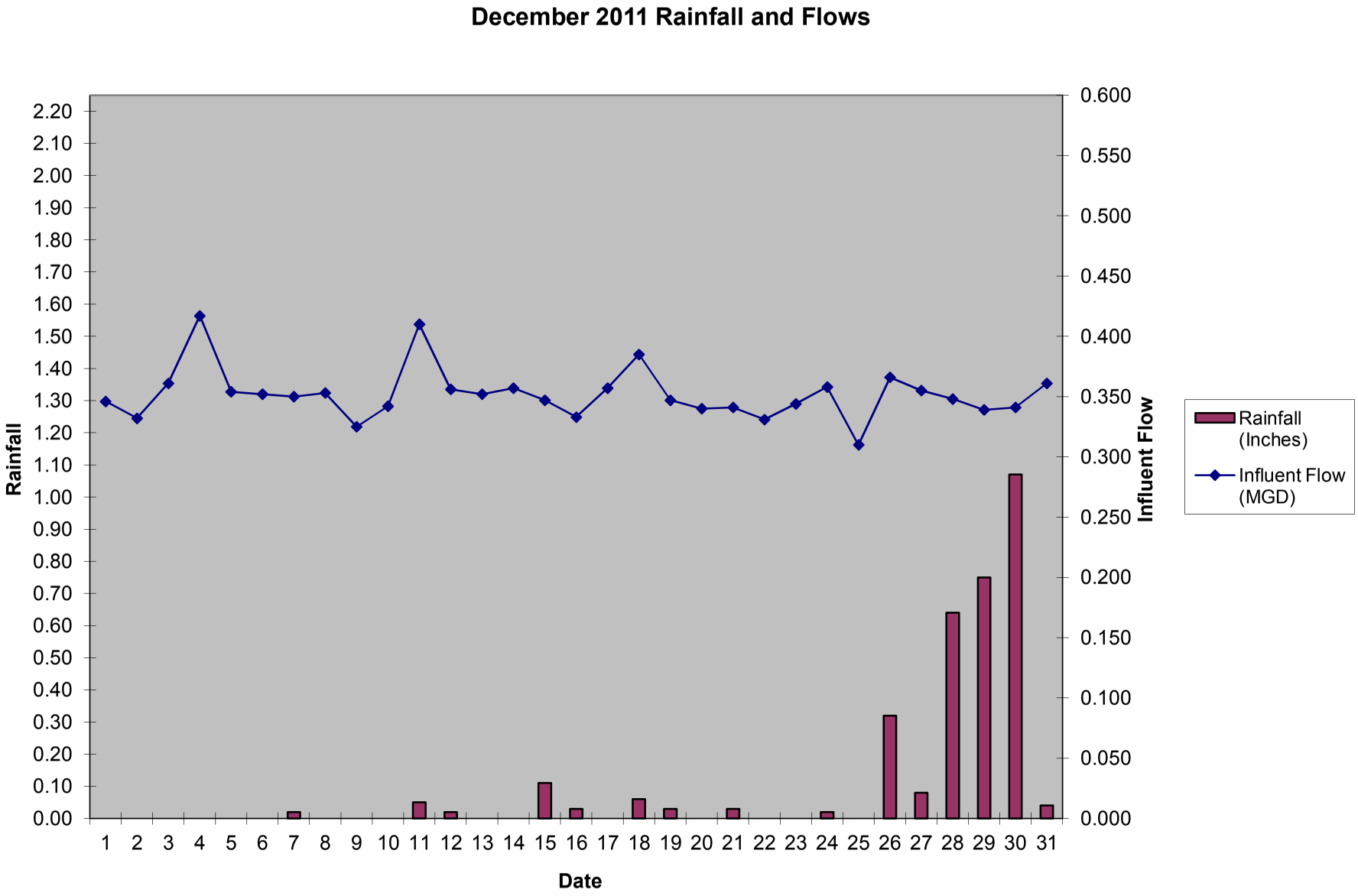


November	Rainfall (Inches)	Influent Flow (MGD)
1	0.00	0.353
2	0.00	0.352
3	0.63	0.356
4	0.20	0.314
5	0.02	0.342
6	0.00	0.411
7	0.00	0.357
8	0.01	0.350
9	0.02	0.356
10	0.00	0.317
11	0.01	0.351
12	0.30	0.351
13	0.22	0.396
14	0.34	0.371
15	0.00	0.353
16	0.00	0.349
17	0.54	0.352
18	0.44	0.323
19	0.20	0.350
20	0.00	0.415
21	0.11	0.371
22	0.25	0.385
23	2.16	0.356
24	0.14	0.353
25	0.35	0.337
26	0.04	0.350
27	0.02	0.410
28	0.52	0.356
29	0.00	0.351
30	0.09	0.348

