CITY OF ASHLAND

SANITARY SEWER COLLECTION SYSTEM MASTER PLAN UPDATE

FINAL
January 2005

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CITY OF ASHLAND

SANITARY SEWER COLLECTION SYSTEM
MASTER PLAN UPDATE

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PROJECT BACKGROUND

1.1 INTRODUCTION

The purpose of this Sanitary Sewer Collection System Master Plan Update is to:

1. Evaluate the capacity of the existing collection system during peak wet weather flows.
2. Evaluate the capacity of the collection system and determine improvement needs under future build-out conditions.
3. Develop a capital improvement program that will provide the City with a reliable and economic sanitary sewer collection system for the future.
4. Provide assistance in developing future program needs.

The City has experienced stable growth over the past 20 years and expects this trend to continue for the next 20 years. This Sanitary Sewer Collection Master Plan Update focuses on evaluating the capacity of the existing system and assessing the impact the next 20 years of growth will have on the system.

Since the previous sanitary sewer master plan (*Sewerage Study Final Report* by CRS SIRRINE, September 1986), the City has completed most of the recommended collection system improvements. Prior to the 1986 study, the last collection system master plan was completed in 1971.

The City has also been proactive in curtailing the effects of inflow and infiltration (I/I) entering their collection system over the past two decades. The City has implemented a root intrusion control program and has performed regular system inspections to identify and replace (or repair) deteriorated sections of the system. These efforts have resulted in a steady decrease in external plant flows during the winter wet weather months.

The scope of work completed for this Sanitary Sewer Collection System Master Plan Update was divided into six (6) major tasks as follows:

Task 1 – Gather and Review Data. Collection system data was obtained from the City's Geographic Information System (GIS), database files, and from City staff. The Ashland School District provided student enrollment for the elementary, middle, and high schools. Southern Oregon State University provided enrollment data for Spring 2003 semester. In addition, the 1986 Sewerage Study was reviewed for relevant information for this master plan.

Task 2 – Computer Model Development. A hydraulic model was constructed with pipelines primarily 10-inches in diameter and larger. City staff provided pipeline length and diameter data from their Geographic Information System (GIS) and CAD systems. The City contracted with a surveyor to provide ground and invert elevations for the pipelines included in the hydraulic model. Once the hydraulic model was constructed, the model was calibrated to dry and wet weather flow data, provided from flow monitoring conducted by the Villalobos & Associates Consulting Engineers. A capacity analysis was then performed to assess the effect of design storm peak wet weather flows on the existing collection system. In addition, 20-year flows were developed and their impact on the existing collection system was assessed.

Task 3 – cMOM. An initial cMOM audit form was completed by City staff. The audit form was used to develop a checklist for the City, for their use in compiling and documenting the cMOM Program. In addition, a guidance document was provided to the City to facilitate developing an Overflow Emergency Response Plan.

Task 4 – Fats, Oils and Grease Ordinance. Pretreatment requirements for commercial and industrial dischargers with fats, oils and grease (FOG) were evaluated to assist the City in developing a FOG Ordinance.

Task 5 – Capital Improvement Program. A Capital Improvement Program (CIP) was developed based on the capacity deficiencies identified in Task 2 for the existing condition and the 20-year development flows. A cost estimate was prepared for the CIP, and phased over a 20-year planning period.

Task 6 – Prepare Report. This report serves as a compilation of the above project tasks for the Sanitary Sewer Collection System Master Plan Update. The report includes nine chapters, which are summarized in the following section.

1.2 REPORT CONTENTS

The report contains the following sections with a brief description of each chapters' contents.

- Chapter 1: Introduction – Provides background information for the report and presents the scope of work completed for the Sanitary Sewer Collection System Master Plan Update.

- Chapter 2: Land Use – Provides a description of the City's existing 2003 land use and population estimates. It also presents the 20-Year Plan and General Plan Land Use population and flow projections for the City's service area.

- Chapter 3: Collection System Facilities – Summarizes the physical characteristics and map of the existing collection system facilities.

- Chapter 4: Flow Monitoring – Summarizes Villalobos & Associates Consulting Engineers, Inc. temporary flow and rainfall monitoring effort conducted in March and April 2003. Also included is a summary of 2002 and 2003 flow data from the wastewater treatment plant meter.

- Chapter 5: Collection System Hydraulic Modeling – Provides a description of the collection system hydraulic modeling effort. Included is a detailed description of the development of the hydraulic model, projections for future dry and wet weather flows, and the calibration process.
- Chapter 6: Capacity Analysis – Discusses the development of the design storm used to assess the hydraulic performance of the collection system. This chapter also summarizes the capacity analysis results derived from the hydraulic model during design storm peak wet weather flows.
- Chapter 7: Capital Improvement Program – Provides a capital improvement program, cost summary and priority list of pipeline improvements for the collection system.
- Chapter 8: cMOM Summary – Provides a summary of the cMOM program elements and includes a checklist of the City's programs that are currently in-place, being updated (or developed), or that may be required for cMOM compliance.

LAND USE

2.1 GENERAL

The City of Ashland's urban growth boundary (UGB) encompasses approximately 4,861 acres within Jackson County. The City resides in the southern most portion of the Interstate 5 (I-5) corridor. Ashland is considered a tourist destination in Oregon, especially in the summer months during the Shakespeare Festival. Also residing in Ashland is one of seven public universities within the Oregon University System. Southern Oregon University occupies approximately 100 acres in the southeastern section of the City. There are several main transportation routes within Ashland's UGB: Interstate 5, Highway 99, Main Street, Siskiyou Boulevard, and Ashland Street/Highway 66.

2.2 EXISTING 2003 POPULATION ESTIMATES & LAND USE

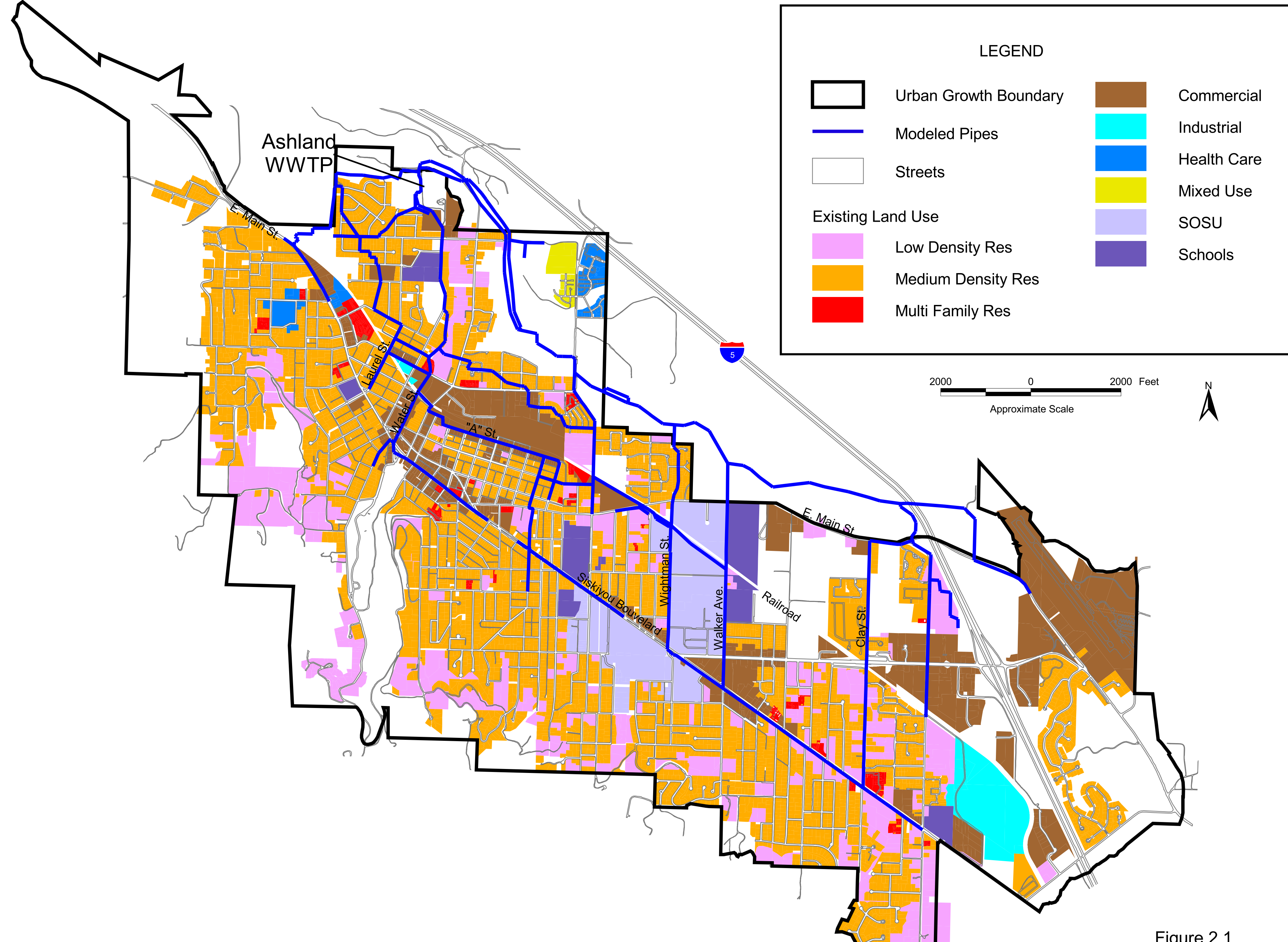
Carollo used the City's GIS taxlots coverage and aerial photograph to develop the existing land use map. The land use map was then used to estimate the existing 2003 population within the City's wastewater service area. The 2003 population estimate was derived utilizing information from the City's Comprehensive Plan document for residential dwelling unit densities and occupancy rates (capita per dwelling unit). The residential densities and occupancy rates are presented in Table 2.1. The estimated population for existing 2003 land use is approximately 20,300. This population estimate correlates well with July 1, 2003 population estimate published by Portland State University's Population Research Center of 20,430.

Table 2.1 Residential Density and Occupancy Rate
Sanitary Sewer Collection System Master Plan Update
City of Ashland

Land Use Designation	Unit	Density or Rate
Residential Density		
Low Density	DU[1] /acre	1.2
Medium Density	DU/acre	5.5
Multi-Family	DU/acre	20
Occupancy Rate [2]		
Existing 2003	capita/DU	2.3
20 Year and Build-out	capita/DU	2.2

Notes:
(1) DU = dwelling units.
(2) Based on City's Comprehensive Plan

The Existing 2003 Land Use map is presented in Figure 2.1. A summary of existing 2003 land use type and acreage is provided in Table 2.2.



Note: All data was provided with the City's current information as of February 2003.

Exst2003LU.pdf

Figure 2.1
Existing 2003 Land Use
City of Ashland

Table 2.2 Summary of Existing 2003 Land Use Sanitary Sewer Collection System Master Plan Update City of Ashland		
Land Use Designation	**Area (acres)**	**Percentage of Total Area**
Health Care	29	1.1%
Low Density Residential	412	15.9%
Medium Density Residential	1,382	53.2%
Multi-Family Residential	36	1.4%
Commercial	475	18.3%
Industrial	69	2.7%
Mixed Use	14	0.5%
Southern Oregon University	101	3.9%
Schools (Elementary, Middle, & High)	79	3.0%
Total	**2,597**	**100 %**

2.3 FUTURE POPULATION ESTIMATES & LAND USE

Future population estimates were projected for the 20-year planning horizon and ultimate build-out. The residential dwelling unit densities and occupancy rates presented in Table 2.1 are used for the build-out and 20-year planning projections. The occupancy rate (persons per household) has dropped dramatically since 1960, according to the City's Comprehensive Plan. It is estimated that the occupancy rate will continue to decline and level off at 2.2 persons per household. As such, the occupancy rate of 2.2 was used for the build-out and 20-year population projections, rather than the 2.3 value used for the Existing 2003 population estimate.

2.3.1 Build-Out Population Projections

The ultimate build-out population based on the City Comprehensive Plan Land Use coverage, residential dwelling unit densities and occupancy rates (capita per dwelling unit) is estimated to be approximately 50,600. Figure 2.2 presents the City Comprehensive Plan Land Use map. Table 2.3 summarizes the Comprehensive Plan Land Use by land use type and acreage.

2.3.2 20-Year Development Population Projections

The City anticipates that the current annual growth rate of 1.5% will remain relatively consistent over the next 20 years. This 1.5 % annual growth rate yields a 20-year planning (Year 2023) population of approximately 27,100.

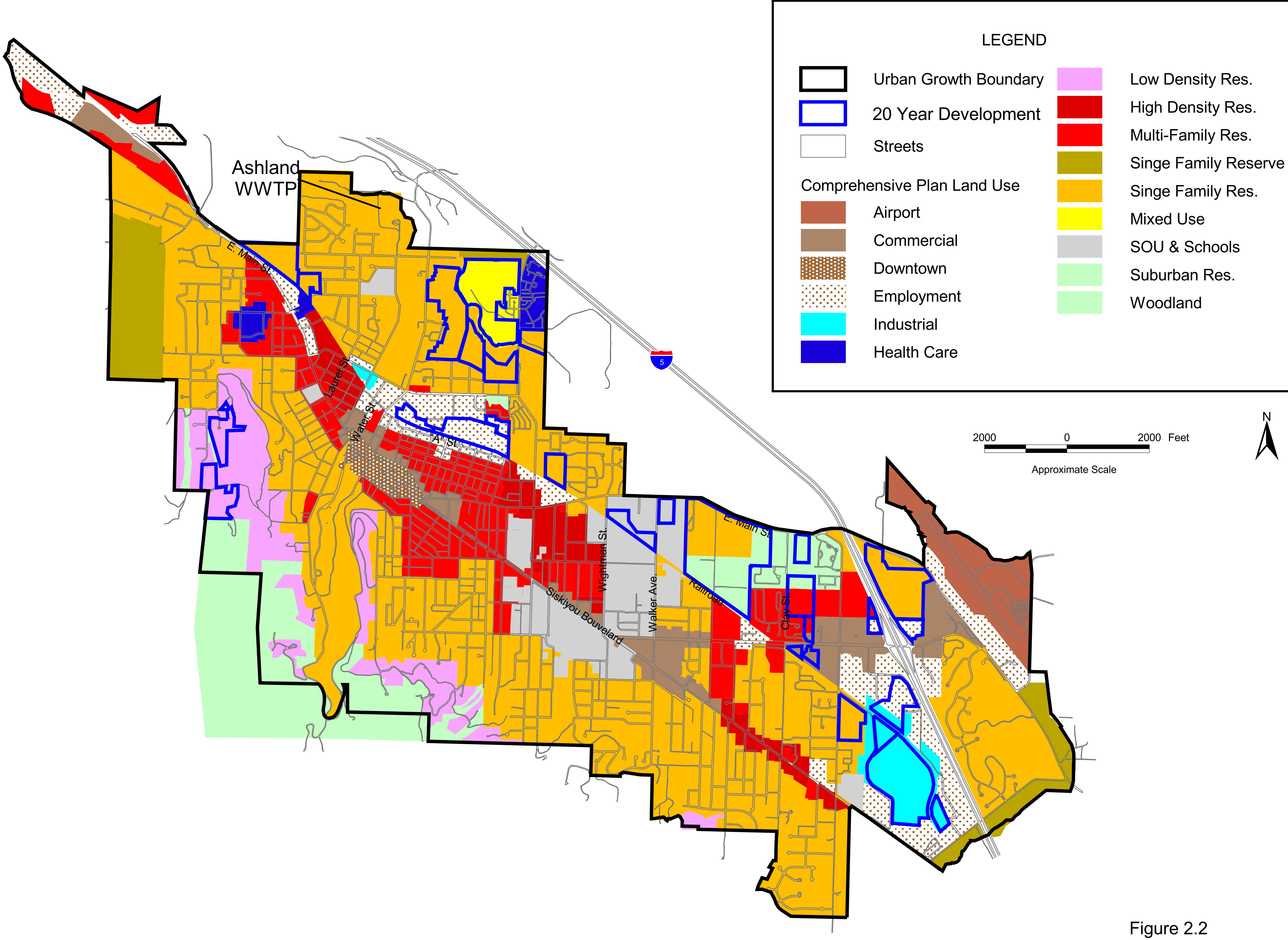


Figure 2.2
Comprehensive Plan Land Use
with 2023 Development Areas
City of Ashland

Note: All data was provided with the City's current information as of February 2003.

CompPlan2023LU.pdf

Table 2.3 Comprehensive Plan Land Use Summary Sanitary Sewer Collection System Master Plan Update City of Ashland		
Land Use Designation	**Area (acres)**	**Percentage of Total Area**
Airport	116	2.4%
Commercial	198	4.1%
Downtown	35	0.7%
Employment	349	7.2%
Health Care	42	0.9%
Industrial	96	2.0%
Low Density Residential	285	5.9%
High Density Multi-Family	141	2.9%
Multi-Family Residential	481	9.9%
Single Family Residential	2199	45.2%
Single Family Reserve	185	3.8%
Mixed Use	60	1.2%
SOU & Public Schools	190	3.9%
Suburban Rural	109	2.3%
Woodland	376	7.7%
Total	4,861	**100%**

The City planning staff provided "20-year development areas" that encompass the most probable areas within the City to be developed during the next 20 years. The City estimated the number of dwelling units and commercial areas to be developed within the 20-year development areas. These dwelling unit and commercial area estimates were used to develop a population projection that was consistent with the 1.5% annual growth rate population estimate, using the occupancy rates presented in Table 2.1. The 20-year development areas are presented on Figure 2.2 Comprehensive Land Use map.

2.4 DRY WEATHER FLOW GENERATION

A sanitary sewer system receives two flow components: dry weather flow (DWF) and wet weather flow (WWF). The dry weather flow component (baseflow) is flow generated from routine water usage by residential, commercial, business and industrial users. Baseflow typically varies throughout the day with peak flows occurring in the morning, between 8 a.m. and 10 a.m., and in the evening between 6 p.m. and 8 p.m. Baseflow will also vary from weekdays to weekends, during holidays, and seasonally.

The land use data, in conjunction with sanitary unit flow factors, generate flows from each land use type. The sanitary flow factors used to generate baseflow are presented in Table 2.4.

Table 2.4 Sanitary Unit Flow Factors
Sanitary Sewer Collection System Master Plan Update
City of Ashland

Land Use Designation	Unit	Flow Factor
Residential	gpd(2)/capita	70
Commercial	gpd/acre	500
Industrial	gpd/acre	1,000
Health Care	gpd/acre	100
Mixed Use	gpd/capita	75
Schools		
Elementary School	gpd/capita	10
Middle School/Junior High School	gpd/capita	15
High School	gpd/capita	20
Southern Oregon State University	gpd/capita	50

Notes:
(1) gpd = gallons per day.

Sanitary sewer flow generated within the City is approximately 2.0 million gallons per day (mgd), based on the existing land use type (presented in Table 2.2) and the flow factors (presented in Table 2.4). In addition, during the winter and spring wet weather season, additional baseflow from groundwater infiltration can increase flow as much as 0.40 mgd. Also, during the summer tourist season, sanitary sewer flows can increase as much as 0.30 mgd. For further discussion on season baseflow variation, refer to Chapter 4.

The baseflow projected for the 20-year plan and ultimate build-out are 2.58 mgd and 4.26 mgd, respectively. These baseflow projections do not include additional flow from seasonal variability. A summary of the population and flow projections for the Existing 2003 Land Use, 20-Year Plan Land Use (Year 2023), and Ultimate Build-Out are presented in Table 2.5.

Table 2.5 Summary of Population and Flow Projections
Sanitary Sewer Collection System Master Plan Update
City of Ashland

Planning Year	Population	Residential Flow (mgd) [1]	Commercial Flow (mgd)	Schools & University Flow (mgd)	Total WWTP Flow (mgd)
Existing 2003	20,300	1.42	0.31	0.32	2.05 [2]
20-Year Plan (Year 2023)	27,100	1.90	0.36	0.32	2.58 [2]
Comprehensive Plan	50,600	3.54	0.40	0.32	4.26 [2]

Note:
(1) mgd = million gallons per day
(2) Flow based only on City residential, commercial and university users. This does not include variation in flow due to wet season groundwater infiltration and the summer tourist season. Refer to Chapter 4 for more detailed discussion on the seasonal baseflow variability.

COLLECTION SYSTEM FACILITIES

3.1 COLLECTION SYSTEM

The City's collection system service area is approximately 6.5 square miles and services 7,514 connections of which there are 6,336 residential, 1,093 commercial and 85 restaurant connections. The collection system contains almost 105 miles of pipeline ranging in diameter from 4 inches to 24 inches, 3,367 manholes, and eight pump stations. The pipelines are constructed primarily of vitrified clay pipe (VCP), concrete pipe (RCP and CP) and plastic pipe. Installation of the collection system dates back to the early 1900's. The primary trunk sewer, which transports wastewater to the treatment plant, is the Bear Creek interceptor. Other major sewers are located along "A" Street, Helman Street, N. Mountain Avenue, Wightman Street, Walker Avenue, and the Railroad Trunk Sewer.

A number of diversion structures exist in the collection system that transfer wastewater between the major sewers. Most of these diversions serve overflow pipes, which have been installed to relieve wastewater flow from downstream capacity deficient areas. Twelve diversion manholes are included in the hydraulic model. Each of the diversion manholes consist of one or two influent pipes entering the structure and two pipelines exiting the structure. The diversion manholes serve to either split flow between two downstream pipes (at the same exiting invert elevations) or to provide an elevated overflow relief to pipelines with more capacity. An elevated overflow relief is defined as an exiting pipeline that is elevated above the invert elevation of the other exiting pipeline at this diversion manhole. A summary of the twelve diversion manhole structures is presented in Table 3.1.

3.2 PUMP STATIONS

The City currently operates and maintains eight pump stations, of which two were incorporated into the collection system hydraulic model. The eight pump stations are North Main, Grandview Drive, Nevada Street, North Mountain, Shamrock, Creek Drive, Winburn Way and Ashland Creek Pump Station. The North Mountain and Ashland Creek pump station were incorporated into the model. A review of the pump stations was performed as part of the *Wastewater Facility Plan Amendment* Final Report, dated July 1997 by Carollo. A summary of the pump station data from the *Wastewater Facility Plan Amendment* report is provided in Table 3.2. There have been a few minor changes to the pump stations since 1997 report. The most significant change has been to the telemetry system. The City has replaced the old telephone telemetry system with a new radio telemetry system. In addition, the Ashland Creek pump station was upgraded as part of the treatment plant upgrade. Also, two new pump stations have been constructed: Creek Drive and Winburn Way Pump Stations. The City has plans to replace the existing North Main Pump Station with a duplex submersible pump station in 2005.

Table 3.1 Summary of Diversion Manholes
Sanitary Sewer Collection System Master Plan Update
City of Ashland

City Manhole ID	Location	Diversion Type	Comment
4CC-007	Hersey & Laurel St.	Elevated Relief	Elevated[(1)] 7”
4CB-028	Ohio & Laurel St.	Elevated Relief	Elevated 3”
9AA-019	N. Mountain	Elevated Relief	Elevated 5”
9AC-041	7th & “B” St	Elevated Relief	Elevated 2”
10DB-009	Walker & Railroad	Elevated Relief	Elevated 3”
14CB-008	Siskiyou & Clay	Elevated Relief	Elevated 11”
4DB-003	Bear Creek Trunk near N. Mountain	Split Flow	Flow splits between 15-inch and 24-inch pipes
3CC-005	Bear Creek Trunk near Fordyce	Split Flow	Flow splits between 15-inch and 24-inch pipes
5AD-003	Nevada near Cambridge	Elevated Relief	Elevated 12.5”
15AB-037	Siskiyou & Walker	Elevated Relief	Elevated 6”
10BD-021 & 10BD-006	Wightman & Railroad	60/40 Split Flow	60% to Bear Creek Trunk 40% to Railroad Trunk sewer

Notes:
(1) Elevated depth above the lowest exiting invert elevation.

Table 3.2 Pump Station Capacity
Sanitary Sewer Collection System Master Plan Update
City of Ashland

Lift Station	Type of Station	Pump Capacity								
		Pump No. 1			Pump No. 2			Pump No. 3		
		Flow (gpm) [(1)]	Head (feet)	Hp [(2)]	Flow (gpm)	Head (feet)	Hp	Flow (gpm)	Head (feet)	Hp
Ashland Creek[(3)]	Submersible	1,500	47	75	1,500	47	75	1,500	47	75
Creek Drive [(3)]	Submersible	150	20	N/A [(5)]	150	20	N/A	N/A	N/A	N/A
Grandview Drive[(4)]	Dry/Wet Well	800	42	20	800	42	20	N/A	N/A	N/A
Nevada Street[(4)]	Vacuum Prime System	82	24	3	82	24	3	N/A	N/A	N/A
North Main[(4)]	Dry/Wet Well	200	22	10	200	22	10	N/A	N/A	N/A
North Mountain[(4)]	Self Priming	513	23	7.5	534	24	7.5	N/A	N/A	N/A
Shamrock[(4)]	Dry/Wet Well	100	42	5	100	42	5	N/A	N/A	N/A
Winburn Way [(3)]	Submersible	150	17	3	150	17	3	N/A	N/A	N/A

Notes:

(1) gpm = gallons per minute.

(2) Hp = horsepower.

(3) Source: City of Ashland

(4) Source: *Wastewater Facility Plan Amendment* Final Report, dated July 1997.

(5) N/A = Not available.

3.2.1 Creek Drive Pump Station

The Creek Drive Pump Station is located along Creek Drive. The pump station consists of two pumps and a wet well. Each pump is rated at 150 gallons per minute (gpm) at a total dynamic head (TDH) of 20 feet. The pumps automatically switch positions from duty to standby after each activation. A float switch in the wet well controls operation of the pumps. Any emergency overflows are directed to the 8-inch diameter sanitary sewer pipeline in Creek Drive. The force main discharges to Manhole No. 11CB-018 approximately 32 feet away on Creek Drive. Table 3.3 presents the design data for the Creek Drive Pump Station.

Table 3.3 Creek Drive Pump Station Data
Sanitary Sewer Collection System Master Plan Update
City of Ashland

PUMP STATION	
Location	Creek Drive
Type	Duplex Submersible, self-priming
Pump Type	Constant Speed, non-clog
Capacity	150 gpm @ 20 feet of TDH
Level Control Type	Float Switch
Overflow Discharge	Manhole No. 11CB-018
Average Time to Overflow (high infiltration of 7500 gpd/ac)	3.5 hours @ 8.5 gpm Design Average Flow
Auxiliary Power Type	Not needed
Wet Well	5 foot diameter
Alarm Telemetry	Audible and Flashing Light, Radio
EPA Reliability Class	1
FORCE MAIN	
Length and Type	32 lineal feet of 4-inch diameter Ductile Iron Pipe
Discharge Manhole	Manhole No. 11CB-018
Air Release Valves	None
Vacuum Release Valves	None
AIR INJECTION EQUIPMENT	
None	
CHEMICAL FEED EQUIPMENT	
None	

3.2.2 Winburn Way Pump Station

The Winburn Way Pump Station is located along Winburn Way, near the City Hall building. The pump station consists of two pumps and a wet well. Each pump is rated at 150 gpm at a TDH of 17 feet. The pumps automatically switch positions from duty to standby after each activation. A float switch in the wet well controls operation of the pumps. A portable emergency backup power generator is available, when needed. Alarms from the pump station are sent to the treatment plant or to the security system during nighttime hours. The force main discharges to Manhole No. 09BB-001 approximately 55 feet away on Winburn Way. Table 3.4 presents the design data for the Winburn Way Pump Station.

Table 3.4 Winburn Way Pump Station Data
Sanitary Sewer Collection System Master Plan Update
City of Ashland

PUMP STATION	
Location	Winburn Way
Type	Duplex Submersible
Pump Type	Constant Speed, non-clog (3" solids)
Capacity	150 gpm @ 17 feet of TDH
Horsepower	75 hp
Level Control Type	Multi-trode
Overflow Point	Overflow at rim elevation of 1892 feet
Overflow Discharge	Ashland Creek
Average Time to Overflow	96 min @ 7 gpm Design Average Flow
Auxiliary Power Type	Portable Generator provided by City
Wet Well	5 foot diameter
Alarm Telemetry	Radio
EPA Reliability Class	1
FORCE MAIN	
Length and Type	55 lineal feet of 4-inch diameter Ductile Iron Pipe
Discharge Manhole	Manhole No. 09BB-001
Air Release Valves	None
Vacuum Release Valves	None
Average Detention	22 minutes @ stat
AIR INJECTION EQUIPMENT	
None	
CHEMICAL FEED EQUIPMENT	
None	

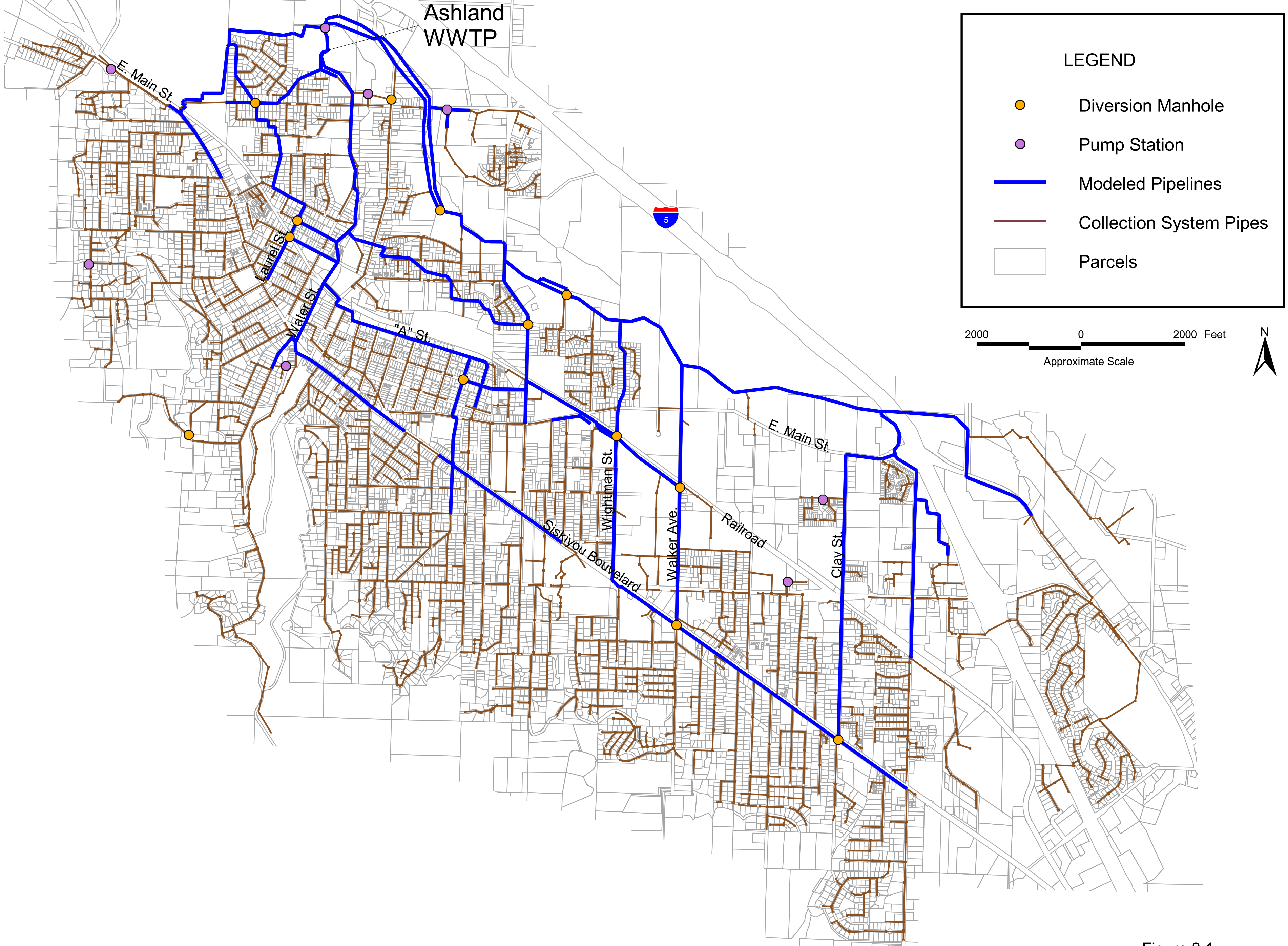
3.2.3 Ashland Creek Pump Station

The Ashland Creek Pump Station is the largest pump station in the City's collection system. The pump station is located on the site of the wastewater treatment plant (WWTP). The old pump station was demolished and a new pump station was constructed as part of the WWTP upgrade in 2000. The pump station consists of three 75 horsepower, 1,500 gpm variable frequency drive (VFD) pumps at a TDH of 47 feet. The maximum operating speed for the VFD's is 1550 rpm. The pumps are controlled by an ultrasonic level sensor located in the wet well. Two float switches are located in the wet well: one for high-high-high alarm and one for low-low-low alarm. The wet well has a diameter of 12 feet and a depth of 23 feet. Table 3.5 presents the design data for the Ashland Creek Pump Station.

Table 3.5 Ashland Creek Pump Station Data
Sanitary Sewer Collection System Master Plan Update
City of Ashland

PUMP STATION	
Location	Wastewater Treatment Plant
Type	Submersible
Pump Type	Variable Speed, non-clog (4 1/2" solids)
Capacity	1,500 gpm @ 47 feet of TDH
Horsepower	75 hp
Maximum Pump Speed	1,550 rpm
Level Control Type	Ultrasonic Level
Alarm Control	Float Switch
Auxiliary Power Type	Generator
Wet Well	12 foot diameter, 23 foot depth
Alarm Telemetry	Radio
EPA Reliability Class	1
FORCE MAIN	
Length and Type	890 feet, 18-inch diameter pipe
Discharge Manhole	Headworks or wastewater treatment plant
Air Release Valves	None
Vacuum Release Valves	None
AIR INJECTION EQUIPMENT	
None	
CHEMICAL FEED EQUIPMENT	
None	

Figure 3.1 presents the collection system map illustrating the locations of the pump stations and manhole diversion structures. Figure 3.1 also highlights which pipelines were included in the hydraulic model.



Note: All data was provided with the City's current information as of February 2003.

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Figure 3.1
Collection System Facilities
City of Ashland

FLOW MONITORING

4.1 INTRODUCTION

As part of the hydraulic modeling effort, temporary flow meters and rain gauges were installed to measure flows in the collection system in order to correlate “real world” collection system flows with the flows in the hydraulic model. Villalobos & Associates (V&A) Consulting Engineers performed the one-month temporary flow-monitoring program from March to April 2003.

In addition to the temporary flow meters installed for this study, the City has a permanent magnetic flow meter at the wastewater treatment plant (WWTP). This chapter summarizes the V&A flow temporary monitoring effort and the 2002 and 2003 data at the City’s WWTP meter.

4.2 WWTP FLOW

The 2002 and 2003 daily flow data at the WWTP meter was evaluated to determine the extent of seasonal variability on baseflows. The City has several seasonal factors that contribute to baseflow variations over the year, including the summer tourist season and elevated groundwater infiltration after rainfall events during the winter and spring.

The daily flow data for 2002 and 2003 is presented in Figure 4.1 and 4.2, respectively. These figures present the percentage of time that daily flow falls within a specific flow range. The flows were divided into 4 categories: (1) less than 2 mgd, (2) flow of 2.0 – 2.2 mgd, (3) flow of 2.2 – 2.5 mgd, and (4) flow greater than 2.5 mgd. A summary of the 2002 percent and 2003 percent flow data are provided in Appendix A. The average daily flow for entire Year 2002 was 2.20 mgd. For Year 2003, the average daily flow increased slightly to 2.25 mgd. The average daily flow includes dry and wet weather days.

The baseflow seasonal variation can be categorized into the following:

- Sanitary sewer flows from the community. The City’s activities generate approximately 2.0 mgd of flow from the community. This flow value is supported by 2002 and 2003 WWTP flow data and Water Treatment Plant consumption flow data. The community flows include flows from Southern Oregon University (SOU).
- Tourism. During the summer months, the City is a popular tourist destination. As such, sanitary flows can increase by as much as 0.4 mgd more than the community sewer flows of 2.0 mgd. The 2.0 mgd of community flows include flow from SOU, which has a diminished enrollment during the summer tourist season.
- Groundwater Infiltration. Groundwater infiltration after a significant rainfall event can contribute as much as 0.5 mgd of flow into the collection system. Based on the 2002

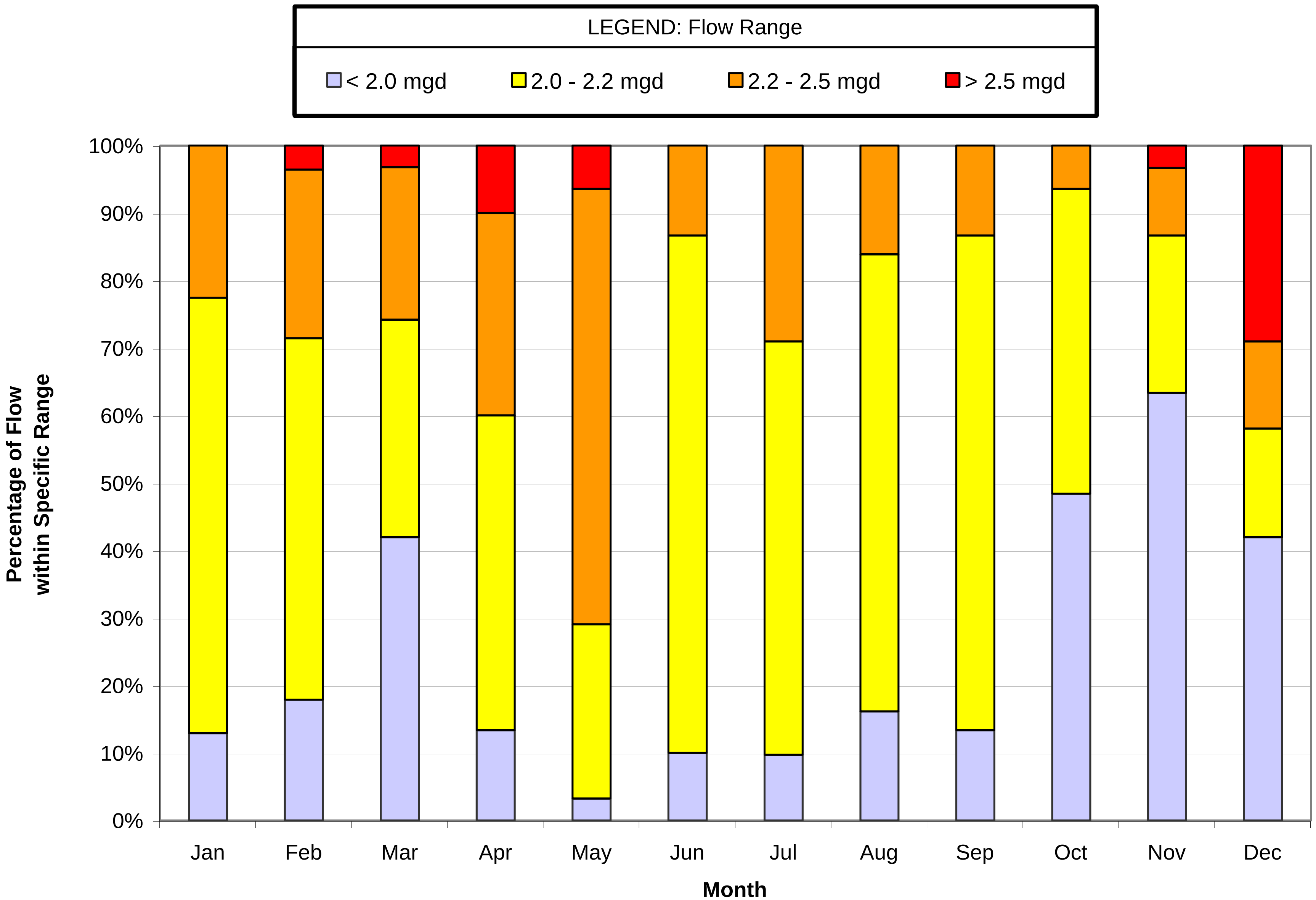

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Figure 4.1
2002 WWTP Flow
City of Ashland

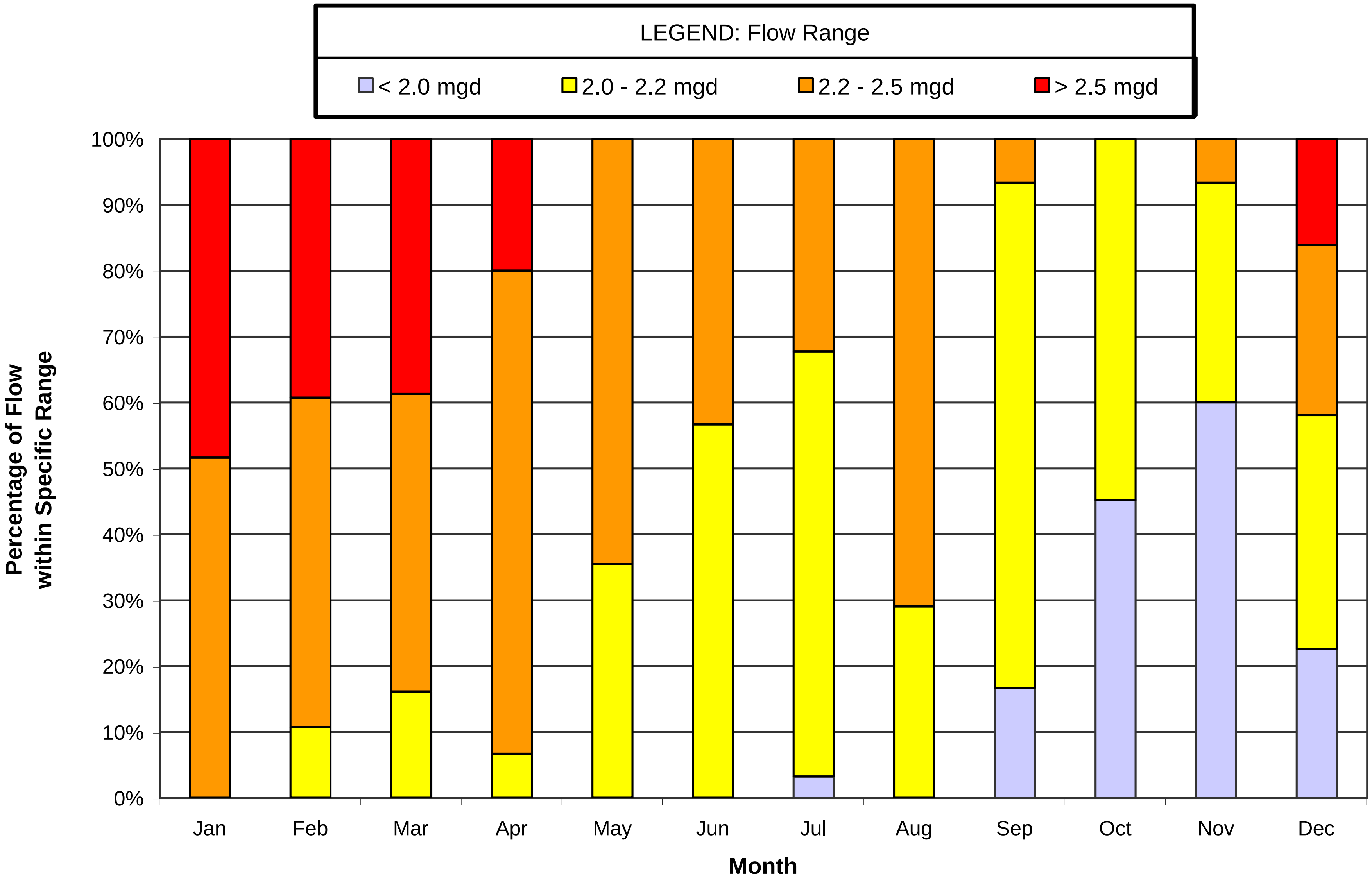

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Figure 4.2
2003 WWTP Flow
City of Ashland

and 2003 flow data, up to one month may elapse without additional rainfall before the groundwater infiltration flows subside. Elevated groundwater infiltration flows typically occur in the winter and spring seasons.

4.3 COLLECTION SYSTEM FLOW MONITORING

A total of nine temporary flow meters and one rain gauge were installed throughout the collection system during the monitoring period of March 13 to April 11, 2003. During flow monitoring, pipeline depth and velocity data was collected at each flow meter in 15-minute intervals. The 15-minute data was compiled into hourly data for the hydraulic modeling effort.

The location of the flow meters divided the collection system into eight unique sewer basins. Each unique sewer basin is defined by a combination of flow meters, which measure the wastewater flow in and out of the basin. Figure 4.1 presents the location of the flow meters and subsequent sewer basin delineation.

A schematic illustrating the direction of flow and connection between the basins is presented in Figure 4.2. The flow schematic represents a simplified illustration of flow within each basin. Several diversion manholes with elevated overflow pipelines interconnect all basins, except for Basin 8. These elevated overflow pipelines were not metered, but are represented on the Figure 4.2 flow schematic, to illustrate how the basins are interconnected. Most of the elevated overflow pipeline inverts were located above the depth of flow during the peak wet weather events and effectively isolated each basins flow.

A characteristic “dry” weather period was selected from the available metered flow data to perform the dry weather flow calibration for the hydraulic model. Flow monitoring data for April 8, 2003 provided the most characteristic daily dry weather flow. However, baseflows on April 8, 2003 were elevated due to groundwater infiltration from a recent rainfall event. Flow metering data was also evaluated to determine the optimal “wet” weather event to calibrate the hydraulic model for wet weather. The peak wet weather flow at each of the 9 temporary flow meters occurred during the March 13-16, 2003 rainfall event.

Table 4.1 summarizes the flow monitoring data for these selected dry and wet weather calibration events.

4.4 RAINFALL MONITORING

One rain gauge was installed during the temporary flow monitoring effort by V&A. The rain gauge was installed on March 13, 2003 and removed on April 18, 2003. Several rainfall events occurred during the monitoring period, however the most significant event occurred March 13 -16, 2003. This rainfall event had the most impact on the collection system

Table 4.1 Flow Metering Summary
Sanitary Sewer Collection System Master Plan Update
City of Ashland

Meter I.D.	Manhole I.D.	Pipe Diameter (inches)	April 8, 2003 Average DWF[1] (mgd)[2]	Mar. 13-17, 2003 Peak WWF[3] (mgd)	Maximum Pipe Depth at Peak WWF (inches)
1	4BB-035	12	0.013	0.031	1.8
2	33CC-001	28	1.21	2.49	5.8
3	4BB-037	15	0.32	0.76	13.6
4	4BA-021	18	0.83	2.05	9.0
5	10BB-003	15	0.74	1.53	9.4
6	10AB-005	12	0.33	0.83	6.9
7	10BC-039	8	0.20	0.37	3.0
8	9AC-040	10	0.36	0.91	4.3
9	4CC-024	15	0.59	1.22	9.0
WWTP	N/A	N/A	2.37	N/A [4]	N/A

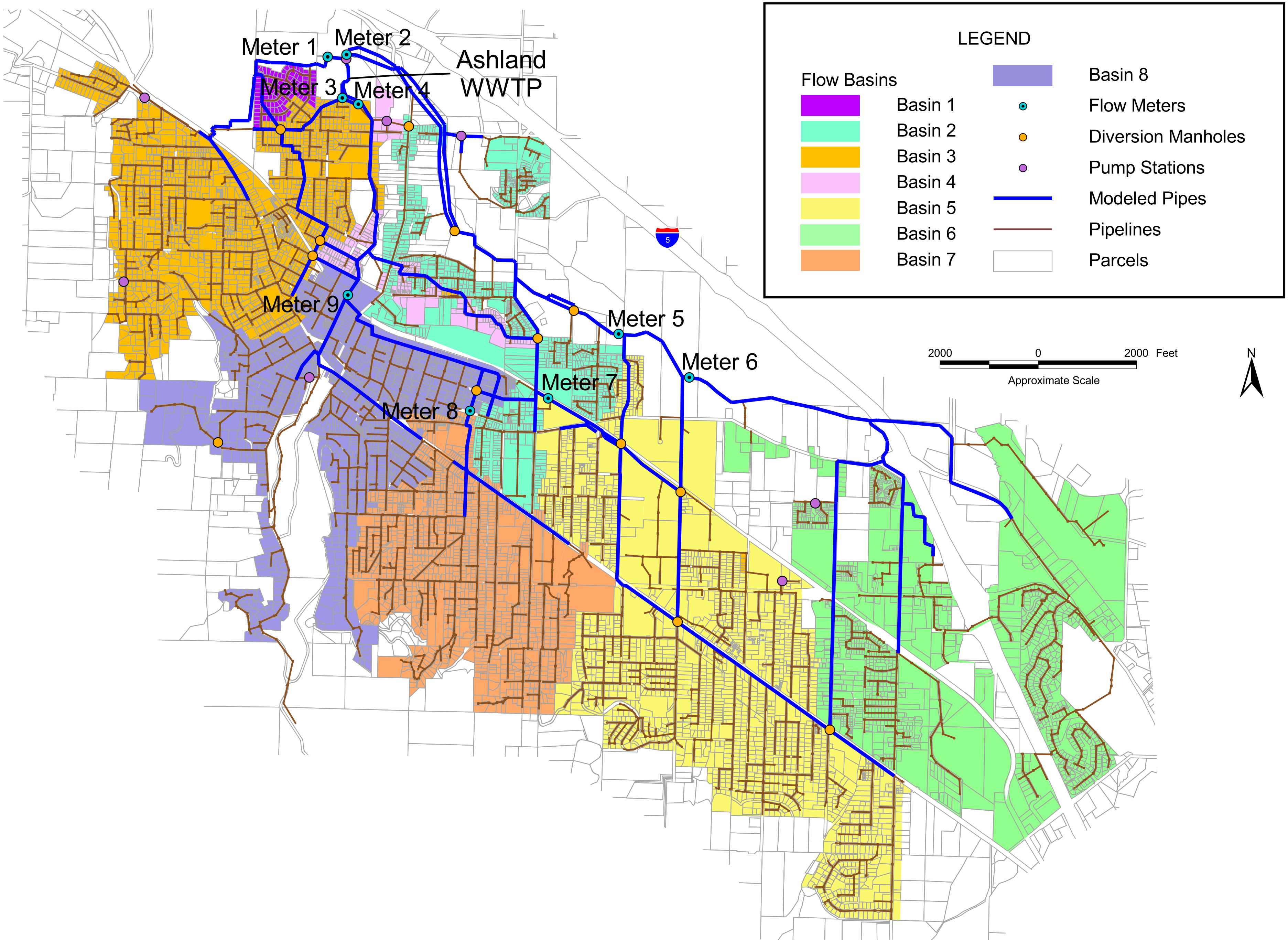
Notes:

(1) DWF = dry weather flow, daily average

(2) mgd = million gallons per day

(3) WWF = wet weather flow, peak hourly

(4) Hourly peak flow data is unavailable at the plant since the data is recorded on a daily time interval.



Note: All data was provided with the City's current information as of February 2003.

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Figure 4.3
Flow Meters and Basins
City of Ashland

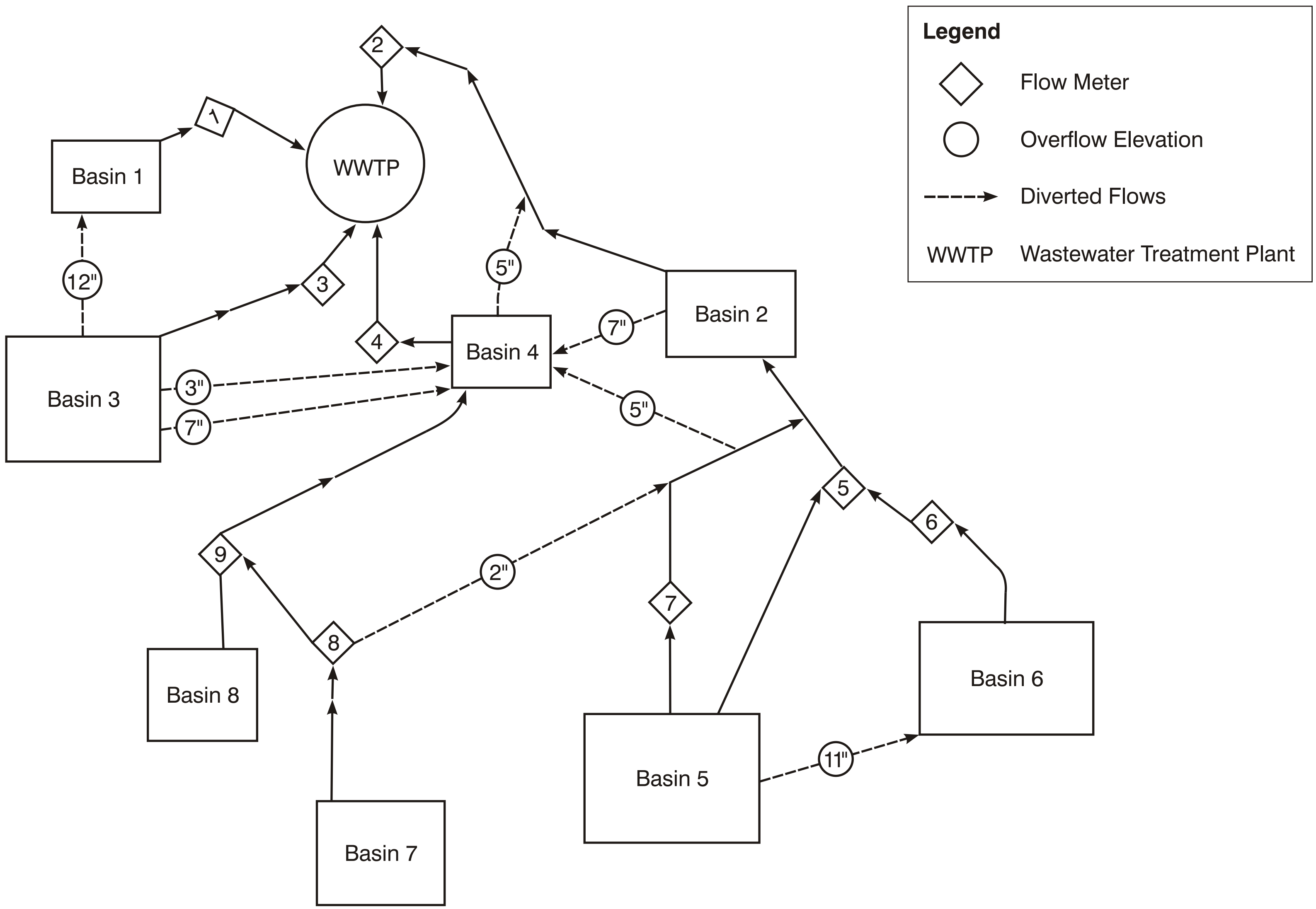

Figure 4.4
BASIN FLOW SCHEMATIC
CITY OF ASHLAND

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facilities and recorded the highest total rainfall volume of 1.82 inches over a four day duration. A summary of the daily rainfall in inches and peak hourly intensity for each day is presented in Table 4.2.

Table 4.2 Rainfall Summary
Sanitary Sewer Collection System Master Plan
City of Ashland

Date	Daily Rainfall Volume (inches)	Peak Hourly Rainfall Intensity (inches per hour)	Daily Plant Flow[1] (mgd)	Date	Daily (inches)	Peak Hourly Intensity (inches per hour)	Daily Plant Flow (mgd)
3/13/03	0.81	0.26	2.63	4/1/03	0.06	0.04	2.58
3/14/03	0.41	0.11	3.05	4/2/03	0.08	0.02	2.61
3/15/03	0.33	0.10	3.27	4/3/03	0.02	0.01	2.53
3/16/03	0.27	0.11	3.08	4/4/03	0.14	0.06	2.40
3/17/03	0.10	0.02	3.00	4/5/03	0.05	0.01	2.40
3/18/03	0.01	0.01	2.56	4/6/03	0.13	0.03	2.58
3/19/03	0.06	0.03	2.77	4/7/03	0.00	0.00	2.56
3/20/03	0.06	0.03	2.64	4/8/03	0.00	0.00	2.36
3/21/03	0.10	0.03	2.36	4/9/03	0.00	0.00	2.45
3/22/03	0.07	0.03	2.66	4/10/03	0.17	0.12	2.39
3/23/03	0.00	0.00	2.35	4/11/03	0.04	0.03	2.32
3/24/03	0.00	0.00	2.27	4/12/03	0.21	0.06	2.32
3/25/03	0.45	0.08	2.76	4/13/03	0.31	0.12	2.48
3/26/03	0.20	0.06	2.82	4/14/03	0.11	0.05	2.38
3/27/03	0.00	0.00	2.50	4/15/03	0.01	0.01	2.25
3/28/03	0.00	0.00	2.40	4/16/03	0.07	0.06	2.36
3/29/03	0.00	0.00	2.46	4/17/03	0.11	0.04	2.27
3/30/03	0.00	0.00	2.38	4/18/03	0.00	0.00	2.25
3/31/03	0.26	0.07	2.66				

Notes:
(1) Daily plant flow provided by City Staff from Parshall flume.

4.5 INFLOW AND INFILTRATION

Inflow and infiltration (I&I) is rainfall that enters the collection system during and after a storm event. I&I enter the collection system through different mechanisms and thus different methodologies are used to quantify their flows. Peak flows are used to determine the relative severity of inflow. Flow volume is used to measure the quantity of infiltration. Analyzing both the flow volume and peak flows of I&I yield an overall picture of the performance of the City's collection system during rainfall events.

I&I can enter the collection system in a variety of ways. Some of the most common sources of I&I are presented in Figure 4.5. Infiltration is defined as stormwater flows that enter the collection system by percolating through the soil and then through defects in pipelines, manholes and joints. Examples of defects that allow infiltration into the collection system are cracked or broken pipes, misaligned joints, deteriorated manholes and root penetration.

Inflow is defined as stormwater that enters the collection system via a direct connection to the system. Examples of inflow are downspout connections, foundation or yard drains, leaky manhole covers and illegal storm drain connections.

The adverse effects of I&I in the collection system is that they increase both the flow volume and peak flows in the system causing it to operate at or above its capacity. If too much I&I enters the collection system, sanitary sewer overflows (SSO's) may occur. Figure 4.6 illustrates the effects of I&I on a collection system.

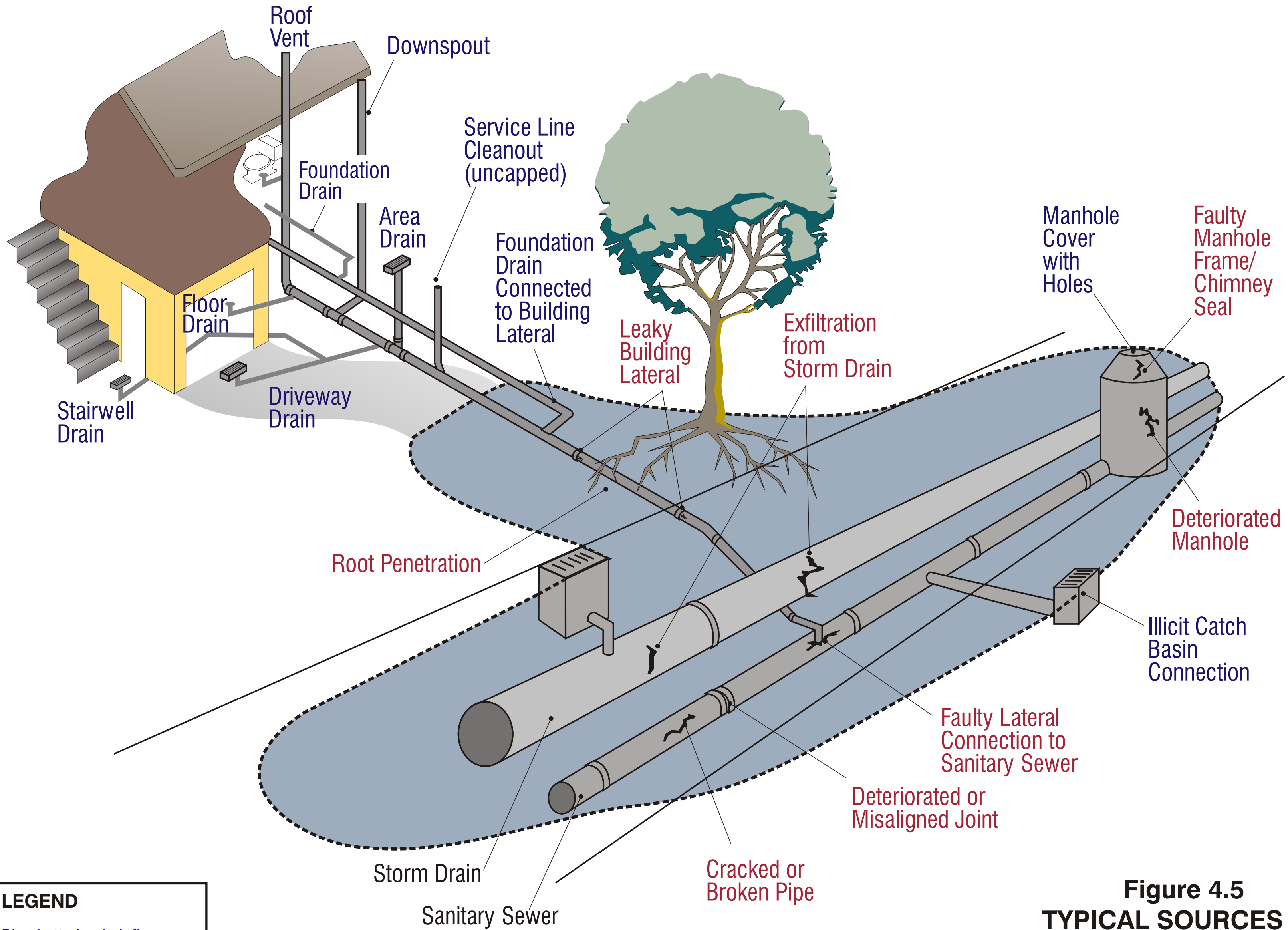
The temporary flow monitoring data provided by V&A was used to perform an I&I analysis. The I&I analysis was based on the rainfall event of March 13 -17, 2003 due to the impacts this event had on the collection system.

4.5.1 Infiltration

There are numerous methods to quantify rainfall dependent infiltration. The two methods used for the City's collection system are (1) percent I&I method (%I&I) and (2) gallons per acre per day (gpad) method. The description of the methods are provided below:

- The %I&I method is defined as the volume of infiltration (in gallons) for the storm event divided by the total volume of flow of the storm event (in gallons). The %I&I relates how much infiltration there is compared to the total flow through the basin.
- The gpad method is defined as the total volume of infiltration for the storm event divided by the basin area in acres.

Both infiltration methods are specific to the storm event being quantified and thus different storm events will yield different %I&I and gpad values. The two infiltration methods provide the City with alternative methods to quantify the severity of infiltration in the collection system. This approach allows comparison between basins based on their differences in flow and basin size. Table 4.3 provides the results of the infiltration evaluation for the March 13 - 17, 2003 rainfall event.



LEGEND

Blue Lettering is Inflow

Red Lettering is Infiltration

Figure 4.5
TYPICAL SOURCES OF INFILTRATION AND INFLOW
CITY OF ASHLAND

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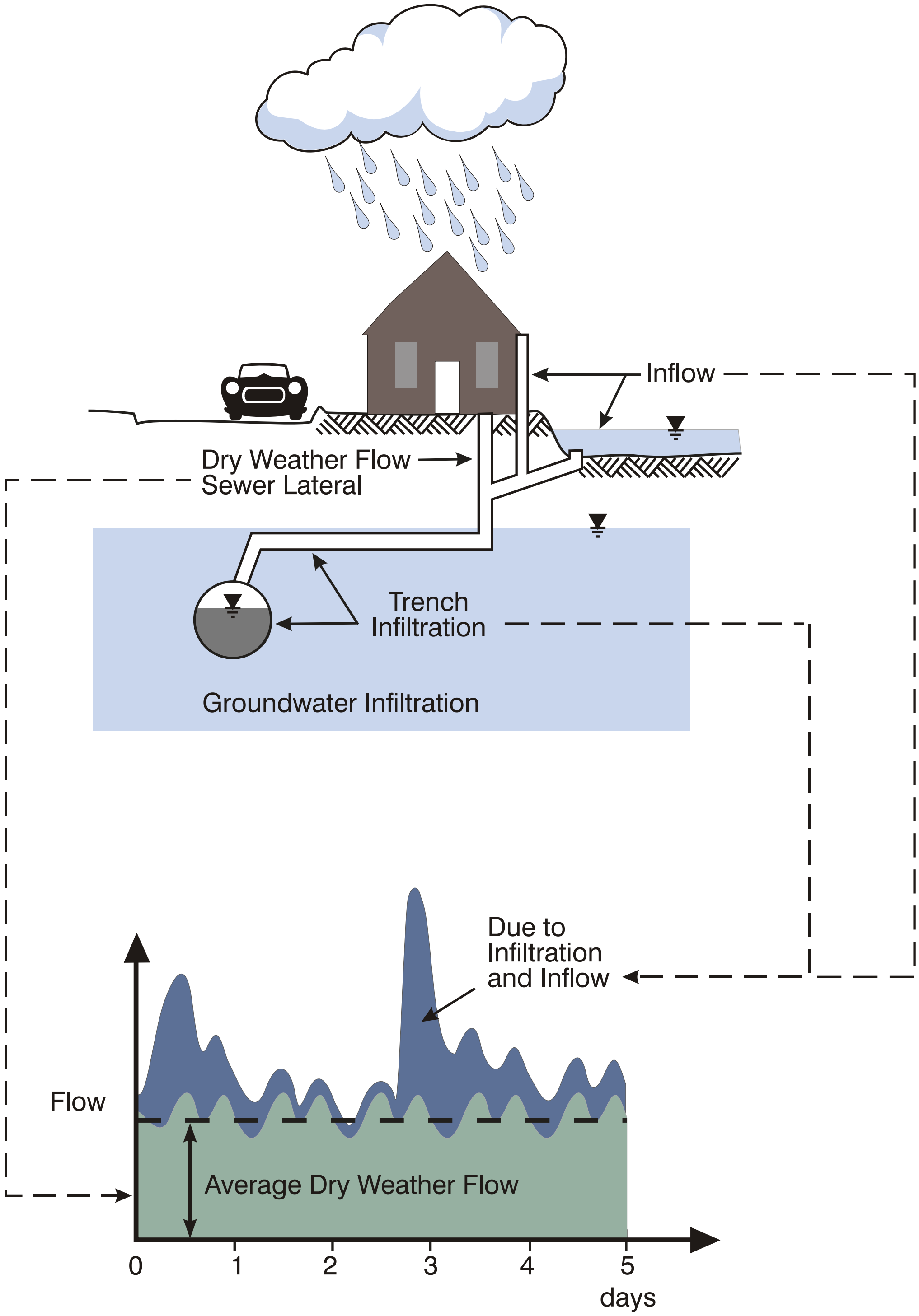

Figure 4.6
EFFECTS OF INFILTRATION AND INFLOW
CITY OF ASHLAND

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Table 4.3 Infiltration Evaluation Sanitary Sewer Collection System Master Plan Update City of Ashland						
					Infiltration Method Results	
Basin	**Service Area (acres)**	**Volume (1) of Baseflow (MG) (2)**	**Volume (1) of I&I (MG)**	**Total Flow Volume (1) (MG)**	**% I&I**	**GPAD**
1	21	0.052	0.029	0.0809	36%	337
2	196	0.428	0.530	0.958	55%	677
3	388	1.28	0.059	1.34	4%	38
4	49	0.808	0.958	1.77	54%	4,877
5	667	2.44	1.43	3.87	37%	536
6	568	1.32	0.891	2.21	40%	393
7	354	1.04	1.46	2.50	58%	1,029
8	354	0.92	0.291	1.03	28%	205

Notes:
(1) Volume = volume over the 4 day wet weather event.
(2) MG = million gallons

4.5.2 Inflow

The inflow component of I&I is measured using peaking factors. Peaking factors define the extent of peak flows in the collection system. The peaking factor method is defined as the hourly peak wet weather flow divided by the average dry weather flow. Table 4.4 presents the inflow evaluation during the March 13 - 17, 2003 rainfall event.

Table 4.4 Inflow Evaluation Sanitary Sewer Collection System Master Plan Update City of Ashland			
Basin	**Average Dry Weather Flow (mgd)**	**Peak Hourly Wet Weather Flow (mgd)**	**Peaking Factor**
1	0.013	0.031	2.4
2	0.107	0.448	4.2
3	0.320	0.760	2.4
4	0.202	0.830	4.1
5	0.610	1.07	1.8
6	0.330	0.830	2.5
7	0.261	0.910	3.5
8	0.230	0.310	1.3

Notes:
(1) mgd = million gallons per day

4.5.3 Inflow and Infiltration Results

Results from the inflow and infiltration analysis show that the collection system overall, is displaying minor to moderate infiltration problems and minor inflow problems. Generally, a peaking factor of more than five to six would be considered excessive inflow into a collection system. The highest peaking factor occurred in Basin 2 with a value of 4.2.

Two basins are exhibiting some infiltration, however should be classified as “low to moderate” infiltration rates. These basins are Basin 4 and 7. The wet weather hydrographs for these two basins are presented in Figures 4.7 and Figure 4.8. In general, a basin with less than 2,000 gpad (design allowance per DEQ sewer pipeline design guidance document) of infiltration is considered acceptable if the system has adequate hydraulic capacity to transport the flows. Basin 4 has the highest gpad value of 4,877 however the hydrograph presented in Figure 4.7 does not show an excessive amount of infiltration flows. The Basin 4 gpad values may be skewed due to its basin size of only 49 acres, with a relatively high associated baseflow and infiltration flows.

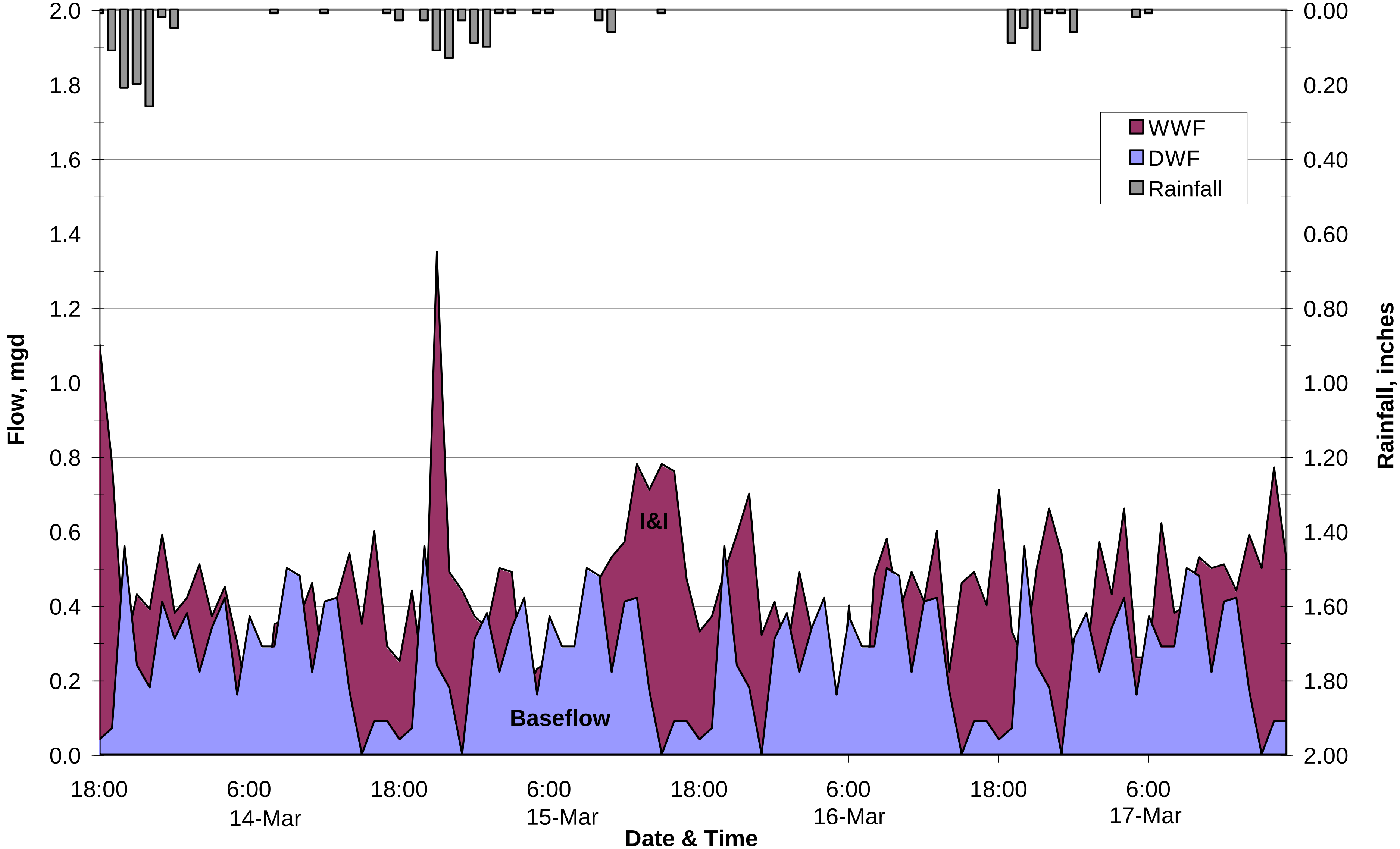

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Figure 4.7
Basin 4 I&I Flows
City of Ashland

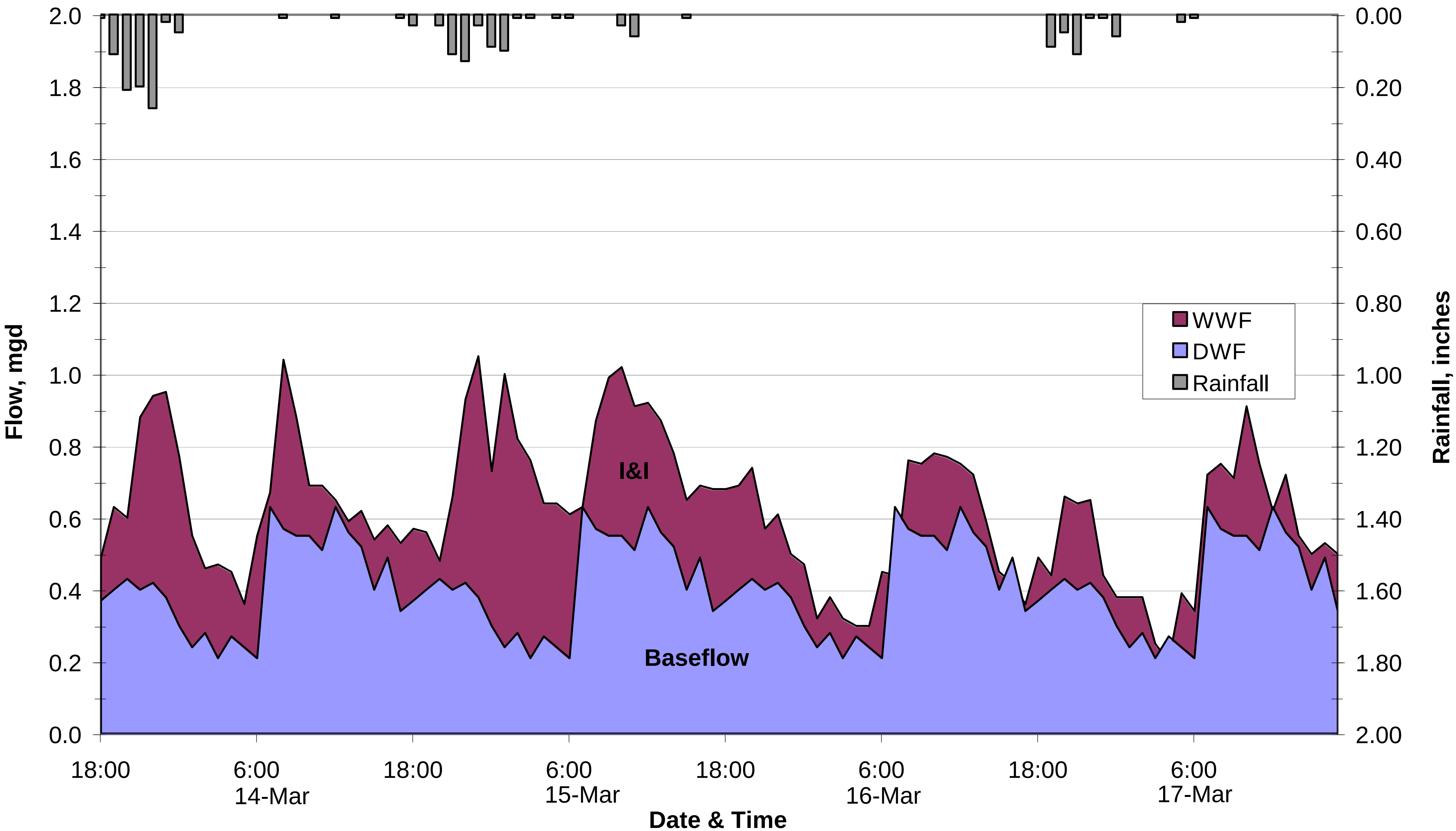

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Figure 4.8
Basin 7 I&I Flows
City of Ashland

Chapter 5

COLLECTION SYSTEM MODELING

5.1 HYDRAULIC MODEL DEVELOPMENT

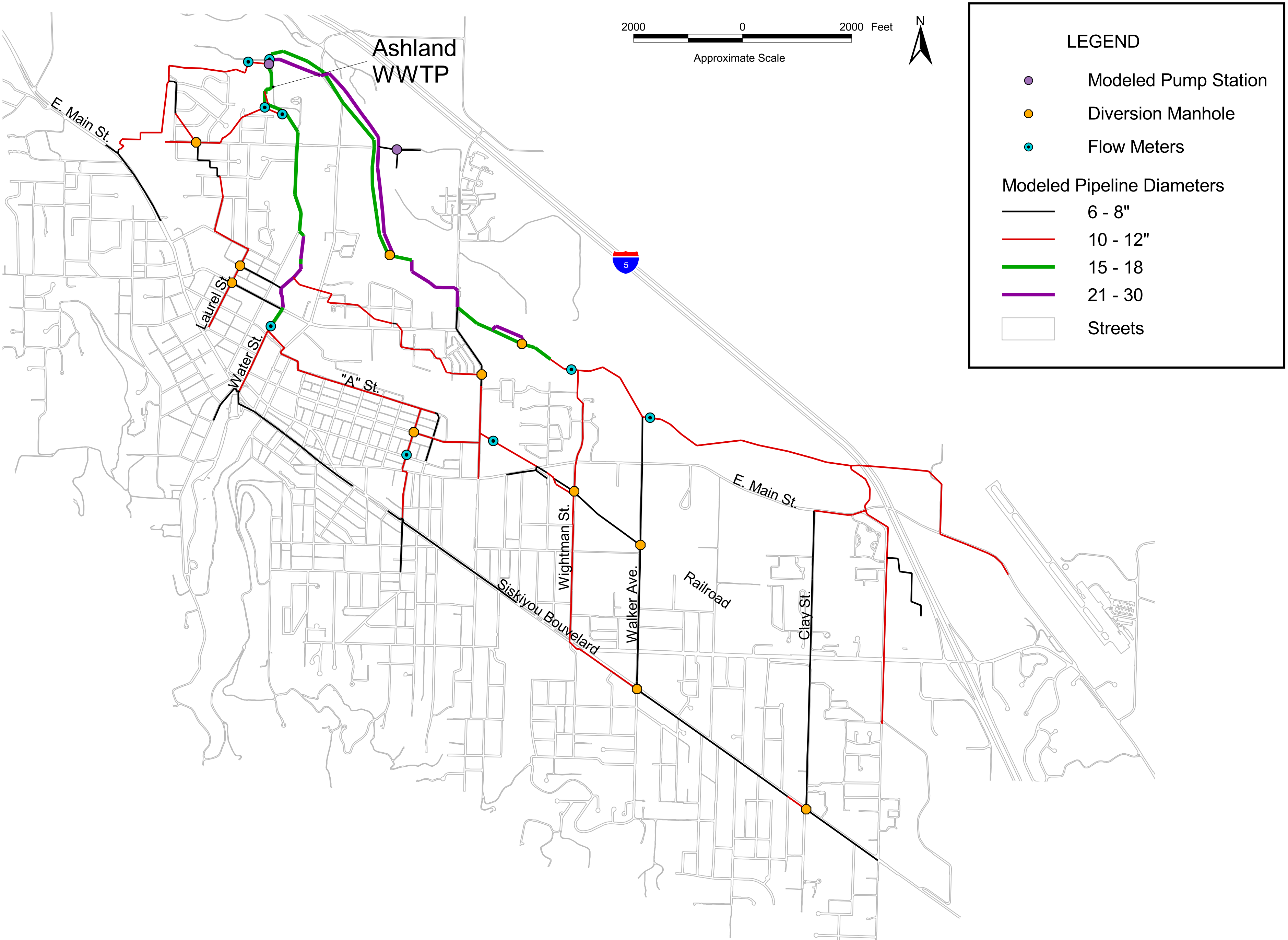
A hydraulic model of the collection system was developed using Pizer, Inc. Hydra (Version 6.2) software. The hydraulic model was utilizing data from the City's GIS, Access database, CAD files, input from City staff, and survey data. The model includes pipes with a diameter of 10-inches or greater, and all associated manholes, diversion structures and lift stations. A number of 6-inch and 8-inch diameter pipes were included in the model to further define a specific area of interest or for hydraulic connectivity purposes.