November 2011 Rainfall and Influent Flow



December	Rainfall (Inches)	Influent Flow (MGD)
1	0.00	0.346
2	0.00	0.332
3	0.00	0.361
4	0.00	0.417
5	0.00	0.354
6	0.00	0.352
7	0.02	0.350
8	0.00	0.353
9	0.00	0.325
10	0.00	0.342
11	0.05	0.410
12	0.02	0.356
13	0.00	0.352
14	0.00	0.357
15	0.11	0.347
16	0.03	0.333
17	0.00	0.357
18	0.06	0.385
19	0.03	0.347
20	0.00	0.340
21	0.03	0.341
22	0.00	0.331
23	0.00	0.344
24	0.02	0.358
25	0.00	0.310
26	0.32	0.366
27	0.08	0.355
28	0.64	0.348
29	0.75	0.339
30	1.07	0.341
31	0.04	0.361


December 2011 Rainfall and Flows
Rainfall
2.20
2.10
2.00
1.90
1.80
1.70
1.60
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Influent Flow
0.600
0.550
0.500
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Date
Rainfall (Inches)
Influent Flow (MGD)

2C: Wastewater Characterization Sampling and Analysis Plan

Sampling and Analysis Plan

Brown AND Caldwell

724 Columbia St NW, Suite 420
Olympia, WA 98501
Tel: 360-943-7525

Prepared for: City of Yelm

Project Title: General Sewer Plan

Project No: 141043

Sampling and Analysis Plan

Subject: Proposed Sampling and Analysis Plan

Date: September 27, 2011

To: Stephanie Ray, Project Manager

From: Jeff Morgan

Copy to: Kate Green

Prepared by: Kate Green, Project Engineer

Reviewed by: Jeff Morgan, Project Manager

Limitations:

This document was prepared solely for City of Yelm in accordance with professional standards at the time the services were performed and in accordance with the contract between City of Yelm and Brown and Caldwell dated 4-20-2011. This document is governed by the specific scope of work authorized by City of Yelm; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by City of Yelm and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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1. Purpose

The scope of work for the General Sewer Plan describes sample collection from a representative set of commercial dischargers. According to the scope, these samples will be analyzed for constituent loads, including fats, oils, and greases (FOG), and related information. The results of this analysis will be used to characterize wastewater and project future loading from commercial dischargers. Additionally, the data that is collected will be used during a cost of service analysis to develop sewer rates.

This Sampling and Analysis Plan (SAP) describes the methodology, sampling equipment, sampling locations, and procedures used to generate a characterization of wastewater from selected commercial dischargers in Yelm.

1.1 Summary of Plan

The purpose of this task will be to collect wastewater samples from commercial customers' STEP Tanks. Activities include:

- Sampling at approximately 18 locations over a period of approximately 4 working days.
- Sample preparation, storage, handling, and shipping to accredited contract laboratory.
- Data distribution to Brown and Caldwell for analysis.

1.2 Constituents of Interest

Samples will be analyzed for the following constituents:

- FOG
- TSS
- TKN
- BOD

2. Field Methodology

Field work will be performed by City of Yelm staff. Brown and Caldwell staff will be available to provide assistance and recommendations as necessary.

2.1 Sampling Methodology

The following methodology will be used when collecting samples:

1. Before samples are collected, all sampling equipment and sample containers will be cleaned in a laboratory or cleaning facility.
2. Samples will be collected by installing a sampling tee and valve to the flexible tubing on the STEP tank discharge line to collect effluent pumped from the tank. See Figure 1. The STEP pump will then be turned on to pump flow into a sample collection bottle in the field. The sampling apparatus should be flushed prior to each use.
3. A total of 4 sample bottles will be collected from each sample site:
    a. 500 mL plastic bottle (for TKN)
    b. 2 Qt Plastic bottle (for FOG)
    c. 250 mL plastic bottle (for TSS)

   d. 1 Qt plastic bottle (for BOD)

4. If preservative is required, the laboratory will add it to the sample bottles prior to shipment. There is no need to add preservative in the field.
5. Each sample bottle should be labeled with the following:
   a. sample site location
   b. container number
   c. date of collection
   d. initials of sample collector
   e. test parameters (laboratory analysis to be performed)
6. After collection and bottling, the samples will be immediately placed on ice. Samples will be subsequently shipped to the analytical laboratory the morning after sampling.

It is estimated that each sampling event will require approximately 30 minutes at each site. Site time includes traffic control and materials setup; access port opening; equipment setup; sampling and bottling; bagging, icing, and storage; equipment clean-up and packing; and access hatch closing.

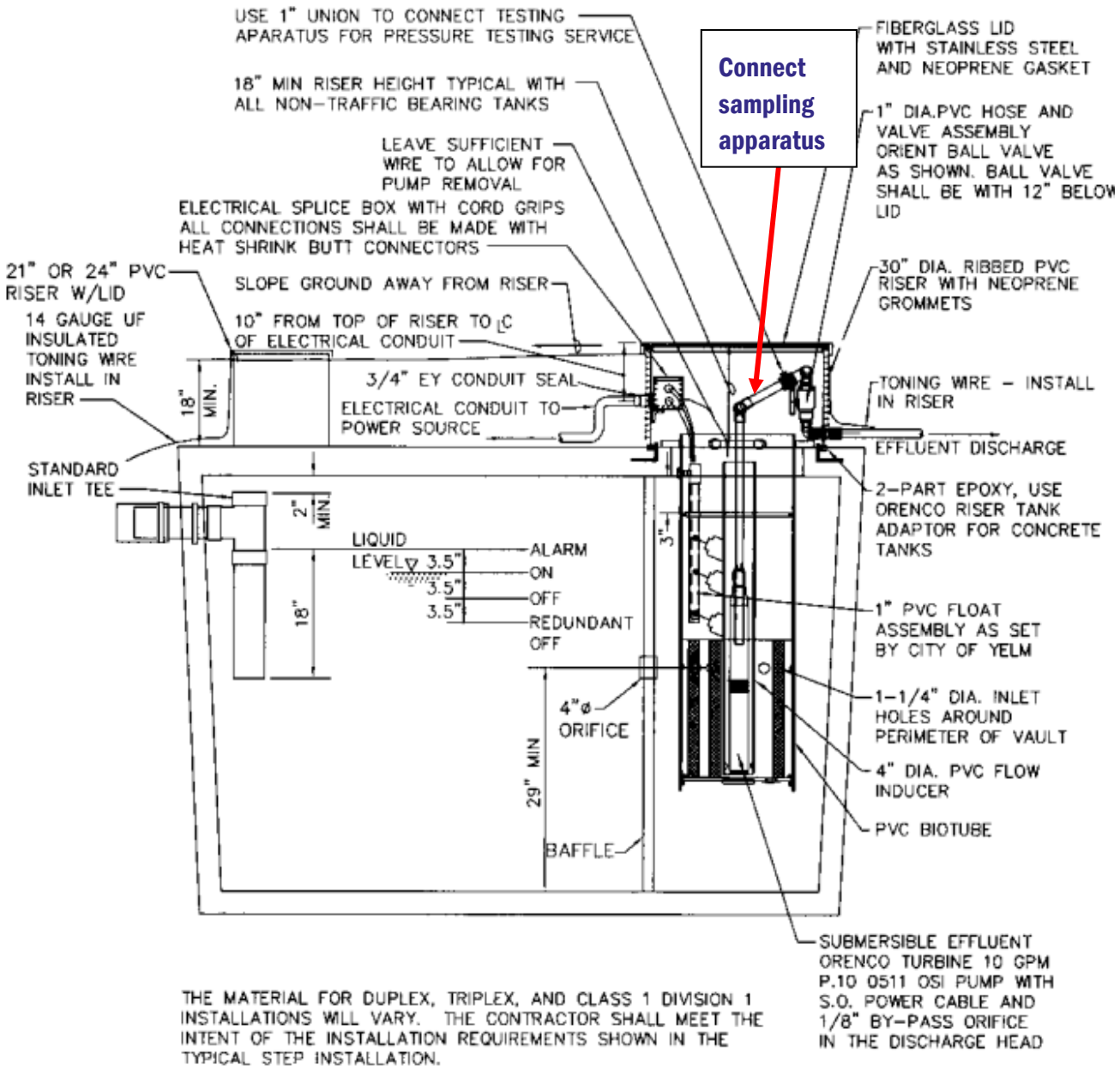

Figure 1. STEP Tank Sampling Location

Source: City of Yelm Sewer Development Guidelines, Chapter 7, DWG. NO 7-9.

2.2 Sampling Equipment

Equipment that will be used while collecting samples is shown in Table 1.