The pipeline length and diameter data from the City's Access database was used in conjunction with the survey data of rim and invert elevations to develop the model. The pipeline slopes in the hydraulic model are calculated based on invert elevations and pipe length. A Mannings "n" value of 0.013 was used for all pipes, based on a typical roughness value for a vitrified clay pipe. However, the model typically runs under variable "n" conditions with "n" values changing depending on flow conditions through the pipe.

Additionally, twelve (12) manhole diversion structures were identified and a flow curve established for each manhole diversion structure. The flow curve is defined as the relationship between system flow and diverted flow. The system flow is the total flow that is routed through the diversion structure from upstream sources, and the diverted flow is the flow routed to the overflow pipe. The flow curve is based on the invert elevations of the main pipeline and overflow pipeline, and their respective pipe capacity.

The Ashland Creek and North Mountain pump stations were incorporated into the model as well as the appropriate values to define the operation of the pump station. Each pump station is defined in the model based on the design pump discharge capacity, pump discharge elevation, pump on and off volumes, wet well volume, force main invert elevation, and whether a pump operates at a variable or a constant speed.

Figure 5.1 presents the City's collection system included in the hydraulic model. Figure 5.1 also presents the range of pipe diameters in the collection system model, as well as the location of the lift stations, flow meters, and diversion manholes.



Note: All data was provided with the City's current information as of February 2003.

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Figure 5.1
Modeled Collection System Facilities
City of Ashland

5.2 WASTEWATER FLOW COMPONENTS

A sanitary sewer collection system receives two flow components: dry weather flow (DWF) and wet weather flow (WWF). The dry weather flow component (or baseflow) is flow generated by routine water usage in the residential, commercial, business and industrial sectors of the City. The other component of dry weather flow is the contribution of dry weather groundwater infiltration into the collection system. Dry weather groundwater infiltration will enter the collection system when the relative depth of the local groundwater table is higher than the depth of the pipeline, and if the pipe allows infiltration through defects such as cracks, misaligned joints and broken pipelines.

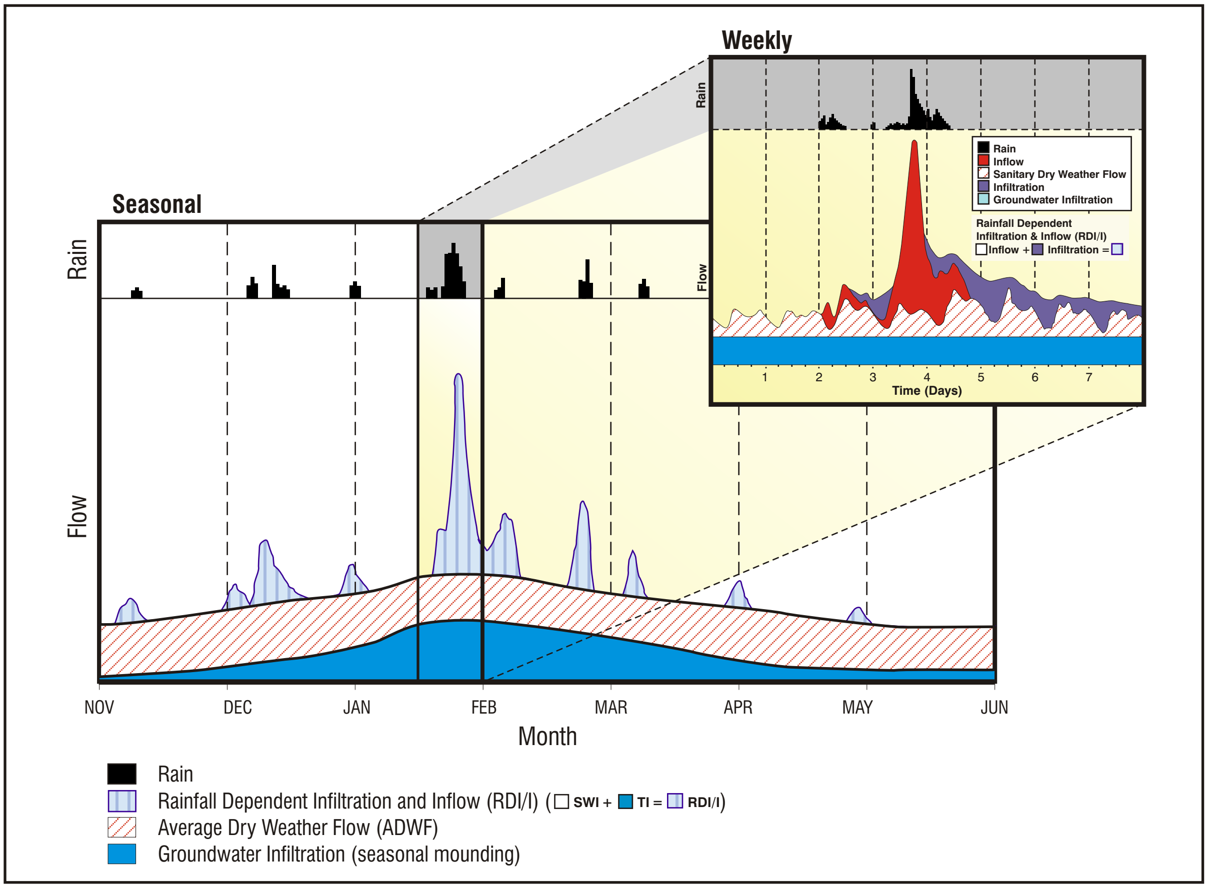
The wet weather flow component includes stormwater inflow through illegal roof drain leaders or storm drain system cross connections, trench infiltration (percolation of stormwater through the soil and into the pipeline trench) and ground water infiltration. The stormwater inflow and trench infiltration comprise the wet weather flow component termed rainfall dependent inflow and infiltration (RDII). The RDII response in the collection system is seen immediately (as with inflow) or within hours after the rainfall event (as with infiltration). The third component of wet weather flow is groundwater infiltration, which is not specific to a single rainfall event. The groundwater infiltration effects on the collection system change over the entire wet weather season. Groundwater infiltration is infiltration caused by the depth of the groundwater table rising above the pipe invert elevation. Sewer pipes located within close proximity to a water body can be greatly influenced by groundwater infiltration. As the groundwater table fluctuates over the wet weather season, this fluctuation is seen as a mounding effect in the flow data.

Thus, at different times during the wet weather season, groundwater infiltration can play a more significant role in the available collection system capacity. It is important in the modeling process to calibrate to the highest groundwater mounding effect seen in the flow data to ensure that the model is being calibrated to the worst-case scenario and that the potential impact of groundwater infiltration is not underestimated.

The various wastewater flow components are illustrated in Figure 5.2. The following sections, Sections 5.3 and 5.4, describe the process of programming, or “loading”, dry and wet weather flow components into the hydraulic model.

5.3 DRY WEATHER FLOW LOADING

Land use and population estimates are the basis for developing the quantity of baseflow generated within the City. The type of land use in an area will affect the volume and characteristic of the baseflow being generated. Adequately estimating the quantity of this wastewater is an important process in maintaining and sizing collection system facilities, both for existing conditions and future developments.



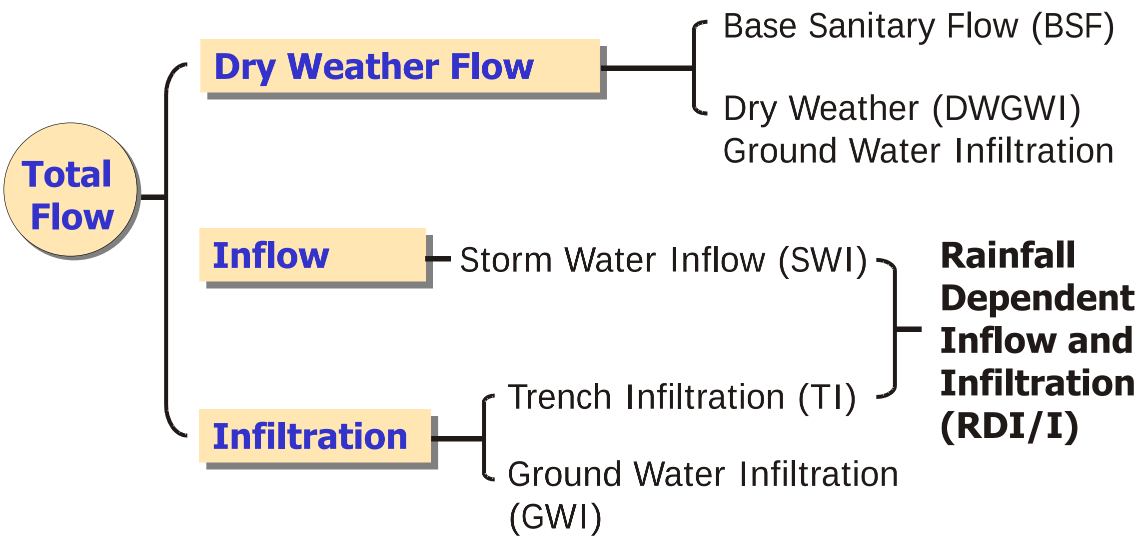


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Figure 5.2
WASTEWATER FLOW COMPONENTS
CITY OF ASHLAND

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Sewersheds are developed for the hydraulic model to facilitate the dry weather flow loading. A sewer shed is defined, as a geographic area within the City where flow generated from this area will be injected into a single pipeline in the hydraulic model. Typically, a sewer shed will encompass a particular subdivision or grouping of lots. For the City's collection system, a 175 sewersheds were developed as flow inputs for the model.

Dry weather flow input in the hydraulic model falls under the two broad categories: residential population and commercial volume. The City's zoning map, aerial photographs and general plan were used to estimate the existing 2003, 20-year plan, and ultimate build-out population and commercial volume projections (refer to Chapter 2 for a summary of this information).

5.4 WET WEATHER FLOW LOADING

Modeling the wet weather flow component consists of modeling the dynamics of inflow and infiltration into the collection system. The age and condition of the collection system facilities will impact the quantity of inflow and infiltration. Typically, older sewer pipes will have a greater tendency to allow inflow and infiltration than newer pipes.

Modeling RDII in the hydra model is comprised of two components. These are: (1) selecting a rainfall event of up to seven days in duration and (2) assigning parameters for inflow, infiltration and groundwater infiltration. The model input parameter for inflow is area. This is described as the surface area contributing immediate stormwater flows to the system. This area could include illegal connections such as roofs, storm drains, or stormwater cross-connections. The model input parameter for infiltration is area. The infiltration area represents the surface area served by a defective, joints and/or manholes that generates a specific volume of infiltration flow. A time parameter is associated with infiltration and represents the time-delayed response as it percolates through the soil and into the pipeline. A beginning, maximum and ending time parameter is established for each infiltration parameter. The area attributed to inflow and infiltration, in conjunction with the rainfall event, in inches per hour, creates the RDII flow volume into the model. The model parameter for groundwater infiltration is gallons per day. The parameters for inflow, trench infiltration and groundwater infiltration are adjusted during the calibration process until the hydraulic model matches the flow metering data.

The selected rainfall event used for model calibration should be representative of a typical wet weather storm. Ideally, the rainfall event will have a total volume relatively close to the design storm that will be used to assess the capacity of the collection system.

5.5 CALIBRATION

Model calibration is a crucial component of the hydraulic modeling effort. The model must be calibrated to flow metering data to ensure the most accurate results possible. The calibration process consists of calibrating to both dry and wet weather flow events. Dry weather flow calibration ensures an accurate depiction of baseflow generated within the City, based on population estimates and land use. The wet weather flow calibration consists of calibrating the hydraulic model to a specific storm event to quantify the peak flows and flow volume of inflow and infiltration. The amount of inflow and infiltration that enters the system is essentially the difference between the wet weather flow and dry weather flow components.

5.5.1 DWF Calibration

The dry weather flow calibration consists of: (1) dividing the area contributing baseflow to the collection system into sewersheds, (2) defining the population, and commercial flow volumes within each sewershed, and (3) creating diurnal curves to match the time variation of flow throughout the day. Usually peaks in the diurnal curve occur in the morning, between 8 a.m. and 10 a.m., and again in the evening between 6 p.m. and 8 p.m.

The calibration process compares the flow metering data with the model flow results. Comparisons are made for minimum, maximum and average flows as well as the time variation of flow. Table 5.1 summarizes the dry weather flow calibration. A sample of the dry weather flow calibration for Flow Meter 6 is presented in Figure 5.4. The remaining dry weather flow calibration plots are provided in Appendix B.

5.5.2 WWF Calibration

Wet weather flow calibration enables the model to accurately portray inflow and infiltration entering the collection system during a storm event. Wet weather flow calibration consists of two steps: (1) determining a rainfall event that characterizes the most significant impact on the collection system facilities, preferably during wet antecedent soil moisture conditions and (2) creating a database of inflow and infiltration parameters for each pipe. The inflow and infiltration parameters, in conjunction with the rain event, generates wet weather flows in the model. These modeled wet weather flows are compared to the flow monitoring data and adjusted until the model mimics the metered collection system response.

The most significant rainfall event during the temporary flow monitoring occurred from March 13 - 16, 2003. This rainfall event recorded a total volume of 1.82 inches over the four-day period. The maximum 24-hour volume of rainfall during this storm event was 0.91 inches yielding a return interval of less than 1 year, based on the NOAA Atlas Maps.

Table 5.1 Dry Weather Flow Calibration Summary Sanitary Sewer Collection System Master Plan Update City of Ashland						
	Meter Flow			Model Flow		
Meter I.D.	Average (mgd) (1)	Minimum (mgd)	Maximum (mgd)	Average (mgd)	Minimum (mgd)	Maximum (mgd)
1	0.013	0.008	0.025	0.015	0.010	0.027
2	1.21	0.55	1.82	1.23	0.65	1.59
3	0.32	0.14	0.47	0.32	0.16	0.46
4	0.83	0.44	1.19	0.83	0.57	1.05
5	0.74	0.31	1.06	0.74	0.33	1.00
6	0.33	0.13	0.50	0.33	0.16	0.48
7	0.20	0.07	0.29	0.20	0.08	0.31
8	0.36	0.18	0.55	0.37	0.21	0.56
9	0.59	0.30	0.85	0.59	0.35	0.85

Notes:
(1) mgd = million gallons per day

Table 5.2 Wet Weather Calibration Rain Gauge Summary Sanitary Sewer Collection System Master Plan Update City of Ashland		
Date	Rainfall (inches)	Peak Hourly Intensity (inches/hour)
Mar. 13, 2003	0.81	0.26
Mar. 14, 2003	0.41	0.11
Mar. 15, 2003	0.33	0.10
Mar. 16, 2003	0.27	0.11
Total	1.82	N/A

The wet weather flow calibration process entails adding inflow and infiltration parameters to the model to match the flow monitoring data for each meter during the March 13 -16, 2003 rainfall event. Wet weather flows injected into the model are calibrated to each flow meter and its tributary pipes in order to match the peak and volume of wet weather flow. The wet weather flow calibration for Flow Meter 6 is presented in Figure 5.5. The remaining

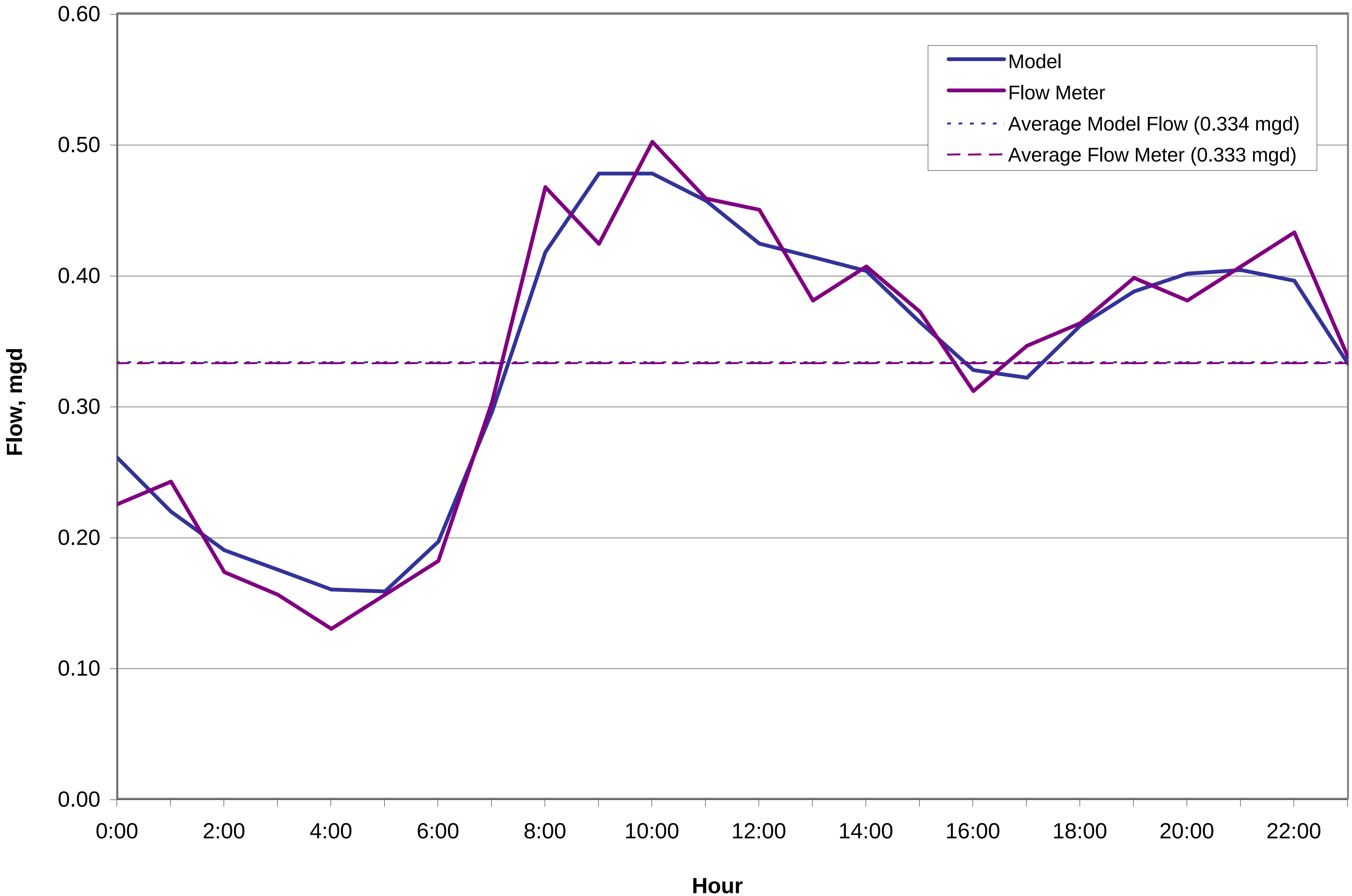

Figure 5.3
Dry Weather Flow
Calibration for Meter 6
City of Ashland

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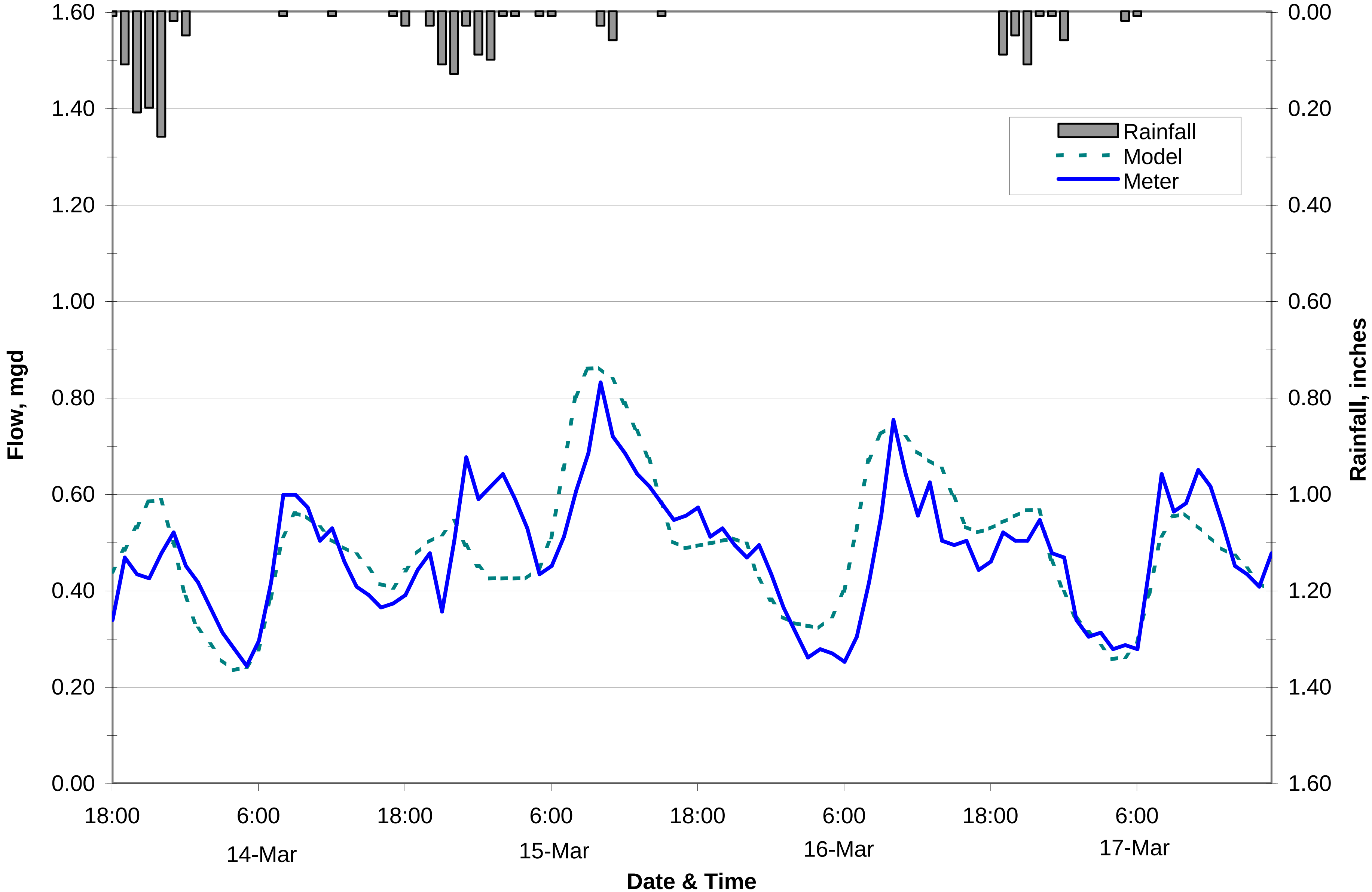

Figure 5.4
Wet Weather Flow
Calibration for Meter 6
City of Ashland

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calibration plots are provided in Appendix C. Table 5.3 summarizes the wet weather flow calibration effort. Both the dry and wet weather metered and modeled flows correlate well. The highest percent difference in wet weather flows was 5.3%.

Table 5.3 Wet Weather Flow Calibration Summary
Sanitary Sewer Collection System Master Plan Update
City of Ashland

Meter I.D.	Manhole I.D.	Meter PWWF (mgd) (1)	Model PWWF (mgd)	Percent Difference (%)
1	4BB-035	0.031	0.032	3.2
2	33CC-001	2.49	2.52	1.2
3	4BB-037	0.76	0.80	5.3
4	4BA-021	2.05	1.98	3.4
5	10BB-003	1.53	1.55	1.3
6	10AB-005	0.83	0.86	3.6
7	10BC-039	0.37	0.37	0
8	9AC-040	0.91	0.95	4.4
9	4CC-024	1.22	1.27	4.1

Notes:

(1) mgd = million gallon per day

CAPACITY ANALYSIS

6.1 INTRODUCTION

Upon completion of the dry and wet weather flow calibration, a capacity analysis of the modeled collection system was performed. The capacity analysis entailed identifying areas in the collection system where flow restrictions occur or where pipe capacity is insufficient to pass peak wet weather flows (PWWF) of the design storm. Pipes that do not have sufficient capacity to pass PWWF's can produce backwater effects in the collection system and potentially cause unwanted sanitary sewer overflows (SSO's).

6.2 DESIGN STORM

Design storms are synthetic rainfall events used to analyze the performance of a collection system under peak flows and volumes. Design storms have a specific recurrence interval and rainfall duration. Developing a design storm entails generating (1) total rainfall volume, (2) peak intensity, and (3) distributing the remaining volume over the storm duration.

A common method used in developing design storms is to use the National Oceanic and Atmospheric Administration (NOAA) Atlas Maps to obtain the rainfall volume. NOAA published Precipitation-Frequency Atlas of the Western United States using over a century of compiled rainfall data. The Precipitation-Frequency Atlas is available on NOAA website for a variety of recurrence intervals and durations.

The rainfall volume is then distributed using the Soil Conservation Service (SCS) Distribution Method. This method distributes the rainfall volume for 6-hour or 24-hour storm durations in a very textbook manner. The SCS method divides the United States into 4 regions, based on climate, to determine the typical rainfall distribution pattern and peak intensity. The City of Ashland resides in Type 1A region indicative of maritime climates with wet winters and dry summers. In Type 1 and Type 1A regions, the NOAA Volume and SCS Distribution method may yield conservative design storms regarding peak intensities. This conservative approach for determining the design storm will provide the City with additional assurance that adequate capacity will be available in the collection system during storm events if the system is improved according to model results.

Two design storms were developed for the capacity analysis: Winter 5 Year 24 Hour design storm and Summer 10 Year 24 Hour design storm (per DEQ guidelines). A summary of the rainfall volume and peak intensity for each design storm is presented in Table 6.1. Also, Figure 6.1 and Figure 6.2 illustrate the hourly distribution for the Summer 10 Year 24 Hour Design Storm and the Winter 5 Year 24 Hour Design Storm using the SCS Method.

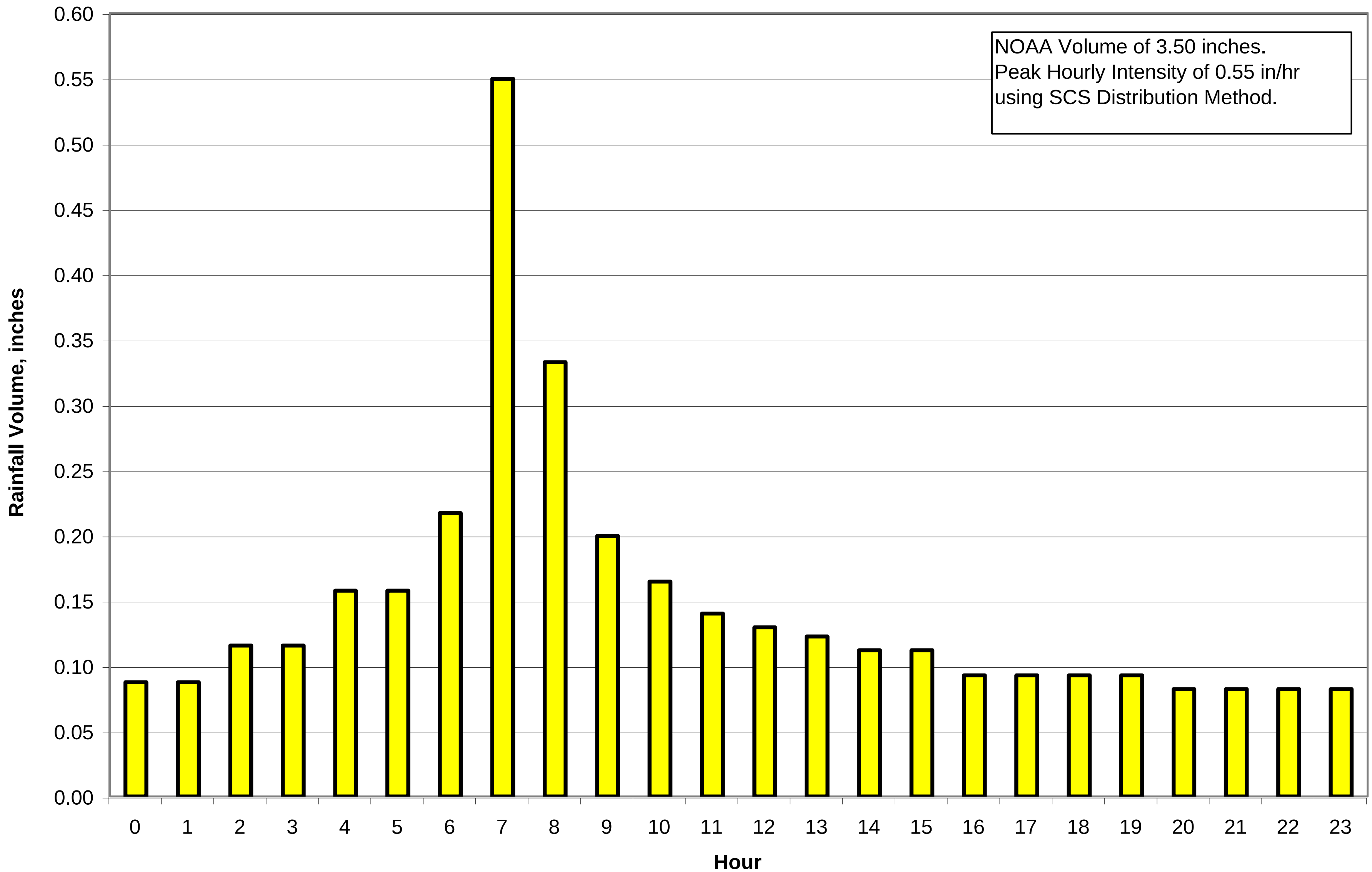

Figure 6.1
SUMMER 10 YEAR 24 HOUR
DESIGN STORM
CITY OF ASHLAND

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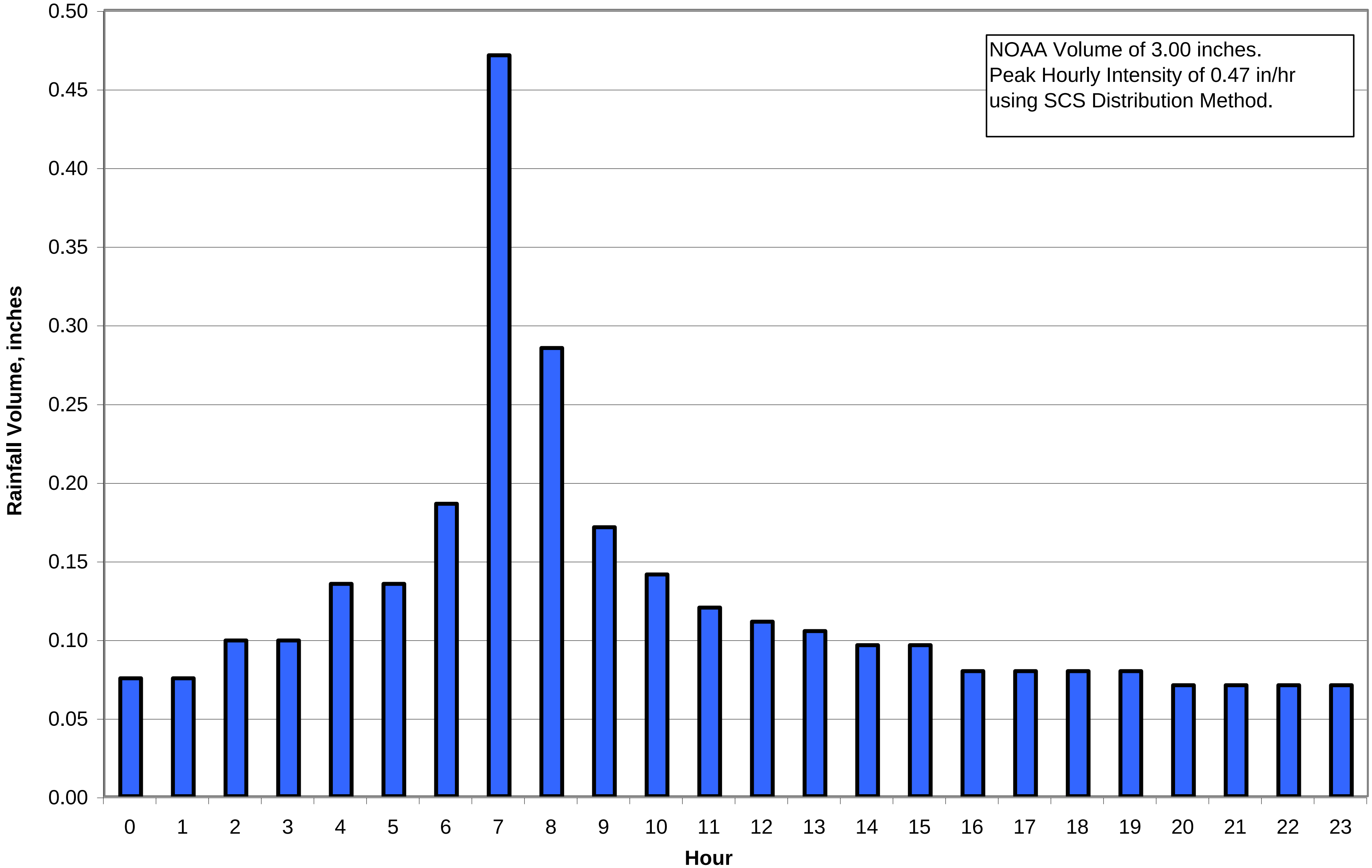

Figure 6.2
WINTER 5 YEAR 24 HOUR
DESIGN STORM
CITY OF ASHLAND

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Table 6.1 Design Storm Summary Sanitary Sewer Collection System Master Plan Update City of Ashland		
Design Storm	Rainfall (inches)	Peak Intensity (inches/hour)
Winter 5 Year 24 Hour	3.00	0.47
Summer 10 Year 24 Hour	3.50	0.55

6.3 COLLECTION SYSTEM PERFORMANCE

The City's collection system was analyzed using the winter 5-year 24-hour design storm and the summer 10-year 24-hour design storm. The capacity of the collection system was assessed for both the Existing 2003 land use condition and the 20-year plan (Year 2023).

The City has established a peak wet weather flow (PWWF) criteria upon which to assess the capacity of their collection system. The PWWF criteria will determine which pipelines will be deemed capacity deficient and therefore recommended for improvement in the capital improvement program (CIP). When flow in a pipeline reaches a depth-to-diameter (d/D) ratio of 0.90 (or 90% full), the pipeline is considered under capacity. New sewers (parallel or replacement) are recommended to relieve these deficient pipelines. When appropriate, flow may be transferred from capacity deficient pipelines to pipelines with adequate capacity in order to optimize the flows within the system.

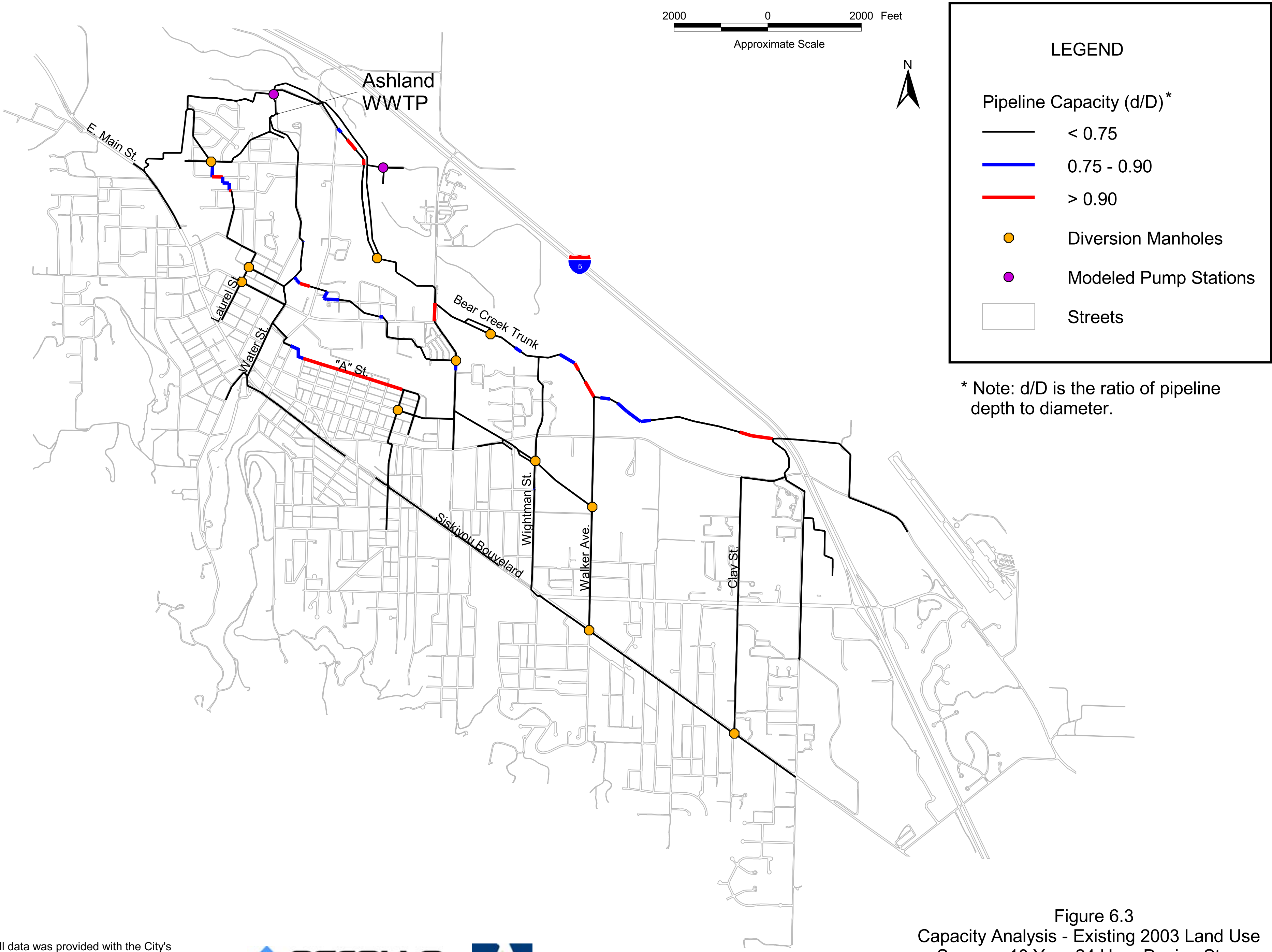
6.3.1 Existing 2003 Condition Capacity Analysis

Summer 10 Year 24 Hour Design Storm

Approximately 15 pipelines during the summer 10 Year 24 Hour design storm did not meet the d/D criteria of 0.90. These pipelines are presented in Figure 6.3. Figure 6.3 also presents the flow percentage that the highlighted pipelines are over capacity and those pipelines that are just under the maximum d/D criteria. The PWWF at the Wastewater Treatment Plant (WWTP) during the Summer 10 Year 24 Hour design storm for the Existing 2003 land use condition is approximately 5.93 million gallons per day (mgd).