Table 1. Sampling Equipment

Equipment Name	Quantity	Supplied by
Sample Bottles	36 each of: • 500 mL plastic bottle • 2 Qt plastic bottle • 250 mL plastic bottle • 1 Qt. plastic bottle	Laboratory
Coolers	At least 4	Laboratory
Ice	As needed	City
Latex/Nitrile gloves	As needed	City
Traffic Diversion Equipment	As needed	City
Field Decontamination Equipment (water, paper towels, hand sanitizer)	As needed	City
Air sampler to detect presence of hazardous gases in tank	City discretion	City
Sampling apparatus to connect to STEP tank	At least 1	City

2.3 Sampling Locations

Sampling locations were discussed with the City in a meeting on September 9, 2011. Based on this discussion, sampling is recommended to occur at the following locations:

Table 2. Recommended Sampling Locations

Location No.	Account No.	Customer Name	Address
1	04-0363-00	CAFE, ELITE	706 YELM AVE E B
2	01-0575-01	PUERTO VALLARTA RESTAURANT	802 YELM AVE W
3	01-0620-00	SCHOOL YELM HIGH	1315 YELM AVE W
4	01-0261-01	MCDONALDS	505 YELM AVE W
5	10-4000-01	YELM MEDICAL PLAZA	201 TAHOMA BLVD
6	04-2500-01	WAL-MART SUPERSTORE	17100 HWY 507 SE
7	01-0565-00	ROSEMONT RETIREMENT	215 KILLION RD NW
8	04-0788-00	DAIRY QUEEN	1202 YELM AVE E STE A
9	01-0579-00	GOLDEN DRAGON III INC	813 YELM AVE W
10	05-0130-03	FRONTIER VILLAGE CLEANERS	404 FIRST ST SE
11	04-0774-00	SAFEWAY #1619	1109 YELM AVE E
12	04-1360-02	RAINIER CHEVRON	16518 HWY 507 SE
13	01-0281-03	ICHIBAN TERIYAKI	506 WEST YELM AVENUE
14	04-0794-01	PIZZA HUT	1412 YELM AVE E BLDG C
15	05-1131-02	MARIACHI ALLEGRE	717 YELM AVE E
16	01-0961	YELM CAR CARE CENTER	511 YELM AVE W
17	01-0616-00	YELM VET CLINIC	1120 YELM AVE W
18	04-0796-00	Kentucky Fried Chicken	1310 YELM AVE E

2.4 Sampling Intervals

Two grab samples will be collected at each site in order to account for diurnal variation in wastewater composition. If 6 locations per day are sampled, sampling will be conducted from 8:30 AM to 3:30 PM, with an hour break between the morning and afternoon sampling events.

2.5 Sampling Schedule

It is anticipated that approximately 6 locations could be sampled per day if the entire work day is devoted to sampling. The proposed sampling schedule below is an example; however, sampling need not be completed on consecutive days and less than 6 locations can be sampled per day to allow time for operators to complete other tasks, as necessary. Sampling is expected to occur from late September through mid-October.

Table 3. Proposed Sampling Schedule

Day	Time	Description of activities	Location
1	Afternoon	Review sampling procedure, prepare sample bottles	Sampling locations 1,2,3,4, & 5
2	8:30 am, 12:30 pm	Collect sample at location 1	Cafe Elite
2	9:00 am, 1:00 pm	Collect sample at location 2	Puerto Vallarta Restaurant
2	9:30 am, 1:30 pm	Collect sample at location 3	Yelm High School
2	10:00 am, 2:00 pm	Collect sample at location 4	McDonalds
2	10:30 am, 2:30 pm	Collect sample at location 5	Yelm Medical Plaza
2	11:00 am, 3:00 pm	Collect sample at location 6	Wal-Mart Superstore
2	3:30	Overnight samples to lab; prepare sample bottles for next day. (Samples could also be shipped the next day after the morning sampling if melted ice is replaced in the morning.)	
3	8:30 am, 12:30 pm	Collect sample at location 7	Rosemont Retirement
	9:00 am, 1:00 pm	Collect sample at location 8	Dairy Queen
3	9:30 am, 1:30 pm	Collect sample at location 9	Golden Dragon
3	10:00 am, 2:00 pm	Collect sample at location 10	Frontier Village Cleaners
3	10:30 am, 2:30 pm	Collect sample at location 11	Safeway
3	11:00 am, 3:00 pm	Collect sample at location 12	Rainier Chevron
3	3:30	Overnight samples to lab; prepare sample bottles for next day. (Samples could also be shipped the next day after the morning sampling if melted ice is replaced in the morning.)	
4	8:30 am, 12:30 pm	Collect sample at location 13	Ichiban Teriyaki
4	9:00 am, 1:00 pm	Collect sample at location 14	Pizza Hut
4	9:30 am, 1:30 pm	Collect sample at location 15	Mariachi Allegre
4	10:00 am, 2:00 pm	Collect sample at location 16	Yelm Car Care Center
4	10:30 am, 2:30 pm	Collect sample at location 17	Yelm Vet Clinic
4	11:00 am, 3:00 pm	Collect sample at location 18	Kentucky Fried Chicken
4	3:30	Overnight samples to lab; prepare sample bottles for next day. (Samples could also be shipped the next day after the morning sampling if melted ice is replaced in the morning.)	

3. Costs

Completion of sampling activities outlined in this SAP is estimated to take one employee approximately 4 working days, depending on the number of sites sampled per day.

Brown and Caldwell obtained the following laboratory costs from Edge Analytical:

Table 4. Laboratory Costs for Samples

Analysis	Cost per Sample	Total Costs (based on 18 locations and 2 samples per location)
FOG	$70	$2,520
TSS	$20	$720
TKN	$34	$1,224
BOD	$55	$1,980
Total:	**$179**	**$6,444**

Based on these quotes, laboratory analysis is expected to cost approximately $6,444.

City of Yelm Commercial Sampling Results
Prepared by the Yelm Sewer Department

					Sample Collection			Analysis Results			
Sample #	Acct. #	Business Name	Address	Sample Name	Date	Time	Operator	5-day BOD (mg/L)	FOG (mg/L)	TSS (mg/L)	TKN (mg/L)
1a	04-0363-00	CAFE, ELITE	706 YELM AVE E B	CAFE, ELITE AM	10/12/2011	9:40 AM	Bob R	2241	28	152	54.3
1b	04-0363-00	CAFE, ELITE	706 YELM AVE E B	CAFE, ELITE PM	10/12/2011	1:25 PM	Bob R	1884	26.8	128	55.2
2a	01-0575-01	PUERTO VALLARTA RESTAURANT	802 YELM AVE W	PUERTO VALLARTA RESTAURANT Am	10/13/2011	9:50 AM	Bob R	140	6.1	92	103
2b	01-0575-01	PUERTO VALLARTA RESTAURANT	802 YELM AVE W	PUERTO VALLARTA RESTAURANT Pm	10/13/2011	2:25 PM	Bob R	120	5.6	74	94.8
3a	01-0620-00	SCHOOL YELM HIGH	1315 YELM AVE W	SCHOOL YELM HIGH AM	10/13/2011	10:30 AM	Bob R	320	13.8	240	138
3b	01-0620-00	SCHOOL YELM HIGH	1315 YELM AVE W	SCHOOL YELM HIGH PM	10/13/2011	1:20 PM	Bob R	210	12.1	60	138
4a	01-0261-01	MCDONALDS	505 YELM AVE W	MCDONALDS AM	10/19/2011	11:15 AM	Jim D	744	98.5	130	51.1
4b	01-0261-01	MCDONALDS	505 YELM AVE W	MCDONALDS Pm	10/19/2011	2:25 PM	Jim D	754	91	252	50.5
5a	10-4000-01	YELM MEDICAL PLAZA	201 TAHOMA BLVD	YELM MEDICAL PLAZA AM	10/13/2011	10:20 AM	Bob R	260	32.3	47	101
5b	10-4000-01	YELM MEDICAL PLAZA	201 TAHOMA BLVD	YELM MEDICAL PLAZA PM	10/13/2011	1:40 AM	Bob R	280	38.9	48	98.1
6a	04-2500-01	WAL-MART SUPERSTORE	17100 HWY 507 SE	WAL-MART SUPERSTORE am	10/12/2011	10:45 AM	Bob R	716	35.5	116	128
6b	04-2500-01	WAL-MART SUPERSTORE	17100 HWY 507 SE	WAL-MART SUPERSTORE Pm	10/12/2011	2:10 PM	Bob R	722	45.7	136	115
7a	01-0565-00	ROSEMONT RETIREMENT	215 KILLION RD NW	ROSEMONT RETIREMENT am	10/13/2011	10:00 AM	Bob R	180	32.5	98	43.5
7b	01-0565-00	ROSEMONT RETIREMENT	215 KILLION RD NW	ROSEMONT RETIREMENT Pm	10/13/2011	2:05 PM	Bob R	170	25.6	58	38.7