Winter 5 Year 24 Hour Design Storm

Approximately 14 pipelines during the Winter 5 Year 24 Hour design Storm did not meet the maximum d/D criteria of 0.90. These pipelines are presented in Figure 6.4. The PWWF at the WWTP during the Winter 5 Year 24 Hour design storm for the existing 2003 land use condition is approximately 5.54 (mgd).



* Note: d/D is the ratio of pipeline depth to diameter.

Figure 6.3
Capacity Analysis - Existing 2003 Land Use
Summer 10 Year 24 Hour Design Storm
City of Ashland

Note: All data was provided with the City's current information as of February 2003.

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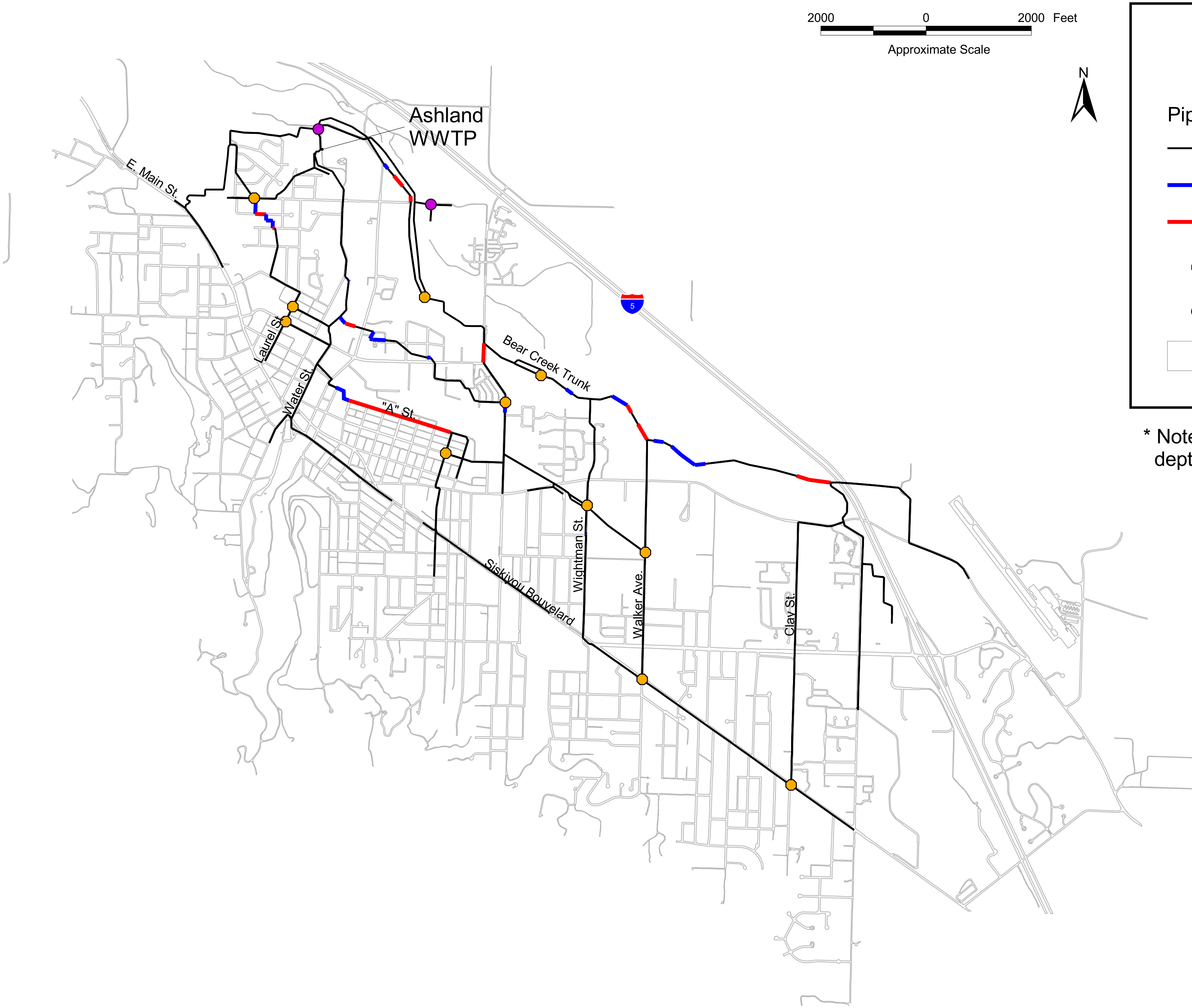

LEGEND

Pipeline Capacity (d/D)*

< 0.75

0.75 - 0.90

> 0.90

Diversion Manholes

Modeled Pump Stations

Streets

* Note: d/D is the ratio of pipeline depth to diameter.

Figure 6.4
Capacity Analysis - Existing 2003 Land Use
Winter 5 Year 24 Hour Design Storm
City of Ashland

Note: All data was provided with the City's current information as of February 2003.

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6.3.2 20 Year Capacity Analysis

Summer 10 Year 24 Hour Design Storm

Approximately 22 pipelines during the summer 10 Year 24 Hour design storm did not meet the maximum d/D criteria of 0.90. These pipelines are presented in Figure 6.5. The PWWF at the WWTP during the Summer 10 Year 24 Hour design storm for the 2023 land use condition is approximately 6.52 mgd.

Winter 5 Year 24 Hour Design Storm

Approximately 16 pipelines during the Winter 5 Year 24 Hour design storm did not meet the maximum d/D criteria of 0.90. These pipelines are presented in Figure 6.6. The PWWF at the WWTP during the Winter 5 Year 24 Hour design storm for the 2023 land use condition is approximately 6.14 mgd.

6.4 FLOW SUMMARY

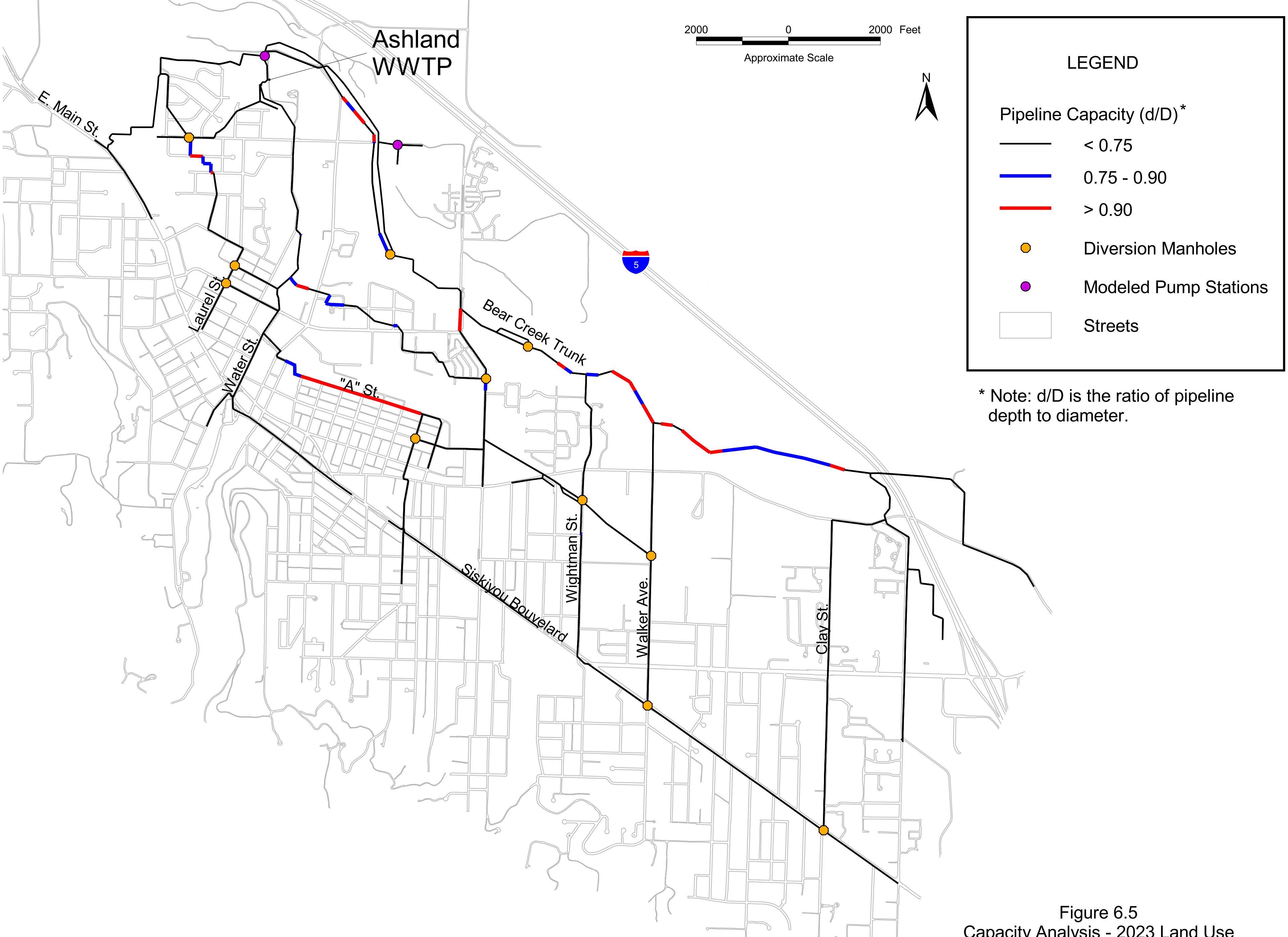
A summary of the WWTP average DWF and hourly PWWF during the design storms is presented in Table 6.2.

Table 6.2 WWTP Capacity Analysis Flow Summary
Sanitary Sewer System Master Plan Update
City of Ashland

Year	Average Dry Weather Flow (mgd) (1)	Winter 5 Year 24 Hour Design Storm Hourly PWWF (2) (mgd)	Summer 10 Year 24 Hour Design Storm Hourly PWWF (2) (mgd)
2003	2.05	5.54	5.93
2023	2.86	6.14 (3)	6.52 (3)

Notes:
(1) mgd = million gallons per day
(2) PWWF = Peak Wet Weather Flow
(3) 2023 flow value does not account for additional deterioration of the system beyond existing condition.

Flow hydrographs for the Existing 2003 and 20-Year Plan, during the Summer 10 Year 24 Hour design storm, are presented in Figure 6.7 and Figure 6.8, respectively.



Note: All data was provided with the City's current information as of February 2003.

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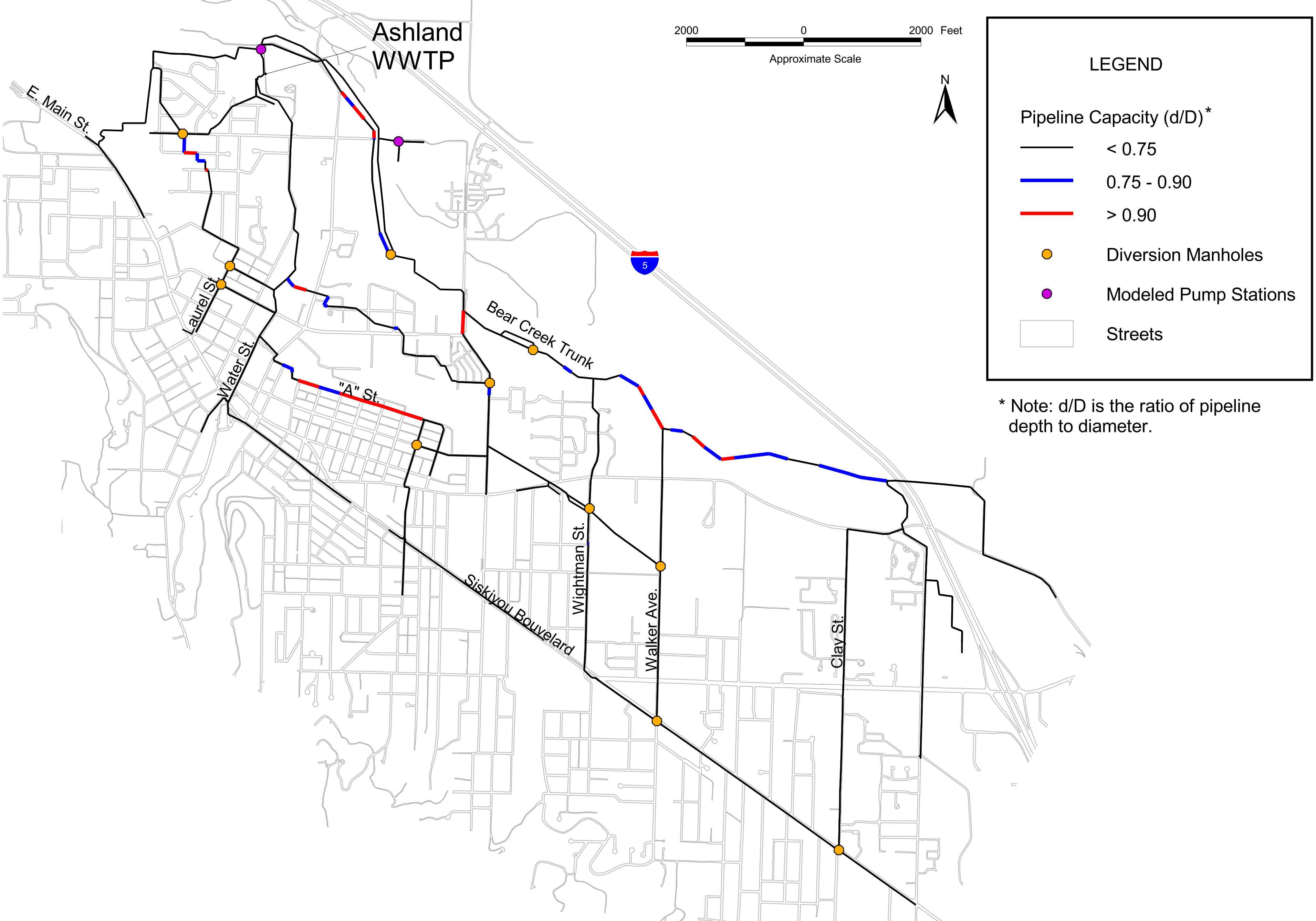
Figure 6.5
Capacity Analysis - 2023 Land Use
Summer 10 Year 24 Hour Design Storm
City of Ashland



Note: All data was provided with the City's current information as of February 2003.

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Figure 6.6
Capacity Analysis - 2023 Land Use
Winter 5 Year 24 Hour Design Storm
City of Ashland

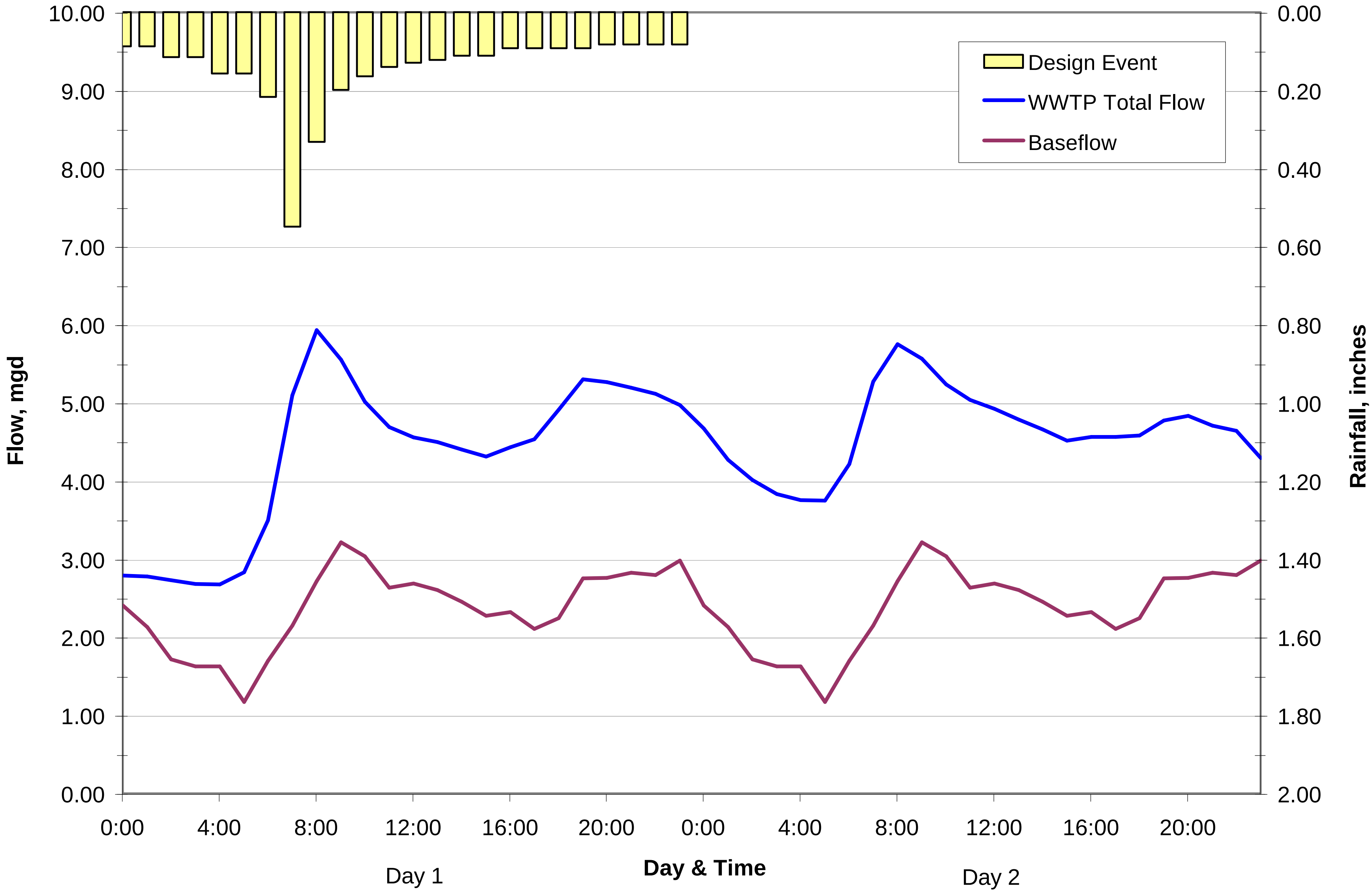

Figure 6.7
2003 WWTP Hydrograph
Summer 10 Year 24 Hour Design Storm
City of Ashland

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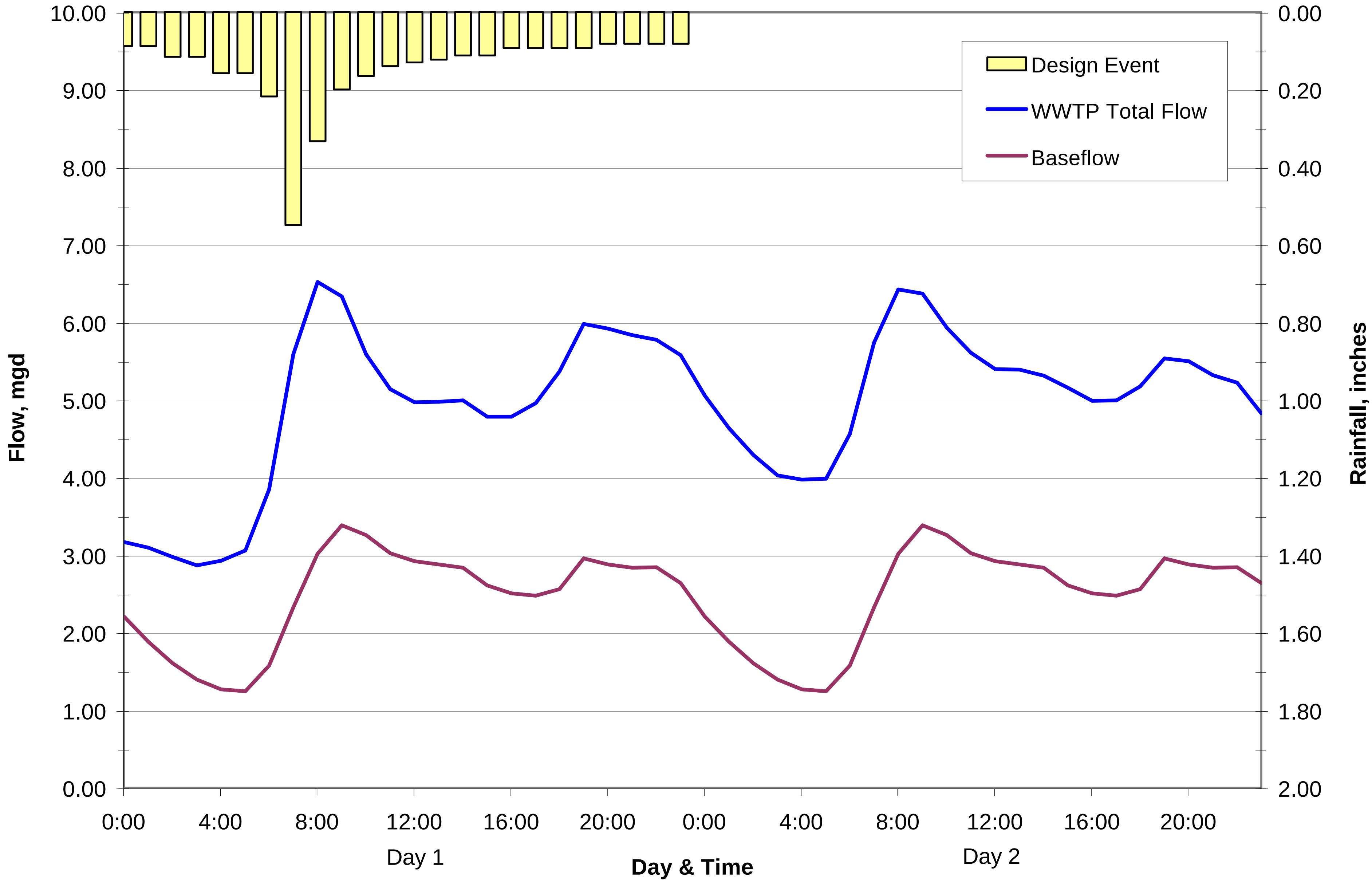

Figure 6.8
2023 WWTP Hydrograph
Summer 10 Year 24 Hour Design Storm
City of Ashland

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CAPITAL IMPROVEMENT PROGRAM

7.1 INTRODUCTION

The capacity analysis, described in Chapter 6, sets the foundation for the capital improvement program (CIP). The CIP focuses on alleviating the collection system capacity deficiencies. The intent of the CIP is to serve as a working document, which the City can follow to update the capacity deficient sections of the collection system. The criteria used to develop the CIP is discussed in this chapter along with a priority list of improvements.

7.2 CAPITAL IMPROVEMENT PROGRAM

The City currently operates and maintains a sewer collection system with original construction dating back to the early 1900's. The CIP will provide the City with a working document to correct the capacity deficiencies in the collection system in order to convey peak wet weather flows (PWWF) to the wastewater treatment plant (WWTP). When fully implemented, the CIP will provide hydraulic capacity to convey PWWF's during the Summer 10 Year 24 Hour design storm for the projected 20-Year Plan (Year 2023). This section provides a discussion of the sewer replacement criteria, modeling assumptions, cost criteria and the recommended improvements included in the CIP.

7.2.1 CIP Criteria

7.2.1.1 *Sewer Replacement Criteria*

When additional capacity is required, existing sewers can be replaced or paralleled. For the purposes of this master plan update, it was assumed that a deficient existing sewer will be replaced with a larger diameter pipeline at the same slope as the existing pipeline, unless otherwise noted. The decision to replace or parallel the existing pipeline should be made during the predesign effort for each improvement. During the predesign effort, the existing sewer should be closed circuit televised (CCTV) to determine its structural condition. If severely deteriorated, the existing sewer should be replaced. If moderately deteriorated, the existing sewer can be rehabilitated by slip lining, pipe bursting, or inversion lining with a parallel sewer constructed to convey the excess flow. Except for pipe bursting, a rehabilitated sewer has less hydraulic capacity because of a reduction in cross-sectional area and this loss in existing capacity needs to be accounted for when sizing the parallel sewer. With pipe bursting, the existing pipe diameter can be increased insitu.

7.2.1.2 *Modeling and Analysis Assumptions*

The CIP is based on several assumptions:

- The hydraulic grade line is to be maintained below a depth to diameter ratio of 0.90 (d/D <0.90) during the peak wet weather flows of the Winter 5 Year 24 Hour and Summer 10 Year 24 Hour design storms.

- The hydraulic model evaluated primarily the 10-inch and greater diameter pipelines. Analysis of the City's 6-inch and 8-inch diameter pipelines was not part of the scope of services for this collection system master plan update. It is assumed that the smaller diameter pipelines have sufficient capacity to transport dry and wet weather flows from their local service areas.

7.2.1.3 *Planning Level Cost Criteria*

The planning level capital cost estimate used in developing the CIP is based upon the unit costs presented in Table 7.1. These unit costs are based on construction bids received for sanitary sewer projects in similar communities in the Portland and Seattle Area. The unit costs are for "typical" field conditions with construction in stable soil at an average depth of ten feet to invert of pipe. The unit costs include pipe and pipe installation, manhole and appurtenances, excavation and backfill, pavement removal and replacement, limited sheeting, dewatering and shoring, and contractor overhead and profit. The planning level costs are based on an Engineering News Record Construction Cost Index of ENR=8,008 (Seattle, August 2004). To develop total CIP project costs, an additional 25 percent is added for construction contingencies and 25 percent is added for engineering, administrative and legal fees.

Table 7.1 Pipeline Unit Costs (ENR = 8008, Seattle, August 2004)
Sanitary Sewer System Master Plan Update
City of Ashland

Pipe Diameter (inches)	Unit Cost(1) ($/lf)
8	118
10	129
12	140
15	156
18	172
21	194
24	215

Notes:
(1) Unit costs include pipe and pipe installation, manhole and appurtenances, lower laterals, excavation and backfill, pavement removal and replacement, limited sheeting, dewatering and shoring, and contractor overhead and profit.

7.2.2 Recommended Capital Improvement Program

City Staff selected to improve the collection system to convey the PWWF's of the Summer 10 Year 24 Hour design storm and the Winter 5 Year 24 Hour design storm (per DEQ guidance documents). The pipe criteria for recommending an improvement is a d/D ratio greater than 0.90. Several pipelines require improvements to meet the City's d/D criteria. The recommended CIP includes approximately 6,310 feet of pipeline improvements and modification of a diversion manhole on the Bear Creek Trunk sewer. The required improvements for the recommended CIP are presented in Figure 7.1. The CIP capital and total project planning level cost estimates are summarized in Table 7.2 and total $939,000 and $1,409,000 respectively. The total project planning level cost estimates include a 25 percent construction contingency and a 25 percent engineering, administrative, and legal contingency. A summary of the recommended improvements are provided below:

"A" Street: Replace approximately 2,220 lineal feet of existing 12-inch diameter pipeline with 15-inch diameter pipe along "A" Street (from 7th Street to 1st Street) from manhole 9AB-015 to 9BA-011.

Mountain Avenue: Replace and realign the existing 394 feet of 8-inch diameter pipeline (slope of 0.0002 feet per feet) with approximately 615 lineal feet of 12-inch diameter pipeline at a slope of 0.0033 feet per feet along Mountain Avenue (from Hersey Street to the Bear Creek Trunk sewer). The new alignment should tie into manhole 4DD-002, rather than the existing alignment to manhole 4DD-008, to provide adequate capacity for the 12-inch diameter pipeline.

Willow Street Extension: Replace approximately 816 lineal feet of 6-inch diameter pipeline with 8-inch diameter pipe extending from the north end of Willow Street north until the connection on Nevada Street (from manhole 4BC-032 to 5AD-013). Replace approximately 47 lineal feet of 6-inch diameter pipeline with 12-inch diameter pipe extending along Randy Street from manhole 4BC-005 to 4BC-006.

Proximity of Hersey Street: Replace approximately 629 lineal feet of 10-inch diameter pipeline with 12-inch diameter pipe extending north of Hersey Street (from Patterson Street east until the extension of Water Street trunk sewer) from manhole 4CD-019 to 4CD-001 and from manhole 4CD-031 to 4CA-018.

Bear Creek Trunk Sewer: Replace approximately 1,983 lineal feet of 12-inch diameter pipeline with 15-inch diameter pipe along Bear Creek Trunk from manhole 10AD-009 to 10AB-002, manhole 10AB-001 to 10AB-005, manhole 10AB-004 to10BA-029, and manhole 10BA-028 to 10BA-003.

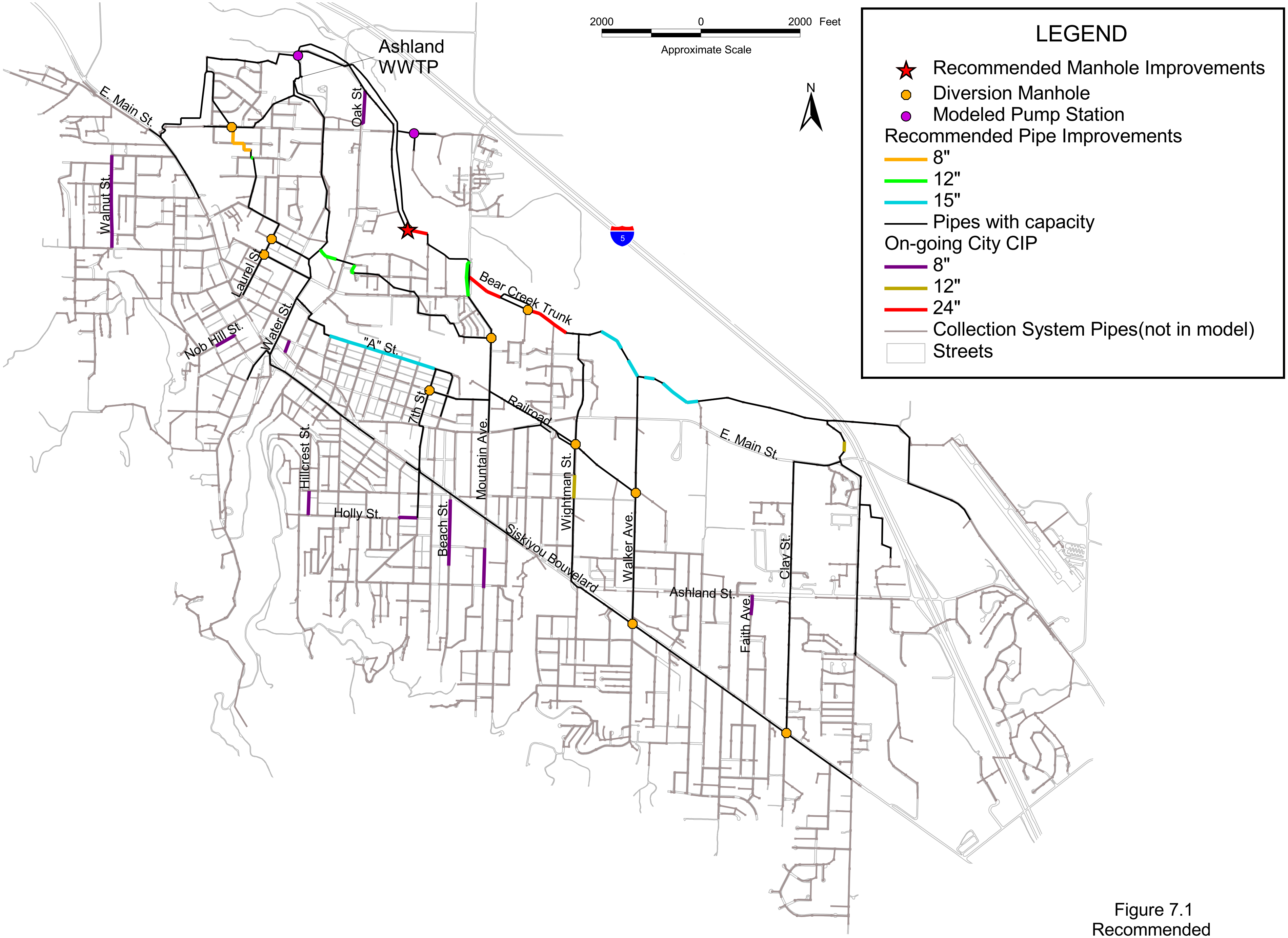

Figure 7.1
Recommended
Capital Improvement Program
City of Ashland

Note: All data was provided with the City's current information as of February 2003.

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Table 7.2 CIP Planning Level Cost Estimates
Sanitary Sewer Collection System Master Plan Update
City of Ashland

Priority Year	Location	Downstream Manhole No.	Upstream Manhole No.	Proposed Diameter (in)	20-Year Proposed Diameter (in)	Existing Diameter (in)	Length (ft)	Slope (ft/ft)	Existing Percent Capacity	Unit Cost ($/ft)	Total Construction Cost ($)
1 - 5	A Street	9BA-012	9BA-011	15		12	370	0.0027	111%	156	$ 58,000
1 - 5	A Street	9BA-001	9BA-012	15		12	371	0.0029	108%	156	$ 58,000
1 - 5	A Street	9AB-001	9BA-001	15		12	368	0.0029	109%	156	$ 58,000
1 - 5	A Street	9AB-012	9AB-001	15		12	371	0.0026	114%	156	$ 58,000
1 - 5	A Street	9AB-013	9AB-012	15		12	368	0.0028	112%	156	$ 57,000
1 - 5	A Street	9AB-015	9AB-013	15		12	372	0.0029	110%	156	$ 58,000
1 - 5	Mountain Ave.	4DD-024	4DD-002 (3)	12		8	615 (4)	0.0033(4)	1061%	140	$ 86,000
1 - 5	Willow St. (1)	4BC-005	4BC-006	12		6	47	0.0002	667%	140	$ 7,000
1 - 5	Willow St. (1)	5AD-004	5AD-013	8		6	325	0.0176	90%	118	$ 38,000
1 - 5	Willow St. (1)	4BC-012	5AD-004	8		6	224	0.0048	165%	118	$ 27,000
1 - 5	Willow St. (1)	4BC-032	4BC-035	8		6	139	0.0142	89%	118	$ 16,000
1 – 5	Willow St. (1)	4BC-035	4BC-012	8		6	128	0.0139	93%	118	$ 15,000
5 - 10	Bear Creek	10AD-009	10AC-005	15		12	221	0.0033	96%	156	$ 35,000
5 - 10	Bear Creek	10AB-004	10BA-029	15		12	379	0.0035	119%	156	$ 59,000
5 - 10	Bear Creek	10BA-028	10BA-002	15		12	177	0.0031	127%	156	$ 28,000
5 - 10	Hersey St. (2)	4CD-032	4CA-021	12		10	108	0.0020	96%	140	$ 15,000
5 - 10	Hersey St. (2)	4CA-021	4CA-018	12		10	68	0.0021	97%	140	$ 10,000
5 - 10	Hersey St. (2)	4CD-031	4CD-032	12		10	221	0.0007	150%	140	$ 31,000
5 - 10	Hersey St. (2)	4CD-019	4CD-029	12		10	65	0.0015	89%	140	$ 9,000
5 - 10	Hersey St. (2)	4CD-029	4CD-001	12		10	167	0.0014	98%	140	$ 23,000
10 - 20	Bear Creek	10BA-002	10BA-003	n/a	15	12	369	0.0068	86%	156	$ 58,000
10 - 20	Bear Creek	10AC-005	10AB-003	n/a	15	12	359	0.0045	82%	156	$ 56,000
10 - 20	Bear Creek	10AB-003	10AB-002	n/a	15	12	271	0.0045	84%	156	$ 42,000
10 - 20	Bear Creek	10AB-001	10AB-005	n/a	15	12	207	0.0051	80%	156	$ 32,000
5 - 10	Bear Creek	Diversion Manhole 4DB-003 Modification							1 @ 5,000		5,000

Subtotal	**6,310**	**$ 939,000**
25% Construction Contingency		**$ 235,000**
25% Engineering/Legal/Admin. Fees		**$ 235,000**
Total Project Costs		**$ 1,409,000**

Notes: (1) Located at Extension of Willow Street

(2) Located north and parallel to Hersey Street

(3) Recommend realigning pipe to connect to downstream Manhole 4DD-002

(4) Recommended length and slope. Existing alignment is 394 feet in length (manhole 4DD-024 to manhole 4DD-008) with a slope of 0.0002 feet per foot

Bear Creek Trunk Diversion Manhole Modification: Install a flow splitting structure in manhole 4DB-003 to split flows at a ratio of 80 percent towards the 24-inch diameter pipeline and 20 percent towards 15-inch diameter pipeline. The downstream 15-inch diameter pipeline between manhole 4AC-019 and manhole 4AC-001 is limited to a capacity of 0.97 mgd. Alternately, manhole 4DB-003 can be configured to limit flow in the 15-inch to no more than 1 mgd.

7.2.3 On-going Capital Improvements by City

The City has an on-going capital improvement program to rehabilitate and replace their smaller diameter pipelines, primarily the 6-inch and 8-inch diameter pipelines. Their on-going capital improvements are based on results from the pipeline inspection program (primarily CCTV inspection). The City is planning on replacing the following pipeline sections during 2004-2005. These improvements are in addition to the CIP discussed in Section 7.2.2 and have been presented on Figure 7.1.

Beach Street: Replace approximately 1,334 lineal feet of 6-inch diameter pipeline with 8-inch diameter pipe along Beach Street from new manhole south of Siskiyou Boulevard to new manhole north of Henry Street.

Walnut Avenue: Replace approximately 1,900 lineal feet of 6-inch diameter pipeline with 8-inch diameter pipe along Walnut Avenue (from Grant Street to Wimer Street) from manhole 5AC-007 to 5DB-007.

Bear Creek Trunk Sewer: Replace approximately 1,350 lineal feet of 15-inch diameter pipeline with 24-inch diameter pipe along Bear Creek Trunk (from Mountain Avenue to the extension of Fordyce Street) from manhole 4DD-008 to 3CC-001. There is a section of parallel 15-inch and 24-inch diameter pipeline along this section of the trunk sewer that will remain in-place.

Wightman Street: Replace 470 feet of 8-inch diameter pipeline with 12-inch diameter pipe from manhole 10CA-003 to 10CA-007.

Nob Hill: Replace 445 feet of 6-inch diameter pipeline with 8-inch diameter pipe from 08AA-010 to 08AA-009.

Oak Street: Replace 625 feet of 6-inch diameter pipeline with 8-inch diameter pipe from 04BD-001 to 04BA-004.

Holly Street: Replace 390 feet of 6-inch diameter pipeline with 8-inch diameter pipe from manhole 09DB-016 to 09DC-052.

S. Mountain Avenue: Replace approximately 300 feet of 6-inch diameter pipeline with 8-inch diameter pipe from manhole 09DD-017 to 09DD-007. Replace approximately 500 feet of 6-inch diameter pipeline with 8-inch diameter pipe from 09DD-007 to 16AA-035.

Faith Avenue: Replace 400 feet of 6-inch diameter pipeline with 8-inch diameter pipe from manhole 15AA-009 to 15AA-012.