8a	04-0788-00	DAIRY QUEEN	1202 YELM AVE E STE A	DAIRY QUEENam	10/12/2011	10:00 AM	Bob R	1005	98.5	236	51.3
8b	04-0788-00	DAIRY QUEEN	1202 YELM AVE E STE A	DAIRY QUEEN pm	10/12/2011	1:40 PM	Bob R	1068	134	206	51.3
9a	01-0579-00	GOLDEN DRAGON III INC	813 YELM AVE W	GOLDEN DRAGON III INC am	10/13/2011	10:10 AM	Bob R	540	12.4	52	68.2
9b	01-0579-00	GOLDEN DRAGON III INC	813 YELM AVE W	GOLDEN DRAGON III INC pm	10/13/2011	1:55 PM	Bob R	540	14.5	44	71.2
10a	05-0130-03	FRONTIER VILLAGE CLEANERS	404 FIRST ST SE	FRONTIER VILLAGE AM	10/19/2011	11:45 AM	Jim D	235	24.3	40	35.6
10b	05-0130-03	FRONTIER VILLAGE CLEANERS	404 FIRST ST SE	FRONTIER VILLAGE CLEANERS Pm	10/19/2011	2:40 PM	Jim D	237	29.2	37	37.7
11a	04-0774-00	SAFEWAY #1619	1109 YELM AVE E	SAFEWAY #1619 AM	10/19/2011	10:40 AM	Jim D	523	66.5	124	44.6
11b	04-0774-00	SAFEWAY #1620	1109 YELM AVE E	SAFEWAY #1620	10/19/2011	2:10 PM	Jim D	515	53.2	110	47
12a	04-1360-02	RAINIER CHEVRON	16518 HWY 507 SE	RAINIER CHEVRON AM	10/19/2011	10:30 AM	Jim D	77	10.3	144	35
12b	04-1360-02	RAINIER CHEVRON	16518 HWY 507 SE	RAINIER CHEVRON	10/19/2011	2:00 PM	Jim D	<41	7.1	188	18.1
13a	01-0281-03	ICHIBAN TERIYAKI	506 WEST YELM AVENUE	ICHIBAN TERIYAKI Am	10/13/2011	9:00 AM	Bob R	270	25.2	144	41.4
13b	01-0281-03	ICHIBAN TERIYAKI	506 WEST YELM AVENUE	ICHIBAN TERIYAKI Pm	10/13/2011	2:40 PM	Bob R	220	12.2	122	43
14a	04-0794-01	Pizza Hut	1412 YELM AVE E BLDG. C	Pizza Hut Am	10/12/2011	10:10 AM	Bob R	1074	130	224	75.7
14b	04-0794-01	Pizza Hut	1412 YELM AVE E BLDG. C	Pizza Hut PM	10/12/2011	1:50 PM	Bob R	1178	124	98	74.1
15a	05-1131-02	MARIACHI ALLEGRE	717 YELM AVE E	MARIACHI ALLEGRE am	10/12/2011	11:10 AM	Bob R	600	72.8	76	109
15b	05-1131-02	MARIACHI ALLEGRE	717 YELM AVE E	MARIACHI ALLEGRE	10/12/2011	2:30 PM	Bob R	501	24.3	60	98.6
16a	01-0961-00	YELM CAR CARE CENTER	511 YELM AVE W	YELM CAR CARE CENTER AM	10/19/2011	11:05 AM	Jim D	74	9	142	9
16b	01-0961-00	YELM CAR CARE CENTER	511 YELM AVE W	YELM CAR CARE CENTER	10/19/2011	2:20 PM	Jim D	58	4.4	98	9.6
17a	01-0616-00	YELM VET CLINIC	1120 YELM AVE W	YELM VET CLINIC AM	10/13/2011	10:40 AM	Bob R	360	152	44	47.1
17b	01-0616-00	YELM VET CLINIC	1120 YELM AVE W	YELM VET CLINIC PM	10/13/2011	1:35 PM	Bob R	360	113	42	46.3
18a	04-0796-00	Kentucky Fried Chicken	1310 YELM AVE E	Kentucky Fried Chicken am	10/12/2011	10:25 AM	Bob R	767	56.9	116	94.5
18b	04-0796-00	Kentucky Fried Chicken	1310 YELM AVE E	Kentucky Fried Chicken pm	10/12/2011	2:00 PM	Bob R	730	59.8	162	70.5