Hillcrest Street: Replace 490 feet of 6-inch diameter pipeline with 8-inch diameter pipe from manhole 09CA-009 to 09CA-017.

E. Main Street Easement: Replace 205 feet of 10-inch diameter pipeline with 12-inch diameter pipe from manhole 11BD-001 to 11BD-004.

Oak Street Easement: Replace 260 feet of 6-inch diameter pipeline with 8-inch diameter pipe from manhole 09BB-028 to 09BB-020.

7.3 CIP PRIORITIZATION PLAN

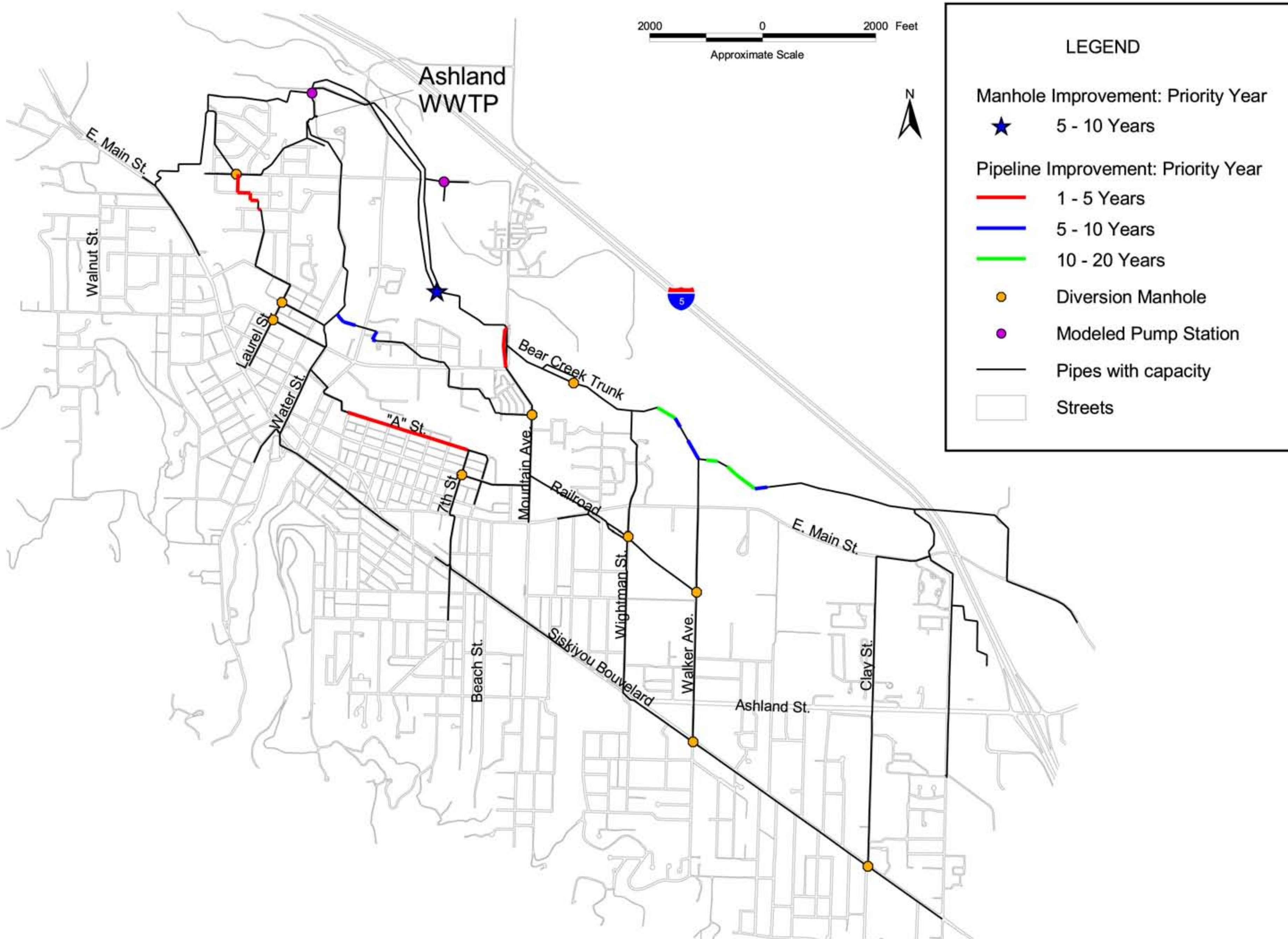
The CIP needs to be phased in over time to provide the City with an affordable approach for implementation based on when the improvements are needed. The recommended improvements were initially separated into 7 projects, based on their location. These 7 projects were then prioritized based on four factors: (1) capacity deficiency, (2) if sufficient downstream conveyance capacity exists, and (3) whether the improvement is development driven or an existing deficiency. The 7 projects are presented in Figure 7.2 and their prioritization provided in Table 7.2.

7.4 COLLECTION SYSTEM MAINTENANCE PLAN

The purpose of operation and maintenance (O&M) programs is to maintain design functionality, both capacity and integrity of the system. Proper maintenance programs can also restore a deteriorated collection system to near original condition and functionality. Effective maintenance plans are based on knowing what components make up the collection system, where they're located, and what their condition is. With this information, proactive maintenance plans can be scheduled, budgeted, and aid in the identification of rehabilitation projects and long-term CIP needs. Incorporating and tracking performance measures in the City's O&M program can also be an effective and efficient way to prioritize maintenance activities. Performance measures will identify where additional (or less) maintenance is required in the collection system, thus enabling the City to use its resources more efficiently.

The major elements of an effective preventative maintenance plan are:

- Planning and scheduling.
- System mapping/GIS.



Note: All data was provided with the City's current information as of February 2003.

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Figure 7.2
Recommended CIP Prioritization
City of Ashland

- Computerized management maintenance system (CMMS).
- Record management.
- Assets inventory and management.
- Spare parts management.
- Cost and budget control.
- Emergency repair procedures.
- Training program.

The benefits of an effective maintenance plan is that maintenance can be planned and scheduled, work backlog can be identified, adequate resources necessary to support the program can be budgeted, CIP items can be identified and budgeted for, and staffing and material resources can be used efficiently and effectively.

7.4.1 Maintenance Priorities

A systematic maintenance plan is essential for managing a collection system. As part of this plan, the major maintenance priorities are typically divided into three priorities: (1) physical inspection, (2) cleaning, and (3) system rehabilitation.

7.4.1.1 *Physical Inspection*

Physical inspection entails systematically identifying and documenting the condition of the collection system facilities. The physical inspections should be performed on a regular basis. This also includes inspection of newly constructed facilities prior to accepting their operation in the system. The main purpose for conducting inspections is to:

- Identify what is in the system (inventory).
- Identify where it is in the system.
- Determine the condition of the system (assessment).
- Prevent problems from happening.
- Develop a baseline upon which to assess the system in future inspections.

Inspection provides a detailed inventory of the system that includes size, material, condition, line sags, joint types, elevations, slopes, location of facilities, location of connections. In addition, inspections will provide information on the system so that City Staff can address these potential problems before they develop. Physical inspections can:

- Identify defects in the system that can contribute to or cause backups, overflows or excessive I&I in the system.
- Identify chronic problem areas so maintenance can be planned, scheduled and prioritized.
- Identify defects that if not fixed can cause future system failures.
- Determine the system needs for long-term replacement and rehabilitation.
- Develop a baseline for future comparisons to determine rates of deterioration.
- Assist in developing and justifying realistic user charges.

There are several common inspection methods used in the industry. These include air testing, vacuum testing, mandrel testing, smoke testing, dye water testing, closed circuit television (CCTV), visual, and sonic testing.

Routine scheduled inspection of the entire collection system is required to verify the condition of the system so that blockages and overflows can be prevented. Typically, inspection of the entire system using CCTV should be completed on a 5 to 10 year cycle. Other inspection may be required more or less frequently depending on the dynamics within the collection system. For example, if inflow is not a problem in the system, than infrequent smoke testing may be warranted.

7.4.1.2 *Cleaning*

Stoppages in collection systems are usually caused by either structural defects or by an accumulation of material in the pipe. Accumulated material can include fat, oil, grease, sediment, or other materials. Structural defects, particularly root intrusion, can be major contributors to blockages. Repair or elimination of any structural defects that cause blockages or a build-up of material, should be evaluated as part of the rehabilitation program.

Mechanical and hydraulic cleaning of sewers is an effective way of removing accumulated material that interferes with the proper operation of the system. Mechanical cleaning methods use equipment to physically remove the material from the walls and invert of the sewer pipe. Hydraulic cleaning methods include equipment that uses water and water velocity to clean the sewer pipe. Cleaning should be scheduled on a regular cycle, with more cleaning performed in areas with chronic material accumulation and less cleaning for the remaining system. The entire system should be cleaned every 3 to 5 years, or as necessary depending on the condition of the system gathered as part of the inspection program. Chronic areas may require cleaning as frequently as monthly. Other areas in the collection system, may need to be cleaned less frequently, i.e. only during CCTV inspection. Cleaning to frequently can result in over-maintenance and over allocation of resources that can be used on more effectively elsewhere in the system.

7.4.1.3 *Pump Stations*

A pump station maintenance program should be based on two factors. The first is the equipment manufacturers recommendations for such additives as lubrication of bearings, oil changes, and parts replacement. The second factor is the specific requirements of an individual pump stations. These items are developed based on the observations of the pump station and knowledge gained by experience with an individual pump station.

Pump stations should be inspected on a regular basis, typically weekly, for the size of the pump stations within the City's collection system. A checklist should be established to ensure that proper inspection and maintenance procedures are followed and for documenting these activities. The basic inspection should include verification that alarm systems are operating properly, wet well levels are properly set, all indicator lights and voltage readings are within acceptable limits, suction and discharge pressures are within normal limits, and that the pumps are running without excessive heat or vibration.

7.4.1.4 *Rehabilitation*

Sewer rehabilitation is performed to maintain the overall viability of the conveyance system. When structural integrity is compromised and/or significant defects of a pipeline, joint or manhole are discovered, these should be scheduled for rehabilitation. Rehabilitation will involve either replacement or repair, depending on the extent of the defect or structural integrity of the system. The purpose of system rehabilitation is to:

- Ensure the structural integrity of the system.
- Limit the loss of conveyance capacity by reducing I&I.
- Limit the potential for sewer backups and overflows by reducing I&I and maintaining the integrity of the system as designed.

An effective maintenance plan will include cleaning the system as well as incorporate a rehabilitation program that has been developed based on the results of the physical inspection program.

7.4.2 Annual System Maintenance Plan

The City has an on-going, proactive maintenance plan currently in-place. The City has seen the benefits of their maintenance and rehabilitation program through the reduction of I&I in their collection system and at the treatment plant.

The City's existing maintenance plan currently involves physical inspection using CCTV and visual inspection; mechanical, hydraulic, and chemical cleaning of their system; and weekly inspections of their eight pump stations. The City also has in-place an ongoing rehabilitation and capital improvement program for replacement and repair of its facilities. Because the City has a very successful preventative maintenance plan already in-place, the recommendations provided for improving their annual maintenance plan is focused on a predictive maintenance program. Predictive maintenance is a method of establishing baseline performance data, monitoring performance criteria over a period of time, and observing changes in performance over time so that failure can be predicted and maintenance can be performed on a planned, scheduled basis. The planned and scheduled maintenance is performed such that the City's resources are maximized, by not doing too much or too little maintenance, but rather what is required given how the collection system functions. The primary components of the predictive maintenance plan are cleaning, physical inspection, pump station inspections, system rehabilitation and on-going CIP improvement, and having a sufficient spare parts and inventory system. Each of these categories is addressed separately, on the following pages.

7.4.2.1 *Cleaning*

The City currently has an aggressive cleaning program in-place. Chemical cleaners are used yearly for control of root intrusion. Hydraulic and mechanical cleaning is on a regularly scheduled basis. Cleaning for newly constructed facilities is on a 3-year cycle. Cleaning for existing facilities varies from a 6-month to 3-year cycle. Based on this information, there is a possibility that the City is "over cleaning" the system. It is recommended that they develop a program to determine when cleaning is needed for different areas of the collection system. Chronic problem areas, pipes with flat slopes, or recurring blockage areas may require cleaning more frequently. Areas in the system with steep slopes may require a less than 3-year cleaning cycle if no material deposition or blockages have occurred in the past in these areas.

7.4.2.2 *Physical Inspection*

The City has an on-going CCTV inspection and visual inspection program. In 2003, the City CCTV'd approximately four miles (of 104 miles) of pipeline and manholes. This equates to approximately 4 percent of their total system length, yielding a CCTV cycle of 25 years. As the City progresses from a preventative to a predictive maintenance approach, they may want to perform more frequent CCTV inspections at either a 5-or 10-year cycle. The CCTV data is then used to determine where best to allocate maintenance activities by correlating the results of inspection data with maintenance activities.

In 2003, the City spent approximately 1,350 labors hours for mechanical and hydraulic cleaning and approximately 700 labors hours on CCTV inspection. The City may want to allocate more labor hours to CCTV in order to develop a baseline of data to determine if 1,350 labor hours for cleaning activities is necessary.

7.4.2.3 *Rehabilitation and CIP*

The City has an on-going rehabilitation and CIP program. The CCTV and visual physical inspections are used to determine which areas in the system require rehabilitation, replacement or requirement improvements for capacity reasons. The condition of the facility is rated as having a minor, moderate or major defect. The City may want to implement a more rigorous rating criteria. The National Association of Sewer Service Companies (NASSCO), a non-profit organization, has recently implemented a Pipeline Condition Assessment and Certification Program (PACP) to provide standardization and consistency in the way sewer pipe conditions are evaluated. The NASSCO rating system is more robust than the City's current rating system. It could help reduce the subjectivity of performing condition assessments and rating defects. It also facilitates standardization of the rating system being used by the City, especially if more than one person is reviewing the CCTV tapes and performing the ratings.

7.4.2.4 *Pump Station Inspections*

The City performs weekly inspections at their eight pump stations. The pump station inspection and maintenance program for their pump stations should be continued as-is.

7.4.2.5 *Spare Parts and Inventory Program*

The City has a program in-place for that tracks and inventories their spare parts. The inventory is tracked every six months and spare parts are ordered when inventory becomes low. The program appears to be run effectively and should continue as-is, unless Maintenance Staff see a need for improvement.

7.4.2.6 *Performance Indicators*

The City currently uses two performance indicators to assess the effectiveness of their O&M program. The two performance indicators are (1) number of overflows per year and (2) number of complaints. The use of performance indicators provides a tangible and trackable tool for City Staff to assess the effectiveness of their current programs.

7.4.3 Summary

The City has an excellent maintenance program currently in-place. The City may want to focus on maintaining the system where it is needed based on predictive methods such as reviewing CCTV data, and identifying overflow problems, blockages, and basement back-ups. This approach will ensure that resources allocated for maintenance activities are effective and efficient, while minimizing costs. The City may want to focus more effort in the next few years evaluating the system to determine trends in residential complaints, sewer backups, blockages, overflow problems, and condition assessment using their CMMS, GIS and CCTV programs. Integrating CMMS, GIS and CCTV results will enable the overall maintenance program to be more efficient, for scheduling and prioritizing maintenance activities, organizing physical and CCTV inspection data, and assessing trends in CCTV data concerning overflow problems, blockages, back-ups and cleaning requirements.

REGULATORY ISSUES

8.1 INTRODUCTION

As new regulatory issues arise regarding the management, operation, and maintenance of sanitary sewer collection systems, the City should position itself to proactively address both current and future regulatory requirements. This chapter discusses the EPA proposed Sanitary Sewer Overflow (SSO) rule.

8.2 EPA PROPOSED SSO RULE & CMOM

Municipal sanitary sewer collection systems with discharges to waters of the United States are required by the Clean Water Act of 1972 to have a National Pollutant Discharge Elimination System (NPDES) permit. In response to the increasing frequency of sanitary sewer overflows in the United States, the EPA has developed the proposed SSO rule focused on the capacity, management, operation, and maintenance (cMOM) of sanitary sewer collection systems. cMOM is intended to be a proactive approach for reducing the public health and environmental impact of overflows, extending the life of sanitary sewer collection systems, and improving customer service.

The proposed SSO rule will impact all current NPDES permit-holders and owners of satellite sewer collection systems by requiring them to develop and implement a cMOM program. After adoption, the proposed SSO rule will require collection system owners and operators to implement cMOM programs that:

- Properly manage, operate, and maintain their sanitary sewer collection systems.
- Provide adequate collection system capacity.
- Respond promptly and effectively to stop or mitigate SSO events.
- Notify affected parties of an SSO event.
- Make the cMOM Program Plan and ongoing audits available to the general public.

Currently, the SSO rule is awaiting review by the Federal Office of Management and Budget (OMB) before being published in the *Federal Register* for public review and comment. Public comments will be incorporated into the final SSO rule for adoption, at which time cMOM requirements for sanitary sewer collection systems will become enforceable. The City can ease the impact of SSO rule and cMOM requirements by starting now to collect and organize cMOM information, taking steps to ensure adequate collection system capacity, and by establishing a proactive operation and maintenance program.

To satisfy the regulatory requirements of the proposed SSO Rule, communities will be required to develop a cMOM Program Plan with four primary components:

1. cMOM Program Summary.
2. System Evaluation and Capacity Assurance Plan (SECAP).
3. Overflow Emergency Response Plan.
4. Ongoing cMOM program audits.

Each of the primary program components is discussed separately on the next several pages.

8.2.1 cMOM Program Summary

The cMOM Program Summary is a general compilation of information about the management, operation and maintenance of the City's sanitary sewer collection system. The Program Summary has seven main components including:

- Program goals
- Organization
- Legal Authority
- Measures and Activities
- Design and Performance Provisions
- Monitoring, Measurement and Program Modifications
- Communication

A description of each of the seven components of the Program Summary are provided below.

8.1.1.1 *Program Goals*

Program goals are an important aspect of the cMOM program because they provide focus for City staff to continue or implement improvements in their management of the sanitary sewer collection system. The goals will determine the steps that must be undertaken to establish and define the purpose and anticipated results of the program. Goals should reflect performance, safety, customer service, resource use, compliance, and other considerations.

8.1.1.2 *Organization*

An organizational chart should be developed which identifies administrative and management positions responsible for implementing the cMOM program. The organizational chart should also include operations and maintenance personnel that will be involved in developing and implementing the program. The employees involved with the cMOM program should be provided with the necessary training required to perform their assigned cMOM duties.

A chain of communication for reporting SSO events will also be required. The chain of communication encompasses all those affected by the SSO event, including the initial receipt of a complaint to the notification of permitting authorities, other agencies, and the public.

8.1.1.3 *Legal Authority*

Sufficient legal authority must be provided to implement an effective cMOM program. The proposed SSO Rule identifies five areas where legal authority is necessary for implementing an effective cMOM program: (1) Controlling inflow and infiltration, (2) requiring sewers and connections to be properly designed and constructed, (3) ensure proper installation, testing, and inspection of new and rehabilitated sewers, (4) addressing flows from municipal satellite collection systems, and (5) implementing the general and specific prohibitions of the national pretreatment program under 40 CFR 403.5.

Legal authority can be provided through sewer use ordinances, service agreements, discharge permits, or other legally binding documents.

8.1.1.4 *Measures and Activities*

Measures and activities specified for implementation as part of a cMOM program should be tailored to the size, complexity, and specific features of the City's collection system. The cMOM Program Summary should include the seven measures and activities outlined below, and identify the person or position in the organization responsible for each of these measures and activities. The seven measures and activities are:

1. <u>Maintenance of facilities and equipment.</u>

The City should allocate adequate resources to the operation and maintenance of its collection system facilities and equipment. These resources include budget, staff, equipment, tools, consumables, contract services, and spare or repair parts. It also includes resources for planning, design, construction, and inspection of new or rehabilitated facilities.

2. <u>Maintenance of a collection system map.</u>

A knowledge of the location of all sanitary sewer collection system facilities is essential to effective management. This requires the maintenance of up-to-date collection system maps, either in hard-copy or electronic format. Information that should be included on sewer maps include facility location, unique facility identifier, pipe size, pipe length, direction of flow and pipe material. Additional information can include installation date, rim elevation, invert elevation (or depth to invert), and the design/construction document reference number. The section should describe the type of maps currently being used, along with procedures for updating the maps with new and rehabilitated facilities.

3. <u>Management and use of information to establish and prioritize cMOM activities.</u>

Describe the City's information management systems used for tracking all cMOM related information, including maintenance, rehabilitation, and emergency calls. This information should also include identifying SSO events and analyzing the trends of SSO events. A dynamic cMOM program should focus on approaches for planning, implementing, reviewing, evaluating, and taking appropriate actions in response to available information.

4. Routine preventive, operation, and maintenance activities.

Describe routine preventive operation and maintenance activities. A good preventive maintenance program is one of the best ways to keep a system in good repair and to prevent service interruptions and system failures that can result in overflows or back-ups. This section should include a description of the extent and frequency of operations and maintenance activities such as inspections, sewer cleaning, and pump station maintenance. The staffing and equipment required to support these activities should be consistent with the allocation of resources in paragraph 1.

5. Appropriate training on a regular basis.

Develop a training program for inspectors, operators, and maintenance personnel. An on-going training program should address the skills necessary to perform proper operations and maintenance, to provide timely and effective emergency response, incorporate recognized safety practices, and other training to ensure City collection system staff are adequately prepared to implement provisions of the cMOM program.

6. General and critical equipment and replacement parts inventory.

Prepare an inventory of equipment and replacement parts and a list of critical parts needed for collection system operation. Maintain an adequate replacement parts inventory, and provide proper storage facilities for these parts. The process for identifying critical parts should be based on a review of existing equipment and manufacturers' recommendations, supplemented by the experience of City collection system staff. The quantity and type of replacement parts will depend on size, age, operation, and condition of the sewer collection system.

7. Structural Deficiencies.

The City should identify and prioritize structural deficiencies and implement short-term and long term actions to address them. Periodic condition assessment should be performed for each sewer line segment to determine the extent and location of problem areas.

Design and Performance Provisions

The City should identify minimum design and construction standards and specification for the installation of new sewer systems and for the rehabilitation and repair of existing sewer systems. An effective program that ensures that new sewers are properly designed and installed can minimize system deficiencies that could create or contribute to future overflows or operations and maintenance problems. The City should establish specific design criteria and construction standards for new construction and for rehabilitation. Design criteria should include specifications such as pipe materials, minimum sizes, minimum cover, strength, minimum slope, trench and backfill, structure standards, and other factors as necessary.

The City should also identify procedures and standards for inspecting and testing the installation of new sewers, pump stations, and other facilities; and for rehabilitation and repair projects.

Monitoring, Measurement, and Program Modifications

The City shall monitor the effectiveness of each cMOM program element and update and modify program elements to keep them accurate, and available for audit, as appropriate. Activities and methods to be used in assessing the effectiveness of the cMOM program should be specified. The effectiveness of the program should be measured by developing and tracking performance indicators on a regular basis. The performance indicators should be in concert with the Program Goals section of the program. Specific program elements should be modified as appropriate based upon performance evaluations. Resulting program modifications should be summarized and included in ongoing audits and the cMOM Program Summary.

Communication

Communication is essential to ensuring that collection system runs efficiently and effectively. Procedures should be in-place for both internal and external communication. External communication may consist of public outreach and education forums.

8.2.2 System Evaluation and Capacity Assurance Plan (SECAP)

The SECAP includes three components: a collection system evaluation, recommended improvements for capacity assurance, and regularly scheduled updates. Many essential elements of the SECAP are addressed as part of the development of this sanitary sewer collection system master plan update. Typically, a master plan will fulfill two of the three SECAP requirements. The remaining component, scheduling regular SECAP updates, will need to be addressed. The three components are described below.

Collection System Evaluation

Evaluation of a sanitary sewer collection system should include a summary of steps planned or undertaken to identify and characterize hydraulic deficiencies contributing to SSO’s. The scope of evaluation for each identified deficiency will vary depending on it’s cause, nature, complexity, and severity.

The system evaluation must provide estimates of peak flows (including flows from SSO’s that escape from the system), provide capacity estimates for key system components, identify hydraulic deficiencies, identify components of the system with limiting capacity, and identify the major sources of inflow and infiltration contributing to SSO events. The evaluation should also include recommended remedial actions to address system deficiencies.

Capacity Assurance

Capacity assurance is the process of developing solutions to address hydraulic deficiencies identified during the sanitary sewer collection system evaluation. Under the proposed cMOM permit provision, the City would be required to implement a program to assess the current capacity of the collection system and treatment facilities that they own or over which they have operational control (i.e. satellite collection systems).

Capacity enhancement measures should establish short and long term actions to correct each identified hydraulic deficiency contributing to SSO's. Short and long term actions for each hydraulic deficiency should include alternative analyses, a prioritization of recommended projects, and an implementation schedule. The capital improvement plan should be coordinated with the identification and prioritization of structural deficiencies identified in Measures and Activities section of the cMOM program.

Future SECAP Updates

Updates to the SECAP should be completed on a regularly scheduled basis to describe any significant change in proposed actions and/or implementation schedule. The SECAP should also be updated to reflect available information on the performance of implemented measures. The City's hydraulic model, used to identify capacity deficiencies, should be maintained on a continuous basis or updated on the same regularly scheduled basis as the SECAP update.

8.2.3 Overflow Emergency Response Plan

An Overflow Emergency Response Plan (OERP) provides a standardized course of action to be followed by collection system personnel during an SSO event. An up-to-date OERP is necessary to ensure that a municipality is adequately prepared to respond to an SSO event. The OERP should describe protocols for the response, remediation, and notification of an SSO event under varying scenarios.

The OERP should identify measures to protect the public health and the environment for a broad range of potential collection system failures that could lead to an SSO. At a minimum, the OERP should ensure:

- Identification of all SSO's.
- Immediate response, emergency operations, and submittal of reports to appropriate personnel for investigation.
- Appropriate notification and reporting to the public, health officials, NPDES authority, and other affected entities.
- Personnel are properly trained in responding to an SSO event.
- Effective organization of emergency operations during an SSO event.

8.2.4 Ongoing cMOM Program Audits

Ongoing audits are required to demonstrate cMOM program effectiveness to the NPDES permitting authority (Oregon DEQ), health officials, and the public. The cMOM audit should include a discussion of cMOM program compliance with permit requirements, identified cMOM deficiencies, and necessary corrective measures. The audit should include details on the size of collection system facilities, as well as the quantity and severity of any SSO events that have occurred.

8.2.5 cMOM Program Implementation

The City completed the cMOM Initial Audit forms in the Summer of 2003. After completing the initial audit, a cMOM Gap Analysis was conducted to assess if further system management, operation, and maintenance activities should be included in the City's programs that are currently in-place. As part of the GAP Analysis, a checklist of program elements was prepared. This checklist identifies which program elements the City (1) has in-place, (2) is in the process of developing, or (3) will need to develop, if the proposed regulations, as they are written, are promulgated. The checklist is provided in Section 8.3.

The EPA has provided an initial timeframe upon which to complete each of the program components based on the quantity of wastewater generated from the City. For collection systems with an average daily flow between 1 and 5 mgd, the EPA has set the following proposed program implementation schedule:

- cMOM Program Summary – 2 years after permit issuance.
- Overflow Response Plan - 1 year after permit issuance.
- Complete & Submit Program Audit - 2 years after permit issuance.
- SECAP – completed within 3-5 years, if required.

8.3 CHECKLIST

An *initial audit* form and *collection system performance assessment* form were filled out by City Staff as part of this project. These completed forms are provided in Appendix D.

The City has done an excellent job maintaining and operating their collection system. On-going operation and maintenance activities are a priority for collection system staff. The City has also undertaken an effective I&I reduction program. This program has resulted in noticeably reduced I&I flows at the WWTP flow parshall flume during rainfall events.

After reviewing the initial audit and collection system performance assessment forms, a checklist was developed for overall cMOM program element compliance. The checklist is presented in Table 8.1 and illustrates the programs that the City currently has in-place (or are on-going), programs that are currently being developed (or in-progress), and programs that the City does not currently have but are required for cMOM compliance.

The City has many of the cMOM program elements either in-place or these programs are currently being developed. However, a few program elements have been identified that the

City may need to develop for compliance with the pending SSO regulations. These program elements are:

- Program Goals – the City needs to establish program goals. The program goals will establish and define the purpose and anticipated results of the overall cMOM program.
- Formal Training Program – the City currently provides on-the-job training but does not have a formal written training program in place.
- Water Quality Monitoring Program – the City is currently not obligated to perform water quality monitoring on their collection system or overflow events. If this changes in the future, the City will be required to implement a water quality monitoring program.
- Hydrogen Sulfide Monitoring & Control Program - the City currently does not have a formal program in place for hydrogen sulfide monitoring & control program.
- Flow Monitoring Program – the City does not currently have a formalized flow monitoring program. However, the City does conduct temporary flow monitoring as part of their collection system master plan updates, and also has a permanent flow meter at the WWTP.

Table 8.1 cMOM Checklist
Sanitary Sewer Collection System Master Plan Update
City of Ashland

Program Element	Completed or On-going Program in Place	Program In-Progress	Program Needed
1. Management (1)			
a. Program Goals			**X**
b. Organizational Structure	**X**		
c. Formal Training Program (2)			**X**
d. Communication	**X**		
e. Customer Service	**X**		
f. Management Information Systems		**X**	
g. SSO Notification Programs	**X**		
h. Legal Authority	**X**		
2. Operation (1)			
a. Operational Budgeting	**X**		
b. Compliance		**X**	
c. Water Quality Monitoring			**N/R** (3)
d. Hydrogen Sulfide Monitoring & Control			**X**
e. Safety	**X**		
f. Emergency Preparedness & Response		**X**	
g. Modeling		**X**	
h. Engineering		**X**	
i. Pump Stations	**X**		
3. Maintenance (1)			
a. Maintenance Budgeting	**X**		
b. Maintenance Activities	**X**		
c. Sewer Cleaning	**X**		
d. Parts & Equipment Inventory	**X**		
e. Flow Monitoring (4)	**X**		
f. Manhole & Pipeline Inspection	**X**		
g. Smoke Testing, Building Inspections & Dyed Water Testing		**X**	
h. Closed Circuit Televised Inspection	**X**		
i. Rehabilitation	**X**		
4. System Evaluation & Capacity Assurance Plan	**X**		
5. Overflow Emergency Response Plan		**X**	
6. cMOM Program Audit Forms (5)	**X**		

Notes:
(1) The Management, Operation and Maintenance elements encompass the cMOM Program Summary.
(2) City has on the job training, but not a formal written training program.
(3) Water Quality Monitoring is currently not required.
(4) Flow Monitoring performed as part of Sanitary Sewer Collection System Master Plan Update.
(5) The City has completed the initial audit form which is provided in Appendix D.

Appendix A

2002 AND 2003 WWTP FLOW DATA

2002 WWTP Flow
Sanitary Sewer Collection System Master Plan
City of Ashland

Flow Range (mgd) [1]	Monthly Percentage of Flow											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
< 2.0	13%	18%	42%	13%	3%	10%	10%	16%	13%	48%	63%	42%
2.0 – 2.2	65%	54%	32%	47%	26%	77%	61%	68%	73%	45%	23%	16%
2.2 – 2.5	23%	25%	23%	30%	65%	13%	29%	16%	13%	6%	10%	13%
> 2.5	0%	4%	3%	10%	6%	0%	0%	0%	0%	0%	3%	29%

Flow Range (mgd)	Seasonal Percentage of Flow			
	January - March	April - June	July - September	October - December
< 2.0	24%	9%	13%	51%
2.0 – 2.2	50%	49%	66%	26%
2.2 – 2.5	23%	36%	21%	12%
> 2.5	2%	5%	0%	11%

Notes:

(1) mgd = million gallons per day

2003 WWTP Flow
Sanitary Sewer Collection System Master Plan
City of Ashland

Flow Range (mgd) [1]	Monthly Percentage of Flow											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
< 2.0	0%	0%	0%	0%	0%	0%	3%	0%	17%	45%	60%	23%
2.0 – 2.2	0%	11%	16%	7%	35%	57%	65%	29%	77%	55%	33%	35%
2.2 – 2.5	52%	50%	45%	73%	65%	43%	32%	71%	7%	0%	7%	26%
> 2.5	48%	39%	39%	20%	0%	0%	0%	0%	0%	0%	0%	16%

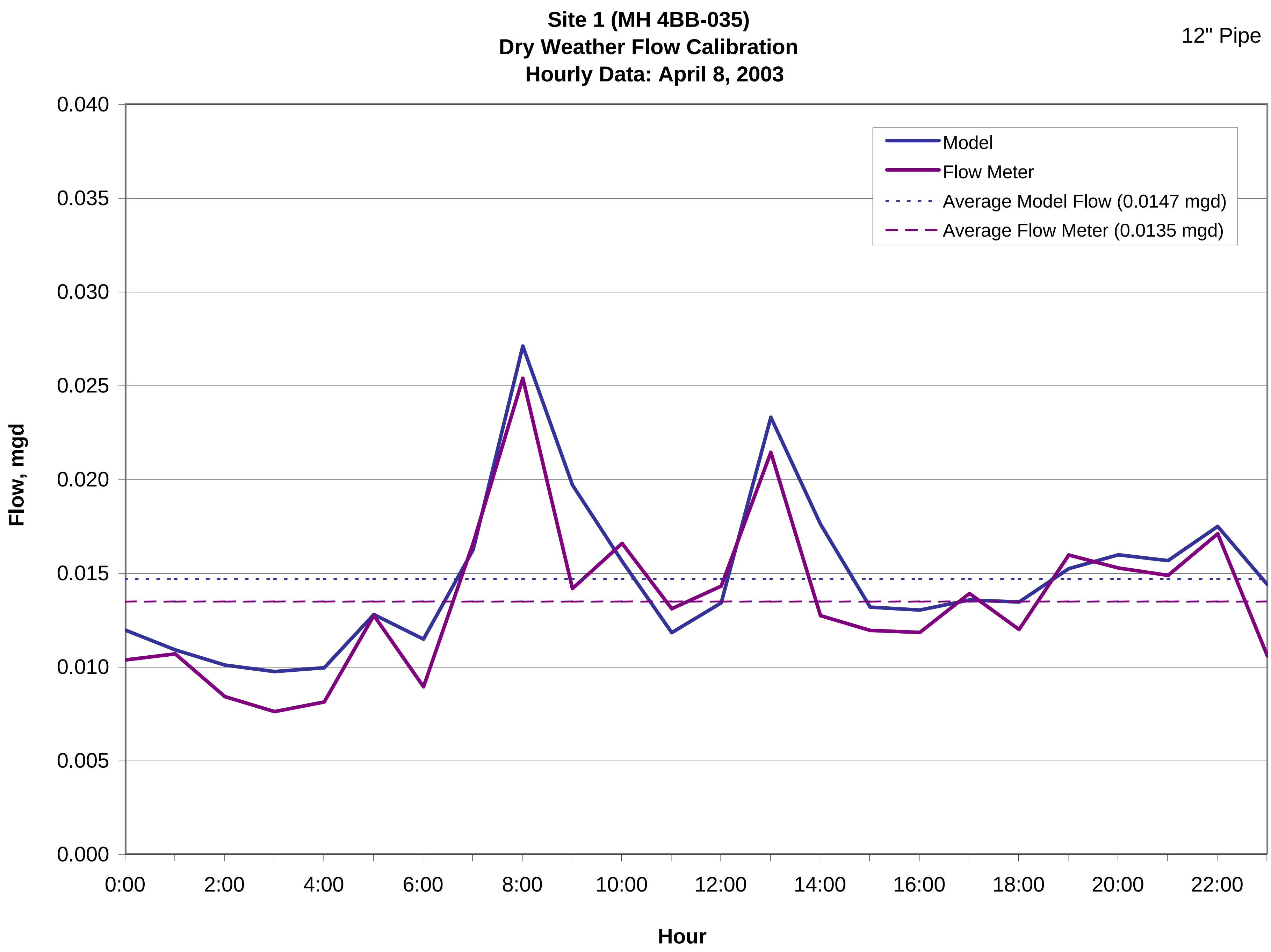
Flow Range (mgd)	Seasonal Percentage of Flow			
	January - March	April - June	July - September	October - December
< 2.0	0%	0%	7%	42%
2.0 – 2.2	9%	33%	55%	39%
2.2 – 2.5	49%	60%	38%	13%
> 2.5	42%	7%	0%	5%

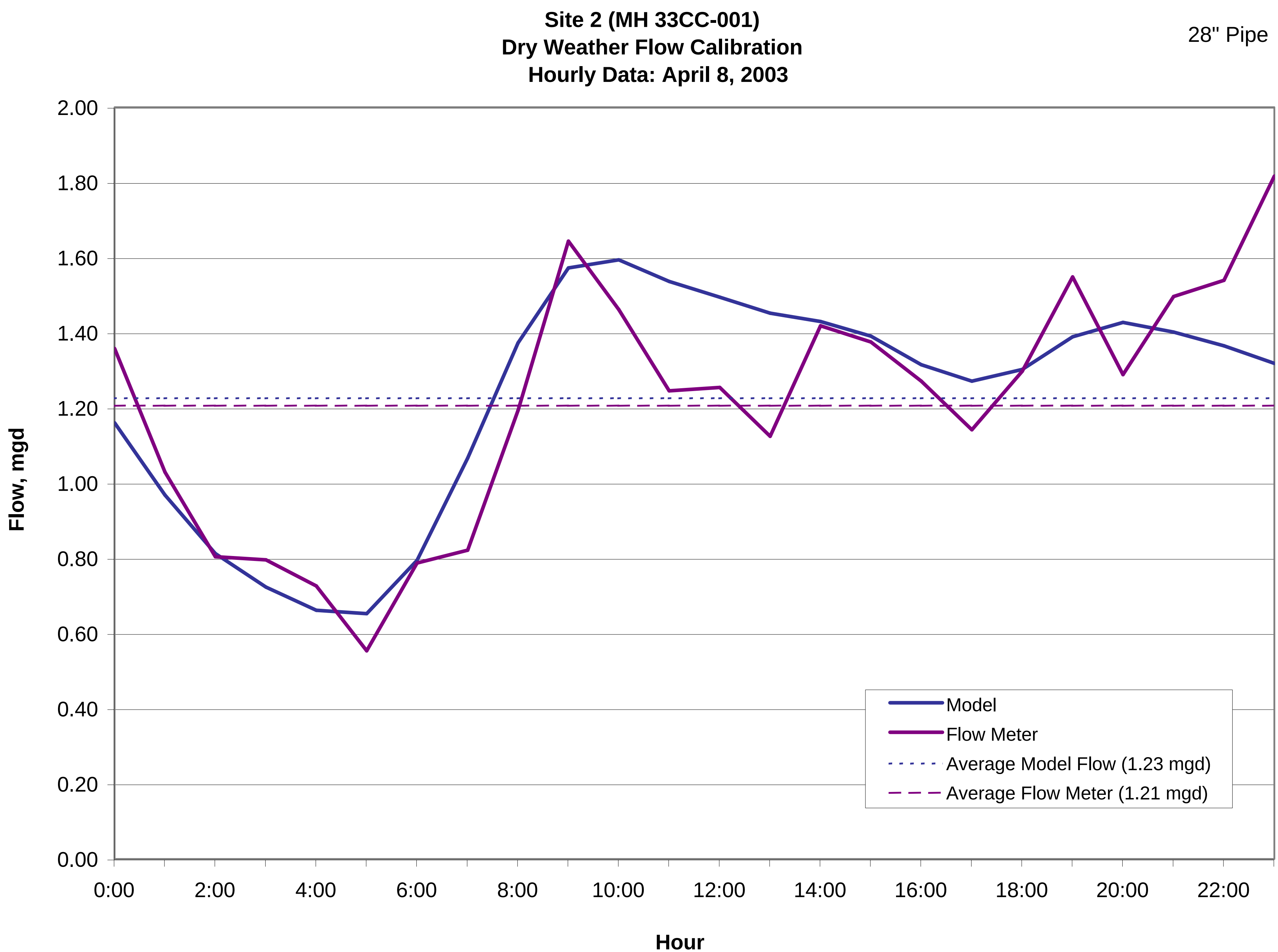
Notes:

(1) mgd = million gallons per day

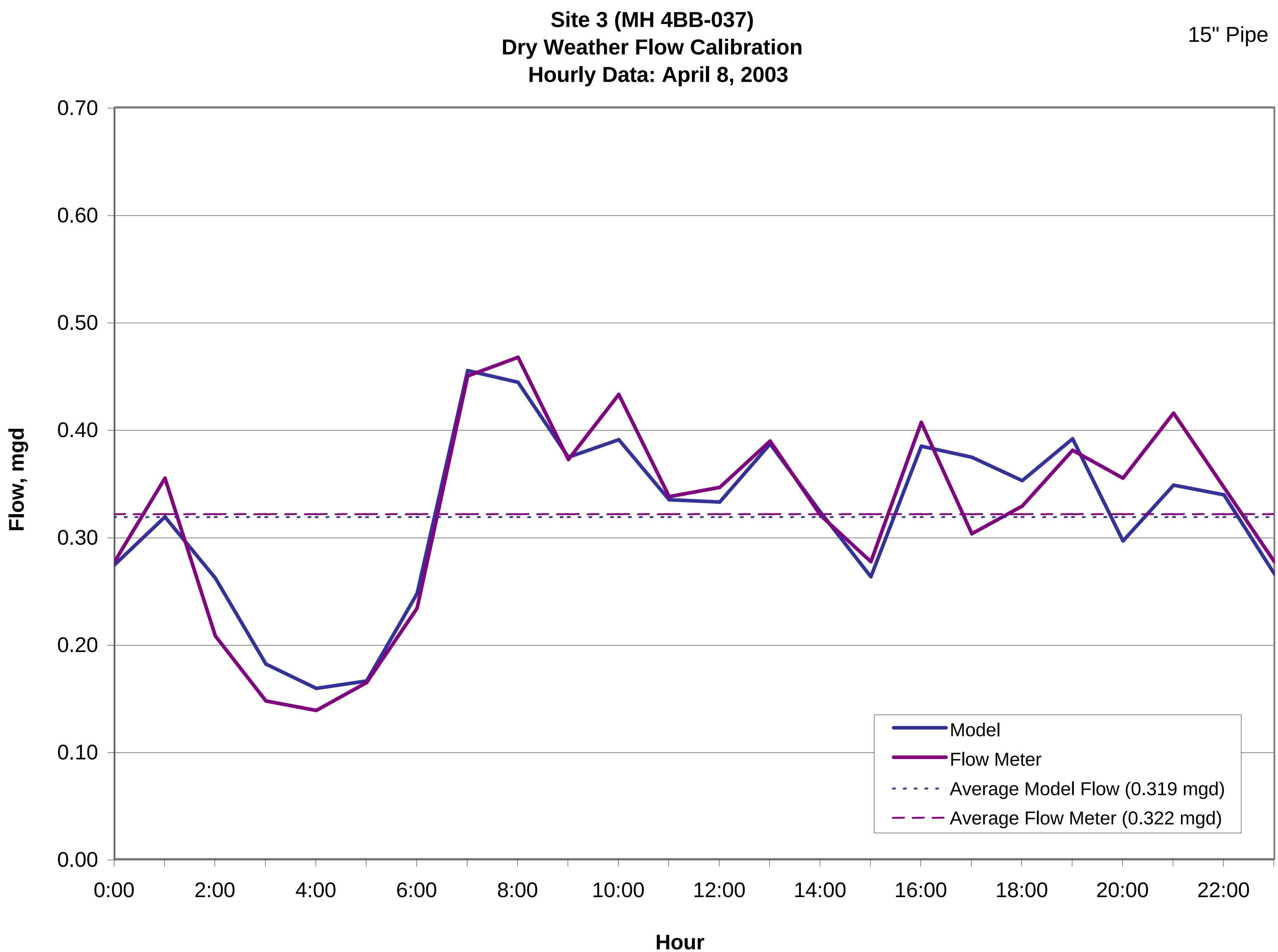
Appendix B

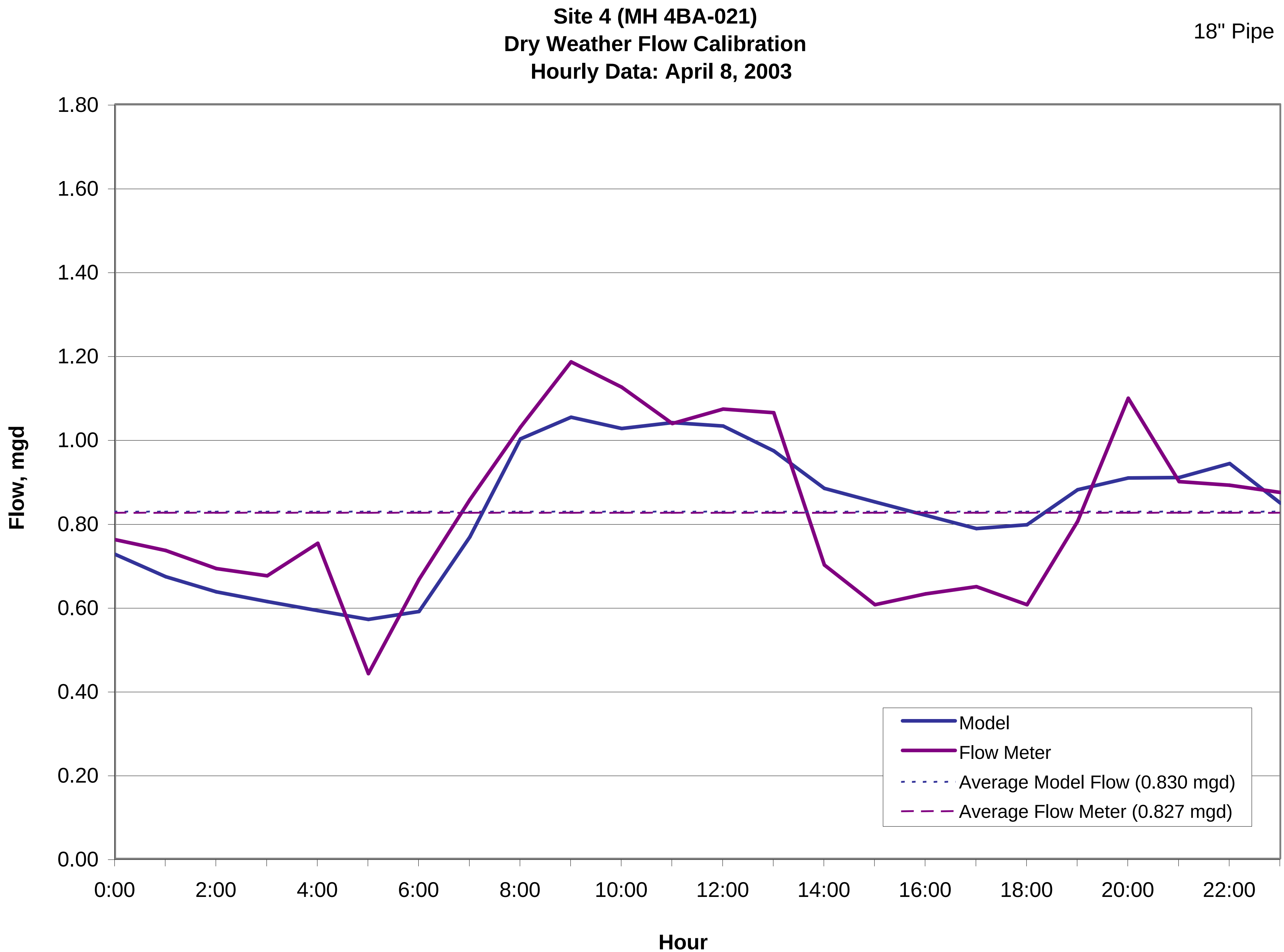
DRY WEATHER FLOW CALIBRATION


Site 1 (MH 4BB-035)
Dry Weather Flow Calibration
Hourly Data: April 8, 2003
12" Pipe
Model
Flow Meter
Average Model Flow (0.0147 mgd)
Average Flow Meter (0.0135 mgd)
Flow, mgd
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour

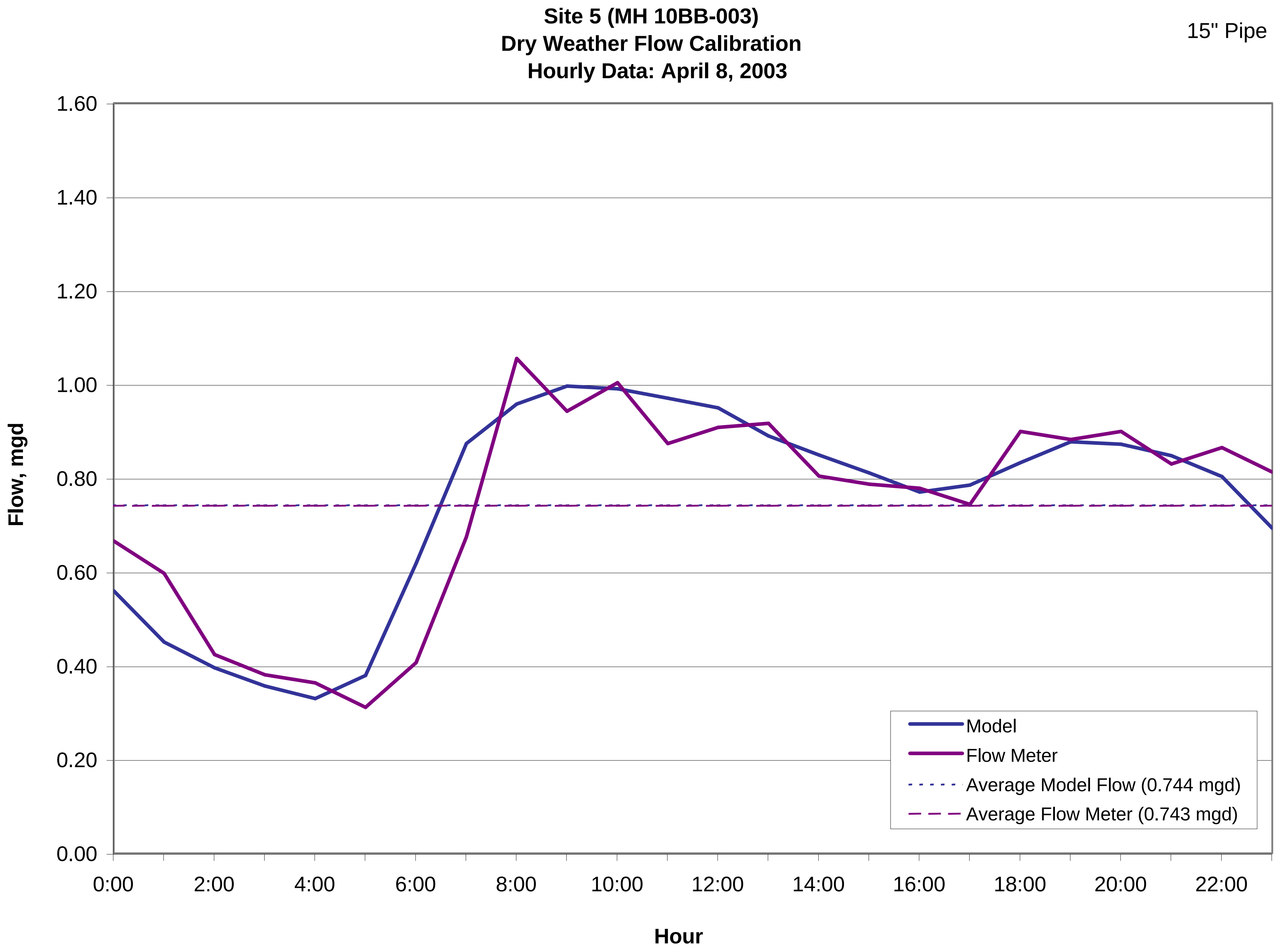


Site 2 (MH 33CC-001)
Dry Weather Flow Calibration
Hourly Data: April 8, 2003
28" Pipe
Flow, mgd
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour
Model
Flow Meter
Average Model Flow (1.23 mgd)
Average Flow Meter (1.21 mgd)

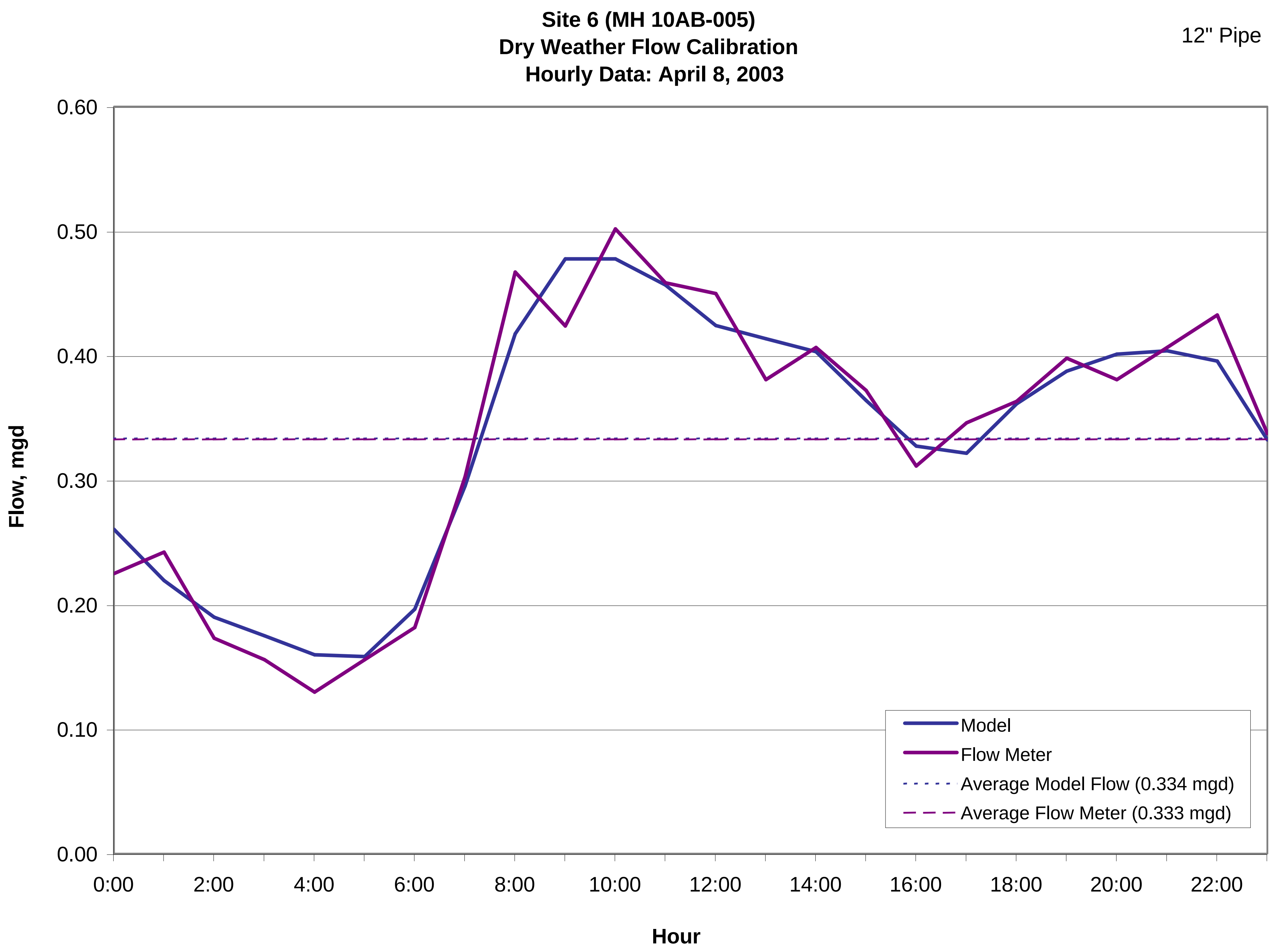

Site 3 (MH 4BB-037)
Dry Weather Flow Calibration
Hourly Data: April 8, 2003
15" Pipe
Flow, mgd
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour
Model
Flow Meter
Average Model Flow (0.319 mgd)
Average Flow Meter (0.322 mgd)

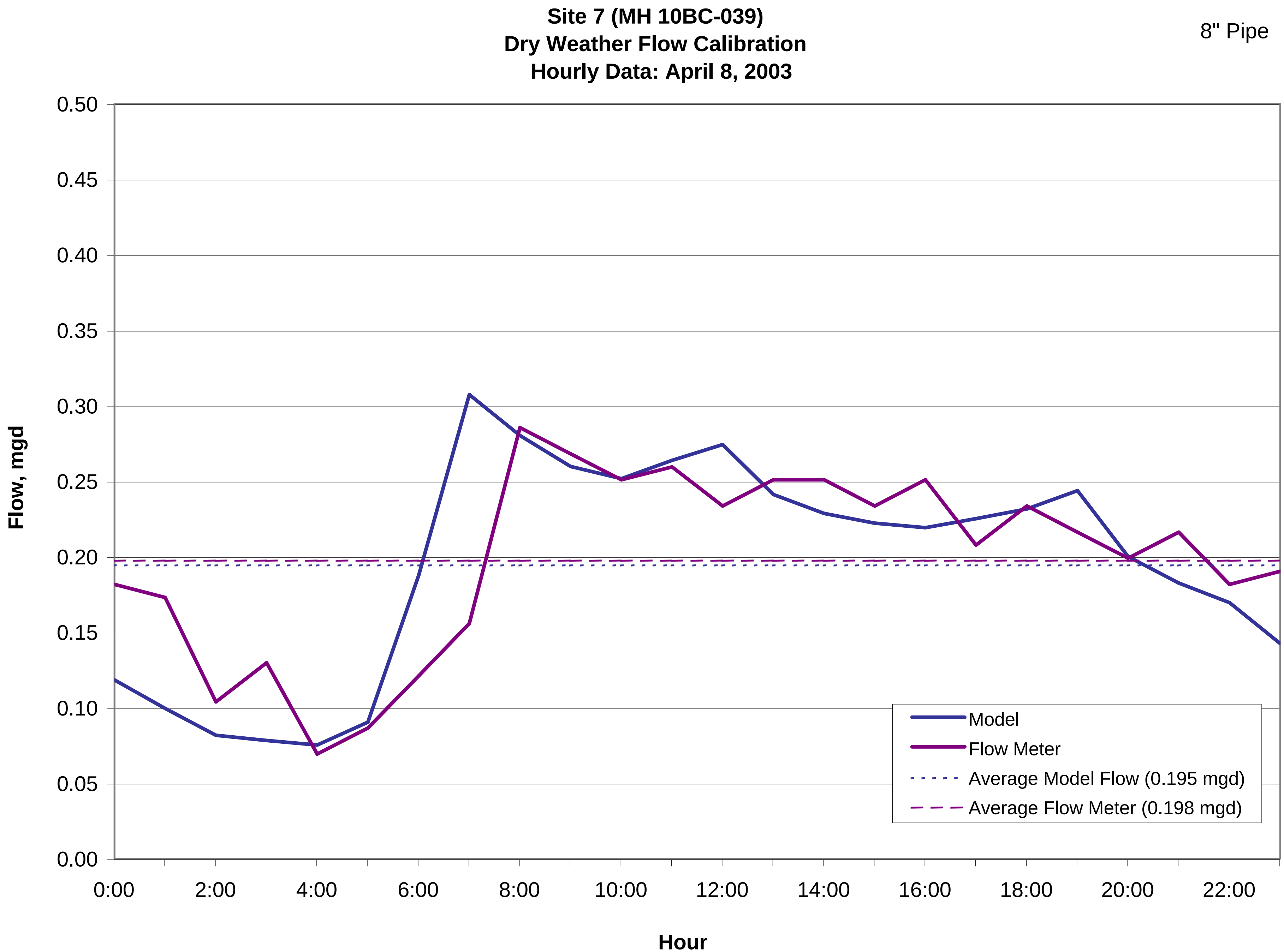


Site 4 (MH 4BA-021)
Dry Weather Flow Calibration
Hourly Data: April 8, 2003
18" Pipe
Flow, mgd
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour
Model
Flow Meter
Average Model Flow (0.830 mgd)
Average Flow Meter (0.827 mgd)

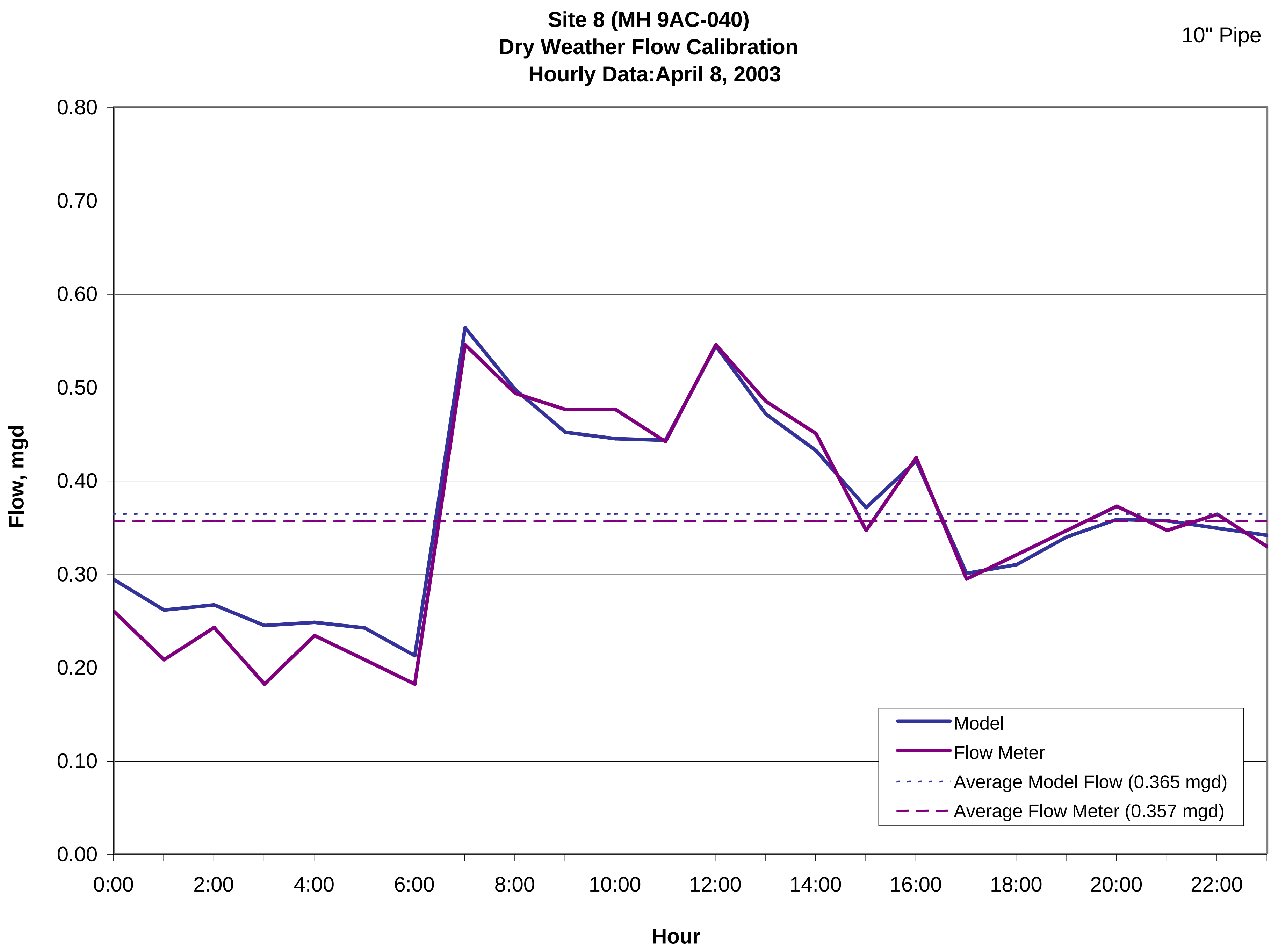


Site 5 (MH 10BB-003)
Dry Weather Flow Calibration
Hourly Data: April 8, 2003
15" Pipe
Flow, mgd
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour
Model
Flow Meter
Average Model Flow (0.744 mgd)
Average Flow Meter (0.743 mgd)

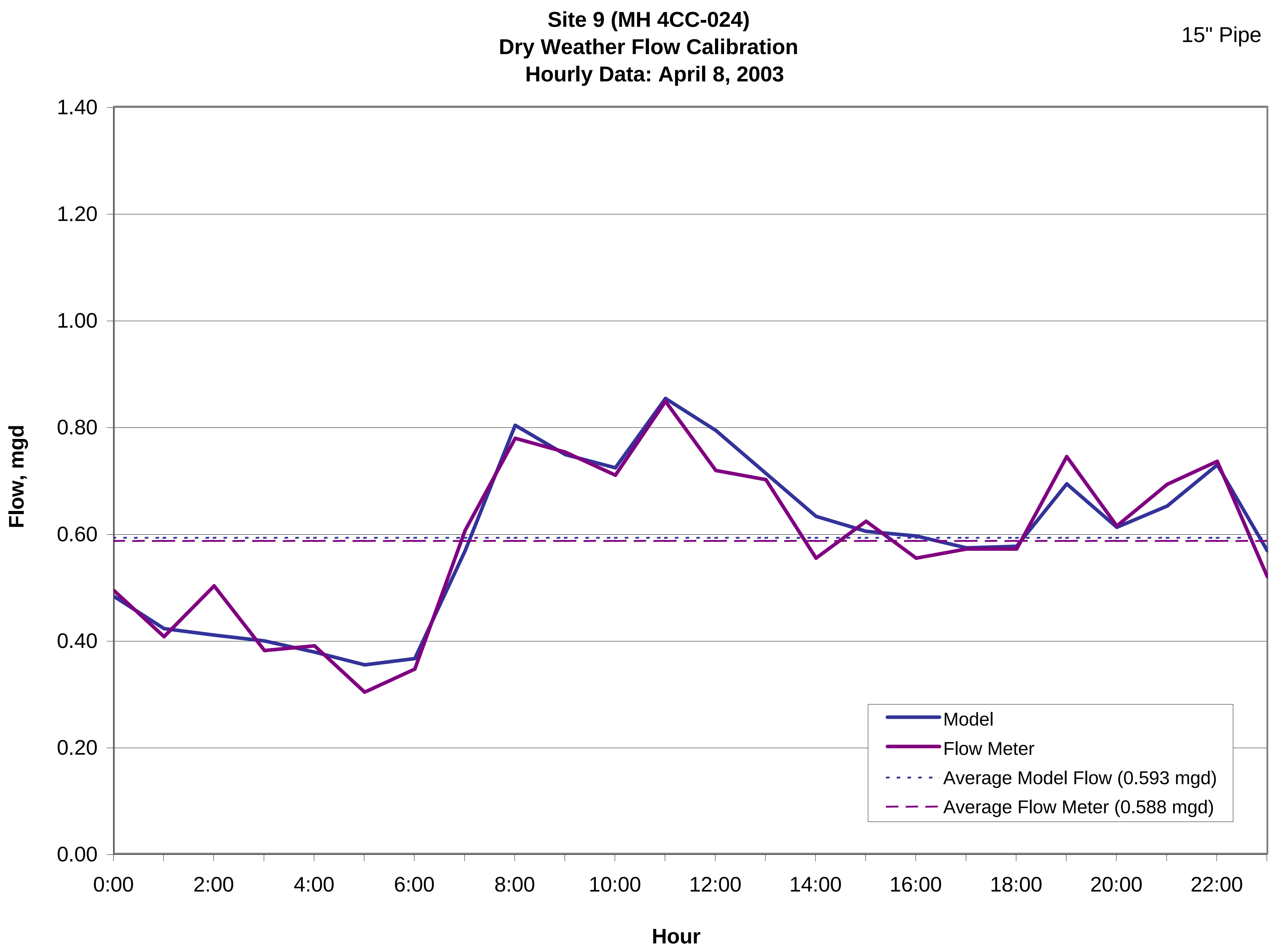

Site 6 (MH 10AB-005)
Dry Weather Flow Calibration
Hourly Data: April 8, 2003
12" Pipe
Flow, mgd
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour
Model
Flow Meter
Average Model Flow (0.334 mgd)
Average Flow Meter (0.333 mgd)



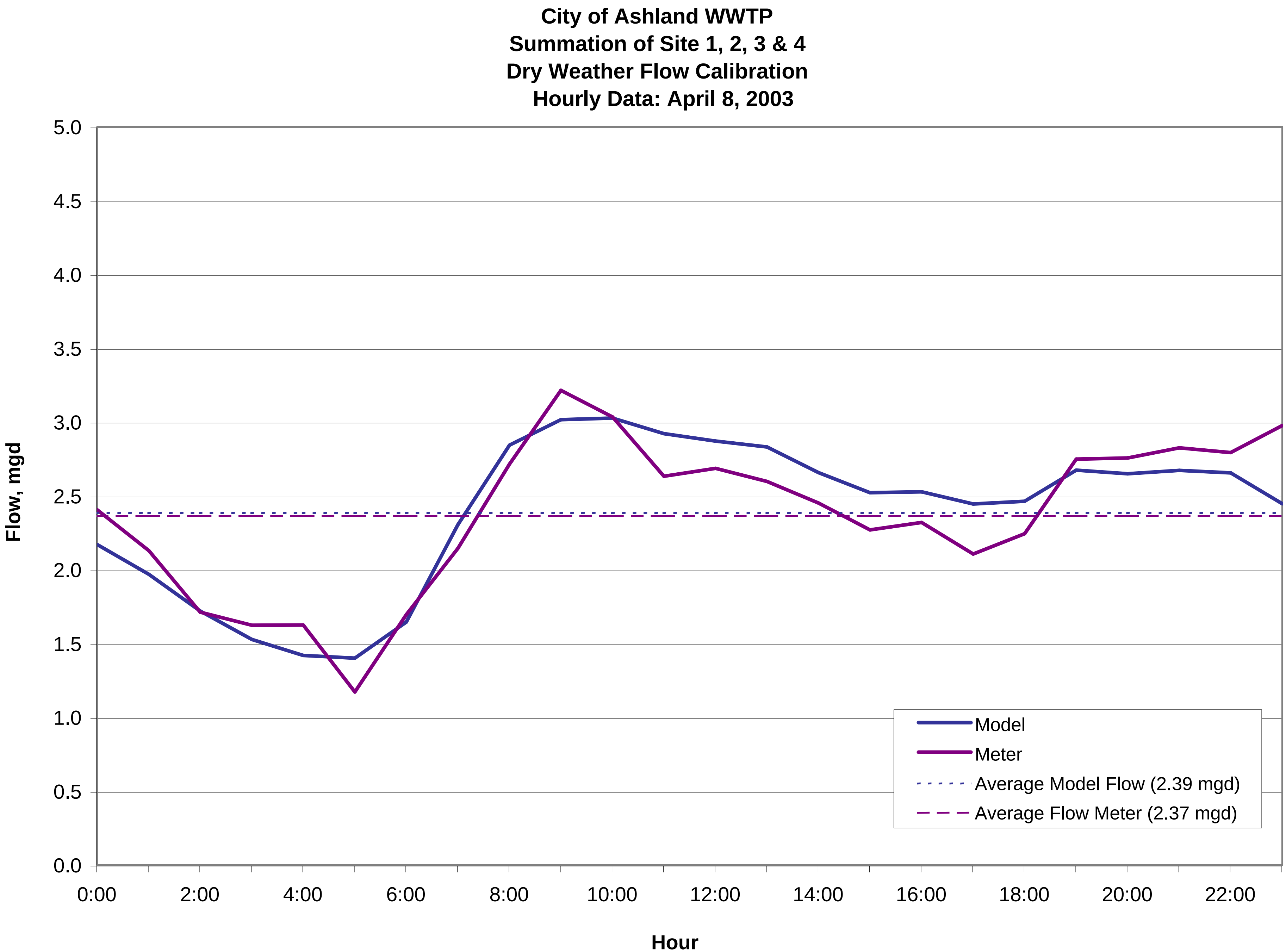
Site 7 (MH 10BC-039)
Dry Weather Flow Calibration
Hourly Data: April 8, 2003
8" Pipe
Flow, mgd
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour
Model
Flow Meter
Average Model Flow (0.195 mgd)
Average Flow Meter (0.198 mgd)



Site 8 (MH 9AC-040)
Dry Weather Flow Calibration
Hourly Data:April 8, 2003
10" Pipe
Flow, mgd
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour
Model
Flow Meter
Average Model Flow (0.365 mgd)
Average Flow Meter (0.357 mgd)

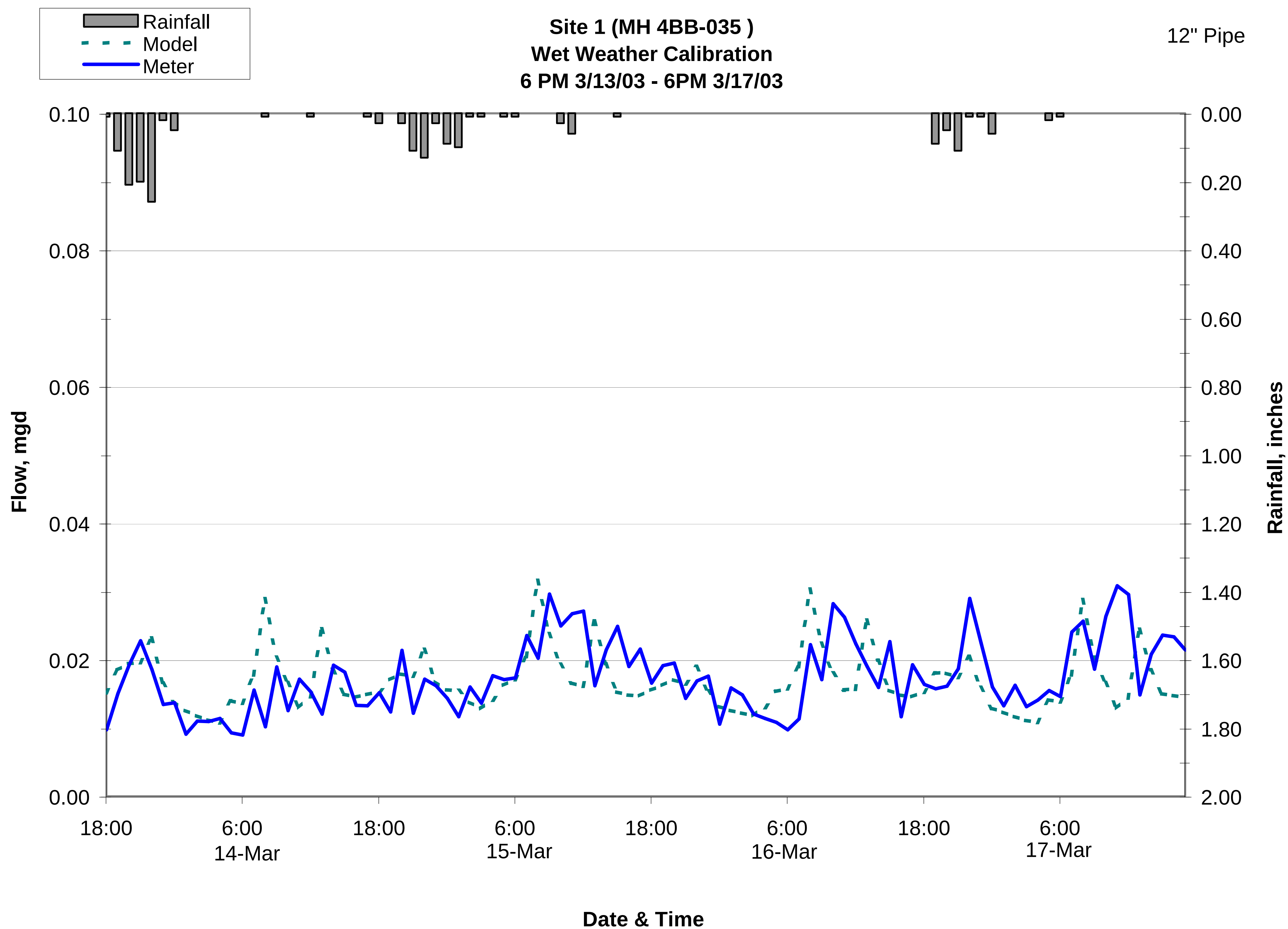


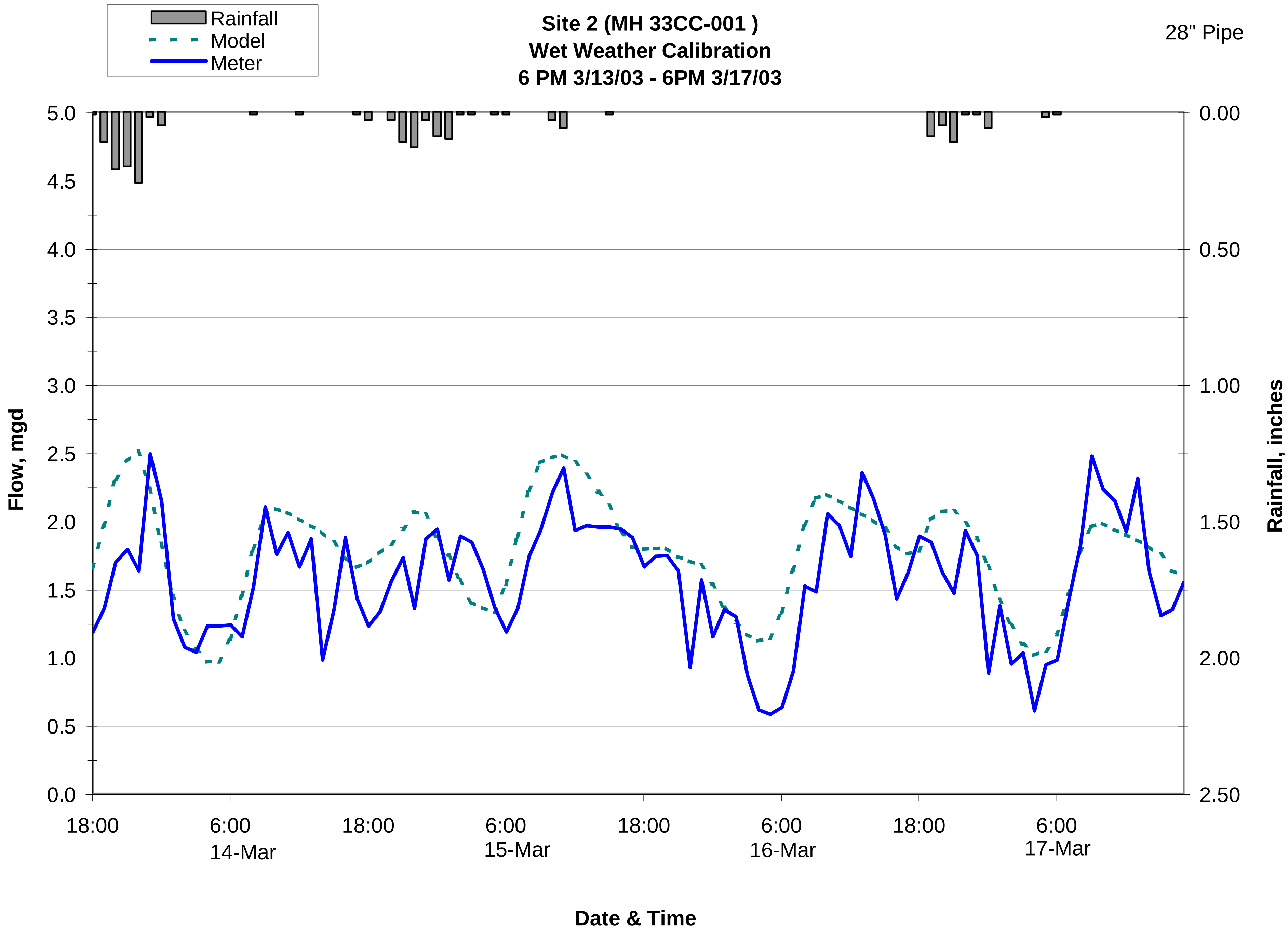
Site 9 (MH 4CC-024)
Dry Weather Flow Calibration
Hourly Data: April 8, 2003
15" Pipe
Flow, mgd
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour
Model
Flow Meter
Average Model Flow (0.593 mgd)
Average Flow Meter (0.588 mgd)


City of Ashland WWTP
Summation of Site 1, 2, 3 & 4
Dry Weather Flow Calibration
Hourly Data: April 8, 2003
Flow, mgd
Hour
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Model
Meter
Average Model Flow (2.39 mgd)
Average Flow Meter (2.37 mgd)

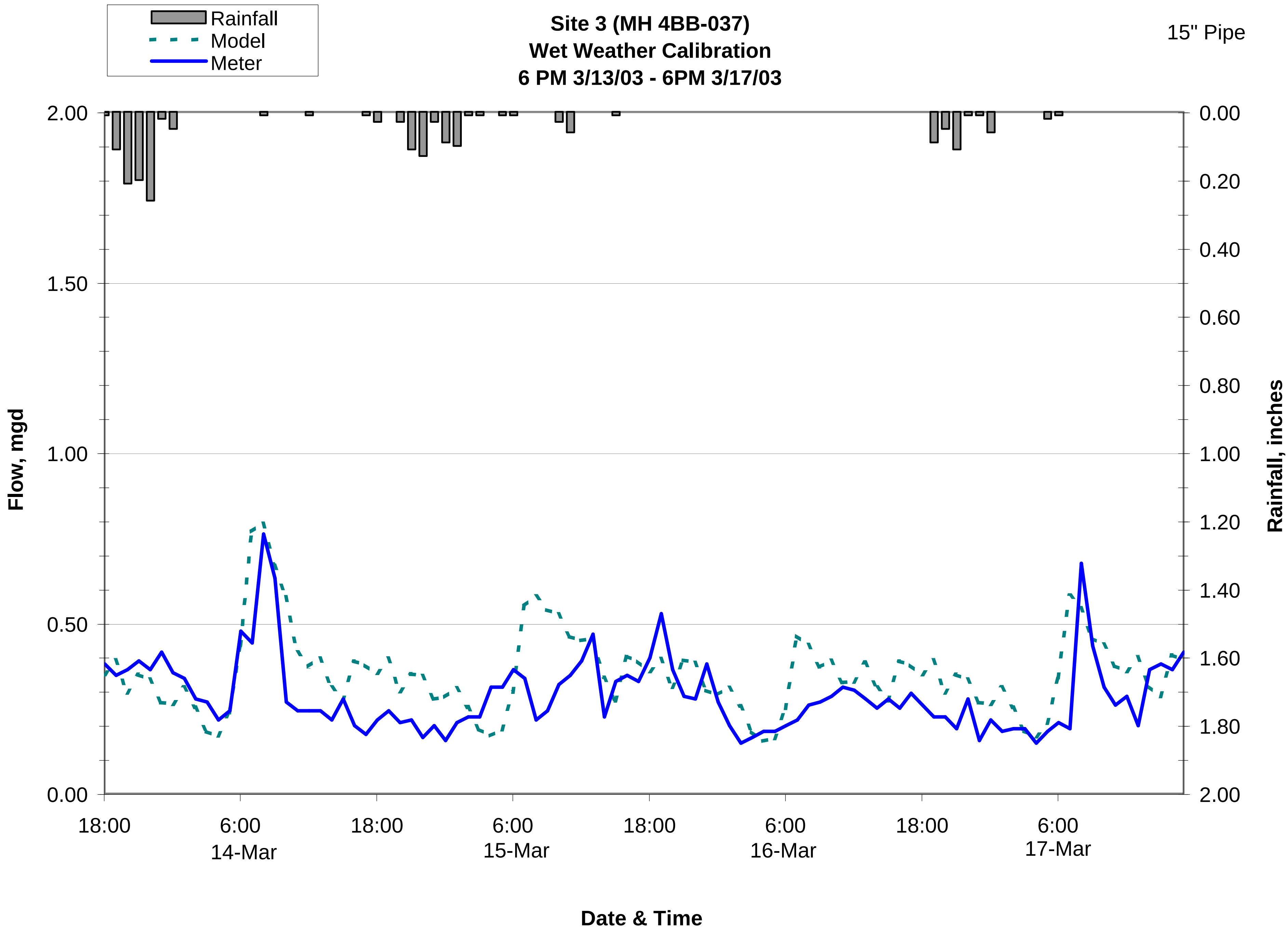
Appendix C

WET WEATHER FLOW CALIBRATION

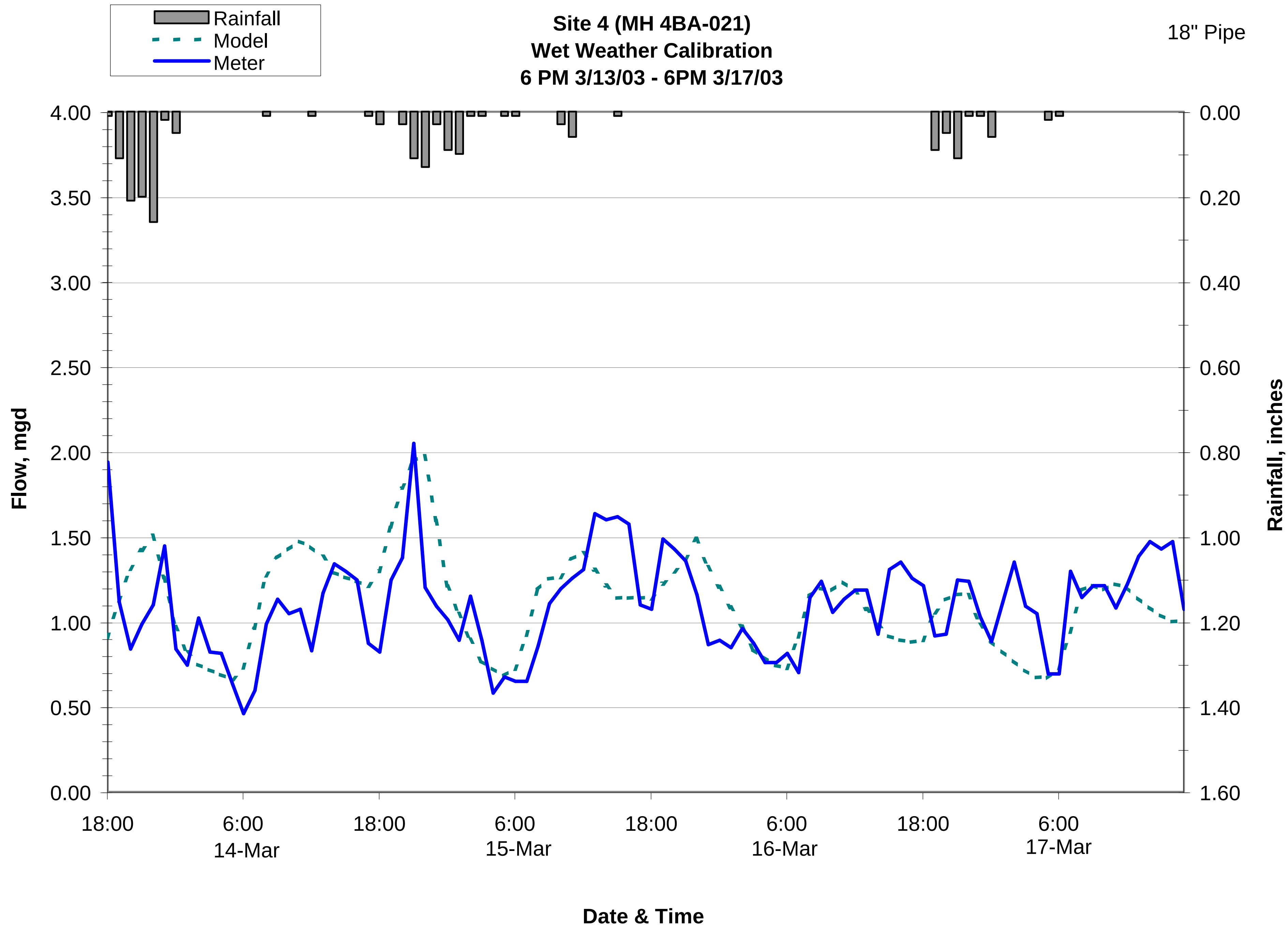

Rainfall
Model
Meter
Site 1 (MH 4BB-035)
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
12" Pipe
0.10
0.08
0.06
0.04
0.02
0.00
Flow, mgd
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
Rainfall, inches
18:00
6:00
14-Mar
18:00
6:00
15-Mar
18:00
6:00
16-Mar
18:00
6:00
17-Mar
Date & Time

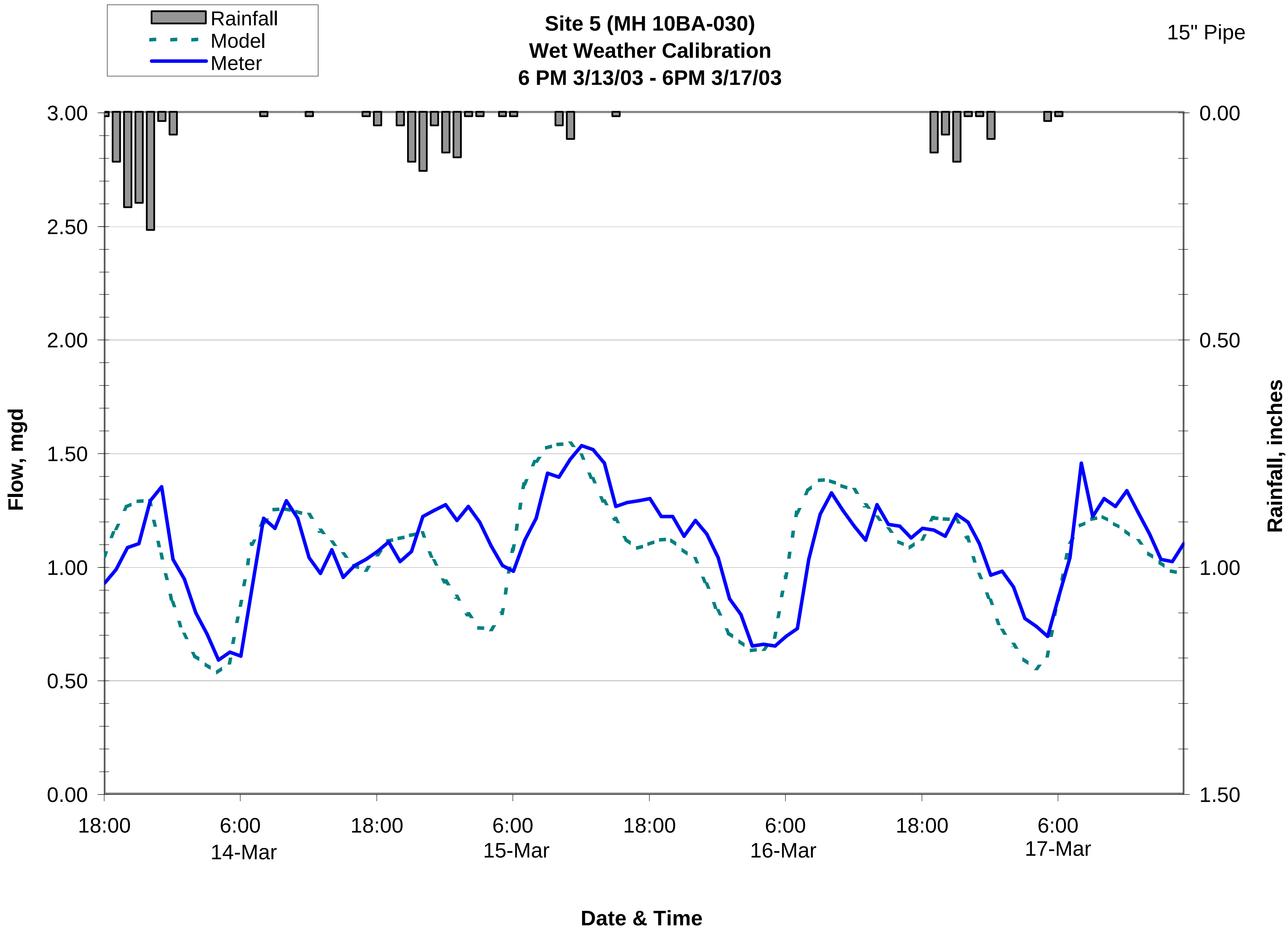


Site 2 (MH 33CC-001)
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
28" Pipe
Rainfall
Model
Meter
Flow, mgd
Rainfall, inches
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.50
1.00
1.50
2.00
2.50
18:00
6:00
14-Mar
18:00
6:00
15-Mar
18:00
6:00
16-Mar
18:00
6:00
17-Mar
Date & Time

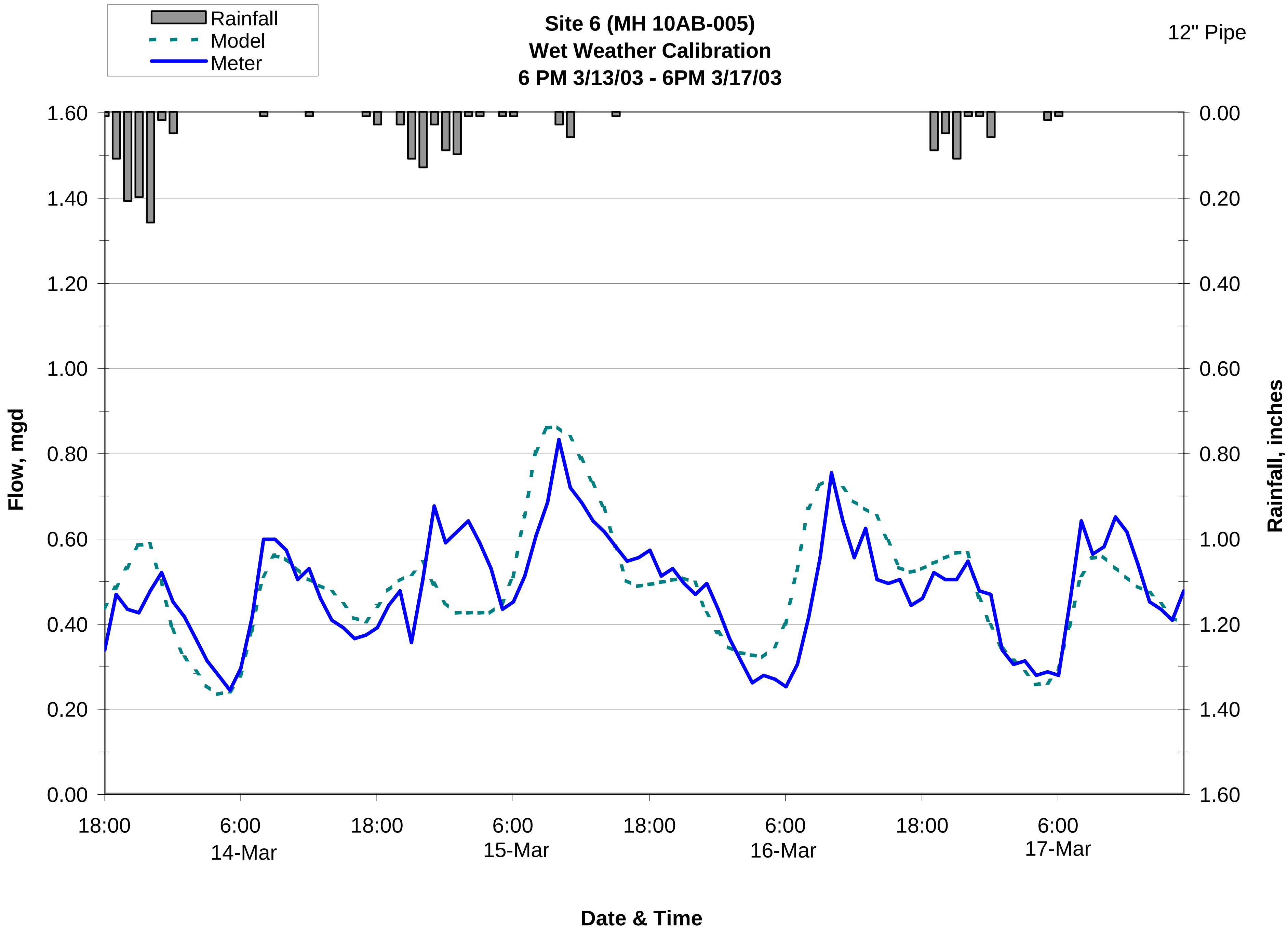


Site 3 (MH 4BB-037)
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
15" Pipe
Rainfall
Model
Meter
Flow, mgd
Rainfall, inches
2.00
1.50
1.00
0.50
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
18:00
6:00
14-Mar
18:00
6:00
15-Mar
18:00
6:00
16-Mar
18:00
6:00
17-Mar
Date & Time

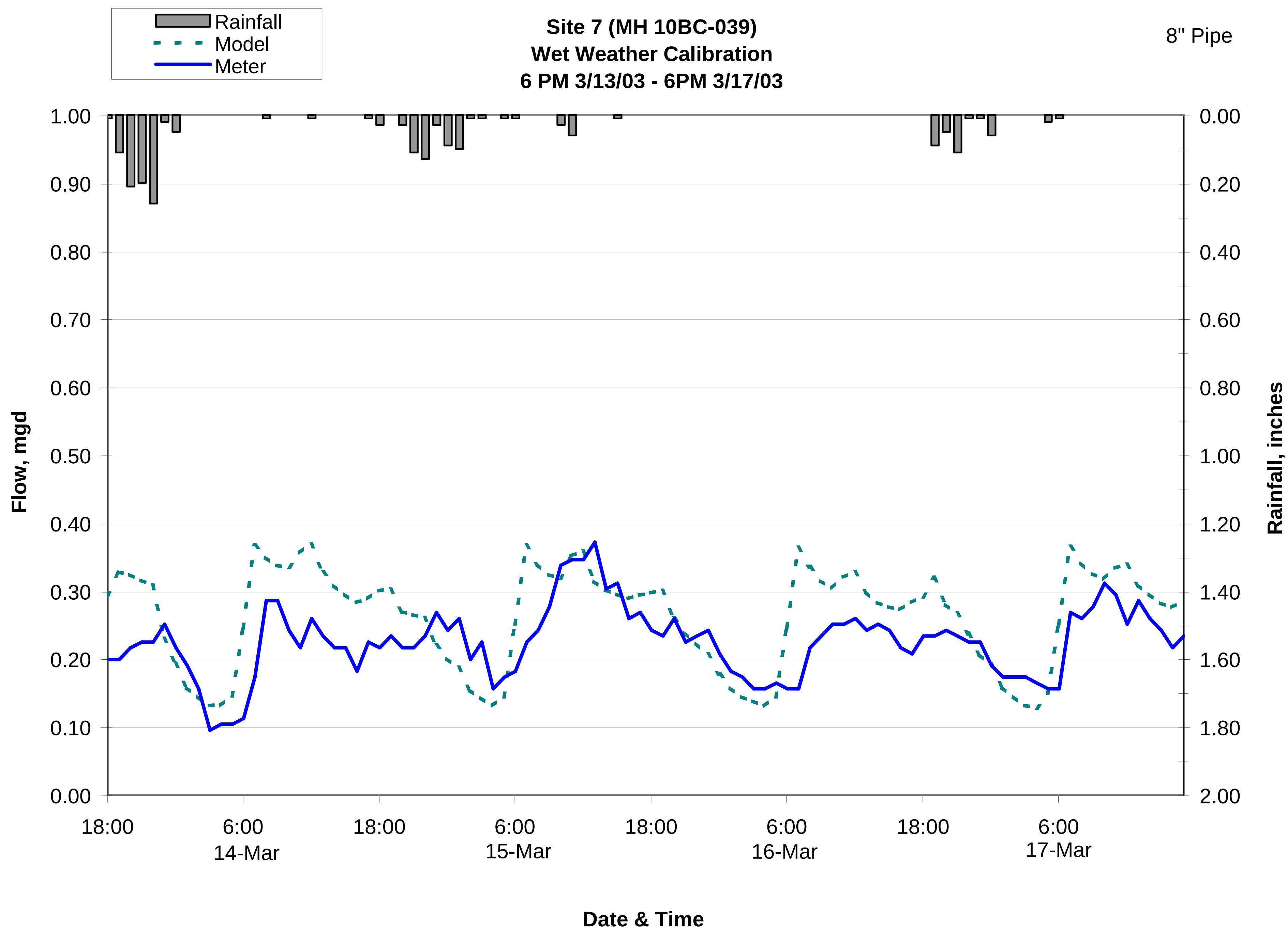

Rainfall
Model
Meter
Site 4 (MH 4BA-021)
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
18" Pipe
Flow, mgd
Rainfall, inches
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
18:00
6:00
14-Mar
18:00
6:00
15-Mar
18:00
6:00
16-Mar
18:00
6:00
17-Mar
Date & Time

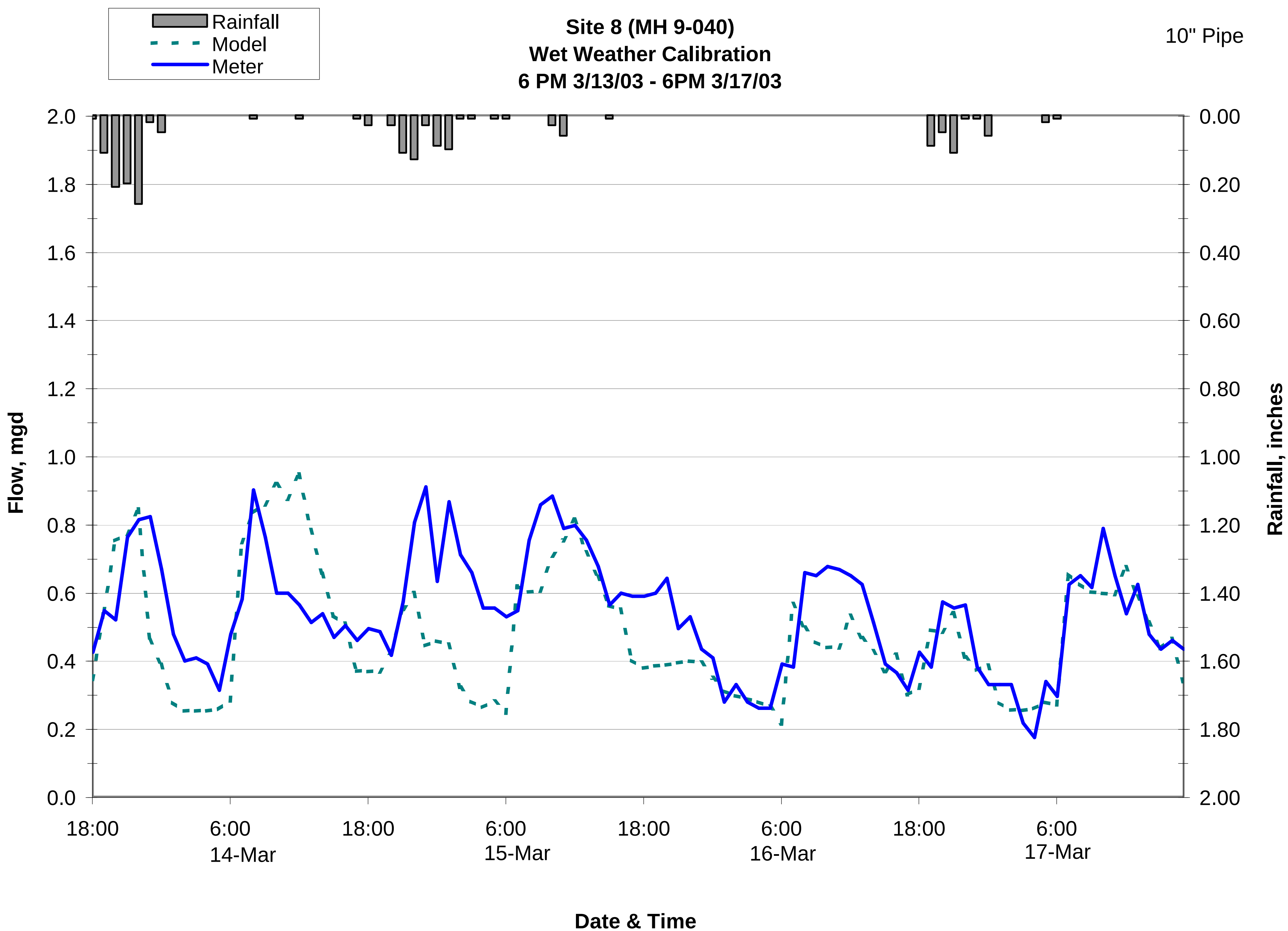


Rainfall
Model
Meter
Site 5 (MH 10BA-030)
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
15" Pipe
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
0.50
1.00
1.50
Flow, mgd
Rainfall, inches
18:00
6:00
14-Mar
18:00
6:00
15-Mar
18:00
6:00
16-Mar
18:00
6:00
17-Mar
Date & Time

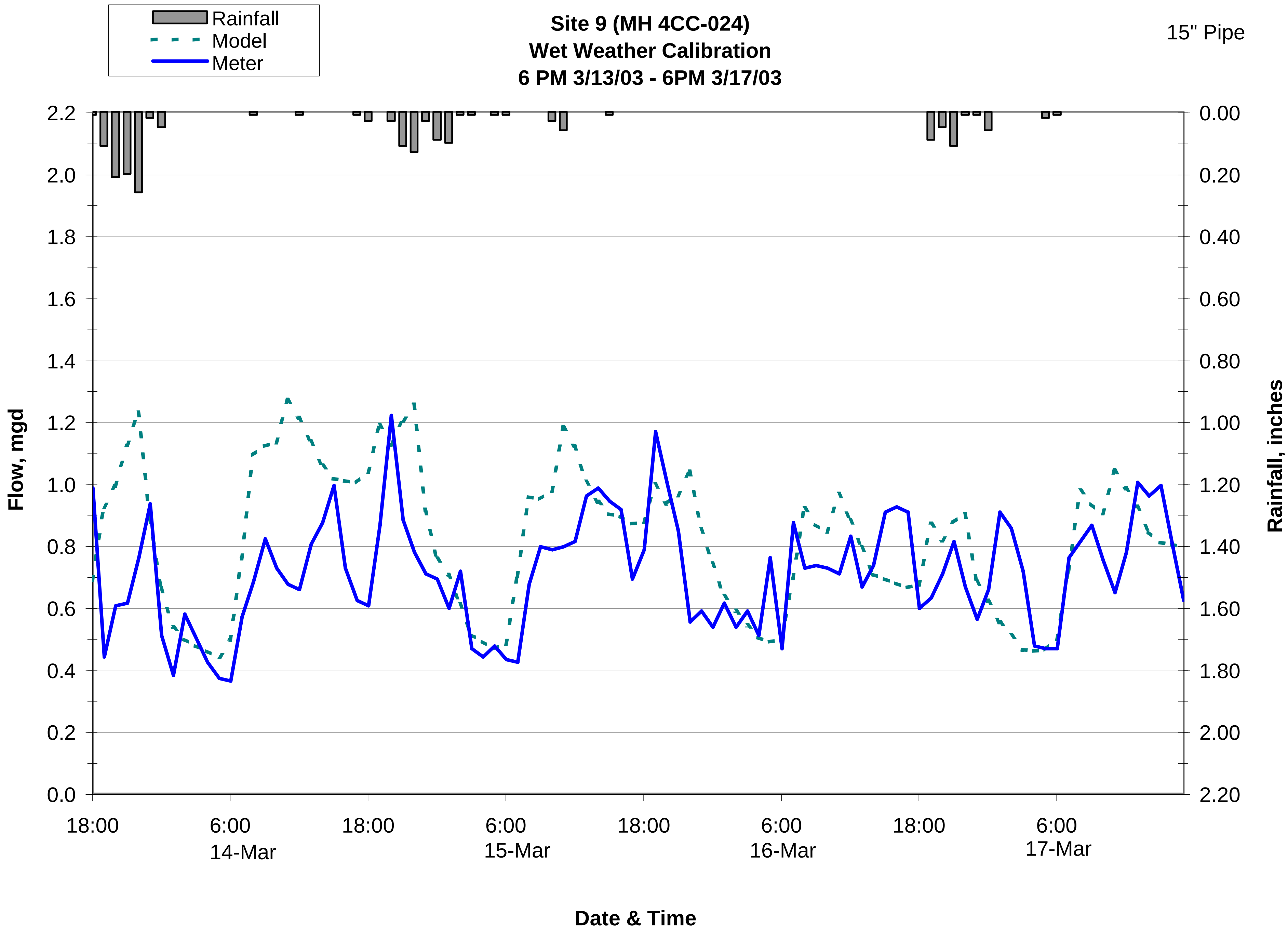


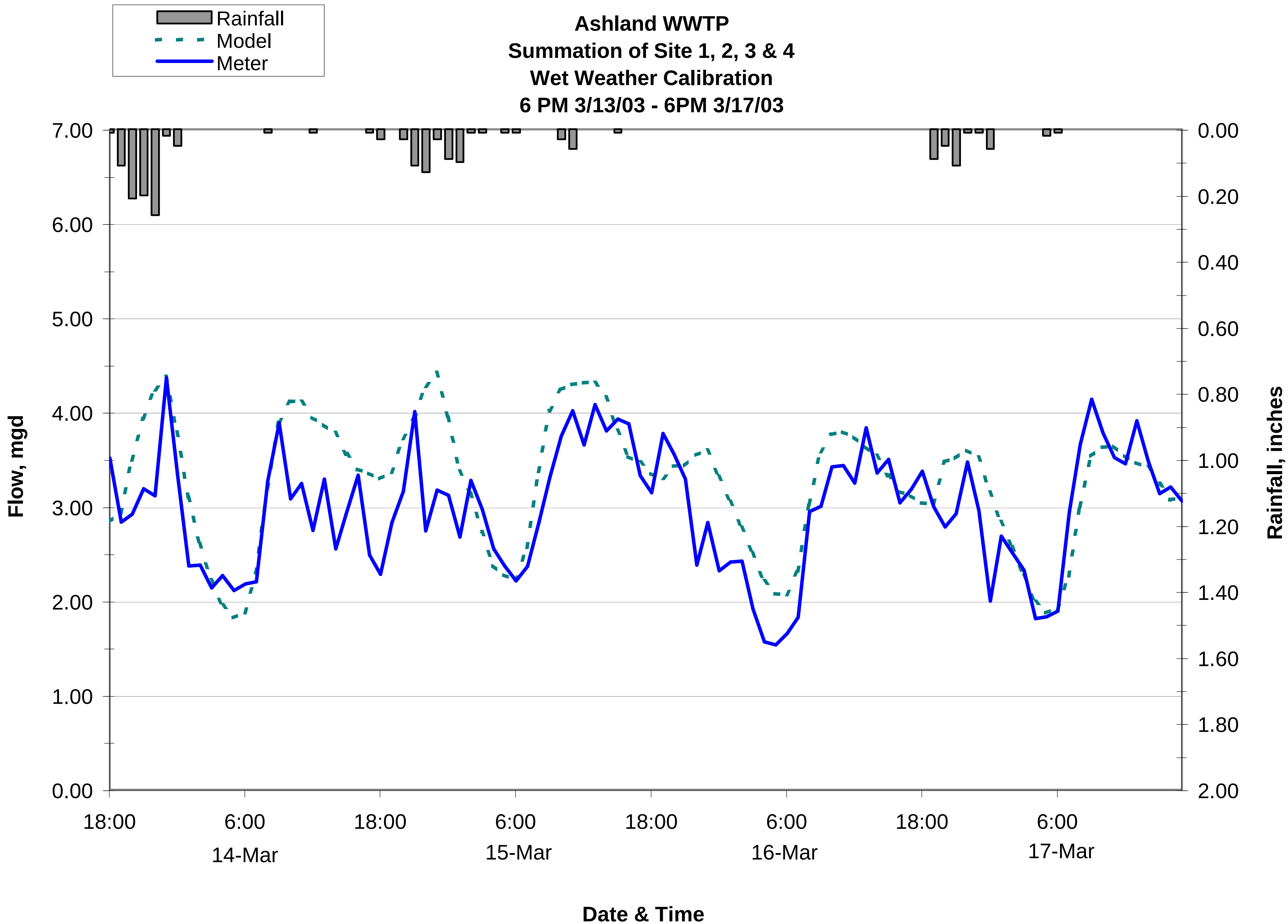
Rainfall
Model
Meter
Site 6 (MH 10AB-005)
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
12" Pipe
Flow, mgd
Rainfall, inches
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
18:00
6:00
14-Mar
18:00
6:00
15-Mar
18:00
6:00
16-Mar
18:00
6:00
17-Mar
Date & Time


Rainfall
Model
Meter
Site 7 (MH 10BC-039)
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
8" Pipe
Flow, mgd
Rainfall, inches
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
18:00
6:00
14-Mar
18:00
6:00
15-Mar
18:00
6:00
16-Mar
18:00
6:00
17-Mar
Date & Time



Rainfall
Model
Meter
Site 8 (MH 9-040)
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
10" Pipe
Flow, mgd
Rainfall, inches
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
18:00
6:00
14-Mar
18:00
6:00
15-Mar
18:00
6:00
16-Mar
18:00
6:00
17-Mar
Date & Time


Site 9 (MH 4CC-024)
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
15" Pipe
Rainfall
Model
Meter
Flow, mgd
Rainfall, inches
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
2.20
18:00
6:00
14-Mar
18:00
6:00
15-Mar
18:00
6:00
16-Mar
18:00
6:00
17-Mar
Date & Time



Ashland WWTP
Summation of Site 1, 2, 3 & 4
Wet Weather Calibration
6 PM 3/13/03 - 6PM 3/17/03
Rainfall
Model
Meter
Flow, mgd
Rainfall, inches
Date & Time
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
18:00
6:00
18:00
6:00
18:00
6:00
18:00
6:00
14-Mar
15-Mar
16-Mar
17-Mar

cMOM AUDIT FORMS

Capacity, Management, Operation and Maintenance (cMOM)

Program

COLLECTION SYSTEM

PERFORMANCE ASSESSMENT FORM

City of Ashland

July 2003

APPENDIX A
COLLECTION SYSTEM PERFORMANCE INDICATOR DATA COLLECTION FORM

I. General Information

A. Agency Name CITY OF ASHLAND

B. Agency Address
Street 90 N. MOUNTAIN AVE.
City ASHLAND State OR
Zip ____ C. Contact Person TERRY ELLIS
D. Telephone: Voice 541-552-2335 Fax 541-552-2364
E-Mail ellist@ashland.or.us

E. Data provided for latest fiscal/calendar year, ~~19~~ ____ 2002-2003

II. Collection System Description

A. Service Area 6.5 Square miles
- Population Served 20,130
- System Inventory

Miles of gravity sewer	Miles of force main	Number of maintenance access structures	Number of pump stations	Number of siphons	Number of air, vacuum, or air/vacuum relief valves
~~104.15~~ 104.15	0.75	3367	8	Ø	Ø

D. Number of Service Connections:
Residential 6679 Commercial 487 ~~Industrial~~ Restraunts 124 Total 7290

E. Lateral Responsibility (check one)
1. At main line connection only X
2. From main line to property line or easement/cleanout ____
3. Beyond property line/cleanout ____
4. Other ____

F. System combined (storm and sanitary)? Yes ___ No X If yes, % combined ____

G. Average Annual Precipitation 20.55 inches (based on last 13 yrs)

H. System Flow Characteristics (total for service area)

Peak Dry Weather Flow (MGD)	Peak Wet Weather Flow (MGD)	Average Daily Flow (MGD)
2.89	5.32	2.26

based May-OCT 02 Nov - Apr 03 MAY 02 - Apr 03

III. Special Conditions

A. Indicate local conditions that are accounted for during design, construction, operation, and maintenance of the collection system.

- **Precipitation: Yes ____ No _x_ If yes, provide brief explanation ______**

  ____

- **Terrain: Yes _x_ No ____ If yes, provide brief explanation ______**

  The City has some very steep areas

- **Soils: Yes ____ No _x_ If yes, provide brief explanation ______**

  ____

4. **Temperature: Yes ____ No _x_ If yes, provide brief explanation ______**

   ____

5. **Groundwater: Yes _x_ No ____ If yes, provide brief explanation ______**

   There are some areas of the City with a high water table or springs

6. **Geology: Yes ____ No _x_ If yes, provide brief explanation ______**

   ____

7. **Other: ______________________________**

   ____

B. Is corrosion a significant problem? Yes ____ No _x_

1. **Is there a corrosion control program in place?** Yes ____ No _x_

C. Is odor a significant problem? Yes _x_ No ____

1. **Is there an odor control program in place?** Yes _x_ No ____
   (Bioxide addition)

- **Is grease a significant problem?** Yes _x_ No ____

1. **Is there a grease control program in place?** **Yes** ____ **No** _X_

E. **Are roots a significant problem?** **Yes** _X_ **No** ____

1. **Is there a root control program in place?** **Yes** _X_ **No** ____

IV. Age Distribution of Collection System

Age	Gravity Sewer, miles	Force Mains, miles or feet	Number of Pump Stations
0 - 25 years	10.6		4
26 - 50 years	13.71	0.2	4
51 - 75 years	6.86		
> 76 years	0.94		
undetermined	72.73		

V. Size Distribution of Collection System

Diameter in inches	Gravity Sewer, miles	Force Mains, miles or feet
8 inches or less	88.4	0.75
9 - 18 inches	11.15	
19 - 36 inches	1.42	
> 36 inches		

VI. Distribution of Gravity Sewer By Material

A. Vitrified Clay Pipe (VCP) 14.77 Miles
B. Reinforced Concrete Pipe (RCP) 48.95 Miles
C. Unreinforced Concrete Pipe (CP) ____ Miles
D. Plastic (all types) 20.19 Miles
E. Brick ____ Miles
F. Other steel 0.03 Miles
G. Other orange burg 0.15 Miles
H. Other unidentified 20.73 Miles

VII. Distribution of Force Mains By Material

(circle one)

A. Reinforced Concrete Pipe (RCP) 0.05 miles or feet
B. Prestressed Concrete Cylinder Pipe (PCCP) ____ miles or feet
C. Asbestos Cement Pipe (ACP) 0.2 miles or feet
D. Polyvinyl Chloride (PVC) ____ miles or feet
E. Steel 0.06 miles or feet
F. Ductile Iron 0.09 miles or feet
G. Cast Iron ____ miles or feet
H. Techite (RPMP) ____ miles or feet
I. High Density Polyethylene (HDPE) ____ miles or feet
J. Fiberglass Reinforced Plastic (FRP) ____ miles or feet

K. Other unidentified **0.36 miles or feet**

VIII. Preventive Maintenance of System

A. Physical Inspection of Collection System, Preventive Maintenance

Inspection Activity	Total Annual Labor Hours Expended for This Activity	Total Completed (Miles of Pipe or Manholes Inspected Annually)	Crew Size (s)
CCTV	704.5	4.04	2 person
Visual Manhole Inspection, Surface Only	completed during rain events as needed		
Visual Manhole Inspection, Remove Cover	Completed as Part of CCTV work		
Visual Gravity Line Inspection, Surface Only	Completed as Part of CCTV work		
Visual Force Main Inspection, Surface Only	Completed as Part of CCTV work		
Other (Sonar, etc.)	ø	ø	ø

B. Mechanical and Hydraulic Cleaning, Preventive Maintenance

Cleaning Activity	Total Annual Labor Hours Expended for This Activity	Total Annual Labor Hours Expended for Scheduled PM	Total Miles Cleaned Annually	Crew Size (s)	Range of Pipe Diameters Cleaned
Hydraulic Jet	1356.0	1356.0	34.76	2 person	4"-24"
Bails, Kites, Scooters	ø	ø	ø	ø	ø
Combination Machines	652.5	652.5	11.61	2 person	4"-24"
Rod Machines	63.0	63.0	0.15	2 person	4"-24"
Hand Rodding	ø	ø	ø	ø	ø
Bucket Machines	ø	ø	ø	ø	ø

Chemical Root Control	∅	∅	∅	∅	4"-24"
Chemical or Biological Grease Control	∅	∅	∅	∅	4"-24"

NOTE: There was not any chemical root control done during this calendar year. Treatment was started in MAY 2003

IX. Dry Weather Stoppages

A. Number of stoppages, annually 13
B. Average time to clear stoppage 0.5 hrs
C. Number of stoppages resulting in overflows and/or backups annually 6
D. Total quantity of overflow(s) unk.
E. Is there an established procedure for problem diagnosis? Yes X No ____
F. Are future preventive measures initiated based on diagnosis? Yes X No ____
G. What equipment is available for emergency response? Mechanical rodder, Jet rodder, Jet Vac, CCTV VAN, utility Vehicle, emergency generator

X. Repairs and Rehabilitation, Proactive

A. Number of annual spot repairs identified 5
B. Number of annual spot repairs completed 5
C. Percent of spot repairs contracted ∅
D. Number of manholes identified for rehabilitation 7
E. Number of manholes rehabilitated annually 7
F. Percent of manhole repairs contracted ∅
G. Feet of main line needing rehabilitation 3340'
H. Feet of main line rehabilitated 3340'
I. Percent of main line rehabilitation contracted 100 %
J. Number of manholes scheduled for rehabilitation under Capital Improvement Program (s) ∅
K. Feet of main line scheduled for rehabilitation under Capital Improvement Program (s) 2500'

XI. Repairs and Rehabilitation, Reactive

A. Number of annual line features 4
B. Number of line repairs 4

XII. Pump Stations

A. Number of pump stations inspected 8
   1. Frequency of inspections wkly (daily, every other day, weekly)
B. Number of inspection crews 3
C. Crew size 2-3 person
D. Number of pump stations with pump capacity redundancy 8
E. Number of pump stations with backup power sources 6
F. Number of pump stations with dry weather capacity limitations ∅
G. Number of pump stations with wet weather capacity limitations ∅
H. Number of pump stations calibrated annually ∅
I. Number of pump stations with permanent flowmeters 1
J. Number of pump stations with remote status monitoring 7
K. Number of pump stations with running time meters 8
L. Number of mechanical maintenance staff assigned to mechanical maintenance 6
M. Number of electrical maintenance staff assigned to electrical maintenance ∅
   COA ELECTRIC DEPT HAS OWN ELECTRICIAN
N. Total labor hours scheduled annually for electrical and mechanical PM tasks ~~78~~ 182 man hours

O. **Total labor hours expended annually for electrical and mechanical PM tasks** 182 manhours

XIII. Pump Station Failures, Dry Weather

A. **Number of failures resulting in overflows/bypass or backup, annually** Ø

B. **Total quantity of overflow/bypass** Ø **Gallons or MG**

C. **Average time to restore operational capability** Ø **hours**

D. **Total labor hours expended for electrical and mechanical corrective maintenance tasks** Ø

E. **Is failure mode and effect diagnosed? Yes ___ No ___** N/A

F. **Are future preventive measures initiated based on diagnosis? Yes** X **No** ___ (IF NEEDED)

G. **What equipment is available for emergency response?** Backup power, Jet Vac, Jet rod, mechanical rodder, utility vehicle

XIV. Force Mains

A. Force mains inspected annually 0.75 miles or feet (visual surface inspection of alignment)

B. Force mains monitored annually 0.75 miles or feet (pressure profile, capacity)

C. Number of force main failures annually Ø

D. Cause(s) of force main failures N/A

XV. Air Relief/Vacuum Valves

A. What is frequency of valve inspections? N/A

B. What is frequency of PM (backflushing, etc)? N/A

C. Number of annual valve failures N/A

D. Cause(s) of valve failures N/A

XVI. System Operation and Maintenance Efficiency

A. Total full time or full time equivalent staff assigned to O & M (excluding administration staff but including line managers, supervisors) 7

B. Total estimated labor hours actually expended for active O & M tasks (this is the total above less hours for sick, vacation, holidays, training, breaks, etc., not directly related to performing O & M tasks) 10,875 hrs

XVII. Level of Service

A. Average annual rate for residential users $11.00 base rate

B. Rate based on: water consumption X Flat rate ____ Other ____

C. Number of complaints annually 8

D. Number of complaints that are agency responsibility 8

E. Number of public health or other warnings issued annually Ø

F. Number of claims for damages due to backups annually 5

G. Total cost of claims settled annually $99696.23 Note: we had one very large claim this year.

XVIII. Financial

A. Total annual revenue received from wastewater $2,574,125

1. 55 % of revenue for long-term debt $1,415,768.75
2. 17 % of revenue for treatment and disposal $437601.25
3. 20 % of revenue for collection and conveyance $514825.00

B. Current value of collection system assets $24,326,321.64

C. Annual O & M expenditure $530,254.00

D. Annual CIP expenditure for repair, replacement, or rehabilitation $628,937

E. **Annual O & M training budget** $3000.00
F. **Total number of O & M personnel (including administrative in O & M department)** ____

G. **Number of personnel with collection system certification** 2
H. **Number of personnel qualified for collection system certification** 4

I. **Amount of O & M budget allocated for contracted services** $130,500.00
J. **Hydroflush cost per foot** 0.34/FT Jet Rod; 0.58/FT Jet Vac
K. **Rodding cost per foot** 3.24/FT mech rod
L. **Bucketing cost per foot** ∅
M. **CCTV cost per foot** 1.27/FT
N. **Spot repairs, cost each** 1627.67

XIX. Safety

A. Total labor hours assigned to O & M 126
B. Number of lost time injuries Ø
C. Total lost time days Ø
D. Total cost of lost time injuries Ø

XX. Regulatory

A. Total number of violations issued annually Ø
B. Total cost of fines paid annually N/A
C. What is minimum reportable quantity in gallons? all overflows
D. What is time reporting requirement? 24 hrs from time of incident
E. Number of annual WWTP upsets due to wet weather flow Ø

XXI. General

A. Has SSES been performed on system? Yes _______ No X
B. Total O & M positions currently budgeted 6 1/2
C. Total O & M positions currently filled 6 1/2
D. Is computerized maintenance management system (s) used for O & M managing? Yes X No _______
E. Is GIS system used for O & M managing? Yes X No _______

XXII. Procedures or Other Documentation Available

A. Overflow, bypass and containment Yes _______ No X
B. Problem evaluation and solution Yes _______ No X
C. Cleanup procedure Yes X No _______
D. Failure mode and effect procedure Yes _______ No X
E. O & M budget process Yes X No _______
F. O & M budget with line item detail Yes X No _______
G. Long-range CIP planning for system expansion, rehabilitation, and replacement Yes X No ____
H. Is there a written procedure for cleanup to mitigate effect of overflow? Yes X No _______
I. Is there a written procedure for containing overflows and bypasses? Yes X No _______
J. Is there an established procedure for containing overflows and bypasses? Yes X No _______
K. Is there an established procedure for problem evaluation and solution? Yes _______ No X
L. Is there an established procedure for cleanup to mitigate effect of overflow? Yes X No _______
M. Is there a grease control program? Yes _______ No X
N. Is there a pretreatment program? Yes _______ No X
O. Is there a private source I/I reduction program? Yes _______ No X
P. Do you have chronic O & M problems that are designed into your system? Yes X No _______
If yes, provide brief description Need better spacing on manholes for maint. purposes

Q. Do you have chronic O & M problems that are constructed into your system? Yes X No _____ If yes, provide brief description Manhole Spacing, easement access pump station telemetry

R. How would you rate your construction inspection program? Very effective _____ Needs improvement x Poor _____

XXIII. Definitions/Clarifications

A. Maintenance access structures, most commonly manholes, in your system that are incorporated into your O & M program.

B. Pump capacity redundancy is the ability to maintain pumping at design capacity with the largest pump out of service.

C. Remote status monitoring is any remote monitoring system such as alarm telemetry or SCADA that provides remote pump station status information.

D. You will notice that in the section on stoppages and pump station failures, we are asking for dry weather incidents only. Dry weather system performance is a good indicator or effectiveness of O & M program. If you have wet weather information that you wish to provide also, please do.

E. Under the Special Conditions sections we are identifying conditions that are present in your system that require consideration during design, construction, and O & M of your system.

F. Any of the questions dealing with labor hours are designed to determine total labor hours irrespective of crew size or crews that are only assigned to cleaning, for example, less than full time.

G. Our goal is to obtain data that can be or are standardized and that are accurate. We also realize that some data may not be available; however, data can be accurately estimated. If you estimate data please follow with an (E).

H. If data is not available please indicate "NA." If data does not apply to your system, please indicate by "DNA."

I. Failure mode and effect refers to any established procedure you have to diagnose system failures to determine the cause and effect of the failure. This can apply to crews clearing stoppages or to pump station failures.

J. Pump station inspection (XII) means scheduled inspection by operators to verify station operation and perform PM. It excludes electrical or mechanical craft maintenance.

K. Stoppage in section IX refers only to stoppages other than pump stations. Pump stations are covered in Section XIII. Backup in this case refers to a basement or other structure backup as opposed to main line sewer backup.

XXIV. Additional Comments

Capacity, Management, Operation and Maintenance (cMOM)

Program

INITIAL AUDIT WORKSHEETS

City of Ashland

July 2003

Table of Contents

I. General Information

Question	Response	Documentation Available	
		Yes	No
Size of service area (acres).	6.5	X	
Population of service area.	20,130	X	
Number of pump stations.	8	X	
Feet (or miles) of sewer.	104.15	X	
Age of system.	0-76 years		X

Comments:

II. Continuing Sewer Assessment Plan

Question	Response	Documentation Available	
		Yes	No
Does the utility experience problems related to I&I? How do these problems manifest themselves? (Manhole overflows, basement flooding, structure, SSOs)	NO, most of The problem areas have been addressed. As new Problem areas are located They are repaired		X
How does the utility prioritize investigation, repairs and rehabilitation related to I & I?	Repaired as budget allows		
What methods are considered to remedy hydraulic deficiencies?	Remove I+I Replace older/smaller lines		
Does the plan include a schedule for investigative activities?	NO		
Is the plan regularly updated?	NO		

Comments:

III. A. Collection System Management: Organizational Structure

Question	Response	Documentation Available	
		Yes	No
Is an organizational chart available that shows the overall organizational structure of the utility?	yes	X	
Are there organizational charts that show functional groups and classifications?	yes	X	
Are up to date job descriptions available?	yes	X	
Does the organizational chart indicate how many positions are budgeted as opposed to actually filled?	NO	X	
Are collection system staff responsible for any other duties, (e.g., road repair or maintenance, O&M of the storm water collection system)?	yes, O+M of storm water System		

Comments:

III. B. Collection System Management: Training

Question	Response	Documentation Available	
		Yes	No
Is there a documented formal training program?	NO		
Does the training program include a general training program to address the fundamental mission, goals, and policies of the collection system utility?	NO		
Does the training program include specialized technical training to address the methods, procedures, etc. required to perform the duties and tasks necessary for collection system operation and maintenance?	NO		
Do these programs have formal curriculums?	NO		
Does On-the-Job (OJT) training use Standard Operating and Standard Maintenance Procedures (SOPs & SMPs)?	yes		
Is OJT progress and performance measured?	yes		
Are operator and maintenance certification programs used?	NO Cert. training offered but not required		
If yes, describe certification programs.			
Does the utility have a system to track employee training?	NO		

III. C. Collection System Management: Communication and Customer Service

Question	Response	Documentation Available	
		Yes	No
What type of public education/outreach programs does the utility have about user rates?	flyers, Newspaper etc.		
Do these programs include communication with groups such as local governments, community groups, the media, schools, youth organizations, senior citizens?	NO		
Is there a public relations program in place?	NO		
Are the employees of the utility trained in public relations?	NO		
Is the public notified prior to major construction or maintenance work?	yes		
How often does the utility communicate with other municipal departments?	Daily		
How are public complaints, regarding the collection system, handled?	imeadiatly, contact customer and resolve		
What are the common complaints received?	loose manhole covers, odors, Rodent Problems, etc.		
What percentage of complaints are the utility's responsibility?	90 + %		
How often are these complaints reported? Is there a record?	occasionally Tracked via work orders		
Does the utility have a formal procedure in place to evaluate and respond to complaints?	NO		
Does the utility have a process for customer evaluation of the services provided?	yes, Customer Survey		
How are complaint records maintained? (i.e., computerized) Is this information used as the basis for other activities such as routine preventative maintenance?	Computerized records CMMS is used for other activities		

Comments:

III. D. Collection System Management: Management Information Systems

Question	Response	Documentation Available	
		Yes	No
What types of work reports are prepared by the O&M Staff?	Daily work orders, monthly and yearly reports		
Do the work reports include enough information? (See example report forms)	yes, still be developed		
How are records kept?	on Computer and hard copy, stored at warehouse located at 90 N. mountain Ave.		
Does the utility use computer technology for its management information system? (Computer Based Maintenance Management Systems, spreadsheets, data bases, SCADA, etc). If so, what type of system(s) does the utility use?	yes we are currently using Cartegraph for work orders and setting it up to use Sewer view. we are currently using spreadsheets until Cartegraph is fully functional		
What kind of reports are generated from work report data?	work order reports		

Comments:

III. E. Collection System Management: SSO Notification Program

Question	Response	Documentation Available	
		Yes	No
Does the utility have standard procedures for notifying state agencies, health agencies, the NPDES authority, and the drinking water purveyor of overflow events?	yes		
Are above notification procedures dependent on the size or location of the overflow? If so, describe this procedure.	yes		
Is there a Standard form for recording overflow events? Does it include location, type, receiving water, estimated volume, cause?	yes		
Chronic SSO locations posted?	no		

Comments:

III. F. Collection System Management: Legal Authority

Question	Response	Documentation Available	
		Yes	No
What types of legal documents, sewer use ordinance, service agreements, contracts, does the agency use to control discharges to the system?	City ordinances	X	
Does the agency use satellite collection systems agreements? Are the agreements easily modified? Flow based? Contain MOM provisions?	NO		
Does the agency maintain the legal authority to control inflow sources?	NO		

Comments:

IV. A. Collection System Operation: Budgeting

Question	Response	Documentation Available	
		Yes	No
What are the utility's current rates?	11.00 base + usage	X	
How are user rates calculated?	based on water consuption		
How often are user charges evaluated and adjusted based on that evaluation?	3-5 years		
How many rate changes have there been in the last 10 years and what were they?	Several in last 10 years		
Does the utility receive sufficient funding from its revenues?	yes		
Are utility enterprise funds used for non-enterprise fund activities?	NO		
Does the utility budget for annual operating costs?	yes		
Does the budget provide sufficient line item detail for labor, materials and equipment?	yes		
Are detailed costs tracked for core and non-core business services delivered?	yes		
Are costs for collection system O&M separated from other utility services, i.e., water, storm water and treatment plants?	yes		
Do O&M managers have current O&M budget data?	yes		
Are O&M staff involved in O&M budget preparation?	yes		
How are priorities determined for budgeting for O&M during the budget process?	Prioritized through ongoing inspection throughout the year and budgeted for		
Does the utility maintain a fund for future equipment and infrastructure replacement?	yes		
Does the operating budget provide for sufficient funding to support an adequate O&M program?	yes		
How is new work typically financed?	SDC + Fee's for O+M LOANS + Fee's for Capital projects		

Comments:

IV. B. Collection System Operation: Compliance

Question	Response	Documentation Available	
		Yes	No
Does the utility have inter-jurisdictional or inter-municipal agreements?	NO		
Is there a sewer-use and a grease ordinance?	yes, but needs updated		
Is there a process in place for enforcing sewer and grease ordinances?	yes		
Are all grease traps inspected regularly?	NO		
How does the utility learn of new or existing unknown grease traps?	complaints, word of mouth we have no current inspection program		
Who is responsible for enforcing the sewer ordinance and grease ordinance? Does this party communicate with the utility department on a regular basis?	city staff		
Are there any significant industrial dischargers to the system?	NO		
Is there a pretreatment program in place? If so, please describe.	NO		
Is there an ordinance dealing with private service laterals?	NO		
Is there an ordinance dealing with storm water connections or requirements to remove storm water connections?	NO		

IV. C. Collection System Operation: Water Quality Monitoring

Question	Response	Documentation Available	
		Yes	No
Is there a water quality monitoring program in the service areas?	NO		
How many locations are monitored?	N/A		
What parameters are monitored and how often?	N/A		
Is water quality monitored after an SSO event?	it depends on severity and location of SSO		
Are there written standard sampling procedures available?	NO		
Is analysis performed in-house or by a contract laboratory?	BoTh		
Are chain-of-custody forms used?	NO		

Comments:

IV. D. Collection System Operation: Hydrogen Sulfide Monitoring and Control

Question	Response	Documentation Available	
		Yes	No
Are odors a frequent source of complaints? How many?	NO		
What is the typical sewer slope? Does the utility take hydrogen sulfide corrosion into consideration when designing sewers?	unknown NO Significant Sulfide problems		
Does the collection system utility have a hydrogen sulfide problem, and if so, does it have in place corrosion control programs?	NO		
What are the major elements of the utility's program?	N/A		

Comments:

IV. E. Collection System Operation: Safety

Question	Response	Documentation Available	
		Yes	No
Is there a documented safety program supported by the top administration official?	yes		
Is there a Safety Department that provides training, equipment, and an evaluation of procedures?	yes		
Are all O&M staff required to follow safe work procedures, such as the use of personal protective equipment (PPE), confined spaces, lock out/tag out, trenching and shoring policies, etc. ?	yes		
What type of safety equipment is available? (Tripod/hoist, atmospheric testing equipment, SCBA, lights and barricades, exhaust fans and personal protective gear?) Is the equipment maintained in a convenient location and in good condition?	Tripod/hoist, Atmospheric monitoring shoring, ventilators, vests, hard hats, barracades, cones, eyewear, shields lights, etc. yes		
Is there a permit required confined space entry procedure for manholes, wetwells, etc.? Are confined spaces clearly marked?	yes Pump station yes manholes - no marking		
How often are safety procedures reviewed and revised?	yearly		
Are workplace accidents investigated?	yes		
How does the Administration communicate with field personnel on safety procedures; memo, direct communication, video, etc.?	rarely		
Is there a Safety Committee with participation by O&M staff? How often does it meet?	yes monthly		
Is there a formal Safety Training Program? Are records of training maintained?	yes yes		

Comments:

IV. F. Collection System Operation: Emergency Preparedness and Response

Question	Response	Documentation Available	
		Yes	No
Does the facility have an emergency response plan? A contingency plan?	yes		
Does the plan take into consideration vulnerable points in the system, severe natural events, failure of critical system components, vandalism or other third party events, and a root cause analysis protocol?	yes		
Are there emergency operation procedures for equipment and processes?	NO		
How does the facility track and report emergencies?	Spreadsheets until CMMS is functional		
Is there an emergency contact list, including telephone numbers?	yes		
Is there a hazard classification system? Where is it located?	yes		
Does the facility conduct vulnerability analyses?	yes		
Are staff trained and drilled to respond to emergency situations? Are responsibilities detailed for all personnel who respond to emergencies?	yes		
Are risk assessments performed? How often?	yes, performed with our Safety Program and city risk manager		
Do work crews have immediate access to tools and equipment during emergencies?	yes		
Is there a public notification plan? If so, does it cover both regular business hours and off-hours?	yes		

Comments:

IV. G. Collection System Operation: Modeling

Question	Response	Documentation Available	
		Yes	No
Does the utility have a hydraulic Model of the Collection system including pump stations? What model is used?	working on it		
What uses does the Model serve (predicting flow capacity, peak flows, force main pressures, etc.)?	working on it		
Is the model calibrated? How? How often?	working on it		
Is the model kept up to date with respect to new construction and repairs that may affect hydraulic capacity?	working on iT		

Comments:

IV. H. Collection System Operation: Engineering- System Mapping and As-built Plans (Record Drawings)

Question	Response	Documentation Available	
		Yes	No
What type of mapping/inventory system is used?	mapping is currently being updated through the City Engineering Dept.		
Is there a procedure for recording changes and for updating the mapping system?	NO		
Are sewer and manhole attributes (size, material, age, slope, invert elevation, etc.) recorded?	yes		
Are "as-built" plans (record drawings) or maps available for use by field crews in the office and in the field?	yes		
Do field crews record changes or inaccuracies and is there a process in place to update "as built" plans (record drawings)?	Field crew identify changes and forward to Engineering		
Is mapping information in a GIS?	yes		

Comments:

IV. I. Collection System Operation: Engineering - Design

Question	Response	Documentation Available	
		Yes	No
Is there a document which details design criteria and standard construction details?	yes		
Is life cycle cost analysis performed as part of the design process?	not yet, installing new CMMS program, Cartegraph		
Is there a document that describes the procedures that the utility follows in conducting design review? Are there any standard forms that guide the utility?	unk		
Are O&M staff involved in the design review process?	yes		
Do design documents have established protocol for start-up, testing and acceptance?	yes		

Comments:

IV. J. Collection System Operation: Engineering - Capacity

Question	Response	Documentation Available	
		Yes	No
What procedures are used in determining whether the capacity of existing gravity sewer system, pump stations and force mains are adequate for new connections?	Just Completed I & I Study No written procedures Gravity Sewers are televised and visually monitored, Pump Stations are analyzed Through Engineering Dept.		
Is any metering of flow performed prior to allowing new connections?	NO		
Is there a hydraulic model of the system used to predict the effects of new connections?	NOT yet		
Is there any certification as to the adequacy of the sewer system to carry additional flow from new connections required?	NO		

Comments:

IV. K. Collection System Operation: Engineering - Construction

Question	Response	Documentation Available	
		Yes	No
Who constructs new sewers? If other than the utility, does the utility review and approve the design?	City staff will do minor replacements Engineering contracts major work Design is done both in house and by contract		
Is there a document that describes the procedures that the utility follows in conducting their construction inspection and testing program?	yes 2002 APWA ODOT STANDARDS SPECS FOR CONST.		
Are there any standard forms that guide the utility in conducting their construction inspection and testing program?	Available but not always used		
Is new construction inspected by the utility or others?	UTILITY		
What are the qualifications of the inspector(s)?	APWA Trained		
What percentage of time is a construction inspector on site?	Full Time		
Is inspection supervision provided by a registered professional engineer?	Const. Engineering review is provided every 2 wks		
How is the new gravity sewer construction tested? (Air, water, weirs, etc.)	Air Mandrel testing		
Are new manholes tested for inflow and infiltration?	Vacuum		
Are new gravity sewers televised?	yes		
What tests are performed on pump stations?	drawdown, pump tests, Scada etc.		
What tests are performed on force mains?	Pressure testing		
Is new construction built to standard specifications established by the local utility and/or the State?	utility and state standards		
Is there a warranty for new construction? If so, is there a warranty inspection done at the end of this period?	1 year minimum with 2 years on some work. No warranty inspection is done on Sanitary Sewer		

Comments:

IV. L. Collection System Operation: Pump Station Operation

Question	Response	Documentation Available	
		Yes	No
How many pump stations are in the system?	8		
How many personnel are assigned to pump station operations?	6½		
Are these personnel assigned full-time or part-time to pump station duties?	Part Time		
Are there manned and un-manned pump stations in the system? How many of each?	all un manned		
Are pump stations typically operated with one or more pumps on standby?	yes		
What set points are established to turn the pumps on and off?	float Controls		
How many times per hour do the pumps(s) typically cycle on and off?	Vary with flow		

Comments:

IV. L. 1. Collection System Operation: Pump Stations - Inspection

Question	Response	Documentation Available	
		Yes	No
How often are pump stations inspected?	weekly		
What work is accomplished during inspections?	Pump operation, wet well maint. Dry well + Equip maint. Scada checks etc		
Is there a checklist?	yes		
Are there Standard Operating Procedures (SOPs) and Standard Maintenance Procedures (SMPs) for each station?	yes		
What are the critical operating characteristics maintained for each station? Are the stations maintained within these criteria?	All pumps and equip is operational at all Times. Backup power is also inspected and tested. SCADA System are tested weekly		

Comments:

IV. L. 2. Collection System Operation: Pump Stations - Emergencies

Question	Response	Documentation Available	
		Yes	No
Is there an Emergency Operating Procedure for each pump station?	yes		
Is there sufficient redundancy of equipment in all pump stations?	yes		
Who responds to lift station failures and overflows? How are they notified?	City Staff during normal hours City duty after hours		
How is loss of power at a station dealt with? (i.e. on-site electrical generators, alternate power source, portable electric generator(s))	Portable generators with diesel Power delivered to site with Utility vehicle. We also have Two pump stations with backup Generators on site		
What equipment is available for pump station bypass?	Portable pumps, Vac trailers and trucks		
What process is used to investigate the cause of pump station failure and take necessary action to prevent future failures?	Investigate problem, repair problems either inhouse or Contract. Electrical problems are handled by City electrician SCADA is repaired by City staff also		

Comments:

IV. L. 3. Collection System Operation: Pump Stations - Emergency Response and Monitoring

Question	Response	Documentation Available	
		Yes	No
How are lift stations monitored?	weekly		
If a SCADA system is used, what parameters are monitored?	Power fail, High wet well. Both are monitored either in house or via SONITROL		

Comments:

IV. L. 4. Collection System Operation: Pump Stations - Recordkeeping

Question	Response	Documentation Available	
		Yes	No
Are operations logs maintained for all pump stations?	yes		
Are manufacturer's specifications and equipment manuals available for all equipment?	yes		
Are pump run times maintained for all pumps?	yes		
Are elapsed time meters used to assess performance?	yes		

Comments:

IV. L. 5. Collection System Operation: Pump Stations - Force Mains and Air/Vacuum Valves

Question	Response	Documentation Available	
		Yes	No
Does the utility regularly inspect the route of force mains?	yes		
Does the utility have a program to regularly assess force main condition?	NO		
Is there a process in place to investigate the cause of force main failures?	NO		
Does the utility have a regular maintenance/inspection program for air/vacuum valves?	NO		
Have force main failures been caused by water hammer?	N/A		

Comments:

V. A. Collection System Maintenance: Maintenance Budgeting

Question	Response	Documentation Available	
		Yes	No
How does the collection system utility track yearly maintenance costs?	work orders		
Is there a maintenance cost control system?	No, other than monitoring by Superv.		
Are maintenance costs developed from past cost records?	yes		
How does the utility categorize costs? Preventive? Corrective? Projected Costs? Projected Repair?	Projected repair and preventative		
How does the utility control expenditures?	Purchase orders		

V. B. Collection System Maintenance: Planned Maintenance

Question	Response	Documentation Available	
		Yes	No
Are preventive maintenance tasks and frequencies established for all pump stations and equipment?	yes		
How were preventative maintenance frequencies established?	Equipment History and operational manuals		
What percentage of the operator's time is devoted to planned as opposed to unplanned maintenance?	Planned 80% (est) unplanned 20% (est)		
What predictive maintenance techniques are used as part of PM program?	currently setting up vibration + infrared testing.		
Is there a formal procedure to repair or replace pump stations and equipment when useful life is reached?	NO, other than looking at historical data		
Has an energy audit been performed on pump station electrical usage?	yes		
Is an adequate parts inventory maintained for all equipment?	no		
Is there a sufficient number of trained personnel to properly maintain all stations?	yes		
Who performs mechanical and electrical maintenance?	Mechanical - in house Electrical - City Electrician		
Are there Standard Maintenance Procedures (SMPs) for each station?	yes		

Comments:

V. C. Collection System Maintenance: Maintenance Scheduling

Question	Response	Documentation Available	
		Yes	No
Does the utility plan and schedule preventive and corrective maintenance activities?	yes		
Is there an established priority system? Who sets priorities for maintenance?	no Supervisor		
Is maintenance backlog tracked?	yes		
How is O&M performance tracked and measured?	work orders and spreadsheets		
Is maintenance performed for other public works divisions?	yes - streets + water + Parks		
How are priorities determined for this work?	Depends on priority and how its fits into our schedule and theirs		
How is this work funded?	In-house - Depending on situation, we do not normally bill other Depts.		
Are maintenance logs maintained for all pump stations?	yes		

Comments:

V. D. Collection System Maintenance: Maintenance Right-of-Way

Question	Response	Documentation Available	
		Yes	No
Does the utility perform scheduled maintenance on Rights-of-Way and Easements?	yes		
Does the utility monitor street paving projects?	NO		
Does the utility have a program to locate and raise manholes (air valves, etc) as needed?	yes		
How are priorities determined?	Prioriety is establish for lines near streams, homes etc.		
How is the effectiveness of the maintenance schedule measured?	Through Complaints, number SSO's etc.		

Comments:

V. E. Collection System Maintenance: Sewer Cleaning

Question	Response	Documentation Available	
		Yes	No
Is there a routine schedule for cleaning sewer lines on a system wide basis, *e.g.*, at the rate of once every seven to twelve years or a rate of between 8% and 14% per year?	yes All new const. is on 3 year rotation and existing lines are inspected and put on more aggressive schedules anywhere from 6 months to 3 years		
Is there a program to identify sewer line segments that have chronic problems and should be cleaned on a more frequent schedule?	yes - CCTV		
Are stoppages diagnosed to determine the cause?	yes - CCTV		
Are stoppages plotted on maps and correlated with other data such as pipe size and material, or location?	NO - NOT yet but we are working towards it with GPS		

Comments:

V. E. 1. Collection System Maintenance: Sewer Cleaning - Cleaning Equipment

Question	Response	Documentation Available	
		Yes	No
What type of cleaning equipment does the collection system utility use?	Jet Rodder, Jet Vac, Mechanical Rodder Portable Vac unit		
How many cleaning units of each type does the utility have? What is the age of each?	Jet Rodder - 12 yrs old Jet Vac - 3 yrs old Mech. Rodder - 5 yrs old Portable Vac - 5 yrs old		
How many cleaning crews and shifts does the utility employ?	2 cleaning crews on one shift		
How many cleaning crews are dedicated to preventative maintenance cleaning?	Two - one storm drain one SS		
How many cleaning crews are dedicated to corrective maintenance cleaning?	No crews dedicated for this. Problems are handled as they arise		
What has the utility's experience been regarding pipe damage caused by mechanical equipment?	The mechanical rodder has caused some structural damage to pipes.		
Where is the equipment stationed?	1195 oak ST. @ WWTP		

Comments:

V. E. 2. Collection System Maintenance: Sewer Cleaning - Chemical Cleaning and Root Removal

Question	Response	Documentation Available	
		Yes	No
Does the utility have a root control program?	yes		
Are chemical cleaners used?	yes		
What types of chemical cleaners are used?	Root-x		
How often are they applied?	yearly		
How are the chemical cleaners applied?	Jet Rodder		
What results are achieved through the use of chemical cleaners?	not enough history yet to determine effectiveness		

Comments:

V. F. Collection System Maintenance: Emergency Maintenance

Question	Response	Documentation Available	
		Yes	No
Is there an established written Emergency Response Plan?	yes		
What type of emergency maintenance equipment does the utility have available?	Jet Rodder, Jet Vac, Mech Rodder, Portable Vac, CCTV, Portable generator Portable rodder		
How quickly can the utility access that equipment in case of an emergency?	less Than 30 minutes normally		
Does the utility have procedures to minimize the volume of untreated wastewater transmitted to the affected portions of the collection system?	Depends on The area and situation.		
Does the utility have a program to monitor water bodies affected by wastewater overflows?	no written plan or procedures		
Does the utility have procedures to investigate the cause of a wastewater overflow?	No written procedures, just normal staff investigation		
Does to utility have procedures to limit public access to and contact with areas affected by wastewater overflow?	not written		
Does the utility have procedures to provide expedient public notice?	not written		

V. G. Collection System Maintenance: Parts Inventory

Question	Response	Documentation Available	
		Yes	No
Does the utility have a central location for the storage of spare parts?	yes		
Have critical spare parts been identified?	yes		
Does the utility maintain a stock of spare parts on its maintenance vehicles?	yes - some parts in stock but not all yet		
What method(s) does the utility employ to keep track of the location, usage, and ordering of spare parts? Are parts logged out when taken by maintenance personnel for use?	Crews notify Supervisor when stock is low. Warehouse Purchasing orders parts when inventory is low		
Does the utility salvage specific equipment parts when equipment is placed out-of-service and not replaced?	yes		
How often does the utility conduct a check of the inventory of parts to ensure that their tracking system is working?	warehouseman tracks inventory every 6 months		
Who has the responsibility of tracking the inventory?	warehouse man		
What other procurement methods are available to O&M staff for non-stock materials?	Purchase through local vendors with purchase orders		

Comments:

V. H. Collection System Maintenance: Equipment and Tools Management

Question	Response	Documentation Available	
		Yes	No
Is there a list of equipment and tools used for operation and maintenance?	no		

Do personnel feel they have access to the necessary equipment and tools to do all aspects of operation and maintenance of the collection system?	yes		
Is there access to suitable equipment if the utility's equipment is down for repair?	yes		
Does the utility own or have access to portable generators?	yes		
Where does the utility store its equipment?	1195 Oak St. - WWTP 90 N. Mountain Ave - warehouse		
Is a detailed equipment maintenance log kept?	yes - Through daily vehicle log book and City maint. shops		
Are written equipment maintenance procedures available?	yes - City shop maint.		
What is the procedure for equipment replacement?	Equipment is depreciated and money set aside for replacement		
Are the services of an in-house vehicle and equipment maintenance services used?	yes		
What is the typical turnaround time for equipment and vehicle maintenance?	less Than 1 day usually		

VI. A. 1. Management Information Systems: Performance Indicators

References:

Question	Response	Documentation Available	
		Yes	No
How many sanitary sewer overflows (SSOs) have occurred in the last year? Is there a record?	6 - yes		
Do SSOs occur from manholes, pump stations or structural bypasses?	manholes, service laterals		
Are there areas that experience basement or street flooding?	yes		
How many SSOs have reached "Waters of the US"? Is there a record?	1 - yes		
What is the per capita wastewater flow for the maximum month and maximum week or day?	264 GPD/CAP (based on max day 12/28/02 @ 5.32 MGD and population of 20,130)		
What is average annual influent BOD?	211 mg/L		
What is the ratio of maximum wet weather flow to average dry weather flow?	1.18 MG : 1.0 MG		
What is the annual number of overflows, and what is the cause (i.e. blockage, pump malfunction, overloaded sewer, construction damage, etc.)?	Roots - 12 Contractor damage - 1 I + I Surcharge - 2 Jet Rodder caused - 1 (during cleaning process)		
What is the annual number of mainline sewer cave-ins? What was the cause (i.e. pipe corrosion, leaks, etc.)	Ø		
What other types of performance indicators does the utility use?	number of complaints received		

VII. A. Sewer System Capacity Evaluation: Internal TV Inspection

Question	Response	Documentation Available	
		Yes	No
Does the utility use internal T.V. inspection? If so please describe the program.	yes, inspecting entire system basin by basin and establishing cleaning schedules		
What percent of the system has been televised as part of the capacity evaluation? As part of the SSES?	less than 20%		
What defects were identified and how were they classified, i.e., structural, infiltration, lateral connections, an operational such as grease and roots?	All defects and conditions are rated Minor, Moderate, or major		
What follow-up actions were performed in response to deficiencies identified in TV inspections?	All lines are prioritized for cleaning and repairs		
Were operational defects used to establish PM tasks and frequencies?	yes		

Comments:

VII. B. Sewer System Capacity Evaluation: Survey and Rehabilitation (general)

Question	Response	Documentation Available	
		Yes	No
Have SSES's been performed in the past? If so, is documentation available?	NO		
Has any sewer rehabilitation work been done in the past 15 years? If so, please describe?	yes, numerous lines have been replaced/repaired. Manholes have been replaced and or sealed also		
Does the utility have standard procedures for performing SSES work?	NO		
Do the SSES reports include recommendations for rehabilitation, replacement, and repair?	No formal written reports done		
Were defects identified in the SSES repaired?	repaired as located during the year		
Does the utility have a multi-year Capital Improvements Program that includes rehabilitation, replacement, and repair?	yes		
How are priorities established for rehabilitation, replacement, and repair?	Take into account line location flow etc.		
Has the utility established schedules for performing recommended rehabilitation, both short term and long term?	no		
Has funding been approved for the recommended rehabilitation?	yes		
Is post rehabilitation flow monitoring used to assess the success of the rehabilitation?	NO		

Comments:

VII. C. Sewer System Capacity Evaluation: Sewer Cleaning Related to I/I Reduction

Question	Response	Documentation Available	
		Yes	No
Are sewers cleaned prior to flow monitoring?	yes if needed. Flow monitoring has not been done routinely in the past.		
Are sewers cleaned prior to internal T.V. inspection?	yes if needed we done inspection both before and after cleaning		
When cleaning, is debris removed from the system?	yes		

Comments:

VII. D. Sewer System Capacity Evaluation: Flow Monitoring

Question	Response	Documentation Available	
		Yes	No
Does the utility have a flow monitoring program? If so, please describe.	NO		
Number of permanent meters? Number of temporary meters?	N/A		
What type(s) of meters are used?	N/A		
Number of rain gauges?	1		
How is flow data used?	N/A		

Comments:

VII. E. Sewer System Capacity Evaluation: Smoke Testing and Dyed Water Flooding

Question	Response	Documentation Available	
		Yes	No
Does the utility have a smoke testing program to identify sources of inflow and infiltration into the system? If so please describe. Is the program routine of only emergency?	yes, no written program, we have been Smoke Testing areas identified in past SS study as potential I + I areas		
Does the utility have a dyed water flooding program to identify suspected sources (indirect connections) of inflow and infiltration into the system when smoke testing yields inconclusive results? If so please describe.	NO		
What follow-up occurs as a result of positive results for smoke or dye testing?	we are currently setting up a system to notify customers of defects in Their System		
Is there a data management system for tracking these activities?	NO		
Is there a document that describes the procedures that the utility follows? Are there any standard forms?	NO, we do have some forms That we use.		
What percent of the system has been smoke tested to date as part of the capacity evaluation? As part of the SSES?	less Than 1%		

Comments:

VII. F. Sewer System Capacity Evaluation: Manhole Inspection

Question	Response	Documentation Available	
		Yes	No
Does the utility have a routine manhole inspection and assessment program?	yes, it is done during the normal CCTV inspections		
What is the purpose of the inspection program?	To check condition of manhole for structural defects and I+I concerns		
Are manholes susceptible to inflow identified and inspected on a regular frequency?	NO - not on a regular basis		
Is there a data management system for tracking manhole inspection activities?	yes - Spreadsheets, in process of setting up new CMMS		
What triggers whether a manhole needs rehabilitation?	I+I, structural damage, Manhole base condition etc.		
Does the utility have a multi-year Capital Improvements Program that includes rehabilitation, replacement, and repair of manholes?	no		
How are priorities established for rehabilitation, replacement, and repair of manholes?	manholes are inspected and repaired/replaced as needed. I+I is a large concern		
Has the utility established schedules for performing rehabilitation, both short term and long term of manholes?	no		
Has funding been approved for the rehabilitation of manholes?	yes - Through yearly budget		

Comments:

VIII. A. Rehabilitation: Manhole Repairs

Question	Response	Documentation Available	
		Yes	No
What rehabilitation techniques are used for manhole repairs?	Have repaired some in-house with Concrete based products and contracted to have some repaved with Strong Seal		
How are priorities determined for manhole repairs?	Based on I+I and Exfiltration		
What type of documentation is kept?	Spreadsheets		
Does the utility use manhole inserts?	no		
Are they used system wide or only on low lying manholes?	N/A		

Comments:

VIII. B. Rehabilitation: Mainline Sewers

Question	Response	Documentation Available	
		Yes	No
What type of main line repairs has the utility used in the past?	open excavation on most, we have also used some no-dig techno. Products like insituform		
Does the utility currently use any of above techniques for main line repairs? What other techniques is the utility presently using?	yes		
How are priorities established for main line repairs?	I + I, structural concerns, Flow's etc.		
What type of follow-up is performed after the repair (e.g., CCTV)?	CCTV inspection		

Comments: