Memorandum of Understanding Between
The Kansas Department of Health and Environment and the City of Lawrence, Kansas
Lawrence, Kansas Integrated Wastewater Plan

Purpose

The purpose of this Memorandum of Understanding ("MOU") between the Kansas Department of Health and Environment (KDHE) and the City of Lawrence, Kansas ("Lawrence") (collectively, the "Parties") is to acknowledge and agree upon an Integrated Municipal Stormwater and Wastewater Planning document for wastewater and stormwater system improvements with implementation timelines.

Background

On June 5, 2012, EPA published its *Integrated Municipal Stormwater and Wastewater Planning Approach Framework* ("Framework")[1]. The stated purpose of the Framework is to "*assist municipalities on their critical paths to achieving the human health and water quality objectives of the Clean Water Act by identifying efficiencies in implementing requirements that arise from distinct wastewater and stormwater programs, including how to best prioritize capital investments*."

Lawrence has recently completed a *Wastewater Facility Master Plan* ("Plan")[2] looking at future wastewater needs, prioritizing the needs, and projecting the cost for funding the needed system-wide improvements (Attachment 2). The Plan contains all components required for an "Integrated Plan" and is hereby adopted as the initial Integrated Plan and the core document for future modifications.

Crosswalk

To more easily identify the portions of the Plan that tie in to the Framework elements, the following table and descriptive text identify and *crosswalk* those elements.

Framework Element	Plan Link/Other Documentation	Comment
1. A description of the water quality, human health and regulatory issues to be addressed in the plan.	1. SSO Potential – Pg. 2-29 2. Nutrient reduction – Wakarusa Plant – Pg. 3-11 3. Nutrient Reduction – KSR Plant – Pg. 3-12	The nutrient reduction facility permit for the new Wakarusa treatment plant is already issued, therefore,there is not much discussion of the need for nutrient reduction.
2. A description of existing wastewater and/or stormwater systems under consideration and summary information describing the systems' current performance.	1. Technical Memo 2 – Sewer System – Pg. 2-1 2. Technical Memo 3 – Wastewater Treatment – Pg. 3-1	

[1] *Integrated Municipal Stormwater and Wastewater Planning Approach Framework* (accessed April 4, 2013); available from http://www.epa.gov/npdes/pubs/integrated_planning_framework.pdf.
[2] *Report on Wastewater Facilities Master Plan City of Lawrence, KS, Project 54793, 2012* (accessed April 4, 2013); available from http://lawrenceks.org/assets/utilities/ReportFinal.pdf.

Framework Element	Plan Link/Other Documentation	Comment
3. A process which opens and maintains channels of communication with relevant community stakeholders in order to give full consideration of the views of others in the planning process and during implementation of the plan.	See attached web notices regarding the Plan. (Attachments 3 and 4)	Lawrence tailors stakeholder involvement to fit the project through announcements of public hearings using the Lawrence's website, direct mailing, or other types of venues.
4. A process for identifying, evaluating, and selecting alternatives and proposing implementation schedules, including the financial aspects of the plan.	Technical Memo 5 – Pg 5-1	Technical Memo 5 lays out the project prioritization, costs, and schedules. [An abbreviated schedule is included as Attachment 1 to this document] In addition, Lawrence performed a complete financial analysis of the plan titled "*Water and Wastewater Capital* *Improvement Plan Options and* *Revenue Requirements* *November 15, 2012"* (Attachment 5). The funding plan and user rate increase package was approved the Lawrence City Commission March 12, 2013. See Attachment 6 for Council agenda and minutes.
5. As the projects identified in the plan are being implemented, a process for evaluating the performance of projects identified in a plan, which may include evaluation of monitoring data, information developed by pilot studies and other studies and other relevant information.	NPDES Permits	Permits will carry a provision for a review of progress and performance each year. The permits will also carry reopener clauses to address unanticipated issues requiring modification of the implementation schedule.
6. Improvements to the Plan	NPDES Permits	The NPDES permits will carry provisions for evaluating and modifying the plan at each five year renewal.

Implementation

While the Framework focuses on enforceable schedules in permits or enforcement orders/decrees, the Framework allows for incorporation of an Integrated Plan into an NPDES permit. The Lawrence Integrated Plan will be referenced in both the Lawrence Kansas River and Wakarusa NPDES permits ("Permits") upon re-issuance. Further, the Permits will contain reopener provisions to amend the Plan, as well as provisions for Lawrence to provide annual updates on Plan progress made during the current year and planned for the next year.

Agreement

The Parties enter into this MOU to provide Lawrence assurance that KDHE agrees with the intent of Lawrence to pursue wastewater upgrades as provided in the Plan to the Lawrence sewer system and wastewater treatment plants.

Agreement to and compliance with this MOU does not remove any obligations of Lawrence to comply with the Clean Water Act ("CWA") and applicable state law, nor does it lower existing regulatory or permitting standards, but rather recognizes the flexibilities in the CWA for the appropriate sequencing and scheduling of work.

Attachment 1 reflects the Parties' best estimate for improvement projects and start of design or construction. The Parties recognize that specific improvement projects and projected start dates may change as circumstances change (growth, regulatory, reliability, etc.). The Parties agree to amend the Plan as warranted by significant changes in circumstances. Significant changes may include financial or technical changes that may be cause for amending implementation.

Entry into Force

The MOU will become effective and enforceable upon signature by the Parties.

Duration and Amendment of the MOU

The MOU is effective and enforceable for an initial period of 20 years, and may be renewed or amended by mutual agreement in writing between the Parties.

Termination

Each Party shall have the right to terminate the MOU by giving six months' written notice in writing to the other Party at any time. If the MOU is terminated by either Party, steps shall be taken to ensure that the termination does not affect any prior obligation, project or activity already in progress pursuant to the MOU, Plan or the Permits.

Authority

Each Party has full knowledge of and has consented to this MOU, and represents and warrants that each person who signs this MOU on its behalf is duly authorized to execute this MOU on behalf of the respective Party and legally bind the Party represented to this MOU.

Signatures

_____	**_____**
Michael B. Tate PE, Director	**David L. Corliss**
Bureau of Water	**City Manager**
Kansas Department of Health and Environment	**City of Lawrence, Kansas**
Date: _____	**Date: _____**

Attachment 1

	Item	Reason for Improvement Project	2012 Cost Opinion	Currently Projected Start Date *
1	**Collection System****			
a	PS 9 expansion to 14 MG	1	$ 2,300,000	2020
b	PS 32 expansion to 1.7 MG, 8" force main	1	$ 800,000	2020
c	PS 25 expansion to 4 MG, Add 3rd Pump	1	$ 150,000	2019
d	PS 25 expansion to 6 MG, parallel 12" force main	1	$ 1,440,000	2030
e	21" gravity sewer to eliminate PS 8	3	$ 3,500,000	2017
f	KR-5B 12" relief sewer	3	$ 800,000	2017
g	KR-6B 21" relief sewer	3	$ 700,000	2018
h	PS 23 expansion to 0.1 MGD	1, 3	$ 200,000	2022
i	PS 48 expansion to 6.4 MGD	1	$ 300,000	2024
j	PS 04 Redundant Forcemain	2, 3	$ 1,600,000	2013
k	Collection System Field Operations Building	3	$ 4,000,000	2021
	Subtotal		**$ 15,790,000**	
2	**New 2 MGD Capacity Wakarusa WWTP**			
a	Wastewater Treatment Plant	1, 2	$ 30,000,000	2013
b	Peak Flow Storage	1, 2	$ 6,000,000	2013
c	Roads, Utilities	1, 2	$ 6,000,000	2013
d	New (Wakarusa) PS 5C, 2 - 16" force mains	1, 2	$ 12,700,000	2013
	Subtotal		**$ 54,700,000**	
3	**Kansas River WWTP**			
a	Nutrient Removal	2	$ 9,000,000	2023
b	Co-generation & Backup Power	3	$ 1,000,000	2013
	Subtotal		**$ 10,000,000**	
4	**Collection System Rehabilitation Plan**			
a	Rapid I/I Reduction Program	2, 3	$ 19,400,000	2013
b	Clay Pipe and Manhole Rehabilitation Program	2, 3	$ 33,500,000	2013
	Subtotal		**$ 52,900,000**	
	Total		**$ 133,390,000**	

*Parties Best Projection for Start of Design or Construction

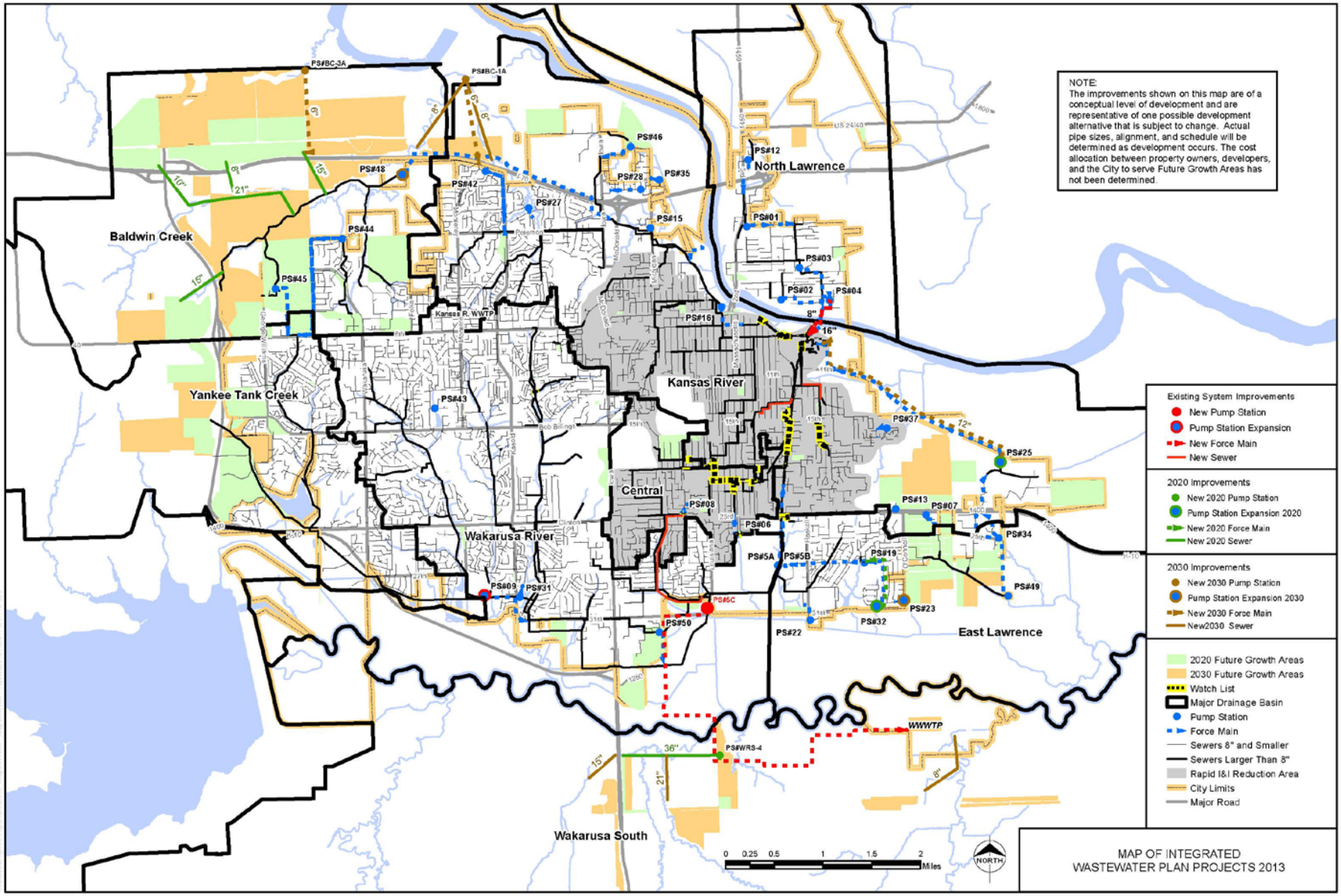
** Development Related Growth Projects Are Not Included in CIP

Reason for Improvement Project

1- Growth

2 - Regulatory

3 - Reliability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The improvements shown on this map are of a conceptual level of development and are representative of one possible development alternative that is subject to change. Actual pipe sizes, alignment, and schedule will be determined as development occurs. The cost allocation between property owners, developers, and the City to serve Future Growth Areas has not been determined.
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MAP OF INTEGRATED
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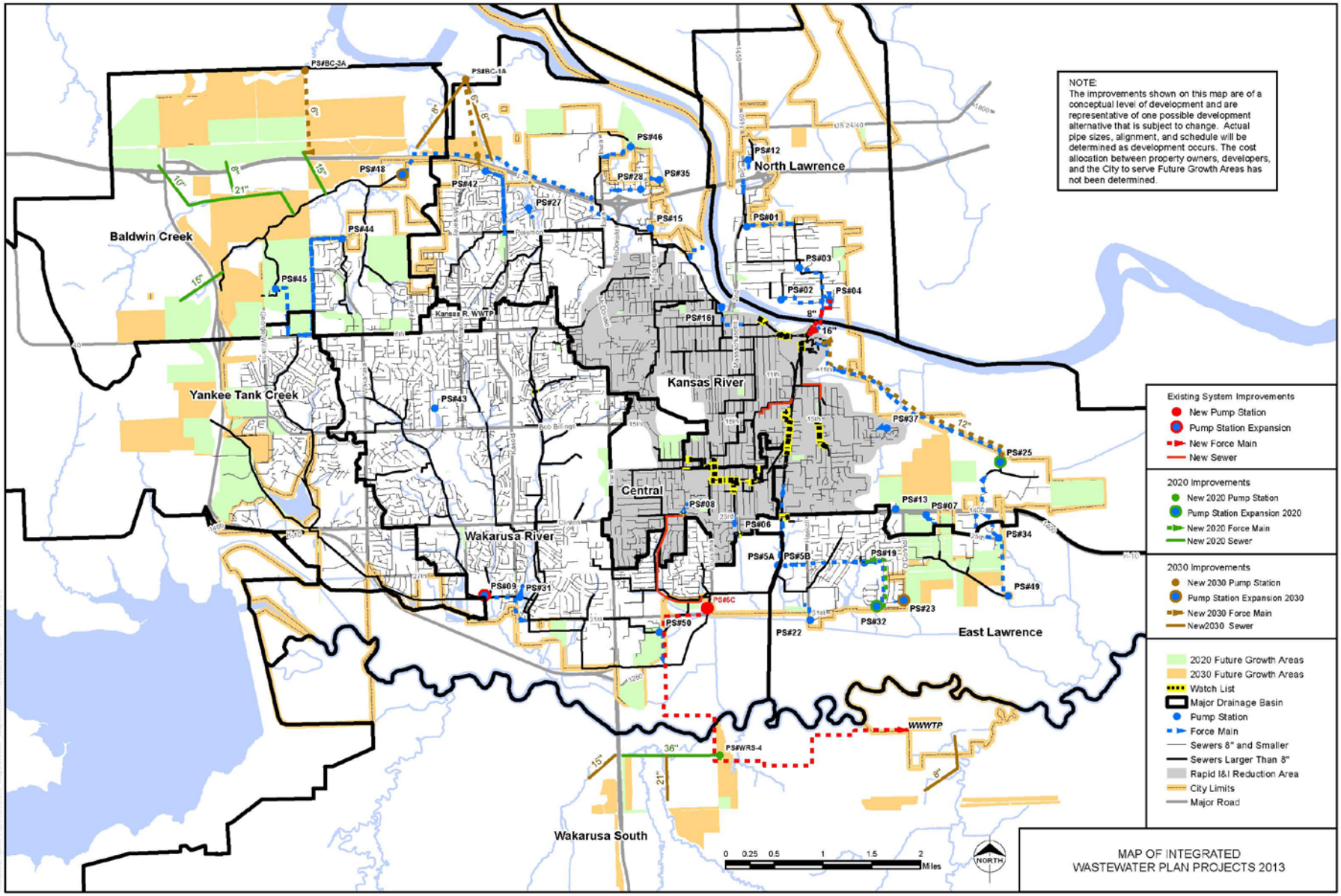
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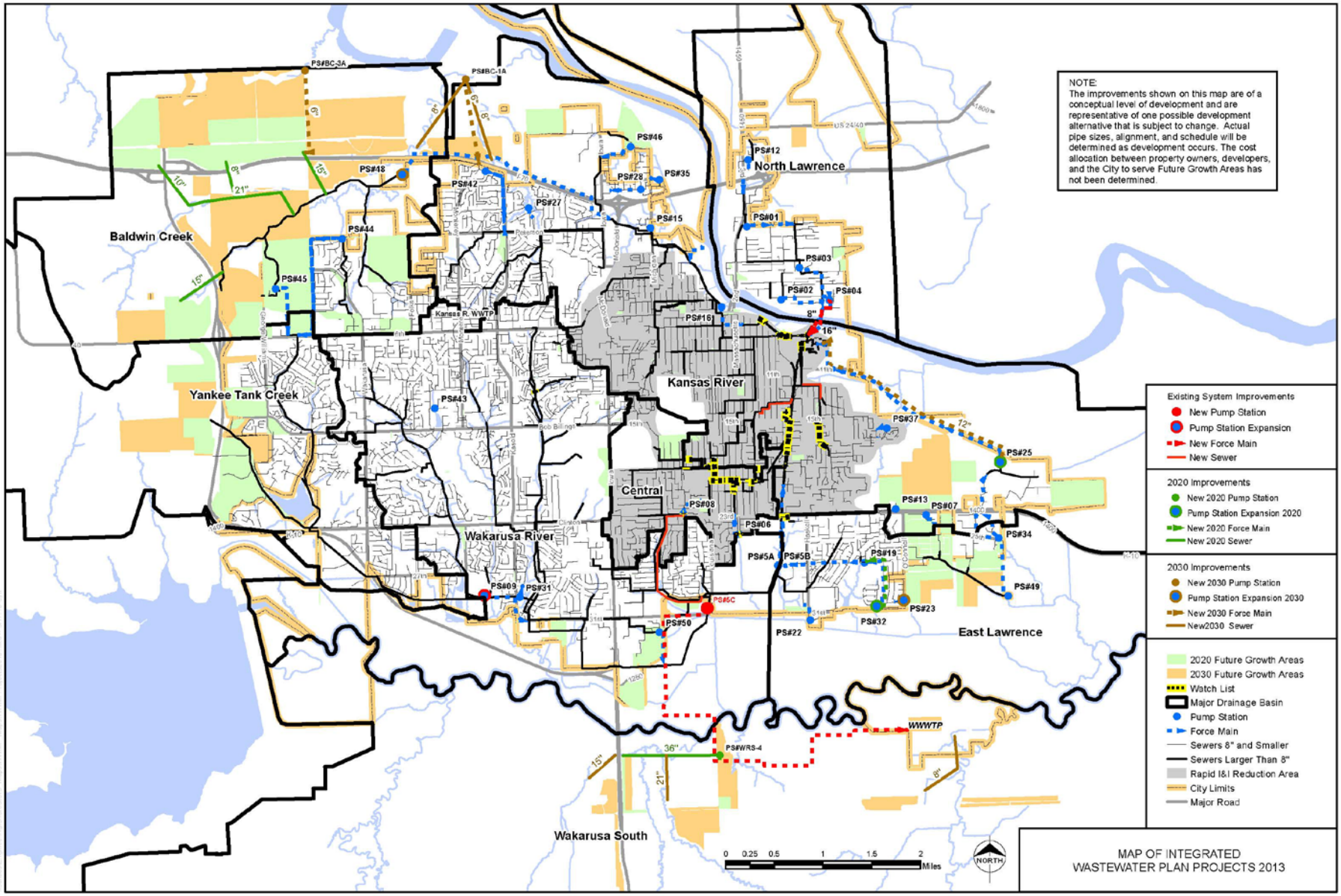
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Attachment 2

City of Lawrence KANSAS

Report on

Wastewater Facilities Master Plan

Project 54793

2012

Burns & McDonnell SINCE 1898

BG CONSULTANTS architects engineers planners surveyors

Report on

Wastewater Facilities Master Plan

City of Lawrence KANSAS

City of Lawrence, Kansas

Project No. 54793

2012

BG CONSULTANTS architects engineers planners surveyors

Burns & McDonnell SINCE 1898

July 25, 2012

Mr. David Wagner
Utilities Director
Department of Utilities
720 West 3rd Street
Lawrence, KS 66044-0708

Re: Wastewater Facilities Master Plan
City of Lawrence, Kansas
B&M Project No. 54793

Dear Mr. Wagner:

Burns & McDonnell in association with BG Consultants is pleased to submit our report titled Wastewater Facilities Master Plan in accordance with our engineering services agreement with the City of Lawrence. The report consists of two volumes as follows:

1. Executive Summary
2. Master Plan Report

This volume is the detailed master plan report. The report consists of technical memoranda completed at various stages of the plan development. The key recommendations of the plan are as follows:

- Implement an 8 year infiltration/inflow reduction program within a targeted area of the collection system that includes the oldest parts of the system close to the Kansas River Wastewater Treatment Plant (WWTP), with the objective of reducing peak wet weather infiltration inflow rates by approximately 19 MGD.
- Construct gravity sewers, relief sewers, and pumping station and force main capacity expansions needed to convey peak flow rates occurring during wet weather periods.
- Construct a new pumping station and force mains to divert a portion of dry and wet weather flows to a new Wakarusa WWTP. Final planning for these facilities should begin by the time the utility service area population is 96,000 so they are in operation before flows to the Kansas River WWTP reach its design capacity. An initial dry weather flow capacity for the new Wakarusa WWTP of 2 MGD would be sufficient for handling flow rates forecast to occur through year 2030.
- Complete a program of clay pipe and brick manhole replacement to insure the long term integrity of the collection system.
- Plan and budget for additions to the collection system that are necessary for extending service to areas outside the existing utility service area as new development occurs.

9400 Ward Parkway • Kansas City, MO 64114-3319
Tel: 816 333-9400 • Fax: 816 333-3690 • www.burnsmcd.com

- Plan and budget for improvements to the Kansas River WWTP that will be necessary for meeting new regulatory requirements such as nutrient (nitrogen and phosphorus) removal.

This master plan was developed to be a living document, subject to revision as dictated by the timing and direction of future regulatory actions, and actual patterns of future growth and development. The collection system computer hydraulic model prepared for this master plan is one tool that may be used to assess future conditions that may differ from those assumed by the master plan.

We sincerely appreciate the assistance and direction received from your staff, including Mike Lawless, P. E. and Philip Ciesielski, P. E., throughout the development of this master plan. We would be pleased to assist you with implementing the recommendations of this plan. Thank you for this opportunity to serve the City of Lawrence.

Sincerely,

Stephen A. Yonker, P. E.
Project Manager

Jeffrey J. Keller, P. E.
Project Review Engineer

John P. Mitchell, P. E.
Project Principal

SAY/say

INDEX AND CERTIFICATION

Report on
Wastewater Facilities Master Plan
City of Lawrence, Kansas

Project 54793

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3	Future System Evaluation and Improvement Plan	22
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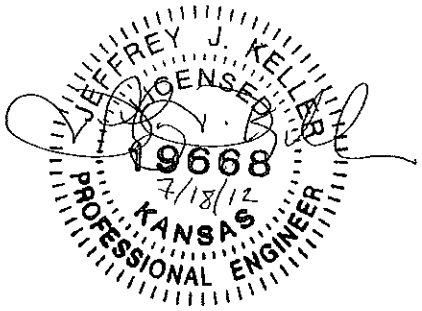
5	Capital Improvements Program	10

Certification

I hereby certify, as a Professional Engineer in the state of Kansas, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the City of Lawrence, Kansas or others without specific verification or adaptation by the Engineer. This certification is made in accordance with the provisions of the laws and rules of the Kansas under Kansas Administrative Code.



Jeffrey J. Keller, P.E. (insert state & license)
Date: 7/18/2012
(Reproductions are not valid unless signed, dated, and embossed with Engineer's seal)

Technical Memorandum No. 1
Initial Services

Wastewater Facilities Master Plan

for

Lawrence, Kansas

City of Lawrence, Kansas

BMcD Project No. 54793

City P.O. 07629

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, MO 64114

Burns & McDonnell
SINCE 1898

BG CONSULTANTS
architects engineers
planners surveyors

City of Lawrence, Kansas

Wastewater Facilities Master Plan Technical Memorandum No. 1

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* = follows page number

Appendices

Wastewater Master Plan List of Abbreviations

BOD	Biochemical Oxygen Demand
CIPP	Cured-in-Place Pipe
DWF	Dry Weather Flow
DWI	Dry Weather Infiltration
ft	Foot
GIS	Geographical Information System
gpd	Gallons per Day
IDM	Inch-Diameter Mile
I/I	Infiltration/Inflow
in	Inch
KDHE	Kansas Department of Health and Environment
KRWWTP	Kansas River Wastewater Treatment Plant
MG	Million Gallons
MGD	Million Gallons per Day
PF	Peaking Factor
PVC	Poly-vinyl Chloride Pipe
ppd	Pounds Per Day
RDII	Rainfall-Derived Infiltration/Inflow
RTK	Rainfall, Time to Peak, and Recession Response Parameters
SSOAP	Sanitary Sewer Overflow Analysis Planning Program
TAZ	Traffic Analysis Zone
TM	Technical Memorandum
VCP	Vitrified Clay Pipe
WWTP	Wastewater Treatment Plant
Wakarusa	Wakarusa Wastewater Treatment Plant

A. Introduction

Technical Memorandum No. 1 is a summary of initial services completed in partial fulfillment of the Lawrence, Kansas Wastewater Facilities Master Plan. The goals of the initial services were to establish the project team (kick-off meeting), obtain the necessary data for performing the master plan, the selection of the collection system modeling software, and the population forecast to be used for the master plan

B. Kick-Off Meeting

The kick-off meeting, commencing the Lawrence, Kansas Wastewater Facilities Master Plan project, was held on December 10, 2009, at the wastewater treatment plant. The agenda is provided in Appendix 1-A. Attendees included representatives from the City of Lawrence (City), BG Consultants (BG) and Burns & McDonnell Engineering (BMcD) and are listed below:

Representative	Org	Contact #	Contact Email
Mike Lawless	City	785-423-3306	mlawless@ci.lawrence.ks.us
Philip Ciesielski	City	785-423-7114	pciesielski@ci.lawrence.ks.us
John Bertrand	City	785-764-6136	jbertrand@ci.lawrence.ks.us
Clint Miller	City	785-832-7827	cmiller@ci.lawrence.ks.us
David R. Guntert	City	785-832-3158	dguntert@lawrence.ks.us
Dave Wagner	City	785-832-7800	dwagner@ci.lawrence.ks.us
Mark Hegeman	City	785-423-3380	mhegeman@ci.lawrence.ks.us
David Hamby	BG	785-749-4474	davidh@bgcons.com
Jeff Keller	BMcD	816-822-4371	jkeller@burnsmcd.com

C. City of Lawrence Data

A preliminary data request was made including the items outlined in the master plan engineering services agreement. Data and information received as a result of this request includes asset data for building the model, relevant background reports related to the Kansas River Wastewater Treatment Plant and the wastewater collection system, available rain gauge and flow meter data, and pertinent GIS information

necessary for an intelligent model. A complete listing of data received and utilized by this master plan is provided in Appendix 1-B.

D. Wastewater Collection System Model Selection

The selection of modeling software was narrowed to two modeling vendors whose products met the City's minimum criteria, which are:

- Commercially available, non-proprietary.
- Provide dynamic (flow versus time) analysis.
- Interface with GIS.
- Availability of both water distribution system and wastewater collection system modeling software from the same vendor.

Bentley Systems and MWH Soft were selected vendors to demonstrate their respective software to the Utilities and Public Works Department staff and Burns & McDonnell. Ultimately, the City selected Bentley Systems after the demonstration and verifying references. City memorandum dated April 19, 2010 is included in Appendix 1-C for further detail of the software selection process.

E. Study Area Description and Population

1. Study Area Description

The master plan study area as delineated by the City of Lawrence Planning Department is shown on Figure 1.1. A memorandum dated April 27, 2010 from City staff to the City Commission concerning the plan study area is included in Appendix 1-D. The planning area boundary is identical to the Planning Department Urban Growth Area 2030 Boundary, with the exception of the North Lawrence area north of the Kansas River where the master planning boundary lies inside of the Urban Growth Area 2030 Boundary. The current wastewater utility service area shown on Figure 1.1 includes some areas immediately adjacent to sewered areas that are considered to be readily served by minor extensions of the existing collection system. In addition to the current wastewater utility service area, the master planning area includes unsewered areas south of the Wakarusa River and the site of the future Wakarusa Treatment Plant.

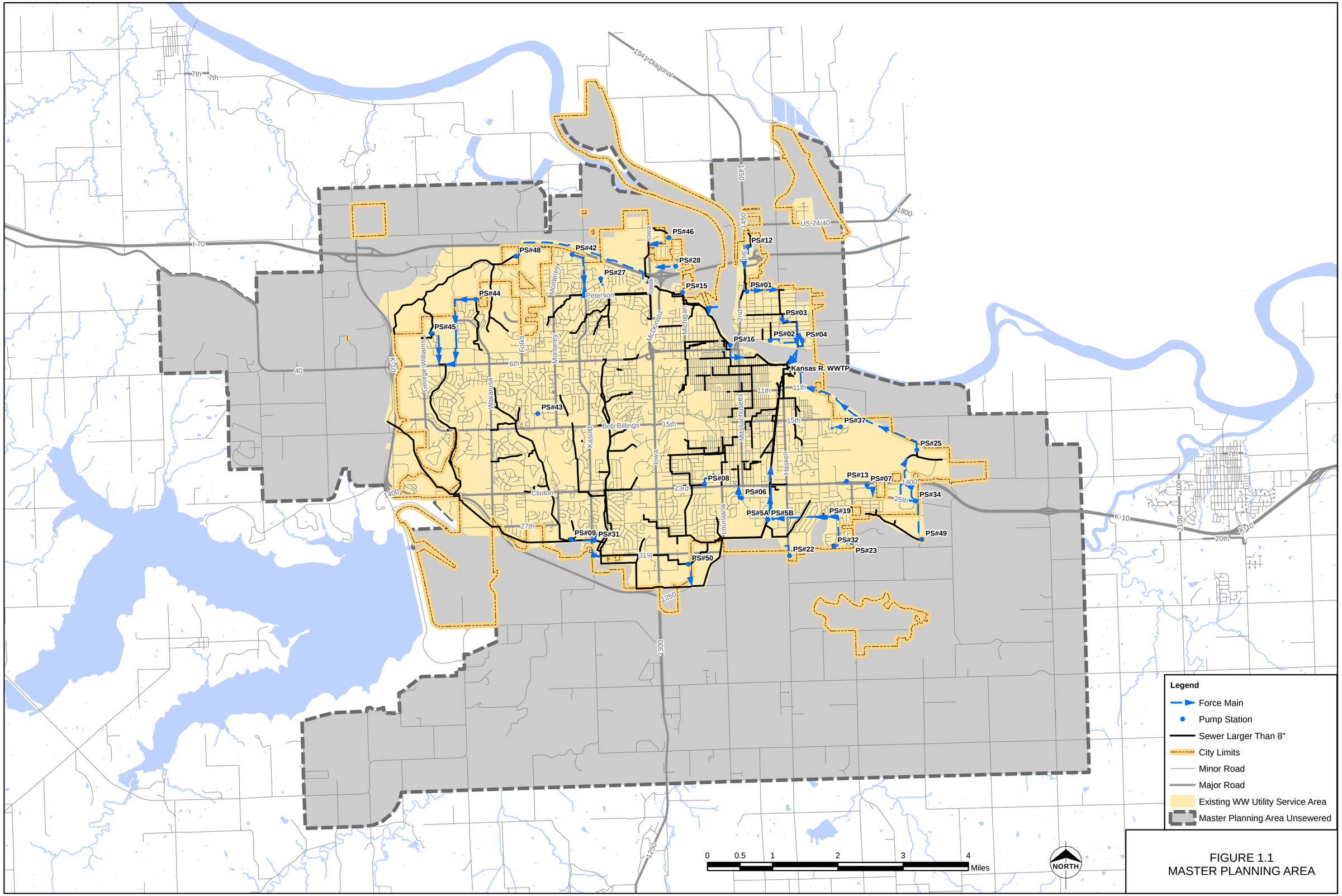

FIGURE 1.1
MASTER PLANNING AREA

2. Existing Population and Population Forecast

The City of Lawrence Planning Department developed the estimate of existing population and the forecast of future population to be used by this master plan for the year 2030 planning period. A memorandum dated April 27, 2010 from City staff to the City Commission concerning existing and forecast population is included in Appendix 1-D. A public comment process began in May 2010, whereby the City requested input from various stakeholders including organizations, individuals, schools and other entities as follows:

- Chamber of Commerce - talked to reps there and emailed the information. No comment returned.
- Perry - Lecompton Schools - voice mail to Dr. Yoder, who was out - emailed information again. No comment returned.
- Lawrence Public Schools - Rick Doll - emailed information to rdoll@usd497.org. No comment returned.
- Gould Evans - left message and emailed again to Steve Clark. No comment returned.
- Land Plan Engineering - talked to Tim Herndon and emailed again. No comment returned.
- Paul Werner Architects - left message. Call not returned.
- Peridian Group - talked to Lance Johnson and emailed again. No comment returned.
- PEC - left message for Jim Martin. No return call received. Attended study session.
- Treanor Architects - left message for Mike Treanor. No return call received.
- Bartlett and West - left message for Stan Meyers. No return call received.
- KU/Facility Operations - left message for Jim Modig and sent email again. Received email with comments.
- Lawrence Association of Neighborhoods - Gwen Klingenberg - wrong number posted on their web site. Sent email again. No comment returned.
- Lawrence Home Builders Association - talked to Bobbie Flory and sent again. No comment returned.
- Kansas Water Office - Talked to Cathy Tucker - Vogel, who is in KDHE now. She called me back and emailed to her again. She also was going to show it around her office. No comment returned.

- KU Civil Engineering - Craig Adams - left message. He called back. He is very interested in water quality, but not so much so in the planning and infrastructure. He welcomes opportunities for KUCE and Lawrence Utilities to work on projects together.
- Rod Geisler - KDHE - talked to him. He did not have comments but commended us for doing master planning.
- First Management - Talked to Robert Green and emailed him a copy. No comments returned.
- Gene Fritzel Construction - Left message and emailed to him. No comments received.
- Steve Schwada - left message and sent email with link. No comments received.
- Michael Stultz - left message and sent email with link. No comments received.

The University of Kansas Facility Operations forwarded to the City 25-year water use projections for the Main and West campuses which is included in Appendix 1-E, along with meeting notes from a follow-up meeting between City staff and University of Kansas representatives.

Table 1.1 summarizes existing and future population within the current service area and within the extensions of the service area forecast for 2020 and 2030, and within the planning area.

Table 1.1
Wastewater Utility Service Area and Master Planning Area
Population Forecasts

Year	Utility Service Area	Master Planning Area
2010	92,727	94,564
2020	106,667	113,051
2030	119,529	129,176
Buildout	251,971	251,971

New development is forecast to occur inside and outside of the current utility service area in accordance with the 2020 and 2030 service area population projection as shown on Figure 1.2.

NOTE:
The future growth areas shown on this figure are of a conceptual level of development and are representative of one possible development alternative that is subject to change. Actual pipe sizes, alignment, and schedule will be determined as development occurs. The cost allocation between property owners, developers, and the City to serve Future Growth Areas has not been determined.

PS#46
PS#12
PS#42
PS#48
PS#28
PS#35
PS#27
PS#15
PS#01
PS#44
PS#03
PS#45
PS#02
PS#04
PS#16
Kansas R. WWTP
PS#43
PS#37
PS#25
PS#08
PS#13
PS#07
PS#34
PS#06
PS#5A
PS#5B
PS#19
PS#49
PS#09
PS#31
PS#32
PS#22
PS#23
PS#50

Peterson
Clinton
Bob Billings
1941+Diagonal
1450
1800
1400
1300
1250
2100
US-24/40
K-10
I-70
40
7th
6th
11th
15th
23rd
25th
27th
31st
Monterey
Folks
George Williams
Wakarusa
Kasold
Iowa
McDonald
Michigan
Massachusetts
Louisiana
Haskell
2nd
3rd

Legend
- Force Main
- Pump Station
- Sewer Larger Than 8"
- City Limits
- Minor Road
- Major Road

Future Growth Areas
- 2020
- 2030
- Existing Service Area
- Master Planning Area

0 0.5 1 2 3 4 Miles

NORTH

FIGURE 1.2
2020 AND 2030 DEVELOPMENT AREAS

Appendix 1-A
Kick-off Meeting Agenda

Lawrence, Kansas Wastewater Facilities Master Plan
BMcD Project 54793
City P.O. 072629

AGENDA

KICK-OFF MEETING

Wednesday, December 10, 2009
10:00 a.m. at WWTP Conference Room

1. Project Objectives
2. City Expectations
3. Project Team
4. Schedule
5. Project Control Plan
6. Review Data Request / City Information
    a. Data needs memorandum
    b. Mapping and GIS
    c. Flow and Rainfall Data
    d. Facility Data
    e. Planning Information
    f. Plans to secure any missing information
7. Software Selection
    a. Dec. 16th – Bentley Software (SewerGEMS & WaterGEMS)
    b. Dec. 17th – MWH-Soft (InfoSewer/SWMM & InfoWater, Suite)
8. Public Relations, Developing Community Support, and Involving Stakeholders
9. Service Area definition
10. Use of SharePoint web site
11. Flow and Rainfall Monitoring Data

Appendix 1-B
City Data

MEMORANDUM
Lawrence, Kansas Wastewater Facilities Master Plan
BMcD Project 54793
City P.O. 072629

Date: December 8, 2009

To: Mike Lawless
From: Jon Gray, Jeff Keller
Re: Data Request

Data to be provided by the City for the Master Plan are described in the contract scope of work in task no. 5. These items are listed below with additional text or comment shown in italics.

5.1. Copy of any correspondence with KDHE related to the Project. *(Note: There may be no pertinent correspondence at this time.)*

5.2 Any other required information and prompt review of draft technical memoranda.

5.2. Assistance by placing at CONSULTANT's disposal all available information pertinent to the assignment, including previous reports and any other data relative thereto. CONSULTANT shall rely on information made available by the CITY as accurate without independent verification.

5.3. Electronic copy of necessary GIS Data for the Project. *GIS data may be provided in the form of an ESRI Personal Geodatabase file.. After the initial data delivery, it may be more convenient to provide additional information in ESRI shapefiles for Burns & McDonnell to add to the project Geodatabase.*

5.3.1 Sanitary Sewer System Facilities information required for the hydraulic model, including manholes, sewer lines, lift stations and wet wells, force mains (merged to single lines), and outlet to the WWTP. All entities will have unique ID's and be attributed with their data. CITY will attribute lift station records with data required for the pumps and wet-well.

5.3.1.1. *Additional sewer facilities information not in the GIS including pump curves for all pumps, and lift station layout drawings for any complex stations.*

5.3.2 Maintenance Management History records (GBA Master Series) for sewer maintenance for the past 5 years. CITY will extract history records to GIS format and attribute manhole and sewer pipe records with the total number of events by type of maintenance.

5.3.3 Planning information including Existing and Future Land Use information, City Limits and Growth Area Boundaries, drainage basins and sub-basins, and TAZ or other population projection areas attributed with available past and projected populations. CITY will overlay planning information layers and attribute sub-

basins with total land use by major use type, existing and projected populations, and total acreage.

5.3.4 Base mapping information for use in preparing report exhibits and layout of new sewers including but not limited to roads and highways, waterways, urban boundaries, 2006 elevation contours (2-foot), and NRCS soils.

5.3.5 Other base GIS information in CITY's files that may be deemed necessary during the Project.

5.4. Electronic copy of all of the City's rainfall and flow monitoring data files stored on the Marsh McBirney web site. *There should be one file for each rain gage and for each flow monitor*.

5.5. CITYs most recent population growth and development projections and assist CONSULTANT in developing a range of realistic growth scenarios. CITY will provide existing ultimate build-out population projection from planned land use and population densities. CITY will review projected growth as developed through Public Participation by sub-area to refine the projected timing and location of growth, according to potential agreed-on development needs, development timing, available utilities, and other influences, and provide projected growth in GIS format.

5.6. Electronic Maintenance Management History records (GBA Master Series) for sewer maintenance for the past 5 years in GIS format, to include total counts of sewer maintenance events by type for each pipe and manhole.

5.7. Operating records for the wastewater treatment plant and lift stations. *Plant records to include each day's total and peak influent flows since 2003, and lift station records to include each day's daily total pumpage or running hours (depending on availability), and daily peak pumping rate, for 2008 and 2009 to date.*

5.8. Purchase of one copy of selected software for use on the Project

5.9. One copy of paper sewer atlas map set. One copy of any other sewer maps that may be useful.

5.10. One copy of any prior studies and reports pertinent to this project.

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Appendix 1-C
Model Software Purchase Memorandum

Memorandum
City of Lawrence
Utilities Department

TO:	**David L. Corliss – City Manager**
	Cynthia Boecker - Assistant City Manager
	Diane Stoddard - Assistant City Manager
FROM:	**Mike Lawless – Asst. Director of Utilities**
CC:	**Dave Wagner – Director of Utilities**
	Philip Ciesielski – Asst. Director of Utilities
	Beth Frailey Krishtalka – Management Analyst
Date:	**April 19, 2010**
RE:	**Agenda Item – Purchase wastewater and water modeling software from Bentley Systems, Inc.**

Please include the following item on the City Commission Agenda for consideration at the April 27, 2010 meeting:

Authorize Staff to purchase 1 license each of wastewater and water modeling software from Bentley Systems, Inc.

Project Description

The Wastewater Master Plan scope of services included the City selecting and purchasing modeling software to be used for this project as well as, the Water Master Plan. Selection of the software vendors to provide demonstrations started with establishing base criteria for the software and vendors to meet. The criteria included the following:

1. Commercially available
2. Vendor could supply dynamic sewer and water system models
3. GIS Interface

Only two software vendors met the criteria: Bentley Systems and MWH Soft. Each vendor was invited to present a demonstration of the software to Utilities and Public Works Department staff as well as, Burns & McDonnell. Utilities GIS data for wastewater and water was provided to the vendors. Each vendor was provided 4 hours to demonstrate the capabilities and functionality of their products.

The demonstrations of each software were very comparable. Staff considered a number of different criteria in the evaluation of the software, some of which are listed below.

- Hydraulic Features
- GIS Interface
- Additional Modules
- Virtual Server Compatible
- Local Users
- Initial Cost
- Data Structure
- Multiple Platform
- Output Presentation
- VFD Capabilities
- Skeletonized Data Retention
- Maintenance Cost

After considerable discussion and checking references, staff concluded that the Bentley Systems software will provide the best and most cost effective solution for water and sewer system modeling for

the City of Lawrence.

	Initial Cost	5 Year Cost (Purchase & Maintenance)
	1 License Each Water & Sewer	1 License Each Water & Sewer
MWH	$ 42,000	$ 81,000
Bentley	$ 35,350	$ 59,350

Project Funding:
Funding for the sewer modeling software was included in the 2009 Capital Improvement Program and funding for the water modeling software was included in the 2010 Capital Improvement Program.

Action Request: Authorize staff to purchase 1 license each of wastewater and water modeling software from Bentley Systems, Inc.

Thank you for your assistance. Please advise if you have any questions.

Appendix 1-D
Planning Area Boundary and Population Growth Forecast Memorandum

Memorandum
City of Lawrence

TO: **David L. Corliss, City Manager**

FROM: **Mike Lawless, Assistant Director, Utilities**
Scott McCullough, Director, Planning and Development Services

CC: **Cynthia Wagner, Assistant City Manager**
Diane Stoddard, Assistant City Manager
Dave Wagner, Utilities Director

Date: **For April 27, 2010 City Commission Meeting**

RE: **Utilities Master Planning Growth Projections**

On November 11, 2009 notice to proceed was issued for an engineering services contract for the Wastewater Master Plan (Plan). The Plan will provide an evaluation of the wastewater collection and treatment systems for improvements to serve potential development planned through the year 2030. The Plan will use existing population for 2010 and population projections for 2020 and 2030 as the input data for the design years. The Plan will provide flow/development triggers for the construction of system improvements.

Plan Boundary

To develop the flow projections for the design years, a defined boundary with the population estimates and distribution of the population within the boundary are needed. Utilities and Planning staff have met several times to discuss the planning boundaries of the project as well as the logistics of preparing the underlying data needed for the population and growth projections for the design years. Several adopted sector plans, including the Southeast Area Plan, the K-10 & Farmer's Turnpike Plan, the West of K-10 Plan, and the Northeast Sector Plan that is currently underway, have guided development of an appropriate boundary for the Plan. In addition to the planning boundaries, the drainage basins are physical boundaries that also effect development and the results of the Plan.

A map of the current Urban Growth Area, basin boundaries, and sector plans is provided to show how these boundaries overlay each other. As a result of these overlays and staff discussions, a logical and justifiable boundary is proposed for the Wastewater Master Plan as shown on the map. This planning boundary, the population projections, and distribution of the population will allow distribution of the basin flows needed for the project. While this boundary is logical based on the discussion above there is always the possibility that a development request could be made outside of the planning area.

Population Projections

Horizon 2020 sets out three population projections using July 1st 2000 Census data of 80,508 for the city of Lawrence: Low, Medium, and High.

Population Projections from Horizon 2020			
Horizon 2020 Projections	**2010**	**2020**	**2030**
Low	88,961	100,076	111,191
Medium	95,178	110,406	125,635
High	99,013	122,394	151,296

Population projection methods primarily rely on trend data and the most accurate projections can only be completed every decade after the Census Bureau releases the Decennial Census Data. Staff will release new population projections after the 2010 Census numbers are calculated and disclosed for public use.

Planning Staff has analyzed the effects that short and long-term growth trends would have on the population projections. Given recent population trends, staff is of the opinion that Lawrence is between the Low and Medium population projections from Horizon 2020 and the department currently projects Lawrence to reach between 112,000 and 126,000 people in 2030. A 2030 population of approximately 125,000 for Lawrence is used to build the growth scenarios for the Wastewater Master Plan.

Population Distribution - Future Development Trends and Growth Areas

To determine appropriate distribution of the 2030 population, staff used existing data and made assumptions about the amount of residential dwelling unit inventory the city of Lawrence currently has and where the likely growth will occur based on historic patterns and identified opportunities and constraints. The following exercise will assist the consultants as they embark on the Plan update.

Staff used census population data, building permit trend data and information from meetings with owners and consultants on specific properties over the last few years to make assumptions about the number of dwelling units that are approved for construction or could be available with the appropriate land use approvals granted and infrastructure extended. Staff concludes that there are approximately 5,100 approved or potentially approved residential units available in the city limits currently. Please see map for locations of approved and not yet, but potentially, approved residential units.

A range of population growth, based on *Horizon 2020* projections, was used to draw conclusions as to the number of years of current or potential residential inventory currently within the city. The data does not differentiate between single-family, duplex, and multi-family structures and so any one of these types of residential units may be more or less under-represented in the exercise.

Build Out Table			
Population / Year	Assumed Persons / Unit	Units Occupied / Year	Years to Build Out Approved and Potentially Approved Inventory of 5,100 units (City Only)
LOW - 1,000 / year	2.3 persons / unit	435	11.7 years
MED. - 1,500 / year	2.3 persons / unit	650	7.8 years

Notes

1. The numbers in the table are approximations and have been rounded for ease of computation. Alignment with the Residential Inventory Analysis, authored by Roger Zalneraitis, is not possible since that memo tracks "lots" and this memo uses "units" (several units can be constructed on a single lot in some instances – duplexes, triplexes, multi-dwelling).
2. There is an assumed potential for approximately 5,100 dwelling units in the city limits including available lots and assuming densities on unplatted parcels that could be served.
    a. These units could serve a population of 11,700 new residents
3. Of the 5,100 units, there are 1,335 lots currently vacant with infrastructure available to serve them.
4. There are several infill and fringe areas that are in the concept stage and the anticipated number of units is currently unknown. The following areas were not assigned a unit count but are on the development radar – the area east of The Exchange Apartments, several lots downtown, N. Lawrence redevelopment near Johnny's Tavern, mixed use potential near the Oread Hotel, several fringe areas, etc. These areas were not included in the total unit count used in the calculations in the table and so the actual potential for units in the table may be low.

Discussion

The table and exercise above concludes that there is approximately a decade's worth of existing and potential residential inventory of building sites within the city limits assuming current absorption rates; however, adequate infrastructure may not be in place to serve all of these areas at this time. This is an overly simplistic view, however, because it does not differentiate between housing types, a level of detail that could be investigated if the commission desires but may not be necessary for the purposes of the Wastewater Master Plan update.

This exercise begs several questions about growth and its impact on infrastructure – roads, sewer, water, and even outside providers – electric, gas, cable, cellular, etc.

1. Is there currently an appropriate amount of residential inventory for the community?

   Historically, the market has dictated the level of residential inventory in the community and the city has not established a certain level of "healthy" residential inventory. It is good to track the current inventory over time to

understand the historic rates, but it is assumed that the inventory will cycle through periods of growth.

2. What is the design capacity of the current wastewater treatment plant? When must the City begin construction of the Wakarusa Water Reclamation Facility (WWRF)?

   The Utilities Department reports that the design population equivalent that can be served by the wastewater treatment plant located on East 8th Street is 100,000. However, for a number of reasons the City should not wait until that number is reached to begin construction of the WWRF. The Utilities Department believes the WWRF should be completed at a population equivalent of 98,000. The WWRF's design and construction is estimated to take up to five years to complete. The 2008 population estimate for the city was determined to be 90,866. The upcoming recommendations from the Wastewater Master Plan will be very important in determining the timing and scope of the necessary WWRF.

3. Assuming a 10-year inventory of residential locations, it is still appropriate to plan for future growth. Where will growth likely occur given the opportunities and constraints specific to this community?

   Providing sewer and water are only two components of setting a framework for growth. Other opportunities and constraints to development include the following:

   - West of K-10 – Expected **High** rate of growth. Growth in this area aligns with the historic growth pattern of Lawrence and would take advantage of K-10 and I-70 access and inclusion in the Lawrence school district. The West of K-10 Plan established a policy for not permitting development for a large portion of this area until a financing plan and a commitment to construct an interchange at 15th Street/Bob Billings Parkway is established.
   - K-10 and Farmer's Turnpike Sector Plan area – Expected **Medium** rate of growth. The area north of I-70 along Farmer's Turnpike has been planned for significant employment center growth. Demand for residential growth would need to be high to develop some portions of this area with sewers given the makeup of the watersheds. Residential growth in this area is not expected to occur at a high rate.
   - Northeast Sector Plan area – Expected **Low** rate of growth. The Grant Township area is an area currently undergoing sector planning to determine the level of future urbanization. Historically, this has been a very slow growth area as it is constrained by floodplain and other elements that make it less desirable to urbanize.
   - East – Expected **Low** rate of growth. Challenging topography, limited highway access, floodplain, and moving too far downstream of the treatment facilities all constrain development to the east along K-10 Highway. Urbanizing within the Southeast Sector Plan area is anticipated, but developing east of this plan's boundaries may not be feasible.
   - South – Expected **High** rate of growth. South of the Wakarusa River, opportunities exist to take advantage of a new treatment facility and the Highway 59 improvements. The area is within the Lawrence school district

and staff believes this could be a significant growth area if the market demands it after the new treatment facility is constructed. Sector planning this area is included on the long range work plan for the department.

- Infill – Expected **Low** rate of growth. While there is opportunity to develop and redevelop certain areas of the community, this will not play a significant role in the long term growth projections for Lawrence. Infill and higher density redevelopment is considered the most efficient use of existing infrastructure but would only provide a small fraction of inventory needed to support the anticipated growth over the coming decades.

While capacity issues can be resolved with the new WWRF, decisions about where to establish water, sewer and road infrastructure will need to be made within the next 10 years. The Utilities Department indicates that once the WWRF is online, projects will continually need to be *balanced* in order to optimize the system. Growth decisions also impact other public services – street maintenance, police, fire, solid waste, and other general government services that must expand to keep up with the growth demand.

Plan Scenarios

Staff believes that the consultant should develop wastewater infrastructure solutions to serve the following three (3) scenarios:

a) **Scenario 2020:** Using the approved sector plans and other assumptions about future growth, disburse the projected 2020 population within the Wastewater Master Plan boundary.
b) **Scenario 2030:** Using the approved sector plans and other assumptions about future growth, disburse the projected 2030 population within the Wastewater Master Plan boundary.
c) **Scenario Build-out:** Using the approved sector plans and other assumptions about future growth, populate the entire Wastewater Master Plan boundary.

Planning Process

It is appropriate for this report and attached maps to be provided to the Planning Commission, County Commission, School Districts, and other stakeholders for review and comment. Input from the stakeholders and general public will be solicited through the meetings staff will hold with the City Commission, Planning Commission, County Commission, and School Districts. Staff can complete the majority of the information sharing in May, 2010. Results of the input and comments will be summarized and a report of the results will be presented for City Commission approval at the end of the information-sharing process in order to provide staff the direction to implement the planning process.

Action Requested:

Receive report and direct staff as appropriate.

2010 Wastewater Master Plan
Study Boundary & Basins

City of Lawrence
UTILITIES

Legend

Wastewater Basins
- Baldwin Creek
- Central
- East Lawrence
- Kansas River
- North Lawrence
- Wakarusa River
- Wakarusa South
- Yankee Tank Creek

WWMP Study Boundary
- WWMP Study Boundary
- Urban Growth Area 2030
- WWRF Site
- WWRF Site Area
- County Limit
- City Limit
- Stream

Topographic
- High : 1180
- Low : 800

NL-1 NL-2 NL-3 NL-4 NL-5
KR-1 KR-2 KR-4 KR-5 KR-6 KR-7 KR-8
BC-1 BC-2 BC-3 BC-4
YTC-1 YTC-2 YTC-3 YTC-4 YTC-5 YTC-6
WR-1 WR-2 WR-3 WR-4 WR-6
C-1 C-2
EL-1 EL-2
WRS-1 WRS-2 WRS-3 WRS-4 WRS-5 WRS-6 WRS-7 WRS-8 WRS-9 WRS-10 WRS-11

I-70
US-40
US59/24
US 24/40
K-10
458
1029
N Iowa St
N 2nd St
Peterson Rd
W 6th St
W 9th St
E 11th St
Kentucky St
W 23rd St
E 23rd St
W 31st St
Wakarusa Dr
Kasold Dr
Iowa St
Haskell Ave
E1900 Rd
E1500 Rd
N1000 Rd
US-59

Miles
0 0.25 0.5 1 1.5 2

WWMP_Basins&Boundary.mxd - Cjm 3/29/10

Residential Development Project Sites, January 2010

Legend

- 2009 New Residential Permits
- Platted Lot -- Need Infrastructure
- Platted Lot -- Available to Build
- Approved or Potential Projects (in Units)
- Potential Projects - No Units Assigned

0 0.25 0.5 1 1.5 Miles

\\Lawgis\gisdata\SHAPEFILES\Planning\Potential Resid Dev Projects 2010\Potential Residential Development and Available Lots_as_of_2010 Project.mxd

Memorandum
City of Lawrence
City Manager's Office

TO: David L. Corliss, City Manager
CC: Diane Stoddard, Assistant City Manager
FROM: Roger Zalneraitis, Economic Development Coordinator/Planner
DATE: January 27, 2010
RE: Update to Residential Inventory Analysis

This memo provides an update to the available residential lot inventory conducted on January 30th, 2009. The update finds that based on current market conditions, there is sufficient inventory to meet 8 to 14 years of demand for new single family residential housing. This represents an increase from last year and is almost exclusively caused by deteriorating housing market conditions.

Previous Report
The residential lot inventory of January, 2009 found that there were about 4,400 lots platted from 1997 to the end of 2008. Of those, approximately 1,000 lots remained available for construction, and a little over 1,400 lots remained available for construction throughout the City. In 2008, there were 141 single family residential permits issued for new construction. As a result, the available lots represented up to 11 years of available inventory for the community.

Inventory Update
From 1999 to the end of 2009, there were approximately 4,087 residential lots platted in Lawrence. The change from the previous analysis suggests that about 300 lots were platted in 1997 and 1998. Perhaps as a result of the recession, there were very few new plats filed in 2009. The majority of new plats were replats of existing subdivisions.

Of the 4,087 lots available at the end of 2009, about 761 of them remained available for development:

Table 1
Residential Inventory as of December 31st, 2009
Lots Platted After January 1, 1999

	Lots	Area (Acres)	Average Lot Size
No Infrastructure, No Dwelling Units	547	137.6	0.25
Infrastructure, No Dwelling Units	761	223.3	0.29
Infrastructure and Dwelling Units	2,779	787.7	0.28
Total Lots	4,087	1,148.7	0.28

Note: The increase in area from 2008 resulted from lots that previously had no acreage recorded within the GIS database.

Additionally, almost 550 lots platted in the last 10 years still have no sewer or water (infrastructure). It is unclear at this time when these lots may receive infrastructure, as the recession has slowed demand for additional housing. The 761 lots with infrastructure represent almost 20% of the total stock of newly platted lots.

Across the City as a whole, there are 1,335 available lots for development (this includes the 761 lots in recently platted subdivisions). This represents a decrease of about 90 available lots since last year. The decrease in available lots resulted because of new building permits and limited new plats over the course of the year.

New Residential Construction
About 141 residential building permits were issued last year:

Table 2
New Residential Permits in 2009

Type	Total	Platted, 1999-2009	Units
Single Family	110	91	110
Duplex	16	13	32
Apartment	15	15	172
Total	141	119	314

source: GIS and Development Services Permit Report

There were 110 single family residential permits issued (compared to 141 single family residential permits in 2008), 16 duplex permits issued (representing 32 units of new construction), and 15 apartment permits issued. However, all 15 apartment building permits were issued to the same site and represent 172 units in 15 new buildings at the one site. In total, 314 new units of residential housing were built. The vast majority of these new units were built on lots that were platted between 1999 and 2009. Three duplex permits and 19 single family housing permits were issued on lots that were platted prior to 1999. Therefore, it is reasonable to expect that new residential building permits will be issued on recently or soon-to-be platted properties in the City.

A map of the residential lots platted from 1999 to 2009 and the building permits that were issued in 2009 is available in the Appendix to this report.

Residential Building Lot Inventory
The residential lots listed in Table 1 are predominantly single family residential units. Therefore, this analysis will use them as a proxy for all available single family residential units in the City.

With approximately 761 single family residential lots available in areas platted from 1999 to 2009, in current market conditions this represents over 8 years of market demand. In other words, the market demand of 91 new single family residential units in newly-constructed subdivisions could be maintained for that time period. However, we also

saw in Table 1 that almost 2,800 lots platted since 1999 have housing on them. The historic rate of demand is thus about 252 units per year. At that rate of development, the 761 single family lots would accommodate about 3 years of growth.

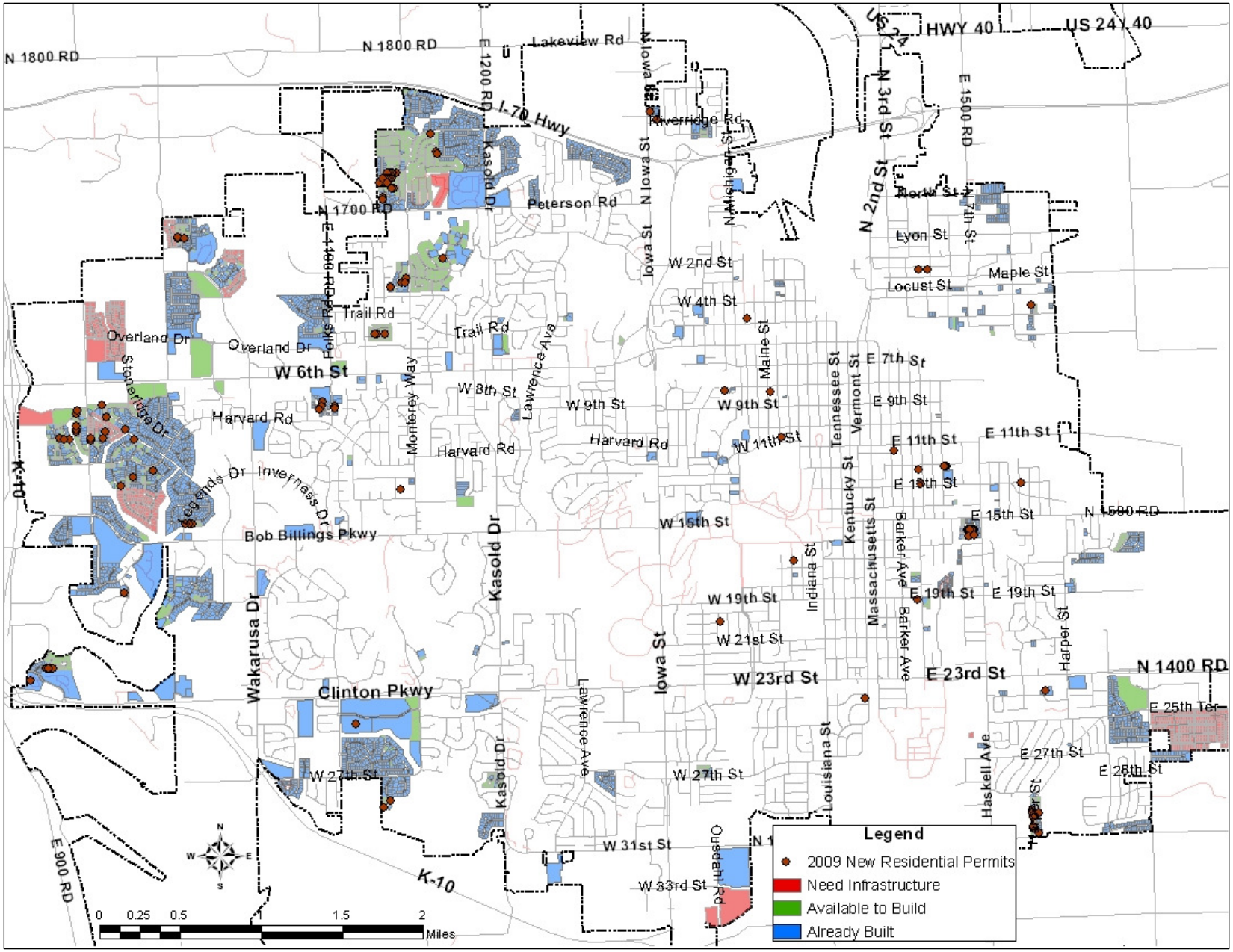
There are a total of 1,335 available residential lots in the City. This implies that there are 574 additional single family residential lots available in older subdivisions. As noted, 18 permits were issued in these subdivisions last year for single family residences. Therefore, under current market conditions these 574 lots could accommodate far more than 20 years of growth.

Finally, there are 547 residential units that are platted but have no infrastructure. If these are added to the 761 available single family residential units, the inventory rises from being able to accommodate 8 years of current demand to being able to accommodate over 14 years of current demand. Under historic demand scenarios, there would be a little more than 5 years of inventory available for single residential family housing.

At the end of 2008, we estimated that existing and potential inventory (lots that do not yet have infrastructure) could accommodate between 5 and 11 years worth of demand. There now appears to be between 5 and 14 years of demand. Additionally, there has been a slight decline in available lot inventory over this period. The fact that demand appears to be slightly greater now is a reflection of deteriorated housing market conditions rather than new supply coming online.

APPENDIX

Lawrence Residential Lots Platted Between 1999 and 2009, and Residential Building Permits Issued 2009



0 1,7503,500 7,000 10,500 14,000 Feet

1 inch = 7,000 feet

Estimated Population Change Between 2010 and 2020 by TAZ for City Wastewater Master Plan

Change_2010-2020

- -10 - 0
- 1 - 97
- 98 - 216
- 217 - 422
- 423 - 791
- 792 - 1,600
- 1,601 - 3,000

70
40
10
24/59
24/40
40/59
32
59

0 1,7503,500 7,000 10,500 14,000 Feet

1 inch = 7,000 feet

Estimated Population Change Between 2020 and 2030 by TAZ for City Wastewater Master Plan

Change_2020-2030

- -8 - 0
- 1 - 97
- 98 - 216
- 217 - 422
- 423 - 791
- 792 - 1,600
- 1,601 - 3,000

24/59
32
24/40
70
40/59
40
10
59

0 1,7503,500 7,000 10,500 14,000 Feet

1 inch = 7,000 feet

Estimated Population Change Between 2010 and 2030 by TAZ for City Wastewater Master Plan

Change_2010-2030

- -18 - 0
- 1 - 97
- 98 - 216
- 217 - 422
- 423 - 791
- 792 - 1,600
- 1,601 - 3,000

70
40
10
24/59
24/40
40/59
32
59

Estimated Build Out Population Per Acre by TAZ for City Wastewater Master Plan

0 1,750 3,500 7,000 10,500 14,000 Feet

1 inch = 7,000 feet

Population / Acre

- 0.0 - 1.0
- 1.1 - 4.0
- 4.1 - 8.0
- 8.1 - 11.0
- 11.1 - 17.0
- 17.1 - 27.0
- 27.1 - 43.0
- 43.1 - 73.1

70 40 10 24/59 24/40 40/59 32 59

Appendix 1-E
University of Kansas Water Use Projections

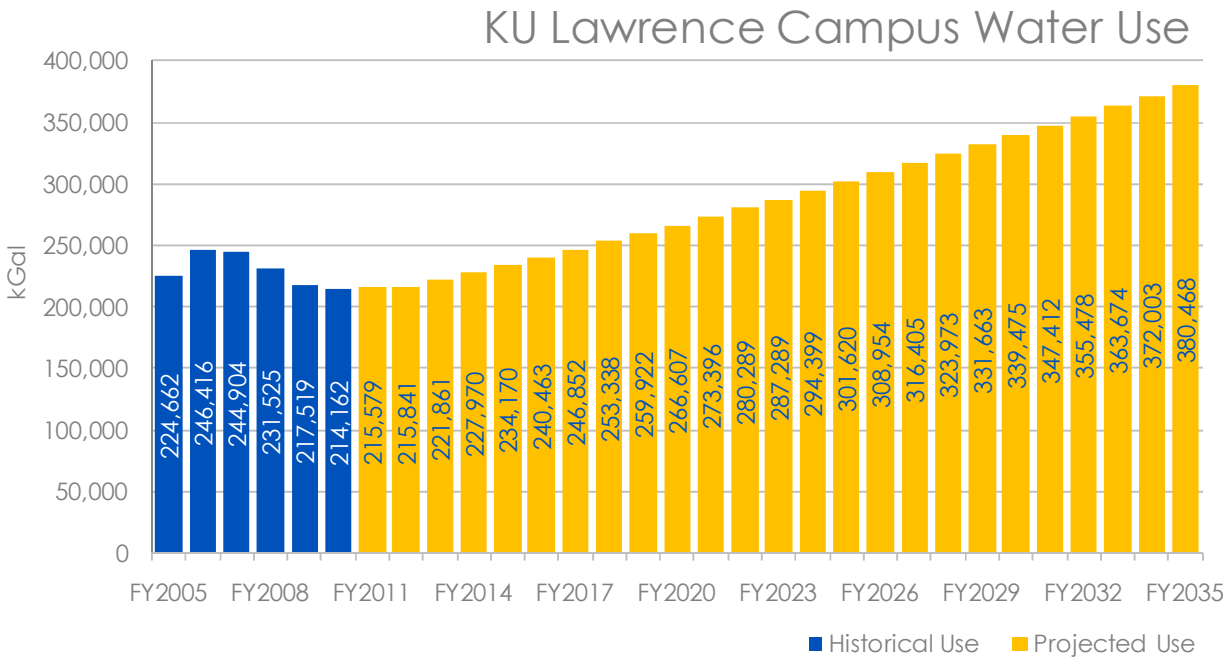
To: Doug Riat

From: Scott McVey

Date: July 27th, 2010

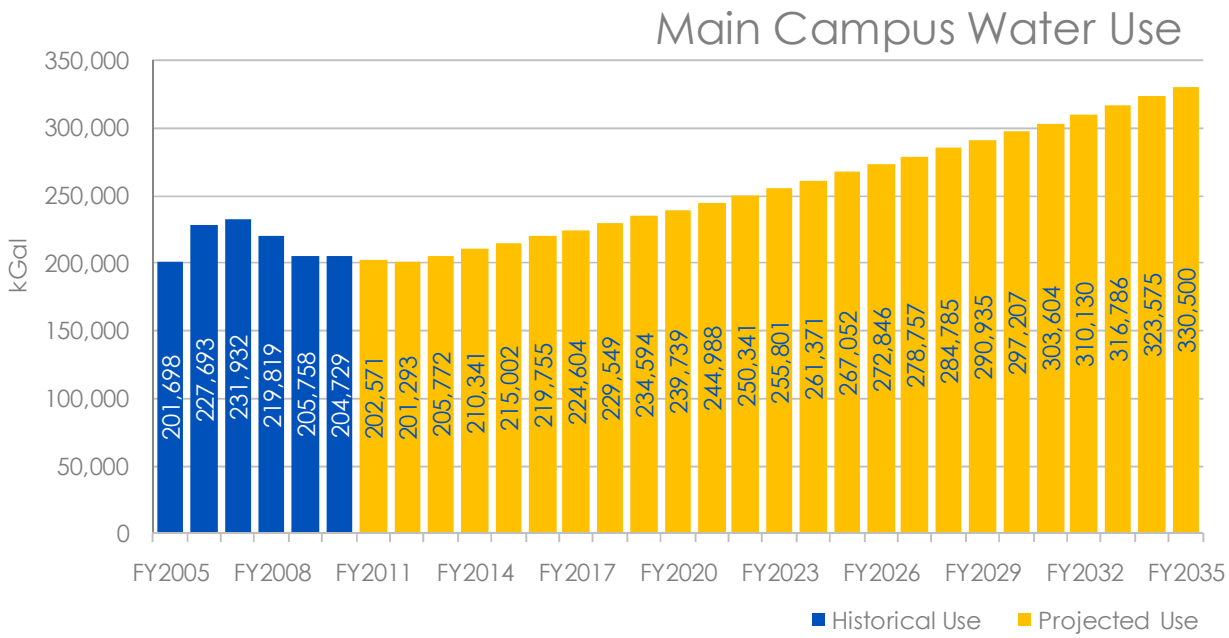
Re: 25 year water use projections for KU's Main and West Campus

This memo summarizes the study of KU's projected water use over the next 25 years. The combined Main and West Campus water usage is expected to increase by 77 percent in 25 years, or 166 million gallons as shown in the following chart:



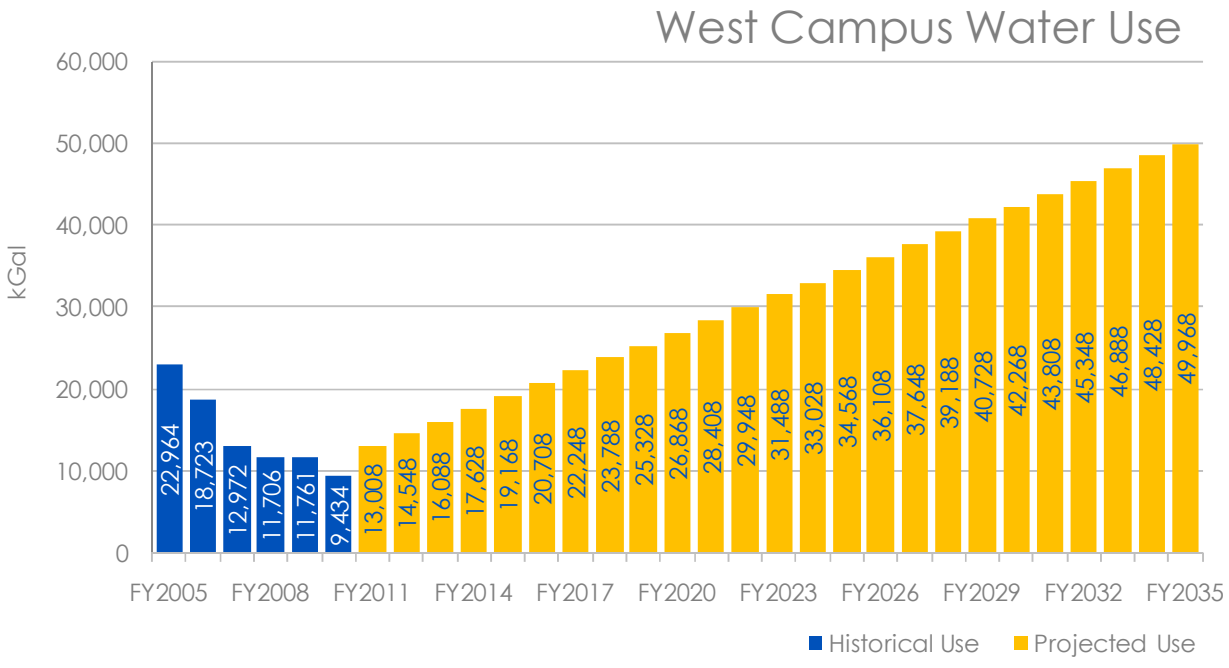
Main Campus water use projections

Modest growth in student population on Main campus is expected. It is assumed that water use will increase proportional to student population growth on Main Campus at a rate of 2 percent per year. The following chart shows KU's Main Campus water use for the past five years and projections for annual water use over the next 25 years. Additionally, it is anticipated that a recent water conservation project on campus will result in a short-term decline in water use. In 25 years it is projected that water use on Main Campus will be approximately 330,500,000 gallons, a 61 percent increase over FY2010's usage.



West Campus water use projections

KU's West Campus has the largest potential for water consumption increases due to the large amount of undeveloped land that will facilitate new buildings. It is projected that KU will expand new building area by approximately 50,000 square foot per year over the next 25 years. On average, west campus research buildings use approximately 31 gallons of water per square foot annually. As a result of this growth it is projected that water use on West Campus will be approximately 50,000,000 gallons, a 400 percent increase over current usage by year 2035.



Lawrence Wastewater Master Plan
Meeting Notes

Date: October 6, 2010
Location: BG Consultants office
Attendees: Mike Lawless, Jim Modig, Doug Riat, Leigh Myers , David Hamby

Topics Discussed:

At the beginning of the meeting there was a short introduction of the master plan process and using population projections to determine flow. The City appreciates the input from KU and for meeting with them to help understand the water use projections and what they represent.

Doug explained the thoughts behind the July 27, 2010 memo that was prepared by Scott McVey and sent to the City of Lawrence staff showing the 25 year water use projections.

Doug shared that KU did not expect a significant enrollment growth either long term or short term.

Doug said that the projected use numbers presented in the memo for Main Campus may be an overestimation. The 2% growth rate used is likely high. A 1% growth rate is more likely.

Doug explained that new building growth on the Main Campus will be limited as there are only a few locations for new buildings. The new buildings will be more efficient than most of the existing buildings.

Jim and Doug stated that they felt comfortable with the West Campus water use projections. They have had extensive growth in the last few years and expect that growth to continue for the foreseeable future. They said that the growth will mainly be in the area to the north of the Shenk Fields. A building could be built near the Lied Center but no building is planned for the Fields Area or west of the existing creek.

The amount of water associated with irrigation on the West Campus was discussed. If KU Staff could isolate this amount they would provide it to the City.

It was decided that the water use information is not appropriate for the master plan build out scenario but is really an addition to the 2020 and 2030 population information.

Technical Memorandum No. 2
Existing Wastewater Collection System Evaluation

Wastewater Facilities Master Plan

for

Lawrence, Kansas

City of Lawrence, Kansas

BMcD Project No. 54793

City P.O. 07629

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, MO 64114

Burns & McDonnell
SINCE 1898

BG CONSULTANTS
architects engineers
planners surveyors

City of Lawrence, Kansas

Wastewater Facilities Master Plan Technical Memorandum No. 2

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* = follows page number

Appendices

A. Introduction

Technical Memorandum (TM) No. 2 is a summary of an evaluation of the existing wastewater collection system completed in partial fulfillment of the Lawrence, Kansas Wastewater Facilities Master Plan. The goals for this TM were to:

- Document the components of the existing system.
- Delineate system drainage basins that are useful for system analysis.
- Document the wastewater flow and rainfall monitoring program performed by the City of Lawrence in support of this master plan.
- Analyze existing wastewater flow components including both dry and wet weather flow components such as wastewater flow, dry weather infiltration, and wet weather derived infiltration and inflow by drainage areas tributary to the wastewater flow meters installed for the City's wastewater flow metering program.
- Compare estimated levels of rainfall derived infiltration and inflow (RDII) within drainage areas and rank them on the basis of RDII level.
- Develop a computer hydraulic model of the existing collection system calibrated for both dry and wet weather flow conditions on the basis of the wastewater flow and rainfall monitoring program performed by the City.
- Run the computer hydraulic model to simulate what flows would occur during a design storm wet weather event.
- Based on the existing system modeled design storm event, identify any system deficiencies which require corrective action to reduce or eliminate all sanitary sewer overflows.
- Determine recommended corrective measures required to address existing system deficiencies. In some cases, alternatives may be compared to arrive at the best solution for the City's needs.

B. Existing System Description

1. Drainage Basins

For purposes of system evaluation, the master plan study area is divided into a total of eight major drainage basins which are further subdivided into sub-basins. The drainage basins and sub-basins generally follow natural watershed and sub-watershed boundaries, which also correspond to the

configuration of gravity sewers, pumping stations and force mains. Drainage basins and sub-basins are shown on Figure 2.1 and are identified below in Table 2.1.

Table 2.1
Drainage Basins

Drainage Basin Name	Drainage Basin Designation	Number of Sub-Basins
Baldwin Creek	BC	7
Central	C	4
East Lawrence	EL	4
Kansas River	KR	12
North Lawrence	NL	4
Wakarusa River	WR	8
Wakarusa River South	WRS	11
Yankee Tank Creek	YTC	6

Parts or all of seven of the drainage basins are currently served by the City's wastewater utility, while one, the Wakarusa River South drainage basin, has no service at this time.

2. Drainage Basin Descriptions

a. Baldwin Creek Basin

The Baldwin Creek Basin lies within northwest Lawrence and includes seven sub-basins. The drainage basin straddles Interstate 70, is bounded by W 6th Street and US 40 on the south, E 700 on the west, and E 1100 Road to the east. Natural drainage is generally to the north and east toward the Kansas River. Due to limited development in this drainage basin, pumping stations convey flows east to gravity sewers in the Kansas River basin and south to gravity sewers in the Yankee Tank Creek and Wakarusa River Basins.

b. Central Basin

The Central Basin includes four sub-basin and contains most of the main University of Kansas campus. The Alabama Street Pumping Station (PS-8) receives the majority of flow from this basin for transfer to the Kansas River Basin. Wet weather peak flows that may exceed PS-8 capacity are diverted to the Wakarusa River Basin via an 15-inch gravity relief sewer.

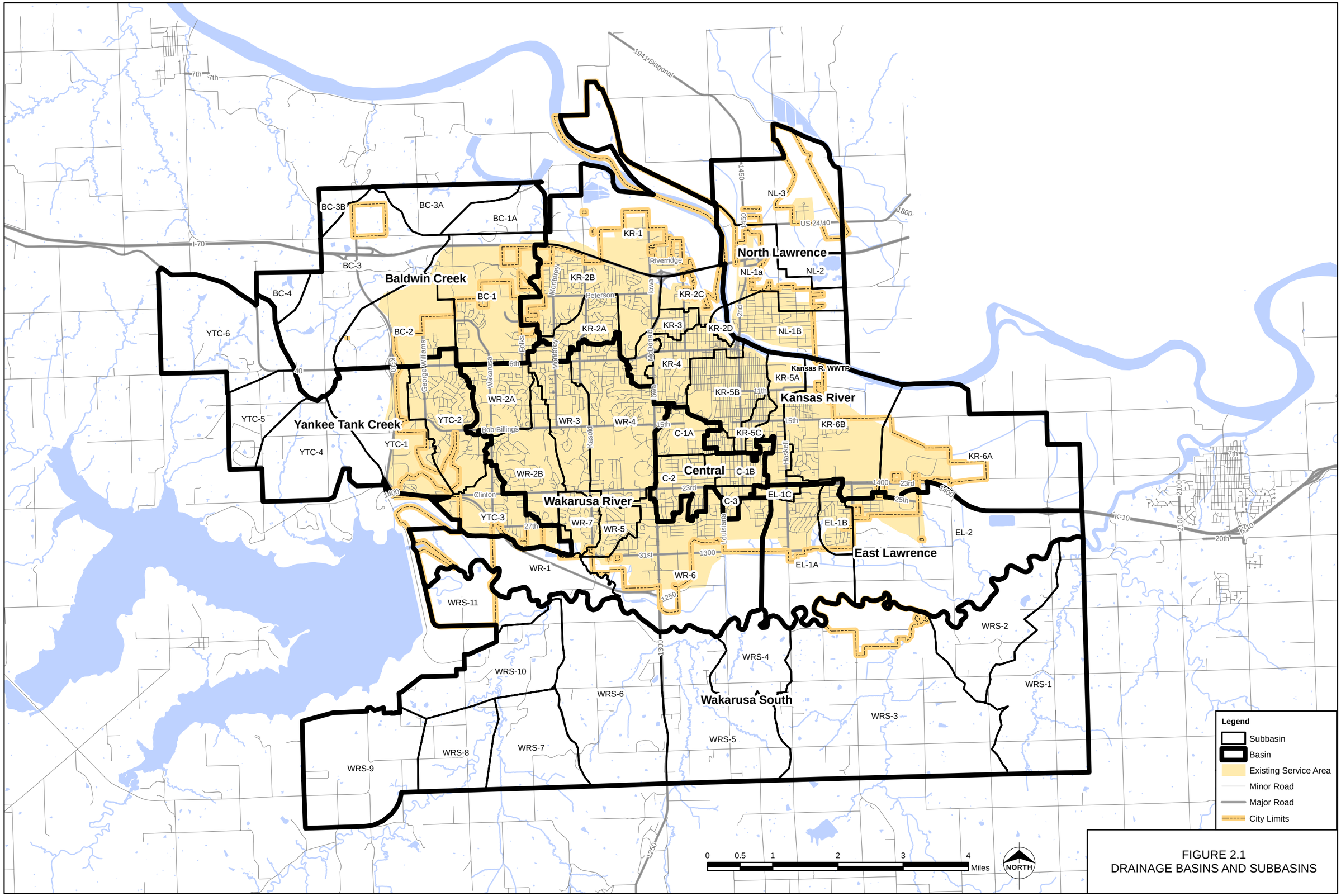


FIGURE 2.1
DRAINAGE BASINS AND SUBBASINS

c. East Lawrence Basin

The East Lawrence Basin is generally bounded by K-10 to the north, the Wakarusa River to the south, Haskell Avenue to the west and E 1900 Road to the east. It includes four sub-basins. Pumping stations transfer basin flows west and north to the Kansas River Basin.

d. Kansas River Basin

The Kansas River Basin includes downtown Lawrence and adjacent areas to the southeast and northwest of downtown. There are 12 sub-basins. All other drainage basins convey their flows to the Kansas River Basin since the KRWWTP is located in this basin. It includes the oldest parts of the City's collection system. Because of these factors, it is a critical part of the City's wastewater collection system. The majority of flows are conveyed to the KRWWTP influent pumping station via the Kentucky Street Pumping Station (PS-16) and gravity interceptors.

e. North Lawrence Basin

The North Lawrence Basin includes the only sewered areas north of the Kansas River and has four sub-basins. Collected flows are pumped south across the Kansas River to the KRWWTP.

f. Wakarusa River Basin

The Wakarusa River Basin includes eight sub-basins. It includes south Lawrence and a portion of west Lawrence to approximately Wakarusa Drive. It lies generally south of 6th Street and west of Iowa Street. Its southern boundary is the Wakarusa River. Major pumping stations in this drainage basin include the Four Seasons Pumping Station (PS-9) and its 6.25 MG total volume wet weather peak flow storage basins, and the Wakarusa Pumping Stations (PS-5A and PS-5B), which convey basin flows north to the Kansas River Basin.

g. Wakarusa River South Basin

The Wakarusa River South Basin includes eleven sub-basins. It lies generally south of the Wakarusa River and bounded to the west, south and east by the master planning area boundary. The Wakarusa River South Basin has no wastewater utility service at this time.

h. Yankee Tank Creek Basin

The Yankee Tank Creek basin lies west of the Wakarusa River Basin and south and west of the Baldwin Creek Basin, extending as far west as East 550 Road. It includes six sub-basins (YTC-1 through YTC-6). Clinton Lake is directly south of the Yankee Tank Creek Basin. Currently, only three sub-basins, YTC-1, YTC-2 and YTC-3 are served by the City's wastewater utility. Flows are conveyed by gravity to the Four Seasons Pumping Station where they are pumped east to the Wakarusa River Basin.

3. Collection System and Treatment Facilities

a. General

The existing collection system and treatment facilities include a network of gravity sewers, pumping stations and force mains, peak flow storage basins, and a wastewater treatment plant. A map of the existing collection system and treatment facilities is shown in Figure 2.2.

b. Gravity Sewers

Gravity sewer sizes range from 6-inch to 48-inch diameters. The oldest sewers, dating as early as 1916, are vitrified clay pipe. More recently, reinforced concrete, composite, and plastic (PVC) have been used. Older manholes are constructed of brick and mortar, while newer manholes are precast concrete. Table 2.2 summarizes existing sewers and other data for each of the drainage basins.

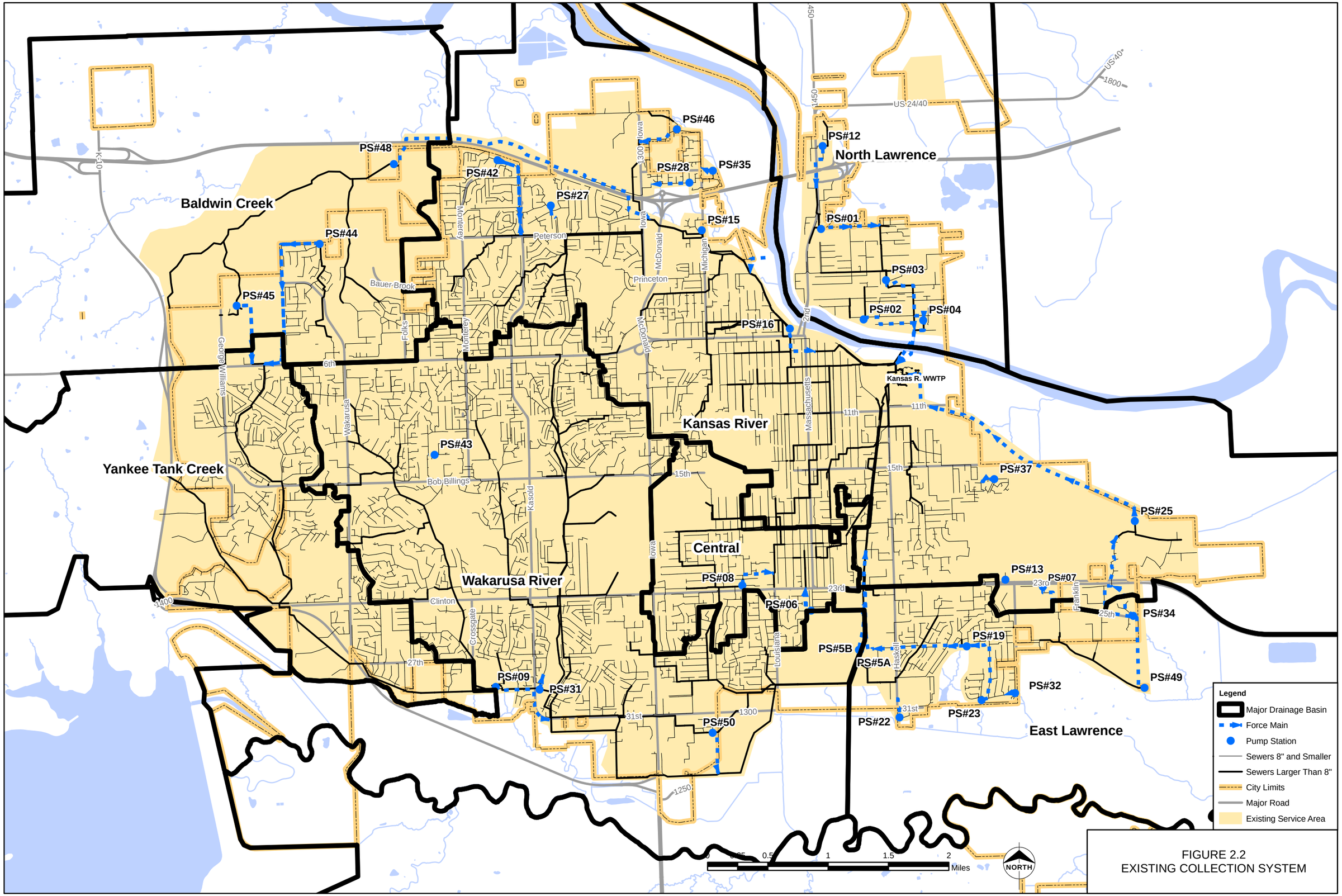


FIGURE 2.2
EXISTING COLLECTION SYSTEM

Table 2.2
Existing Sewers

Gravity Sewers					Manholes		
Basin	**Average Age (Years)**	**Length (Miles)**	**Material (>10%)**		**Number**	**Material (>10%)**	
Baldwin Creek	9.5	16.8	PVC	37.8%	407	Conc	100%
			Truss	44.3%			
			VCP	11.3%			
Central	52.3	31.2	VCP	88.9%	786	Brick	61%
						Conc	37%
East Lawrence	23.2	21.9	PVC	20.9%	570	Brick	7%
			Truss	46.8%		Conc	93%
			VCP	31.2%			
Kansas River	37.4	139.9	PVC	10.8%	3366	Brick	39%
			VCP	71.6%		Conc	59%
North Lawrence	47.9	16.0	Truss	10.9%	354	Brick	43%
			VCP	80.7%		Conc	54%
Wakarusa River	32.1	135.8	PVC	15.5%	3611	Brick	14%
			Truss	42.1%		Conc	85%
			VCP	41.0%			
Yankee Tank Creek	12.6	44.3	PVC	30.8%	1084	Conc	100%
			Truss	60.3%			

c. Pumping Stations and Force Mains

The collection system includes 33 wastewater pumping stations as needed to convey wastewater from one drainage basin to another or at locations where it is not practical to extend gravity sewers. Table 2.3 summarizes pumping station and force main information by drainage sub-basin.

Table 2.3
Pumping Station and Force Main Summary

Sub-basin	Pump Station No.	Total Peak Capacity-MGD (1)	Firm Peak Capacity-MGD (2)	Force Main No. 1		Force Main No. 2	
				Size (in)	Length (ft)	Size (in)	Length (ft)
North Lawrence Basin							
NL-1	PS_01	1.97	1.86	10/8	2,648	NA	NA
NL-1	PS_02	0.62	0.54	6	2,933	NA	NA
NL-1	PS_03	3.24	2.90	12/6	3,492	NA	NA
NL-1	PS_04	4.82	3.56	18	2,712	8	2,595
NL-1	PS_12	0.46	0.39	6	2,175	NA	NA
Wakarusa River Basin							
WR-6	PS_5a	3.05	2.77	12	4,519	NA	NA
WR-6	PS_5b	16.59	12.72	24	2,088	NA	NA
WR-2	PS_09	7.12	3.91	20	3,499	NA	NA
WR-2	PS_09 WW	4.74	0.00	20	412	NA	NA
WR-2	PS_31	0.17	0.16	4	686	NA	NA
WR-3	PS_43	0.13	0.08	2	267	NA	NA
WR-6	PS_50	0.80	0.61	6	1,995	NA	NA
Central Basin							
C-3	PS_06	2.29	1.80	8	1,299	8	1,243
C-2	PS_08	3.04	2.87	10	1,999	NA	NA
Baldwin Creek Basin							
BC-1	PS_44	3.72	1.86	10	7,716	10	7,716
BC-2	PS_45	1.60	0.79	8	3,192	8	3,192
BC-1	PS_48	6.56	6.03	16/24	13,665	NA	NA
Kansas River Basin							
KR-6	PS_07	0.34	0.30	4	1,359	NA	NA
KR-6	PS_13	0.16	0.15	4	349	NA	NA
KR-2	PS_15	0.34	0.29	4	342	NA	NA
KR-4	PS_16	19.52	17.41	24	2,124	NA	NA
KR-6	PS_25	4.40	3.63	12	13,743	8/10	13,114
KR-2	PS_27	0.74	0.53	6	651	NA	NA
KR-1	PS_28	0.13	0.12	4	1,681	NA	NA
KR-1	PS_35	0.13	0.11	4	653	NA	NA
KR-6	PS_37	0.17	0.11	4	914	NA	NA
KR-2	PS_42	1.26	0.55	8	3,950	6	3,950
KR-1	PS_46	1.57	1.23	8	1,937	NA	NA
East Lawrence Basin							
EL-1	PS_19	2.60	1.93	12	7,319	NA	NA
EL-1	PS_22	0.13	0.12	4	1,139	NA	NA
EL-1	PS_23	0.08	0.05	4	508	NA	NA
EL-1	PS_32	0.79	0.69	6	3,576	NA	NA
EL-2	PS_34	0.13	0.09	4	1,860	NA	NA
EL-2	PS_49	2.63	1.78	12	8,439	NA	NA

(1) Capacity based on all pumps in service using all force main(s).

(2) Capacity based on largest pump out of service using all force main(s).

d. Wet Weather Storage Basins

Three wet weather storage basins having a total storage volume of 6.25 MG are located adjacent to the Four Seasons Pumping Station (PS-9). PS-9 includes two pumps used for pumping peak wet weather flows that exceed the capacity of the dry weather pumps to the storage basins. Stored flows are returned to the pumping station and pumped with other dry weather flows to the wastewater treatment plant after flows return to normal rates.

e. Wastewater Treatment Plant

All wastewater flows are now conveyed to the City's Kansas River Wastewater Treatment Plant (KRWWTP) for treatment. Treated wastewater is discharged to the Kansas River. The KRWWTP has a permitted annual average flow rate of 12.5 MGD. The treatment plant provides secondary biological treatment and disinfection of flows up to a peak flow rate of 25 MGD. During wet weather, flows rates that exceed 25 MGD are pumped to a high rate wet weather treatment facility or an on-site peak flow storage basin. These facilities have a firm peak flow rate capacity of 40 MGD, providing a total firm peak flow rate capacity of 65 MGD.

Wastewater flows will exceed the capacities of the KRWWTP at some time during the master planning period. The City has purchased land south of the Wakarusa River, which is to be the site of a new wastewater treatment plant.

C. Flow Monitoring Program

The City of Lawrence has conducted a flow monitoring program for about 5 years, beginning in September of 2006. There are 33 flow meters and 8 rain gauges used in the program. The locations of the flow meters are shown on Figure 2.3.

The City has leased the flow metering and rainfall monitoring equipment from Marsh McBirney. The start and stop dates for some flow meters do not span the entire length of the 5-year flow monitoring period. Three flow meters were moved part way through the monitoring period, others started after the beginning of the monitoring period, and most meters experienced periods when the flow meter was active, but did not record data at some time during the program. An attempt was made to utilize all available data, so there were 36 meter locations examined. A chart showing active dates by flow meter is shown in Table 2.4.

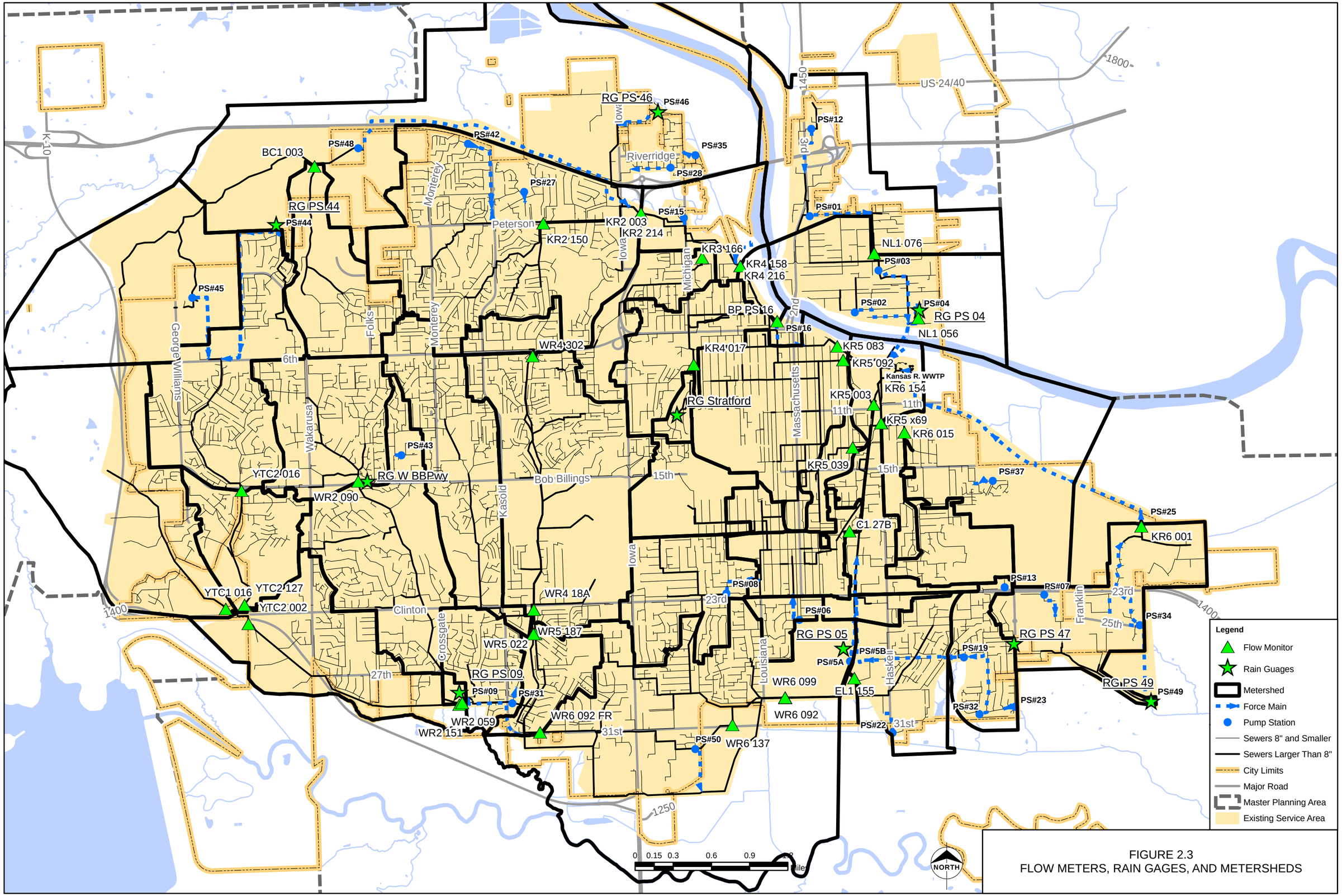


FIGURE 2.3
FLOW METERS, RAIN GAGES, AND METERSHEDS

Table 2.4
Flow Meter Coverage

Transition date (no overlap is assumed)

9/22/2006	9/26/2007	4/22/2008	8/8/2008	6/17/2009	PRESENT
	BC1 003	9/26/07 TO PRESENT			
		C1 27B	4/22/08 TO PRESENT		
EL1 155	9/22/06 TO PRESENT				
KR2 003	9/22/06 TO PRESENT				
			KR2 150	8/10//2008 TO PRESENT	
KR2 214	9/25/06 TO PRESENT				
			KR3 166	8/05/08 TO PRESENT	
KR4 017	9/26 TO 8/8/08				
KR4 158	9/22/06 TO PRESENT				
			KR4 171	8/12/08 TO PRESENT	
KR4 216	9/21/06 TO PRESENT				
KR5 003	ALL				
				KR5 039	6/17/09 TO PRESENT
KR5 083	9/26/06 TO PRESENT				
KR5 092	ALL				
KR5 x69	9/20/06 TO 4/22/08				
KR6 001	ALL				
KR6 015	ALL	big gap from 6/23/08 to 11/4/08			
KR6 154	9/22/06 TO PRESENT				
NL1 056	ALL				
NL1 076	ALL				
WR2 059	ALL				
WR2 090	ALL	GAPS			
WR2 151	ALL				
		WR4 18A	4/22/08 TO PRESENT		
WR4 302	9/26/06 TO 4/22/08				
WR5 022	9/26/06 TO 4/22/08				
WR5 187	ALL	gaps: 5/18/07 + , 10/4/2008			
WR6 092	9/22/06 to PRESENT				
WR6 092 FR	9/26/06 TO PRESENT				
WR6 099	9/20/06 TO PRESENT				
		WR6 137	4/22/08 TO PRESENT		
YTC1 016	ALL	BIG FLOW at 7/6/09			
YTC2 016	9/25/06 TO 8/8/08				
YTC2 002	9/26/06 TO 8/8/08				
			YTC2 127	8/10/08 to PRESENT	

The sanitary sewer network was partitioned for analysis into networks tributary to flow meters. Each of the tributary networks, or "metersheds", was given a shortened name derived from the flow meter. For example, the pipe network tributary to the meter KR2_214_HALLMRK was named the KR2 214 metershed (as seen in Table 2.4). The metersheds used for the analysis in this report were created by following the flow path through the sewer network according to pipe invert elevations. The metersheds were compared and found to be different from the study areas in the 2003 Master Plan Report and

different from the areas created by the City in subsequent analysis. Further comparative analysis between the three study areas was not done due to these differences.

In several instances, there are adjacent metersheds interconnected upstream of their flow meters by what are termed as "crossover" gravity sewers by this TM. A typical situation is two gravity sewers exiting from a single manhole, with one of the sewers conveying flow further downstream in the metershed, and the second conveying flow to an adjacent metershed. Often, the two exiting gravity sewers are installed at the same invert elevation.

There are a total of 31 such crossover gravity sewers that were referred to the City during TM2 development for investigation and verification of their conditions before the flow analysis proceeded further. Crossover sewers are installed to maximize system capacity. This number of crossover sewers, however, is unusual for a collection system of this size and makes it much more problematic to analyze the system without adding significantly more flow metering locations.

A schematic of these crossover sewers is provided in Figure 2.4, showing their relationships with the metersheds and flow meters. The crossover sewers are shown with their pipe size, slope, and whether each pipe's invert elevation is the same or higher than other pipes leaving the manhole at the upstream end of the crossover sewer.

Where these crossover conditions occur, it is likely that some portion of the upstream flow from one metershed is being diverted to the adjacent metershed. The actual diversion of flows by these crossover sewers is unknown and likely varies with different wet weather events. This raises uncertainties about the analysis of flows. As an example, there are cases where a downstream flow meter in a metershed records less flow than an upstream flow meter in the same metershed. In other cases, the dry weather metered flow rate is outside of reasonable expectations based on the population and land use that exists in the metershed. Both of these circumstances can be explained by one or more crossover sewers located in the system between the two meters that is diverting a portion of the flow to an adjacent metershed.

The first analysis step taken was the insertion of the average base flow rate observed at each flow meter into a spreadsheet and subtracting the flow components from the upstream metershed from those of the immediately downstream metershed. This step identified a number of inconsistencies in the flow meter data. The inconsistencies all occur at flow meters, which are, in one way or another, affected by the crossover gravity sewers. This makes it likely they are due to the unknown amounts of flow diversions that occur as a result of the crossover gravity sewers rather than inaccuracies in the flow meter data.

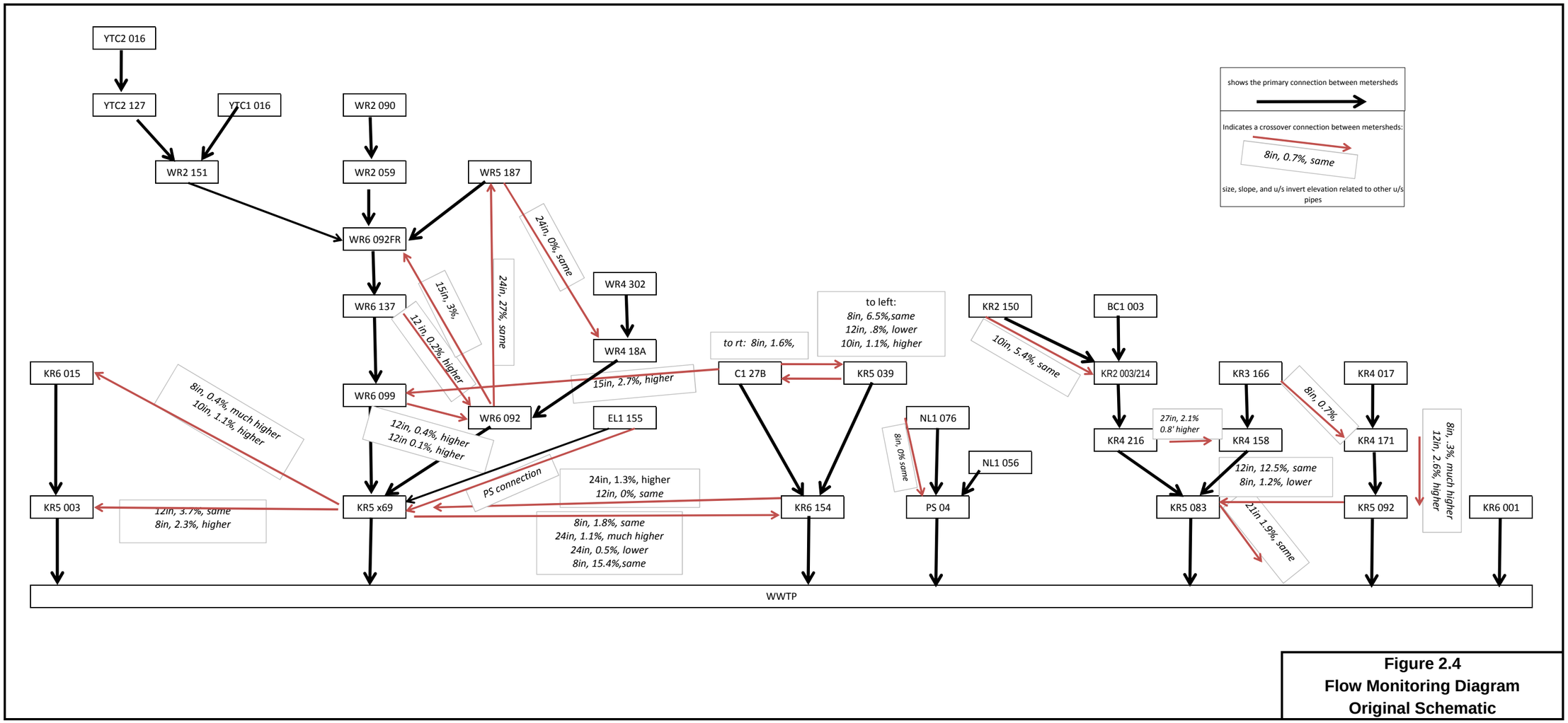


Figure 2.4
Flow Monitoring Diagram
Original Schematic

Each of these cases was analyzed to determine a reasonable approach for the subsequent detailed analysis of flows by metershed. In some cases, it was necessary to combine two or more flow meters into a single metershed or eliminate separate metersheds where their flow meters yielded a negative result due to the subtraction process. Table 2.5 summarizes those flow meters which needed to be eliminated from the flow component analysis and the reason each was eliminated. The net effect of the eliminated flow meters was a reduction in the total number of flow meters that are used for evaluation from 36 to 17, with a corresponding reduction in the number of separate metersheds that may be analyzed for flow components from 36 to 16.

Table 2.5
Flow Meter Drainage Area Elimination and Adjustments

FLOW METER	Action and Rationale
KR2 003	Data combined because of crossover connection immediately upstream of meter.
KR2 214	
YTC2 002	Data not used: this meter is immediately downstream of YTC1 016 and YTC2 127.
WR6 092FR	Data not used: flow is higher than expected according to area and population. Likely affected by upstream crossovers.
WR6 137	Data not used: flow is higher than expected according to area and population. Likely affected by upstream crossovers.
WR6 092	Data not used: negative interior flow.
KR6 x69	Data not used: negative interior flow.
C1 27B	Data not used: uneven distribution of base flow for similar areas, likely affected by upstream crossovers.
KR5 039	
KR4 216	Data not used: negative interior flow.
KR5 083	Data not used: negative interior flow when KR4 216 is accounted for. Likely affected by upstream crossovers.
KR4 171	Data not used: negative interior flow. Likely caused by crossovers both into and out of this metershed.
NL1 076	Data not used: uneven distribution of base flow, likely affected by upstream crossover.
NL1 056	Data combined with PS 03 and PS 04: flow is much smaller than it should be without scaling to PS 04 quantities.
KR5 003	Data not used: very high interior flow, likely affected by upstream crossover.
WR5 022	Data not used: this flow meter was an early term meter, immediately downstream of WR4 18A. Not used because coverage with very similar to u/s meter coverage.
KR2 150	Data not used: there is a crossover conduit adjacent to the flow meter with greater slope that appears to take more flow during low flow conditions than the flow meter conduit.
KR5 092	Data not used: this metershed loses substantial amounts through two crossovers on the north boundary. More leaves the metershed than goes through the meter. There are substantial differences in ratios between high and low flow models.
KR4 158	Data not used: there is very large inflow from a crossover that splits the flow that comes out of KR2 003/214.
WR5 187	Data not used: this metershed loses through one crossover and gains through another, very near the flow monitor. It gains a lot more than it loses. A lot of what comes out of WR4 18A crosses over and goes thru this flow monitor.
WR6 099	Data not used: this metershed has minimal gains and losses from crossovers, and is bracketed with meters at both the upstream and downstream boundaries. However, the difference between the two meters yields daily negative flows.
KR6 154	Data not used: large flows enter this metershed from the south under high flow conditions, and then just above the flow monitor a substantial amount enters from the east.
KR3 166	Data is scaled: at a midway point about 1/3 of the available flow leaves the metershed. This amounts to about 10% of the total metershed flow. This flow meter is scaled to 110%.
WR4 18A	Data is scaled: this shed gains from a crossover with WR5 187 near the meter. The distribution is fairly consistent between high and low flow conditions, a scaling of 75% compensates for the gain.

As a result of this analysis, the schematic of meters and crossover sewers shown in Figure 2.4 is modified to the revised schematic shown in Figure 2.5.

D. Flow Components

U.S. EPA's Sanitary Sewer Overflow Analysis Planning (SSOAP) toolbox program was used to analyze the flow monitoring data and determine various wastewater flow components. The following sections present the analysis for each flow component.

1. Dry Weather Flow

Dry weather flow (DWF) is defined as flow that is not influenced by wet weather conditions. Previous master plans referred to DWF as average daily dry weather flow. It includes wastewater flow (WWF) discharged by utility customers, which is considered to be equal to winter quarter metered water usage. It also includes dry weather infiltration (DWI), which is groundwater that enters the sewer system through system defects such as defective service line connections, broken sewer pipe, and manhole defects. DWI occurs at a nearly constant rate year-round and is not influenced by wet weather conditions.

The SSOAP program uses the flow meter raw data to develop flow component statistics. Because this program is in its first iteration, these statistics were verified for many of the metersheds using spreadsheet analysis. This check was done by choosing dry periods from the rain gauge information and finding the average and maximum flows for each meter. This check found that the SSOAP DWFs were reliable. The SSOAP analysis develops separate weekday and weekend statistics, and these were combined into a single statistic to characterize the base flow for each metershed (2/7*weekend + 5/7* weekday) with an average daily DWF.

Representative examples of the diurnal curves calculated by the SSOAP program during dry weather are shown below in Figures 2.6 and 2.7.

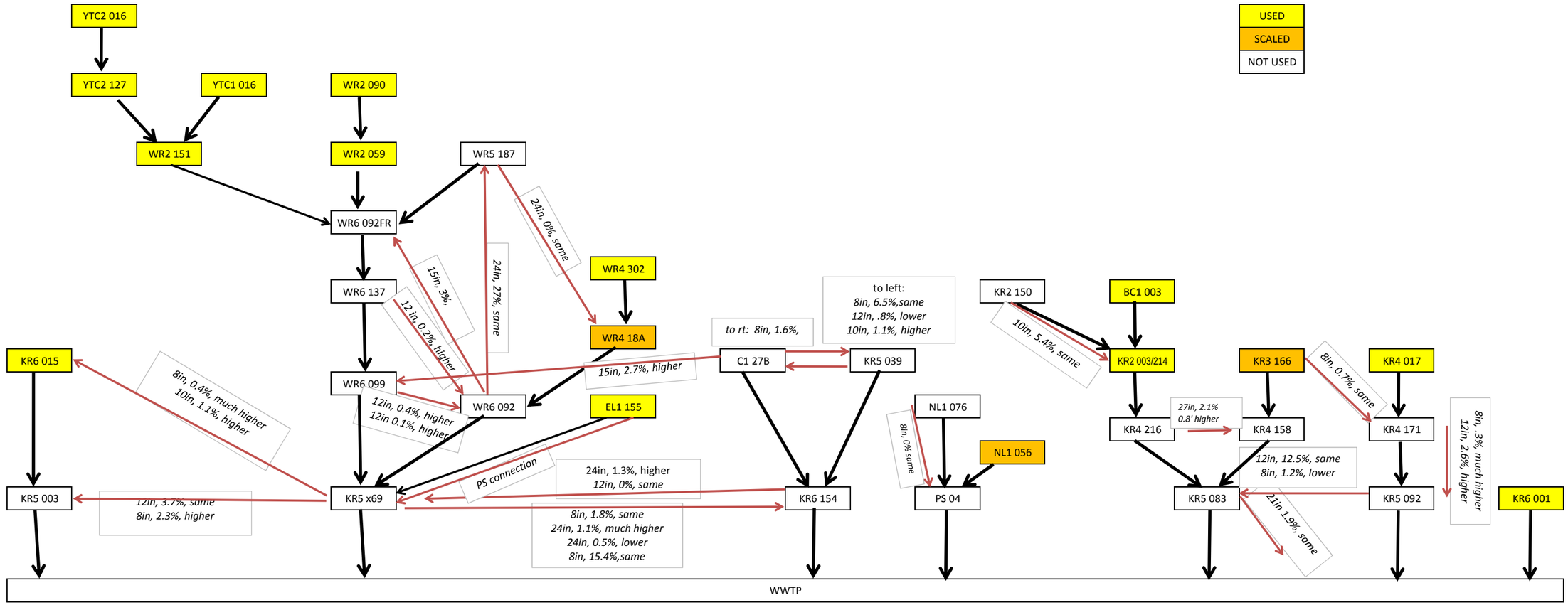


Figure 2.5
Flow Monitoring Diagram
Final Schematic

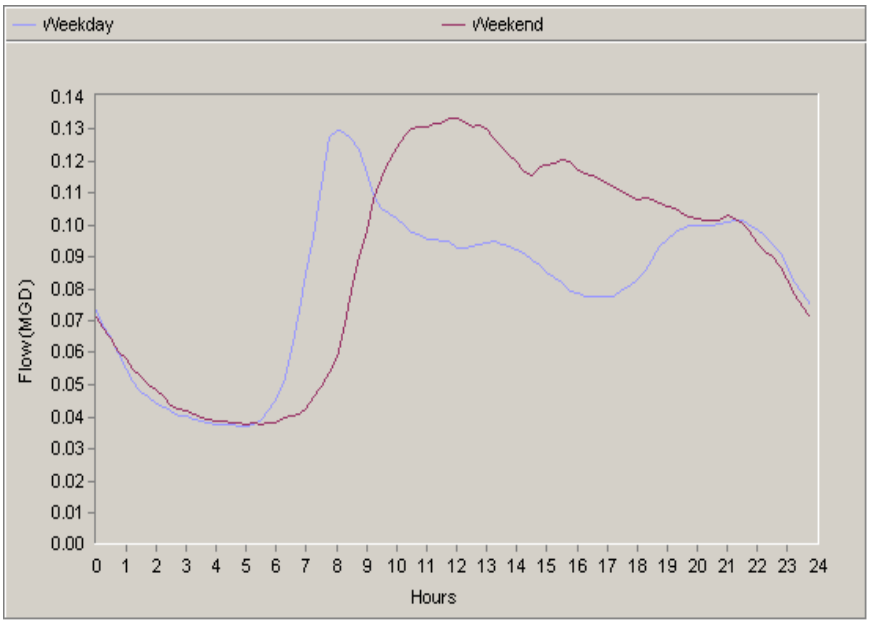


Figure 2.6. Diurnal Curves - Flow Meter BC1 003

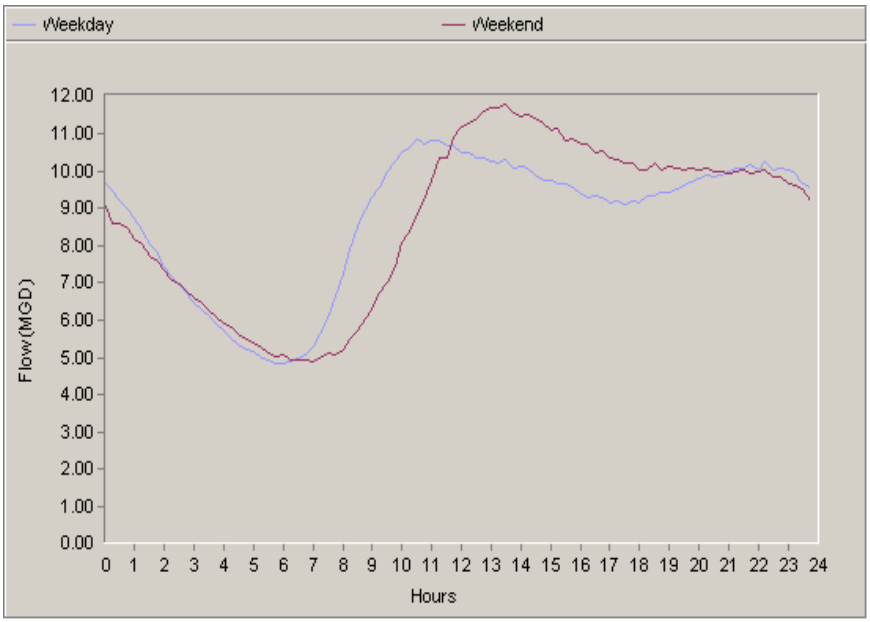


Figure 2.7. Diurnal Curves - Wastewater Treatment Plant

The flow meters and values are shown below in Table 2.6. The last three columns are calculated as previously explained.

Table 2.6
Diurnal Curve Values

Flow Meter	Weekday			Weekend			Week		
	Max (MGD)	Ave (MGD)	Min (MGD)	Max (MGD)	Ave (MGD)	Min (MGD)	Max (MGD)	Ave (MGD)	Min (MGD)
BC1_003	0.130	0.081	0.037	0.133	0.088	0.038	0.131	0.083	0.037
EL1_155	0.444	0.310	0.201	0.456	0.331	0.196	0.448	0.316	0.199
KR2 003/214	1.226	0.808	0.414	1.232	0.844	0.410	1.228	0.818	0.413
KR3_166	0.302	0.230	0.109	0.317	0.233	0.122	0.306	0.231	0.113
KR4_017	0.138	0.097	0.046	0.146	0.102	0.054	0.140	0.099	0.048
KR6_001	0.082	0.054	0.030	0.039	0.033	0.026	0.070	0.048	0.029
KR6_015	0.286	0.212	0.098	0.330	0.229	0.098	0.298	0.217	0.098
NL1_056	0.120	0.090	0.053	0.127	0.090	0.045	0.122	0.090	0.051
WR2_059	0.904	0.613	0.330	0.907	0.643	0.341	0.905	0.622	0.333
WR2_090	0.597	0.428	0.239	0.635	0.464	0.269	0.608	0.439	0.247
WR2_151	0.662	0.420	0.179	0.687	0.444	0.179	0.669	0.427	0.179
WR4_18A	0.969	0.767	0.408	1.151	0.858	0.462	1.021	0.793	0.423
WR3_302	0.376	0.245	0.111	0.414	0.271	0.128	0.387	0.252	0.116
YTC1_016	0.086	0.051	0.021	0.083	0.056	0.023	0.085	0.053	0.022
YTC2_016	0.345	0.170	0.053	0.347	0.193	0.058	0.346	0.176	0.054
YTC1_127	0.397	0.222	0.092	0.383	0.247	0.095	0.393	0.229	0.093
WWTP	10.810	8.675	4.817	11.810	8.671	4.863	11.096	8.674	4.830

Diurnal curves for flow meters are provided in Appendix 2-A.

In Table 2.7 below, the DWF results for each utilized metershed are shown. These are cumulative DWF values for the total tributary system for each meter, and the interior metershed DWF calculated by subtraction of upstream metershed DWFs. The DWF per person per day is shown in the fourth column for the interior metersheds and in last column for the complete metersheds. These were important statistics when combined with the land use information in evaluating the validity of the flow meter data.

Table 2.7
Dry Weather Flow by Metershed and Interior Metershed

(a)	(b)	(c)	(d)	(e)	(f)	(g)
Meter	**Interior Metershed Population**	**Interior Metershed DWF- MGD**	**Interior Metershed DWF per person gpcpd**	**Metershed Population**	**Metershed DWF - MGD**	**Metershed DWF per person - gpcpd**
	From TAZ-Metershed GIS Intersection	**Difference of Metershed(s)**	**DWF / Population**	**From TAZ-Metershed GIS Intersection**	**From Table 2.3**	**DWF / Population**
BC1 003				1,133	0.083	82
EL1 155				2,140	0.316	207
KR2 003/214	9,130	0.735	81	10,265	0.818	80
KR3 166				1,795	0.2539	141
KR4 017				783	0.099	126
KR6 001				246	0.048	196
KR6 015				1,424	0.217	152
NL1 056				1,838	0.17	92
WR2 059	4,566	0.183	40	7,345	0.622	85
WR2 090				2,779	0.439	158
WR2 151	2,719	0.145	53	7,763	0.427	85
WR4 18A	8,033	0.541	67	9,208	0.5925	64
WR4 302				1,175	0.252	214
YTC1 016				1,042	0.053	51
YTC2 016				3,289	0.176	53
YTC2 127	713	0.053	74	4,002	0.229	57
WWTP				92,727	8.674	94

Column (g) of Table 2.7 provides a measure of per person DWF as determined from the analyzed flow meter data and estimated population served upstream of each flow meter. This provides a check of the reasonableness of the flow meter data. The per person DWF values shown in column (g) are considered to be reasonable and therefore support a conclusion that the flow data is reasonable.

A comparison was made between SSOAP analyzed DWFs of a group of seven flow meters termed "first tier meters" and DWFs recorded at the KRWWTP. First tier meters are those meters located at points in the collection system where there is no downstream meter between them and the KRWWTP. They include the following meters:

KR5 003, KR5 x69, KR5 083, KR5 092, KR6 001, KR6 154, PS#04

The locations of the first tier meters are shown on Figure 2.8.

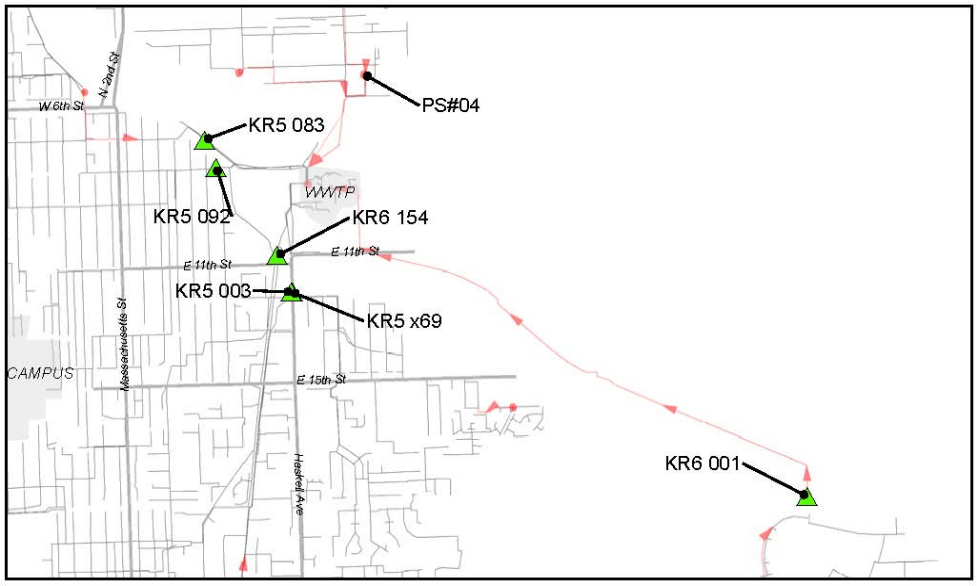


Figure 2.8. First Tier Flow Meters

Initially, this continuity check indicated there was an unacceptable discrepancy between the sum of first tier meter flows and the KRWWTP metered flows, with first tier metered flows being much less than KRWWTP metered flows. As a result of this check, it was subsequently determined that meter KR6 154 was not providing accurate data due to conditions at the meter location. Actual flows were field measured and a correction was made for this flow meter. A means was also determined to estimate flows through a 21-inch sewer parallel to the KR5 083 sewer that was not metered by any of the first tier meters using flow meter data from upstream Pump Station 16. Finally, a correction of flows received from the North Lawrence Drainage Basin was made using operating data for Pumping Station 4. With these corrections, it was possible to arrive at a reasonable agreement between the first tier meter flows and KRWWTP metered flows.

2. Rainfall Derived Infiltration and Inflow

Rainfall derived infiltration and inflow (RDII) is additional groundwater infiltration that is associated with higher than normal groundwater immediately following a wet weather event, plus inflow of stormwater runoff into the sewer system through sources such as leaking private sewer laterals, building roof drains and foundation drains connected to the sewer, and other sewer and manhole defects. Levels of RDII in a collection system can vary significantly depending on rainfall intensity and duration, and the condition of the system. The relative condition of collection system sub-basins can be measured in part by RDII levels that occur during comparable wet weather events.

RDII flows are estimated using the SSOAP toolbox program. For the SSOAP analysis, a rain gauge file was created for each flow meter that apportioned the influence of nearby rain gauges. The inverse of the square of the distance from the centroid of each metershed was used to calculate the influence of each rain gauge. Figure 2.9 shows an example of this procedure graphically for flow meter YTC2 016 and Table 2.8 lists the composite rain gauge information by flow meter.

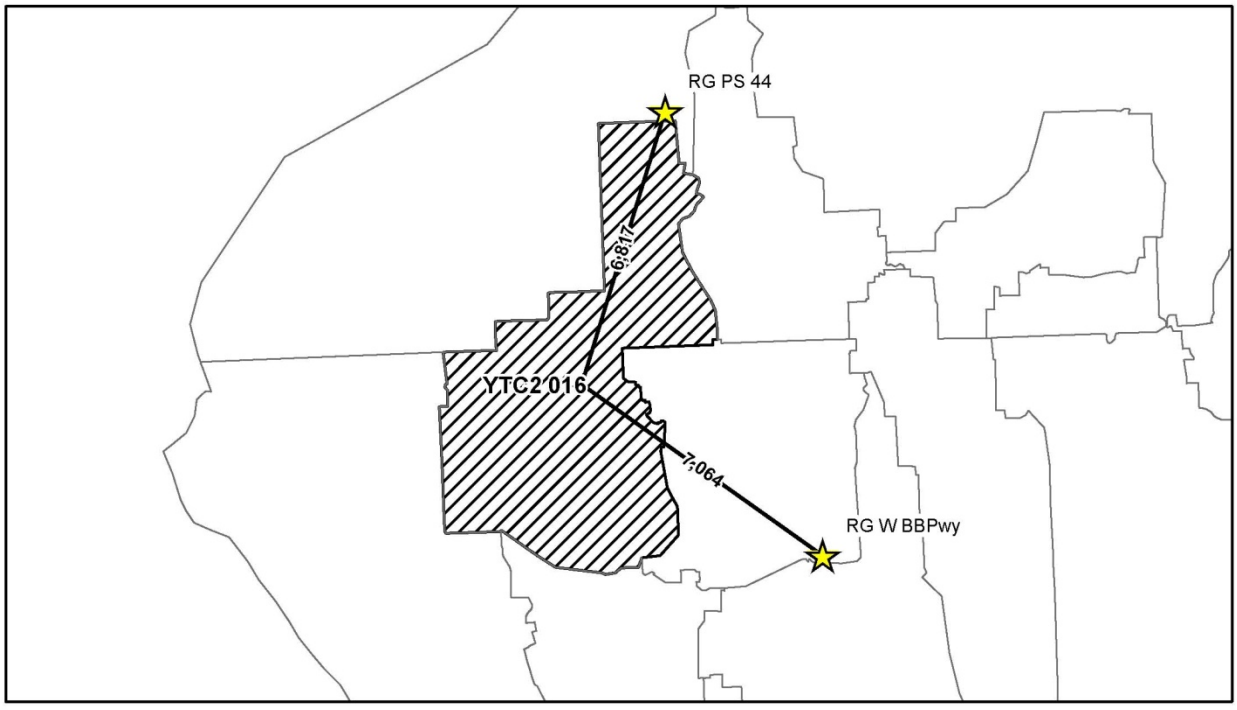


Figure 2.9. Rain Gage Apportioning Example

Table 2.8

Rain Gage Allocation to Metersheds

		RAIN GAGE							
		RG PS 44	RG WBBPwy	RG PS 46	RG PS 05	Stratford	RG PS 09	RG PS 49	RG PS 04
FLOW METER	BC1 003 PS48	86%	14%						
	EL1 155 PS5				85%			15%	
	KR2 003/214	53%	14%	23%		10%			
	KR3 166 2ND		7%	18%		66%			9%
	KR4 017					100%			
	KR6 001 EHBP				14%			86%	
	KR6 015 1221				63%			17%	20%
	NL 1 056 PS4			18%		13%			69%
	WR2 059 PS9		99%				1%		
	WR2 090 QUAI	11%	89%						
	WR2 151 PS9	20%	63%				17%		
	WR4 18A 2301		27%			56%	17%		
	WR4 302	20%	34%			46%			
	YTC1 016 LK	33%	48%				19%		
	YTC2 016	52%	48%						
	YTC2-127	31%	69%						

Rainfall events were then examined in SSOAP, where the system response could be compared visually with the rain gauge data, RDII flow, and the constructed DWF curves. Based on the rain gauge data, there were approximately 250 events available for analysis for most of the flow meters. An initial set of event choices used every event that was sufficiently isolated from previous and successive events. This set of about 60 events for each meter yielded some outliers and unexpected results, and these events were sorted such that the storms that produced the most RDII for a given rainfall depth were plotted. Ultimately, a fairly narrow range of storm durations and storm intensities was used to develop RDII peaking factors.

These plots were used to draw regression lines so that the peaking factors for one- and two-inch storms could be found with a fair amount of confidence. After the final sort there were about 12 events plotted for each meter with average storm duration of 7.22 hours. An example of a final set of storms and peaking factors is shown below in Figure 2.10 for meter EL1 155.

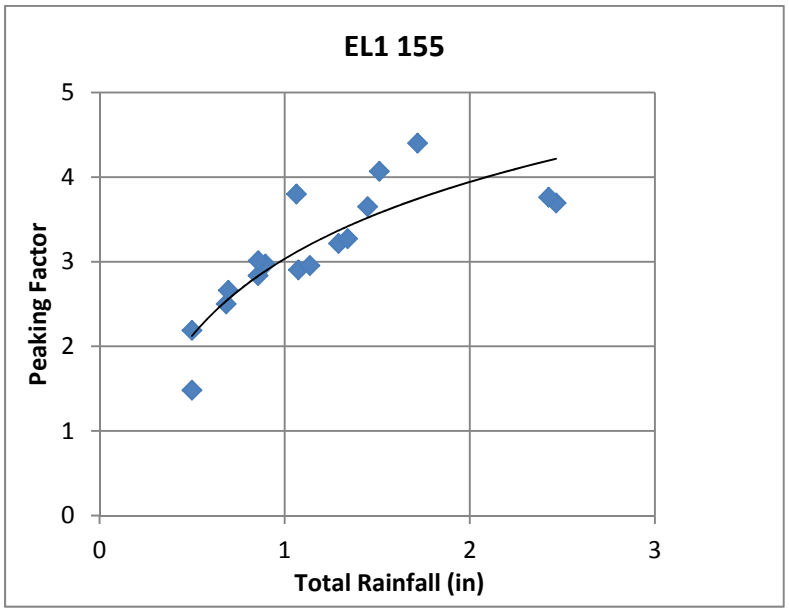


Figure 2.10. RDII Peaking Factors versus Rainfall

RDII peaking factors for all analyzed flow meters are provided in Appendix 2-B.

The line of regression should be expected to be a curve that points to an upper limit of peak flows as the local system nears its capacity, and this line should cross the vertical axis near a peaking factor of 1 as the flow approaches the DWF rate at a zero storm depth. This example flow meter is best characterized with a logarithmic curve, but some flow meters had a better fit with a linear regression line. This should be expected because the storms analyzed would not necessarily indicate an upper limit to the peak flow at every point in the system. Using this methodology and flow meter EL1 155 as an example, a peaking factor (PF) of 3.9 can be inferred for the 2-inch storm, and a PF of 3.0 can be inferred for the 1-inch storm. The average 2-inch storm PF was not observed to be twice the 1-inch PF, which was expected. The PFs for the 2-inch and 1-inch rain events are listed in Table 2.9.

Table 2.9
Peaking Factors

Flow Meter	PF 2-inch Storm	PF 1-inch Storm	2in/1in PF Ratio
WWTP	3.5	2.3	1.5
BC1 003	7.6	4.6	1.7
EL1 155	3.9	3.0	1.3
KR2 003/214	6.5	4.2	1.4
KR3 166	4.9	2.7	1.8
KR4 017	11.3	5.3	2.1
KR6 001	7.7	4.0	1.9
KR6 015	10.5	5.5	1.9
NL1 056	8.8	5.8	1.5
WR2 059	4.4	2.6	1.7
WR2 090	4.4	3.4	1.3
WR2 151	5.7	3.4	1.7
WR4 18A	5.1	2.8	1.8
WR4 302	6.7	4.0	1.7
YTC1 016	6.2	4.0	1.6
YTC2 016	5.4	3.3	1.6
YTC2 127	6.5	5.0	1.3
AVERAGE	6.4	3.9	1.7

The PF multiplied by the average DWF gives the peak flow in the sanitary system for the given rain event. Hence, the DWF* (PF -1) gives the portion of the peak flow rate that is attributable to the RDII for a given rain even.

E. Metershed Ranking by RDII

The interior metershed ranking was then found by comparing the peak RDII flow rate per inch diameter mile (IDM) sewer for the interior metersheds. The interior metersheds that included the University of Kansas campus have large poorly documented sanitary systems that would skew the IDM values because of the missing network information, so the metershed IDMs affected by the campus were increased proportionally according to the percentage of the campus area to the total interior metershed area. The interior metershed rankings according to RDII per IDM, or relative "leakiness," are listed in Table 2.10.

Table 2.10
Interior Metershed Rankings

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Flow Meter	Peaking Factor for the 2-inch Event	DWF (MGD)	Flow in the 2-in Event (MGD)	RDII in the 2-in Event (MGD)	IDM	RDII / IDM (gpd/IDM)	Rank	Sewered Area (ac)	RDII / Sewered Area (gpd/ac)	RDII / Sewered Area Rank
	From Table 2.6	From Table 2.4	PF * DWF (interior)	2-in flow − DWF	Calculated from GIS data					
BC1 003	7.6	0.083	0.631	0.548	64.7	8,467	7	151	4,255	5
EL1 155	3.9	0.316	1.232	0.916	111.0	8,256	8	506	2,161	10
KR2 003/214	6.5	0.265	1.7225	1.458	418.8	2,717	15	1,732	2,942	7
KR3 166	4.9	0.254	1.245	0.991	63.9	15,502	5	221	4,701	4
KR4 017	11.3	0.099	1.119	1.020	15.8	64,538	1	59	17,283	1
KR6 001	7.7	0.048	0.370	0.322	72.2	4,455	12	228	2,084	11
KR6 015	10.5	0.217	2.279	2.062	46.3	44,488	3	183	10,272	3
NL1 056	8.8	0.340	2.992	2.652	139.7	18,984	4	655	2,426	9
WR2 059	4.4	0.183	0.8052	0.622	183.7	3,387	17	640	617	17
WR2 090	4.4	0.439	1.932	1.493	124.8	11,962	6	560	4,108	6
WR2 151	5.7	0.145	0.8265	0.682	145.5	4,684	11	332	2,607	8
WR4 18A	5.1	0.592	3.0192	2.427	303.4	8,000	9	995	1,620	13
WR4 302	6.7	0.252	1.688	1.436	31.3	45,939	2	132	11,600	2
YTC1 016	6.2	0.053	0.329	0.276	68.9	4,002	13	245	1,153	15
YTC2 016	5.4	0.176	0.950	0.774	201.6	3,841	14	544	1,432	14
YTC2 127	6.5	0.053	0.3445	0.292	84.9	3,433	16	220	1,100	16

(1) Highest RDII/IDM metershed is ranked 1, lowest is ranked 17.

(2) IDM is adjusted for KU campus from KU Main estimates.

A graphical interpretation of these results is shown in Figure 2.11, where the RDII rankings are used to color the metersheds (worst to best is symbolized by coloring the metershed from reds to yellow to greens), and the age of the infrastructure is shown using similar symbolization.

Because various methodologies were employed to arrive at these ratings and rankings, they may be compared to check the reasonableness and consistency of results as presented in Table 2.10 as measured by RDII production per sewered acre. The RDII production per sewered acre produced rankings that are very similar to those based on RDII/IDM.

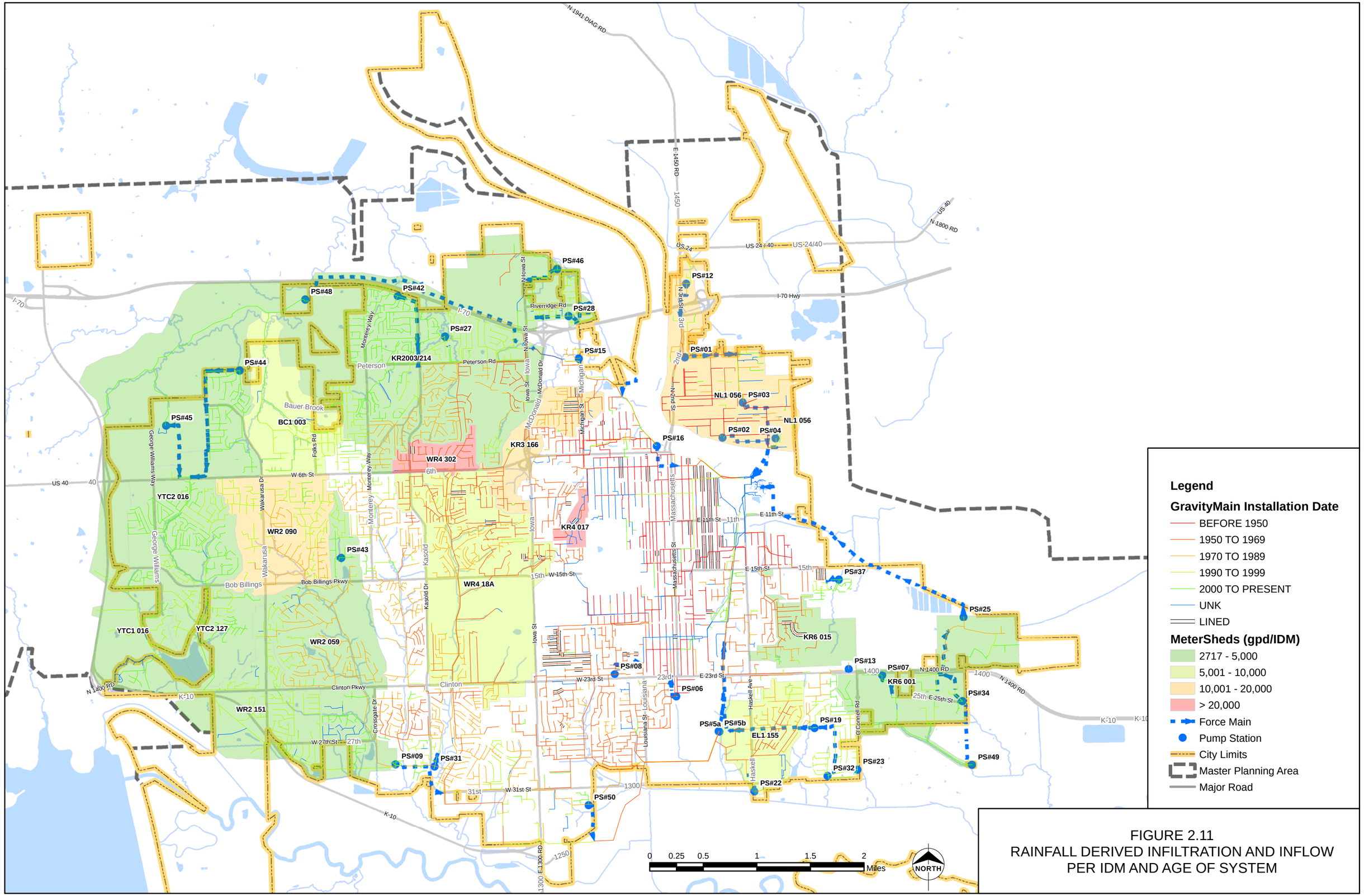


FIGURE 2.11
RAINFALL DERIVED INFILTRATION AND INFLOW
PER IDM AND AGE OF SYSTEM

F. Existing System Flows and Capacity Analysis

1. Hydraulic Model Development

a. Model Construction

A hydraulic model of the wastewater collection system was prepared including all gravity sewers, manholes, pumping stations and force mains, and storage facilities. The model was prepared from the City's wastewater geodatabase. The existing system model database includes approximately 10,250 sewer pipe elements, matching the quantities in the geodatabase. Further details of the model development are presented in Appendix 2-C.

b. Existing Flow Development

Model existing wastewater flows were developed to match the dry weather flow and rainfall derived infiltration and inflow components previously described. Flows are developed by the model by component for an analysis of the collection system as set forth below.

Dry Weather Flow (DWF)

DWF includes Wastewater Flow (WWF) discharged by the utility's customers and is measured by winter quarter metered water usage. Metered water usage was input to the model using a geodatabase of each utility customer's metered water usage. Areas closest to each manhole were determined by the software, and the winter quarter metered water usage within each area was used to allocate the DWF (WWF plus DWI), and input to the model at each manhole. WWF rates typically vary throughout the day. These diurnal flow patterns at each flow meter were developed previously and used by the model to input DWF at each manhole to simulate the daily variation of flow.

Rainfall Derived Infiltration/Inflow (RDII)

Rainfall derived infiltration and inflow (RDII) was input to the model within metersheds in accordance with how the collection system responds to rainfall events within each metershed as previously analyzed. For metersheds where it was not possible to analyze RDII levels, RDII levels in other analyzed metersheds were used that have comparable system age and pipe materials. RDII is input to the model at various loading manholes or nodes located throughout the system.

RDII is estimated by developing a storm hydrograph specific to each flow monitoring location for each rainfall event. The curve-fitting procedure uses RTK variables, which consists of 9 parameters that were manually determined for each meter at each rainfall event. During calibration, peak flow rate and total volume predicted by the model are compared to observed flow monitoring data and RTK parameters are adjusted until a reasonable fit has been established. R is the percent of rainfall that enters the system and can vary from storm to storm. R is dependent on antecedent moisture conditions, where wet conditions with soil already saturated usually have higher R values than dry conditions. T and K parameters, which define the shape of the wet weather response curve, represent time to peak and recession of the curve. A normal limitation of modeling is the insertion of RDII into the system model at selected inflow points, rather than inserting RDII at every manhole in the system.

c. Model Calibration and Validation

The model was calibrated to duplicate flows occurring during an actual wet weather event using rainfall and flow meter data. Various model flow input parameters were adjusted until a good correlation was developed between modeled flows and actual metered flows, including flows measured at the wastewater treatment plant. Once calibrated, a second specific wet weather event using actual rainfall data was modeled and the model output checked for correlation with the flow meter data to verify or validate the accuracy of the model. The model calibration and validation wet weather events were more frequently occurring rainfall events of 1 to 3 inches. A further validation was performed using a wet weather event that occurred in May 2009 with total rainfall measuring 2.9 inches over a 6-hour period, which corresponds well with the 10 year design storm. This event resulted in a peak flow rate of 68 MGD at the wastewater treatment plant. The model was then refined to produce a reasonable correlation with actual flows at both the smaller rainfall validation storms and the May 2009 storm. Table 2.11 summarizes a comparison of metered and modeled peak wet weather flows for the calibration and validation storms.

Table 2.11
Wet Weather Calibration Results

Flow Meter	Event	Depth - in	Duration - hr	Predicted / Observed	
				Volume (%)	Peak (%)
BC1 003	8/31/2010	1.21	15.00	100%	100%
	7/11/2010	0.86	1.00	78%	44%
EL1 155	3/2/2008	0.82	10.00	97%	99%
	3/17/2008	1.52	16.00	96%	103%
KR2 003/214	8/31/2010	1.21	15.00	119%	*
	7/11/2010	0.86	1.00	66%	*
KR3 166	8/31/2010	1.21	15.00	114%	99%
	7/11/2010	0.86	1.00	105%	97%
KR4 017	3/2/2008	0.82	10.00	99%	102%
	3/17/2008	1.52	16.00	101%	98%
KR6 001	3/2/2008	0.82	10.00	89%	*
	3/17/2008	1.52	16.00	85%	*
KR6 015	3/2/2008	0.82	10.00	100%	111%
	3/17/2008	1.52	16.00	102%	70%
PS 04	3/2/2008	0.82	10.00	95%	**
	3/17/2008	1.52	16.00	88%	**
WR2 059	3/2/2008	0.82	10.00	101%	100%
	3/17/2008	1.52	16.00	96%	96%
WR2 090	3/2/2008	0.82	10.00	106%	96%
	3/17/2008	1.52	16.00	93%	85%
WR2 151	3/2/2008	0.82	10.00	103%	101%
	3/17/2008	1.52	16.00	109%	98%
WR4 18A	8/31/2010	1.21	15.00	29%	408%
	7/11/2010	0.86	1.00	150%	113%
WR4 302	3/2/2008	0.82	10.00	100%	102%
	3/17/2008	1.52	16.00	106%	90%
YTC1 016	3/2/2008	0.82	10.00	101%	104%
	3/17/2008	1.52	16.00	104%	124%
YTC2 016	3/2/2008	0.82	10.00	98%	97%
	3/17/2008	1.52	16.00	100%	98%
YTC2 127	8/31/2010	1.21	15.00	140%	112%
	7/11/2010	0.86	1.00	118%	94%
WWTP	3/2/2008	0.82	10.00	91%	112%
	3/17/2008	1.52	16.00	95%	104%

* Model produces very large spikes with every pump cycle, hence peaks are not comparable.
** Only the daily running time for PS 04 was available for calibration of North Lawrence, so no peak flow is available.

The comparison of model predicted and observed volumes and peak flow rates shown in Table 2.11 is shown to provide an indication of the calibrated model's ability to simulate actual wet weather flow conditions in the collection system. Based on these comparisons, the model's ability to simulate actual wet weather flow conditions is considered to be reasonable.

2. Design Storm

The design storm selected for system evaluation is the 10-year storm, i.e., a storm that has a 10% chance of occurring in any given year. There is not at this time any State or federal regulatory standard directing

the use of a 10-year storm or any other design storm when evaluating the performance of municipal wastewater collection systems. Federal rules concerning wet weather performance of separate sanitary sewer systems have been under development for many years and it is not clear at this time if a level of performance based on a design storm will be adopted. This design storm was selected with input from City staff because it is considered to provide a level of system performance and reliability that is consistent with what is now commonly practiced for evaluating the performance of municipal wastewater collection systems in the United States. The model was used to estimate the time of concentration of flows arriving at the wastewater treatment plant by simultaneously inputting a continuous flow rate into each manhole and modeling the time required for the flow at the wastewater treatment plant to reach a maximum. Based on this analysis, a 6-hour storm duration was used for the design storm. A 10-year, 6-hour storm at Lawrence, Kansas has a maximum intensity of 2.60 inches per hour and a total rainfall depth of 3.95 inches. Figure 2.12 is a cumulative hyetograph of the storm used for this analysis.

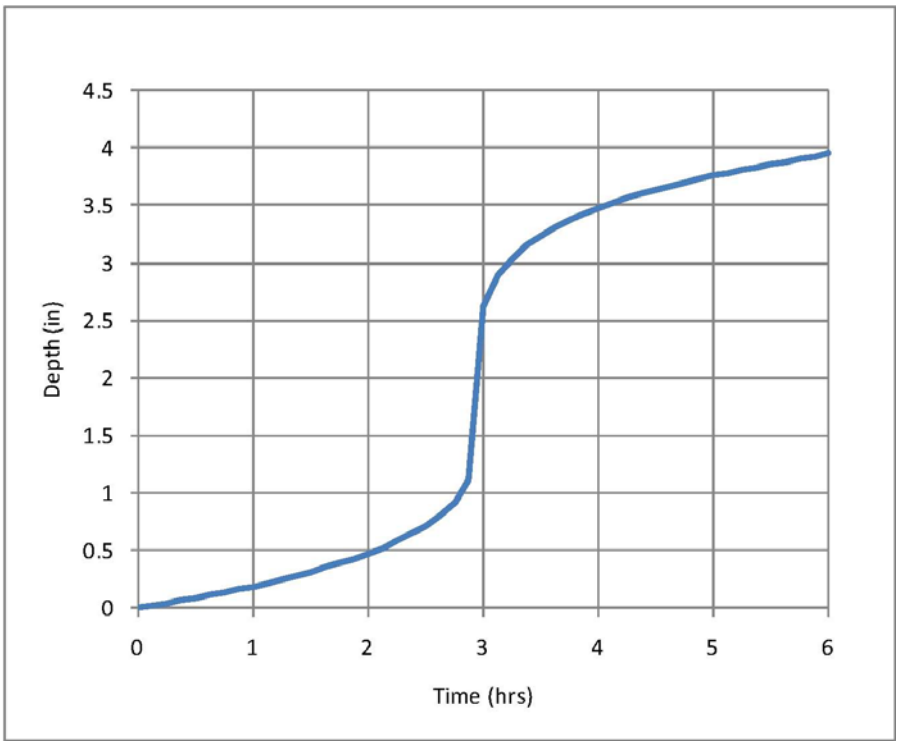


Figure 2.12. Cumulative Rainfall for 10-year 6-hour Storm

When the design storm is inserted into the model it is set to begin at 6:00 a.m. so that the peak intensity occurs at 9:00 a.m. This makes the peak flow rate from the RDII arrive at the WWTP near the same time of the day the maximum expected dry weather flow rate occurs.

3. Results of Analysis

a. Existing System

A summary of the existing system model at the design storm is depicted on Figure 2.13. Surcharged sewers are highlighted in yellow. A flow hydrograph predicted by the model at the KRWWTP is shown on Figure 2.14. The actual flow hydrograph that occurred at the KRWWTP during the May 2009 storm event is also shown to illustrate the correlation between the modeled design storm event and an actual similar but lesser storm event.

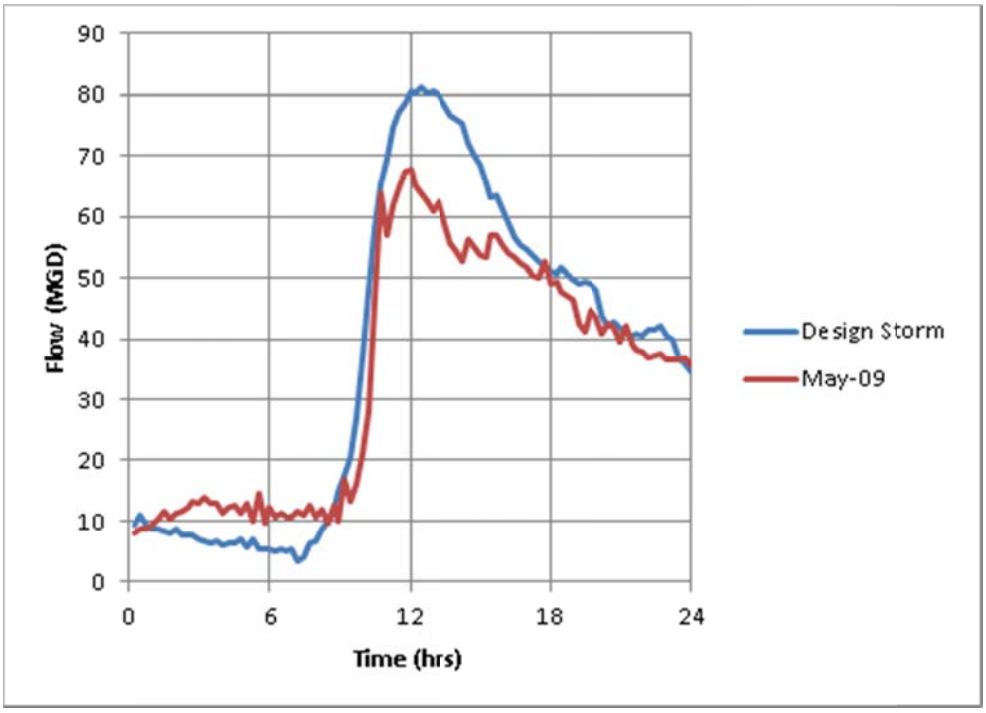


Figure 2.14. Existing System Design Storm and May 2009 Storm Flow Hydrographs at Kansas River WWTP

The model predicts an instantaneous peak flow rate of 81 MGD. This result is considered to be reasonable when compared to the instantaneous peak flow rate of 68 MGD measured during the May 2009 storm event. Based on an analysis of the model results, the following conclusions concerning the adequacy of the existing collection system can be made:

- The instantaneous peak flow rate of 81 MGD exceeds the KRWWTP peak flow firm capacity of 65 MGD.

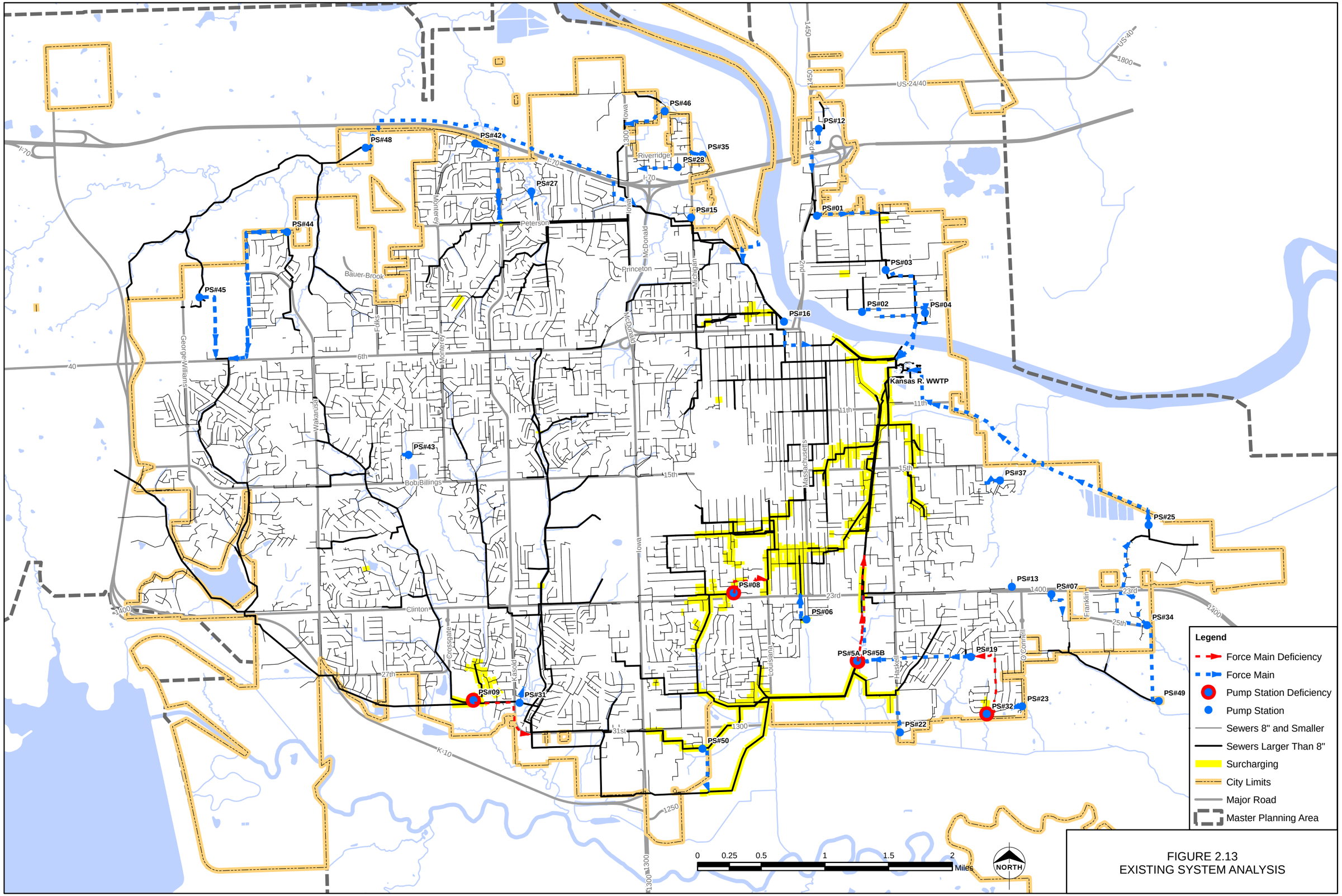


FIGURE 2.13
EXISTING SYSTEM ANALYSIS

- Many of the sewers the model predicts to be overloaded or surcharged are upstream of pumping stations which the model indicates do not have sufficient firm pumping capacities. In these cases, the pumping station wet well levels rise above the crowns of the upstream sewers causing them to be surcharged. The surcharged conditions in these cases are not due to inadequate sewer capacities but to inadequate pumping station capacities. This is the case for surcharged sewers upstream of Pumping Station Nos. 5A/5B, 8, 9 and 32.
- Some surcharging of sewers downstream of Pumping Station Nos. 5A/5B and 8 is due to gravity sewer capacities less than peak flow rates predicted by the model.
- The KRWWTP flow hydrograph shown on Figure 2.14 shows a very quick flow response following the beginning of the storm event up to the instantaneous wet weather peak flow rate, followed by a relatively rapid decline in flow rate which is then followed by a period of steady sustained flow higher than DWF before flows return to normal. These characteristics are typical of actual significant storm events such as the May 2007 validation storm. From an existing system capacity analysis perspective, the ability of the system to convey and treat at the peak instantaneous flow rate is more critical to system performance rather than the total volume of wet weather flows. As such, the most immediate concern is limiting peak flow rates. The quick response to the storm event up to the peak flow rate means there are appreciable infiltration/inflow (I/I) sources that rapidly contribute I/I to the system that are relatively close to the KRWWTP. This is as expected based on the RDII rankings of metersheds presented earlier which identified higher RDII levels for the older parts of the collection system that are relatively close to the KRWWTP. This suggests the rehabilitation/replacement plan set forth in Technical Memorandum No. 4 should make removal of rapid I/I sources in close proximity to the KRWWTP a priority.

Table 2-12 presents a summary of existing system deficiencies at the design storm event.

Table 2.12
Summary of Existing System Deficiencies

Drainage Sub-Basin	Description	Existing Peak Capacity-MGD(1)	Design Storm Peak Flow-MGD
C-2	PS 08	2.9	12.7
C-2	PS 08 Force Main	3.3	12.7
EL-1B	PS 23	0.05	0.05
EL-1B	PS 32	0.7	1.6
EL-1B	PS 32 Force Main	0.8	1.6
KR-5C	12-Inch Sewer	1.0	2.9
KR-6B	Kansas River WWTP	65	81
KR-6B	21-Inch Sewer	4.0	9.4
WR-1	PS 09	8.6	11
WR-6	PS 5A/5B	15.5	24
WR-6	PS 5A/5B Force Mains	15.5	24

(1) Pumping station capacities shown are based on firm pumping capacities.

b. Existing System Analysis Assumptions Moving Forward

(1) Future Infiltration/Inflow Reduction

The City will be continuing efforts to rehabilitate and replace aging and defective components of the collection system in accordance with a plan set forth in Technical Memorandum No. 4. As stated earlier, priority will be given to removal of rapid I/I sources relatively close to the KRWWTP. This will reduce levels of RDII in the future, thereby reducing the required capacities of parts of the existing collection system and the KRWWTP. As such, this plan assumes it is not necessary to address existing system problems that will not occur after completing a program of further I/I reduction. A reduction of 35% of I/I as measured by peak flow rates within the targeted area is considered to be achievable over a reasonable period of time based on a survey of I/I reduction programs implemented by other cities. From this point forward, the existing system analysis is modified to reflect a 35% reduction of I/I within the targeted area.

(2) Future Wakarusa Wastewater Treatment Plant

As stated earlier, average dry weather flows and their associated pollutant loadings plus peak wet weather flow rates will exceed the capacities of the KRWWTP at some time during the master planning period. This will require the construction of a new wastewater treatment plant which this plan will name as the Wakarusa Wastewater Treatment Plant (Wakarusa) located south of the Wakarusa River on a site owned

by the City. Based on projections set forth in Technical Memorandum No. 3, this will need to occur sometime before 2020. As such, this plan assumes it is not necessary to address existing system problems that will not occur after a portion of flows are diverted to the future Wakarusa. Flow diversion to the future Wakarusa will involve at a minimum the pumping of some or all flows that exceed the capacities of Pumping Station Nos. 5A/5B to the south and east to the Wakarusa. The plan should maximize utilization of the KRWWTP, thereby minimizing the initial constructed capacity of the future Wakarusa. As such, the existing system analysis from this point forward is based on modeled conditions that occur with this flow diversion.

c. Flow Diversion to Future Wakarusa Wastewater Treatment Plant Analysis and Plan

(1) Background

Previous planning for the future Wakarusa included diverting flows from Pumping Station No. 9 south of the Wakarusa River and then east to the future treatment plant site. Since the time the previous planning was completed, some important planning factors have changed, making it appropriate to re-evaluate the flow diversion plan. First, the previous planning was based on a year 2025 service area population forecast of 153,000. The majority of the population growth was expected to occur within the Baldwin Creek, Yankee Tank Creek and Wakarusa South drainage basins. This growth would result in significantly higher flow rates to Pumping Station No. 9. This plan forecasts service area population to increase to only 119,529 in year 2030. The lower population forecast will result in significantly smaller increases in flow rates to Pumping Station No. 9. Second, peak flow rates seen at the KRWWTP have increased significantly from those recorded at the time previous planning was done. This will require potentially significant diversions of wet weather peak flows to the Wakarusa from areas that are in close proximity to the KRWWTP in order to limit peak flow rates to the KRWWTP to 65 MGD and to address surcharged sewer conditions downstream of Pumping Station Nos. 5A/5B and 8.

(2) Flow Diversion from Pumping Station No. 9

The first flow diversion plan investigated was diversion of flows from Pumping Station No. 9 as previously planned. The existing system model was run incorporating the 35% system infiltration/inflow reduction plan previously described and the diversion of all flows from Pumping Station No. 9 to the future Wakarusa. The model determined these steps alone are not nearly sufficient to reduce the peak flow rates in the system tributary to Pumping Station Nos. 5A/5B to its firm pumping capacity. This is because the wet weather peak flow storage at Pumping Station No. 9 effectively minimizes the impact of

Pumping Station No. 9 peak flow discharges to the downstream collection system. Since diversion of flows from Pumping Station No. 9 has limited impact on peak flow rates that occur within the downstream collection system, an alternate diversion plan is needed.

(3) Flow Diversion from Pumping Station Nos. 5A and 5B

The next plan investigated was diversion of flows from Pumping Station Nos. 5A /5B. This pumping station has a large capacity and is relatively close to the KRWWTP, making it more likely to have an impact on the peak flow rate seen at the KRWWTP. It is also necessary in any event to reduce peak flow rates to the firm capacities of Pumping Station 5A and 5B. This is also needed to address surcharged sewer conditions upstream of Pumping Station Nos. 5A/5B. It is not desirable to expand this station at its current location due to site constraints. For that reason, a separate and new pumping station upstream of the current site and intercepting a portion of the flows from the gravity sewer running parallel to 27th Street would be constructed. A force main would also be constructed routed west and then south across the Wakarusa River to the Wakarusa site, coordinated with plans for the construction of the South Lawrence Trafficway and related wetland mitigation areas. The most appropriate site appears to be near the northwest intersection of 31st and Louisiana Streets. When this flow diversion is modeled, there is a reduction of the peak flow rate seen at the KRWWTP. The capacities of the existing Pumping Station Nos. 5A/5B, plus this new station need to be sufficient for handling the design storm peak flow rates and achieve a peak flow diversion to the Wakarusa necessary to limit the KRWWTP peak flow rate to 65 MGD.

(4) Conclusions

Of the two flow diversion plans investigated, the diversion of flows upstream of Pumping Station Nos. 5A/5B will achieve necessary reductions of peak flow rates to the KRWWTP while at the same time providing additional firm pumping capacity needed to supplement existing 5A/5B firm pumping capacity. Technical Memorandum No. 3 addresses conditions forecast to occur in 2020 and 2030 including future capacity requirements for Pumping Station No. 9. With that information, it will be possible to determine if this flow diversion plan which is based on existing conditions will need to be modified.

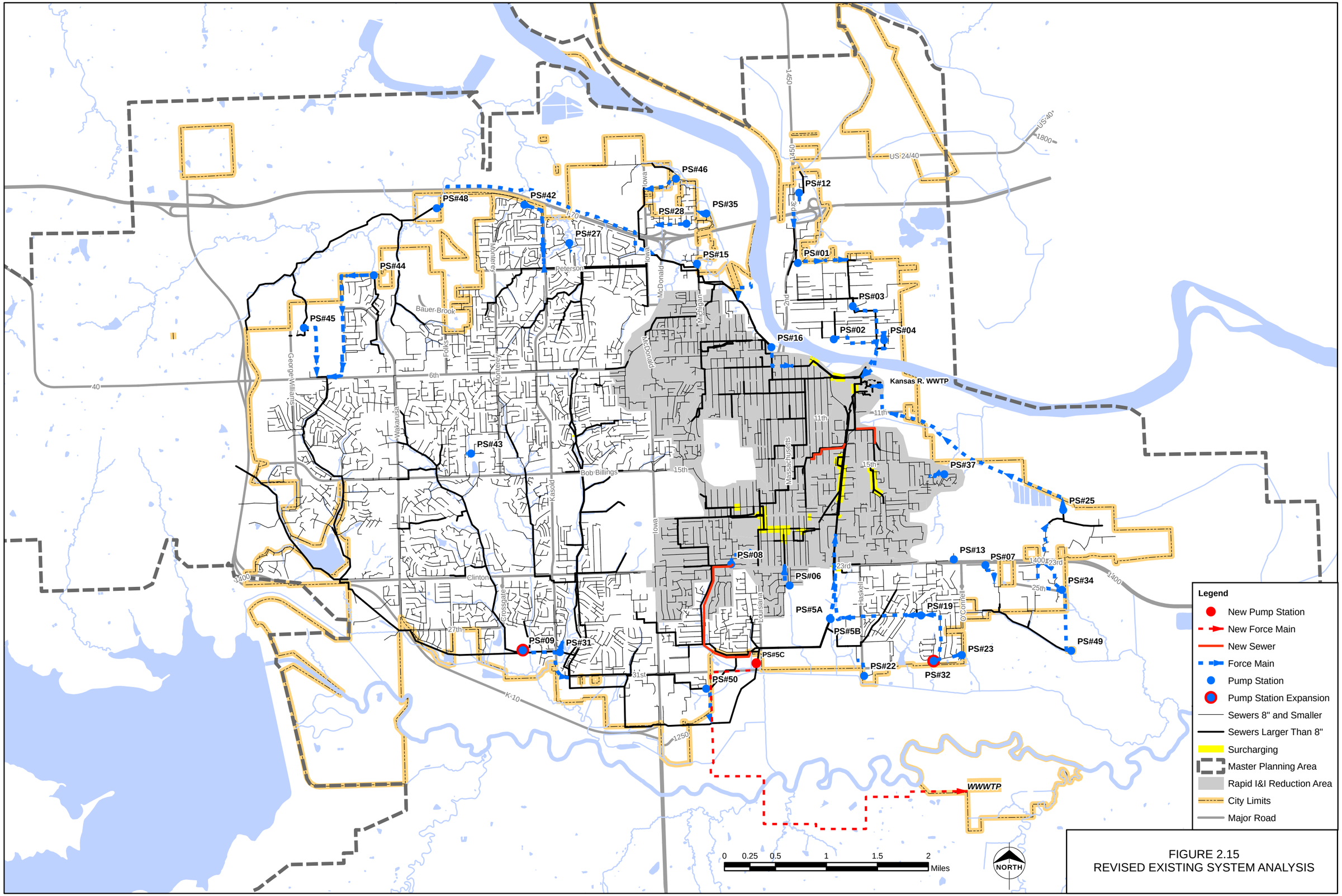
G. Existing System Improvements

Existing system improvements are needed to correct current system limitations that remain after incorporating assumptions about the future Wakarusa and I/I reduction. In summary, they include the following:

- A new pumping station upstream of 5A/5B to provide the necessary firm pumping capacities at the design storm peak flow rate and accomplish the diversion of some dry and wet weather flows to the future Wakarusa. This new pumping station is identified as Pumping Station No. 5C and would need to have an initial firm peak flow pumping capacity of 8.5 MGD.
- Expansion of capacity of Pumping Station 8 including its force main, or alternatively the elimination of Pumping Station No. 8 and its force main by a new gravity sewer to convey flows south into gravity sewers that drain to Pumping Station Nos. 5A/5B and further expansion of Pumping Station Nos. 5A/5B and its force mains. The gravity sewer plan is preferred since it will eliminate Pumping Station No. 8.
- Expansion of capacity of Pumping Station Nos. 9, 23 and 32.
- Relief sewers as needed to correct sewer surcharging due to inadequate gravity sewer capacities.

H. Existing System Analysis with Improvements and Future System Assumptions

A summary of the existing system model at the design storm incorporating the assumptions just described concerning the future Wakarusa and 35% I/I reduction, plus the required pumping station expansions and relief sewers, is depicted in Figure 2.15 and the resulting flow hydrograph at the KRWWTP is shown in Figure 2.16.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PS#15
PS#01
PS#44
PS#03
PS#45
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PS#04
PS#16
Kansas R. WWTP
PS#43
PS#37
PS#25
PS#08
PS#13
PS#07
PS#06
PS#34
PS#5A
PS#19
PS#5B
PS#49
PS#09
PS#31
PS#5C
PS#23
PS#22
PS#32
PS#50
WWWTP
Legend
New Pump Station
New Force Main
New Sewer
Force Main
Pump Station
Pump Station Expansion
Sewers 8" and Smaller
Sewers Larger Than 8"
Surcharging
Master Planning Area
Rapid I&I Reduction Area
City Limits
Major Road
0 0.25 0.5 1 1.5 2 Miles
NORTH
FIGURE 2.15
REVISED EXISTING SYSTEM ANALYSIS

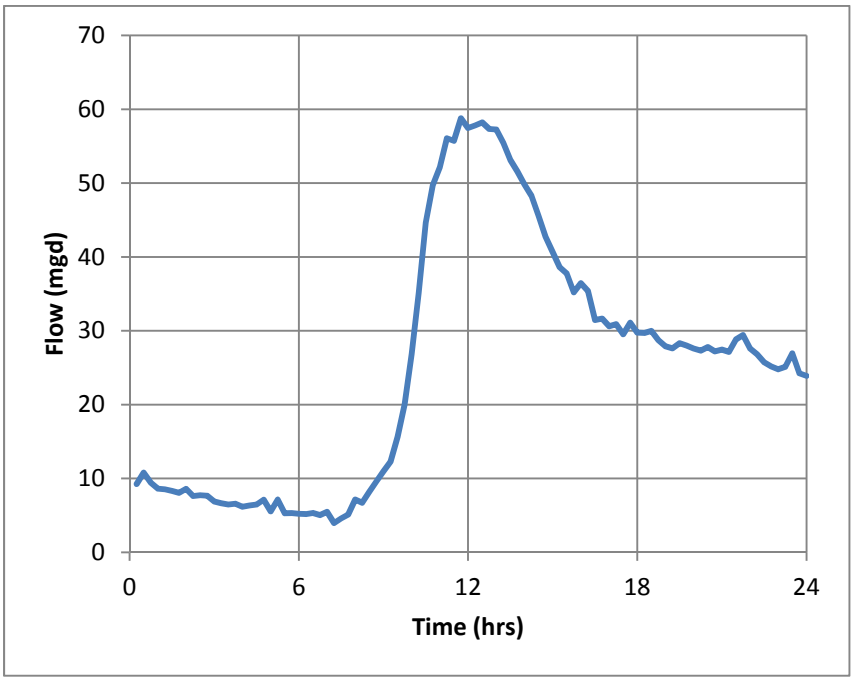


Figure 2.16. Improved System Design Storm Hydrograph at Kansas River WWTP

The model predicts the instantaneous peak flow rate at the KRWWTP to be reduced from 81 MGD to 59 MGD. Given the accuracy of the model and the likelihood there will be some further increase in peak flow rate due to projected growth in the service area, this result is considered to be acceptable in terms of KRWWTP peak flow capacity.

Technical Memorandum No. 3 addresses the forecast of future flows for planning years 2020 and 2030. The required capacities of these and other parts of the existing collection system may need to be increased further to address the forecast of future flows. As such, improvements to address existing conditions are included in Technical Memorandum No. 3 in order to provide for the additional capacity that may be needed for the forecast of future flows. These improvements are scheduled early in the capital improvements program set forth in Technical Memorandum No. 5.

* * * * *

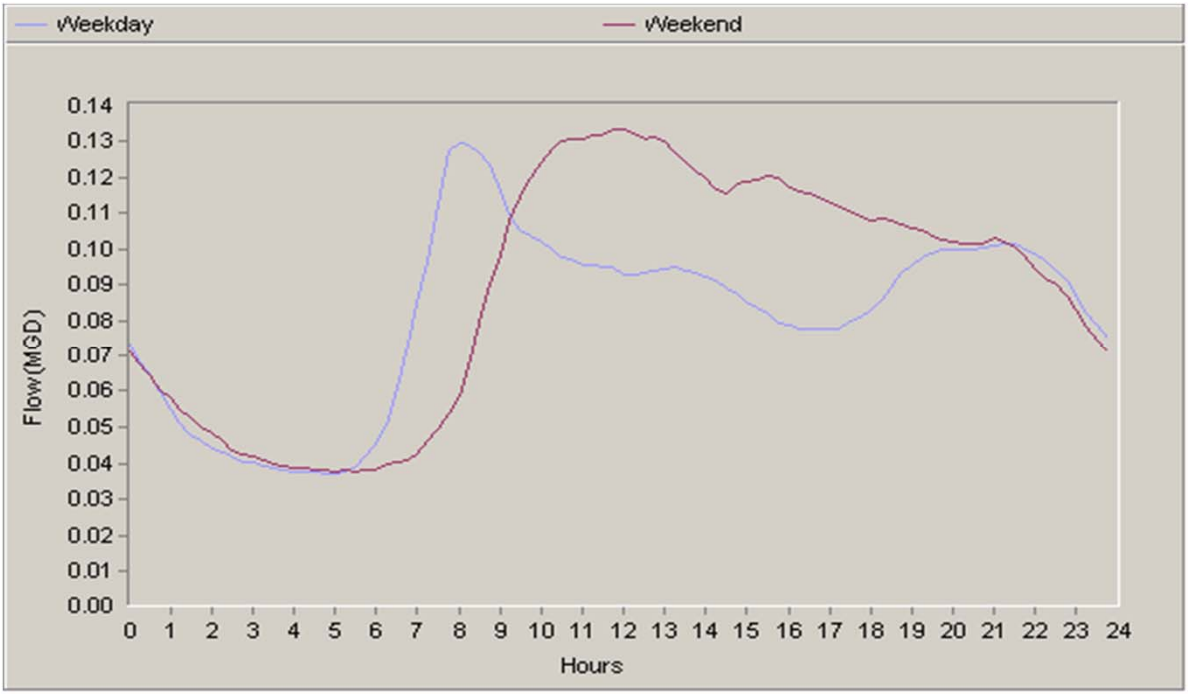
Appendix 2-A
Dry Weather Flows and Diurnal Curves

APPENDIX 2A

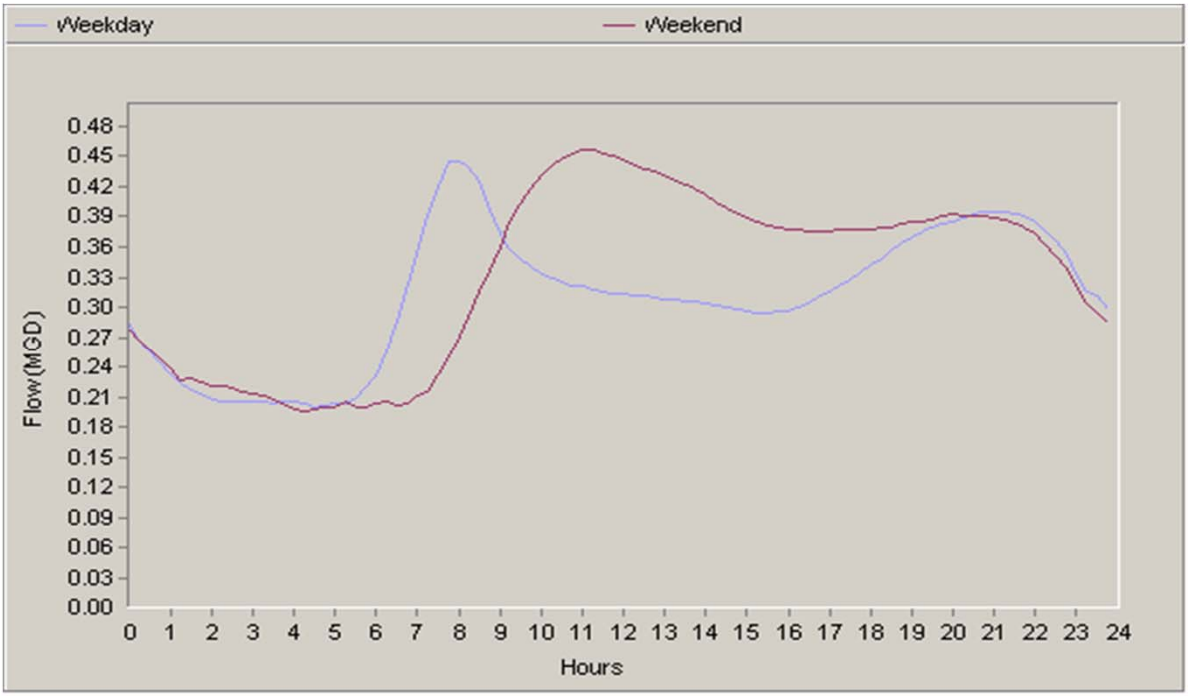
SSOAP-calculated Dry Weather Flows

This appendix contains a flow table and the hydrographs for each individual meter.
The 'Week' columns combine the weekday and weekend flow numbers with a weighted sum (2/7 * weekend + 5/7 * weekday) in order to have a single base flow statistic.

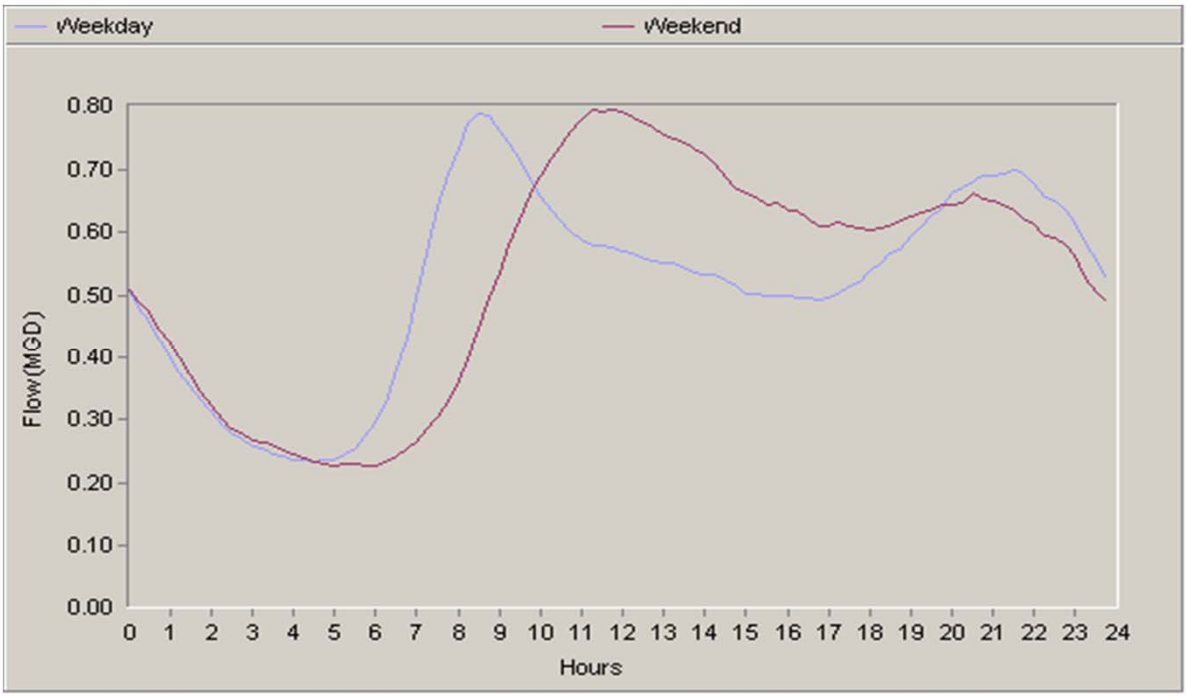
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
BC1_003	0.130	0.081	0.037	0.133	0.088	0.038	0.131	0.083	0.037
EL1_155	0.444	0.310	0.201	0.456	0.331	0.196	0.448	0.316	0.199
KR2 003/214	1.226	0.808	0.414	1.232	0.844	0.410	1.228	0.818	0.413
KR3_166	0.302	0.230	0.109	0.317	0.233	0.122	0.306	0.231	0.113
KR4_017	0.138	0.097	0.046	0.146	0.102	0.054	0.140	0.099	0.048
KR6_001	0.082	0.054	0.030	0.039	0.033	0.026	0.070	0.048	0.029
KR6_015	0.286	0.212	0.098	0.330	0.229	0.098	0.298	0.217	0.098
NL1_056	0.120	0.090	0.053	0.127	0.090	0.045	0.122	0.090	0.051
WR2_059	0.904	0.613	0.330	0.907	0.643	0.341	0.905	0.622	0.333
WR2_090	0.597	0.428	0.239	0.635	0.464	0.269	0.608	0.439	0.247
WR2_151	0.662	0.420	0.179	0.687	0.444	0.179	0.669	0.427	0.179
WR4_18A	0.969	0.767	0.408	1.151	0.858	0.462	1.021	0.793	0.423
WR3_302	0.376	0.245	0.111	0.414	0.271	0.128	0.387	0.252	0.116
YTC1_016	0.086	0.051	0.021	0.083	0.056	0.023	0.085	0.053	0.022
YTC2_016	0.345	0.170	0.053	0.347	0.193	0.058	0.346	0.176	0.054
YTC1_127	0.397	0.222	0.092	0.383	0.247	0.095	0.393	0.229	0.093
WWTP	10.810	8.675	4.817	11.810	8.671	4.863	11.096	8.674	4.830



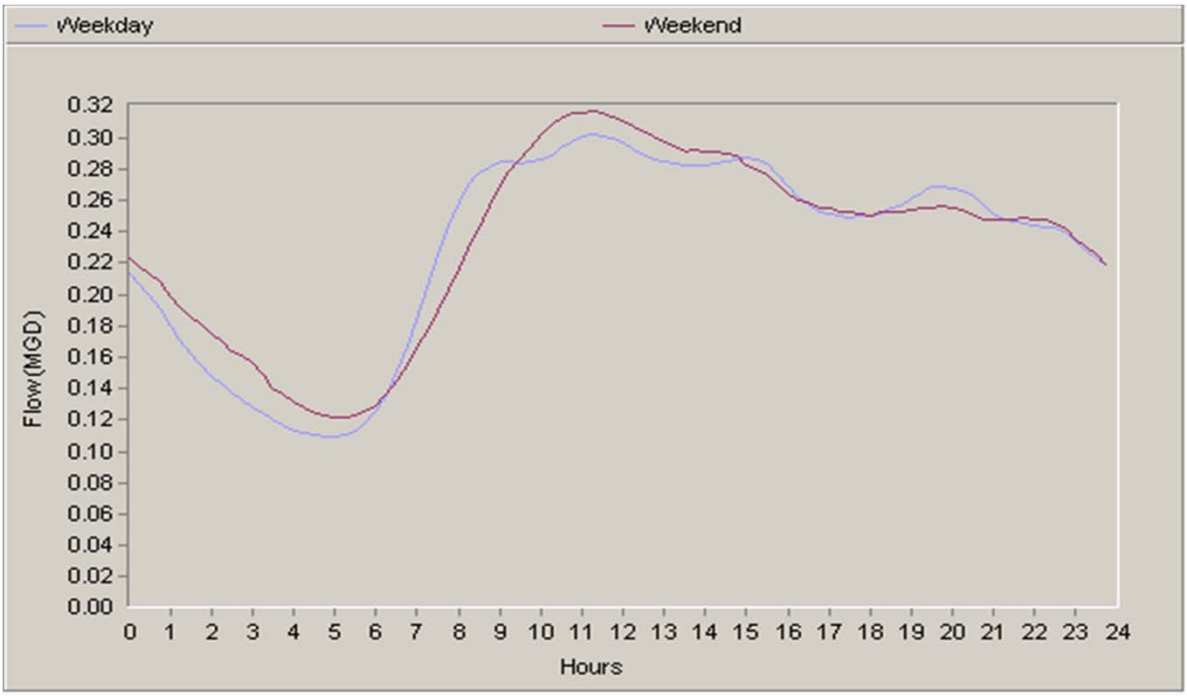
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
BC1_003	0.1297	0.0810	0.0372	0.1334	0.0881	0.0376	0.1308	0.0830	0.0373



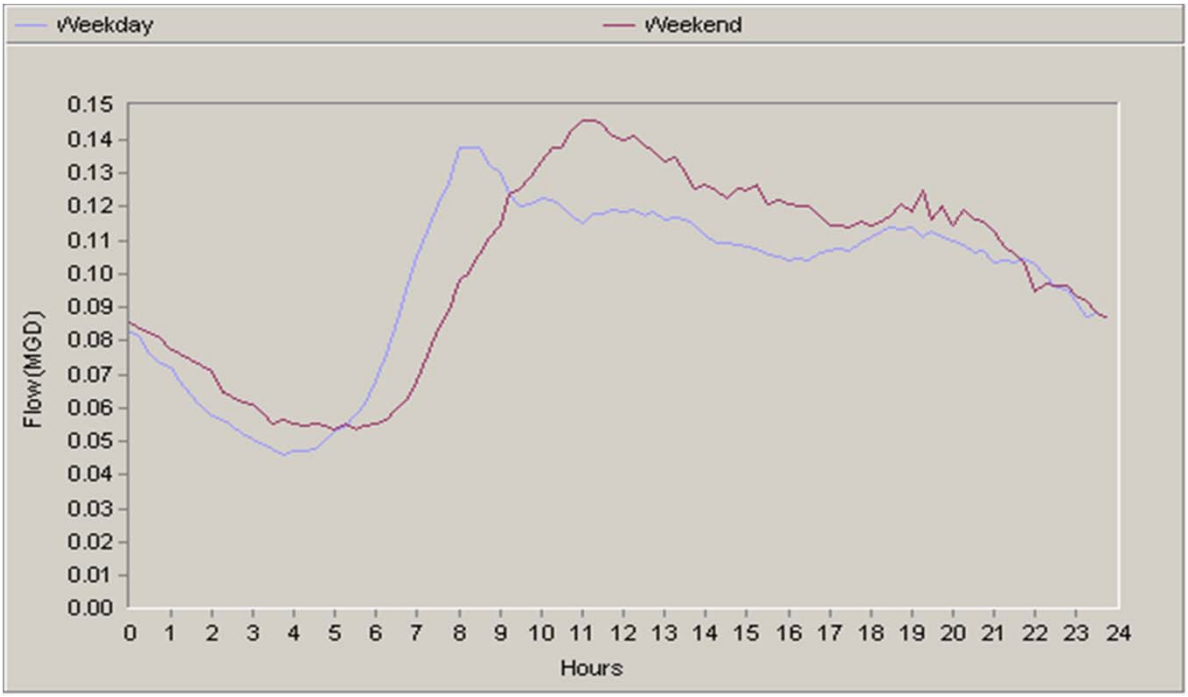
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
EL1_155	0.4442	0.3104	0.2005	0.4562	0.3311	0.1956	0.4476	0.3163	0.1991



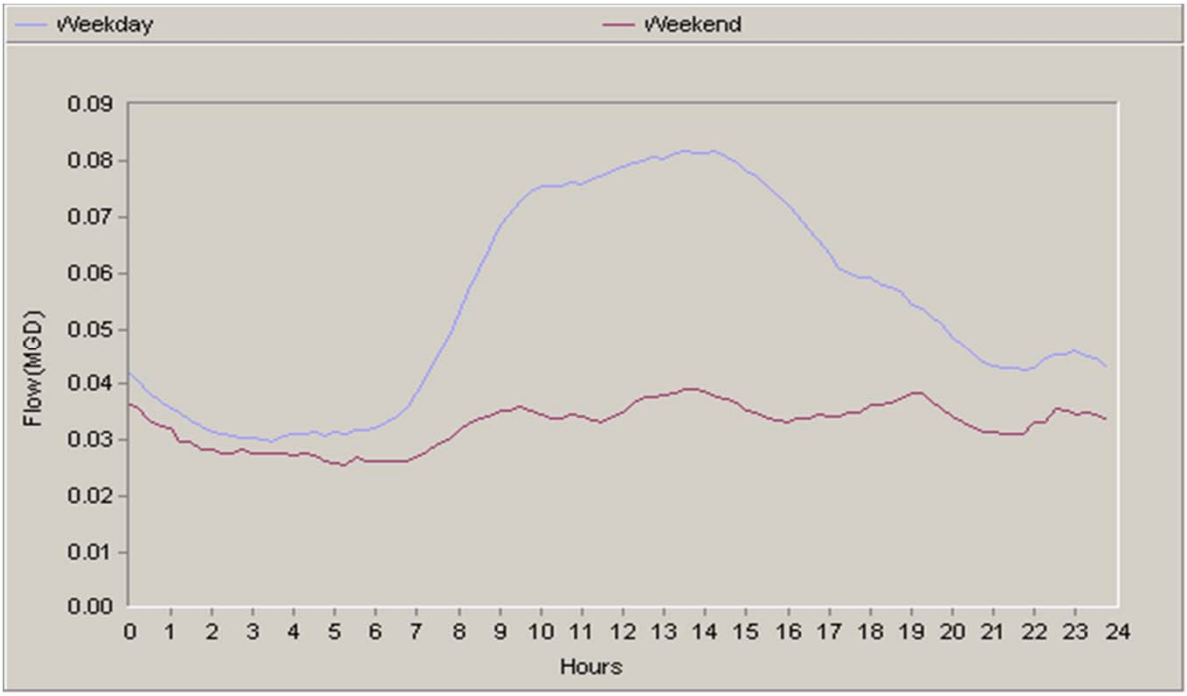
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
KR2_214	0.7894	0.5181	0.2324	0.7965	0.5302	0.2281	0.7914	0.5216	0.2312
KR2 003/214	0.7894	0.5181	0.2324	0.7965	0.5302	0.2281	0.7914	0.5216	0.2312



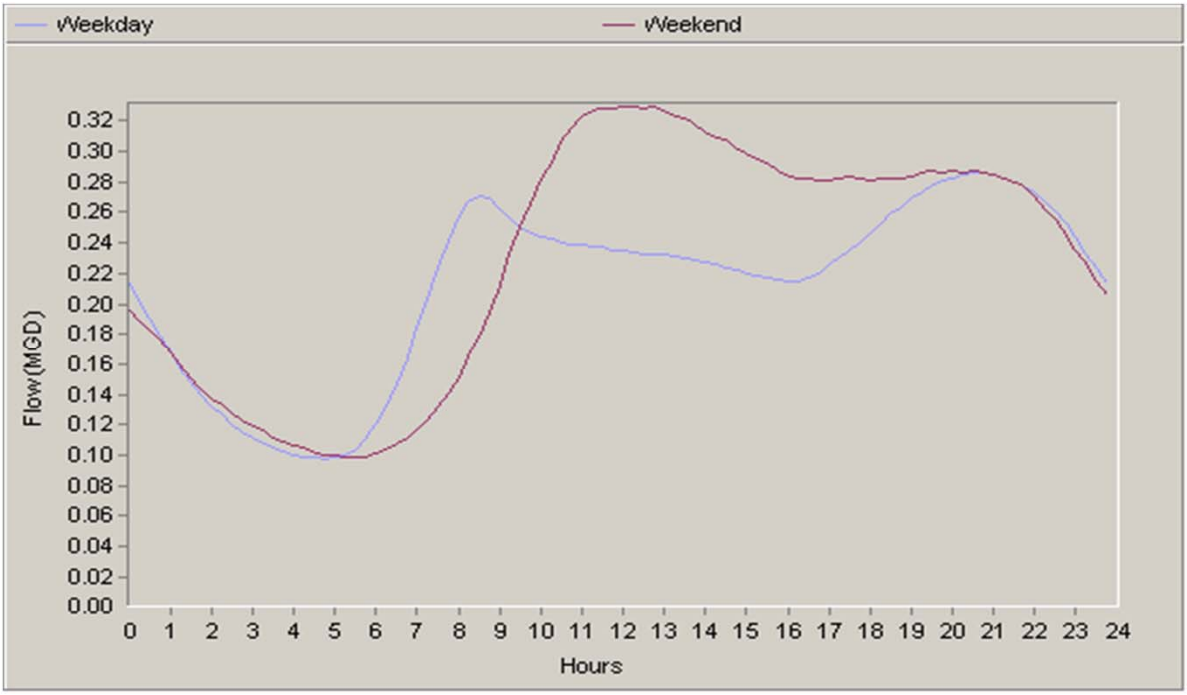
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
KR3_166	0.3022	0.2298	0.1090	0.3172	0.2330	0.1223	0.3065	0.2307	0.1128



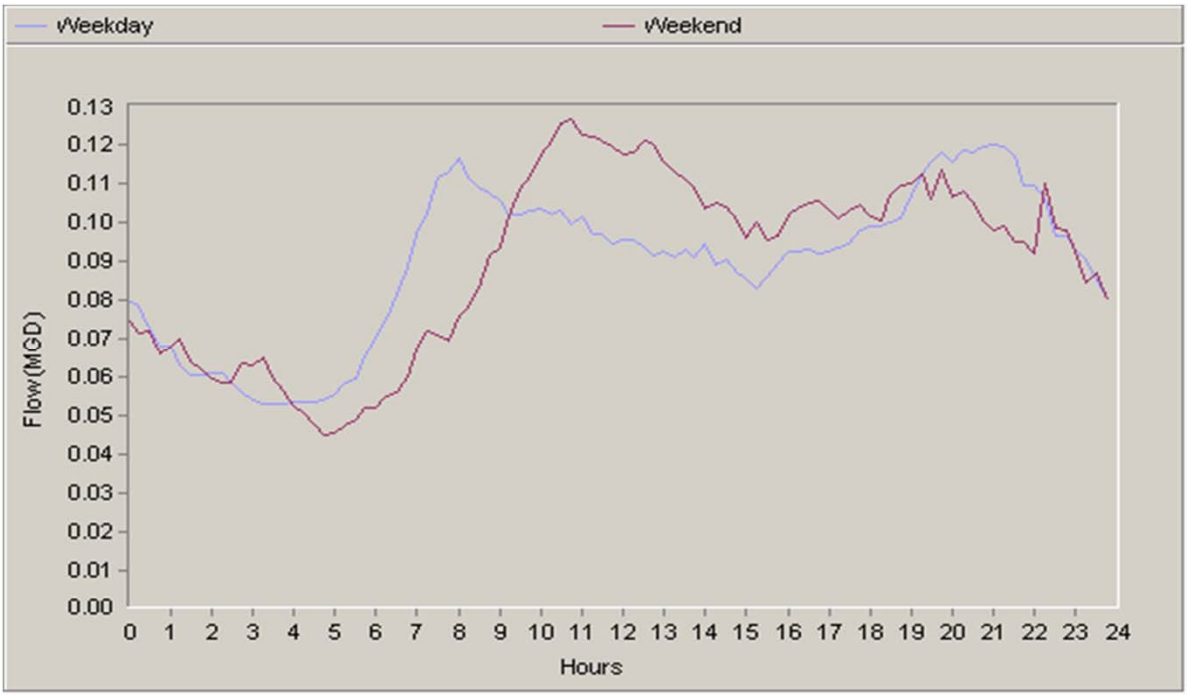
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
KR4_017	0.1378	0.0973	0.0463	0.1455	0.1015	0.0536	0.1400	0.0985	0.0484



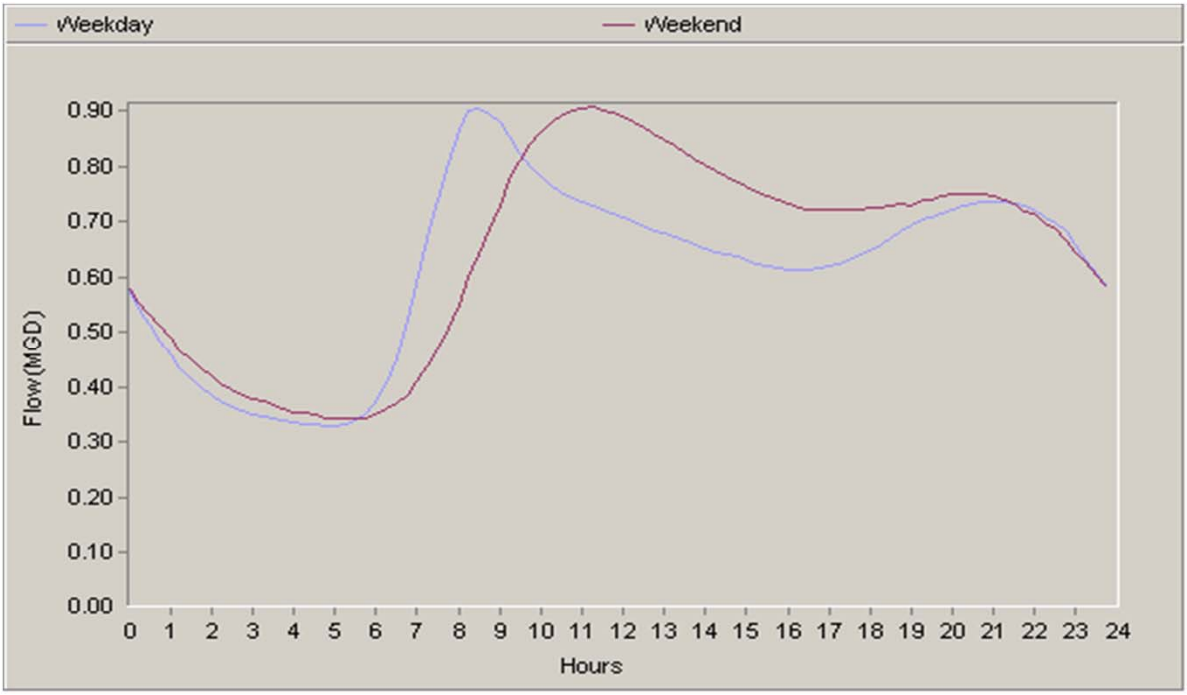
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
KR6_001	0.0820	0.0540	0.0298	0.0391	0.0328	0.0257	0.0697	0.0479	0.0286



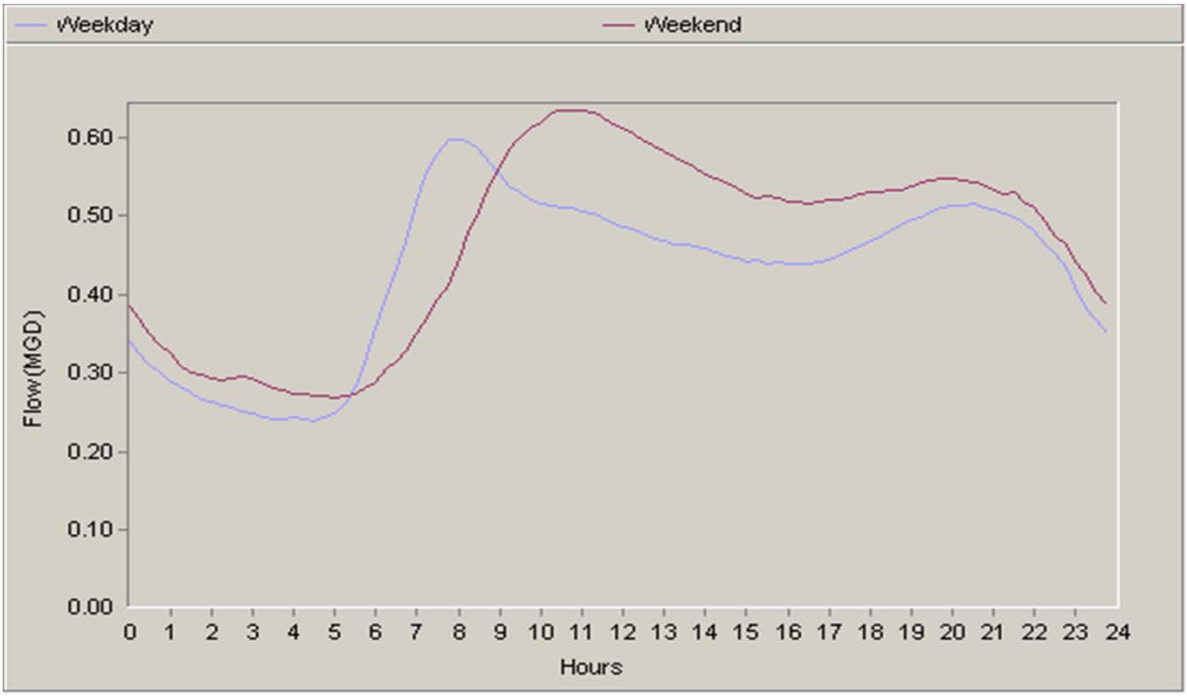
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
KR6_015	0.2858	0.2116	0.0977	0.3300	0.2288	0.0983	0.2984	0.2165	0.0979



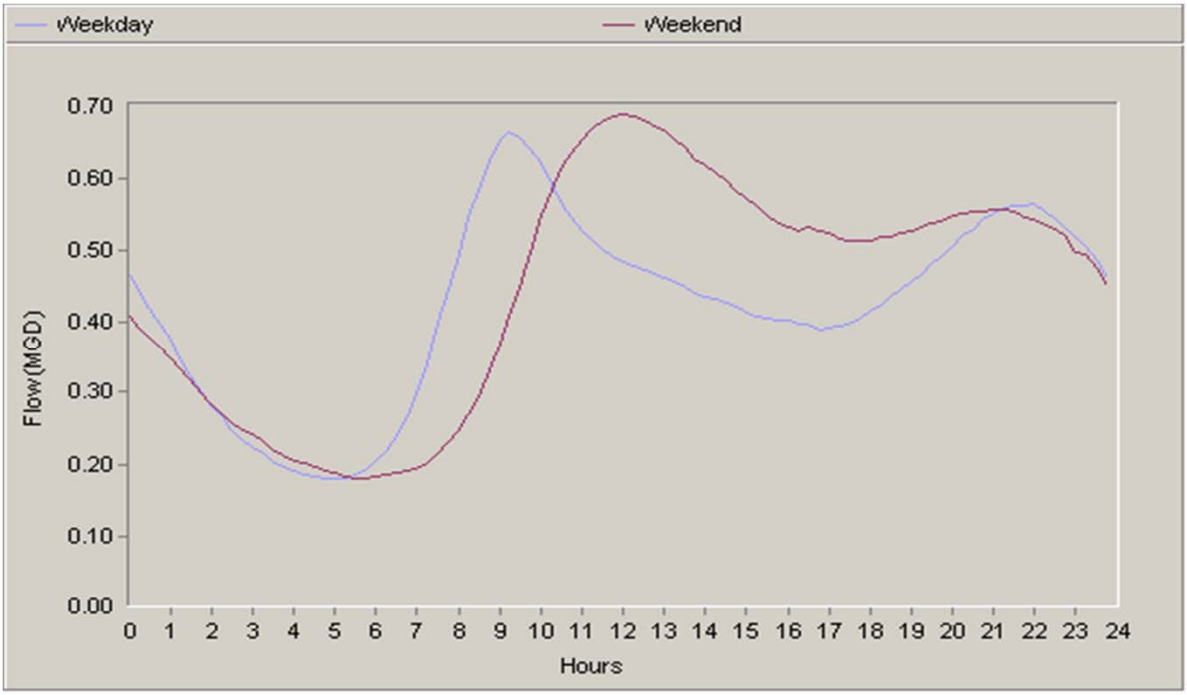
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
NL1_056	0.1200	0.0896	0.0529	0.1270	0.0898	0.0451	0.1220	0.0897	0.0507



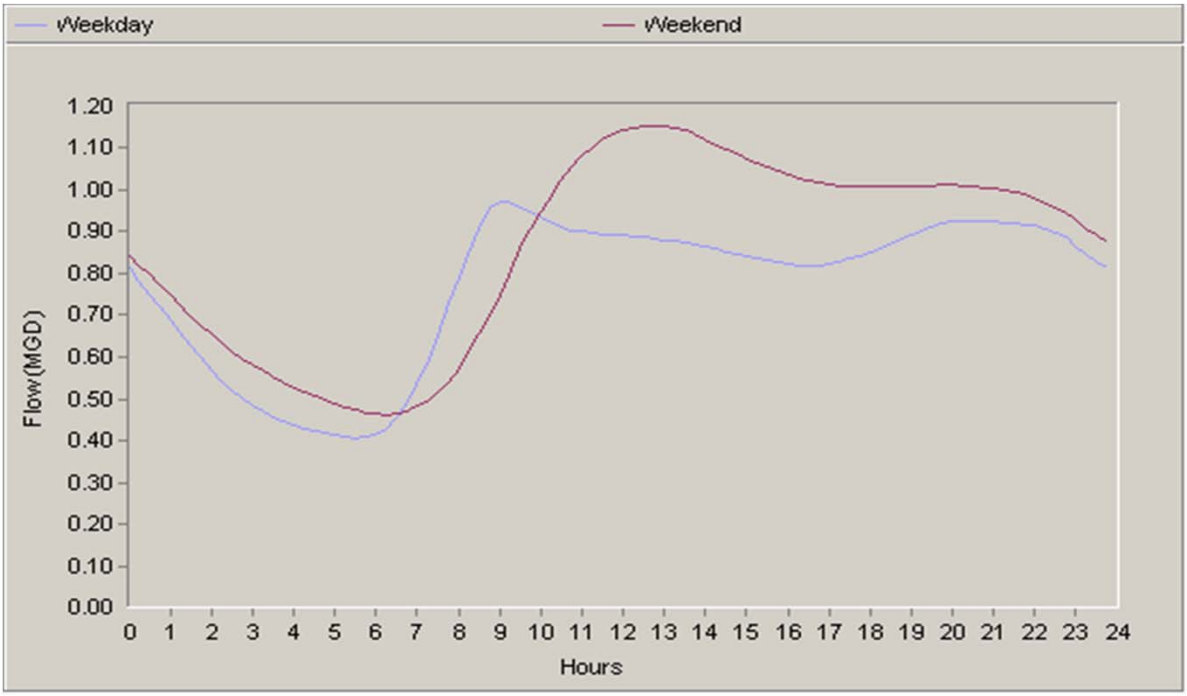
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
WR2_059	0.9038	0.6132	0.3302	0.9070	0.6430	0.3410	0.9047	0.6217	0.3333



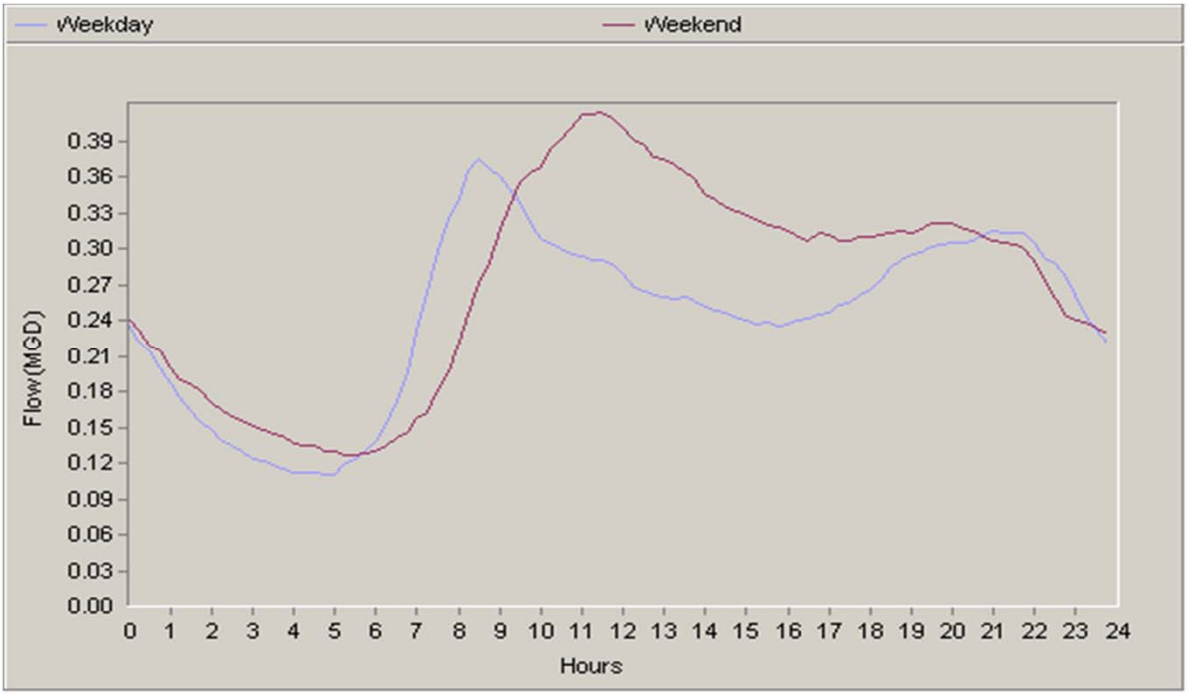
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
WR2_090	0.5973	0.4283	0.2385	0.6347	0.4643	0.2691	0.6080	0.4386	0.2472



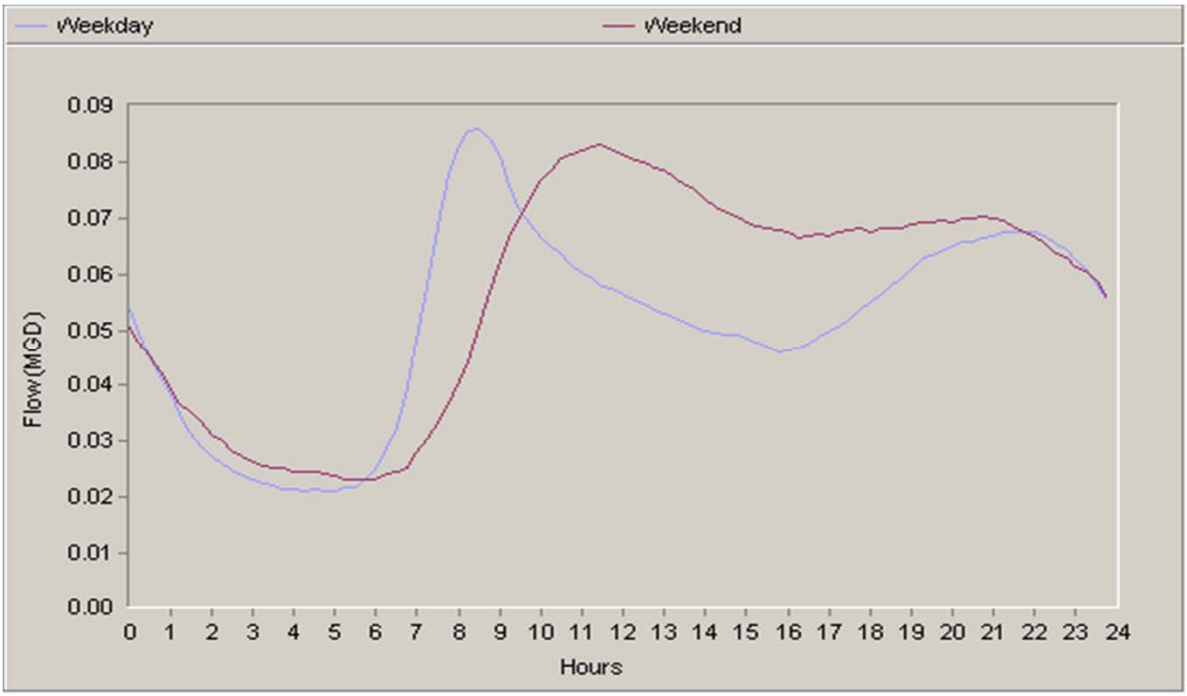
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
WR2_151	0.6624	0.4199	0.1794	0.6871	0.4435	0.1793	0.6695	0.4266	0.1794



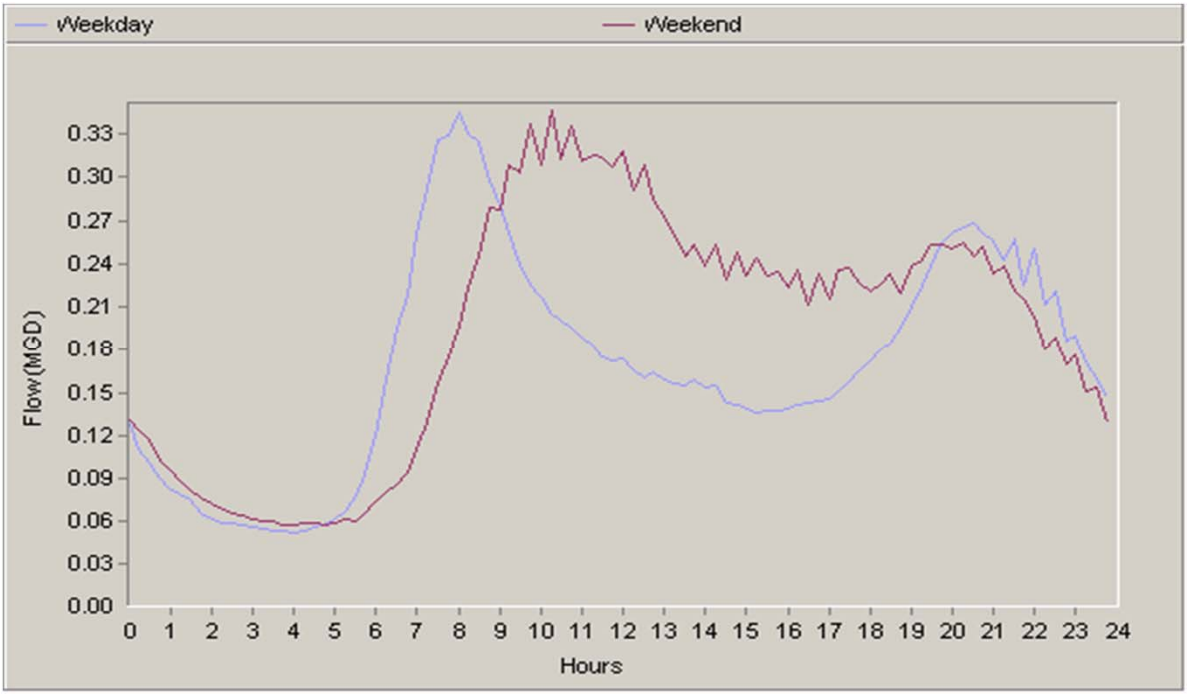
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
WR4_18A	0.9692	0.7674	0.4077	1.1511	0.8583	0.4621	1.0212	0.7934	0.4232



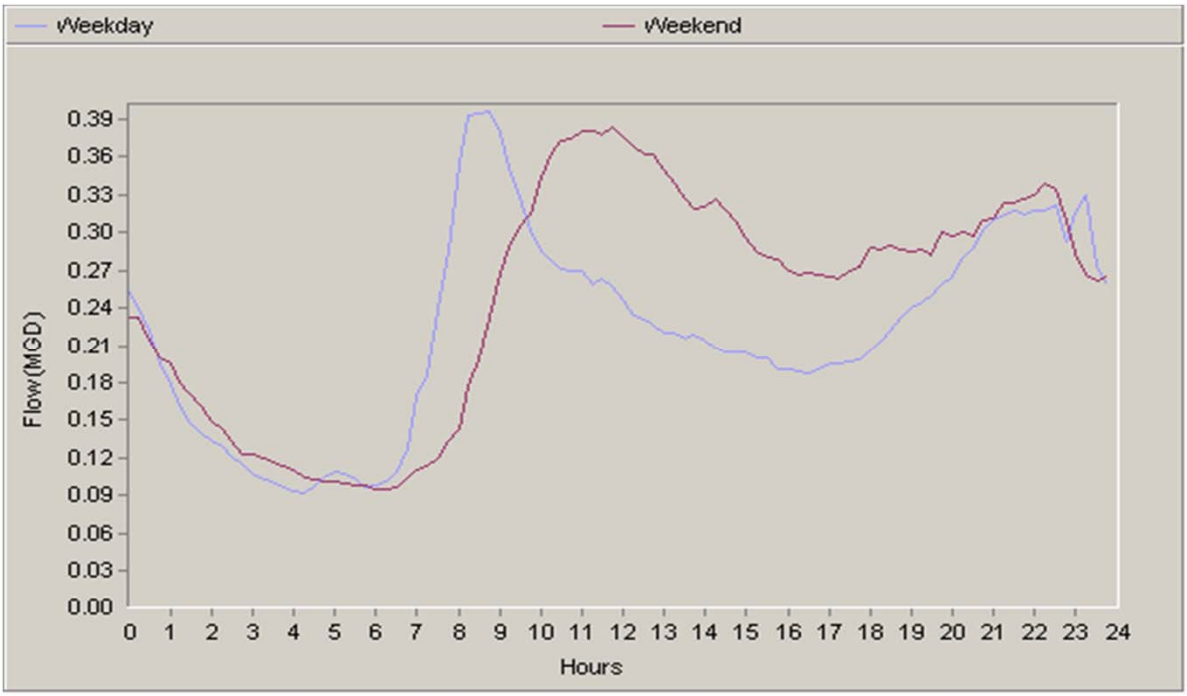
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
WR3_302	0.3761	0.2445	0.1111	0.4144	0.2708	0.1278	0.3870	0.2520	0.1159



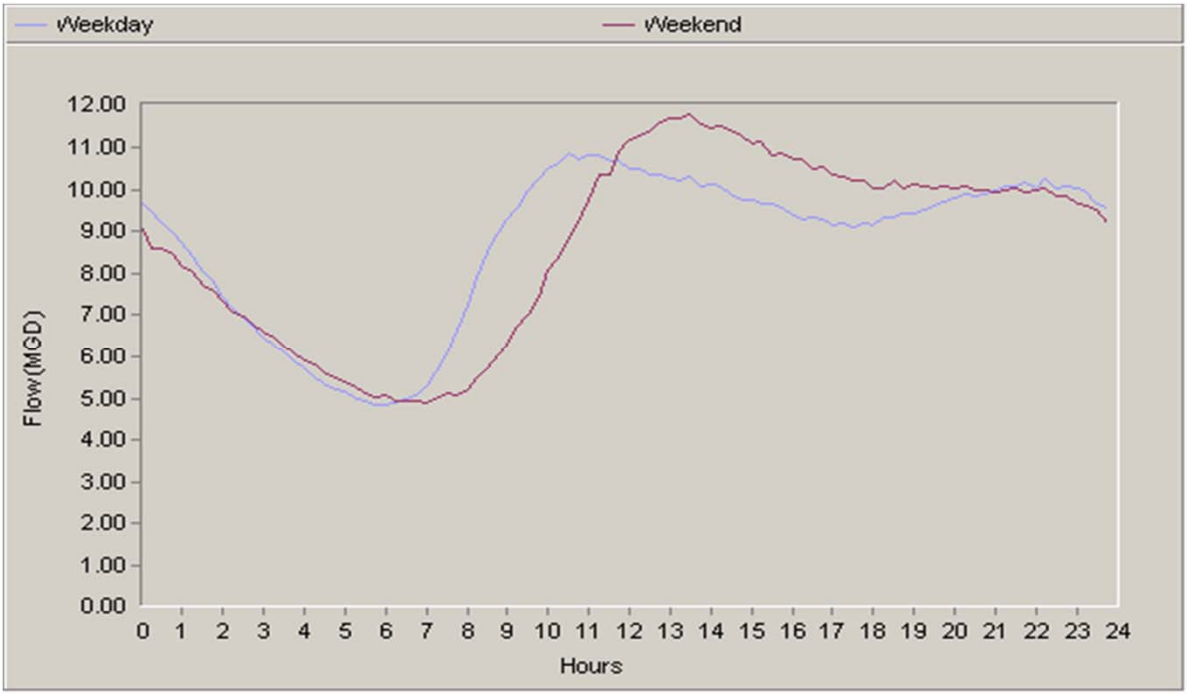
Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
YTC1_016	0.0861	0.0512	0.0210	0.0832	0.0563	0.0230	0.0853	0.0527	0.0216



Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
YTC2_016	0.3453	0.1698	0.0525	0.3468	0.1932	0.0579	0.3457	0.1765	0.0540



Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
YTC1_127	0.3967	0.2216	0.0920	0.3833	0.2472	0.0950	0.3929	0.2289	0.0929



Flow Meter	Weekday			Weekend			Week		
	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)	Max (mgd)	Ave (mgd)	Min (mgd)
WWTP_all	10.8101	8.6751	4.8168	11.8098	8.6714	4.8627	11.0957	8.6740	4.8299

Appendix 2-B
Peaking Factors

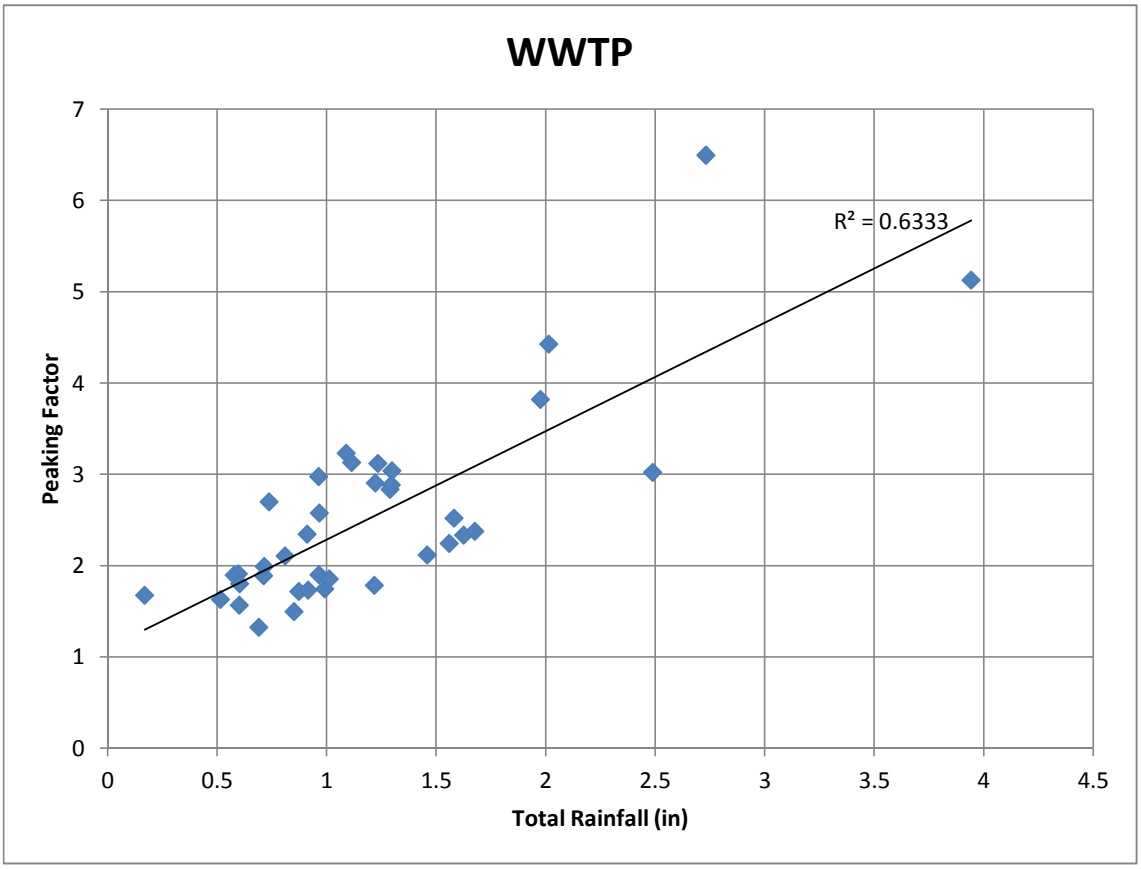
APPENDIX 2-B

Peaking Factors (PF)

This Appendix contains all of the scatterplots and lines of regression for the flow meters analyzed for this memo. A summary from these plots is shown in the table below.

Flow Meter	PF 2-inch Storm	PF 1-inch Storm	2in/1in Ratio	Average Storm Duration (hrs)	Coefficient of Determination (R^2)
WWTP	3.5	2.3	1.5	8.82	0.633
BC1 003	7.6	4.6	1.7	6.20	0.802
EL1 155	3.9	3.0	1.3	8.00	0.732
KR2 003/214	6.5	4	1.4	7.71	0.935
KR3 166	4.9	2.7	1.8	7.58	0.930
KR4 017	11.3	5.3	2.1	5.27	0.839
KR6 001	7.7	4.0	1.9	7.78	0.877
KR6 015	10.5	5.5	1.9	7.95	0.952
NL1 056	8.8	5.8	1.5	6.74	0.808
WR2 059	4.4	2.6	1.7	6.97	0.946
WR2 090	4.4	3.4	1.3	6.00	0.883
WR2 151	5.7	3.4	1.7	9.04	0.826
WR4 18A	5.1	2.8	1.8	7.64	0.936
WR4 302	6.7	4.0	1.7	8.85	0.888
YTC1 016	6.2	4.0	1.6	6.14	0.808
YTC2 016	5.4	3.3	1.6	6.97	0.770
YTC2 127	6.5	5.0	1.3	5.67	0.646

AVERAGE	6.42	3.87	1.64	7.25	0.836
MAX	11.30	5.75	2.13	9.04	0.952
MIN	3.50	2.30	1.29	5.27	0.633


WWTP
Peaking Factor
Total Rainfall (in)
R² = 0.6333
0
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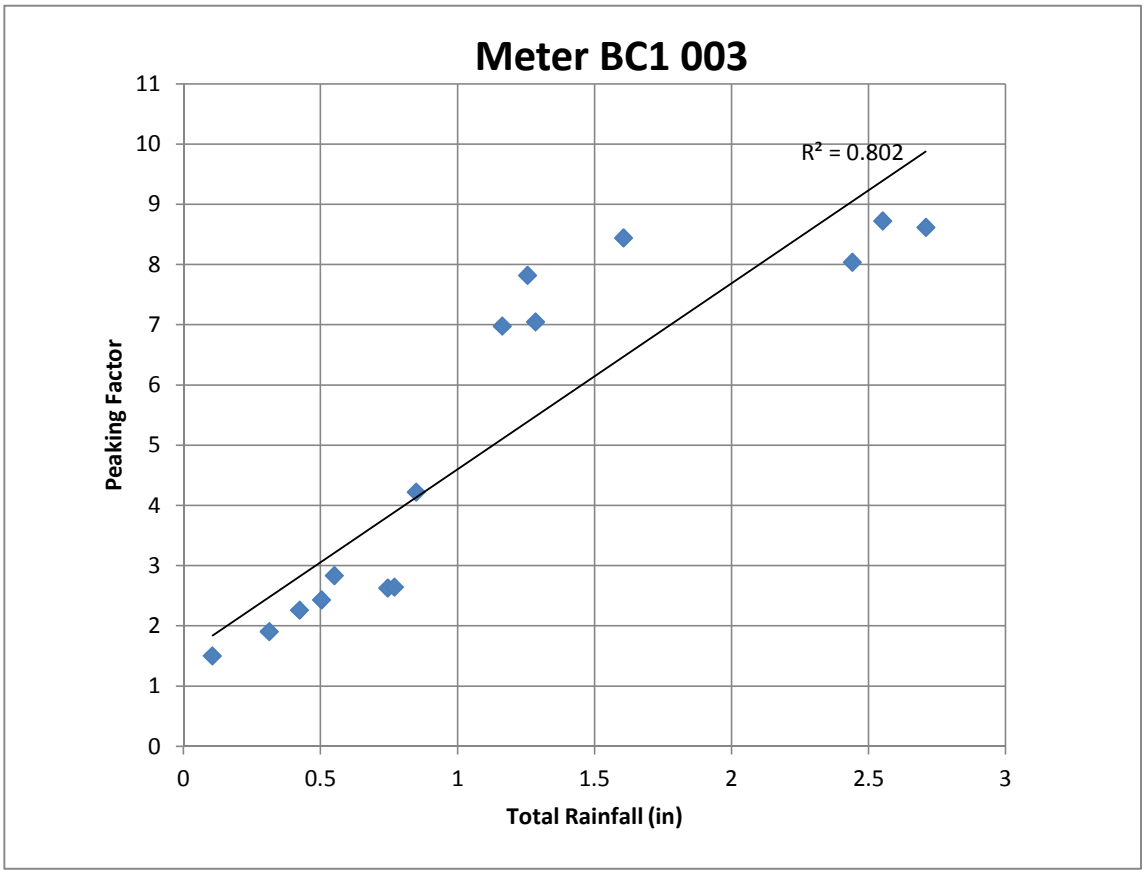
2
3
4
5
6
7
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5


Meter BC1 003
Peaking Factor
Total Rainfall (in)
R² = 0.802
0
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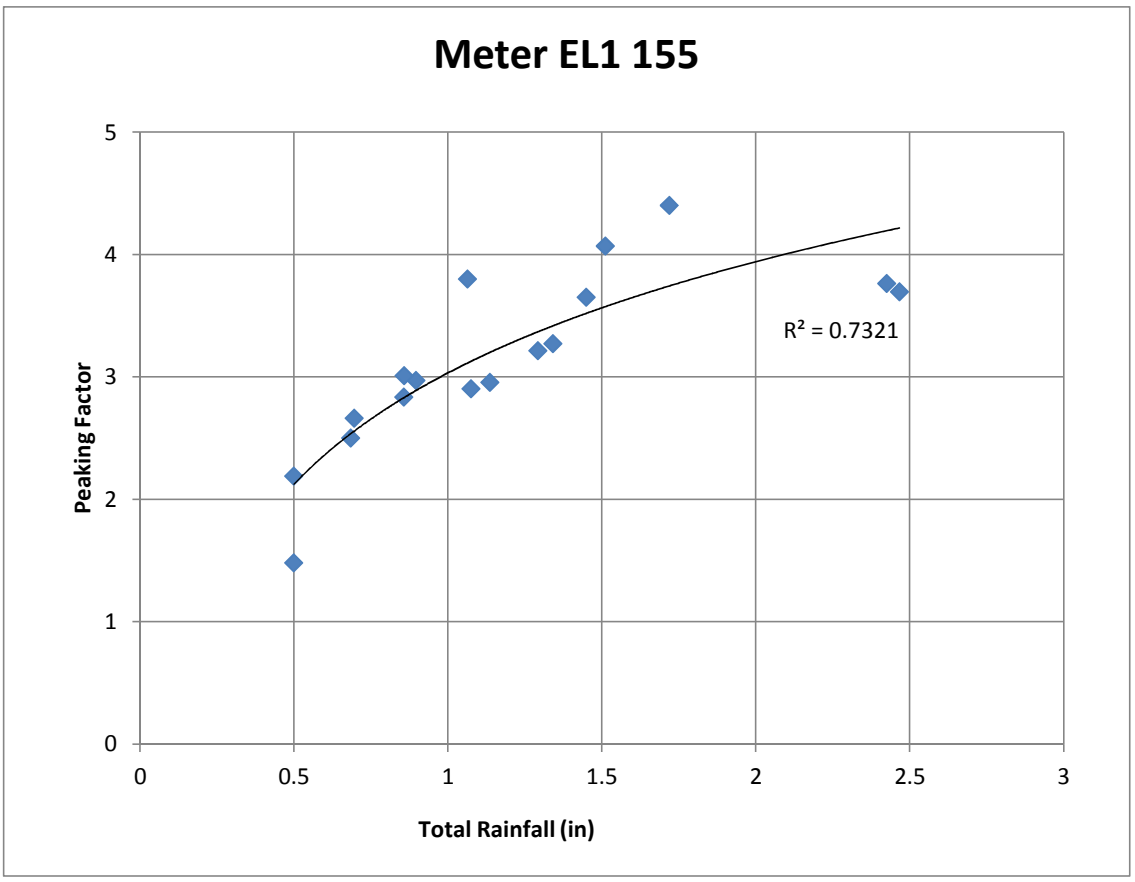
3
4
5
6
7
8
9
10
11
0
0.5
1
1.5
2
2.5
3


Meter EL1 155
Peaking Factor
Total Rainfall (in)
R² = 0.7321
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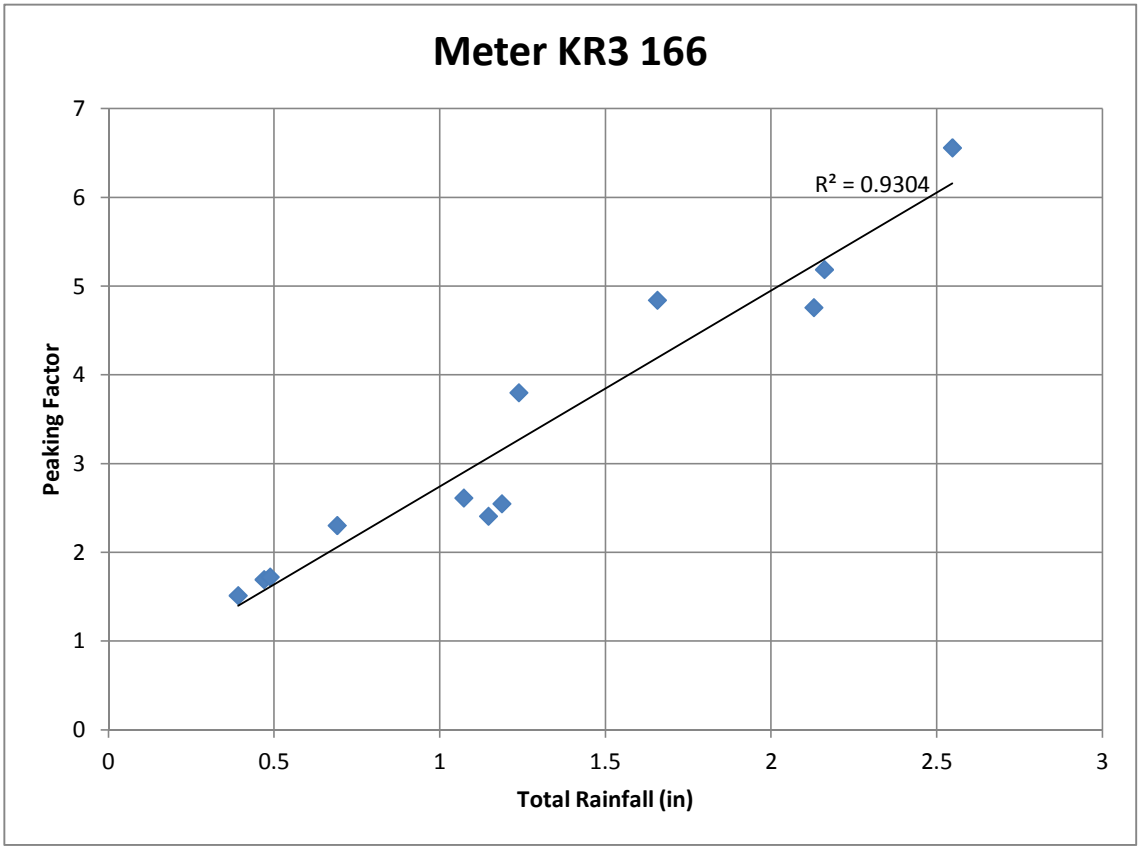
2
3
4
5
0
0.5
1
1.5
2
2.5
3


Meter KR3 166
Peaking Factor
Total Rainfall (in)
R² = 0.9304
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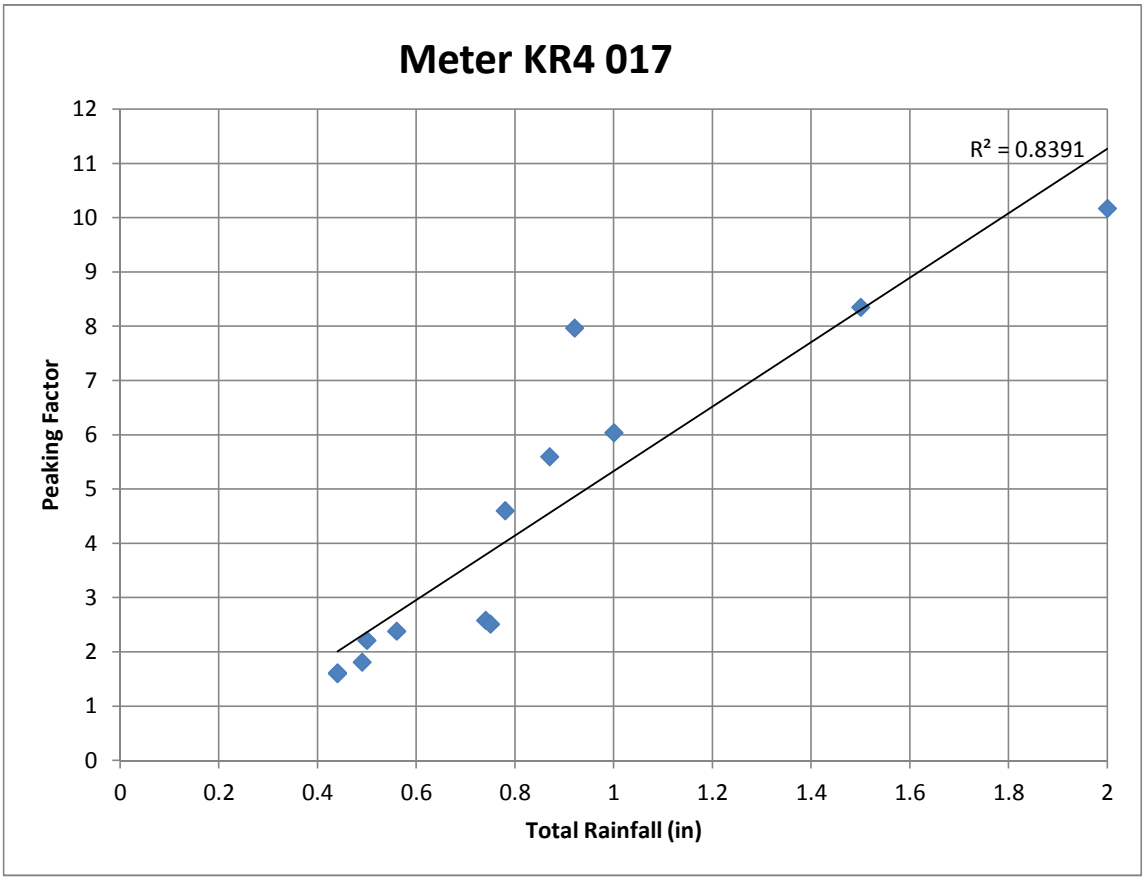
2
3
4
5
6
7
0
0.5
1
1.5
2
2.5
3


Meter KR4 017
R² = 0.8391
Peaking Factor
Total Rainfall (in)
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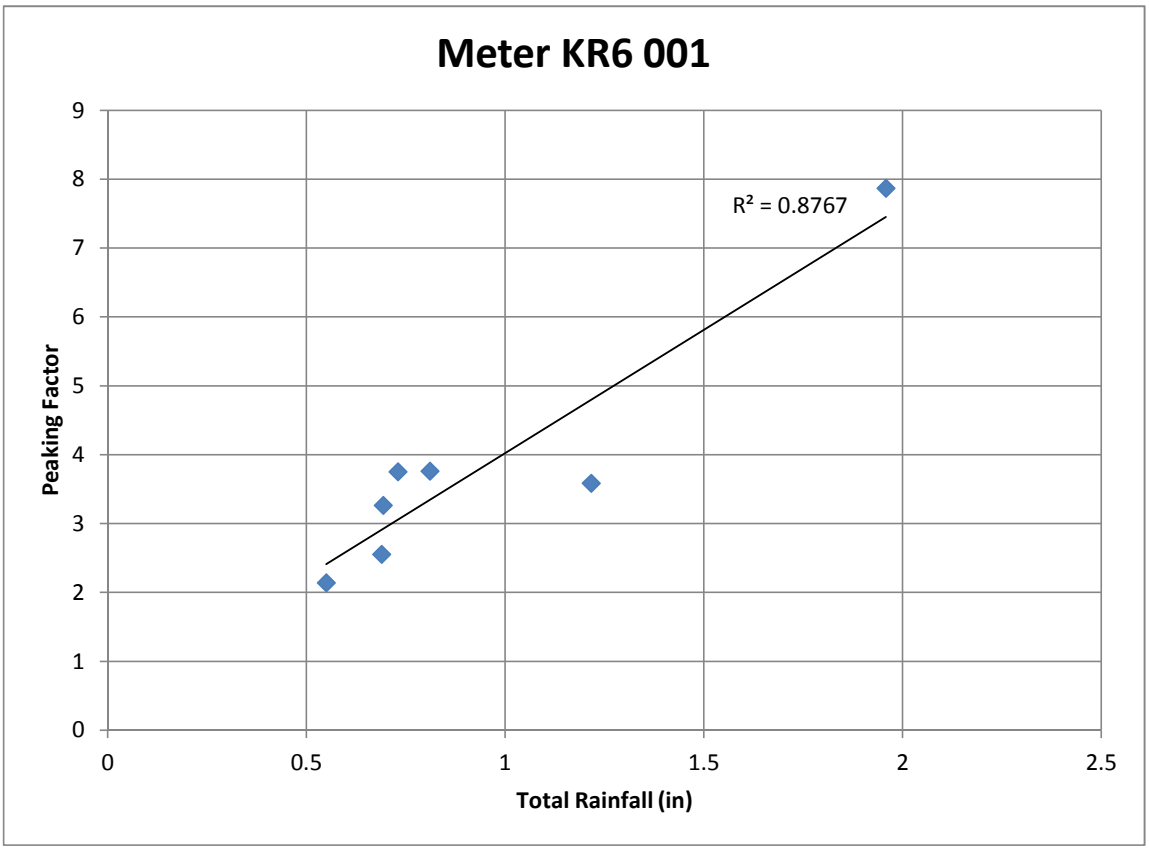
2
3
4
5
6
7
8
9
10
11
12
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2


Meter KR6 001
R² = 0.8767
Peaking Factor
Total Rainfall (in)
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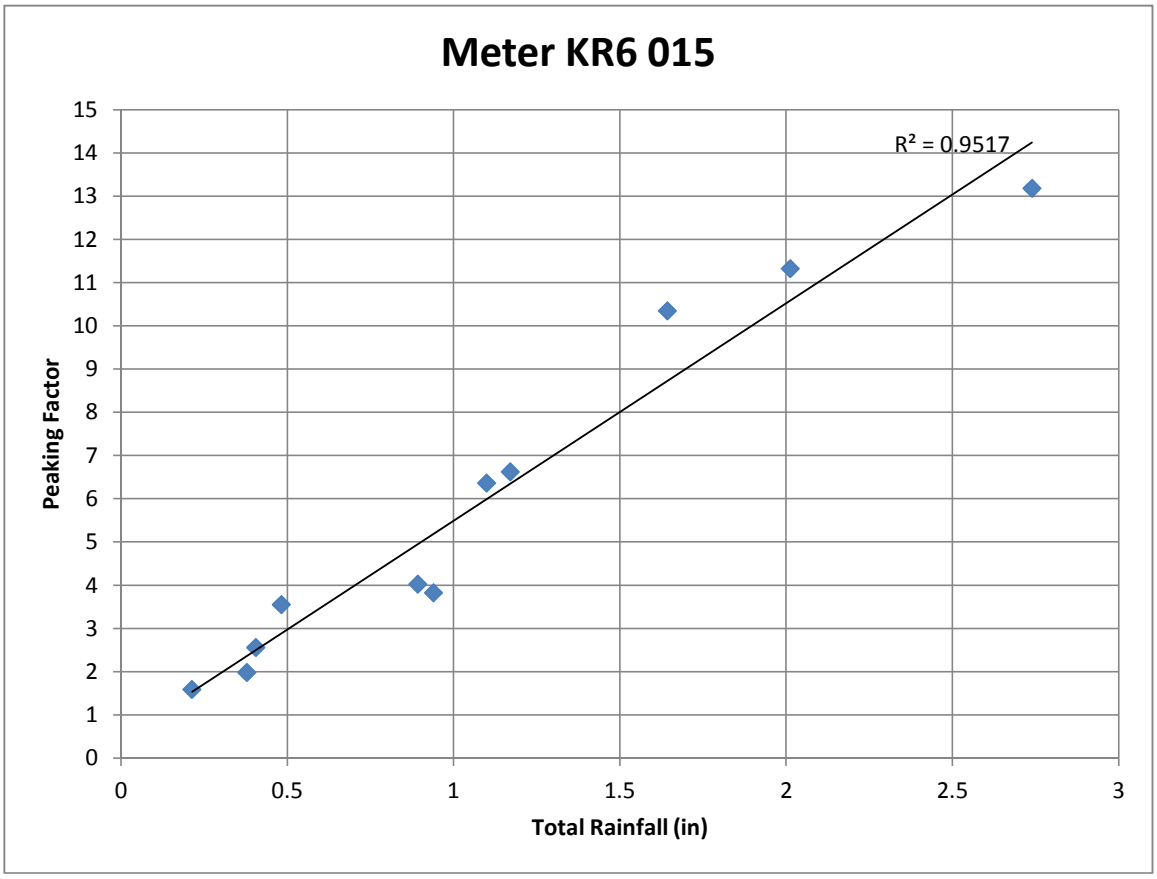
3
4
5
6
7
8
9
0
0.5
1
1.5
2
2.5


Meter KR6 015
Peaking Factor
Total Rainfall (in)
R² = 0.9517
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2
3
4
5
6
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9
10
11
12
13
14
15
0
0.5
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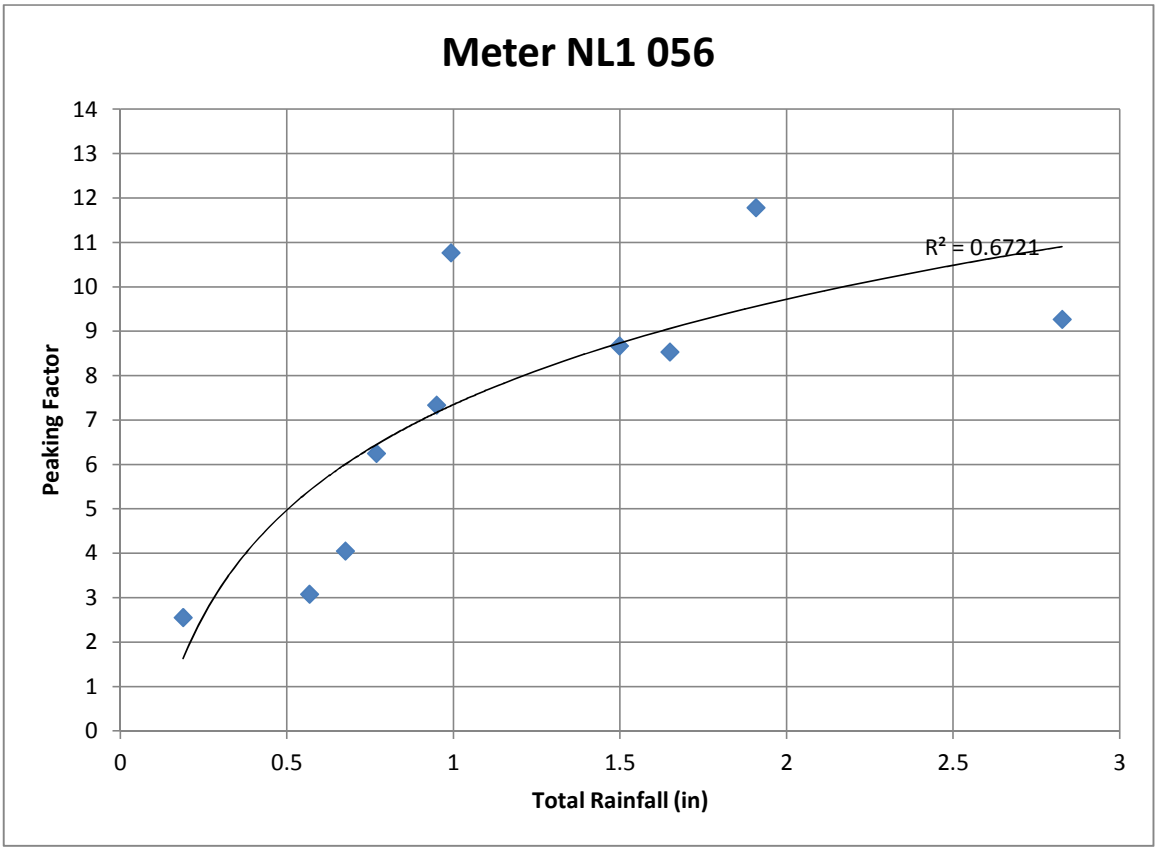
1.5
2
2.5
3


Meter NL1 056
Peaking Factor
Total Rainfall (in)
R² = 0.6721
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1
2
3
4
5
6
7
8
9
10
11
12
13
14
0
0.5
1
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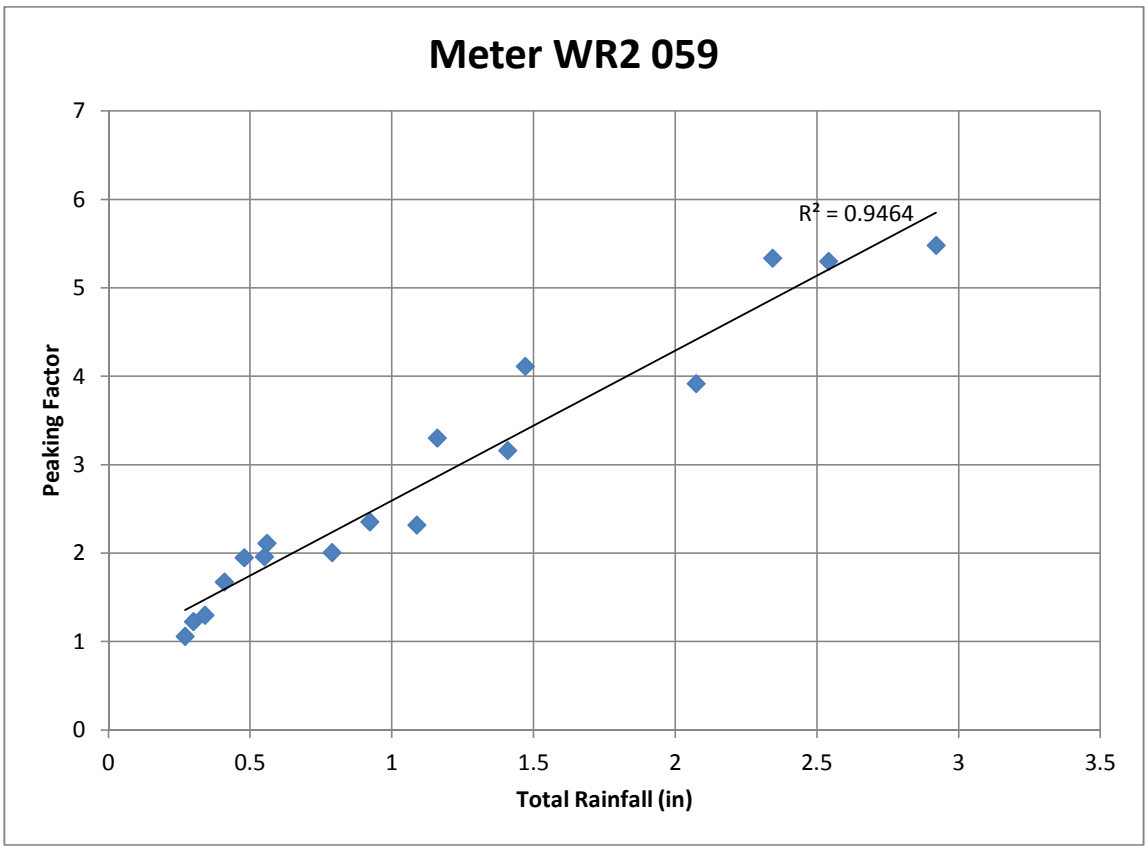
2
2.5
3


Meter WR2 059
Peaking Factor
Total Rainfall (in)
R² = 0.9464
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3
4
5
6
7
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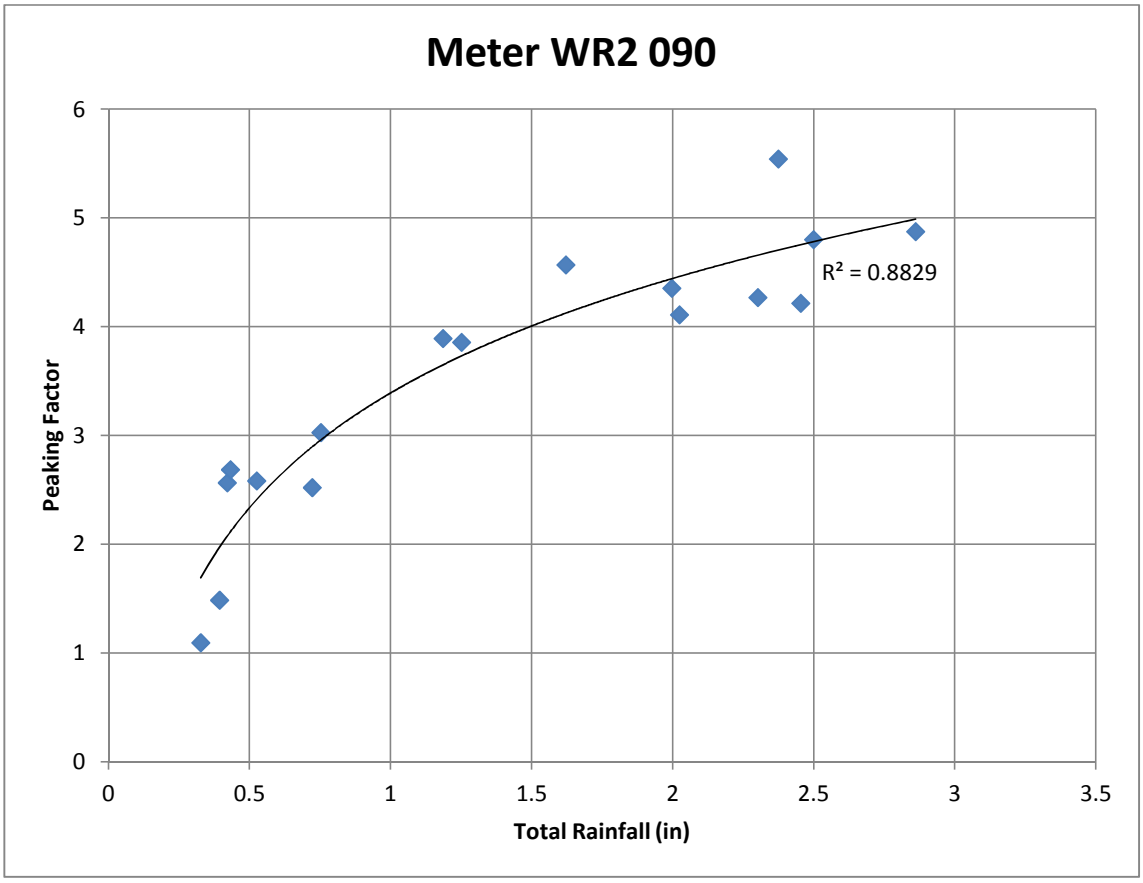
2
2.5
3
3.5


Meter WR2 090
Peaking Factor
Total Rainfall (in)
R² = 0.8829
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4
5
6
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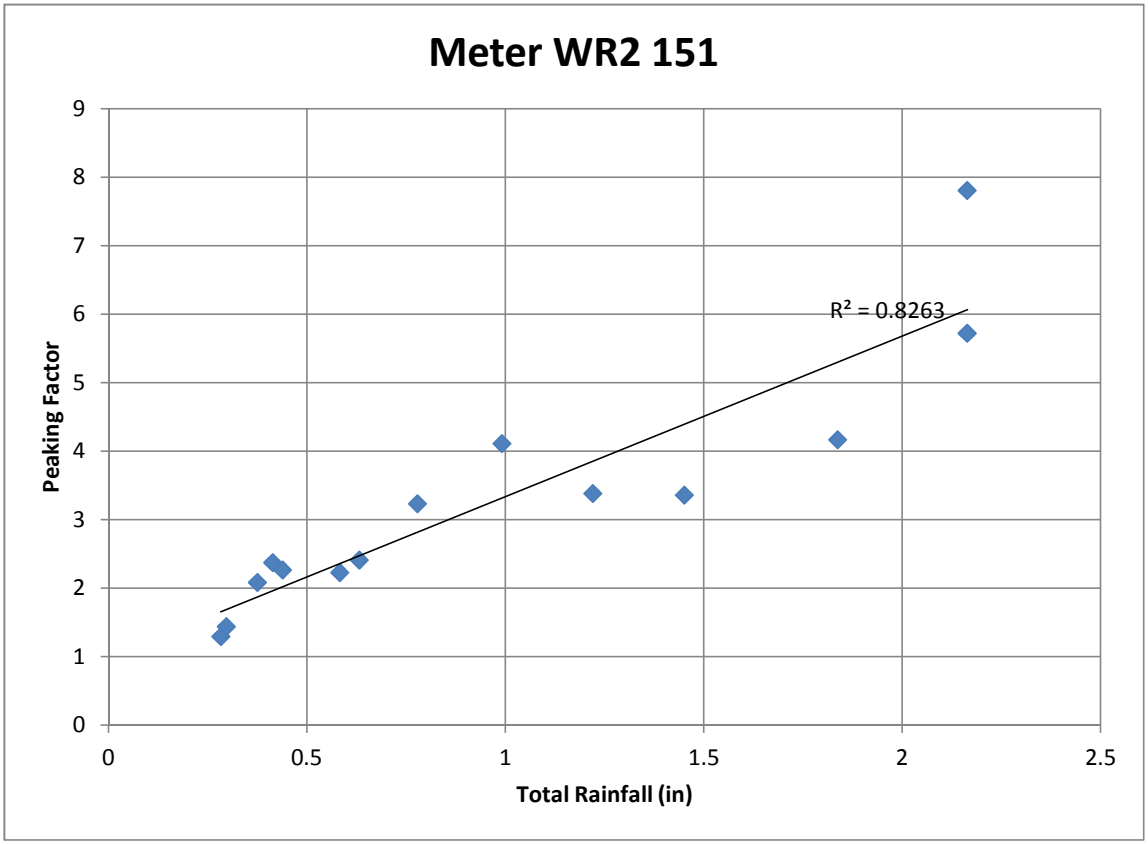
1
1.5
2
2.5
3
3.5


Meter WR2 151
Peaking Factor
Total Rainfall (in)
R² = 0.8263
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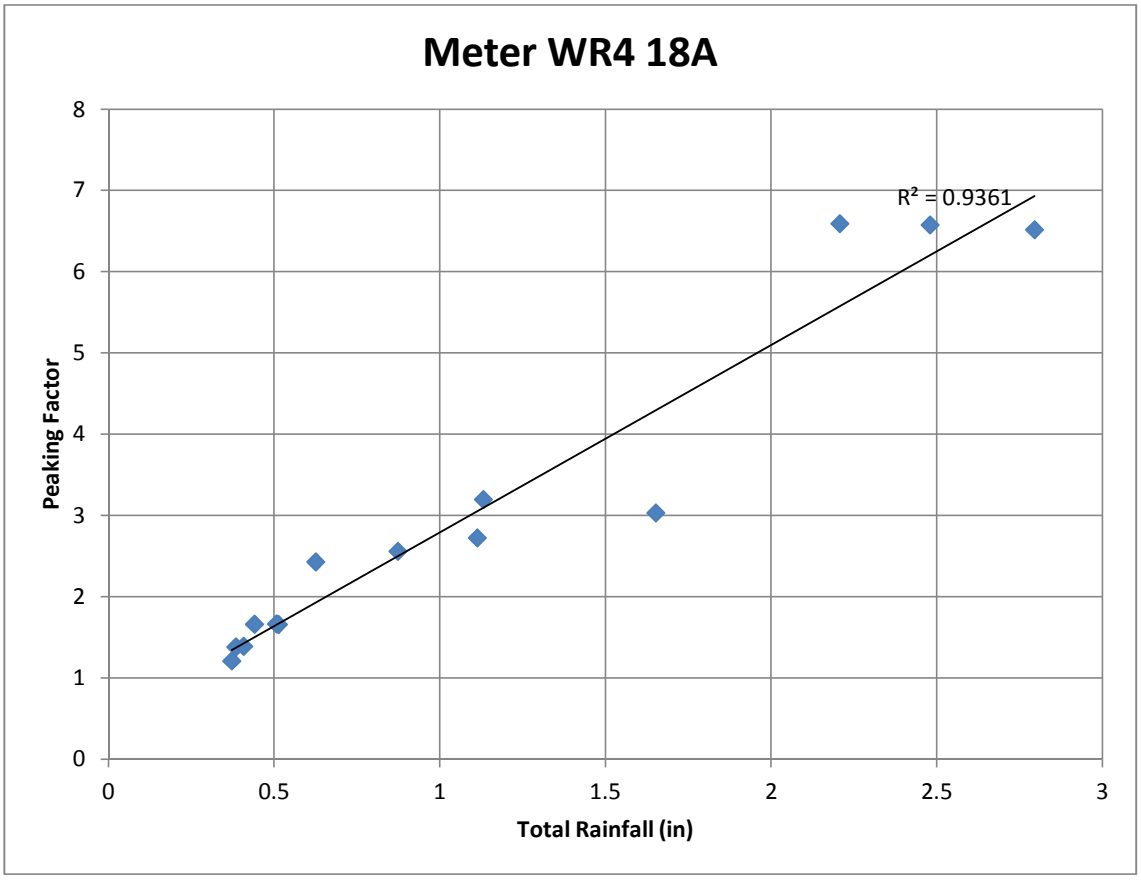
2
3
4
5
6
7
8
9
0
0.5
1
1.5
2
2.5


Meter WR4 18A
Peaking Factor
Total Rainfall (in)
R² = 0.9361
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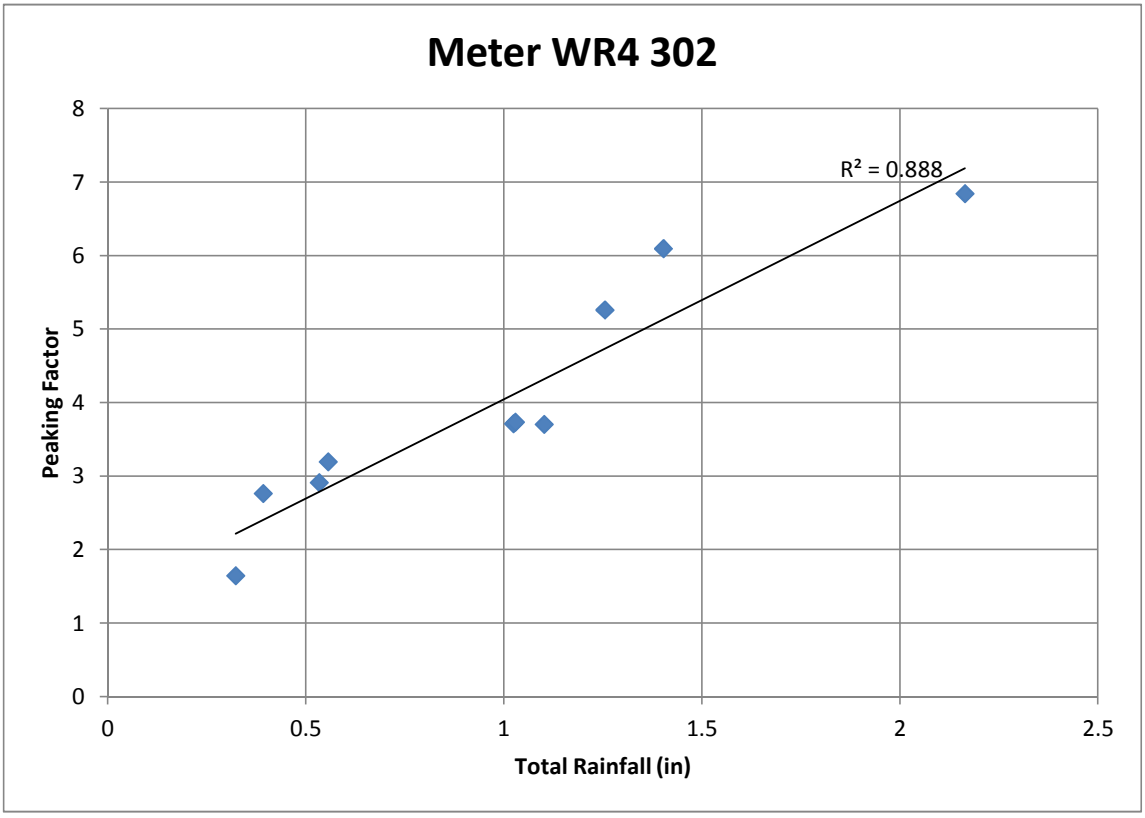
2
3
4
5
6
7
8
0
0.5
1
1.5
2
2.5
3


Meter WR4 302
R² = 0.888
Peaking Factor
Total Rainfall (in)
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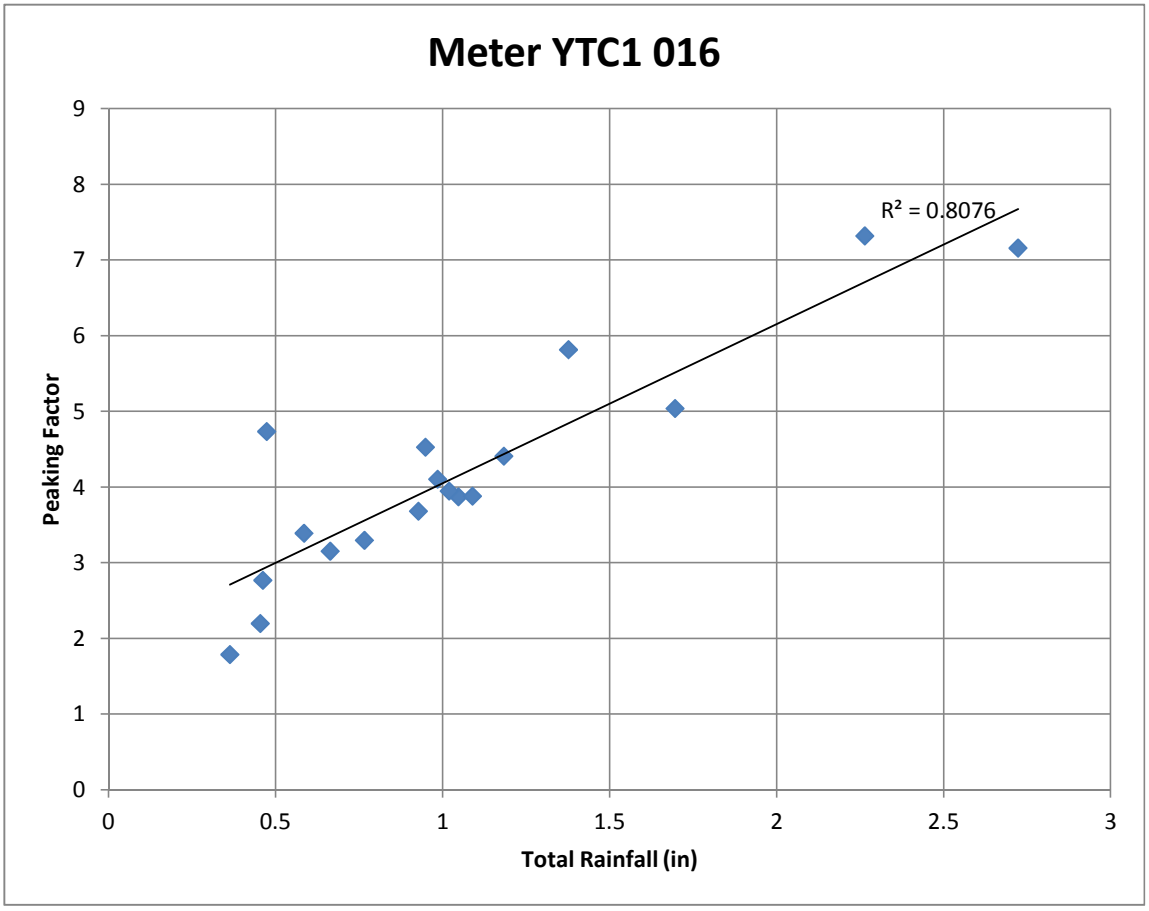
1
2
3
4
5
6
7
8
0
0.5
1
1.5
2
2.5


Meter YTC1 016
R² = 0.8076
Peaking Factor
Total Rainfall (in)
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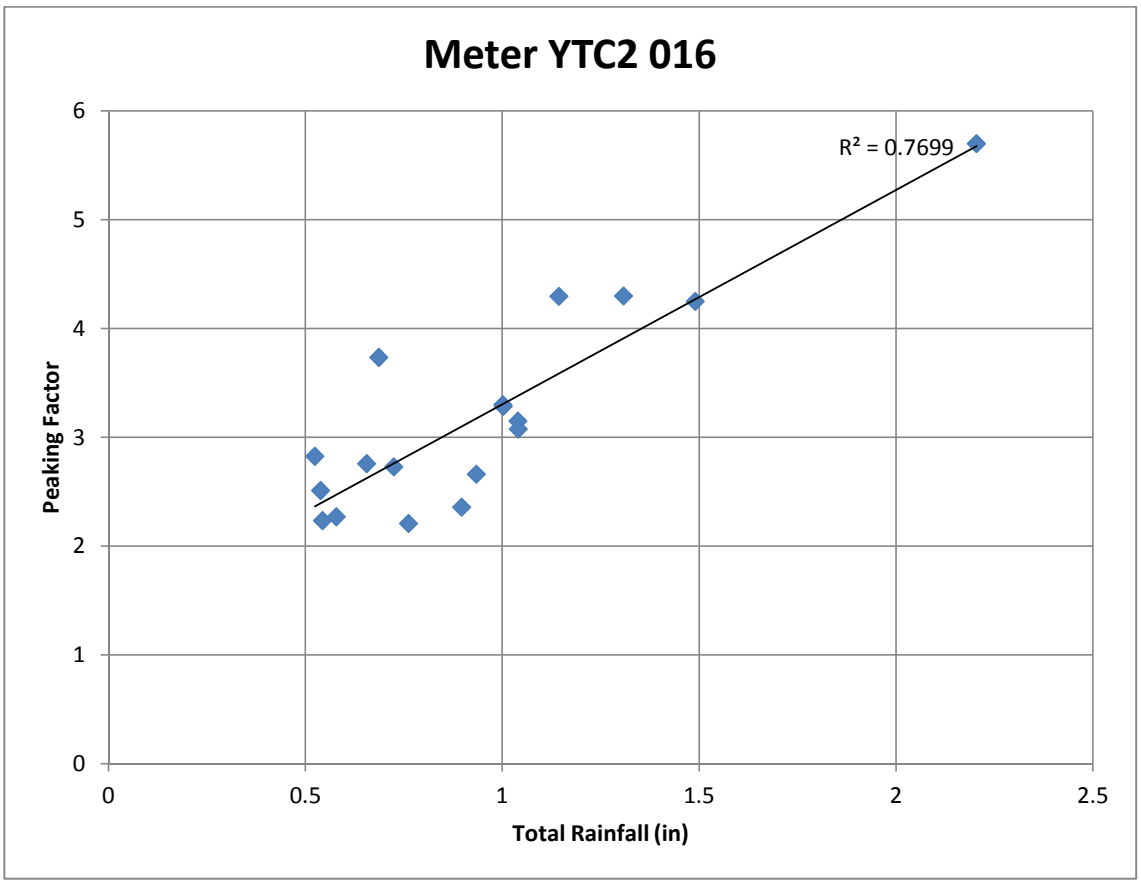
2
3
4
5
6
7
8
9
0
0.5
1
1.5
2
2.5
3


Meter YTC2 016
R² = 0.7699
Peaking Factor
Total Rainfall (in)
0
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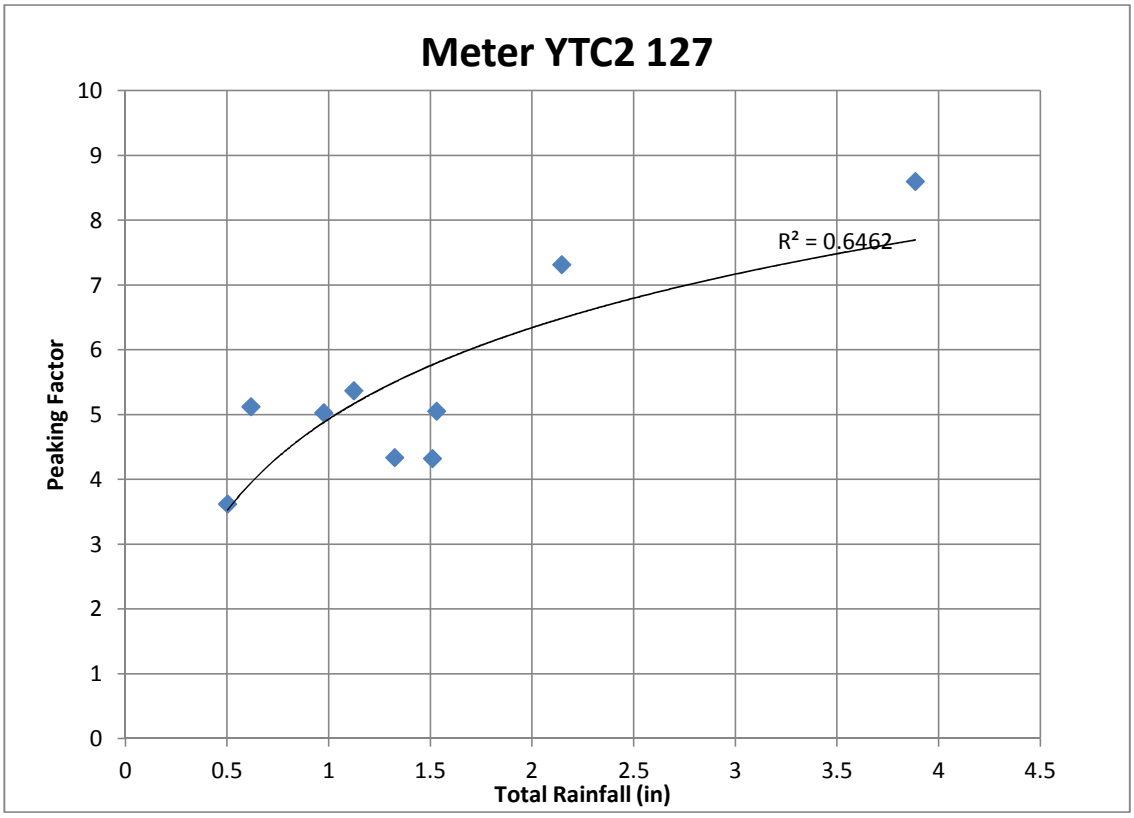
2
3
4
5
6
0
0.5
1
1.5
2
2.5


Meter YTC2 127
R² = 0.6462
Peaking Factor
Total Rainfall (in)
0
1
2
3
4
5
6
7
8
9
10
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5

Appendix 2-C
Model Plot and Data Summary

Model Plot and Data Summary

Wastewater Facilities Master Plan

for

Lawrence, Kansas

City of Lawrence, Kansas

BMcD Project No. 54793

City P.O. 07629

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, MO 64114

A. Submittal Summary

This model plot and data summary is submitted in partial fulfillment of the Lawrence, Kansas Wastewater Facilities Master Plan. Included in this summary are the following:

- Discussion of the SewerGEMS software option selected for this model.
- Electronic GIS map-document file and modifications to GIS files.
- Electronic data summary spreadsheet file.
- Model validation procedure and outcome.

B. Selected SewerGEMS Software Option

The software used for modeling the wastewater collection system is Bentley Systems SewerGEMS version 8i (SELECT Series 20, version 12/13/2010 [08.11.02.49]. This version includes two programs called SewerGEMS and SewerGEMS Sanitary. The two programs have various advantages and disadvantages. They were evaluated based on the conditions that exist in the City's wastewater collection system, and considering which of the two programs is most suitable for modeling those conditions and for meeting the objectives of the master plan. The evaluation included consultations with Bentley Systems technical support. Based on this evaluation, SewerGEMS was selected for this model. The significant factors leading to this decision are summarized below.

- SewerGEMS is able to model the hydrology of rainfall events in a more realistic manner than SewerGEMS Sanitary which is considered to be an important attribute of the model.
- SewerGEMS is able to model situations where flow is split among two or more sewers exiting from a single manhole. There are approximately 100 locations where this occurs in the City's wastewater collection systems, so this becomes another important attribute of the model. SewerGEMS Sanitary requires the user to provide a "rating curve" to essentially tell the model how flows are to be split among multiple exiting sewers rather than the model software analyzing the split of flows.

C. Electronic GIS Map-Document File and GIS Modifications

An electronic copy in two versions (.mxd and PDF) of the GIS map-document file is included with this summary. They were created directly from the model and reflect various and necessary modifications made to the City's database files when the model was created. The current model is based on the GIS update from the City dated 10/22/2010. This GIS update has been edited and all edits have been documented. The documentation of edits is provided in Appendix A to this summary. The editing is intended to correct various types of conditions found in the City's files such as:

- Duplicate facility ID's.
- Locations where connectivity was absent.
- Locations where elevations were clearly in error due to their magnitude (such as 100 feet).
- Locations where a large pipe flows into a very small pipe (such as a 21" sewer into a 6" sewer).
- Locations where there are significant differences in upstream and downstream pipe inverts.
- In GIS, pump stations are represented by a single point. For modeling purposes, it is necessary to show individual pumps in a pump station as well as the pump station wet well as separate nodes, with links or "virtual pipes" connecting them to the system. An example of this situation is shown below in Figures 1 and 2.

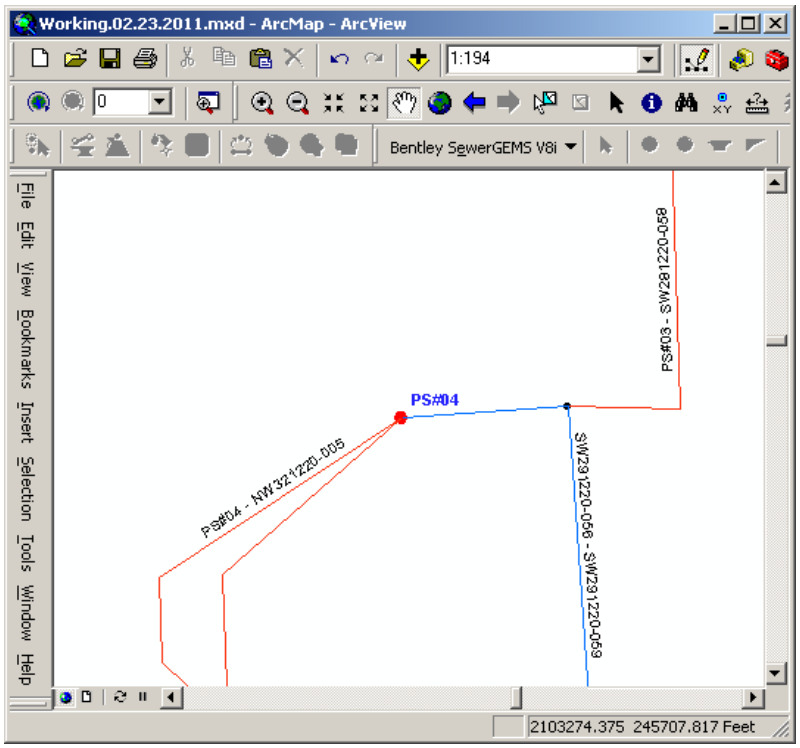


Figure 1. GIS Representation of Pump Station 04

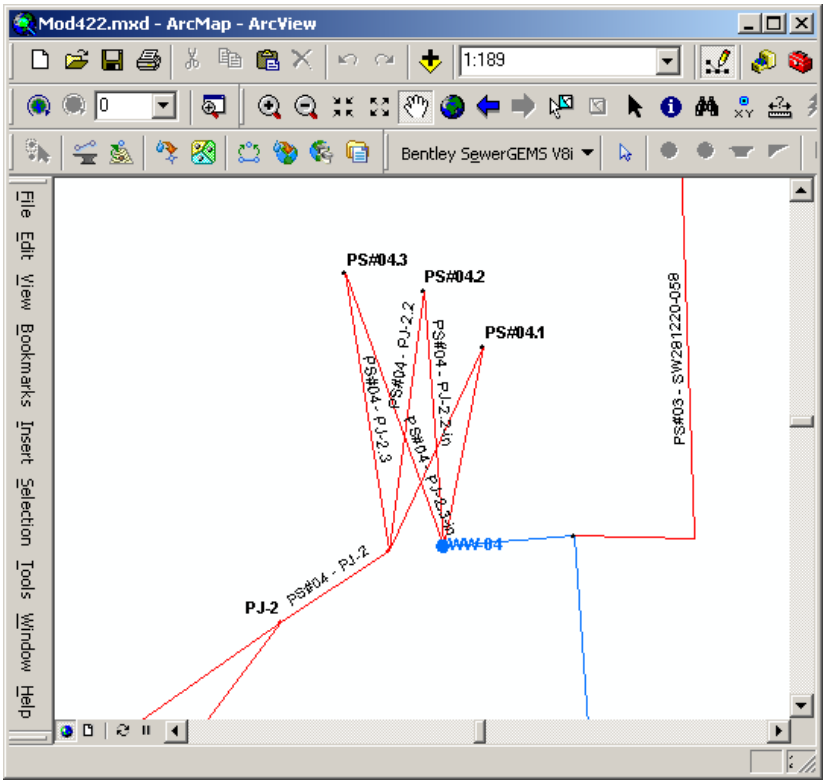


Figure 2. Model Representation of Pump Station 04

There are other GIS modifications made necessary by technical shortcomings that exist in all computational hydraulic models. Changes to the "real world" are necessary for conditions such as short (meaning sewers shorter than 30 feet) sewers where they are lengthened and given a lower roughness coefficient to result in a sewer equivalent to the actual sewer. This and other similar adjustments are accomplished automatically by the software.

D. Electronic Data Summary Spreadsheet File

An electronic data Excel spreadsheet file is included with this summary. It provides a record of all nodes (manholes, junctions, pressure junctions, and pump station wet wells), links (gravity sewers and force mains), and pump data from the model. The data are copied directly from the model.

E. Model Validation Procedure and Outcome

A validation procedure has been performed to demonstrate the model has been properly constructed. The procedure involves inputting a small amount of flow, in this case 1 gallon per minute per manhole throughout the system, and verifying the input flow arrives at various points in the system such as pump stations and the wastewater treatment plants at the volumes expected at those points in the system.

Upon running the model using this validation procedure, it was determined that just over 99% of the total flow input to the model was seen at the output end of the model which is the wastewater treatment plant. This degree of accuracy is considered to be very good and constitutes an acceptable validation of the model. In addition, expected influent flows to pump stations were compared to flows leaving pump stations. This validation at each pump station is summarized in Table 1 based on a 12 hour simulation run. The weighted average result of this validation procedure is an influent flow volume of slightly more than 100% of the total flows leaving the pump stations which is again considered to be a very good and acceptable level of accuracy.

Table 1: Validation Calculations at Pump Stations

Facility ID	Direct MHs	Sum of u/s MHs	Expected 6-hour Volume (cf)	Inflow to PS (cf)	Pumped Volume out of PS (cf)	Outflow Volume / Inflow Volume	Expected Volume / Inflow Volume
PS#01	40	61	21,960	22,506	23,079	103%	97.6%
PS#02	44	44	15,840	15,840	18,432	116%	100.0%
PS#03	171	232	83,520	83,553	95,280	114%	100.0%
PS#04	77	349	125,640	136,616	131,849	97%	92.0%
PS#5a		331	119,160	123,817	126,894	102%	96.2%
PS#5b		4,575	1,647,000	1,650,656	1,652,794	100%	99.8%
PS#06	100	100	36,000	35,999	48,426	135%	100.0%
PS#07	8	8	2,880	2,880	735	26%	100.0%
PS#08	360	360	129,600	134,825	160,835	119%	96.1%
PS#09		2,480	892,800	902,706	894,964	99%	98.9%
PS#12	20	20	7,200	7,200	5,954	83%	100.0%
PS#13	2	2	720	720	617	86%	100.0%
PS#15	16	16	5,760	5,760	8,823	153%	100.0%
PS#16		2,304	829,440	835,105	822,545	98%	99.3%
PS#19	103	230	82,800	84,227	102,656	122%	98.3%
PS#22	19	19	6,840	6,840	7,025	103%	100.0%
PS#23	16	16	5,760	2,160	4,512	209%	266.7%
PS#25	57	165	59,400	58,056	52,369	90%	102.3%
PS#27	99	99	35,640	35,639	26,665	75%	100.0%
PS#28	40	40	14,400	14,400	15,715	109%	100.0%
PS#31	5	5	1,800	1,800	1,884	105%	100.0%
PS#32	109	125	45,000	44,705	38,877	87%	100.7%
PS#34	13	13	4,680	4,680	4,571	98%	100.0%
PS#35	16	16	5,760	5,760	6,033	105%	100.0%
PS#37	60	60	21,600	21,599	22,493	104%	100.0%
PS#42	213	213	76,680	76,677	77,037	100%	100.0%
PS#43	13	13	4,680	4,680	4,927	105%	100.0%
PS#44	175	175	63,000	62,998	47,459	75%	100.0%
PS#45	11	11	3,960	3,960	3,957	100%	100.0%
PS#46	86	102	36,720	36,766	31,021	84%	99.9%
PS#48	210	**210**	75,600	75,597	65,544	87%	100.0%
PS#49	87	95	34,200	33,327	34,822	104%	102.6%
PS#50	11	11	3,960	3,960	3,850	97%	100.0%

Technical Memorandum No. 3
Future System Evaluation and Improvement Plan

Wastewater Facilities Master Plan

for

Lawrence, Kansas

City of Lawrence, Kansas

BMcD Project No. 54793

City P.O. 07629

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, MO 64114

City of Lawrence, Kansas

Wastewater Facilities Master Plan Technical Memorandum No. 3

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* = follows page number.

Appendix

A. Introduction

Technical Memorandum No. 3 is a summary of the forecast and distribution of future wastewater flows for the planning years 2020 and 2030; the analysis of a flow-development "trigger" that will be used to guide the scheduling for planning, design and construction for the future Wakarusa Wastewater Treatment Plant (Wakarusa); and the analysis of wastewater collection facilities improvements needed to serve growth and development forecast for planning years 2020 and 2030 plus conveyance of flows to the future Wakarusa; all in partial fulfillment of the Lawrence, Kansas Wastewater Facilities Master Plan. The goals of this technical memorandum were to:

- Determine a flow-development trigger for the start of further planning and then design and construction of the future Wakarusa which will put the new Wakarusa in service before Kansas River Wastewater Treatment Plant (KRWWTP) flows and pollutant loadings reach its capacity.
- Modify the existing collection system computer hydraulic model to reflect the forecast of 2020 and 2030 growth and associated increases in wastewater flows within the existing service area, plus extensions of the service area.
- Develop a plan of improvements to the existing collection system to address current capacity deficiencies during the design storm wet weather event and accommodate projected 2020 and 2030 service area growth.
- Develop a plan to convey flows in excess of KRWWTP capacities to the future Wakarusa.

B. Flow-Development Trigger for Future Wakarusa Wastewater Treatment Plant

1. General Considerations

The flow/development trigger must anticipate how much time will be needed to complete the design and construction of the Wakarusa. Based on experience with projects of this type, a minimum of 4 years should be scheduled for design and construction of a new wastewater treatment plant of the scale of the Wakarusa. A 5-year schedule is recommended to provide for scheduling uncertainties such as permitting and regulatory reviews of the project.

The flow/development trigger should also be based on bringing the Wakarusa on line before the full capacity of the KRWWTP is reached. This will provide an appropriate contingency for various factors such as accelerated growth during the 5-year project design and construction schedule, to insure the

KRWWTP will perform within its permitted effluent limits up to the time the Wakarusa is on line and to provide time for the start-up phase of the Wakarusa.

2. Population Based Trigger

The first flow/development trigger evaluated is based on wastewater utility service area population. Population is seen to be a more meaningful trigger than wastewater flow for the following reasons:

- Wastewater flow can vary significantly from year to year due to reasons that do not relate to service area development, such as unusually wet or dry conditions.
- Population accounts for other parameters which affect wastewater treatment plant capacity in addition to flow rate, such as pollutant loading rates that tend to relate closely to service area population.

The 1999 KRWWTP design memorandum establishes plant capacities based on a design population of 100,000, or nearly 7,300 more than 2010 population. There is some possibility that parts of the plant are designed for somewhat more capacity, such as an extra 10% aeration basin capacity for nitrification (ammonia reduction). This analysis, however, is based on an overall plant capacity for a population of 100,000. As suggested earlier, a contingency should be incorporated into the setting of the trigger. A population contingency of 2,000 is recommended to provide a buffer of more than one year. This requires the Wakarusa to be scheduled to be on line when population reaches 98,000. With utility service area population projected to grow annually by 1,394 from 2010 to 2020, it will be necessary for design and construction of the proposed Wakarusa to start at a population trigger of 91,000. This would provide a schedule of about 5 years to complete the project and have the Wakarusa on line before development exceeds the design capacity of the KRWWTP.

3. Pollutant Loading Based Trigger

The second flow/development trigger is based on pollutant loading rates. A brief review of KRWWTP operating data indicates influent wastewater characteristics that are typical for municipal wastewater. There are several pollutant loading rate parameters used for establishing wastewater treatment plant capacities. The single most significant pollutant loading parameter for establishing wastewater treatment plant capacities is BOD. Unlike flow rates which can vary from year to year for reasons unrelated to service area development, BOD loading rates for typical municipal wastewater normally track population and commercial development in a fairly predictable manner.

The 1999 KRWWTP design memorandum establishes plant capacities based on an average BOD loading rate of 15,800 pounds per day (ppd) and a maximum month BOD loading rate of 20,370 ppd. The resulting BOD loading rates per person based on the design population of 100,000 are 0.158 ppd/person and 0.204 ppd /person, respectively, at the average and maximum month BOD loading rates. Based on plant operating data and population estimates from 2003 to present, daily BOD loadings per person have averaged 0.165 ppd and maximum month BOD loadings have averaged 0.194 ppd. The historical average BOD loading rate per person is somewhat higher than the plant design average loading rate, but the historical maximum month BOD loading rate per person is lower than the plant design maximum month BOD loading rate. Plant facilities are sized for the maximum month BOD loading rate. As such, the KRWWTP has sufficient capacity for a population of 105,000 based on its design maximum month BOD loading rate of 20,370 and the recent historical maximum month BOD loading rate per person of 0.194 ppd/person.

Once again, a population contingency of 2,000 is recommended to provide a buffer of more than one year. This requires the Wakarusa to be scheduled to be on line when population reaches 103,000. This would result in a population trigger of 96,000.

4. Recommended Wakarusa Wastewater Treatment Plant Trigger

Of the two triggers evaluated, the recommended Wakarusa trigger is the pollutant loading based trigger. It is recommended since it more accurately relates the existing KRWWTP capacity to population by reflecting actual per person pollutant loading rates rather than estimated per person pollutant loading rates established at the time the KRWWTP was designed in 1999. The recommended population trigger is 96,000. According to the service area population forecast shown earlier, a service area population of 96,000 is expected to be reached by 2012-13. Construction of the new Wakarusa would be completed by 2017-18 under this growth scenario.

Some judgment will be needed to decide when conditions have actually reached the trigger point to start design as follows:

- The recommended outcomes are based on population increasing at a rate of 1,394 per year. If actual growth proves to be slower - say 1,000 per year - the pollutant loading based trigger can be revised to 98,000 with design starting in 2015 and construction completed in 2020.
- There has been some scatter in KRWWTP BOD loading rates measured from month to month and year to year due to various factors, including sampling frequency and technique,

and analytical methods used. This is why the BOD loading analysis is converted to an equivalent population, which is expected to track actual BOD loading rates to the KRWWTP closely. It is probably unreasonable, for example, to trigger the start of the Wakarusa design based on a single high month BOD result.

- The analysis of triggers is based on KRWWTP design capacities established at the time the current plant facilities were designed in 1999. It is possible that actual plant capacities could be greater than design capacities, which may be proven out by historical operating data and plant performance. This would involve a formal process with KDHE to re-rate the plant capacity and modify the NPDES discharge permit to reflect the revised capacity. This topic was discussed with the Kansas Department of Health and Environment (KDHE) during a meeting on future regulation changes and effluent limits. KDHE indicated that re-rating the Kansas River WWTP would require an antidegradation review, likely resulting in nutrient limits for the re-rated plant and is, therefore, not a practical option. Minutes of the meeting with KDHE are included in Appendix 3-A.
- Not addressed by this analysis is the likelihood of future nutrient limits at the KRWWTP and their timing. Some de-rating of KRWWTP capacity might be necessary to meet future nutrient limits depending on what limits may be required and the type and size of new facilities that are needed to meet the limits. Based on available information, however, having to de-rate the plant capacity to meet future nutrient limits appears unlikely.

C. Year 2020 System Analysis

1. Hydraulic Model Development

The existing system computer hydraulic model developed in TM-2 was extended, as appropriate, to serve projected growth and development to year 2020 as set forth in TM-1. The model includes the same assumptions concerning the rapid I/I reduction program and diversion of flows to the future Wakarusa as incorporated in the improved existing system model. The model also includes additional firm pumping capacity as needed at Pumping Station Nos. 9 and 32, and elimination of Pumping Station No. 8 by a new gravity sewer. Some new gravity sewers, pumping stations and force mains are needed to extend service to the projected year 2020 growth areas. Sizing of gravity sewers is based on ultimate or build-out development within the tributary area, while pumping stations and force mains are sized for year 2030 peak flows forecast within the tributary area. Flows from new development areas south of the Wakarusa River will be conveyed directly to the future Wakarusa. A summary of the year 2020 system model at the

design storm is depicted on Figure 3.1. Overloaded or surcharged sewers are highlighted in yellow. A flow hydrograph predicted by the model at the KRWWTP is shown on Figure 3.2.

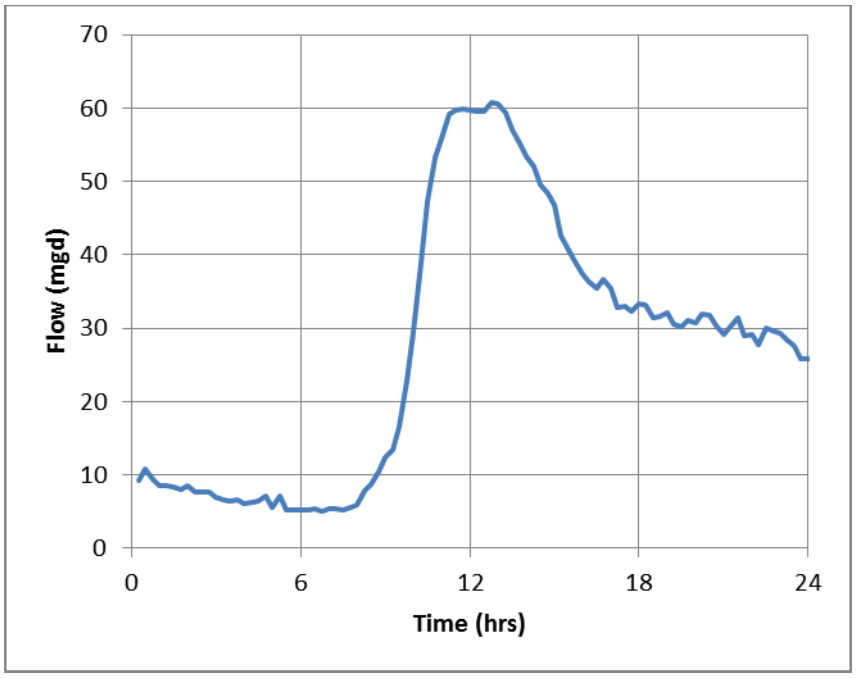

Figure 3.2. 2020 Design Storm Flow Hydrograph at the Kansas River WWTP

The model predicts an instantaneous peak flow rate of 61 MGD.

2. Year 2020 System Analysis Conclusions

Based on an analysis of the year 2020 model results, the following conclusions can be made:

- There is some limited additional surcharging of gravity sewers compared to the improved existing system model.
- The peak flow at the KRWWTP remains below its existing peak flow firm capacity.
- The peak flow at Pumping Station No. 23 exceeds its firm capacity causing some limited surcharging of upstream sewers.
- The peak flow at Pumping Station No. 25 exceeds its firm pumping capacity causing some limited surcharging of upstream sewers. Conditions at Pumping Station No. 25 at projected 2030 development and flows are examined later to determine what is the best approach to addressing this deficiency.

NOTE:
The improvements shown on this map are of a conceptual level of development and are representative of one possible development alternative that is subject to change. Actual pipe sizes, alignment, and schedule will be determined as development occurs. The cost allocation between property owners, developers, and the City to serve Future Growth Areas has not been determined.

PS#48
PS#46
PS#42
PS#27
PS#28
PS#35
PS#12
PS#15
PS#01
PS#44
PS#45
Kansas R. WWTP
PS#03
PS#02
PS#04
PS#16
PS#43
PS#37
PS#25
PS#08
PS#06
PS#13
PS#07
PS#34
PS#5A
PS#5B
PS#19
PS#49
PS#09
PS#31
PS#5C
PS#23
PS#32
PS#50
PS#22
PS#WRS-4
WWWTP
2-16"
36"
10"
8"
21"
15"
21"
18"

Existing System Improvements
- New Pump Station
- Pump Station Expansion
- New Force Main
- New Sewer

2020 Improvements
- New 2020 Pump Station
- Pump Station Expansion 2020
- New 2020 Force Main
- New 2020 Sewer

- Surcharging
- 2020 Future Growth Areas
- Master Planning Area
- Pump Station
- Force Main
- Sewers 8" and Smaller
- Sewers Larger Than 8"
- Rapid I&I Reduction Area
- City Limits
- Major Road

0 0.25 0.5 1 1.5 2 Miles

NORTH

FIGURE 3.1
2020 SYSTEM ANALYSIS

D. Year 2030 System Analysis

1. Hydraulic Model Development

The existing system computer hydraulic model developed in TM-2 was extended, as appropriate, to serve projected growth and development to year 2030 as set forth in TM-1. The model includes the same assumptions concerning the rapid I/I reduction program and diversion of flows to the future Wakarusa as incorporated in the improved existing system model. The model also includes additional firm pumping capacity, as needed, at Pumping Station Nos. 9, 23, 25 and 32, and elimination of Pumping Station No. 8 by a new gravity sewer. Some new gravity sewers, pumping stations and force mains are needed to extend service to the projected year 2030 growth areas. Sizing of gravity sewers is based on ultimate or build-out development within the tributary area, while pumping stations and force mains are sized for year 2030 peak flows forecast within the tributary area. A summary of the year 2030 system model at the design storm is depicted on Figure 3.3. Overloaded or surcharged sewers are highlighted in yellow. A flow hydrograph predicted by the model at the KRWWTP is shown on Figure 3.4.

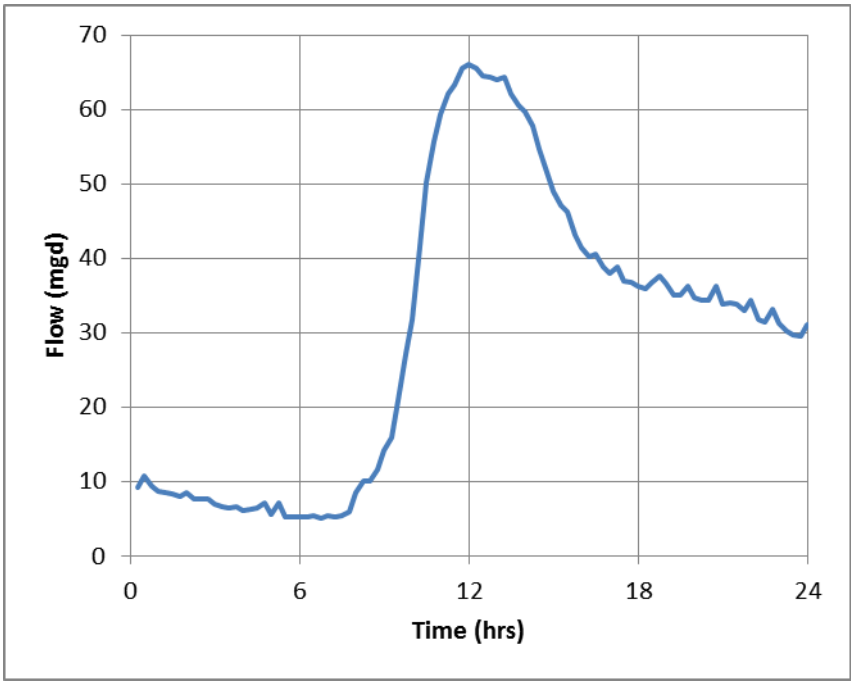

Figure 3.4. 2030 Design Storm Flow Hydrograph at the Kansas River WWTP

The model predicts an instantaneous peak flow rate of 65 MGD.

NOTE:
The improvements shown on this map are of a conceptual level of development and are representative of one possible development alternative that is subject to change. Actual pipe sizes, alignment, and schedule will be determined as development occurs. The cost allocation between property owners, developers, and the City to serve Future Growth Areas has not been determined.

PS#BC-3A
PS#BC-1A
PS#48
PS#42
PS#27
PS#44
PS#45
Kansas R. WWTP
PS#46
PS#28
PS#35
PS#15
PS#12
PS#01
PS#03
PS#02
PS#04
PS#16
PS#43
PS#37
PS#25
PS#08
PS#06
PS#13
PS#07
PS#34
PS#5A
PS#5B
PS#19
PS#49
PS#09
PS#31
PS#5C
PS#50
PS#22
PS#32
PS#23
PS#WRS-4
2-16" WWWTP
6" 8" 15" 10" 21" 36"
Peterson
Bob Billings
Clinton
George Williams
Wakarusa
Folks
Kasold
Iowa
McDonald
Michigan
2nd
3rd
Haskell
Louisiana
Crossgate
Massachusetts
6th
11th
15th
23rd
25th
27th
31st
US-24/40
I-70
K-10
1450
1800
1400
1250
0 0.5 1 2 3 Miles
NORTH

Existing System Improvements
- New Pump Station
- Pump Station Expansion
- New Force Main
- New Sewer

2020 Improvements
- New 2020 Pump Station
- Pump Station Expansion 2020
- New 2020 Force Main
- New 2020 Sewer

2030 Improvements
- New 2030 Pump Station
- Pump Station Expansion 2030
- New 2030 Force Main
- New2030 Sewer

- Surcharging
- 2020 Future Growth Areas
- 2030 Future Growth Areas
- Master Planning Area
- Pump Station
- Force Main
- Sewers 8" and Smaller
- Sewers Larger Than 8"
- Rapid I&I Reduction Area
- City Limits
- Major Road

FIGURE 3.3
2030 SYSTEM ANALYSIS

2. Year 2030 System Analysis Conclusions

Based on an analysis of the year 2030 model results, the following conclusions can be made:

- There is some limited additional surcharging of gravity sewers compared to the 2020 system model.
- The peak flow at the KRWWTP reaches its existing peak flow firm capacity.
- The peak flows at Pumping Station No. 48 exceed its firm capacity.

E. System Improvements Plan

1. Summary of Deficiencies

A summary of system deficiencies is presented below in Table 3.1, indicating the affected system component, existing capacity, and the amount and timing of additional capacity needed.

Table 3.1
Summary of Deficiencies

Drainage Sub-Basin	Description	Existing Peak Capacity - MGD(1)	Design Storm Peak Flow - MGD			Year Needed
			2010	2020	2030	
BC-1	PS 48	6.0	0.3	3.2	6.4	2030(2)
C-2	PS 08	2.9	12.7	6.4	6.6	(3)
C-2	PS 08 Force Main	3.3	12.7	6.4	6.6	(3)
EL-1	PS 23	0.05	0.05	0.07	0.1	(3)
EL-1	PS 32	0.7	1.6	1.7	1.7	(3)
EL-1	PS 32 Force Main	0.8	1.6	1.7	1.7	(3)
KR-5C	12-inch Sewer	1.0	2.9	2.6(4)	2.6(4)	(3)
KR-6A	PS 25	3.6	1.7	3.4	5.1	2020(5)
KR-6A	PS 25 Force Main	3.6	1.7	3.4	5.1	2020(5)
KR-6B	21-inch Sewer	4.0	9.4	6.6(4)	8.3(4)	(3)
WR-1	PS 09	8.6	11	13	15	(3)
WR-6	PS 5A/5B	15.5	24	26	26	(3)
WR-6	PS 5A/5B Force Mains	15.5	24	26	26	(3)

(1) Pumping station capacities shown are based on firm pumping capacities.
(2) Verify based on actual growth and development.
(3) As soon as funding will allow to provide capacity for design storm peak flow rate.
(4) Following Rapid I/I Reduction Program
(5) Verify expanding PS 25 instead of directing PS 49 flow to future Wakarusa WWTP is preferred plan based on actual growth and development.

2. Analysis of Required Improvements

a. Pumping Station Nos. 5A/5B

Pumping Station Nos. 5A/5B requires immediate expansion to provide capacity for the design storm peak flow rate, as well as some further additional capacity for future growth and development through year 2030. As explained in TM-2, significant expansion of this pumping station is not feasible due to site constraints. Furthermore, TM-2 determined the only plan for diverting flows to the future Wakarusa, which also addresses the wet weather peak flow issues concerning Pumping Station Nos. 5A/5B and the KRWWTP is the construction of a new pumping station upstream of 5A/5B. This new pumping station is identified as Pumping Station 5C and will have a firm capacity of 11 MGD.

b. Pumping Station No. 8

Plans have been in place to eliminate Pumping Station No. 8 due to its age and condition and need for additional capacity. As such, a 21-inch diameter gravity sewer intercepting flows into Pumping Station No. 8 and conveying them south to the interceptor sewer tributary to Pumping Station Nos. 5A/5B is recommended.

c. Pumping Station No. 9

Pumping Station No. 9 requires expansion from 8.6 MGD to 15 MGD to accommodate existing wet weather peak flows and projected upstream growth and development. The expansion could be done in stages, but it is considered to be more cost effective to complete the full expansion at one time. The existing structure and piping is designed to accommodate two more pumps. It may also be necessary to replace existing pumps to provide the needed capacity. The additional pumps and other station improvements should be configured to provide flexibility for pumping all flows east to the downstream collection system during dry weather periods, and pumping varying portions of wet weather peak flows east to the downstream collection system and to the existing wet weather peak flow storage basins. The division of capacities needs to be approximately 5 MGD east to the downstream collection system, and 10 MGD to the peak flow storage basins. Use of the wet weather peak flow storage basins will continue to limit peak flows received by the collection system downstream of Pumping Station No. 9, thereby reducing the required peak flow capacities of the downstream system. The 2030 model predicts a maximum of 5.9 MG of storage is needed or somewhat less than the current 6.25 MG capacity of the existing storage basins.

d. Pumping Station No. 23

The existing system model predicts the design storm wet weather peak flow to Pumping Station No. 23 equals its firm pumping capacity. Pumping capacity will need to be increased to accommodate growth through 2030. Future development and flows tributary to this pumping station should be monitored and necessary expansions be done as dictated by actual development. Additional firm capacity for this station beyond what is forecast for 2030 should be considered when it is expanded.

e. Pumping Station No. 25

The 2020 system model predicts 2020 wet weather peak flows to this pumping station will nearly reach its firm capacity. Past planning for the future Wakarusa anticipated it will be necessary to divert Pumping Station No. 49 flows which are now conveyed to Pumping Station No. 25 to the Wakarusa due to growth and development within the East Lawrence Drainage Basin. While the 2020 model indicates expansion of Pumping Station No. 25 could be delayed if this were done by 2020, the 2030 model shows it will be necessary to expand Pumping Station No. 25 even if Pumping Station No. 49 flows were diverted to the future Wakarusa. As such, an initial expansion of Pumping Station No. 25 by 2020 to 4.4 MGD firm capacity by addition of a third pump is recommended. A further expansion of Pumping Station No. 25 to 6 MGD by the addition of a second, parallel 12-inch diameter force main is recommended by 2025. The diversion of Pumping Station No. 49 flows to the future Wakarusa can be deferred until sometime after 2030. Actual development should be examined at the time it becomes necessary to expand Pumping Station No. 25 to confirm that is still appropriate to do so, or if actual growth and development in the East Lawrence Drainage Basin would instead dictate diverting Pumping Station No. 49 flows to the Wakarusa.

f. Pumping Station No. 32

The existing system model shows the Pumping Station No. 32 existing firm capacity of 0.7 MGD is exceeded by the design storm wet weather peak flow rate and requires expansion. The design storm peak flow rate in 2030 to this pumping station is forecast to be 1.7 MGD. Expansion of Pumping Station No. 32 firm capacity to 1.7 MGD is recommended, which will also require installation of a parallel 8-inch force main to provide the necessary peak flow capacity.

g. New Wakarusa Pumping Station 5C and Force Mains

As previously explained by the evaluation of Pumping Station Nos. 5A/5B, a new Pumping Station No. 5C with a firm capacity of 11 MGD is recommended to provide sufficient peak flow capacity through year 2030. This same pumping station will also serve to divert dry weather flows to the future Wakarusa.

A location near the northwest intersection of 31st and Louisiana Streets would be preferred location for this pumping station. The new pumping station and force mains should be constructed and placed into service at the same time the future Wakarusa is placed into service.

The force main from this pumping station will be routed west and then south and east to the future Wakarusa site. The range of dry and wet weather flows to be handled by this pumping station is wide, from as little as 1 to 3 MGD during dry weather periods up to the 11 MGD peak flow rate. As such, a dual force main is proposed, with one force main in service during dry weather periods, and both in service during peak wet weather flow conditions. Two 16-inch diameter force mains are recommended to provide sufficient flow velocity during dry weather flows when one force main will be in service.

h. Relief Sewers

Gravity sewer surcharging remains at two locations following the Rapid I/I Reduction Program within the program target area due to inadequate flow capacities for conveying the design storm peak flow rate. In these instances, parallel gravity relief sewers are recommended to provide the additional peak flow capacity needed to convey the design storm peak flow rate. The 12-inch gravity sewer in Drainage Sub-basin KR-5C requires a 12-inch parallel relief sewer. The 21-inch gravity sewer in Drainage Sub-basin KR-6B requires a 24-inch parallel relief sewer.

i. New Wakarusa Wastewater Treatment Plant

Earlier discussion concluded the future Wakarusa should be constructed and in service by the time the service area population reaches 103,000 which is forecast to occur in 2018. The KRWWTP pollutant loading capacity is estimated to be equivalent to a service area population of 105,000. The annual average daily flow at a service area population of 105,000 is estimated to be 12.2 MGD or somewhat less than the permitted flow capacity of the KRWWTP. At the projected 2030 service area population of 119,529, the annual average daily flow is estimated to be 13.9 MGD. The minimum required 2030 permitted flow capacity of the Wakarusa is, therefore, 1.7 MGD. A minimum initial treatment capacity of 2 MGD or more is recommended. A larger initial capacity may be appropriate given that the future Wakarusa is expected to be put into service in 2018, and with a 2 MGD capacity would nearly be operating at its capacity 12 years later in 2030 based on the population forecast used for this plan. The final selection of treatment capacity remains to be determined by further planning for the Wakarusa and will be based on costs and other factors concerning the most appropriate initial treatment capacity.

With a 2 MGD annual average daily flow capacity, the Wakarusa could readily be designed to fully treat wet weather peak flow rates up to approximately 6 MGD. This will not be sufficient peak flow rate capacity for the Pumping Station No. 5C required firm pumping capacity of 11 MGD. As such, flows received at the Wakarusa in excess of its peak flow capacity will need to be stored and then fully treated after flow rates return to less than its peak flow treatment capacity. The storage volume needed for the design storm event is estimated to be 4 MG.

j. Pumping Station No. 48

The 2030 system model predicts 2030 wet weather peak flows to this pumping station will marginally exceed its existing firm capacity. As such, future development and flows tributary to this pumping station should be monitored and necessary expansion be done as dictated by actual development. Additional firm capacity for this station beyond what is forecast for 2030 should be considered at the time it needs to be expanded.

k. Kansas River Wastewater Treatment Plant

At a meeting with KDHE arranged to discuss regulatory actions that may affect this master plan, KDHE informed the City that new effluent limits for nutrients (total nitrogen and phosphorus) should be anticipated at the time of the second 5 year renewal of the KRWWTP discharge permit. This would occur at approximately year 2020 with a compliance deadline likely to occur three years thereafter. Minutes of the meeting with KDHE are included in Appendix 3-A. This will require significant improvements to the KRWWTP as previously documented by others. Future wastewater utility capital improvements planning should include funding for the necessary improvements.

l. System Extensions to Future Growth Areas

Extensions of the existing collection system are needed to provide service to the future growth areas forecast to occur by years 2020 and 2030 as described below. The collection system extensions to future growth areas are based on a conceptual level of development and representative of one possible development alternative that is subject to change. Actual pipe sizes, alignment, and schedule will be determined as growth occurs. The cost allocation between property owners, developers, and the City to serve future development areas has not been determined.

- Baldwin Creek West of K-10 (BC-2): 15-inch gravity sewer west from existing Baldwin Creek Interceptor across K-10 to serve 2020 and 2030 growth areas west of K-10.

- Baldwin Creek North of I-70 (BC-3): 8-, 10-, 15-, and 21-inch gravity sewers extended from the existing Baldwin Creek Interceptor crossing to the north side of I-70 at three locations to serve 2020 and 2030 growth areas north of I-70.

- Wakarusa River South – US 59 & 1100 Road (WRS-5): 36-inch gravity sewer, 1 MGD firm capacity pumping station, and 8-inch force main connecting to one of the Pumping Station 5C force mains to the future Wakarusa to serve 2020 and 2030 growth areas east of US 59 and south of the Wakarusa River.

- Baldwin Creek North of I-70 (BC-1A): 8-inch gravity sewers, 0.5 MGD firm capacity pumping station, and 6-inch force main connecting to the 15-inch BC-3 gravity sewer to serve 2030 growth areas north of I-70.

- Baldwin Creek North of I-70 (BC-3A): 8-inch gravity sewers, 0.5 MGD firm capacity pumping station and 6-inch force main connecting to the Pumping Station No. 48 force main to serve 2030 growth areas north of I-70.

- Wakarusa River South – US 59 & 1100 Road (WRS-3, 5 & 6): Extension of 36-inch gravity sewer west across US 59 and 15-inch gravity sewer to serve 2030 growth areas west of US 59 and south of the Wakarusa River. New 21-inch gravity sewer from the 36-inch gravity sewer to serve 2030 growth areas east of US 59 and south of the Wakarusa River. New 8-inch gravity sewer from the future Wakarusa site south to serve 2030 growth areas south of the future Wakarusa.

3. Recommended System Improvements Plan

The recommended system improvements plan along with extensions to future growth areas are presented in Figure 3.5. Improvements are shown as required by 2020 to provide capacity for wet weather peak flow rates during the design storm event, to provide for projected growth and development through 2020, and for diversion of a portion of both dry and wet weather flows as necessary to the future Wakarusa. A limited amount of further improvements are needed by 2030 to accommodate further growth and development expected to occur between 2020 and 2030. Table 3.2 provides a summary of recommended improvements to the existing system and their timing.

NOTE:
The improvements shown on this map are of a conceptual level of development and are representative of one possible development alternative that is subject to change. Actual pipe sizes, alignment, and schedule will be determined as development occurs. The cost allocation between property owners, developers, and the City to serve Future Growth Areas has not been determined.

Existing System Improvements
- New Pump Station
- Pump Station Expansion
- New Force Main
- New Sewer

2020 Improvements
- New 2020 Pump Station
- Pump Station Expansion 2020
- New 2020 Force Main
- New 2020 Sewer

2030 Improvements
- New 2030 Pump Station
- Pump Station Expansion 2030
- New2030 Sewer
- New 2030 Force Main

- 2020 Future Growth Areas
- 2030 Future Growth Areas
- Watch List
- Major Drainage Basin
- Pump Station
- Force Main
- Sewers 8" and Smaller
- Sewers Larger Than 8"
- Rapid I&I Reduction Area
- City Limits
- Major Road

0 0.25 0.5 1 1.5 2 Miles

NORTH

FIGURE 3.5
RECOMMENDED PLAN OF IMPROVEMENTS

Table 3.2
Summary of Recommended Existing System Improvements

Drainage Sub-Basin	Description	Existing Peak Capacity - MGD(1)	Design Storm Peak Flow - MGD			Year Needed
			2010	2020	2030	
(1)	Rapid I/I Reduction Program (1)	(2)	(2)	(2)	(2)	2016(2)
BC-1	Expand PS 48 to 6.4 MGD	6.0	0.3	3.2	6.4	2030
C-2	Replace PS 08 with Gravity Sewer	2.9	6.1(3)	6.4(3)	6.6(3)	(4)
C-2	Replace PS 08 Force Main with Gravity Sewer	3.3	6.1(3)	6.4(3)	6.6(3)	(4)
EL-1	Expand PS 23 to 0.1 MGD	0.05	0.05	0.07	0.1	(4)
EL-1	Expand PS 32 to 1.7 MGD	0.7	1.1	1.7	1.7	(4)
EL-1	Parallel PS 32 Force Main	0.8	1.1	1.7	1.7	(4)
KR-5C	12-inch Relief Sewer	N/A	N/A	1.6(3)	1.6(3)	(4)
KR-6A	Expand PS 25 to 4.4 MGD	3.6	1.6	3.4	5.1	2020
KR-6A	Expand PS 25 to 6.0 MGD	3.6	1.6	3.4	5.1	2025(5)
KR-6B	24-inch Relief Sewer	N/A	N/A	4.2(3)	4.3(3)	(4)
WR-1	Expand PS 09 to 15 MGD	8.6	11	13	15	(4)
WR-6	New PS 5C to Wakarusa WWTP	N/A	8.5	10.5	10.5	2018
WR-6	New PS 5C Force Mains to Wakarusa WWTP	N/A	8.5	10.5	10.5	2018
WRS-3	New 2 MGD Wakarusa WWTP	N/A	N/A	2	2	2018
WRS-3	4 MG Storage at Wakarusa WWTP	N/A	N/A	N/A	N/A	2018

(1) Pumping station capacities shown are based on firm pumping capacities
(2) As explained in further detail in TM-4.
(3) After completion of Rapid I/I Reduction Program.
(4) As soon as funding will allow to provide capacity for design storm peak flow rate.
(5) Verify expanding PS 25 instead of directing PS 49 flow to future Wakarusa WWTP is preferred plan based on actual growth and development.

The model indicates some sewer surcharging remaining following implementation of the recommended improvements. The model indicates these to be marginally surcharged conditions which are considered to be acceptable at these locations and within the degree of accuracy of the system model. These locations are identified on Figure 3.5 as sewers recommended to be put on a “watch list” to be periodically monitored over time during significant wet weather events to verify conditions are acceptable, or if necessary, corrective action taken.

* * * * *

Appendix 3-A
Minutes of September 22, 2010 Meeting with the Kansas Department of Health and Environment

WASTEWATER MASTER PLAN

City of Lawrence, Kansas

Meeting with Kansas Department of Health and Environment
September 22, 2010, 2:00 PM
KDHE – Curtis Building

Kansas River WWTP and Proposed Wakarusa River WWTP
Flow Capacities, Effluent Limits

MEETING MINUTES

1. See attached attendance sheet for list of attendees.

2. Summary of Current Master Planning
   a. Population
      -Population forecast prepared by City Planning and Development Services for both water and wastewater master plans through 2030
         2010: 92,000 (estimate)
         2020: 108,500
         2030: 125,000
      -This population forecast is less than that used by the 2003 master plan which was a population of 150,000 in year 2025.
   b. Master Plan Service Area: See attached service area map. The service area for the current master plan has been modified from the 2003 master plan service area to reflect an expanded service area in the northwest consistent with the K-10 and Farmers Turnpike Sector Plan and a scaled back service area in the northeast consistent with the draft Northeast Sector Plan. The south service area border is based on the adopted Horizon 2020 and Transportation 2030 urban growth area.
   c. The focus of the current master plan is the collection system. The 2003 master plan only modeled sewers 12" and larger and was based on 6 flow meter locations and two months of flow meter data. The current master plan will model all sewers and will be based on 37 flow meter locations with up to four years of data.

3. Kansas River WWTP Capacity – See Attached Draft Wakarusa Trigger Memorandum
   a. Design Population Based Capacity: 100,000
   b. Pollutant Loading Based Design Capacity: 105,000. It was suggested we consider ammonia loadings in the assessment of the pollutant loading based design capacity. Ammonia loadings will generally affect aeration system capacity. The operational and performance data of the aeration basins suggests (even though plant ammonia and hydraulic loadings approach or exceed design criteria) that there is a significant amount of remaining treatment capacity for additional organic and or ammonia load. Specifically the basins routinely operate with excess oxygen as aeration rates are often driven by minimum mixing requirements and not by oxygen demand.

4. Forecast Wakarusa River Start-up Date
    a. Population Based:
        -Near Term Growth - 2015
        -Master Plan Projection - 2014
    b. Pollutant Loading Based:
        -Near Term Growth - 2019
        -Master Plan Projection - 2017

5. Discussion of Effluent Standards
    a. Kansas River WWTP – Based on 12.5 MGD Permitted Capacity
        (1) Near Term: The next permit is expected to be issued for 5 years and have a requirement to perform a study of nutrient removal costs for various nutrient reduction goals. There are no expected changes to the effluent limits contained in the draft permit to which the EPA objected. No new effluent limits are expected.
        (2) After Wakarusa WWTP Start-up: New permit limits on nutrients (both total nitrogen and total phosphorus) should be anticipated for the second 5 year permit cycle or 8 years from the issuance of the draft permit.
        (3) Longer Term: New ammonia criteria are under development by EPA that will likely result in lower ammonia limits – perhaps as low as one-third of current limits. The new criteria could be in place within the next 6 years (two triennial review cycles of the water quality standards) and thus come into play as soon as the second 5 year permit cycle. Disinfection standards based on *enterrococci* rather than *E-coli* may be put in place, perhaps by the second 5 year permit cycle. The 503 biosolids land application rules are undergoing review and may become more restrictive in terms of pollutant limits. KDHE will follow up on whether there are any new TMDL's under development for the Kansas or Wakarusa Rivers.
        (4) Kansas River has been listed on the 303d impaired streams for Phosphorus.
        (5) Pharmaceuticals will likely be an area of future regulatory requirements.
    b. Wakarusa WWTP – Based on 7 MGD Permitted Capacity
        (1) Start-up – Based on 7.0 MGD Design Flow or Less: The current permit expires in 2011. Expect no changes in permit limits over the next 5 year renewal of the permit. The City needs to plan on doing the Wakarusa River biota assessment to benchmark its condition prior to beginning construction of the Wakarusa WWTP. This will be used after Wakarusa start-up to measure water quality impacts of the plant effluent on the Wakarusa River.
        (2) Longer Term: Same as Kansas River WWTP.

6. Wet Weather Treatment Strategies
    a. Maximize use of Kansas River Actiflo:
        -Plant Peak Flow Capacity – 25 MGD
        -Actiflo Peak Flow Capacity – 40 MGD
        -Total Peak Flow Capacity – 65 MGD
    b. Distribution of Flows between Treatment Plants:
        -To be determined by master plan
        -Maintain capability to direct some flows to either plant (Four Seasons Pump Station)

c. Wakarusa WWTP Peak Flow Management Strategy: Storage and full treatment of stored flows. Utilize existing storage at Four Seasons Pump Station plus new storage at the Wakarusa WWTP.
d. During wet weather peak flows, peak flow capacities of both treatment plants will be used, followed by Actiflo capacity, followed by storage and subsequent full treatment.
e. KDHE advised the City to continue with a meaningful program of collection system infiltration/inflow correction in combination with future use of Actiflo. Lack of an infiltration/inflow correction program will, in KDHE's words, "clash" with use of Actiflo given EPA's current objections to the Kansas River permit renewal. The City advised KDHE that they have not funded collection system infiltration/inflow correction over the past 2 years but are seeking funding to resume it this year.
f. KDHE takes no position on a design storm to be used for collection system infiltration/inflow evaluation. It was noted that Kansas City Missouri's program is based on a 5 year storm. A 10 year storm was used for the 2003 master plan and will be used for the current master plan.

7. Other Considerations
   a. Kansas River WWTP capacity rating analysis necessary to re-rate plant to allow construction of the Wakarusa WWTP to be delayed: KDHE pointed out a re-rating of the Kansas River WWTP would require an antidegradation review, likely resulting in nutrient limits for the re-rated plant, consistent with KDHE's nutrient reduction plan.
   b. "Effluent Trading" possibilities between Kansas River and Wakarusa WWTP's: KDHE is open to the possibility of effluent trading between the two plants.
   c. KDHE noted the Kansas River WWTP flows have exceeded its permitted capacity during some wet weather months which is acceptable as long as permit limits are met.

* * * * *

KDHE Meeting
Lawrence, Kansas Wastewater Facilities Master Plan
09/22/10

Name	Organization	Phone	Email
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Steve Yoakum	Burns & McDonnell	816-822-3102	syoakum@burnsmcd.com

Technical Memorandum No. 4
Wastewater Collection System Rehabilitation Plan

Wastewater Facilities Master Plan

for

Lawrence, Kansas

City of Lawrence, Kansas

BMcD Project No. 54793

City P.O. 07629

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SINCE 1898

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City of Lawrence, Kansas

Wastewater Facilities Master Plan Technical Memorandum No. 4

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A. Introduction

Technical Memorandum (TM) No. 4 was completed in partial fulfillment of the Lawrence, Kansas Wastewater Facilities Master Plan to develop the wastewater collection system rehabilitation plan and budgetary costs. The recommended scope and funding level of the rehabilitation plan is based on:

- The conclusions established by hydraulic modeling set forth in TM No. 2
- An inventory of the wastewater collection system
- Input from City staff.

B. Development of Prioritization and Funding Level

Prior to the completion of hydraulic modeling for TM No. 2, a preliminary prioritization schedule was developed in order to evaluate likely Inflow/Infiltration (I/I) sources within the collection system. The prioritization schedule was developed by taking a partial inventory of a portion of the system identified to have high rainfall-derived infiltration and inflow (RDII). The inventory categorized sewer age and material, maintenance issues and failures in order to identify likely sources of I/I.

As an outcome of discussing this prioritization schedule with City Staff, an 18 year rehabilitation project plan was developed that included all Vitrified Clay Pipe (VCP) sewers, brick manholes and other manholes in need of rehabilitation based on the City's GIS data base.

Upon completion of the hydraulic modeling for TM No. 2, the results of the modeling established that the older parts of the system located in close proximity to the Kansas River Wastewater Treatment Plant (KRWWTP) are a higher priority than other I/I sources within the overall system. Moreover, it was concluded that the reduction of the peak flow rate caused by rapid I/I sources (sources with short travel time) is more critical than the overall reduction of the total volume of wet weather flows. Based on this conclusion set forth in TM No. 2, the rehabilitation plan set forth in this TM addresses rapid I/I sources in close proximity to the KRWWTP (Rapid I/I Reduction Program area) as a higher priority in the overall 18-year rehabilitation plan.

The scope of the Rapid I/I Reduction Program was also set forth by TM No. 2 based on a targeted amount of I/I reduction for both public and private sources located in close proximity to the KRWWTP. Figure 4.1 identifies the drainage basins and sub-basins in close proximity to the KRWWTP that are

recommended in TM No. 2 to be addressed by the Rapid I/I Reduction Program. The area includes the oldest parts of the collection system and was found by TM-2 to have relatively high levels of RDII/IDM of sewer. The objective of the Rapid I/I Reduction Program is an overall 35% reduction of I/I within the areas shown in Figure 4.1. This will amount to removal of approximately 19 MGD of peak I/I occurring during the 10 year design storm. In order for the public portion of the Rapid I/I Reduction Program to effectively achieve the target I/I reduction, a Sewer System Evaluation Survey (SSES) should be completed prior to rehabilitation work to identify and evaluate public sources of rapid I/I. The overall 35% reduction objective would be achieved in conjunction with the private portion of the Rapid I/I Reduction Program. The private portion of the program requires building inspections and program management to identify and eliminate private I/I sources. Once the public and private programs have been implemented, monitoring programs should be put into place to measure I/I reductions concurrently as rehabilitation progresses. Based on results of the monitoring programs, the scope and timeline of the Rapid I/I Reduction Program can be adjusted as required to achieve the targeted rapid I/I reduction objective(s).

Rehabilitation of the remainder of the collection system would be addressed in a Clay Pipe and Manhole Rehabilitation Program. The phasing and funding level of the Clay Pipe and Manhole Rehabilitation Program is based on continuing the City's current efforts to rehabilitate VCP lines concurrently with the higher priority Rapid I/I Reduction Program. Subsequent to reaching the reduction target of the Rapid I/I Reduction Program, the Clay Pipe and Manhole Rehabilitation Program would be ramped up to be completed within an overall 18-year timeline for both programs. The Clay Pipe and Manhole Rehabilitation Program would address all of the remaining VCP sewers, brick manholes and other manholes in need of rehabilitation throughout the system, including remaining sewers and manholes not addressed by the Rapid I/I Reduction Program within the program area.

C. Inventory of Collection System

The inventory of the existing collection system was derived from the City of Lawrence GIS wastewater collection system database. Vitrified Clay Pipe (VCP) sewers, brick manholes and other manholes in need of rehabilitation were filtered and extracted from the database for (1) the entire system (system-wide) and (2) the Rapid I/I Reduction Program area. Additionally, an inventory of the total length of sewers and number of manholes located within the Rapid I/I Reduction Program area was taken. VCP sewers that were indicated in the GIS database to have already been lined were excluded from the

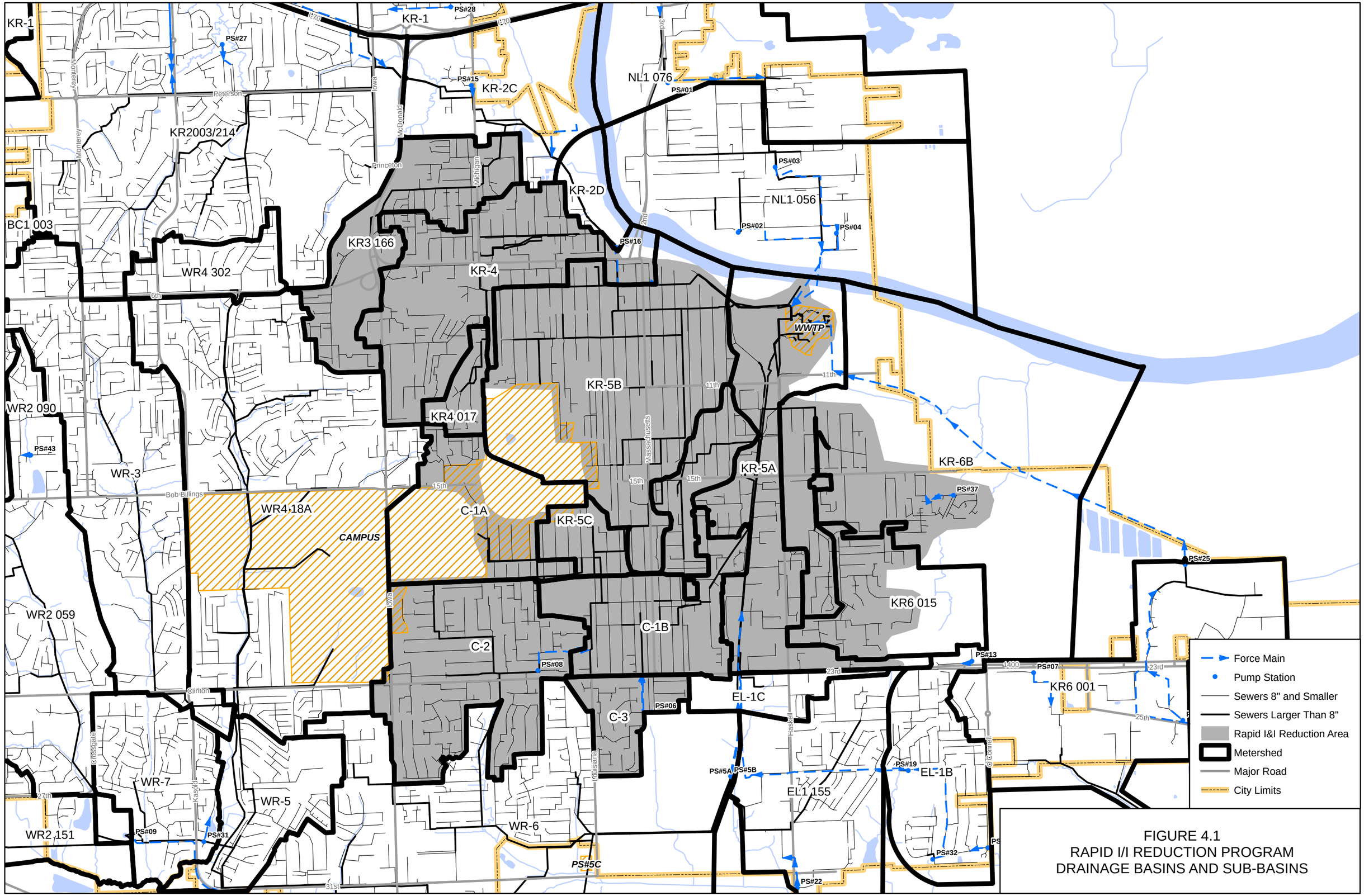

FIGURE 4.1
RAPID I/I REDUCTION PROGRAM
DRAINAGE BASINS AND SUB-BASINS

rehabilitation inventories. The entire system includes a total of 406 miles of gravity sewers of various materials, of which 111 miles are located in the Rapid I/I Reduction Program area.

The public portion of the Rapid I/I Reduction Program estimates there will be rehabilitation of 20% of the total length of pipes and manholes located in the Rapid I/I Reduction Program area. This level of rehabilitation is typical of system infiltration/inflow reduction programs based on a survey of cities where these programs have been completed. The remainder of pipe and manhole rehabilitation not addressed in the Rapid I/I Reduction Program would be addressed in the Clay Pipe and Manhole Rehabilitation Program to follow. The scope of the Clay Pipe and Manhole Rehabilitation Program was quantified by deducting the length of pipes and manholes rehabilitated in Rapid I/I Reduction Program from the system-wide rehabilitation inventory.

The Clay Pipe and Manhole Rehabilitation Program inventory quantified pipe lengths by diameter and manhole depths in order to estimate associated rehabilitation costs. Six-inch diameter lines extracted from the GIS database are included in the 8-inch diameter total as it is believed these are in fact 8-inch diameter lines per City Staff. Tables 4.1 and Table 4.2 below summarize the quantities of VCP pipe lengths and total vertical feet of manhole depths respectively. Both Tables show inventory totals for (1) the entire system, (2) the Rapid I/I Reduction Program, and (3) the resulting Clay Pipe and Manhole Rehabilitation Program totals.

Table 4.1

Total Lengths of VCP by Diameter (Linear Feet)

Area ↓	Pipe Diameter										
	8”	**9”**	**10”**	**12”**	**15”**	**18”**	**21”**	**24”**	**27”**	**30”**	**36”**
Entire System	547,580	3,028	33,699	58,643	27,987	16,508	9,391	40,738	5,687	3,815	374
Rapid I/I Reduction Program* *(20% of Rapid I/I Reduction Program Area)*	90,523	720	4,093	7,815	2,625	2,616	1,490	4,882	1,555	1,092	374
Clay Pipe Rehabilitation Program Totals *(Entire System – Rapid I/I Reduction Program)*	457,057	2,308	29,606	50,828	25,362	13,892	7,901	35,856	4,132	2,723	0

* Rapid I/I Reduction Program VCP lengths are shown for purposes of quantifying Clay Pipe and Manhole Rehabilitation Program Quantities only. VCP lengths were not used to develop Rapid I/I Reduction Program scope/budget. See Development of Probable Costs section in this TM for further information.

Table 4.2

Total Depths of Manhole Rehabilitation (Vertical Feet)

Area ↓	Brick Manhole Depths	Depths of Other Manholes in Need of Rehabilitation	Total Manhole Rehabilitation Depths
Entire System	19,581	2,571	22,152
Rapid I/I Reduction Program* *(20% of Rapid I/I Reduction Program Area)*	3,925	757	4,682
Manhole Rehabilitation Program Totals *(Entire System – Rapid I/I Reduction Program)*	963	2,154	17,470

* Vertical Footages of Manholes included in Rapid I/I Reduction Program are shown for purposes of quantifying Clay Pipe and Manhole Rehabilitation Program Quantities only. Vertical Manhole Heights were not used to develop Rapid I/I Reduction Program scope/budget. See Development of Probable Costs section in this TM for further information.

D. Development of Probable Costs

The Rapid I/I Reduction Program and Clay Pipe and Manhole Rehabilitation Program utilized different methods to develop budgetary costs. The budgetary costs for the Rapid I/I Reduction Program are based on a unit cost per foot of the 111 miles of sewers located within the Rapid I/I Reduction Program area. The budgetary costs for the Clay Pipe and Manhole Rehabilitation Program are based on actual quantities derived from inventories and corresponding unit costs.

The costs that were utilized in this report to develop funding levels for Rapid I/I Reduction Program and Clay Pipe and Manhole Rehabilitation Program are intended for budgetary purposes. The City should anticipate actual costs necessary to achieve the targeted I/I reductions set forth in TM No. 4 may require adjustments to the scope and/or duration of Rapid I/I Reduction Program and later phases of the rehabilitation plan based on (1) annual cost limits and (2) scope adjustments made to Rapid I/I Reduction Program based on measured I/I reduction as part of a monitoring program for both the public and private of the program.

Rapid I/I Reduction Program Costs:

The public portion of the Rapid I/I Reduction Program is based on a budgetary rehabilitation cost of $28.00 per foot of all sewers located within the Rapid I/I Reduction Program area. This budgetary figure includes costs to rehabilitate 20% of the total pipes and manholes within the Rapid I/I Reduction Program area, an SSES and other engineering services to identify and eliminate sources of I/I, and a monitoring program to measure I/I reduction and assess any required adjustment to the project scope. This budgetary

cost is based on a survey of similar I/I reduction program costs experienced by several Midwestern wastewater utilities.

The private portion of the Rapid I/I Reduction Program is based on a budgetary program cost of $5.00 per foot of all sewers located within the Rapid I/I Reduction Program area. This budgetary figure includes costs for removal of private I/I sources such as downspouts, cleanout caps, and sump pumps, as well as an allowance for building inspections and management of the program, including a monitoring program to measure I/I reduction and assess any required adjustment to the project scope. These budgetary program costs are based on a similar program cost budget developed for a Midwestern wastewater utility. Budgetary costs for the Rapid I/I Reduction Program are summarized in Table 4.3 below.

Table 4.3
Rapid I/I Reduction Program Budgetary Costs

Public Rapid I/I Reduction Program Costs (588,939 ft.* x $28.00/ft.) = $ 16,490,292
*Total Sanitary Sewer Length within Priority 1 Program Area

Private Rapid I/I Reduction Program Costs (588,939 ft.* x $5.00/ft.) = $ 2,944,695
*Total Sanitary Sewer Length within Priority 1 Program Area

Rapid I/I Reduction Program Total Costs (Rounded):	
Public Rapid I/I Reduction Program Costs =	$ 16,500,000
Private Rapid I/I Reduction Program Costs =	$ 2,900,000
Rapid I/I Reduction Program Total =	**$ 19,400,000**

Clay Pipe and Manhole Rehabilitation Program Costs:

The development of rehabilitation costs for the Clay Pipe and Manhole Rehabilitation Program is based on utilizing Cured-In-Place Pipe (CIPP) to address VCP lines and a cementitious manhole liner to address brick manholes and other manholes in need of rehabilitation. CIPP was discussed at the meeting with City Staff on June 24, 2011 as an acceptable method to rehabilitate VCP lines. The utilization of cementitious lining to rehabilitate manholes is subject to City's approval as an acceptable method.

As described above, the budgetary costs for the Clay Pipe and Manhole Rehabilitation Program are based on actual inventoried quantities and corresponding unit costs. The budgetary program costs that were developed include an allowance for inspection and program management. Unit costs for CIPP were developed utilizing average bid results from City of Lawrence 2010 CIPP Sanitary Sewer Rehabilitation provided by the City. The unit cost for cementitious manhole rehabilitation was based on three previous sewer rehabilitation projects that took place from 2005 to 2010 in northeastern Kansas. A budgetary cost of $172.00 per vertical foot of manhole depth was developed for the manhole rehabilitation portion of the

program. A summary of the unit costs for the CIPP portion of the program are included in Table 4.4 below, followed by a summary of the overall Clay Pipe and Manhole Rehabilitation Program costs in Table 4.5.

Table 4.4
CIPP Unit Program Costs

Pipe Diameter	Clay Pipe Length (Feet)	Project Cost Per Foot	CIPP Cost Subtotals
8"	457,057	$35.76	$16,342,168
9"	2,308	$39.97	$92,260
10"	29,606	$43.23	$1,279,843
12"	50,828	$52.60	$2,673,765
15"	25,362	$65.99	$1,673,628
18"	13,892	$95.78	$1,330,593
21"	7,901	$111.33	$879,604
24"	35,856	$144.48	$5,180,445
27"	4,132	$156.07	$644,872
30"	2,723	$167.66	$456,528
36"	0	$208.05	$0
Total Cost of CIPP for Clay Pipe Rehabilitation =			**$30,553,705**

Table 4.5
Clay Pipe and Manhole Rehabilitation Program Costs

Clay Pipe and Manhole Rehabilitation Program Total Costs (Rounded):	
CIPP Costs =	$ 30,500,000
*Manhole Rehabilitation Costs (17,470 V.F. x $172/V.F.) =	$ 3,000,000
Clay Pipe and Manhole Rehabilitation Program Total =	**$ 33,500,000**

*Manhole Rehabilitation Costs calculated by Total Vertical Feet (Table TM4.3) multiplied by the Unit Budgetary Cost discussed in this section of the TM above.

E. Recommended Rehabilitation Plan

The budgetary cost for the Rapid I/I Reduction Program is **$19,400,000**. The budgetary cost for Clay Pipe and Manhole Rehabilitation Program is **$33,500,000**. The total combined cost for both programs is **$52,900,000**. The Rapid I/I Reduction Program has been divided into an 8-year phased program to be implemented concurrently with the City's ongoing CIPP efforts. Subsequent to completion of the Rapid I/I Reduction Program, the annual budget has been allocated to the Clay Pipe and Manhole Rehabilitation. The first year of the Rapid I/I Rehabilitation Program costs have been reduced to account for time to implement a SSES of the Rapid I/I Reduction Program area before rehabilitation activities begin. The

recommended funding level for the 18-year phased rehabilitation plan in 2012 dollars is summarized below in Table 4.6.

Table 4.6
18-Year Phased Rehabilitation Plan

Year	Rapid I/I Reduction Program	Clay Pipe and Manhole Rehabilitation Program	Annual Costs
1	$1,800,000	$400,000	$2,200,000
2	$2,515,000	$400,000	$2,915,000
3	$2,515,000	$400,000	$2,915,000
4	$2,515,000	$400,000	$2,915,000
5	$2,515,000	$400,000	$2,915,000
6	$2,515,000	$1,000,000	$3,515,000
7	$2,515,000	$3,000,000	$5,515,000
8	$2,510,000	$1,000,000	$3,510,000
9	$0	$4,000,000	$4,000,000
10	$0	$4,000,000	$4,000,000
11	$0	$0	$0
12	$0	$3,000,000	$3,000,000
13	$0	$3,000,000	$3,000,000
14	$0	$2,500,000	$2,500,000
15	$0	$2,500,000	$2,500,000
16	$0	$2,500,000	$2,500,000
17	$0	$2,500,000	$2,500,000
18	$0	$2,500,000	$2,500,000
Total			**$52,900,000**

* * * * *

Technical Memorandum No. 5
Capital Improvements Program

Wastewater Facilities Master Plan

for

Lawrence, Kansas

City of Lawrence, Kansas

BMcD Project No. 54793

City P.O. 07629

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Wastewater Facilities Master Plan Technical Memorandum No. 5

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* = follows page number

A. Introduction

Technical Memorandum (TM) No. 5 sets forth a program and schedule for capital improvements for the City's wastewater utility as recommended by prior master plan technical memoranda. Improvements are needed for current utility service area requirements, for serving growth and development forecast to occur by years 2020 and 2030, and for addressing new regulatory actions expected to occur over the next 10 to 20 years. This TM sets forth a schedule for capital improvements based on a combination of priorities as follows:

- Improvements needed for meeting current capacity needs or regulatory requirements first, followed by those necessary for providing capacity for future growth and development.
- Implement improvements that will achieve the greatest benefit for the money spent first, followed by those having a lower benefit relative to cost.
- Implement improvements in a manner that is most affordable to the utility's rate payers.

Improvements are grouped into three justification categories – growth, regulatory, and reliability.

B. Opinions of Probable Costs

Opinions of probable project costs are based on construction and other cost allowances including contingency, engineering, surveying, legal, and other related costs and are summarized in Table 5.1. Unit cost data and component cost information for the proposed improvements are based on historical projects and vendor's cost information. Unit costs are based on an Engineering News Record Construction Cost Index (ENR-CCI) of 10,500 Kansas City, Missouri for February 2012.

Project costs include construction costs, contingencies, and other costs. Land and right-of-way acquisition costs are not included. The total includes a contingency, which varies based on the project from 20 to 25 percent, and engineering and other costs, which vary by project. Contingency covers items that are not anticipated, changes in conditions, or other factors whose costs cannot be anticipated at this level of project development.

Table 5.1
Capital Improvements Opinions of Costs Summary

By Year	Classification	Category	Reason for Improvement	Item No.	Item	Quantity	Unit	Unit Cost	Const Cost w/ Contingency	Engineering/Other Costs	Subtotal Cost	Category Total
2020	Collection System	Gravity Sewers	3	1	21" Gravity Sewer to Eliminate PS 8	8,100	LF	360	2,916,000	584,000	3,500,000	
			3	2	KR-5C 12" Relief Sewer	2,300	LF	290	667,000	133,000	800,000	
			3	3	KR-6B 24" Relief Sewer	1,730	LF	340	588,200	111,800	700,000	
			1	4	15" Baldwin Creek West of K-10, Bore (BC-2) - Brink - (2)	3,300	LF	240	792,000	158,000	950,000	
					Subtotal - Gravity Sewers (2020)							**5,950,000**
		Pumping Stations	1,2	1	PS 9 Expansion to 14 MGD	1	LS	1,900,000	1,900,000	400,000	2,300,000	
			1,2	2	PS 32 Expansion to 1.7 MGD	1	LS	430,000	430,000	90,000	520,000	
			1,2	3	PS 25 Expansion to 4 MGD, Add 3rd Pump	1	LS	125,000	125,000	25,000	150,000	
			1,3	4	PS 23 Expansion to 0.1 MGD	1	LS	170,000	170,000	30,000	200,000	
					Subtotal - Pumping Stations (2020)							**3,170,000**
		Force Mains	1,2	1	PS 32 - 8" Force Main	3,600	LF	65	234,000	46,000	280,000	
					Subtotal - Force Mains (2020)							**280,000**
					Subtotal - Collection System (2020)							**9,400,000**
	New 2 MGD Wakarusa WWTP	Plant	1,2	1	Wastewater Treatment Plant	1	LS	25,000,000	25,000,000	5,000,000	30,000,000	
			1,2	2	Peak Flow Storage	1	LS	5,000,000	5,000,000	1,000,000	6,000,000	
			1,2	3	Roads, Utilities	1	LS	5,000,000	5,000,000	1,000,000	6,000,000	
					Subtotal - Plant (2020)							**42,000,000**
		Pumping Stations	1,2	1	New (Wakarusa) 11 MGD PS 5C	1	LS	4,330,000	4,330,000	860,000	5,190,000	
					Subtotal - Pumping Stations (2020)							**5,190,000**
		Force Mains	1,2	1	2 - 16" Force Mains	27,000	LF	240	6,480,000	1,030,000	7,510,000	
					Subtotal - Force Mains (2020)							**7,510,000**
					Subtotal - New 2 MGD Wakarusa WWTP (2020)							**54,700,000**
	Kansas River WWTP	Plant	3	1	Co-generation and Backup Power	1	LS	830,000	830,000	170,000	1,000,000	
					Subtotal - Kansas River WWTP (2020)							**1,000,000**
	Collection System Rehabilitation Plan	Gravity Sewers	2,3	1	Rapid I/I Reduction Program	8	Year	2,000,000	16,000,000	3,400,000	19,400,000	
			2,3	2	Clay Pipe and Manhole Rehabilitation Program	8	Year	750,000	6,000,000	1,000,000	7,000,000	
					Subtotal - Collection System Rehabilitation Plan (2020)							**26,400,000**
	Annual Maintenance	Plant	3	1	Annual Maintenance	8	Year	300,000	2,400,000	-	2,400,000	
		Pumping Stations	3	2	Annual Maintenance	8	Year	100,000	800,000	-	800,000	
		Gravity Sewers	1	3	Sewer Main Relocations for Road Projects	8	Year	260,000	2,080,000	320,000	2,400,000	
					Subtotal - Annual Maintenance (2020)							**5,600,000**
	Collection System Growth Related Projects	Baldwin Creek N of I-70 (BC-3)	1	1	8" Gravity Sewer, Bore	2,400	LF	220	528,000	102,000	630,000	
			1	2	10" Gravity Sewer, Bore	2,400	LF	240	576,000	114,000	690,000	
			1	3	15" Gravity Sewer, Bore	2,400	LF	295	708,000	142,000	850,000	
			1	4	21" Gravity Sewer	6,600	LF	205	1,353,000	277,000	1,630,000	
					Subtotal - Baldwin Creek N of I-70 (BC-3)							**3,800,000**
		Wakarusa US 59 & 1100 Rd (WRS-5)	1	1	36" Gravity Sewer	5,700	LF	360	2,052,000	428,000	2,480,000	
			1	2	1.0 MGD Lift Station	1	LS	825,000	825,000	165,000	990,000	
			1	3	8" Force Main	400	LF	65	26,000	4,000	30,000	
					Subtotal - Wakarusa US 59 & 1100 Rd (WRS-5)							**3,500,000**
					Subtotal - Collection System Growth Related Projects (2020)							**7,300,000**
2030	Collection System	Pumping Stations	1	1	PS 48 Expansion to 6.4 MGD	1	LS	250,000	250,000	50,000	300,000	
					Subtotal - Pumping Stations (2030)							**300,000**
		Force Mains	1,2	1	PS 25 Parallel 12" Force Main	13,800	LF	90	1,242,000	198,000	1,440,000	
					Subtotal - Force Mains (2030)							**1,440,000**
		Building	3	1	Collection System Field Operations Building	1	LS	3,330,000	3,330,000	670,000	4,000,000	
					Subtotal - Building (2030)							**4,000,000**
					Subtotal - Collection System (2030)							**5,740,000**
	Kansas River WWTP	Plant	2	1	Kansas River WWTP Nutrient Removal	1	LS	7,500,000	7,500,000	1,500,000	9,000,000	
					Subtotal - Kansas River WWTP (2030)							**9,000,000**
	Collection System Rehabilitation Plan	Gravity Sewers	2,3	1	Clay Pipe and Manhole Rehabilitation Program	10	Year	2,300,000	23,000,000	3,500,000	26,500,000	
					Subtotal - Collection System Rehabilitation Plan (2030)							**26,500,000**
	Annual Maintenance	Plant	3	1	Annual Maintenance	10	Year	600,000	6,000,000	-	6,000,000	
		Pumping Stations	3	2	Annual Maintenance	10	Year	100,000	1,000,000	-	1,000,000	
		Gravity Sewers	1	3	Sewer Main Relocations for Road Projects	10	Year	260,000	2,600,000	400,000	3,000,000	
					Subtotal - Annual Maintenance (2030)							**10,000,000**
	Collection System Growth Related Projects	Baldwin Creek N of I-70 (BC-1A)	1	1	8" Gravity Sewer	8,800	LF	155	1,364,000	246,000	1,610,000	
				2	0.5 MGD Lift Station	1	LS	625,000	625,000	125,000	750,000	
				3	6" Force Main	4,400	LF	45	198,000	42,000	240,000	
					Subtotal - Baldwin Creek N of I-70 (BC-1A)							**2,600,000**
		Baldwin Creek N of I-70 (BC-3A)	1	1	0.5 MGD Lift Station	1	LS	625000	625,000	125000	750,000	
				2	6" Force Main	4,800	LF	45	216,000	34000	250,000	
					Subtotal - Baldwin Creek N of I-70 (BC-3A)							**1,000,000**
		Wakarusa US 59 & 1100 Rd (WRS-3, 5 &6)	1	1	8" Gravity Sewer	3,500	LF	155	542,500	87500	630,000	
				2	15" Gravity Sewer	2,200	LF	200	440,000	90000	530,000	
				3	21" Gravity Sewer, Bore	2,300	LF	305	701,500	138500	840,000	
					Subtotal - Wakarusa US 59 & 1100 Rd (WRS-3, 5 & 6)							**2,000,000**
					Subtotal - Collection System Growth Related Projects (2030)							**5,600,000**
					Subtotal - 2020 Existing System Improvements							**97,100,000**
					Subtotal - 2030 Existing System Improvements							**51,240,000**
					Subtotal - All Existing System Improvements							**148,340,000**
					Subtotal - 2020 Collection System Growth Related Projects							**7,300,000**
					Subtotal - 2030 Collection System Growth Related Projects							**5,600,000**
					Subtotal - All Collection System Growth Related Projects							**12,900,000**
					GRAND TOTAL - ALL CAPITAL IMPROVEMENTS							**161,240,000**

Reason for Improvement
1 - Growth
2 - Regulatory
3 - Reliability

Engineering and other costs account for technical, professional and special services that are required to execute the project. These include environmental, technical, and geotechnical studies; land and right-of-way appraisals and negotiations, design and resident engineering fees, construction material testing, legal fees, project insurance, land surveying and legal descriptions, project design surveying, operation and maintenance manuals, and personnel training. Land and right-of-way costs for each improvement are not included in the cost opinions.

These order-of-magnitude cost opinions are based on experience and judgment as a professional consultant combined with information from past experience, vendors, and published sources such as RSMeans Construction Cost Data. Since Burns & McDonnell has no control over numerous factors which can affect the cost and pricing of construction work, economic conditions, government regulations and laws, competitive bidding or market conditions and other factors affecting such opinions or projection, Burns & McDonnell does not guarantee the actual rates, costs, etc. will not vary from the opinions and projections developed herein.

C. Capital Improvements Program – Existing System Improvements

1. Description

Recommended existing system capital improvements and the year they are planned to occur are summarized in Table 5.2 through year 2030. The program presents the improvements by the following categories:

1. Existing Collection System Improvements
2. Existing Collection System Rehabilitation
3. New Wakarusa Wastewater Treatment Plant
4. Kansas River Wastewater Treatment Plant Improvements
5. Annual Wastewater Utility Maintenance

The improvements included in each of these categories are described below.

Table 5.2

Capital Improvements Program Summary - Existing System Improvements

Item	Reason for Improvement			2012 Cost Opinion		2013 (1)	2014 (1)	2015 (1)	2016 (1)	2017 (1)	2018 (1)	2019 (1)	2020 (1)	2021 (1)	2022 (1)	2023 (1)	2024 (1)	2025 (1)	5 Year Period Ending 2030 (1)
1 Collection System**																			
a PS 9 expansion to 14 MGD	1, 2			$ 2,300,000									$ 3,147,700						
b PS 32 expansion to 1.7 MGD, 8" force main	1, 2			$ 800,000		$ 832,000													
c PS 25 expansion to 4.4 MGD, Add 3rd Pump	1, 2			$ 150,000								$ 197,400							
d PS 25 expansion to 6 MGD, parallel 12" force main	1, 2			$ 1,440,000															$ 2,917,200
e 21" gravity sewer to eliminate PS 8	3			$ 3,500,000						$ 425,800	$ 4,002,800								
f KR-5C 12" relief sewer	3			$ 800,000						$ 973,300									
g KR-6B 24" relief sewer	3			$ 700,000							$ 885,700								
h PS 23 expansion to 0.1 MGD	1, 3			$ 200,000		$ 208,000													
i PS 48 expansion to 6.4 MGD	1			$ 300,000													$ 480,300		
j Baldwin Creek West of K-10 (BC-2) - Brink - (2)	1			$ 950,000		$ 988,000													
k Collection System Field Operations Building	3			$ 4,000,000										$ 5,693,200					
Subtotal				$ 15,140,000															
2 New 2 MGD Capacity Wakarusa WWTP																			
a Wastewater Treatment Plant	1, 2			$ 30,000,000		$ 2,184,000	$ 6,489,600	$ 10,686,200	$ 11,698,600	$ 2,920,000									
b Peak Flow Storage	1, 2			$ 6,000,000		$ 499,200		$ 2,249,700	$ 3,509,600	$ 632,700									
c Roads, Utilities	1, 2			$ 6,000,000		$ 499,200	$ 2,995,200	$ 3,125,000											
d New (Wakarusa) PS 5C, 2 - 16" force mains	1, 2			$ 12,700,000		$ 924,600	$ 5,408,000	$ 5,624,300	$ 2,118,600										
Subtotal				$ 54,700,000															
3 Kansas River WWTP																			
a Nutrient Removal	2			$ 9,000,000												$ 13,855,100			
b Co-generation & Backup Power	3			$ 1,000,000		$ 600,000	$ 481,600												
Subtotal				$ 10,000,000															
4 Collection System Rehabilitation Plan																			
a Rapid I/I Reduction Program	2, 3			$ 19,400,000		$ 1,872,000	$ 2,720,200	$ 2,829,000	$ 2,942,200	$ 3,059,900	$ 3,182,300	$ 3,309,600	$ 3,442,000						
b Clay Pipe and Manhole Rehabilitation Program	2, 3			$ 33,500,000		$ 416,000	$ 432,600	$ 449,900	$ 467,900	$ 486,700	$ 1,265,300	$ 3,947,800	$ 1,368,600	$ 5,693,200	$ 5,921,000	$ -	$ 4,803,100	$ 4,995,200	$ 25,322,700
Subtotal				$ 52,900,000															
5 Annual Maintenance																			
a Wastewater Treatment Plant: 2013 - 2020	3	300,000	8	$ 2,400,000		$ 300,000	$ 312,000	$ 324,500	$ 337,500	$ 351,000	$ 365,000	$ 379,600	$ 394,800						
b Wastewater Treatment Plant - 2 Plants: 2021 - 2030	3	600,000	10	$ 6,000,000										$ 600,000	$ 624,000	$ 649,000	$ 674,900	$ 701,900	$ 3,953,900
c Pump Stations: 2013 - 2030	3	100,000	18	$ 1,800,000		$ 100,000	$ 104,000	$ 108,200	$ 112,500	$ 117,000	$ 121,700	$ 126,500	$ 131,600	$ 136,900	$ 142,300	$ 148,000	$ 153,900	$ 160,100	$ 901,800
d Sewer Main Relocations for Road Projects: 2013 - 2030	1	300,000	18	$ 5,400,000		$ 300,000	$ 312,000	$ 324,500	$ 337,500	$ 351,000	$ 365,000	$ 379,600	$ 394,800	$ 410,600	$ 427,000	$ 444,100	$ 461,800	$ 480,300	$ 2,705,400
Subtotal				$ 15,600,000															
Total				**$ 148,340,000**		$ 9,723,000	$ 19,255,200	$ 25,721,300	$ 21,524,400	$ 9,317,400	$ 10,187,800	$ 8,340,500	$ 8,879,500	$ 12,533,900	$ 7,114,300	$ 15,096,200	$ 6,574,000	$ 6,337,500	$ 35,801,000

(1) - 4% Inflation Used to Calculate 2013 to 2030 Costs

(2) - Cost allocation between property owners, developers and the City to serve Future Growth Areas has not been determined.

** Development Related Growth Projects Are Not Included in CIP

2013 - 2020 Total	**$ 112,949,100**

Reason for Improvement

1- Growth

2 - Regulatory

3 - Reliability

2. Existing Collection System Improvements

a. Expand Pumping Station No. 9

Pumping Station No. 9 requires expansion from 8.6 MGD to 15 MGD to accommodate existing wet weather peak flows and projected upstream growth and development. A portion of this expansion is necessary now in order to provide firm pumping capacity for the 10 year design storm event. The expansion could be done in stages, but it is considered to be more cost effective to complete the full expansion at one time. The existing structure and piping is designed to accommodate two more pumps. It may also be necessary to replace existing pumps to provide the needed capacity. The additional pumps and other station improvements should be configured to provide flexibility for pumping all flows east to the downstream collection system during dry weather periods, and pumping varying portions of wet weather peak flows east to the downstream collection system and to the existing wet weather peak flow storage basins. The division of capacities needs to be approximately 5 MGD east to the downstream collection system, and 10 MGD to the peak flow storage basins.

b. Expand Pumping Station No. 23

The existing system model predicts the 10 year design storm wet weather peak flow to Pumping Station No. 23 equals its firm pumping capacity. Pumping capacity will need to be increased to accommodate growth through 2030. Future development and flows tributary to this pumping station should be monitored and necessary expansions be done as dictated by actual development. Additional firm capacity for this station beyond what is forecast for 2030 should be considered when it is expanded.

c. Expand Pumping Station No. 32 and New Force Main

The existing system model shows the Pumping Station No. 32 existing firm capacity of 0.7 MGD is exceeded by the 10 year design storm wet weather peak flow rate and requires expansion. The design storm peak flow rate in 2030 to this pumping station is forecast to be 1.7 MGD. Expansion of Pumping Station No. 32 firm capacity to 1.7 MGD is recommended, which will also require installation of a parallel 8-inch force main to provide the necessary peak flow capacity.

d. KR-5C and KR-6B Relief Sewers

Gravity sewer surcharging remains at two locations following the Rapid I/I Reduction Program within the program target area due to inadequate flow capacities for conveying the 10 year design storm peak flow rate. In these instances, parallel gravity relief sewers are recommended to provide the additional peak flow capacity needed to convey the design storm peak flow rate. The 12-inch gravity sewer in Drainage Sub-basin KR-5C requires a 12-inch parallel relief sewer. The 21-inch gravity sewer in Drainage Sub-basin KR-6B requires a 24-inch parallel relief sewer. Recommended relief sewer sizes are based on 10 year design storm peak flow reductions that will occur as a result of implementing the Rapid I/I Reduction Program as explained below. As such, it is recommended that relief sewer construction occur after implementing the Rapid I/I Reduction Program.

e. Expand Pumping Station No. 25 and New Parallel Force Main

The 2020 system model predicts the 10 year design storm wet weather peak flow to this pumping station will exceed its firm capacity. As such, an initial expansion of Pumping Station No. 25 by 2020 to 4.4 MGD firm capacity by addition of a third pump is recommended. A further expansion of Pumping Station No. 25 to 6 MGD by the addition of a second, parallel 12-inch diameter force main is recommended by 2030. The diversion of Pumping Station No. 49 flows, which are now conveyed to Pumping Station No. 25, to the future WWWTP can be deferred until sometime after 2030. Actual development should be examined at the time it becomes necessary to expand Pumping Station No. 25 to confirm that is still appropriate to do so, or if actual growth and development in the East Lawrence Drainage Basin would instead dictate diverting Pumping Station No. 49 flows to the WWWTP.

f. Eliminate Pumping Station No. 8

Plans have been in place to eliminate Pumping Station No. 8 due to its age and condition and need for additional capacity. As such, a 21-inch diameter gravity sewer intercepting flows into Pumping Station No. 8 and conveying them south to the interceptor sewer tributary to new Pumping Station No. 5C (see below) is recommended. The recommended gravity sewer size is based on 10 year design storm peak flow reductions that will occur as a result of implementing the Rapid I/I Reduction Program as explained below. As such, it is recommended that elimination of Pumping Station No. 8 occur after implementing the Rapid I/I Reduction Program.

g. Expand Pumping Station No. 48

The 2030 system model predicts 2030 wet weather peak flows to this pumping station will marginally exceed its existing firm capacity. As such, future development and flows tributary to this pumping station should be monitored and necessary expansion be done as dictated by actual development. Additional firm capacity for this station beyond what is forecast for 2030 should be considered at the time it needs to be expanded.

3. Existing Collection System Rehabilitation

a. Rapid I/I Reduction Program

A Rapid I/I Reduction Program is recommended to achieve a targeted amount of I/I reduction for both public and private sources located in close proximity to the KRWWTP. The objective the Rapid I/I Reduction Program is an overall 35% reduction of I/I within the program area. In order for the public portion of the Rapid I/I Reduction Program to effectively achieve the target I/I reduction, a Sewer System Evaluation Survey (SSES) should be completed prior to rehabilitation work to identify and evaluate public sources of rapid I/I. The overall 35% reduction objective would be achieved in conjunction with the private portion of the Rapid I/I Reduction Program. The private portion of the program requires building inspections and program management to identify and eliminate private I/I sources. Once the public and private programs have been implemented, monitoring programs should be put into place to measure I/I reductions concurrently as rehabilitation progresses. Based on results of the monitoring programs, the scope and timeline of the Rapid I/I Reduction Program can be adjusted as required to achieve the targeted rapid I/I reduction objective(s).

b. Clay Pipe and Manhole Rehabilitation Program

Rehabilitation of the remainder of the collection system will be addressed in a Clay Pipe and Manhole Rehabilitation Program. The phasing and funding level of the Clay Pipe and Manhole Rehabilitation Program is based on continuing the City's current efforts to rehabilitate VCP lines concurrently with the higher priority Rapid I/I Reduction Program. Subsequent to reaching the reduction target of the Rapid I/I Reduction Program, the Clay Pipe and Manhole Rehabilitation Program would be ramped up to be completed within the desired timeline for both programs. The Clay Pipe and Manhole Rehabilitation Program would address all of the remaining VCP sewers, brick manholes and other manholes in need of

rehabilitation throughout the system, including remaining sewers and manholes not addressed by the Rapid I/I Reduction Program within that program area.

4. Wakarusa Wastewater Treatment Plant

a. New Pumping Station No. 5C and Force Mains

A new Pumping Station No. 5C with a firm capacity of 11 MGD is recommended to provide sufficient peak flow capacity through year 2030. This same pumping station will also serve to divert dry weather flows to the new WWWTP. A location near the northwest intersection of 31st and Louisiana Streets would be preferred location for this pumping station. The new pumping station and force mains should be constructed and placed into service at the same time the future WWWTP is placed into service.

The force main from this pumping station will be routed west and then south and east to the future Wakarusa WWTP site. The range of dry and wet weather flows to be handled by this pumping station is wide, from as little as 1 to 3 MGD during dry weather periods up to the 11 MGD peak flow rate. As such, a dual force main is proposed, with one force main in service during dry weather periods, and both in service during peak wet weather flow conditions. Two 16-inch diameter force mains are recommended to provide sufficient flow velocity during dry weather flows when one force main will be in service.

b. New Wakarusa WWTP, Peak Flow Storage, and Support Systems

TM-3 concluded the future WWWTP should be constructed and in service by the time the service area population reaches 103,000 which is forecast to occur in 2018. A minimum initial treatment capacity of 2 MGD or more is recommended. A larger initial capacity may be appropriate given that the future WWWTP is expected to be put into service in 2018, and with a 2 MGD capacity would nearly be operating at its capacity 12 years later in 2030 based on the population forecast used for this plan. The final selection of treatment capacity remains to be determined by further planning for the WWWTP and will be based on costs and other factors concerning the most appropriate initial treatment capacity. The cost opinion included in this capital improvements program is based on 2 MGD capacity.

With a 2 MGD annual average daily flow capacity, the WWWTP could readily be designed to fully treat wet weather peak flow rates up to approximately 6 MGD. This will not be sufficient peak flow rate capacity for the Pumping Station No. 5C required firm pumping capacity of 11 MGD. As such, flows received at the WWWTP in excess of its peak flow capacity will need to be stored and then fully treated

after flow rates return to less than its peak flow treatment capacity. The storage volume needed for the 10 year design storm event is estimated to be 4 MG.

The new WWWTP will require supporting systems such as utilities (water, electricity, natural gas) and road improvements to handle anticipated vehicular traffic related to plant operations. A cost opinion for these support systems is included in the capital improvements program.

5. Kansas River Wastewater Treatment Plant Improvements

At a meeting with KDHE arranged to discuss regulatory actions that may affect this master plan, KDHE informed the City that new effluent limits for nutrients (total nitrogen and phosphorus) should be anticipated at the time of the second 5 year renewal of the KRWWTP discharge permit. This would occur at approximately year 2020 with a compliance deadline likely to occur three years thereafter. This will require significant improvements to the KRWWTP as previously documented by others. A cost opinion for these improvements based on previous planning is included in the capital improvements program.

Other capital improvements at the KRWWTP are anticipated including new co-generation and back-up power systems. A cost opinion provided by City staff for these facilities is included in the capital improvements program.

6. Annual Wastewater Utility Maintenance

Various utility maintenance activities are required for reasons of reliability and in support of other City utility and road projects. They include replacement of mechanical equipment such as pumps and motors at lift stations and treatment plants. Relocations of sewers and force mains for road projects are also included. The capital improvements program includes cost opinions provided by City staff for these types of maintenance activities.

D. Capital Improvements Program – Service to Future Growth Areas

Some extensions of the existing collection system are needed to provide service to the future growth areas forecast to occur by years 2020 and 2030. Capital improvements and the year they are planned to occur are summarized in Table 5.3 through year 2030. Extensions are included for the following future development areas:

- Baldwin Creek West of K-10 (BC-2)

Table 5.3

Capital Improvements Program Summary - Service to Future Growth Areas

Item	Reason for Improvement			2012 Cost Opinion		2013 (1)	2014 (1)	2015 (1)	2016 (1)	2017 (1)	2018 (1)	2019 (1)	2020 (1)	2021 (1)	2022 (1)	2023 (1)	2024 (1)	2025 (1)	5 Year Period Ending 2030 (1)
1 Collection System Growth Related Projects**																			
a Baldwin Creek North of I-70 (BC-3) - (2)	1			$ 3,800,000							$ 4,808,200								
b Wakarusa US 59 & 1100 Road (WR-5) - (2)	1			$ 3,500,000								$ 4,605,800							
c Baldwin Creek North of I-70 (BC-1A) - (2)	1			$ 2,600,000															$ 5,267,100
d Baldwin Creek North of I-70 (BC-3A) - (2)	1			$ 1,000,000															$ 2,025,800
e Wakarusa US 59 & 1100 Road (WR-3, 5, & 6) - (2)	1			$ 2,000,000														$ 3,330,100	
Subtotal				$ 12,900,000															
Total				**$ 12,900,000**		**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 4,808,200**	**$ 4,605,800**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 3,330,100**	**$ 7,292,900**

(1) - 4% Inflation Used to Calculate 2013 to 2030 Costs

(2) - Cost allocation between property owners, developers and the City to serve Future Growth Areas has not been determined.

** Development Related Growth Projects Are Not Included in CIP

Reason for Improvement

1- Growth

2 - Regulatory

3 - Reliability

- Baldwin Creek North of I-70 (BC-3)
- Wakarusa River South – US 59 & 1100 Road (WRS-5)
- Baldwin Creek North of I-70 (BC-1A)
- Baldwin Creek North of I-70 (BC-3A)
- Wakarusa River South – US 59 & 1100 Road (WRS-3, 5 & 6)

The collection system extensions to future growth areas are based on a conceptual level of development and representative of one possible development alternative that is subject to change. Actual pipe sizes, alignment, and schedule will be determined as development occurs. The cost allocation between property owners, developers, and the City to serve future development areas has not been determined.

* * * * *

Attachment 3

City of Lawrence KANSAS

Wastewater Master Planning

The City of Lawrence wishes to receive public comment and encourage the public's participation in the current wastewater master planning efforts. The purpose of the master plan is to evaluate the wastewater treatment and collections systems for improvements to address regulatory requirements, system maintenance and improvements, and potential development planning through 2030. The City uses the master plan to guide decisions in construction, including timing, location, and size, based on these factors. Therefore, the public's input and participation is an important part of developing this master plan.

The documents below include memorandums, the master plan boundary map and population projections necessary for the plan.

A comment form is also available for electronic submittal of public comments. These comments will be reviewed and incorporated into a technical memorandum. This memorandum will be presented to the City Commission for their consideration.

Supporting Documentation:

- Utilities Master Planning Growth Projections Memo - April 27, 2010
- Wastewater Master Plan Study Boundry Map
- Residential Development Project Sites, January 2010
- Update to Residential Inventory Analysis Memo
- Plan Scenario Maps

Public Meeting Schedule

- Planning Commission Meeting - May 24, 2010 at 6:30 pm at the City Commission Meeting Room.
- Board of County Commissioners Meeting- June 16, 2010 at 4 pm at the County Commission Meeting Room.
- City Commission Meeting - TBD

Please complete the above form or mail comments to:

David Hamby, P.E.
BG Consultants, Inc.
1405 Wakarusa Drive
Lawrence, KS 66049

If you have specific questions about this project, please contact:

Mike Lawless
Assistant Director of Utilities - Operations
(785) 832-7862

David Hamby
BG Consultants
(785) 749-4474, ext. 106

Attachment 4

City of Lawrence KANSAS

Wastewater Master Plan

Final Report

The complete package of information collected for analysis for this master plan may be viewed at the City of Lawrence Department of Utilities by appointment. To arrange a time for viewing please contact the Utilities Department at (785) 832-7800.

- Wastewater Master Plan (PDF 1,221 KB)
- Wastewater Master Plan Appendices (PDF 1,171 KB)

Attachment 5

Water and Wastewater Capital Improvement Plan Options and Revenue Requirements

November 15, 2012

City of Lawrence
UTILITIES

Contents

Introduction

For City Commission consideration this report presents seven Capital Improvement Plans (CIPs) based on recently completed Master Plans for Lawrence's Water and Wastewater Utilities. Previously, staff presented two scenarios. Staff updated these with the latest information and formulated an additional five scenarios based on City Commission comments and questions. The scenarios help compare benefits relative to costs of the various CIP plans, determine rate impacts to customers, and compare those to what is happening nationally and within our region.

Lawrence has an opportunity to expand wastewater capacity to support economic development, initiate programs that will address deferred infrastructure maintenance and upcoming maintenance needs, comply with expected new regulatory requirements, and improve the quality of water and services for the customer with rate increases below those of our peers. This can be accomplished for less than a total $15.56 increase spread out over five years to a typical monthly bill. The table on page 3 summarizes the scenarios' costs and relative levels of services provided.

Lawrence is seeing the benefits of adoption and implementation of several previous five-year CIP's that initiated programs and addressed utility needs. In addition, operational efficiency efforts and use of technology have allowed the department to increase services provided while reducing budgeted FTE's by five over the last 3 years. Current water treatment capacity is sufficient to meet community growth for the next two decades. Improvements in the mechanical reliability of the wastewater plant and lift stations, plus sewer line maintenance and rehabilitation programs, have resulted in significant reductions in sanitary sewer overflows. As with other communities, Lawrence still has infrastructure needs to address. For Lawrence this includes water lines, old equipment, and structures at the Kaw water plant, and rapid wastewater inflow and infiltration. Several of the scenarios presented address these issues and expand capacities of the systems to provide for community growth and at rate increases that are less than surrounding communities.

Staff recommends adoption of the 5-Year CIP and Rate Plan outlined in Scenario 1 and the Master Plans to meet the needs of the Utility. While implementation will require adjustments to both the CIP and rates annually, having plan adoption for a five-year period allows customers and developers to have predictability with future costs. It also helps with implementation of projects and programs since many span years or even decades.

Scenario	WWTP Capacity Sufficient to	Total Increase in Typical Monthly Bill From 2012 to 2017	Total Additional Cost Over the 5 Year Period	Growth Supported Outside Existing City Limits	Addresses Water & Wastewater Infrastructure Needs	Regulatory Compliance**
1 - Recommended	2030	$13.66	$453.60	Yes	Yes	Yes
2 - Reduced Water	2030	$11.01	$384.12	Yes	No	Yes
3 - Deferred Maintenance/Reliability	2030	$12.10	$404.52	Yes	Yes	Yes
4 - Deferred Maintenance/Reliability & Wakarusa WWTP	2018	$8.54	$291.48	No*	No	No
5 - Taste, Odor, & Toxins	2030	$15.56	$519.96	Yes	Yes	Yes
6 - Delay Wakarusa WWTP & Accelerate Rapid I/I	2018	$11.70	$368.76	No*	No	No
7 - Roadway Relocations Only - No Wakarusa WWTP	2018	$1.38	$72.48	No*	No	No

* Annexation is not supported west of K-10, south of west 6th, and Southeast Lawrence.
** As it applies to wet weather overloading in the collection system and at the existing WWTP.

Community Growth and Population Projections

The Master Plans evaluated the latest population projections as summarized in the table below. The recommended Scenario 1 is based on Lawrence having a population of 119,529 in the year 2030. This follows a rate of growth between Horizon 2020's low and medium growth projections. The Planning Staff indicates the current growth rate is above the low growth rate estimates from Horizon 2020.

Population Projections	2010	2020	2030
Low (Horizon 2020)	88,961	100,076	111,191
Medium (Horizon 2020)	95,178	110,406	125,635
High (Horizon 2020)	99,013	122,394	151,296
Master Plan Service Area Populations	92,727	106,667	119,529

Based on actual wastewater loading in 2010 the Master Plan determined the existing wastewater treatment plant has the ability to serve an additional population of about 13,000 people in addition to the population at the time[1]. The Master plan projects remaining existing capacity (excluding wet weather treatment that currently exceeds treatment capacity) will be fully utilized around 2018.

CIP Scenarios

Based on City Commission comments received during the budget study session staff has developed five new CIP scenarios and updated the two originally presented to help evaluate options and rate impacts. A summary description of each scenario follows:

- Scenario 1 – Recommended
  This CIP scenario represents the most recent and updated staff and master plan recommendations. For the purposes of project timing, it reflects project timing based on the Planning Department's population projections between the Low and Medium Population Projections from Horizon 2020. This CIP includes major projects and programs that address water and wastewater system needs related to reliability, regulatory requirements, and growth.

  These include:
  - Construction of the Wakarusa WWTP with completion in 2018
  - Programs and projects (Rapid I&I and Wakarusa WWTP) to address current wet weather overloading at the Kaw WWTP
  - Sanitary Sewer Rehabilitation Program
  - Water Line Replacement Program
  - Construction and renovation of Kaw water plant intake(s)
  - Construction of the Kaw Transmission Main Phase I which is a second transmission main to North Lawrence that is also sized to eventually provide additional transmission capacity to South East Lawrence including Farmland

[1] The remaining capacity estimated is based on load and translated to population equivalents. There is not more or less capacity if actual 2010 population is different from the value used.

- Renovation and or replacement of the 1931 and 1954 Oread water tanks
- Other projects as outlined in the detailed project listing

- Scenario 2 – Reduced Water
  This CIP scenario extends and or reduces projects for the water utility. The wastewater CIP is the same as in Scenario 1. The Reduced Water CIP addresses wastewater system needs but does not address water system needs related to reliability, regulatory requirements, and growth. It shows the rate impacts of projects primarily related to the water utility.

  This CIP includes water projects related to roadway relocations and funds the 33-year, $72 million dollar water main rehabilitation program at $0.5 million annually. This is one-half of the historical level of funding and less than 25% of what is needed. It does not deal with Kaw Water Plant intake issues, the aging Oread Water Tanks, the need for a second water transmission main for North Lawrence, nor expansion of transmission capacity to serve the South East Lawrence (Kaw Transmission Main Phase I).

- Scenario 3 – Deferred Maintenance/Reliability
  This CIP scenario modifies Scenario 1 by extending the Rapid I/I Reduction Program by 5 years to 2025 and deferring to 2015 the co-generation and backup power project at the WWTP. On the water side the Kaw Transmission Main Phase I (second transmission source for North Lawrence and transmission capacity for the South East Lawrence) is delayed by 4 years until 2017 and the water main replacement program is spread out over an additional 5 years extending the program to 2050.

- Scenario 4 – Deferred Maintenance/Reliability & Wakarusa WWTP (Low Growth)
  This CIP scenario modifies Scenario 3 and adjusts the Wakarusa WWTP for completion in 2022 based on the population estimates for the Low Growth Population Projections from Horizon 2020. The Wakarusa WWTP expansion in conjunction with the Rapid I&I Removal Program provides for relief of current wet weather overloading of the existing treatment plant and of Lift Station 5A/5B on the Haskell campus. This scenario may result in reduction in the ability to serve additional growth through the Wakarusa Valley and areas to the West. The model also indicates bypassing will occur under design conditions, which does not comply with state and federal regulations.

- Scenario 5 – Taste, Odor & Microtoxins
  This CIP scenario modifies Scenario 1 with the acceleration of projects to begin in 2013 that would enhance treatment capability to further control Taste, Odor, and Microtoxins. The Master Plan schedules this project for 2025. Staff has received responses to RFPs for evaluating enhanced treatment options. Staff will interview firms this month.

  Over the last year, treatment staff has improved effectiveness of the existing powder activated carbon (PAC) technology. They achieved 90% removal of the taste and odor causing compounds consistently. In most cases, this is sufficient to reduce taste and odor causing compounds to levels below those detectable by sensitive individuals. However, there could be periods when the severity of the outbreak is beyond the ability of the existing system to manage completely and some portions of the taste and odor causing compounds pass through to the finished water.

- Scenario 6 – Delay Wakarusa WWTP & Accelerate Rapid I/I
  This CIP scenario modifies Scenario 1 by deferring the start of the Wakarusa WWTP by 3 years to 2016 and accelerates the Rapid I/I Program by 3 years for completion in 2017 instead of 2020.

  Achieving the goals of the Rapid I/I Program 3 years sooner would help to mitigate current wet weather overloading at the WWTP. However, since the Wakarusa WWTP is integral to alleviating the wet weather overloading at Lift Station 5A/5B, this station and the area it serves would continue to be overloaded for an additional 3 years. Just as with Scenario 4, deferral of the Wakarusa WWTP may limit the ability to serve additional growth through the Wakarusa Valley and areas to the West due to collection system limitations, not just treatment capacity limitations. The model indicates bypassing will occur under design conditions unless and until projects are initiated and completed to either expand 5A/5B and its downstream sewers, or divert flows to the Wakarusa WWTP.

- Scenario 7 – Roadway Relocations Only – No Wakarusa WWTP
  This CIP Scenario only addresses utility relocations in advance of roadway projects. It does no major projects including the Wakarusa WWTP, Rapid I/I Removal Program, Kaw Intake, Oread Storage Tanks, water main rehabilitation, and treatment plant maintenance. This scenario provides a baseline for comparing other scenarios.

Rate Model Adjustments and Fiscal Requirements

Lawrence's rate model calculates the revenue needed to support the Operations & Maintenance (O & M) and Capital Budgets of the Department. The model follows American Water Works Association's practices for establishing reasonable costs of service for the various classes of water and wastewater customers for a five-year period. For the seven scenarios evaluated, the model calculates revenue needs and the corresponding water and wastewater rates. For each scenario, the model uses the same values for operations and maintenance costs, water use characteristics, and growth. The model adjusts utilization of cash, debt financing, and debt service to ensure there is adequate bond coverage and reserve funds.

As of December 31, 2011, the Water and Wastewater Fund had $32,634,608 in cash and investments. Of this amount, $13,089,415[2] was from bond proceeds for current capital projects and $5,990,033 allocated to cash finance current and future capital improvement projects. The remaining $13,555,160 was available for operating expenses. Purchase orders encumbered a total of $1,380,262. In addition, bond covenants require the City to maintain a three-month operating reserve, which is equal to just over $5,000,000. As a result, as of December 31, 2011, approximately $7.1 million was available for future operating expenses. These were the inputs to the model to begin the 2013 rate model runs.

All of the scenarios use the same beginning cash balances. A common goal of the scenarios is to maintain at least $1.0 million in cash available for both water and wastewater operating expenses and the same for capital projects. This provides a total of $4.0 million in cash available for unplanned events. All of the scenarios approximate this goal with the exception of

[2] As of October 31, 2012 the balance of bond proceeds is $2,721,796

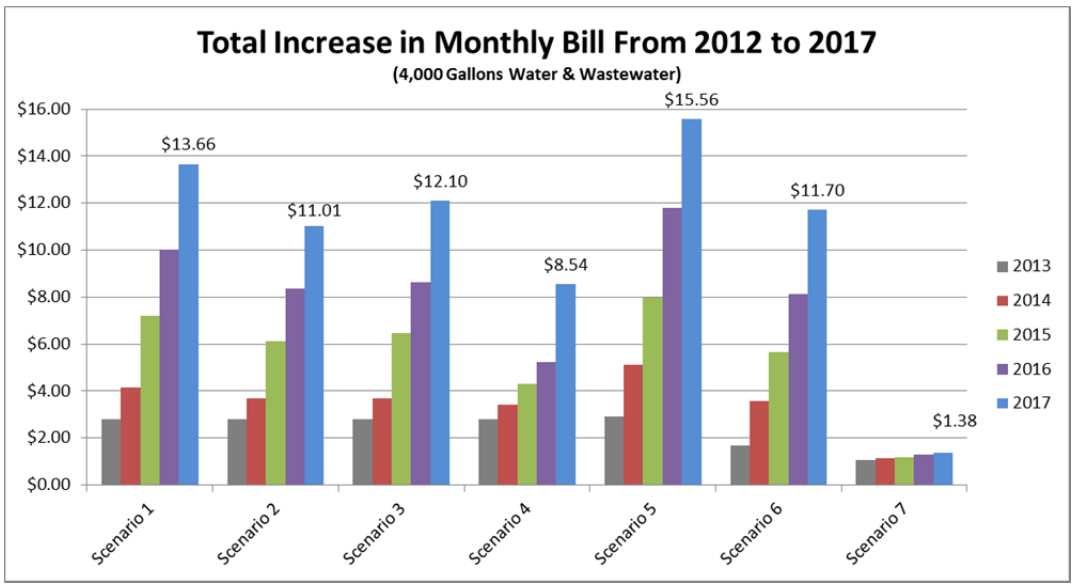
scenario 7. This scenario projects available cash in 2018 of $10.2 million for wastewater operations and $3.0 million for wastewater capital projects despite no increase in rates.

The City must maintain a debt coverage ratio of 1.25 to stay in compliance with our bond covenants. The calculation for debt coverage ratio is revenues minus expenses divided by debt expense. All of the scenarios meet this requirement when combining water and wastewater. However, the water utility alone only meets the coverage requirements under Scenarios 2 and 3. Under the other scenarios, the debt coverage ratio when looking at just the water operations is less than 1.25 and reduces the amount of cash available for water operations.

Scenario Rate Results

The table and graph below show a summary of the increase in a typical[3] residential bill from 2012 to 2017 for each scenario. In 2012, a typical bill is $47.64 per month. The recommended scenario 1 will cost a customer paying a typical bill an additional $453.60 over the five years.

Scenario	Average Yearly Increase in Monthly Bill	Total Increase in Typical Monthly Bill From 2012 to 2017 *	Total Additional Cost Over the 5 Year Period
1 - Recommended	$2.73	$13.66	$453.60
2 - Reduced Water	$2.20	$11.01	$384.12
3 - Deferred Maintenance/Reliability	$2.42	$12.10	$404.52
4 - Deferred Maintenance/Reliability & Wakarusa WWTP	$1.71	$8.54	$291.48
5 - Taste, Odor, & Toxins	$3.11	$15.56	$519.96
6 - Delay Wakarusa WWTP & Accelerate Rapid I/I	$2.34	$11.70	$368.76
7 - Roadway Relocations Only - No Wakarusa WWTP	$0.28	$1.38	$72.48



[3] The median water usage for all billings over the year defines "Typical" for this comparison. Over the course of a year, generally half of monthly bills use less than the 4,000-gallon quantity and half of bills use more than 4,000 gallons. Residential bills will vary based on actual metered water usage (water) and winter average water usage (wastewater).

Many combinations of customer class, meter size, and usage affect the increase a particular customer may realize in their bill. Appendix II contains tables detailing rate changes over the 5-year rate plan for all customer classes.

The table below shows the yearly percentage revenue increase for 2013 through 2018 required for the seven scenarios.

Full Year Revenue Increase

	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
	Water	Wastewater	Water	Wastewater	Water	Wastewater	Water	Wastewater	Water	Wastewater	Water	Wastewater	Water	Wastewater
2013	3.0%	4.0%	3.0%	4.0%	3.0%	4.0%	3.0%	4.0%	5.0%	3.0%	3.0%	0.0%	0.0%	0.0%
2014	5.0%	1.0%	3.0%	1.0%	3.0%	1.0%	3.0%	0.0%	6.0%	3.0%	5.0%	3.0%	0.0%	0.0%
2015	6.0%	6.0%	3.0%	6.0%	4.0%	6.0%	4.0%	0.0%	8.0%	4.0%	6.0%	3.0%	0.0%	0.0%
2016	6.0%	5.0%	3.0%	5.0%	5.0%	4.0%	5.0%	0.0%	8.0%	6.0%	6.0%	4.0%	0.0%	0.0%
2017	7.0%	6.0%	3.0%	6.0%	7.0%	6.0%	7.0%	6.0%	6.0%	7.0%	7.0%	6.0%	0.0%	0.0%
2018	3.0%	7.0%	1.0%	7.0%	6.0%	6.0%	6.0%	5.0%	3.0%	6.0%	3.0%	6.0%	2.0%	0.0%

System Development Charges

System Development Charges (SDCs) are fees paid by new development to recover the cost of the existing (but unused) and new capacity utilized or required by growth that help fund new and existing water and wastewater infrastructure. The City Commission established system development charges for customers in 1996. A 3-year phased-in approach for SDCs began in January 1997. Annual increases of SDC's from adopted 5-year Rate Plans in 2000 and 2004 also used a phased-in approach. Later, the City Commission adjusted the SDC charges outlined in the 2004 Rate Plan for the years 2008 and 2009. There have been no changes to SDCs since 2009 and the 2009 SDCs remain in effect today. The SDCs for the recommended Scenario 1's five-year period are in the table located on page 9. The SDCs for all of the scenarios are in Appendix III. The SDCs for all scenarios begin with a phase-in approach but the fifth year is at the calculated and recommended SDC funding level.

Utilities staff met and continues to communicate with the Lawrence Home Builders Association and the Lawrence Board of Realtors about SDC's. Through last November and December Utilities staff provided detailed information to the Lawrence Home Builders Association and the Lawrence Board of Realtors about how SDC's are calculated and the rationalization for why SDC's are collected. Utilities staff shared the seven scenarios presented in this document and discussed with both organization's executives. They presented and discussed the scenarios with their governing boards and developed written position statements (see Appendix III) that accept adoption of a phased-in 5-year SDC rate adjustment. Their acceptance is predicated on adoption of a Capital Improvement Plan that meets the Master Plan recommendations that address growth, infrastructure maintenance needs, and future regulatory requirements. This includes construction of the Wakarusa Wastewater Treatment Plant.

Scenario 1 - Recommended System Development Charges

	Existing	2013	2014	2015	2016	2017
	$	$	$	$	$	$
Water Utility						
Residential						
5/8"	1,560	1,590	1,580	1,570	1,560	1,550
1"	3,900	3,980	3,960	3,930	3,910	3,880
1-1/2"	7,800	7,950	7,900	7,850	7,800	7,750
2"	12,480	12,720	12,640	12,560	12,480	12,400
All Other						
5/8"	1,560	1,590	1,580	1,570	1,560	1,550
1"	3,900	3,980	3,960	3,930	3,910	3,880
1-1/2"	7,800	7,950	7,900	7,850	7,800	7,750
2"	12,480	12,720	12,640	12,560	12,480	12,400
3"	23,400	23,850	23,700	23,550	23,400	23,250
4"	39,000	39,750	39,500	39,250	39,000	38,750
6"	78,000	79,500	79,000	78,500	78,000	77,500
8"	156,000	159,000	158,000	157,000	156,000	155,000
10"	234,000	238,500	237,000	235,500	234,000	232,500
12"	343,200	349,800	347,600	345,400	343,200	341,000
16"	858,000	874,500	869,000	863,500	858,000	852,500
Wastewater Utility						
Residential						
All Meters	1,470	1,680	1,860	2,050	2,230	2,410
All Other						
5/8"	2,970	3,510	3,890	4,280	4,660	5,040
1"	7,430	8,780	9,740	10,690	11,650	12,600
1-1/2"	14,850	17,550	19,460	21,380	23,290	25,200
2"	23,760	28,080	31,140	34,200	37,260	40,320
3"	44,550	52,650	58,390	64,130	69,860	75,600
4"	74,250	87,750	97,310	106,880	116,440	126,000
6"	148,500	175,500	194,630	213,750	232,880	252,000
8"	297,000	351,000	389,250	427,500	465,750	504,000
10"	445,500	526,500	583,880	641,250	698,630	756,000
12"	653,400	772,200	856,350	940,500	1,024,650	1,108,800
16"	1,633,500	1,930,500	2,140,880	2,351,250	2,561,630	2,772,000
Combined Utilities						
Residential						
5/8"	3,030	3,270	3,440	3,620	3,790	3,960
1"	5,370	5,660	5,820	5,980	6,140	6,290
1-1/2"	9,270	9,630	9,760	9,900	10,030	10,160
2"	13,950	14,400	14,500	14,610	14,710	14,810
All Other						
5/8"	4,530	5,100	5,470	5,850	6,220	6,590
1"	11,330	12,760	13,700	14,620	15,560	16,480
1-1/2"	22,650	25,500	27,360	29,230	31,090	32,950
2"	36,240	40,800	43,780	46,760	49,740	52,720
3"	(a)	76,500	82,090	87,680	93,260	98,850
4"	(a)	127,500	136,810	146,130	155,440	164,750
6"	(a)	255,000	273,630	292,250	310,880	329,500
8"	(a)	510,000	547,250	584,500	621,750	659,000
10"	(a)	765,000	820,880	876,750	932,630	988,500
12"	(a)	1,122,000	1,203,950	1,285,900	1,367,850	1,449,800
16"	(a)	2,805,000	3,009,880	3,214,750	3,419,630	3,624,500

(a) Determined based on analysis of new customer's anticipated use of the system.

Area and National Rate Trends

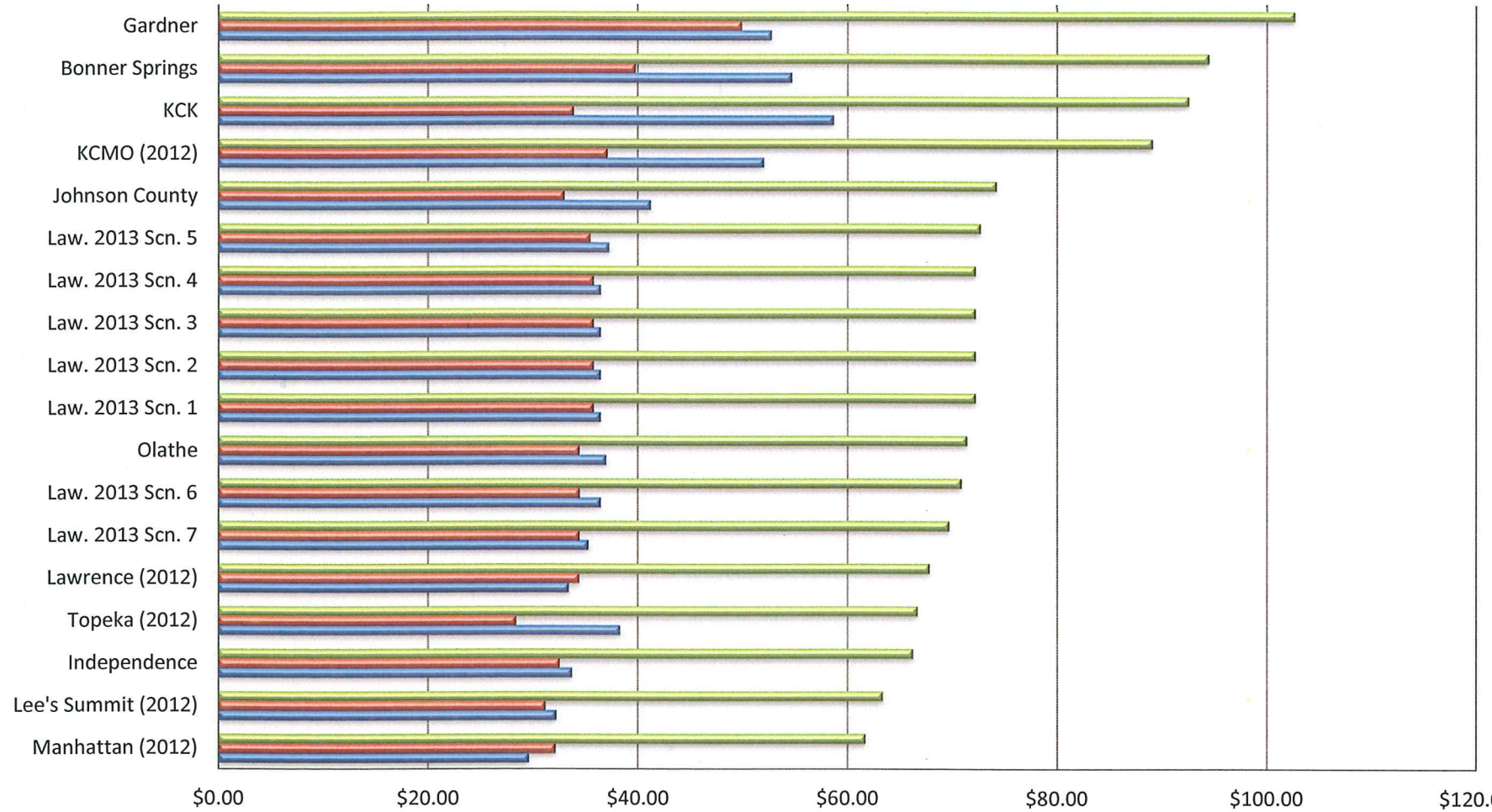
Addressing aging water and wastewater infrastructure is an issue that requires a continuous investment to maintain the quality of service expected by customers and required by regulations. Many of the water and wastewater providers surveyed in this region increased rates for 2013 and anticipate annual increases in the coming years to pay for infrastructure replacement and maintenance, comply with regulatory requirements, and meet operational needs. Regional trends are consistent with the findings of a survey completed by USA Today on water and wastewater rates across the country.

Many of the area utilities have completed the budget process for 2013 including water and wastewater rate changes. A summary of utility rate changes follows.

- Johnson County Wastewater approved a 7.3% revenue increase to pay for regulatory requirements, CIP, salaries, maintenance, and rate increases for wastewater treated by KCMO. Property tax assessments generate most of their revenue for capital projects.
- Johnson County WaterOne approved a 3.2% increase in revenue.
- Lee's Summit increased their water and sewer rates 6% in April 2012. Discussion of a 6% revenue increase will begin in early 2013.
- Olathe approved increases of 6.9% for both water and wastewater for 2013. They anticipate future annual increases of up to 7% for sewer and 4-6% for water to fund their 5-year capital plan.
- Manhattan increased wastewater rates by 15% and third tier and higher water rates by 7% in 2012 to fund expansion of both water and wastewater facilities. For 2013, Manhattan is requesting revenue increases of 7% for water and 3% for wastewater.
- Topeka has proposed revenue increases of 3% for water and 4% for wastewater. Prior to approval Topeka is planning to perform a detailed rate study in response to numerous recent water line leaks and infrastructure needs.
- Independence, MO increased the minimum charge for water by 9% for 2012 and expect the same 2013 and 2014. Wastewater revenues will increase by 4.5% annually until 2015. In addition to these increases there is a special charge funding work mandated by an EPA wet weather consent order. This charge increased by 50% to $6.00 per month in July 2012. The charge will increase by another 50% to $9.00 per month in 2014.
- KCMO increased water rates by 12% and wastewater rates by 17% or a combined increase of 14% effective May 1, 2012. More wastewater increases are planned for the near future for infrastructure improvements required to comply with a $2.4 billion wet weather EPA consent order. Discussion on 2013 adjustments will begin in early 2013.
- Both the Unified Government, which provides wastewater services to Kansas City, Kansas, and the Kansas City Board of Public Utilities, which provides water treatment, have approved 5% rate increases effective 1/1/13.

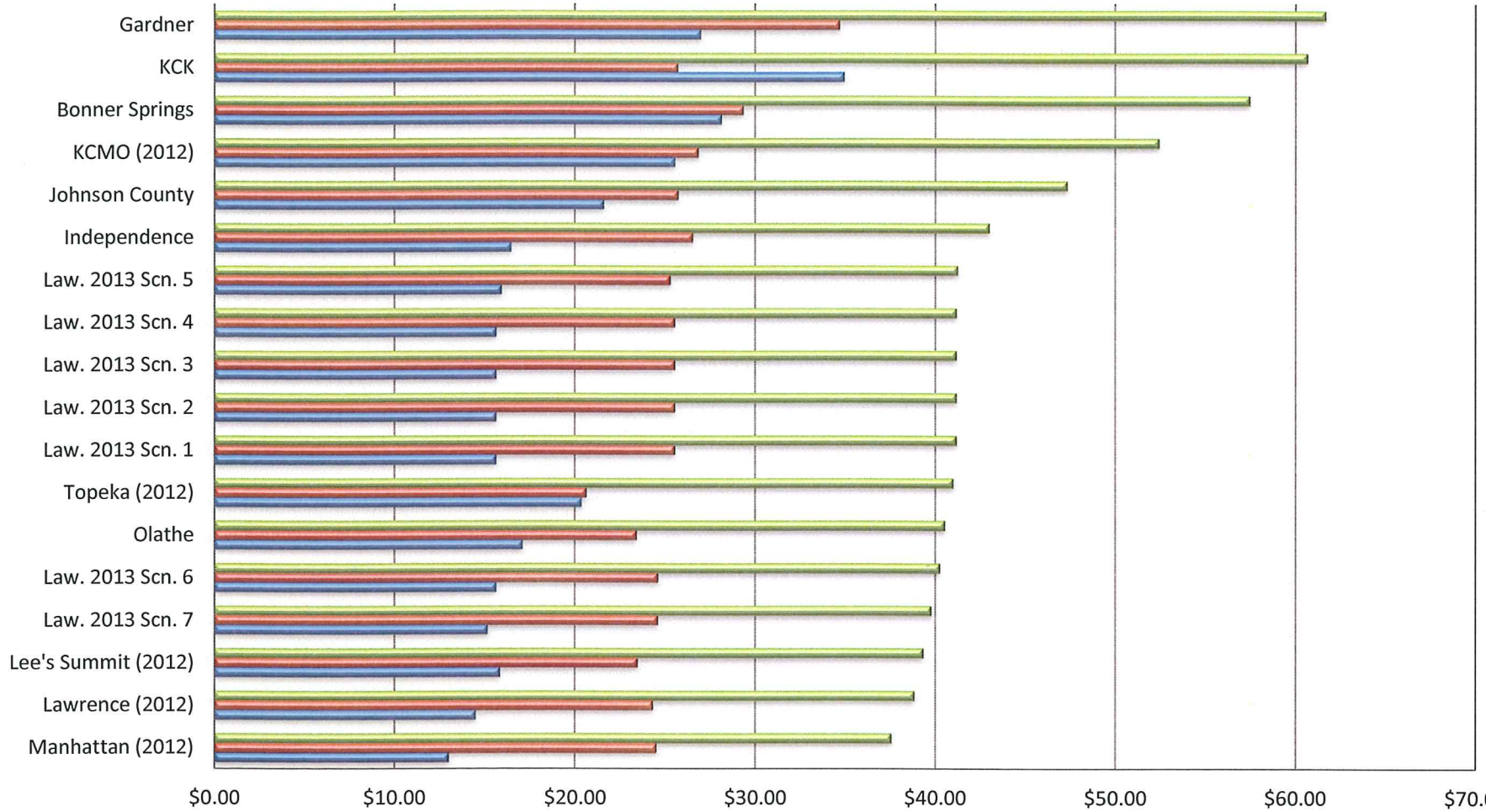
The graphs on pages 11 and 12 compare the area's residential utility bills for 8,000 gallon and 3,000-gallon usage. The 2013 proposed rates for the seven CIP scenarios are included.

2013 Summer Use Residential Monthly Utility Bill Comparison



	Manhattan (2012)	Lee's Summit (2012)	Independence	Topeka (2012)	Lawrence (2012)	Law. 2013 Scn. 7	Law. 2013 Scn. 6	Olathe	Law. 2013 Scn. 1	Law. 2013 Scn. 2	Law. 2013 Scn. 3	Law. 2013 Scn. 4	Law. 2013 Scn. 5	Johnson County	KCMO (2012)	KCK	Bonner Springs	Gardner
2013 Monthly Bill	$61.69	$63.33	$66.22	$66.63	$67.78	$69.68	$70.86	$71.37	$72.20	$72.20	$72.20	$72.20	$72.67	$74.19	$89.07	$92.56	$94.44	$102.65
2013 Monthly Bill Sewer (5,000 gal.)	$32.11	$31.15	$32.52	$28.36	$34.39	$34.42	$34.43	$34.41	$35.77	$35.77	$35.77	$35.77	$35.44	$32.95	$37.07	$33.87	$39.78	$49.90
2013 Monthly Bill Water (8,000 gal.)	$29.58	$32.18	$33.70	$38.27	$33.39	$35.26	$36.43	$36.95	$36.43	$36.43	$36.43	$36.43	$37.23	$41.24	$52.01	$58.68	$54.65	$52.75

2013 Low Use Residential Monthly Utility Bill Comparison



	Manhattan (2012)	Lawrence (2012)	Lee's Summit (2012)	Law. 2013 Scn. 7	Law. 2013 Scn. 6	Olathe	Topeka (2012)	Law. 2013 Scn. 1	Law. 2013 Scn. 2	Law. 2013 Scn. 3	Law. 2013 Scn. 4	Law. 2013 Scn. 5	Independence	Johnson County	KCMO (2012)	Bonner Springs	KCK	Gardner
2013 Monthly Bill	$37.56	$38.84	$39.33	$39.78	$40.26	$40.54	$41.01	$41.18	$41.18	$41.18	$41.18	$41.25	$43.02	$47.36	$52.43	$57.49	$60.68	$61.70
2013 Monthly Bill Sewer (3,000 gal.)	$24.54	$24.35	$23.49	$24.62	$24.63	$23.44	$20.64	$25.55	$25.55	$25.55	$25.55	$25.32	$26.55	$25.74	$26.87	$29.35	$25.73	$34.70
2013 Monthly Bill Water (3,000 gal.)	$13.01	$14.49	$15.84	$15.16	$15.63	$17.10	$20.37	$15.63	$15.63	$15.63	$15.63	$15.93	$16.47	$21.61	$25.57	$28.14	$34.95	$27.00

Supporting Staff Reports

Wastewater Treatment Capacity and Project Drivers for Wakarusa WWTP
Staff Report – City of Lawrence Department of Utilities
November 14, 2012

Current Loading and Treatment Capacity

The 2012 wastewater loading for wet weather, suspended solids, and nitrogen exceeds the existing Wastewater Treatment Plant (WWTP) design capacity and the current organic loading is at or near rated design capacity. Only average day hydraulic loading and population are below current design values. Plant performance indicates that most treatment units, (excluding wet weather units) can treat pollutant loads beyond their rated design. Based on performance and current loads, the master plan indicates sufficient capacity at the existing WWTP for an additional 13,000 people, excluding wet weather treatment. This assumes that the distribution and characteristics of waste sources between residential, commercial, and industrial remains consistent with historical experience. The master plan indicates peak wet weather loading of the existing WWTP is at or near 81 MGD and exceeds the design capacity of 65 MGD.

Wet Weather Solutions

The Wastewater Master Plan recommends two actions to reduce peak wet weather flows to a level within the capacity of the existing facilities and to meet future wet weather treatment and conveyance needs. These are:

1) Construct the Wakarusa WWTP, influent pump station, and wet weather storage.
2) Reduce inflow and infiltration both from public and private system sources into the collection system by 35%. This program would focus on the area that drains to the existing WWTP by gravity. The First step would be to perform a detailed Sanitary Sewer Evaluation (SSES) to identify the public and private sources of I/I in the collection system, refine the program scope, and prioritize site-specific work to correct deficiencies.

The objective of these improvements is to:

1) Reduce the current 81 million gallons per day (MGD) peak flow to the existing WWTP to 59 MGD.
2) Alleviate surcharging in the collection system near 31st St. and Louisiana and downstream of Pump Station 5A/5B by diverting flows to the Wakarusa WWTP.
3) Avoid having to add interceptor capacity between Pump Station 5A/5B and the WWTP.
4) Justify to EPA the continued use of Actiflo to manage wet weather flows[4]

[4] Since 2008, EPA has objected to the reissuance of the City's NPDES permit based on their interpretation that treated wet weather discharges from Actiflo are illegal sanitary sewer overflows (SSOs). . EPA contends the Clean Water Act requires reducing wet weather flows so that Actiflo is not needed (unless no feasible alternative exists). The City has taken the position these are not SSOs and our programs to manage inflow and infiltration, combined with wet weather treatment are best management practices. Due to EPA's objections, the City is operating on an administrative extension of the expired permit. The current Master Plan assumes that the EPA will allow the City to use Actiflo to manage 40 MGD of wet weather flows. At this time, there are no clear answers or direction as to how the EPA is planning to resolve wet weather permit objections.

Without the diversion of wet weather flows provided by the Wakarusa WWTP in the area of 31st and Louisiana, additional projects, such as expansion of pump station 5A/5B, the interceptors along Burroughs Creek Trail, and additional wet weather treatment at the existing WWTP would be required to manage current wet weather flows and serve growth within the Wakarusa watershed. KDHE does review all design plans for sewer extensions ensuring minimum design standards are met. This includes making sure there is sufficient downstream capacity to collect and transport the sewage. If there is insufficient collection system capacity, KDHE may withhold approval until sufficient capacity is available by adding relief sewers or achieving better control of peak flows.

Effectiveness of Water Conservation on Wastewater Load

Water conservation and reductions of wet weather flows will not significantly reduce overall organic, nutrient, and solids loadings. Therefore, those measures do not help defer the timing of additional treatment capacity. In addition, since the collection system is designed to handle volumes of flow under wet weather conditions, the reduced volumes resulting from water conservation do not appreciably reduce the scope or timing of collection system projects.

Planning for Economic Development

The latest master plan assumes a proportional growth in industrial loads based on existing community demographics. It does not plan for a large industry that would generate large amounts of organic or nutrient loads[5]. Currently industries use about 11% of the available organic wastewater treatment capacity. Assessing the impact of additional industrial expansion requires knowing the detailed characterizations of the wastewater discharges. Even within like industries, owner specific choices of processes and pretreatment options can change the wastewater load and treatment requirements. Servicing a large wastewater generating industry would require a wastewater treatment process specifically designed to handle that industry's wastewater.

Wakarusa Project Status and Prior Project Development

The Wakarusa siting is based on the lowest costs and preferred option presented in the 2004 Master plan and confirmed in the subsequent siting study. The site has been acquired and significant assessment work has been done to ensure the site is suitable. It is annexed and zoned appropriately for the use. The National Pollution Discharge Elimination Permit (NPDES) has been issued by KDHE and approved by the EPA and is current (unlike the existing WWTP's)[4].

This site was selected based on cost and non-cost factors using detailed evaluations and public input. It has significant long-term advantages in having the ability to be expanded and can serve a very large area via gravity that encompasses a significant portion of Douglas County.

[5] The City of Lawrence industrial organic load (Biochemical Oxygen Demand (BOD)) averages 1,675 lbs/day and industries contribute about 18 million gallons of wastewater per year or less than 0.4% of the hydraulic capacity. As a comparison, the City of St Joseph, MO, has an average industrial organic load of 41,700 lbs BOD/day and treats approximately 1.2 billion gallons per year from industries that include corn processing (ethanol), meat processing, and meatpacking. With the construction of the Wakarusa WWTP, as called for in the master plan, the combined organic treatment capacity of the existing Kansas WWTP and the Wakarusa WWTP would be 18,800 lbs BOD/day. Accommodating loads similar to those of St Joseph's, or even a single large industrial user would require significant expansion of wastewater treatment processes beyond those considered in the master plan.

Evaluation of expanding the existing WWTP showed it had a higher cost based on a present worth analysis. Further expansion of the existing WWTP is problematic due to wastewater conveyance limitations through the Burroughs Creek, Haskell Indian Nations University, and Baker Wetlands. Also with any increase in capacity, a revised permit would require enhanced treatment to remove additional nutrients. While we expect KDHE to impose this regulatory requirement in several permit cycles, expansion would trigger this requirement sooner and for a larger overall flow initially. Installation of Biological Nutrient Removal at the existing plant will require significant re-pumping and thus energy costs as compared to a new facility designed with these processes in mind.

Project Timing

Based on the current capacity utilization, projected growth, and the objectives of the community to support economic development, the recommendation is to proceed with design and construction of the Wakarusa WWTP for a targeted completion by 2017. Staff recommends completion of the Wakarusa WWTP by 2018 or earlier because:

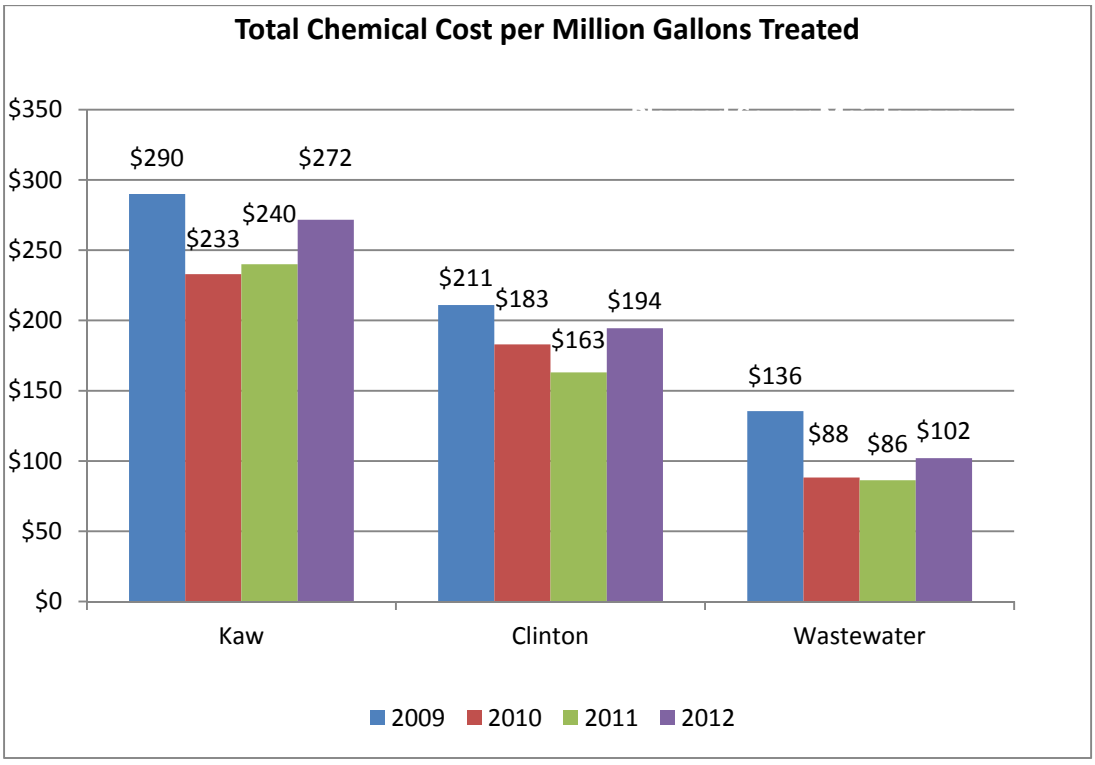
- By their nature, there is uncertainty in growth and population projections.
- It takes at least 5 years to design and construct additional treatment capacity using conventional Design-Bid-Build processes.
- The existing WWTP facility is overloaded under wet weather conditions.
- The existing pump station 5A/5B on the Haskell campus is overloaded under wet weather conditions.
- Additional treatment capacity is needed in order to attract economic development opportunities.
- Additional treatment capacity is needed to serve community growth.
- Continued growth combined without capacity expansion may result in permit violations and potential regulatory interventions to address permit violations, sanitary sewer overflows, and inflow and infiltration control or a moratorium on sewer extensions by KDHE.

Efficiency and Operational Cost Controls
Staff Report – City of Lawrence Department of Utilities
November 14, 2012

The Utilities Department strives continually to increase efficiency and reliability. The Department uses savings to repair and replace critical and aging infrastructure and absorb increases for services and resources used in the production of water and treatment of wastewater. As a result, the Department is able to curtail requested budget increases for the last several years despite increases for personnel costs, general fund transfers, energy, and commodities. Utilities staff continue to look for efficiencies in the day-to-day operations and maintenance of the facilities and activities. Some of these efficiencies include:

Chemical Usage

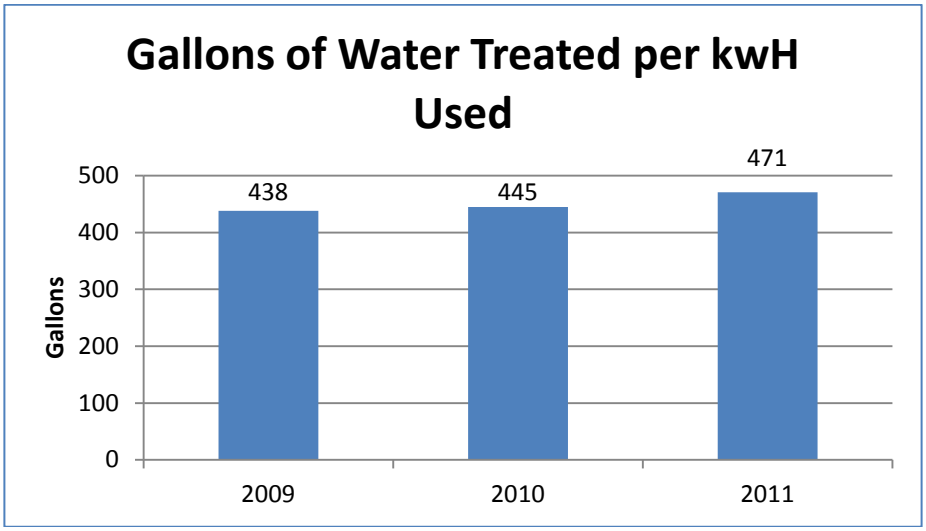
The chemical cost per unit of water treated continues to be less than three years ago in both water and wastewater treatment. The overall decrease has been the result of optimizing the chemical dosing through the use of plant automation and laboratory testing, use of the GCMS analyzer results for faster chemical adjustment, and increasing the staff's knowledge of processes through advanced training. The cost increase in 2012 for water treatment is due to treatment of taste and odor. The increase in wastewater treatment is due to the decreased flows due to the drought conditions. Both conditions resulted in an increase in chemical usage. The graph below shows a reduction in chemical costs per million gallons at all three treatment facilities from 2009.



Energy Usage

All of the department water and wastewater facilities have a base energy demand plus a demand that is influenced by the volume and rate of production. Energy demand increases as both the volume and rate of treatment increase. In general, the energy used on a per volume basis will decrease as volume treated increases.

The graph below indicates the water plants are treating an additional 33 gallons of water for every kWh used in 2011 compared with two year ago. This represents a 7.5% increase in energy utilization. Annual electrical bills for both water treatment facilities are around $700,000 annually. A 7.5% savings represents a savings of about $52,000 annually. Some of that savings results from increases in production and some due to energy efficiency efforts.



Energy Efficiency Measures

Some of the steps taken to improve energy efficiency and control related environmental impacts include:

- Expanding the use of low distortion variable frequency drives to regulate pump speeds. The ability to adjust the pump's speed to less than 100 percent saves energy when lower water and wastewater flows occur. This also provides a unity power factor that reduces energy costs and reduces wear and tear on internal electrical distribution equipment.

- Continued specification of high efficiency electric motors.

- Replacement of the current T-12 interior lighting fixtures as they fail with T-5 fixtures and replacement of exterior door and basin lights with LED fixtures for improved and more energy efficient lighting[6].

- Addition of biogas storage with the recent anaerobic digester expansion. The biogas is used in place of natural gas to operate the sludge heaters that were replaced with larger units as part of the expansion and to provide building heat.

- Digester complex modification to provide space for a future micro turbine to generate electricity on-site using biogas.

- Modification of field crews hours to four 10-hour days per week decreasing fuel usage by approximately 20%.

- Use of an electric car, gator, and industrial tricycle at the wastewater treatment plant in place of full size vehicles to save on fuel usage.

Internal Water Conservation

The Utilities Department uses water for operational needs on a routine base. By decreasing the use of potable water within the department, it decreases the need to treat more water and decreases expenses. Examples of ways that the department has decreased the use of water internally include:

- Circulation water to cool pumps at the wastewater treatment plant uses treated plant effluent (TPE) instead of potable water.

- Irrigation of the front lawn and landscaping at the wastewater treatment plant uses TPE instead of potable water.

- An increase in filter run time at the Clinton Water Treatment Plant may result in a savings of 177 million gallons of potable water or $350,000 per year.

- The wastewater treatment plant is working with the Parks & Recreation Department to provide TPE for watering of trees, medians, and landscaping on park and city owned areas that receive minimal public exposure.

- The department needs to flush hydrants periodically, especially on lines that receive low flows. Parks & Recreation has been given a schedule for hydrant flushing so they can use the water typically wasted to fill their trucks for irrigation, watering of trees, and landscaping.

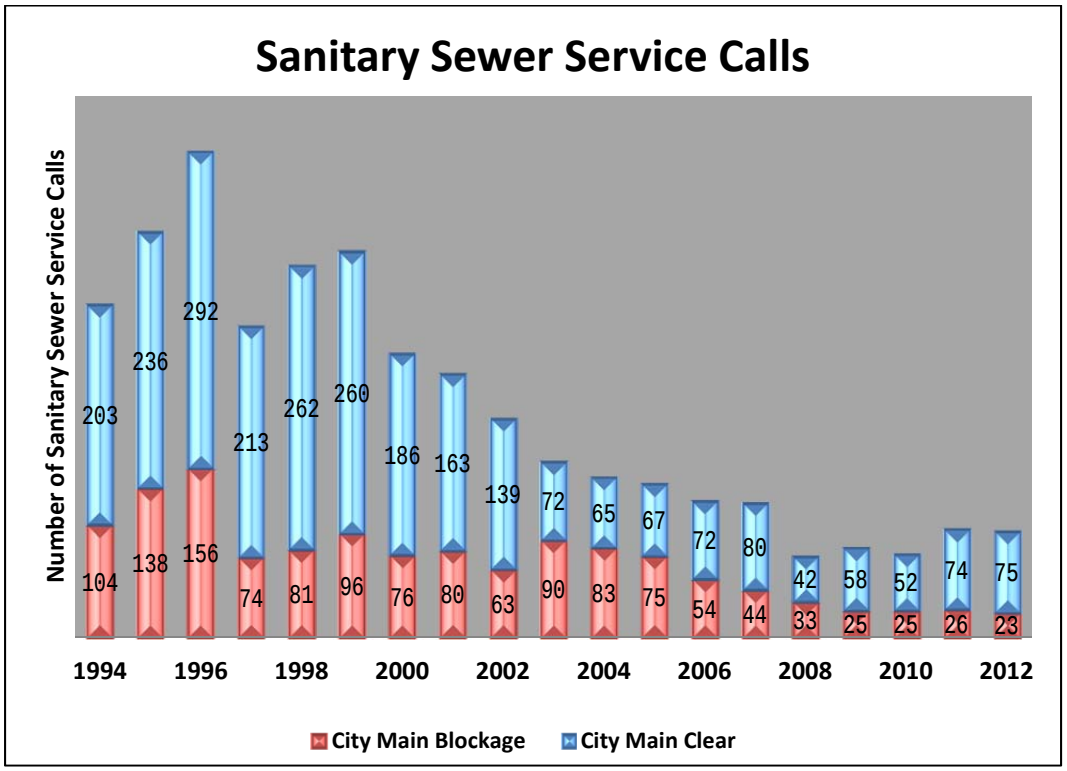
[6] The utility department's facilities have over 1,500 light fixtures with in excess of 3,500 bulbs. New basin LED lighting puts out 3 times the light at a fraction of the energy usage. A significant benefit is these bulbs have an estimated 50 year life that reduces the resources need to change out bulbs and helps ensure they remain lit. Increased and more light output in industrial settings creates a safer work environment reducing risk of injury.

Personnel and Staff Time

The Utilities Department has decreased staffing by five FTE's in the last three years and continues to look for ways to use staff time more efficiently. Despite the decrease in staff, the department was able to take on additional workload, such as hydrant flow testing, answering customer service calls after hours, additional internal data analysis and usage, education of food service providers on FOG, and additional laboratory analysis.

Expansion and rehabilitation of department infrastructure also increased the responsibility and work for utilities employees. This includes the expansions of the Clinton Water Treatment Plant, anaerobic digester facility at the wastewater treatment plant, two lift stations, the Stoneridge Water Tank, and extension of water and sewer lines. Some of the changes implemented by the department, which have resulted in improved use of time include:

- Collections system preventive maintenance programs, including the 4-year section cleaning, chemical root control, TV inspection of the sewer lines, and monthly/3-month/6-month cleaning of specific trouble areas. These programs have decreased the number of service calls, specifically related to city main blockage, which not only decrease the likelihood of a compliance issue due to a sanitary sewer overflow, but also decrease the staff time necessary to attend to these service calls. Staff can then be re-directed to other tasks and projects. The graph below shows there has been a significant reduction in the number of sanitary sewer service calls over the past 18 years.



- Replacement of the TV truck has resulted in faster and more comprehensive review and analysis of sewer lines for more accurate and effective identification of sewer line failures.

- Altering field crew shifts to four 10-hour days per week has decreased the site set up and tear down time by allowing the crews to stay on the job for the additional 2 hours each workday.

- Implementation and use of automation and control systems to redirect employee time away from manual operation and monitoring of the various facilities and structures, including plant, lift stations, and water towers to tasks that are more technical in nature.

- Overall, preventive, and predictive maintenance of equipment has resulted in increased reliability of the system, as well as decreased time and money spent on unplanned repairs.

- Overall, improved cause analysis of equipment and infrastructure failures has resulted in a decrease in repeat failures.

- Cross training between water and wastewater operations staff, water and wastewater maintenance staff, and collections and distributions staff has increased the flexibility of the work units to provide adequate resources to the areas needed.

- Enhanced staff training and certification incentive programs has advanced the overall knowledge of the department to work smarter and faster using fewer resources to get the job done.

- More effective use of operational data has resulted in better operational decisions.

- Implementing comprehensive inventory best management practices department wide as well as delivery of supplies to the job site has decreased the amount of time spent in gathering supplies and equipment for job completion as well as improved the accounting for inventory parts and costs.

The outlined modifications to Utilities Department activities have resulted in significant progress in making the water and wastewater treatment processes more efficient. The Department continues to look for additional ways to become more effective and efficient at providing a great quality product and service to our customers.

Appendix I – Detailed Capital Improvement Plans

2013 CIP Scenario 1 - Recommended
10/19/2012

Water CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
1	Kaw WTP Supply Improvements (a) (c)		4,770,500					4,770,500	
2	Oread Storage & BPS Replacement (c)		1,248,000	2,704,600				3,952,600	
3	19th & Kasold Pump Station (b) (c)			411,000				411,000	
4	Harper Booster Pump Station (b) (c)		624,000					624,000	
5	Tower Protective Coatings (c)		1,040,000			1,684,600	876,000	3,600,600	
6	Kaw 36" WM to North Lawrence (One 30" river crossings) - Phase 1	(a) (c)	7,836,400				0	7,836,400	0
7	Concrete Main Assessment (c)			648,960			0	648,960	0
8	Pipeline Replacement Program (c)	0	2,338,600	2,432,100	2,529,400	2,630,600	2,735,800	12,666,500	2,845,200
9	Water Main Relocation for Road Projects (a)		1,985,000	500,000	520,000	540,800	562,400	4,108,200	584,900
10	Small Water Main Replacement Program (c)	0	968,500	1,007,200	1,047,500	1,089,400	1,133,000	5,245,600	1,178,300
11	Kaw Structural, Electrical, Process (b) (c)		723,800	811,200		166,700		1,701,700	
12	Clinton Intake (a) (c)	0	0	1,297,900	517,400			1,815,300	
13	Clinton Process (b) (c)			108,200		187,200		295,400	
14	Clinton Basin Coatings (c)						1,374,800	1,374,800	
15	Plant Maintenance (c)		150,000	156,000	600,000	624,000	649,000	2,179,000	675,000
16	31st St. - extend 12" to O'Connell (a)		685,400					685,400	
17	31st St. & O'Connell - Extend 16" to WWTP (includes River crossing)	(a)	1,852,700					1,852,700	
								0	
18	Bowersock Dam Improvements (c)		425,000					425,000	
19	Clinton Backup Generator (15MGD) (a) (c)				849,300			849,300	
21	Total	0	24,647,900	10,077,160	6,063,600	6,923,300	7,331,000	55,042,960	5,283,400

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

Wastewater CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
	Collection System								
1	PS 32 Expansion & Force Main (a)		832,000					832,000	
2	21" Gravity Sewer to Eliminate PS 8 (c)						425,800	425,800	4,002,800
3	KR-5B 12" Relief Sewer (c)		0				973,300	973,300	
	KR-6B 21" Relief Sewer (c)	**0**	0					0	885,700
4	PS 23 Expansion (a) (c)	**0**	208,000	0				208,000	
5	Rapid I/I Reduction Program (b) (c)		1,872,000	2,720,200	2,829,000	2,942,200	3,059,900	13,423,300	3,182,300
6	Sewer Rehabilitation, Replacement, CIPP & MHs		416,000	432,600	449,900	467,900	486,700	2,253,100	1,265,300
8	Subtotal	0	3,328,000	3,152,800	3,278,900	3,410,100	4,945,700	18,115,500	9,336,100
	Treatment System								
	Kansas River WWTP								
9	Co-generation & Backup Power		600,000	481,600				1,081,600	
	Wakarusa River WWTP	**0**							
10	Wakarusa River WWTP Treatment Plant (a) (b)		3,784,000	6,489,600	10,686,200	11,698,600	2,920,000	35,578,400	
11	Wakarusa Peak Flow Storage (a) (b)		499,200		2,249,700	3,509,600	632,700	6,891,200	
12	Roads & Utilities (a) (b)		499,200	2,995,200	3,125,000			6,619,400	
13	Wakarusa PS 5C, 2 - 16" Force Mains (a) (b)		924,600	5,408,000	5,624,300	2,118,600		14,075,500	
15	Subtotal	0	6,307,000	15,374,400	21,685,200	17,326,800	3,552,700	64,246,100	0
	Other								
								0	
16	General Pumping Station Improvements (c)		100,000	104,000	108,200	112,500	117,000	541,700	121,700
17	General WWTP Improvements (c)		300,000	312,000	324,500	337,500	351,000	1,625,000	365,000
18	Sanitary Sewer Relocations (a)		1,000,000	312,000	500,000	337,500	351,000	2,500,500	365,000
20	Subtotal	0	1,400,000	728,000	932,700	787,500	819,000	4,667,200	851,700
22	Total	0	11,035,000	19,255,200	25,896,800	21,524,400	9,317,400	87,028,800	10,187,800

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

2013 CIP Scenario 2 - Reduced Water
10/22/2012

Water CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
1	Kaw WTP Supply Improvements (a) (c)							0	
	Oread Storage & BPS Replacement (c)							0	
	19th & Kasold Pump Station (b) (c)							0	
	Harper Booster Pump Station (b) (c)		0					0	
	Tower Protective Coatings (c)							0	1,822,063
	Kaw 36" WM to North Lawrence (One 30" river crossings) - Phase 1 (a) (c)							0	0
	Concrete Main Assessment (c)						0	0	0
2	Pipeline Replacement Program (c)	0	2,338,600	520,000	540,800	562,432	584,929	4,546,761	608,326
3	Water Main Relocation for Road Projects (a)		1,985,000	500,000	520,000	540,800	562,400	4,108,200	584,900
	Small Water Main Replacement Program (c)	0						0	
	Kaw Structural, Electrical, Process (b) (c)							0	
	Clinton Intake (a) (c)	0	0					0	
	Clinton Process (b) (c)							0	
	Clinton Basin Coatings (c)							0	
4	Plant Maintenance (c)		400,000	156,000	600,000	624,000	649,000	2,429,000	675,000
5	31st St. - extend 12" to O'Connell (a)		685,400					685,400	
6	31st St. & O'Connell - Extend 16" to WWTP (includes River crossing) (a)		1,852,700					1,852,700	
								0	
7	Bowersock Dam Improvements (c)		425,000					425,000	
	Clinton Backup Generator (15MGD) (a) (c)							0	
9	Total	0	7,686,700	1,176,000	1,660,800	1,727,232	1,796,329	14,047,061	3,690,289

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

Wastewater CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
	Collection System								
1	PS 32 Expansion & Force Main (a)		832,000					832,000	
2	21" Gravity Sewer to Eliminate PS 8 (c)						425,800	425,800	4,002,800
3	KR-5B 12" Relief Sewer (c)		0				973,300	973,300	
	KR-6B 21" Relief Sewer (c)	0	0					0	885,700
4	PS 23 Expansion (a) (c)	0	208,000	0				208,000	
5	Rapid I/I Reduction Program (b) (c)		1,872,000	2,720,200	2,829,000	2,942,200	3,059,900	13,423,300	3,182,300
6	Sewer Rehabilitation, Replacement, CIPP & MHs		416,000	432,600	449,900	467,900	486,700	2,253,100	1,265,300
8	Subtotal	0	3,328,000	3,152,800	3,278,900	3,410,100	4,945,700	18,115,500	9,336,100
	Treatment System								
	Kansas River WWTP								
9	Co-generation & Backup Power		600,000	481,600				1,081,600	
	Wakarusa River WWTP	0							
10	Wakarusa River WWTP Treatment Plant (a) (b)		3,784,000	6,489,600	10,686,200	11,698,600	2,920,000	35,578,400	
11	Wakarusa Peak Flow Storage (a) (b)		499,200		2,249,700	3,509,600	632,700	6,891,200	
12	Roads & Utilities (a) (b)		499,200	2,995,200	3,125,000			6,619,400	
13	Wakarusa PS 5C, 2 - 16" Force Mains (a) (b)		924,600	5,408,000	5,624,300	2,118,600		14,075,500	
14									
15	Subtotal	0	6,307,000	15,374,400	21,685,200	17,326,800	3,552,700	64,246,100	0
	Other							0	
16	General Pumping Station Improvements (c)		100,000	104,000	108,200	112,500	117,000	541,700	121,700
17	General WWTP Improvements (c)		300,000	312,000	324,500	337,500	351,000	1,625,000	365,000
18	Sanitary Sewer Relocations (a)		1,000,000	312,000	500,000	337,500	351,000	2,500,500	365,000
20	Subtotal	0	1,400,000	728,000	932,700	787,500	819,000	4,667,200	851,700
	Total	0	11,035,000	19,255,200	25,896,800	21,524,400	9,317,400	87,028,800	10,187,800

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

2013 CIP Scenario 3 - Deferred Maintenance/Reliability
10/22/2012

Water CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
1	Kaw WTP Supply Improvements (a) (c)		4,770,500					4,770,500	
2	Oread Storage & BPS Replacement (c)		1,248,000	2,704,600				3,952,600	
3	19th & Kasold Pump Station (b) (c)			411,000				411,000	
4	Harper Booster Pump Station (b) (c)		0		674,918			674,918	
5	Tower Protective Coatings (c)				1,124,864			1,124,864	1,822,063
6	Kaw 36" WM to North Lawrence (One 30" river crossings) - Phase 1 (a) (c)						9,167,500	9,167,500	0
7	Concrete Main Assessment (c)			648,960			0	648,960	0
8	Pipeline Replacement Program (c)	0	1,830,200	1,903,400	1,979,500	2,058,700	2,141,100	9,912,900	2,226,700
9	Water Main Relocation for Road Projects (a)		1,985,000	500,000	520,000	540,800	562,400	4,108,200	584,900
10	Small Water Main Replacement Program (c)	0	596,000	619,800	644,600	670,400	725,100	3,255,900	754,100
11	Kaw Structural, Electrical, Process (b) (c)		723,800	811,200		166,700		1,701,700	
12	Clinton Intake (a) (c)	0	0	1,297,900	517,400			1,815,300	
13	Clinton Process (b) (c)			108,200		187,200		295,400	
14	Clinton Basin Coatings (c)						1,374,800	1,374,800	
15	Plant Maintenance (c)		400,000	156,000	600,000	624,000	649,000	2,429,000	675,000
16	31st St. - extend 12" to O'Connell (a)		685,400					685,400	
17	31st St. & O'Connell - Extend 16" to WWTP (includes River crossing) (a)		1,852,700					1,852,700	
								0	
18	Bowersock Dam Improvements (c)		425,000					425,000	
19	Clinton Backup Generator (15MGD) (a) (c)						918,603	918,603	
21	Total	0	14,516,600	9,161,060	6,061,282	4,247,800	15,538,503	49,525,245	6,062,763

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

Wastewater CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
	Collection System								
1	PS 32 Expansion & Force Main (a)		832,000					832,000	
2	21" Gravity Sewer to Eliminate PS 8 (c)						425,800	425,800	4,002,800
3	KR-5B 12" Relief Sewer (c)		0				973,300	973,300	
	KR-6B 21" Relief Sewer (c)	0	0					0	885,700
4	PS 23 Expansion (a) (c)	0	208,000	0				208,000	
5	Rapid I/I Reduction Program (b) (c)		1,872,000	1,590,000	1,653,600	1,719,700	1,788,500	8,623,800	1,860,000
6	Sewer Rehabilitation, Replacement, CIPP & MHs		416,000	432,600	449,900	467,900	486,700	2,253,100	1,265,300
8	Subtotal	0	3,328,000	2,022,600	2,103,500	2,187,600	3,674,300	13,316,000	8,013,800
	Treatment System								
	Kansas River WWTP								
9	Co-generation & Backup Power				648,960	520,899		1,169,859	
	Wakarusa River WWTP	0							
10	Wakarusa River WWTP Treatment Plant (a) (b)		3,784,000	6,489,600	10,686,200	11,698,600	2,920,000	35,578,400	
11	Wakarusa Peak Flow Storage (a) (b)		499,200		2,249,700	3,509,600	632,700	6,891,200	
12	Roads & Utilities (a) (b)		499,200	2,995,200	3,125,000			6,619,400	
13	Wakarusa PS 5C, 2 - 16" Force Mains (a) (b)		924,600	5,408,000	5,624,300	2,118,600		14,075,500	
15	Subtotal	0	5,707,000	14,892,800	22,334,160	17,847,699	3,552,700	64,334,359	0
	Other								
								0	
16	General Pumping Station Improvements (c)		100,000	104,000	108,200	112,500	117,000	541,700	121,700
17	General WWTP Improvements (c)		300,000	312,000	324,500	337,500	351,000	1,625,000	365,000
18	Sanitary Sewer Relocations (a)		1,000,000	312,000	500,000	337,500	351,000	2,500,500	365,000
20	Subtotal	0	1,400,000	728,000	932,700	787,500	819,000	4,667,200	851,700
22	Total	0	10,435,000	17,643,400	25,370,360	20,822,799	8,046,000	82,317,559	8,865,500

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

2013 CIP Scenario 4 - Deferred Maintenance/Reliability & Wakarusa WWTP (Low Growth)
10/22/2012

Water CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
1	Kaw WTP Supply Improvements (a) (c)		4,770,500					4,770,500	
2	Oread Storage & BPS Replacement (c)		1,248,000	2,704,600				3,952,600	
3	19th & Kasold Pump Station (b) (c)			411,000				411,000	
4	Harper Booster Pump Station (b) (c)		0		674,918			674,918	
5	Tower Protective Coatings (c)				1,124,864			1,124,864	1,822,063
6	Kaw 36" WM to North Lawrence (One 30" river crossings) - Phase 1 (a) (c)						9,167,500	9,167,500	0
7	Concrete Main Assessment (c)			648,960			0	648,960	0
8	Pipeline Replacement Program (c)	0	1,830,200	1,903,400	1,979,500	2,058,700	2,141,100	9,912,900	2,226,700
9	Water Main Relocation for Road Projects (a)		1,985,000	500,000	520,000	540,800	562,400	4,108,200	584,900
10	Small Water Main Replacement Program (c)	0	596,000	619,800	644,600	670,400	725,100	3,255,900	754,100
11	Kaw Structural, Electrical, Process (b) (c)		723,800	811,200		166,700		1,701,700	
12	Clinton Intake (a) (c)	0	0	1,297,900	517,400			1,815,300	
13	Clinton Process (b) (c)			108,200		187,200		295,400	
14	Clinton Basin Coatings (c)						1,374,800	1,374,800	
15	Plant Maintenance (c)		400,000	156,000	600,000	624,000	649,000	2,429,000	675,000
16	31st St. - extend 12" to O'Connell (a)		685,400					685,400	
17	31st St. & O'Connell - Extend 16" to WWTP (includes River crossing) (a)		1,852,700					1,852,700	
								0	
18	Bowersock Dam Improvements (c)		425,000					425,000	
19	Clinton Backup Generator (15MGD) (a) (c)						918,603	918,603	
21	Total	0	14,516,600	9,161,060	6,061,282	4,247,800	15,538,503	49,525,245	6,062,763

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

Wastewater CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
	Collection System								
1	PS 32 Expansion & Force Main (a)		832,000					832,000	
2	21" Gravity Sewer to Eliminate PS 8 (c)						425,800	425,800	4,002,800
3	KR-5B 12" Relief Sewer (c)		0				973,300	973,300	
	KR-6B 21" Relief Sewer (c)	0	0					0	885,700
4	PS 23 Expansion (a) (c)	0	208,000	0				208,000	
5	Rapid I/I Reduction Program (b) (c)		1,872,000	1,590,000	1,653,600	1,719,700	1,788,500	8,623,800	1,860,000
6	Sewer Rehabilitaiton, Replacement, CIPP & MHs		416,000	432,600	449,900	467,900	486,700	2,253,100	1,265,300
8	Subtotal	0	3,328,000	2,022,600	2,103,500	2,187,600	3,674,300	13,316,000	8,013,800
	Treatment System								
	Kansas River WWTP								
9	Co-generation & Backup Power				648,960	520,899		1,169,859	
	Wakarusa River WWTP	0							
10	Wakarusa River WWTP Treatment Plant (a) (b)						4,155,000	4,155,000	7,591,900
11	Wakarusa Peak Flow Storage (a) (b)						584,000	584,000	
12	Roads & Utilities (a) (b)						584,000	584,000	3,796,000
13	Wakarusa PS 5C, 2 - 16" Force Mains (a) (b)						1,081,600	1,081,600	6,326,600
15	Subtotal	0	0	0	648,960	520,899	6,404,600	7,574,459	17,714,500
	Other								
								0	
16	General Pumping Station Improvements (c)		100,000	104,000	108,200	112,500	117,000	541,700	121,700
17	General WWTP Improvements (c)		300,000	312,000	324,500	337,500	351,000	1,625,000	365,000
18	Sanitary Sewer Relocations (a)		1,000,000	312,000	500,000	337,500	351,000	2,500,500	365,000
20	Subtotal	0	1,400,000	728,000	932,700	787,500	819,000	4,667,200	851,700
22	Total	0	4,728,000	2,750,600	3,685,160	3,495,999	10,897,900	25,557,659	26,580,000

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

2013 CIP Scenario 5 - Taste, Odor, & Microtoxins
10/22/2012

Water CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
1	Kaw WTP Supply Improvements (a) (c)		4,770,500					4,770,500	
2	Oread Storage & BPS Replacement (c)		1,248,000	2,704,600				3,952,600	
3	19th & Kasold Pump Station (b) (c)			411,000				411,000	
4	Harper Booster Pump Station (b) (c)		624,000					624,000	
5	Tower Protective Coatings (c)		1,040,000			1,684,600	876,000	3,600,600	
6	Kaw 36" WM to North Lawrence (One 30" river crossings) - Phase 1 (a) (c)		7,836,400				0	7,836,400	0
7	Concrete Main Assessment (c)			648,960			0	648,960	0
8	Pipeline Replacement Program (c)	0	2,338,600	2,432,100	2,529,400	2,630,600	2,735,800	12,666,500	2,845,200
9	Water Main Relocation for Road Projects (a)		1,985,000	500,000	520,000	540,800	562,400	4,108,200	584,900
10	Small Water Main Replacement Program (c)	0	968,500	1,007,200	1,047,500	1,089,400	1,133,000	5,245,600	1,178,300
11	Kaw Structural, Electrical, Process (b) (c)		723,800	811,200		166,700		1,701,700	
12	Clinton Intake (a) (c)	0	0	1,297,900	517,400			1,815,300	
13	Clinton Process (b) (c)			108,200		187,200		295,400	
14	Clinton Basin Coatings (c)						1,374,800	1,374,800	
15	Plant Maintenance (c)		150,000	156,000	600,000	624,000	649,000	2,179,000	675,000
16	31st St. - extend 12" to O'Connell (a)		685,400					685,400	
17	31st St. & O'Connell - Extend 16" to WWTP (includes River crossing) (a)		1,852,700					1,852,700	
18	Taste & Odor and Microtoxins at Clinton & Kaw WTPs		1,440,000	17,900,000				19,340,000	
19	Bowersock Dam Improvements (c)		425,000					425,000	
20	Clinton Backup Generator (15MGD) (a) (c)				849,300			849,300	
22	Total	0	26,087,900	27,977,160	6,063,600	6,923,300	7,331,000	74,382,960	5,283,400

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

Wastewater CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
	Collection System								
1	PS 32 Expansion & Force Main (a)		832,000					832,000	
2	21" Gravity Sewer to Eliminate PS 8 (c)						425,800	425,800	4,002,800
3	KR-5B 12" Relief Sewer (c)		0				973,300	973,300	
	KR-6B 21" Relief Sewer (c)	**0**	0					0	885,700
4	PS 23 Expansion (a) (c)	**0**	208,000	0				208,000	
5	Rapid I/I Reduction Program (b) (c)		1,872,000	2,720,200	2,829,000	2,942,200	3,059,900	13,423,300	3,182,300
6	Sewer Rehabilitation, Replacement, CIPP & MHs		416,000	432,600	449,900	467,900	486,700	2,253,100	1,265,300
8	Subtotal	0	3,328,000	3,152,800	3,278,900	3,410,100	4,945,700	18,115,500	9,336,100
	Treatment System								
	Kansas River WWTP								
9	Co-generation & Backup Power		600,000	481,600				1,081,600	
	Wakarusa River WWTP	**0**							
10	Wakarusa River WWTP Treatment Plant (a) (b)		3,784,000	6,489,600	10,686,200	11,698,600	2,920,000	35,578,400	
11	Wakarusa Peak Flow Storage (a) (b)		499,200		2,249,700	3,509,600	632,700	6,891,200	
12	Roads & Utilities (a) (b)		499,200	2,995,200	3,125,000			6,619,400	
13	Wakarusa PS 5C, 2 - 16" Force Mains (a) (b)		924,600	5,408,000	5,624,300	2,118,600		14,075,500	
15	Subtotal	0	6,307,000	15,374,400	21,685,200	17,326,800	3,552,700	64,246,100	0
	Other							0	
16	General Pumping Station Improvements (c)		100,000	104,000	108,200	112,500	117,000	541,700	121,700
17	General WWTP Improvements (c)		300,000	312,000	324,500	337,500	351,000	1,625,000	365,000
18	Sanitary Sewer Relocations (a)		1,000,000	312,000	500,000	337,500	351,000	2,500,500	365,000
20	Subtotal	0	1,400,000	728,000	932,700	787,500	819,000	4,667,200	851,700
22	Total	0	11,035,000	19,255,200	25,896,800	21,524,400	9,317,400	87,028,800	10,187,800

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

2013 CIP Scenario 6 - Delay Wakarusa WWTP & Accelerate Rapid I/I
10/23/2012

Water CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
1	Kaw WTP Supply Improvements (a) (c)		4,770,500					4,770,500	
2	Oread Storage & BPS Replacement (c)		1,248,000	2,704,600				3,952,600	
3	19th & Kasold Pump Station (b) (c)			411,000				411,000	
4	Harper Booster Pump Station (b) (c)		624,000					624,000	
5	Tower Protective Coatings (c)		1,040,000			1,684,600	876,000	3,600,600	
6	Kaw 36" WM to North Lawrence (One 30" river crossings) - Phase 1 (a) (c)		7,836,400				0	7,836,400	0
7	Concrete Main Assessment (c)			648,960			0	648,960	0
8	Pipeline Replacement Program (c)	0	2,338,600	2,432,100	2,529,400	2,630,600	2,735,800	12,666,500	2,845,200
9	Water Main Relocation for Road Projects (a)		1,985,000	500,000	520,000	540,800	562,400	4,108,200	584,900
10	Small Water Main Replacement Program (c)	0	968,500	1,007,200	1,047,500	1,089,400	1,133,000	5,245,600	1,178,300
11	Kaw Structural, Electrical, Process (b) (c)		723,800	811,200		166,700		1,701,700	
12	Clinton Intake (a) (c)	0	0	1,297,900	517,400			1,815,300	
13	Clinton Process (b) (c)			108,200		187,200		295,400	
14	Clinton Basin Coatings (c)						1,374,800	1,374,800	
15	Plant Maintenance (c)		150,000	156,000	600,000	624,000	649,000	2,179,000	675,000
16	31st St. - extend 12" to O'Connell (a)		685,400					685,400	
17	31st St. & O'Connell - Extend 16" to WWTP (includes River crossing) (a)		1,852,700					1,852,700	
								0	
18	Bowersock Dam Improvements (c)		425,000					425,000	
19	Clinton Backup Generator (15MGD) (a) (c)				849,300			849,300	
21	Total	0	24,647,900	10,077,160	6,063,600	6,923,300	7,331,000	55,042,960	5,283,400

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

Wastewater CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
	Collection System								
1	PS 32 Expansion & Force Main (a)		832,000					832,000	
2	21" Gravity Sewer to Eliminate PS 8 (c)						425,800	425,800	4,002,800
3	KR-5B 12" Relief Sewer (c)		0				973,300	973,300	
	KR-6B 21" Relief Sewer (c)	0	0					0	885,700
4	PS 23 Expansion (a) (c)	0	208,000	0				208,000	
5	Rapid I/I Reduction Program (b) (c)		1,872,000	4,759,000	4,949,400	5,147,400	5,353,300	22,081,100	
6	Sewer Rehabilitation, Replacement, CIPP & MHs		416,000	432,600	449,900	467,900	486,700	2,253,100	1,265,300
8	Subtotal	0	3,328,000	5,191,600	5,399,300	5,615,300	7,239,100	26,773,300	6,153,800
	Treatment System								
	Kansas River WWTP								
9	Co-generation & Backup Power		600,000	481,600				1,081,600	
	Wakarusa River WWTP	0							
10	Wakarusa River WWTP Treatment Plant (a) (b)					4,056,700	7,299,900	11,356,600	12,020,500
11	Wakarusa Peak Flow Storage (a) (b)					561,500		561,500	2,530,600
12	Roads & Utilities (a) (b)					561,500	3,650,000	4,211,500	3,796,000
13	Wakarusa PS 5C, 2 - 16" Force Mains (a) (b)					1,040,000	6,083,300	7,123,300	6,326,600
15	Subtotal	0	600,000	481,600	0	6,219,700	17,033,200	24,334,500	24,673,700
	Other								
								0	
16	General Pumping Station Improvements (c)		100,000	104,000	108,200	112,500	117,000	541,700	121,700
17	General WWTP Improvements (c)		300,000	312,000	324,500	337,500	351,000	1,625,000	365,000
18	Sanitary Sewer Relocations (a)		1,000,000	312,000	500,000	337,500	351,000	2,500,500	365,000
19									
20	Subtotal	0	1,400,000	728,000	932,700	787,500	819,000	4,667,200	851,700
22	Total	0	5,328,000	6,401,200	6,332,000	12,622,500	25,091,300	55,775,000	31,679,200

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

2013 CIP Scenario 7 - Roadway Relocations Only - No Wakarusa WWTP
10/22/2012

Water CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
1	Kaw WTP Supply Improvements (a) (c)							0	
	Oread Storage & BPS Replacement (c)							0	
	19th & Kasold Pump Station (b) (c)							0	
	Harper Booster Pump Station (b) (c)		0					0	
	Tower Protective Coatings (c)							0	
	Kaw 36" WM to North Lawrence (One 30" river crossings) - Phase 1 (a) (c)							0	0
	Concrete Main Assessment (c)						0	0	0
	Pipeline Replacement Program (c)	0						0	
2	Water Main Relocation for Road Projects (a)		1,985,000	500,000	520,000	540,800	562,400	4,108,200	584,900
	Small Water Main Replacement Program (c)	0						0	
	Kaw Structural, Electrical, Process (b) (c)							0	
	Clinton Intake (a) (c)	0	0					0	
	Clinton Process (b) (c)							0	
	Clinton Basin Coatings (c)							0	
	Plant Maintenance (c)							0	
	31st St. - extend 12" to O'Connell (a)							0	
	31st St. & O'Connell - Extend 16" to WWTP (includes River crossing) (a)							0	
								0	
3	Bowersock Dam Improvements (c)		425,000					425,000	
	Clinton Backup Generator (15MGD) (a) (c)							0	
5	Total	0	2,410,000	500,000	520,000	540,800	562,400	4,533,200	584,900

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

Wastewater CIP

Line No.	Description	2012	2013	2014	2015	2016	2017	Total	2018
		$	$	$	$	$	$	$	$
	Collection System								
1	PS 32 Expansion & Force Main (a)							0	
	21" Gravity Sewer to Eliminate PS 8 (c)							0	
	KR-5B 12" Relief Sewer (c)		0					0	
	KR-6B 21" Relief Sewer (c)	**0**	0					0	
	PS 23 Expansion (a) (c)	**0**		0				0	
	Rapid I/I Reduction Program (b) (c)							0	
	Sewer Rehabilitation, Replacement, CIPP & MHs							0	
	Subtotal	0	0	0	0	0	0	0	0
	Treatment System								
	Kansas River WWTP								
	Co-generation & Backup Power							0	
	Wakarusa River WWTP	**0**							
	Wakarusa River WWTP Treatment Plant (a) (b)							0	
	Wakarusa Peak Flow Storage (a) (b)							0	
	Roads & Utilities (a) (b)							0	
	Wakarusa PS 5C, 2 - 16" Force Mains (a) (b)							0	
3									
	Subtotal	0	0	0	0	0	0	0	0
	Other								
								0	
	General Pumping Station Improvements (c)							0	
	General WWTP Improvements (c)							0	
4	Sanitary Sewer Relocations (a)		1,000,000	312,000	500,000	337,500	351,000	2,500,500	365,000
6	Subtotal	0	1,000,000	312,000	500,000	337,500	351,000	2,500,500	365,000
	Total	0	1,000,000	312,000	500,000	337,500	351,000	2,500,500	365,000

(a) Project required to meet anticipated growth related requirements.
(b) Project required by EPA and KDHE regulations.
(c) Project required to improve system reliability or transmission capacity.

Appendix II – Rate Tables for CIP Scenarios

Scenario 1 – Recommended

Comparison of Typical Monthly Bills
Under Existing and Proposed 2013 Rates - Scenario 1

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	9.29	12.44	3.15	10.22	13.37	0.93	7.5%
5/8	1	6.93	14.31	21.24	7.31	15.33	22.64	1.40	6.6%
5/8	2	10.71	19.33	30.04	11.47	20.44	31.91	1.87	6.2%
5/8	4	18.27	29.37	47.64	19.79	30.66	50.45	2.81	5.9%
5/8	6	25.83	39.41	65.24	28.11	40.88	68.99	3.75	5.7%
5/8	10	40.95	59.49	100.44	44.75	61.32	106.07	5.63	5.6%
5/8	15	59.85	84.59	144.44	65.55	86.87	152.42	7.98	5.5%
5/8	20	78.75	109.69	188.44	86.35	112.42	198.77	10.33	5.5%
Multifamily									
5/8	0	3.15	9.29	12.44	3.15	10.22	13.37	0.93	7.5%
5/8	1	6.44	14.31	20.75	6.41	15.33	21.74	0.99	4.8%
5/8	2	9.73	19.33	29.06	9.67	20.44	30.11	1.05	3.6%
5/8	4	16.31	29.37	45.68	16.19	30.66	46.85	1.17	2.6%
5/8	6	22.89	39.41	62.30	22.71	40.88	63.59	1.29	2.1%
5/8	10	36.05	59.49	95.54	35.75	61.32	97.07	1.53	1.6%
5/8	15	52.50	84.59	137.09	52.05	86.87	138.92	1.83	1.3%
5/8	20	68.95	109.69	178.64	68.35	112.42	180.77	2.13	1.2%
Commercial									
2	50	153.80	260.29	414.09	170.00	265.72	435.72	21.63	5.2%
2	100	301.80	511.29	813.09	334.50	521.22	855.72	42.63	5.2%
3	200	609.00	1,013.29	1,622.29	673.50	1,032.22	1,705.72	83.43	5.1%
3	300	905.00	1,515.29	2,420.29	1,002.50	1,543.22	2,545.72	125.43	5.2%
4	500	1,501.00	2,519.29	4,020.29	1,664.50	2,565.22	4,229.72	209.43	5.2%
4	1000	2,981.00	5,029.29	8,010.29	3,309.50	5,120.22	8,429.72	419.43	5.2%
Industrial									
3	200	591.00	1,013.29	1,604.29	589.50	1,032.22	1,621.72	17.43	1.1%
3	300	878.00	1,515.29	2,393.29	876.50	1,543.22	2,419.72	26.43	1.1%
4	2500	7,196.00	12,559.29	19,755.29	7,194.50	12,785.22	19,979.72	224.43	1.1%
6	5000	14,381.00	25,109.29	39,490.29	14,378.00	25,560.22	39,938.22	447.93	1.1%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2013 and Proposed 2014 Rates - Scenario 1

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water $	Wastewater $	Combined $	Water $	Wastewater $	Combined $	$	
Residential									
5/8	0	3.15	10.22	13.37	3.15	10.35	13.50	0.13	1.0%
5/8	1	7.31	15.33	22.64	7.56	15.51	23.07	0.43	1.9%
5/8	2	11.47	20.44	31.91	11.97	20.67	32.64	0.73	2.3%
5/8	4	19.79	30.66	50.45	20.79	30.99	51.78	1.33	2.6%
5/8	6	28.11	40.88	68.99	29.61	41.31	70.92	1.93	2.8%
5/8	10	44.75	61.32	106.07	47.25	61.95	109.20	3.13	3.0%
5/8	15	65.55	86.87	152.42	69.30	87.75	157.05	4.63	3.0%
5/8	20	86.35	112.42	198.77	91.35	113.55	204.90	6.13	3.1%
Multifamily									
5/8	0	3.15	10.22	13.37	3.15	10.35	13.50	0.13	1.0%
5/8	1	6.41	15.33	21.74	6.49	15.51	22.00	0.26	1.2%
5/8	2	9.67	20.44	30.11	9.83	20.67	30.50	0.39	1.3%
5/8	4	16.19	30.66	46.85	16.51	30.99	47.50	0.65	1.4%
5/8	6	22.71	40.88	63.59	23.19	41.31	64.50	0.91	1.4%
5/8	10	35.75	61.32	97.07	36.55	61.95	98.50	1.43	1.5%
5/8	15	52.05	86.87	138.92	53.25	87.75	141.00	2.08	1.5%
5/8	20	68.35	112.42	180.77	69.95	113.55	183.50	2.73	1.5%
Commercial									
2	50	170.00	265.72	435.72	181.60	268.35	449.95	14.23	3.3%
2	100	334.50	521.22	855.72	357.60	526.35	883.95	28.23	3.3%
3	200	673.50	1,032.22	1,705.72	720.00	1,042.35	1,762.35	56.63	3.3%
3	300	1,002.50	1,543.22	2,545.72	1,072.00	1,558.35	2,630.35	84.63	3.3%
4	500	1,664.50	2,565.22	4,229.72	1,780.00	2,590.35	4,370.35	140.63	3.3%
4	1000	3,309.50	5,120.22	8,429.72	3,540.00	5,170.35	8,710.35	280.63	3.3%
Industrial									
3	200	589.50	1,032.22	1,621.72	610.00	1,042.35	1,652.35	30.63	1.9%
3	300	876.50	1,543.22	2,419.72	907.00	1,558.35	2,465.35	45.63	1.9%
4	2500	7,194.50	12,785.22	19,979.72	7,445.00	12,910.35	20,355.35	375.63	1.9%
6	5000	14,378.00	25,560.22	39,938.22	14,879.00	25,810.35	40,689.35	751.13	1.9%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2014 and Proposed 2015 Rates - Scenario 1

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.35	13.50	3.30	10.88	14.18	0.68	5.0%
5/8	1	7.56	15.51	23.07	7.97	16.37	24.34	1.27	5.5%
5/8	2	11.97	20.67	32.64	12.64	21.86	34.50	1.86	5.7%
5/8	4	20.79	30.99	51.78	21.98	32.84	54.82	3.04	5.9%
5/8	6	29.61	41.31	70.92	31.32	43.82	75.14	4.22	6.0%
5/8	10	47.25	61.95	109.20	50.00	65.78	115.78	6.58	6.0%
5/8	15	69.30	87.75	157.05	73.35	93.23	166.58	9.53	6.1%
5/8	20	91.35	113.55	204.90	96.70	120.68	217.38	12.48	6.1%
Multifamily									
5/8	0	3.15	10.35	13.50	3.30	10.88	14.18	0.68	5.0%
5/8	1	6.49	15.51	22.00	6.79	16.37	23.16	1.16	5.3%
5/8	2	9.83	20.67	30.50	10.28	21.86	32.14	1.64	5.4%
5/8	4	16.51	30.99	47.50	17.26	32.84	50.10	2.60	5.5%
5/8	6	23.19	41.31	64.50	24.24	43.82	68.06	3.56	5.5%
5/8	10	36.55	61.95	98.50	38.20	65.78	103.98	5.48	5.6%
5/8	15	53.25	87.75	141.00	55.65	93.23	148.88	7.88	5.6%
5/8	20	69.95	113.55	183.50	73.10	120.68	193.78	10.28	5.6%
Commercial									
2	50	181.60	268.35	449.95	192.80	285.38	478.18	28.23	6.3%
2	100	357.60	526.35	883.95	379.80	559.88	939.68	55.73	6.3%
3	200	720.00	1,042.35	1,762.35	765.00	1,108.88	1,873.88	111.53	6.3%
3	300	1,072.00	1,558.35	2,630.35	1,139.00	1,657.88	2,796.88	166.53	6.3%
4	500	1,780.00	2,590.35	4,370.35	1,891.00	2,755.88	4,646.88	276.53	6.3%
4	1000	3,540.00	5,170.35	8,710.35	3,761.00	5,500.88	9,261.88	551.53	6.3%
Industrial									
3	200	610.00	1,042.35	1,652.35	649.00	1,108.88	1,757.88	105.53	6.4%
3	300	907.00	1,558.35	2,465.35	965.00	1,657.88	2,622.88	157.53	6.4%
4	2500	7,445.00	12,910.35	20,355.35	7,921.00	13,735.88	21,656.88	1,301.53	6.4%
6	5000	14,879.00	25,810.35	40,689.35	15,830.00	27,460.88	43,290.88	2,601.53	6.4%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2015 and Proposed 2016 Rates - Scenario 1

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.30	10.88	14.18	3.40	11.29	14.69	0.51	3.6%
5/8	1	7.97	16.37	24.34	8.35	17.08	25.43	1.09	4.5%
5/8	2	12.64	21.86	34.50	13.30	22.87	36.17	1.67	4.8%
5/8	4	21.98	32.84	54.82	23.20	34.45	57.65	2.83	5.2%
5/8	6	31.32	43.82	75.14	33.10	46.03	79.13	3.99	5.3%
5/8	10	50.00	65.78	115.78	52.90	69.19	122.09	6.31	5.4%
5/8	15	73.35	93.23	166.58	77.65	98.14	175.79	9.21	5.5%
5/8	20	96.70	120.68	217.38	102.40	127.09	229.49	12.11	5.6%
Multifamily									
5/8	0	3.30	10.88	14.18	3.40	11.29	14.69	0.51	3.6%
5/8	1	6.79	16.37	23.16	7.12	17.08	24.20	1.04	4.5%
5/8	2	10.28	21.86	32.14	10.84	22.87	33.71	1.57	4.9%
5/8	4	17.26	32.84	50.10	18.28	34.45	52.73	2.63	5.2%
5/8	6	24.24	43.82	68.06	25.72	46.03	71.75	3.69	5.4%
5/8	10	38.20	65.78	103.98	40.60	69.19	109.79	5.81	5.6%
5/8	15	55.65	93.23	148.88	59.20	98.14	157.34	8.46	5.7%
5/8	20	73.10	120.68	193.78	77.80	127.09	204.89	11.11	5.7%
Commercial									
2	50	192.80	285.38	478.18	204.50	300.79	505.29	27.11	5.7%
2	100	379.80	559.88	939.68	403.00	590.29	993.29	53.61	5.7%
3	200	765.00	1,108.88	1,873.88	811.50	1,169.29	1,980.79	106.91	5.7%
3	300	1,139.00	1,657.88	2,796.88	1,208.50	1,748.29	2,956.79	159.91	5.7%
4	500	1,891.00	2,755.88	4,646.88	2,006.50	2,906.29	4,912.79	265.91	5.7%
4	1000	3,761.00	5,500.88	9,261.88	3,991.50	5,801.29	9,792.79	530.91	5.7%
Industrial									
3	200	649.00	1,108.88	1,757.88	691.50	1,169.29	1,860.79	102.91	5.9%
3	300	965.00	1,657.88	2,622.88	1,028.50	1,748.29	2,776.79	153.91	5.9%
4	2500	7,921.00	13,735.88	21,656.88	8,446.50	14,486.29	22,932.79	1,275.91	5.9%
6	5000	15,830.00	27,460.88	43,290.88	16,881.00	28,961.29	45,842.29	2,551.41	5.9%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2016 and Proposed 2017 Rates - Scenario 1

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.40	11.29	14.69	3.50	11.88	15.38	0.69	4.7%
5/8	1	8.35	17.08	25.43	8.83	18.03	26.86	1.43	5.6%
5/8	2	13.30	22.87	36.17	14.16	24.18	38.34	2.17	6.0%
5/8	4	23.20	34.45	57.65	24.82	36.48	61.30	3.65	6.3%
5/8	6	33.10	46.03	79.13	35.48	48.78	84.26	5.13	6.5%
5/8	10	52.90	69.19	122.09	56.80	73.38	130.18	8.09	6.6%
5/8	15	77.65	98.14	175.79	83.45	104.13	187.58	11.79	6.7%
5/8	20	102.40	127.09	229.49	110.10	134.88	244.98	15.49	6.7%
Multifamily									
5/8	0	3.40	11.29	14.69	3.50	11.88	15.38	0.69	4.7%
5/8	1	7.12	17.08	24.20	7.50	18.03	25.53	1.33	5.5%
5/8	2	10.84	22.87	33.71	11.50	24.18	35.68	1.97	5.8%
5/8	4	18.28	34.45	52.73	19.50	36.48	55.98	3.25	6.2%
5/8	6	25.72	46.03	71.75	27.50	48.78	76.28	4.53	6.3%
5/8	10	40.60	69.19	109.79	43.50	73.38	116.88	7.09	6.5%
5/8	15	59.20	98.14	157.34	63.50	104.13	167.63	10.29	6.5%
5/8	20	77.80	127.09	204.89	83.50	134.88	218.38	13.49	6.6%
Commercial									
2	50	204.50	300.79	505.29	220.70	319.38	540.08	34.79	6.9%
2	100	403.00	590.29	993.29	435.20	626.88	1,062.08	68.79	6.9%
3	200	811.50	1,169.29	1,980.79	876.00	1,241.88	2,117.88	137.09	6.9%
3	300	1,208.50	1,748.29	2,956.79	1,305.00	1,856.88	3,161.88	205.09	6.9%
4	500	2,006.50	2,906.29	4,912.79	2,167.50	3,086.88	5,254.38	341.59	7.0%
4	1000	3,991.50	5,801.29	9,792.79	4,312.50	6,161.88	10,474.38	681.59	7.0%
Industrial									
3	200	691.50	1,169.29	1,860.79	744.00	1,241.88	1,985.88	125.09	6.7%
3	300	1,028.50	1,748.29	2,776.79	1,107.00	1,856.88	2,963.88	187.09	6.7%
4	2500	8,446.50	14,486.29	22,932.79	9,097.50	15,386.88	24,484.38	1,551.59	6.8%
6	5000	16,881.00	28,961.29	45,842.29	18,182.00	30,761.88	48,943.88	3,101.59	6.8%

The charges shown are for customers inside the City Limits.

Scenario 2 – Reduced Water

Comparison of Typical Monthly Bills
Under Existing and Proposed 2013 Rates - Scenario 2

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	9.29	12.44	3.15	10.22	13.37	0.93	7.5%
5/8	1	6.93	14.31	21.24	7.31	15.33	22.64	1.40	6.6%
5/8	2	10.71	19.33	30.04	11.47	20.44	31.91	1.87	6.2%
5/8	4	18.27	29.37	47.64	19.79	30.66	50.45	2.81	5.9%
5/8	6	25.83	39.41	65.24	28.11	40.88	68.99	3.75	5.7%
5/8	10	40.95	59.49	100.44	44.75	61.32	106.07	5.63	5.6%
5/8	15	59.85	84.59	144.44	65.55	86.87	152.42	7.98	5.5%
5/8	20	78.75	109.69	188.44	86.35	112.42	198.77	10.33	5.5%
Multifamily									
5/8	0	3.15	9.29	12.44	3.15	10.22	13.37	0.93	7.5%
5/8	1	6.44	14.31	20.75	6.41	15.33	21.74	0.99	4.8%
5/8	2	9.73	19.33	29.06	9.67	20.44	30.11	1.05	3.6%
5/8	4	16.31	29.37	45.68	16.19	30.66	46.85	1.17	2.6%
5/8	6	22.89	39.41	62.30	22.71	40.88	63.59	1.29	2.1%
5/8	10	36.05	59.49	95.54	35.75	61.32	97.07	1.53	1.6%
5/8	15	52.50	84.59	137.09	52.05	86.87	138.92	1.83	1.3%
5/8	20	68.95	109.69	178.64	68.35	112.42	180.77	2.13	1.2%
Commercial									
2	50	153.80	260.29	414.09	170.00	265.72	435.72	21.63	5.2%
2	100	301.80	511.29	813.09	334.50	521.22	855.72	42.63	5.2%
3	200	609.00	1,013.29	1,622.29	673.50	1,032.22	1,705.72	83.43	5.1%
3	300	905.00	1,515.29	2,420.29	1,002.50	1,543.22	2,545.72	125.43	5.2%
4	500	1,501.00	2,519.29	4,020.29	1,664.50	2,565.22	4,229.72	209.43	5.2%
4	1000	2,981.00	5,029.29	8,010.29	3,309.50	5,120.22	8,429.72	419.43	5.2%
Industrial									
3	200	591.00	1,013.29	1,604.29	589.50	1,032.22	1,621.72	17.43	1.1%
3	300	878.00	1,515.29	2,393.29	876.50	1,543.22	2,419.72	26.43	1.1%
4	2500	7,196.00	12,559.29	19,755.29	7,194.50	12,785.22	19,979.72	224.43	1.1%
6	5000	14,381.00	25,109.29	39,490.29	14,378.00	25,560.22	39,938.22	447.93	1.1%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2013 and Proposed 2014 Rates - Scenario 2

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.22	13.37	3.15	10.35	13.50	0.13	1.0%
5/8	1	7.31	15.33	22.64	7.45	15.51	22.96	0.32	1.4%
5/8	2	11.47	20.44	31.91	11.75	20.67	32.42	0.51	1.6%
5/8	4	19.79	30.66	50.45	20.35	30.99	51.34	0.89	1.8%
5/8	6	28.11	40.88	68.99	28.95	41.31	70.26	1.27	1.8%
5/8	10	44.75	61.32	106.07	46.15	61.95	108.10	2.03	1.9%
5/8	15	65.55	86.87	152.42	67.65	87.75	155.40	2.98	2.0%
5/8	20	86.35	112.42	198.77	89.15	113.55	202.70	3.93	2.0%
Multifamily									
5/8	0	3.15	10.22	13.37	3.15	10.35	13.50	0.13	1.0%
5/8	1	6.41	15.33	21.74	6.43	15.51	21.94	0.20	0.9%
5/8	2	9.67	20.44	30.11	9.71	20.67	30.38	0.27	0.9%
5/8	4	16.19	30.66	46.85	16.27	30.99	47.26	0.41	0.9%
5/8	6	22.71	40.88	63.59	22.83	41.31	64.14	0.55	0.9%
5/8	10	35.75	61.32	97.07	35.95	61.95	97.90	0.83	0.9%
5/8	15	52.05	86.87	138.92	52.35	87.75	140.10	1.18	0.8%
5/8	20	68.35	112.42	180.77	68.75	113.55	182.30	1.53	0.8%
Commercial									
2	50	170.00	265.72	435.72	177.60	268.35	445.95	10.23	2.3%
2	100	334.50	521.22	855.72	349.60	526.35	875.95	20.23	2.4%
3	200	673.50	1,032.22	1,705.72	704.00	1,042.35	1,746.35	40.63	2.4%
3	300	1,002.50	1,543.22	2,545.72	1,048.00	1,558.35	2,606.35	60.63	2.4%
4	500	1,664.50	2,565.22	4,229.72	1,740.00	2,590.35	4,330.35	100.63	2.4%
4	1000	3,309.50	5,120.22	8,429.72	3,460.00	5,170.35	8,630.35	200.63	2.4%
Industrial									
3	200	589.50	1,032.22	1,621.72	596.00	1,042.35	1,638.35	16.63	1.0%
3	300	876.50	1,543.22	2,419.72	886.00	1,558.35	2,444.35	24.63	1.0%
4	2500	7,194.50	12,785.22	19,979.72	7,270.00	12,910.35	20,180.35	200.63	1.0%
6	5000	14,378.00	25,560.22	39,938.22	14,529.00	25,810.35	40,339.35	401.13	1.0%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2014 and Proposed 2015 Rates - Scenario 2

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.35	13.50	3.25	10.88	14.13	0.63	4.7%
5/8	1	7.45	15.51	22.96	7.67	16.37	24.04	1.08	4.7%
5/8	2	11.75	20.67	32.42	12.09	21.86	33.95	1.53	4.7%
5/8	4	20.35	30.99	51.34	20.93	32.84	53.77	2.43	4.7%
5/8	6	28.95	41.31	70.26	29.77	43.82	73.59	3.33	4.7%
5/8	10	46.15	61.95	108.10	47.45	65.78	113.23	5.13	4.7%
5/8	15	67.65	87.75	155.40	69.55	93.23	162.78	7.38	4.7%
5/8	20	89.15	113.55	202.70	91.65	120.68	212.33	9.63	4.8%
Multifamily									
5/8	0	3.15	10.35	13.50	3.25	10.88	14.13	0.63	4.7%
5/8	1	6.43	15.51	21.94	6.59	16.37	22.96	1.02	4.6%
5/8	2	9.71	20.67	30.38	9.93	21.86	31.79	1.41	4.6%
5/8	4	16.27	30.99	47.26	16.61	32.84	49.45	2.19	4.6%
5/8	6	22.83	41.31	64.14	23.29	43.82	67.11	2.97	4.6%
5/8	10	35.95	61.95	97.90	36.65	65.78	102.43	4.53	4.6%
5/8	15	52.35	87.75	140.10	53.35	93.23	146.58	6.48	4.6%
5/8	20	68.75	113.55	182.30	70.05	120.68	190.73	8.43	4.6%
Commercial									
2	50	177.60	268.35	445.95	182.80	285.38	468.18	22.23	5.0%
2	100	349.60	526.35	875.95	359.80	559.88	919.68	43.73	5.0%
3	200	704.00	1,042.35	1,746.35	724.50	1,108.88	1,833.38	87.03	5.0%
3	300	1,048.00	1,558.35	2,606.35	1,078.50	1,657.88	2,736.38	130.03	5.0%
4	500	1,740.00	2,590.35	4,330.35	1,790.50	2,755.88	4,546.38	216.03	5.0%
4	1000	3,460.00	5,170.35	8,630.35	3,560.50	5,500.88	9,061.38	431.03	5.0%
Industrial									
3	200	596.00	1,042.35	1,638.35	612.50	1,108.88	1,721.38	83.03	5.1%
3	300	886.00	1,558.35	2,444.35	910.50	1,657.88	2,568.38	124.03	5.1%
4	2500	7,270.00	12,910.35	20,180.35	7,470.50	13,735.88	21,206.38	1,026.03	5.1%
6	5000	14,529.00	25,810.35	40,339.35	14,930.00	27,460.88	42,390.88	2,051.53	5.1%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2015 and Proposed 2016 Rates - Scenario 2

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.25	10.88	14.13	3.35	11.29	14.64	0.51	3.6%
5/8	1	7.67	16.37	24.04	7.90	17.08	24.98	0.94	3.9%
5/8	2	12.09	21.86	33.95	12.45	22.87	35.32	1.37	4.0%
5/8	4	20.93	32.84	53.77	21.55	34.45	56.00	2.23	4.1%
5/8	6	29.77	43.82	73.59	30.65	46.03	76.68	3.09	4.2%
5/8	10	47.45	65.78	113.23	48.85	69.19	118.04	4.81	4.2%
5/8	15	69.55	93.23	162.78	71.60	98.14	169.74	6.96	4.3%
5/8	20	91.65	120.68	212.33	94.35	127.09	221.44	9.11	4.3%
Multifamily									
5/8	0	3.25	10.88	14.13	3.35	11.29	14.64	0.51	3.6%
5/8	1	6.59	16.37	22.96	6.77	17.08	23.85	0.89	3.9%
5/8	2	9.93	21.86	31.79	10.19	22.87	33.06	1.27	4.0%
5/8	4	16.61	32.84	49.45	17.03	34.45	51.48	2.03	4.1%
5/8	6	23.29	43.82	67.11	23.87	46.03	69.90	2.79	4.2%
5/8	10	36.65	65.78	102.43	37.55	69.19	106.74	4.31	4.2%
5/8	15	53.35	93.23	146.58	54.65	98.14	152.79	6.21	4.2%
5/8	20	70.05	120.68	190.73	71.75	127.09	198.84	8.11	4.3%
Commercial									
2	50	182.80	285.38	468.18	188.40	300.79	489.19	21.01	4.5%
2	100	359.80	559.88	919.68	370.90	590.29	961.19	41.51	4.5%
3	200	724.50	1,108.88	1,833.38	747.00	1,169.29	1,916.29	82.91	4.5%
3	300	1,078.50	1,657.88	2,736.38	1,112.00	1,748.29	2,860.29	123.91	4.5%
4	500	1,790.50	2,755.88	4,546.38	1,846.00	2,906.29	4,752.29	205.91	4.5%
4	1000	3,560.50	5,500.88	9,061.38	3,671.00	5,801.29	9,472.29	410.91	4.5%
Industrial									
3	200	612.50	1,108.88	1,721.38	633.00	1,169.29	1,802.29	80.91	4.7%
3	300	910.50	1,657.88	2,568.38	941.00	1,748.29	2,689.29	120.91	4.7%
4	2500	7,470.50	13,735.88	21,206.38	7,721.00	14,486.29	22,207.29	1,000.91	4.7%
6	5000	14,930.00	27,460.88	42,390.88	15,431.00	28,961.29	44,392.29	2,001.41	4.7%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2016 and Proposed 2017 Rates - Scenario 2

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.35	11.29	14.64	3.45	11.88	15.33	0.69	4.7%
5/8	1	7.90	17.08	24.98	8.13	18.03	26.16	1.18	4.7%
5/8	2	12.45	22.87	35.32	12.81	24.18	36.99	1.67	4.7%
5/8	4	21.55	34.45	56.00	22.17	36.48	58.65	2.65	4.7%
5/8	6	30.65	46.03	76.68	31.53	48.78	80.31	3.63	4.7%
5/8	10	48.85	69.19	118.04	50.25	73.38	123.63	5.59	4.7%
5/8	15	71.60	98.14	169.74	73.65	104.13	177.78	8.04	4.7%
5/8	20	94.35	127.09	221.44	97.05	134.88	231.93	10.49	4.7%
Multifamily									
5/8	0	3.35	11.29	14.64	3.45	11.88	15.33	0.69	4.7%
5/8	1	6.77	17.08	23.85	6.97	18.03	25.00	1.15	4.8%
5/8	2	10.19	22.87	33.06	10.49	24.18	34.67	1.61	4.9%
5/8	4	17.03	34.45	51.48	17.53	36.48	54.01	2.53	4.9%
5/8	6	23.87	46.03	69.90	24.57	48.78	73.35	3.45	4.9%
5/8	10	37.55	69.19	106.74	38.65	73.38	112.03	5.29	5.0%
5/8	15	54.65	98.14	152.79	56.25	104.13	160.38	7.59	5.0%
5/8	20	71.75	127.09	198.84	73.85	134.88	208.73	9.89	5.0%
Commercial									
2	50	188.40	300.79	489.19	194.10	319.38	513.48	24.29	5.0%
2	100	370.90	590.29	961.19	382.10	626.88	1,008.98	47.79	5.0%
3	200	747.00	1,169.29	1,916.29	769.50	1,241.88	2,011.38	95.09	5.0%
3	300	1,112.00	1,748.29	2,860.29	1,145.50	1,856.88	3,002.38	142.09	5.0%
4	500	1,846.00	2,906.29	4,752.29	1,901.50	3,086.88	4,988.38	236.09	5.0%
4	1000	3,671.00	5,801.29	9,472.29	3,781.50	6,161.88	9,943.38	471.09	5.0%
Industrial									
3	200	633.00	1,169.29	1,802.29	653.50	1,241.88	1,895.38	93.09	5.2%
3	300	941.00	1,748.29	2,689.29	971.50	1,856.88	2,828.38	139.09	5.2%
4	2500	7,721.00	14,486.29	22,207.29	7,971.50	15,386.88	23,358.38	1,151.09	5.2%
6	5000	15,431.00	28,961.29	44,392.29	15,931.00	30,761.88	46,692.88	2,300.59	5.2%

The charges shown are for customers inside the City Limits.

Scenario 3 – Deferred Maintenance/Reliability

Comparison of Typical Monthly Bills
Under Existing and Proposed 2013 Rates - Scenario 3

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	9.29	12.44	3.15	10.22	13.37	0.93	7.5%
5/8	1	6.93	14.31	21.24	7.31	15.33	22.64	1.40	6.6%
5/8	2	10.71	19.33	30.04	11.47	20.44	31.91	1.87	6.2%
5/8	4	18.27	29.37	47.64	19.79	30.66	50.45	2.81	5.9%
5/8	6	25.83	39.41	65.24	28.11	40.88	68.99	3.75	5.7%
5/8	10	40.95	59.49	100.44	44.75	61.32	106.07	5.63	5.6%
5/8	15	59.85	84.59	144.44	65.55	86.87	152.42	7.98	5.5%
5/8	20	78.75	109.69	188.44	86.35	112.42	198.77	10.33	5.5%
Multifamily									
5/8	0	3.15	9.29	12.44	3.15	10.22	13.37	0.93	7.5%
5/8	1	6.44	14.31	20.75	6.41	15.33	21.74	0.99	4.8%
5/8	2	9.73	19.33	29.06	9.67	20.44	30.11	1.05	3.6%
5/8	4	16.31	29.37	45.68	16.19	30.66	46.85	1.17	2.6%
5/8	6	22.89	39.41	62.30	22.71	40.88	63.59	1.29	2.1%
5/8	10	36.05	59.49	95.54	35.75	61.32	97.07	1.53	1.6%
5/8	15	52.50	84.59	137.09	52.05	86.87	138.92	1.83	1.3%
5/8	20	68.95	109.69	178.64	68.35	112.42	180.77	2.13	1.2%
Commercial									
2	50	153.80	260.29	414.09	170.00	265.72	435.72	21.63	5.2%
2	100	301.80	511.29	813.09	334.50	521.22	855.72	42.63	5.2%
3	200	609.00	1,013.29	1,622.29	673.50	1,032.22	1,705.72	83.43	5.1%
3	300	905.00	1,515.29	2,420.29	1,002.50	1,543.22	2,545.72	125.43	5.2%
4	500	1,501.00	2,519.29	4,020.29	1,664.50	2,565.22	4,229.72	209.43	5.2%
4	1000	2,981.00	5,029.29	8,010.29	3,309.50	5,120.22	8,429.72	419.43	5.2%
Industrial									
3	200	591.00	1,013.29	1,604.29	589.50	1,032.22	1,621.72	17.43	1.1%
3	300	878.00	1,515.29	2,393.29	876.50	1,543.22	2,419.72	26.43	1.1%
4	2500	7,196.00	12,559.29	19,755.29	7,194.50	12,785.22	19,979.72	224.43	1.1%
6	5000	14,381.00	25,109.29	39,490.29	14,378.00	25,560.22	39,938.22	447.93	1.1%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2013 and Proposed 2014 Rates - Scenario 3

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.22	13.37	3.15	10.35	13.50	0.13	1.0%
5/8	1	7.31	15.33	22.64	7.45	15.51	22.96	0.32	1.4%
5/8	2	11.47	20.44	31.91	11.75	20.67	32.42	0.51	1.6%
5/8	4	19.79	30.66	50.45	20.35	30.99	51.34	0.89	1.8%
5/8	6	28.11	40.88	68.99	28.95	41.31	70.26	1.27	1.8%
5/8	10	44.75	61.32	106.07	46.15	61.95	108.10	2.03	1.9%
5/8	15	65.55	86.87	152.42	67.65	87.75	155.40	2.98	2.0%
5/8	20	86.35	112.42	198.77	89.15	113.55	202.70	3.93	2.0%
Multifamily									
5/8	0	3.15	10.22	13.37	3.15	10.35	13.50	0.13	1.0%
5/8	1	6.41	15.33	21.74	6.45	15.51	21.96	0.22	1.0%
5/8	2	9.67	20.44	30.11	9.75	20.67	30.42	0.31	1.0%
5/8	4	16.19	30.66	46.85	16.35	30.99	47.34	0.49	1.0%
5/8	6	22.71	40.88	63.59	22.95	41.31	64.26	0.67	1.1%
5/8	10	35.75	61.32	97.07	36.15	61.95	98.10	1.03	1.1%
5/8	15	52.05	86.87	138.92	52.65	87.75	140.40	1.48	1.1%
5/8	20	68.35	112.42	180.77	69.15	113.55	182.70	1.93	1.1%
Commercial									
2	50	170.00	265.72	435.72	177.60	268.35	445.95	10.23	2.3%
2	100	334.50	521.22	855.72	349.60	526.35	875.95	20.23	2.4%
3	200	673.50	1,032.22	1,705.72	704.00	1,042.35	1,746.35	40.63	2.4%
3	300	1,002.50	1,543.22	2,545.72	1,048.00	1,558.35	2,606.35	60.63	2.4%
4	500	1,664.50	2,565.22	4,229.72	1,740.00	2,590.35	4,330.35	100.63	2.4%
4	1000	3,309.50	5,120.22	8,429.72	3,460.00	5,170.35	8,630.35	200.63	2.4%
Industrial									
3	200	589.50	1,032.22	1,621.72	596.00	1,042.35	1,638.35	16.63	1.0%
3	300	876.50	1,543.22	2,419.72	886.00	1,558.35	2,444.35	24.63	1.0%
4	2500	7,194.50	12,785.22	19,979.72	7,270.00	12,910.35	20,180.35	200.63	1.0%
6	5000	14,378.00	25,560.22	39,938.22	14,529.00	25,810.35	40,339.35	401.13	1.0%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2014 and Proposed 2015 Rates - Scenario 3

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.35	13.50	3.25	10.89	14.14	0.64	4.7%
5/8	1	7.45	15.51	22.96	7.75	16.38	24.13	1.17	5.1%
5/8	2	11.75	20.67	32.42	12.25	21.87	34.12	1.70	5.2%
5/8	4	20.35	30.99	51.34	21.25	32.85	54.10	2.76	5.4%
5/8	6	28.95	41.31	70.26	30.25	43.83	74.08	3.82	5.4%
5/8	10	46.15	61.95	108.10	48.25	65.79	114.04	5.94	5.5%
5/8	15	67.65	87.75	155.40	70.75	93.24	163.99	8.59	5.5%
5/8	20	89.15	113.55	202.70	93.25	120.69	213.94	11.24	5.5%
Multifamily									
5/8	0	3.15	10.35	13.50	3.25	10.89	14.14	0.64	4.7%
5/8	1	6.45	15.51	21.96	6.62	16.38	23.00	1.04	4.7%
5/8	2	9.75	20.67	30.42	9.99	21.87	31.86	1.44	4.7%
5/8	4	16.35	30.99	47.34	16.73	32.85	49.58	2.24	4.7%
5/8	6	22.95	41.31	64.26	23.47	43.83	67.30	3.04	4.7%
5/8	10	36.15	61.95	98.10	36.95	65.79	102.74	4.64	4.7%
5/8	15	52.65	87.75	140.40	53.80	93.24	147.04	6.64	4.7%
5/8	20	69.15	113.55	182.70	70.65	120.69	191.34	8.64	4.7%
Commercial									
2	50	177.60	268.35	445.95	184.80	285.39	470.19	24.24	5.4%
2	100	349.60	526.35	875.95	363.80	559.89	923.69	47.74	5.5%
3	200	704.00	1,042.35	1,746.35	732.50	1,108.89	1,841.39	95.04	5.4%
3	300	1,048.00	1,558.35	2,606.35	1,090.50	1,657.89	2,748.39	142.04	5.4%
4	500	1,740.00	2,590.35	4,330.35	1,810.50	2,755.89	4,566.39	236.04	5.5%
4	1000	3,460.00	5,170.35	8,630.35	3,600.50	5,500.89	9,101.39	471.04	5.5%
Industrial									
3	200	596.00	1,042.35	1,638.35	622.50	1,108.89	1,731.39	93.04	5.7%
3	300	886.00	1,558.35	2,444.35	925.50	1,657.89	2,583.39	139.04	5.7%
4	2500	7,270.00	12,910.35	20,180.35	7,595.50	13,735.89	21,331.39	1,151.04	5.7%
6	5000	14,529.00	25,810.35	40,339.35	15,180.00	27,460.89	42,640.89	2,301.54	5.7%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2015 and Proposed 2016 Rates - Scenario 3

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.25	10.89	14.14	3.35	11.21	14.56	0.42	3.0%
5/8	1	7.75	16.38	24.13	8.05	16.94	24.99	0.86	3.6%
5/8	2	12.25	21.87	34.12	12.75	22.67	35.42	1.30	3.8%
5/8	4	21.25	32.85	54.10	22.15	34.13	56.28	2.18	4.0%
5/8	6	30.25	43.83	74.08	31.55	45.59	77.14	3.06	4.1%
5/8	10	48.25	65.79	114.04	50.35	68.51	118.86	4.82	4.2%
5/8	15	70.75	93.24	163.99	73.85	97.16	171.01	7.02	4.3%
5/8	20	93.25	120.69	213.94	97.35	125.81	223.16	9.22	4.3%
Multifamily									
5/8	0	3.25	10.89	14.14	3.35	11.21	14.56	0.42	3.0%
5/8	1	6.62	16.38	23.00	6.88	16.94	23.82	0.82	3.6%
5/8	2	9.99	21.87	31.86	10.41	22.67	33.08	1.22	3.8%
5/8	4	16.73	32.85	49.58	17.47	34.13	51.60	2.02	4.1%
5/8	6	23.47	43.83	67.30	24.53	45.59	70.12	2.82	4.2%
5/8	10	36.95	65.79	102.74	38.65	68.51	107.16	4.42	4.3%
5/8	15	53.80	93.24	147.04	56.30	97.16	153.46	6.42	4.4%
5/8	20	70.65	120.69	191.34	73.95	125.81	199.76	8.42	4.4%
Commercial									
2	50	184.80	285.39	470.19	194.40	297.71	492.11	21.92	4.7%
2	100	363.80	559.89	923.69	382.90	584.21	967.11	43.42	4.7%
3	200	732.50	1,108.89	1,841.39	771.00	1,157.21	1,928.21	86.82	4.7%
3	300	1,090.50	1,657.89	2,748.39	1,148.00	1,730.21	2,878.21	129.82	4.7%
4	500	1,810.50	2,755.89	4,566.39	1,906.00	2,876.21	4,782.21	215.82	4.7%
4	1000	3,600.50	5,500.89	9,101.39	3,791.00	5,741.21	9,532.21	430.82	4.7%
Industrial									
3	200	622.50	1,108.89	1,731.39	657.00	1,157.21	1,814.21	82.82	4.8%
3	300	925.50	1,657.89	2,583.39	977.00	1,730.21	2,707.21	123.82	4.8%
4	2500	7,595.50	13,735.89	21,331.39	8,021.00	14,336.21	22,357.21	1,025.82	4.8%
6	5000	15,180.00	27,460.89	42,640.89	16,031.00	28,661.21	44,692.21	2,051.32	4.8%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2016 and Proposed 2017 Rates - Scenario 3

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.35	11.21	14.56	3.45	11.77	15.22	0.66	4.5%
5/8	1	8.05	16.94	24.99	8.49	17.86	26.35	1.36	5.4%
5/8	2	12.75	22.67	35.42	13.53	23.95	37.48	2.06	5.8%
5/8	4	22.15	34.13	56.28	23.61	36.13	59.74	3.46	6.1%
5/8	6	31.55	45.59	77.14	33.69	48.31	82.00	4.86	6.3%
5/8	10	50.35	68.51	118.86	53.85	72.67	126.52	7.66	6.4%
5/8	15	73.85	97.16	171.01	79.05	103.12	182.17	11.16	6.5%
5/8	20	97.35	125.81	223.16	104.25	133.57	237.82	14.66	6.6%
Multifamily									
5/8	0	3.35	11.21	14.56	3.45	11.77	15.22	0.66	4.5%
5/8	1	6.88	16.94	23.82	7.26	17.86	25.12	1.30	5.5%
5/8	2	10.41	22.67	33.08	11.07	23.95	35.02	1.94	5.9%
5/8	4	17.47	34.13	51.60	18.69	36.13	54.82	3.22	6.2%
5/8	6	24.53	45.59	70.12	26.31	48.31	74.62	4.50	6.4%
5/8	10	38.65	68.51	107.16	41.55	72.67	114.22	7.06	6.6%
5/8	15	56.30	97.16	153.46	60.60	103.12	163.72	10.26	6.7%
5/8	20	73.95	125.81	199.76	79.65	133.57	213.22	13.46	6.7%
Commercial									
2	50	194.40	297.71	492.11	209.10	316.27	525.37	33.26	6.8%
2	100	382.90	584.21	967.11	412.10	620.77	1,032.87	65.76	6.8%
3	200	771.00	1,157.21	1,928.21	829.50	1,229.77	2,059.27	131.06	6.8%
3	300	1,148.00	1,730.21	2,878.21	1,235.50	1,838.77	3,074.27	196.06	6.8%
4	500	1,906.00	2,876.21	4,782.21	2,052.00	3,056.77	5,108.77	326.56	6.8%
4	1000	3,791.00	5,741.21	9,532.21	4,082.00	6,101.77	10,183.77	651.56	6.8%
Industrial									
3	200	657.00	1,157.21	1,814.21	707.50	1,229.77	1,937.27	123.06	6.8%
3	300	977.00	1,730.21	2,707.21	1,052.50	1,838.77	2,891.27	184.06	6.8%
4	2500	8,021.00	14,336.21	22,357.21	8,647.00	15,236.77	23,883.77	1,526.56	6.8%
6	5000	16,031.00	28,661.21	44,692.21	17,282.00	30,461.77	47,743.77	3,051.56	6.8%

The charges shown are for customers inside the City Limits.

Scenario 4 – Deferred Maintenance/Reliability & Wakarusa WWTP (Low Growth)

Comparison of Typical Monthly Bills
Under Existing and Proposed 2013 Rates - Scenario 4

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	9.29	12.44	3.15	10.22	13.37	0.93	7.5%
5/8	1	6.93	14.31	21.24	7.31	15.33	22.64	1.40	6.6%
5/8	2	10.71	19.33	30.04	11.47	20.44	31.91	1.87	6.2%
5/8	4	18.27	29.37	47.64	19.79	30.66	50.45	2.81	5.9%
5/8	6	25.83	39.41	65.24	28.11	40.88	68.99	3.75	5.7%
5/8	10	40.95	59.49	100.44	44.75	61.32	106.07	5.63	5.6%
5/8	15	59.85	84.59	144.44	65.55	86.87	152.42	7.98	5.5%
5/8	20	78.75	109.69	188.44	86.35	112.42	198.77	10.33	5.5%
Multifamily									
5/8	0	3.15	9.29	12.44	3.15	10.22	13.37	0.93	7.5%
5/8	1	6.44	14.31	20.75	6.41	15.33	21.74	0.99	4.8%
5/8	2	9.73	19.33	29.06	9.67	20.44	30.11	1.05	3.6%
5/8	4	16.31	29.37	45.68	16.19	30.66	46.85	1.17	2.6%
5/8	6	22.89	39.41	62.30	22.71	40.88	63.59	1.29	2.1%
5/8	10	36.05	59.49	95.54	35.75	61.32	97.07	1.53	1.6%
5/8	15	52.50	84.59	137.09	52.05	86.87	138.92	1.83	1.3%
5/8	20	68.95	109.69	178.64	68.35	112.42	180.77	2.13	1.2%
Commercial									
2	50	153.80	260.29	414.09	170.00	265.72	435.72	21.63	5.2%
2	100	301.80	511.29	813.09	334.50	521.22	855.72	42.63	5.2%
3	200	609.00	1,013.29	1,622.29	673.50	1,032.22	1,705.72	83.43	5.1%
3	300	905.00	1,515.29	2,420.29	1,002.50	1,543.22	2,545.72	125.43	5.2%
4	500	1,501.00	2,519.29	4,020.29	1,664.50	2,565.22	4,229.72	209.43	5.2%
4	1000	2,981.00	5,029.29	8,010.29	3,309.50	5,120.22	8,429.72	419.43	5.2%
Industrial									
3	200	591.00	1,013.29	1,604.29	589.50	1,032.22	1,621.72	17.43	1.1%
3	300	878.00	1,515.29	2,393.29	876.50	1,543.22	2,419.72	26.43	1.1%
4	2500	7,196.00	12,559.29	19,755.29	7,194.50	12,785.22	19,979.72	224.43	1.1%
6	5000	14,381.00	25,109.29	39,490.29	14,378.00	25,560.22	39,938.22	447.93	1.1%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2013 and Proposed 2014 Rates - Scenario 4

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.22	13.37	3.15	10.25	13.40	0.03	0.2%
5/8	1	7.31	15.33	22.64	7.45	15.36	22.81	0.17	0.8%
5/8	2	11.47	20.44	31.91	11.75	20.47	32.22	0.31	1.0%
5/8	4	19.79	30.66	50.45	20.35	30.69	51.04	0.59	1.2%
5/8	6	28.11	40.88	68.99	28.95	40.91	69.86	0.87	1.3%
5/8	10	44.75	61.32	106.07	46.15	61.35	107.50	1.43	1.3%
5/8	15	65.55	86.87	152.42	67.65	86.90	154.55	2.13	1.4%
5/8	20	86.35	112.42	198.77	89.15	112.45	201.60	2.83	1.4%
Multifamily									
5/8	0	3.15	10.22	13.37	3.15	10.25	13.40	0.03	0.2%
5/8	1	6.41	15.33	21.74	6.45	15.36	21.81	0.07	0.3%
5/8	2	9.67	20.44	30.11	9.75	20.47	30.22	0.11	0.4%
5/8	4	16.19	30.66	46.85	16.35	30.69	47.04	0.19	0.4%
5/8	6	22.71	40.88	63.59	22.95	40.91	63.86	0.27	0.4%
5/8	10	35.75	61.32	97.07	36.15	61.35	97.50	0.43	0.4%
5/8	15	52.05	86.87	138.92	52.65	86.90	139.55	0.63	0.5%
5/8	20	68.35	112.42	180.77	69.15	112.45	181.60	0.83	0.5%
Commercial									
2	50	170.00	265.72	435.72	177.60	265.75	443.35	7.63	1.8%
2	100	334.50	521.22	855.72	349.60	521.25	870.85	15.13	1.8%
3	200	673.50	1,032.22	1,705.72	704.00	1,032.25	1,736.25	30.53	1.8%
3	300	1,002.50	1,543.22	2,545.72	1,048.00	1,543.25	2,591.25	45.53	1.8%
4	500	1,664.50	2,565.22	4,229.72	1,740.00	2,565.25	4,305.25	75.53	1.8%
4	1000	3,309.50	5,120.22	8,429.72	3,460.00	5,120.25	8,580.25	150.53	1.8%
Industrial									
3	200	589.50	1,032.22	1,621.72	596.00	1,032.25	1,628.25	6.53	0.4%
3	300	876.50	1,543.22	2,419.72	886.00	1,543.25	2,429.25	9.53	0.4%
4	2500	7,194.50	12,785.22	19,979.72	7,270.00	12,785.25	20,055.25	75.53	0.4%
6	5000	14,378.00	25,560.22	39,938.22	14,529.00	25,560.25	40,089.25	151.03	0.4%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2014 and Proposed 2015 Rates - Scenario 4

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.25	13.40	3.25	10.27	13.52	0.12	0.9%
5/8	1	7.45	15.36	22.81	7.75	15.38	23.13	0.32	1.4%
5/8	2	11.75	20.47	32.22	12.25	20.49	32.74	0.52	1.6%
5/8	4	20.35	30.69	51.04	21.25	30.71	51.96	0.92	1.8%
5/8	6	28.95	40.91	69.86	30.25	40.93	71.18	1.32	1.9%
5/8	10	46.15	61.35	107.50	48.25	61.37	109.62	2.12	2.0%
5/8	15	67.65	86.90	154.55	70.75	86.92	157.67	3.12	2.0%
5/8	20	89.15	112.45	201.60	93.25	112.47	205.72	4.12	2.0%
Multifamily									
5/8	0	3.15	10.25	13.40	3.25	10.27	13.52	0.12	0.9%
5/8	1	6.45	15.36	21.81	6.62	15.38	22.00	0.19	0.9%
5/8	2	9.75	20.47	30.22	9.99	20.49	30.48	0.26	0.9%
5/8	4	16.35	30.69	47.04	16.73	30.71	47.44	0.40	0.9%
5/8	6	22.95	40.91	63.86	23.47	40.93	64.40	0.54	0.8%
5/8	10	36.15	61.35	97.50	36.95	61.37	98.32	0.82	0.8%
5/8	15	52.65	86.90	139.55	53.80	86.92	140.72	1.17	0.8%
5/8	20	69.15	112.45	181.60	70.65	112.47	183.12	1.52	0.8%
Commercial									
2	50	177.60	265.75	443.35	184.80	265.77	450.57	7.22	1.6%
2	100	349.60	521.25	870.85	363.80	521.27	885.07	14.22	1.6%
3	200	704.00	1,032.25	1,736.25	732.50	1,032.27	1,764.77	28.52	1.6%
3	300	1,048.00	1,543.25	2,591.25	1,090.50	1,543.27	2,633.77	42.52	1.6%
4	500	1,740.00	2,565.25	4,305.25	1,810.50	2,565.27	4,375.77	70.52	1.6%
4	1000	3,460.00	5,120.25	8,580.25	3,600.50	5,120.27	8,720.77	140.52	1.6%
Industrial									
3	200	596.00	1,032.25	1,628.25	622.50	1,032.27	1,654.77	26.52	1.6%
3	300	886.00	1,543.25	2,429.25	925.50	1,543.27	2,468.77	39.52	1.6%
4	2500	7,270.00	12,785.25	20,055.25	7,595.50	12,785.27	20,380.77	325.52	1.6%
6	5000	14,529.00	25,560.25	40,089.25	15,180.00	25,560.27	40,740.27	651.02	1.6%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2015 and Proposed 2016 Rates - Scenario 4

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.25	10.27	13.52	3.35	10.27	13.62	0.10	0.7%
5/8	1	7.75	15.38	23.13	8.05	15.38	23.43	0.30	1.3%
5/8	2	12.25	20.49	32.74	12.75	20.49	33.24	0.50	1.5%
5/8	4	21.25	30.71	51.96	22.15	30.71	52.86	0.90	1.7%
5/8	6	30.25	40.93	71.18	31.55	40.93	72.48	1.30	1.8%
5/8	10	48.25	61.37	109.62	50.35	61.37	111.72	2.10	1.9%
5/8	15	70.75	86.92	157.67	73.85	86.92	160.77	3.10	2.0%
5/8	20	93.25	112.47	205.72	97.35	112.47	209.82	4.10	2.0%
Multifamily									
5/8	0	3.25	10.27	13.52	3.35	10.27	13.62	0.10	0.7%
5/8	1	6.62	15.38	22.00	6.88	15.38	22.26	0.26	1.2%
5/8	2	9.99	20.49	30.48	10.41	20.49	30.90	0.42	1.4%
5/8	4	16.73	30.71	47.44	17.47	30.71	48.18	0.74	1.6%
5/8	6	23.47	40.93	64.40	24.53	40.93	65.46	1.06	1.6%
5/8	10	36.95	61.37	98.32	38.65	61.37	100.02	1.70	1.7%
5/8	15	53.80	86.92	140.72	56.30	86.92	143.22	2.50	1.8%
5/8	20	70.65	112.47	183.12	73.95	112.47	186.42	3.30	1.8%
Commercial									
2	50	184.80	265.77	450.57	194.40	265.77	460.17	9.60	2.1%
2	100	363.80	521.27	885.07	382.90	521.27	904.17	19.10	2.2%
3	200	732.50	1,032.27	1,764.77	771.00	1,032.27	1,803.27	38.50	2.2%
3	300	1,090.50	1,543.27	2,633.77	1,148.00	1,543.27	2,691.27	57.50	2.2%
4	500	1,810.50	2,565.27	4,375.77	1,906.00	2,565.27	4,471.27	95.50	2.2%
4	1000	3,600.50	5,120.27	8,720.77	3,791.00	5,120.27	8,911.27	190.50	2.2%
Industrial									
3	200	622.50	1,032.27	1,654.77	657.00	1,032.27	1,689.27	34.50	2.1%
3	300	925.50	1,543.27	2,468.77	977.00	1,543.27	2,520.27	51.50	2.1%
4	2500	7,595.50	12,785.27	20,380.77	8,021.00	12,785.27	20,806.27	425.50	2.1%
6	5000	15,180.00	25,560.27	40,740.27	16,031.00	25,560.27	41,591.27	851.00	2.1%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2016 and Proposed 2017 Rates - Scenario 4

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.35	10.27	13.62	3.45	11.05	14.50	0.88	6.5%
5/8	1	8.05	15.38	23.43	8.49	16.43	24.92	1.49	6.4%
5/8	2	12.75	20.49	33.24	13.53	21.81	35.34	2.10	6.3%
5/8	4	22.15	30.71	52.86	23.61	32.57	56.18	3.32	6.3%
5/8	6	31.55	40.93	72.48	33.69	43.33	77.02	4.54	6.3%
5/8	10	50.35	61.37	111.72	53.85	64.85	118.70	6.98	6.2%
5/8	15	73.85	86.92	160.77	79.05	91.75	170.80	10.03	6.2%
5/8	20	97.35	112.47	209.82	104.25	118.65	222.90	13.08	6.2%
Multifamily									
5/8	0	3.35	10.27	13.62	3.45	11.05	14.50	0.88	6.5%
5/8	1	6.88	15.38	22.26	7.26	16.43	23.69	1.43	6.4%
5/8	2	10.41	20.49	30.90	11.07	21.81	32.88	1.98	6.4%
5/8	4	17.47	30.71	48.18	18.69	32.57	51.26	3.08	6.4%
5/8	6	24.53	40.93	65.46	26.31	43.33	69.64	4.18	6.4%
5/8	10	38.65	61.37	100.02	41.55	64.85	106.40	6.38	6.4%
5/8	15	56.30	86.92	143.22	60.60	91.75	152.35	9.13	6.4%
5/8	20	73.95	112.47	186.42	79.65	118.65	198.30	11.88	6.4%
Commercial									
2	50	194.40	265.77	460.17	209.10	280.05	489.15	28.98	6.3%
2	100	382.90	521.27	904.17	412.10	549.05	961.15	56.98	6.3%
3	200	771.00	1,032.27	1,803.27	829.50	1,087.05	1,916.55	113.28	6.3%
3	300	1,148.00	1,543.27	2,691.27	1,235.50	1,625.05	2,860.55	169.28	6.3%
4	500	1,906.00	2,565.27	4,471.27	2,052.00	2,701.05	4,753.05	281.78	6.3%
4	1000	3,791.00	5,120.27	8,911.27	4,082.00	5,391.05	9,473.05	561.78	6.3%
Industrial									
3	200	657.00	1,032.27	1,689.27	707.50	1,087.05	1,794.55	105.28	6.2%
3	300	977.00	1,543.27	2,520.27	1,052.50	1,625.05	2,677.55	157.28	6.2%
4	2500	8,021.00	12,785.27	20,806.27	8,647.00	13,461.05	22,108.05	1,301.78	6.3%
6	5000	16,031.00	25,560.27	41,591.27	17,282.00	26,911.05	44,193.05	2,601.78	6.3%

The charges shown are for customers inside the City Limits.

Scenario 5 – Taste, Odor & Microtoxins

Comparison of Typical Monthly Bills
Under Existing and Proposed 2013 Rates - Scenario 5

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	9.29	12.44	3.15	10.14	13.29	0.85	6.8%
5/8	1	6.93	14.31	21.24	7.41	15.20	22.61	1.37	6.5%
5/8	2	10.71	19.33	30.04	11.67	20.26	31.93	1.89	6.3%
5/8	4	18.27	29.37	47.64	20.19	30.38	50.57	2.93	6.2%
5/8	6	25.83	39.41	65.24	28.71	40.50	69.21	3.97	6.1%
5/8	10	40.95	59.49	100.44	45.75	60.74	106.49	6.05	6.0%
5/8	15	59.85	84.59	144.44	67.05	86.04	153.09	8.65	6.0%
5/8	20	78.75	109.69	188.44	88.35	111.34	199.69	11.25	6.0%
Multifamily									
5/8	0	3.15	9.29	12.44	3.15	10.14	13.29	0.85	6.8%
5/8	1	6.44	14.31	20.75	6.41	15.20	21.61	0.86	4.1%
5/8	2	9.73	19.33	29.06	9.67	20.26	29.93	0.87	3.0%
5/8	4	16.31	29.37	45.68	16.19	30.38	46.57	0.89	1.9%
5/8	6	22.89	39.41	62.30	22.71	40.50	63.21	0.91	1.5%
5/8	10	36.05	59.49	95.54	35.75	60.74	96.49	0.95	1.0%
5/8	15	52.50	84.59	137.09	52.05	86.04	138.09	1.00	0.7%
5/8	20	68.95	109.69	178.64	68.35	111.34	179.69	1.05	0.6%
Commercial									
2	50	153.80	260.29	414.09	176.00	263.14	439.14	25.05	6.0%
2	100	301.80	511.29	813.09	346.50	516.14	862.64	49.55	6.1%
3	200	609.00	1,013.29	1,622.29	698.00	1,022.14	1,720.14	97.85	6.0%
3	300	905.00	1,515.29	2,420.29	1,039.00	1,528.14	2,567.14	146.85	6.1%
4	500	1,501.00	2,519.29	4,020.29	1,724.50	2,540.14	4,264.64	244.35	6.1%
4	1000	2,981.00	5,029.29	8,010.29	3,429.50	5,070.14	8,499.64	489.35	6.1%
Industrial									
3	200	591.00	1,013.29	1,604.29	590.00	1,022.14	1,612.14	7.85	0.5%
3	300	878.00	1,515.29	2,393.29	877.00	1,528.14	2,405.14	11.85	0.5%
4	2500	7,196.00	12,559.29	19,755.29	7,194.50	12,660.14	19,854.64	99.35	0.5%
6	5000	14,381.00	25,109.29	39,490.29	14,378.00	25,310.14	39,688.14	197.85	0.5%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2013 and Proposed 2014 Rates - Scenario 5

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.14	13.29	3.15	10.43	13.58	0.29	2.2%
5/8	1	7.41	15.20	22.61	7.72	15.65	23.37	0.76	3.4%
5/8	2	11.67	20.26	31.93	12.29	20.87	33.16	1.23	3.9%
5/8	4	20.19	30.38	50.57	21.43	31.31	52.74	2.17	4.3%
5/8	6	28.71	40.50	69.21	30.57	41.75	72.32	3.11	4.5%
5/8	10	45.75	60.74	106.49	48.85	62.63	111.48	4.99	4.7%
5/8	15	67.05	86.04	153.09	71.70	88.73	160.43	7.34	4.8%
5/8	20	88.35	111.34	199.69	94.55	114.83	209.38	9.69	4.9%
Multifamily									
5/8	0	3.15	10.14	13.29	3.15	10.43	13.58	0.29	2.2%
5/8	1	6.41	15.20	21.61	6.57	15.65	22.22	0.61	2.8%
5/8	2	9.67	20.26	29.93	9.99	20.87	30.86	0.93	3.1%
5/8	4	16.19	30.38	46.57	16.83	31.31	48.14	1.57	3.4%
5/8	6	22.71	40.50	63.21	23.67	41.75	65.42	2.21	3.5%
5/8	10	35.75	60.74	96.49	37.35	62.63	99.98	3.49	3.6%
5/8	15	52.05	86.04	138.09	54.45	88.73	143.18	5.09	3.7%
5/8	20	68.35	111.34	179.69	71.55	114.83	186.38	6.69	3.7%
Commercial									
2	50	176.00	263.14	439.14	188.20	271.43	459.63	20.49	4.7%
2	100	346.50	516.14	862.64	370.70	532.43	903.13	40.49	4.7%
3	200	698.00	1,022.14	1,720.14	746.50	1,054.43	1,800.93	80.79	4.7%
3	300	1,039.00	1,528.14	2,567.14	1,111.50	1,576.43	2,687.93	120.79	4.7%
4	500	1,724.50	2,540.14	4,264.64	1,845.00	2,620.43	4,465.43	200.79	4.7%
4	1000	3,429.50	5,070.14	8,499.64	3,670.00	5,230.43	8,900.43	400.79	4.7%
Industrial									
3	200	590.00	1,022.14	1,612.14	632.50	1,054.43	1,686.93	74.79	4.6%
3	300	877.00	1,528.14	2,405.14	940.50	1,576.43	2,516.93	111.79	4.6%
4	2500	7,194.50	12,660.14	19,854.64	7,720.00	13,060.43	20,780.43	925.79	4.7%
6	5000	14,378.00	25,310.14	39,688.14	15,429.00	26,110.43	41,539.43	1,851.29	4.7%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2014 and Proposed 2015 Rates - Scenario 5

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.43	13.58	3.30	10.82	14.12	0.54	4.0%
5/8	1	7.72	15.65	23.37	8.24	16.25	24.49	1.12	4.8%
5/8	2	12.29	20.87	33.16	13.18	21.68	34.86	1.70	5.1%
5/8	4	21.43	31.31	52.74	23.06	32.54	55.60	2.86	5.4%
5/8	6	30.57	41.75	72.32	32.94	43.40	76.34	4.02	5.6%
5/8	10	48.85	62.63	111.48	52.70	65.12	117.82	6.34	5.7%
5/8	15	71.70	88.73	160.43	77.40	92.27	169.67	9.24	5.8%
5/8	20	94.55	114.83	209.38	102.10	119.42	221.52	12.14	5.8%
Multifamily									
5/8	0	3.15	10.43	13.58	3.30	10.82	14.12	0.54	4.0%
5/8	1	6.57	15.65	22.22	7.00	16.25	23.25	1.03	4.6%
5/8	2	9.99	20.87	30.86	10.70	21.68	32.38	1.52	4.9%
5/8	4	16.83	31.31	48.14	18.10	32.54	50.64	2.50	5.2%
5/8	6	23.67	41.75	65.42	25.50	43.40	68.90	3.48	5.3%
5/8	10	37.35	62.63	99.98	40.30	65.12	105.42	5.44	5.4%
5/8	15	54.45	88.73	143.18	58.80	92.27	151.07	7.89	5.5%
5/8	20	71.55	114.83	186.38	77.30	119.42	196.72	10.34	5.5%
Commercial									
2	50	188.20	271.43	459.63	203.40	282.32	485.72	26.09	5.7%
2	100	370.70	532.43	903.13	400.90	553.82	954.72	51.59	5.7%
3	200	746.50	1,054.43	1,800.93	807.00	1,096.82	1,903.82	102.89	5.7%
3	300	1,111.50	1,576.43	2,687.93	1,202.00	1,639.82	2,841.82	153.89	5.7%
4	500	1,845.00	2,620.43	4,465.43	1,996.00	2,725.82	4,721.82	256.39	5.7%
4	1000	3,670.00	5,230.43	8,900.43	3,971.00	5,440.82	9,411.82	511.39	5.7%
Industrial									
3	200	632.50	1,054.43	1,686.93	687.00	1,096.82	1,783.82	96.89	5.7%
3	300	940.50	1,576.43	2,516.93	1,022.00	1,639.82	2,661.82	144.89	5.8%
4	2500	7,720.00	13,060.43	20,780.43	8,396.00	13,585.82	21,981.82	1,201.39	5.8%
6	5000	15,429.00	26,110.43	41,539.43	16,781.00	27,160.82	43,941.82	2,402.39	5.8%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2015 and Proposed 2016 Rates - Scenario 5

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.30	10.82	14.12	3.45	11.29	14.74	0.62	4.4%
5/8	1	8.24	16.25	24.49	8.82	17.09	25.91	1.42	5.8%
5/8	2	13.18	21.68	34.86	14.19	22.89	37.08	2.22	6.4%
5/8	4	23.06	32.54	55.60	24.93	34.49	59.42	3.82	6.9%
5/8	6	32.94	43.40	76.34	35.67	46.09	81.76	5.42	7.1%
5/8	10	52.70	65.12	117.82	57.15	69.29	126.44	8.62	7.3%
5/8	15	77.40	92.27	169.67	84.00	98.29	182.29	12.62	7.4%
5/8	20	102.10	119.42	221.52	110.85	127.29	238.14	16.62	7.5%
Multifamily									
5/8	0	3.30	10.82	14.12	3.45	11.29	14.74	0.62	4.4%
5/8	1	7.00	16.25	23.25	7.45	17.09	24.54	1.29	5.5%
5/8	2	10.70	21.68	32.38	11.45	22.89	34.34	1.96	6.1%
5/8	4	18.10	32.54	50.64	19.45	34.49	53.94	3.30	6.5%
5/8	6	25.50	43.40	68.90	27.45	46.09	73.54	4.64	6.7%
5/8	10	40.30	65.12	105.42	43.45	69.29	112.74	7.32	6.9%
5/8	15	58.80	92.27	151.07	63.45	98.29	161.74	10.67	7.1%
5/8	20	77.30	119.42	196.72	83.45	127.29	210.74	14.02	7.1%
Commercial									
2	50	203.40	282.32	485.72	220.20	301.29	521.49	35.77	7.4%
2	100	400.90	553.82	954.72	434.20	591.29	1,025.49	70.77	7.4%
3	200	807.00	1,096.82	1,903.82	874.00	1,171.29	2,045.29	141.47	7.4%
3	300	1,202.00	1,639.82	2,841.82	1,302.00	1,751.29	3,053.29	211.47	7.4%
4	500	1,996.00	2,725.82	4,721.82	2,162.50	2,911.29	5,073.79	351.97	7.5%
4	1000	3,971.00	5,440.82	9,411.82	4,302.50	5,811.29	10,113.79	701.97	7.5%
Industrial									
3	200	687.00	1,096.82	1,783.82	740.00	1,171.29	1,911.29	127.47	7.1%
3	300	1,022.00	1,639.82	2,661.82	1,101.00	1,751.29	2,852.29	190.47	7.2%
4	2500	8,396.00	13,585.82	21,981.82	9,047.50	14,511.29	23,558.79	1,576.97	7.2%
6	5000	16,781.00	27,160.82	43,941.82	18,083.00	29,011.29	47,094.29	3,152.47	7.2%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2016 and Proposed 2017 Rates - Scenario 5

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.45	11.29	14.74	3.55	11.97	15.52	0.78	5.3%
5/8	1	8.82	17.09	25.91	9.25	18.19	27.44	1.53	5.9%
5/8	2	14.19	22.89	37.08	14.95	24.41	39.36	2.28	6.1%
5/8	4	24.93	34.49	59.42	26.35	36.85	63.20	3.78	6.4%
5/8	6	35.67	46.09	81.76	37.75	49.29	87.04	5.28	6.5%
5/8	10	57.15	69.29	126.44	60.55	74.17	134.72	8.28	6.5%
5/8	15	84.00	98.29	182.29	89.05	105.27	194.32	12.03	6.6%
5/8	20	110.85	127.29	238.14	117.55	136.37	253.92	15.78	6.6%
Multifamily									
5/8	0	3.45	11.29	14.74	3.55	11.97	15.52	0.78	5.3%
5/8	1	7.45	17.09	24.54	7.81	18.19	26.00	1.46	5.9%
5/8	2	11.45	22.89	34.34	12.07	24.41	36.48	2.14	6.2%
5/8	4	19.45	34.49	53.94	20.59	36.85	57.44	3.50	6.5%
5/8	6	27.45	46.09	73.54	29.11	49.29	78.40	4.86	6.6%
5/8	10	43.45	69.29	112.74	46.15	74.17	120.32	7.58	6.7%
5/8	15	63.45	98.29	161.74	67.45	105.27	172.72	10.98	6.8%
5/8	20	83.45	127.29	210.74	88.75	136.37	225.12	14.38	6.8%
Commercial									
2	50	220.20	301.29	521.49	234.00	322.97	556.97	35.48	6.8%
2	100	434.20	591.29	1,025.49	461.50	633.97	1,095.47	69.98	6.8%
3	200	874.00	1,171.29	2,045.29	929.00	1,255.97	2,184.97	139.68	6.8%
3	300	1,302.00	1,751.29	3,053.29	1,384.00	1,877.97	3,261.97	208.68	6.8%
4	500	2,162.50	2,911.29	5,073.79	2,298.50	3,121.97	5,420.47	346.68	6.8%
4	1000	4,302.50	5,811.29	10,113.79	4,573.50	6,231.97	10,805.47	691.68	6.8%
Industrial									
3	200	740.00	1,171.29	1,911.29	789.00	1,255.97	2,044.97	133.68	7.0%
3	300	1,101.00	1,751.29	2,852.29	1,174.00	1,877.97	3,051.97	199.68	7.0%
4	2500	9,047.50	14,511.29	23,558.79	9,648.50	15,561.97	25,210.47	1,651.68	7.0%
6	5000	18,083.00	29,011.29	47,094.29	19,284.00	31,111.97	50,395.97	3,301.68	7.0%

The charges shown are for customers inside the City Limits.

Scenario 6 – Delay Wakarusa WWTP & Accelerate Rapid I/I

Comparison of Typical Monthly Bills
Under Existing and Proposed 2013 Rates - Scenario 6

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	9.29	12.44	3.15	9.93	13.08	0.64	5.1%
5/8	1	6.93	14.31	21.24	7.31	14.83	22.14	0.90	4.2%
5/8	2	10.71	19.33	30.04	11.47	19.73	31.20	1.16	3.9%
5/8	4	18.27	29.37	47.64	19.79	29.53	49.32	1.68	3.5%
5/8	6	25.83	39.41	65.24	28.11	39.33	67.44	2.20	3.4%
5/8	10	40.95	59.49	100.44	44.75	58.93	103.68	3.24	3.2%
5/8	15	59.85	84.59	144.44	65.55	83.43	148.98	4.54	3.1%
5/8	20	78.75	109.69	188.44	86.35	107.93	194.28	5.84	3.1%
Multifamily									
5/8	0	3.15	9.29	12.44	3.15	9.93	13.08	0.64	5.1%
5/8	1	6.44	14.31	20.75	6.41	14.83	21.24	0.49	2.4%
5/8	2	9.73	19.33	29.06	9.67	19.73	29.40	0.34	1.2%
5/8	4	16.31	29.37	45.68	16.19	29.53	45.72	0.04	0.1%
5/8	6	22.89	39.41	62.30	22.71	39.33	62.04	(0.26)	-0.4%
5/8	10	36.05	59.49	95.54	35.75	58.93	94.68	(0.86)	-0.9%
5/8	15	52.50	84.59	137.09	52.05	83.43	135.48	(1.61)	-1.2%
5/8	20	68.95	109.69	178.64	68.35	107.93	176.28	(2.36)	-1.3%
Commercial									
2	50	153.80	260.29	414.09	170.00	254.93	424.93	10.84	2.6%
2	100	301.80	511.29	813.09	334.50	499.93	834.43	21.34	2.6%
3	200	609.00	1,013.29	1,622.29	673.50	989.93	1,663.43	41.14	2.5%
3	300	905.00	1,515.29	2,420.29	1,002.50	1,479.93	2,482.43	62.14	2.6%
4	500	1,501.00	2,519.29	4,020.29	1,664.50	2,459.93	4,124.43	104.14	2.6%
4	1000	2,981.00	5,029.29	8,010.29	3,309.50	4,909.93	8,219.43	209.14	2.6%
Industrial									
3	200	591.00	1,013.29	1,604.29	589.50	989.93	1,579.43	(24.86)	-1.5%
3	300	878.00	1,515.29	2,393.29	876.50	1,479.93	2,356.43	(36.86)	-1.5%
4	2500	7,196.00	12,559.29	19,755.29	7,194.50	12,259.93	19,454.43	(300.86)	-1.5%
6	5000	14,381.00	25,109.29	39,490.29	14,378.00	24,509.93	38,887.93	(602.36)	-1.5%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2013 and Proposed 2014 Rates - Scenario 6

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	9.93	13.08	3.15	10.20	13.35	0.27	2.1%
5/8	1	7.31	14.83	22.14	7.56	15.25	22.81	0.67	3.0%
5/8	2	11.47	19.73	31.20	11.97	20.30	32.27	1.07	3.4%
5/8	4	19.79	29.53	49.32	20.79	30.40	51.19	1.87	3.8%
5/8	6	28.11	39.33	67.44	29.61	40.50	70.11	2.67	4.0%
5/8	10	44.75	58.93	103.68	47.25	60.70	107.95	4.27	4.1%
5/8	15	65.55	83.43	148.98	69.30	85.95	155.25	6.27	4.2%
5/8	20	86.35	107.93	194.28	91.35	111.20	202.55	8.27	4.3%
Multifamily									
5/8	0	3.15	9.93	13.08	3.15	10.20	13.35	0.27	2.1%
5/8	1	6.41	14.83	21.24	6.49	15.25	21.74	0.50	2.4%
5/8	2	9.67	19.73	29.40	9.83	20.30	30.13	0.73	2.5%
5/8	4	16.19	29.53	45.72	16.51	30.40	46.91	1.19	2.6%
5/8	6	22.71	39.33	62.04	23.19	40.50	63.69	1.65	2.7%
5/8	10	35.75	58.93	94.68	36.55	60.70	97.25	2.57	2.7%
5/8	15	52.05	83.43	135.48	53.25	85.95	139.20	3.72	2.7%
5/8	20	68.35	107.93	176.28	69.95	111.20	181.15	4.87	2.8%
Commercial									
2	50	170.00	254.93	424.93	181.60	262.70	444.30	19.37	4.6%
2	100	334.50	499.93	834.43	357.60	515.20	872.80	38.37	4.6%
3	200	673.50	989.93	1,663.43	720.00	1,020.20	1,740.20	76.77	4.6%
3	300	1,002.50	1,479.93	2,482.43	1,072.00	1,525.20	2,597.20	114.77	4.6%
4	500	1,664.50	2,459.93	4,124.43	1,780.00	2,535.20	4,315.20	190.77	4.6%
4	1000	3,309.50	4,909.93	8,219.43	3,540.00	5,060.20	8,600.20	380.77	4.6%
Industrial									
3	200	589.50	989.93	1,579.43	610.00	1,020.20	1,630.20	50.77	3.2%
3	300	876.50	1,479.93	2,356.43	907.00	1,525.20	2,432.20	75.77	3.2%
4	2500	7,194.50	12,259.93	19,454.43	7,445.00	12,635.20	20,080.20	625.77	3.2%
6	5000	14,378.00	24,509.93	38,887.93	14,879.00	25,260.20	40,139.20	1,251.27	3.2%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2014 and Proposed 2015 Rates - Scenario 6

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	10.20	13.35	3.30	10.53	13.83	0.48	3.6%
5/8	1	7.56	15.25	22.81	7.97	15.73	23.70	0.89	3.9%
5/8	2	11.97	20.30	32.27	12.64	20.93	33.57	1.30	4.0%
5/8	4	20.79	30.40	51.19	21.98	31.33	53.31	2.12	4.1%
5/8	6	29.61	40.50	70.11	31.32	41.73	73.05	2.94	4.2%
5/8	10	47.25	60.70	107.95	50.00	62.53	112.53	4.58	4.2%
5/8	15	69.30	85.95	155.25	73.35	88.53	161.88	6.63	4.3%
5/8	20	91.35	111.20	202.55	96.70	114.53	211.23	8.68	4.3%
Multifamily									
5/8	0	3.15	10.20	13.35	3.30	10.53	13.83	0.48	3.6%
5/8	1	6.49	15.25	21.74	6.79	15.73	22.52	0.78	3.6%
5/8	2	9.83	20.30	30.13	10.28	20.93	31.21	1.08	3.6%
5/8	4	16.51	30.40	46.91	17.26	31.33	48.59	1.68	3.6%
5/8	6	23.19	40.50	63.69	24.24	41.73	65.97	2.28	3.6%
5/8	10	36.55	60.70	97.25	38.20	62.53	100.73	3.48	3.6%
5/8	15	53.25	85.95	139.20	55.65	88.53	144.18	4.98	3.6%
5/8	20	69.95	111.20	181.15	73.10	114.53	187.63	6.48	3.6%
Commercial									
2	50	181.60	262.70	444.30	192.80	270.53	463.33	19.03	4.3%
2	100	357.60	515.20	872.80	379.80	530.53	910.33	37.53	4.3%
3	200	720.00	1,020.20	1,740.20	765.00	1,050.53	1,815.53	75.33	4.3%
3	300	1,072.00	1,525.20	2,597.20	1,139.00	1,570.53	2,709.53	112.33	4.3%
4	500	1,780.00	2,535.20	4,315.20	1,891.00	2,610.53	4,501.53	186.33	4.3%
4	1000	3,540.00	5,060.20	8,600.20	3,761.00	5,210.53	8,971.53	371.33	4.3%
Industrial									
3	200	610.00	1,020.20	1,630.20	649.00	1,050.53	1,699.53	69.33	4.3%
3	300	907.00	1,525.20	2,432.20	965.00	1,570.53	2,535.53	103.33	4.2%
4	2500	7,445.00	12,635.20	20,080.20	7,921.00	13,010.53	20,931.53	851.33	4.2%
6	5000	14,879.00	25,260.20	40,139.20	15,830.00	26,010.53	41,840.53	1,701.33	4.2%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2015 and Proposed 2016 Rates - Scenario 6

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.30	10.53	13.83	3.40	10.93	14.33	0.50	3.6%
5/8	1	7.97	15.73	23.70	8.35	16.34	24.69	0.99	4.2%
5/8	2	12.64	20.93	33.57	13.30	21.75	35.05	1.48	4.4%
5/8	4	21.98	31.33	53.31	23.20	32.57	55.77	2.46	4.6%
5/8	6	31.32	41.73	73.05	33.10	43.39	76.49	3.44	4.7%
5/8	10	50.00	62.53	112.53	52.90	65.03	117.93	5.40	4.8%
5/8	15	73.35	88.53	161.88	77.65	92.08	169.73	7.85	4.8%
5/8	20	96.70	114.53	211.23	102.40	119.13	221.53	10.30	4.9%
Multifamily									
5/8	0	3.30	10.53	13.83	3.40	10.93	14.33	0.50	3.6%
5/8	1	6.79	15.73	22.52	7.12	16.34	23.46	0.94	4.2%
5/8	2	10.28	20.93	31.21	10.84	21.75	32.59	1.38	4.4%
5/8	4	17.26	31.33	48.59	18.28	32.57	50.85	2.26	4.7%
5/8	6	24.24	41.73	65.97	25.72	43.39	69.11	3.14	4.8%
5/8	10	38.20	62.53	100.73	40.60	65.03	105.63	4.90	4.9%
5/8	15	55.65	88.53	144.18	59.20	92.08	151.28	7.10	4.9%
5/8	20	73.10	114.53	187.63	77.80	119.13	196.93	9.30	5.0%
Commercial									
2	50	192.80	270.53	463.33	205.00	281.43	486.43	23.10	5.0%
2	100	379.80	530.53	910.33	404.00	551.93	955.93	45.60	5.0%
3	200	765.00	1,050.53	1,815.53	813.50	1,092.93	1,906.43	90.90	5.0%
3	300	1,139.00	1,570.53	2,709.53	1,211.50	1,633.93	2,845.43	135.90	5.0%
4	500	1,891.00	2,610.53	4,501.53	2,011.50	2,715.93	4,727.43	225.90	5.0%
4	1000	3,761.00	5,210.53	8,971.53	4,001.50	5,420.93	9,422.43	450.90	5.0%
Industrial									
3	200	649.00	1,050.53	1,699.53	689.50	1,092.93	1,782.43	82.90	4.9%
3	300	965.00	1,570.53	2,535.53	1,025.50	1,633.93	2,659.43	123.90	4.9%
4	2500	7,921.00	13,010.53	20,931.53	8,421.50	13,535.93	21,957.43	1,025.90	4.9%
6	5000	15,830.00	26,010.53	41,840.53	16,831.00	27,060.93	43,891.93	2,051.40	4.9%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2016 and Proposed 2017 Rates - Scenario 6

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.40	10.93	14.33	3.50	11.60	15.10	0.77	5.4%
5/8	1	8.35	16.34	24.69	8.83	17.33	26.16	1.47	6.0%
5/8	2	13.30	21.75	35.05	14.16	23.06	37.22	2.17	6.2%
5/8	4	23.20	32.57	55.77	24.82	34.52	59.34	3.57	6.4%
5/8	6	33.10	43.39	76.49	35.48	45.98	81.46	4.97	6.5%
5/8	10	52.90	65.03	117.93	56.80	68.90	125.70	7.77	6.6%
5/8	15	77.65	92.08	169.73	83.45	97.55	181.00	11.27	6.6%
5/8	20	102.40	119.13	221.53	110.10	126.20	236.30	14.77	6.7%
Multifamily									
5/8	0	3.40	10.93	14.33	3.50	11.60	15.10	0.77	5.4%
5/8	1	7.12	16.34	23.46	7.50	17.33	24.83	1.37	5.8%
5/8	2	10.84	21.75	32.59	11.50	23.06	34.56	1.97	6.0%
5/8	4	18.28	32.57	50.85	19.50	34.52	54.02	3.17	6.2%
5/8	6	25.72	43.39	69.11	27.50	45.98	73.48	4.37	6.3%
5/8	10	40.60	65.03	105.63	43.50	68.90	112.40	6.77	6.4%
5/8	15	59.20	92.08	151.28	63.50	97.55	161.05	9.77	6.5%
5/8	20	77.80	119.13	196.93	83.50	126.20	209.70	12.77	6.5%
Commercial									
2	50	205.00	281.43	486.43	220.70	298.10	518.80	32.37	6.7%
2	100	404.00	551.93	955.93	435.20	584.60	1,019.80	63.87	6.7%
3	200	813.50	1,092.93	1,906.43	876.00	1,157.60	2,033.60	127.17	6.7%
3	300	1,211.50	1,633.93	2,845.43	1,305.00	1,730.60	3,035.60	190.17	6.7%
4	500	2,011.50	2,715.93	4,727.43	2,167.50	2,876.60	5,044.10	316.67	6.7%
4	1000	4,001.50	5,420.93	9,422.43	4,312.50	5,741.60	10,054.10	631.67	6.7%
Industrial									
3	200	689.50	1,092.93	1,782.43	744.00	1,157.60	1,901.60	119.17	6.7%
3	300	1,025.50	1,633.93	2,659.43	1,107.00	1,730.60	2,837.60	178.17	6.7%
4	2500	8,421.50	13,535.93	21,957.43	9,097.50	14,336.60	23,434.10	1,476.67	6.7%
6	5000	16,831.00	27,060.93	43,891.93	18,182.00	28,661.60	46,843.60	2,951.67	6.7%

The charges shown are for customers inside the City Limits.

Scenario 7 – Roadway Relocations Only – No Wakarusa WWTP

Comparison of Typical Monthly Bills
Under Existing and Proposed 2013 Rates - Scenario 7

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.15	9.29	12.44	3.10	9.92	13.02	0.58	4.7%
5/8	1	6.93	14.31	21.24	7.12	14.82	21.94	0.70	3.3%
5/8	2	10.71	19.33	30.04	11.14	19.72	30.86	0.82	2.7%
5/8	4	18.27	29.37	47.64	19.18	29.52	48.70	1.06	2.2%
5/8	6	25.83	39.41	65.24	27.22	39.32	66.54	1.30	2.0%
5/8	10	40.95	59.49	100.44	43.30	58.92	102.22	1.78	1.8%
5/8	15	59.85	84.59	144.44	63.40	83.42	146.82	2.38	1.6%
5/8	20	78.75	109.69	188.44	83.50	107.92	191.42	2.98	1.6%
Multifamily									
5/8	0	3.15	9.29	12.44	3.10	9.92	13.02	0.58	4.7%
5/8	1	6.44	14.31	20.75	6.11	14.82	20.93	0.18	0.9%
5/8	2	9.73	19.33	29.06	9.12	19.72	28.84	(0.22)	-0.8%
5/8	4	16.31	29.37	45.68	15.14	29.52	44.66	(1.02)	-2.2%
5/8	6	22.89	39.41	62.30	21.16	39.32	60.48	(1.82)	-2.9%
5/8	10	36.05	59.49	95.54	33.20	58.92	92.12	(3.42)	-3.6%
5/8	15	52.50	84.59	137.09	48.25	83.42	131.67	(5.42)	-4.0%
5/8	20	68.95	109.69	178.64	63.30	107.92	171.22	(7.42)	-4.2%
Commercial									
2	50	153.80	260.29	414.09	166.00	254.92	420.92	6.83	1.6%
2	100	301.80	511.29	813.09	326.50	499.92	826.42	13.33	1.6%
3	200	609.00	1,013.29	1,622.29	657.50	989.92	1,647.42	25.13	1.5%
3	300	905.00	1,515.29	2,420.29	978.50	1,479.92	2,458.42	38.13	1.6%
4	500	1,501.00	2,519.29	4,020.29	1,624.50	2,459.92	4,084.42	64.13	1.6%
4	1000	2,981.00	5,029.29	8,010.29	3,229.50	4,909.92	8,139.42	129.13	1.6%
Industrial									
3	200	591.00	1,013.29	1,604.29	557.50	989.92	1,547.42	(56.87)	-3.5%
3	300	878.00	1,515.29	2,393.29	828.50	1,479.92	2,308.42	(84.87)	-3.5%
4	2500	7,196.00	12,559.29	19,755.29	6,794.50	12,259.92	19,054.42	(700.87)	-3.5%
6	5000	14,381.00	25,109.29	39,490.29	13,578.00	24,509.92	38,087.92	(1,402.37)	-3.6%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2013 and Proposed 2014 Rates - Scenario 7

Meter Size	Monthly Usage	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
Inches	1,000 gal.	$	$	$	$	$	$	$	
Residential									
5/8	0	3.10	9.92	13.02	3.16	9.97	13.13	0.11	0.8%
5/8	1	7.12	14.82	21.94	7.18	14.86	22.04	0.10	0.5%
5/8	2	11.14	19.72	30.86	11.20	19.75	30.95	0.09	0.3%
5/8	4	19.18	29.52	48.70	19.24	29.53	48.77	0.07	0.1%
5/8	6	27.22	39.32	66.54	27.28	39.31	66.59	0.05	0.1%
5/8	10	43.30	58.92	102.22	43.36	58.87	102.23	0.01	0.0%
5/8	15	63.40	83.42	146.82	63.46	83.32	146.78	(0.04)	0.0%
5/8	20	83.50	107.92	191.42	83.56	107.77	191.33	(0.09)	0.0%
Multifamily									
5/8	0	3.10	9.92	13.02	3.16	9.97	13.13	0.11	0.8%
5/8	1	6.11	14.82	20.93	6.16	14.86	21.02	0.09	0.4%
5/8	2	9.12	19.72	28.84	9.16	19.75	28.91	0.07	0.2%
5/8	4	15.14	29.52	44.66	15.16	29.53	44.69	0.03	0.1%
5/8	6	21.16	39.32	60.48	21.16	39.31	60.47	(0.01)	0.0%
5/8	10	33.20	58.92	92.12	33.16	58.87	92.03	(0.09)	-0.1%
5/8	15	48.25	83.42	131.67	48.16	83.32	131.48	(0.19)	-0.1%
5/8	20	63.30	107.92	171.22	63.16	107.77	170.93	(0.29)	-0.2%
Commercial									
2	50	166.00	254.92	420.92	165.50	254.47	419.97	(0.95)	-0.2%
2	100	326.50	499.92	826.42	325.50	498.97	824.47	(1.95)	-0.2%
3	200	657.50	989.92	1,647.42	656.00	987.97	1,643.97	(3.45)	-0.2%
3	300	978.50	1,479.92	2,458.42	976.00	1,476.97	2,452.97	(5.45)	-0.2%
4	500	1,624.50	2,459.92	4,084.42	1,619.50	2,454.97	4,074.47	(9.95)	-0.2%
4	1000	3,229.50	4,909.92	8,139.42	3,219.50	4,899.97	8,119.47	(19.95)	-0.2%
Industrial									
3	200	557.50	989.92	1,547.42	556.00	987.97	1,543.97	(3.45)	-0.2%
3	300	828.50	1,479.92	2,308.42	826.00	1,476.97	2,302.97	(5.45)	-0.2%
4	2500	6,794.50	12,259.92	19,054.42	6,769.50	12,234.97	19,004.47	(49.95)	-0.3%
6	5000	13,578.00	24,509.92	38,087.92	13,528.00	24,459.97	37,987.97	(99.95)	-0.3%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2014 and Proposed 2015 Rates - Scenario 7

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.16	9.97	13.13	3.22	10.04	13.26	0.13	1.0%
5/8	1	7.18	14.86	22.04	7.24	14.91	22.15	0.11	0.5%
5/8	2	11.20	19.75	30.95	11.26	19.78	31.04	0.09	0.3%
5/8	4	19.24	29.53	48.77	19.30	29.52	48.82	0.05	0.1%
5/8	6	27.28	39.31	66.59	27.34	39.26	66.60	0.01	0.0%
5/8	10	43.36	58.87	102.23	43.42	58.74	102.16	(0.07)	-0.1%
5/8	15	63.46	83.32	146.78	63.52	83.09	146.61	(0.17)	-0.1%
5/8	20	83.56	107.77	191.33	83.62	107.44	191.06	(0.27)	-0.1%
Multifamily									
5/8	0	3.16	9.97	13.13	3.22	10.04	13.26	0.13	1.0%
5/8	1	6.16	14.86	21.02	6.21	14.91	21.12	0.10	0.5%
5/8	2	9.16	19.75	28.91	9.20	19.78	28.98	0.07	0.2%
5/8	4	15.16	29.53	44.69	15.18	29.52	44.70	0.01	0.0%
5/8	6	21.16	39.31	60.47	21.16	39.26	60.42	(0.05)	-0.1%
5/8	10	33.16	58.87	92.03	33.12	58.74	91.86	(0.17)	-0.2%
5/8	15	48.16	83.32	131.48	48.07	83.09	131.16	(0.32)	-0.2%
5/8	20	63.16	107.77	170.93	63.02	107.44	170.46	(0.47)	-0.3%
Commercial									
2	50	165.50	254.47	419.97	164.60	253.54	418.14	(1.83)	-0.4%
2	100	325.50	498.97	824.47	323.60	497.04	820.64	(3.83)	-0.5%
3	200	656.00	987.97	1,643.97	652.00	984.04	1,636.04	(7.93)	-0.5%
3	300	976.00	1,476.97	2,452.97	970.00	1,471.04	2,441.04	(11.93)	-0.5%
4	500	1,619.50	2,454.97	4,074.47	1,610.00	2,445.04	4,055.04	(19.43)	-0.5%
4	1000	3,219.50	4,899.97	8,119.47	3,200.00	4,880.04	8,080.04	(39.43)	-0.5%
Industrial									
3	200	556.00	987.97	1,543.97	554.00	984.04	1,538.04	(5.93)	-0.4%
3	300	826.00	1,476.97	2,302.97	823.00	1,471.04	2,294.04	(8.93)	-0.4%
4	2500	6,769.50	12,234.97	19,004.47	6,745.00	12,185.04	18,930.04	(74.43)	-0.4%
6	5000	13,528.00	24,459.97	37,987.97	13,479.00	24,360.04	37,839.04	(148.93)	-0.4%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2015 and Proposed 2016 Rates - Scenario 7

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.22	10.04	13.26	3.28	10.09	13.37	0.11	0.8%
5/8	1	7.24	14.91	22.15	7.30	14.96	22.26	0.11	0.5%
5/8	2	11.26	19.78	31.04	11.32	19.83	31.15	0.11	0.4%
5/8	4	19.30	29.52	48.82	19.36	29.57	48.93	0.11	0.2%
5/8	6	27.34	39.26	66.60	27.40	39.31	66.71	0.11	0.2%
5/8	10	43.42	58.74	102.16	43.48	58.79	102.27	0.11	0.1%
5/8	15	63.52	83.09	146.61	63.58	83.14	146.72	0.11	0.1%
5/8	20	83.62	107.44	191.06	83.68	107.49	191.17	0.11	0.1%
Multifamily									
5/8	0	3.22	10.04	13.26	3.28	10.09	13.37	0.11	0.8%
5/8	1	6.21	14.91	21.12	6.25	14.96	21.21	0.09	0.4%
5/8	2	9.20	19.78	28.98	9.22	19.83	29.05	0.07	0.2%
5/8	4	15.18	29.52	44.70	15.16	29.57	44.73	0.03	0.1%
5/8	6	21.16	39.26	60.42	21.10	39.31	60.41	(0.01)	0.0%
5/8	10	33.12	58.74	91.86	32.98	58.79	91.77	(0.09)	-0.1%
5/8	15	48.07	83.09	131.16	47.83	83.14	130.97	(0.19)	-0.1%
5/8	20	63.02	107.44	170.46	62.68	107.49	170.17	(0.29)	-0.2%
Commercial									
2	50	164.60	253.54	418.14	163.80	253.59	417.39	(0.75)	-0.2%
2	100	323.60	497.04	820.64	321.80	497.09	818.89	(1.75)	-0.2%
3	200	652.00	984.04	1,636.04	648.00	984.09	1,632.09	(3.95)	-0.2%
3	300	970.00	1,471.04	2,441.04	964.00	1,471.09	2,435.09	(5.95)	-0.2%
4	500	1,610.00	2,445.04	4,055.04	1,600.00	2,445.09	4,045.09	(9.95)	-0.2%
4	1000	3,200.00	4,880.04	8,080.04	3,180.00	4,880.09	8,060.09	(19.95)	-0.2%
Industrial									
3	200	554.00	984.04	1,538.04	554.00	984.09	1,538.09	0.05	0.0%
3	300	823.00	1,471.04	2,294.04	823.00	1,471.09	2,294.09	0.05	0.0%
4	2500	6,745.00	12,185.04	18,930.04	6,745.00	12,185.09	18,930.09	0.05	0.0%
6	5000	13,479.00	24,360.04	37,839.04	13,479.00	24,360.09	37,839.09	0.05	0.0%

The charges shown are for customers inside the City Limits.

Comparison of Typical Monthly Bills
Under Proposed 2016 and Proposed 2017 Rates - Scenario 7

Meter Size Inches	Monthly Usage 1,000 gal.	Existing			Proposed			Total Increase	Percent Increase
		Water	Wastewater	Combined	Water	Wastewater	Combined		
		$	$	$	$	$	$	$	
Residential									
5/8	0	3.28	10.09	13.37	3.35	10.23	13.58	0.21	1.6%
5/8	1	7.30	14.96	22.26	7.37	15.07	22.44	0.18	0.8%
5/8	2	11.32	19.83	31.15	11.39	19.91	31.30	0.15	0.5%
5/8	4	19.36	29.57	48.93	19.43	29.59	49.02	0.09	0.2%
5/8	6	27.40	39.31	66.71	27.47	39.27	66.74	0.03	0.0%
5/8	10	43.48	58.79	102.27	43.55	58.63	102.18	(0.09)	-0.1%
5/8	15	63.58	83.14	146.72	63.65	82.83	146.48	(0.24)	-0.2%
5/8	20	83.68	107.49	191.17	83.75	107.03	190.78	(0.39)	-0.2%
Multifamily									
5/8	0	3.28	10.09	13.37	3.35	10.23	13.58	0.21	1.6%
5/8	1	6.25	14.96	21.21	6.32	15.07	21.39	0.18	0.8%
5/8	2	9.22	19.83	29.05	9.29	19.91	29.20	0.15	0.5%
5/8	4	15.16	29.57	44.73	15.23	29.59	44.82	0.09	0.2%
5/8	6	21.10	39.31	60.41	21.17	39.27	60.44	0.03	0.0%
5/8	10	32.98	58.79	91.77	33.05	58.63	91.68	(0.09)	-0.1%
5/8	15	47.83	83.14	130.97	47.90	82.83	130.73	(0.24)	-0.2%
5/8	20	62.68	107.49	170.17	62.75	107.03	169.78	(0.39)	-0.2%
Commercial									
2	50	163.80	253.59	417.39	163.40	252.23	415.63	(1.76)	-0.4%
2	100	321.80	497.09	818.89	320.90	494.23	815.13	(3.76)	-0.5%
3	200	648.00	984.09	1,632.09	646.50	978.23	1,624.73	(7.36)	-0.5%
3	300	964.00	1,471.09	2,435.09	961.50	1,462.23	2,423.73	(11.36)	-0.5%
4	500	1,600.00	2,445.09	4,045.09	1,595.50	2,430.23	4,025.73	(19.36)	-0.5%
4	1000	3,180.00	4,880.09	8,060.09	3,170.50	4,850.23	8,020.73	(39.36)	-0.5%
Industrial									
3	200	554.00	984.09	1,538.09	552.50	978.23	1,530.73	(7.36)	-0.5%
3	300	823.00	1,471.09	2,294.09	820.50	1,462.23	2,282.73	(11.36)	-0.5%
4	2500	6,745.00	12,185.09	18,930.09	6,720.50	12,110.23	18,830.73	(99.36)	-0.5%
6	5000	13,479.00	24,360.09	37,839.09	13,430.00	24,210.23	37,640.23	(198.86)	-0.5%

The charges shown are for customers inside the City Limits.

Appendix III – System Development Charge Tables & Position Statements

Scenario 1 - Recommended
System Development Charges

	Existing	2013	2014	2015	2016	2017
	$	$	$	$	$	$
Water Utility						
Residential						
5/8"	1,560	1,590	1,580	1,570	1,560	1,550
1"	3,900	3,980	3,960	3,930	3,910	3,880
1-1/2"	7,800	7,950	7,900	7,850	7,800	7,750
2"	12,480	12,720	12,640	12,560	12,480	12,400
All Other						
5/8"	1,560	1,590	1,580	1,570	1,560	1,550
1"	3,900	3,980	3,960	3,930	3,910	3,880
1-1/2"	7,800	7,950	7,900	7,850	7,800	7,750
2"	12,480	12,720	12,640	12,560	12,480	12,400
3"	23,400	23,850	23,700	23,550	23,400	23,250
4"	39,000	39,750	39,500	39,250	39,000	38,750
6"	78,000	79,500	79,000	78,500	78,000	77,500
8"	156,000	159,000	158,000	157,000	156,000	155,000
10"	234,000	238,500	237,000	235,500	234,000	232,500
12"	343,200	349,800	347,600	345,400	343,200	341,000
16"	858,000	874,500	869,000	863,500	858,000	852,500
Wastewater Utility						
Residential						
All Meters	1,470	1,680	1,860	2,050	2,230	2,410
All Other						
5/8"	2,970	3,510	3,890	4,280	4,660	5,040
1"	7,430	8,780	9,740	10,690	11,650	12,600
1-1/2"	14,850	17,550	19,460	21,380	23,290	25,200
2"	23,760	28,080	31,140	34,200	37,260	40,320
3"	44,550	52,650	58,390	64,130	69,860	75,600
4"	74,250	87,750	97,310	106,880	116,440	126,000
6"	148,500	175,500	194,630	213,750	232,880	252,000
8"	297,000	351,000	389,250	427,500	465,750	504,000
10"	445,500	526,500	583,880	641,250	698,630	756,000
12"	653,400	772,200	856,350	940,500	1,024,650	1,108,800
16"	1,633,500	1,930,500	2,140,880	2,351,250	2,561,630	2,772,000
Combined Utilities						
Residential						
5/8"	3,030	3,270	3,440	3,620	3,790	3,960
1"	5,370	5,660	5,820	5,980	6,140	6,290
1-1/2"	9,270	9,630	9,760	9,900	10,030	10,160
2"	13,950	14,400	14,500	14,610	14,710	14,810
All Other						
5/8"	4,530	5,100	5,470	5,850	6,220	6,590
1"	11,330	12,760	13,700	14,620	15,560	16,480
1-1/2"	22,650	25,500	27,360	29,230	31,090	32,950
2"	36,240	40,800	43,780	46,760	49,740	52,720
3"	(a)	76,500	82,090	87,680	93,260	98,850
4"	(a)	127,500	136,810	146,130	155,440	164,750
6"	(a)	255,000	273,630	292,250	310,880	329,500
8"	(a)	510,000	547,250	584,500	621,750	659,000
10"	(a)	765,000	820,880	876,750	932,630	988,500
12"	(a)	1,122,000	1,203,950	1,285,900	1,367,850	1,449,800
16"	(a)	2,805,000	3,009,880	3,214,750	3,419,630	3,624,500

(a) Determined based on analysis of new customer's anticipated use of the system.

Scenario 2 - Reduced Water

System Development Charges

	Existing	2013	2014	2015	2016	2017
	$	$	$	$	$	$
Water Utility						
Residential						
5/8"	1,560	1,590	1,630	1,670	1,700	1,740
1"	3,900	3,980	4,070	4,170	4,260	4,350
1-1/2"	7,800	7,950	8,140	8,330	8,510	8,700
2"	12,480	12,720	13,020	13,320	13,620	13,920
All Other						
5/8"	1,560	1,590	1,630	1,670	1,700	1,740
1"	3,900	3,980	4,070	4,170	4,260	4,350
1-1/2"	7,800	7,950	8,140	8,330	8,510	8,700
2"	12,480	12,720	13,020	13,320	13,620	13,920
3"	23,400	23,850	24,410	24,980	25,540	26,100
4"	39,000	39,750	40,690	41,630	42,560	43,500
6"	78,000	79,500	81,380	83,250	85,130	87,000
8"	156,000	159,000	162,750	166,500	170,250	174,000
10"	234,000	238,500	244,130	249,750	255,380	261,000
12"	343,200	349,800	358,050	366,300	374,550	382,800
16"	858,000	874,500	895,130	915,750	936,380	957,000
Wastewater Utility						
Residential						
All Meters	1,470	1,680	1,830	1,980	2,130	2,280
All Other						
5/8"	2,970	3,510	3,830	4,150	4,460	4,780
1"	7,430	8,780	9,570	10,370	11,160	11,950
1-1/2"	14,850	17,550	19,140	20,730	22,310	23,900
2"	23,760	28,080	30,620	33,160	35,700	38,240
3"	44,550	52,650	57,410	62,180	66,940	71,700
4"	74,250	87,750	95,690	103,630	111,560	119,500
6"	148,500	175,500	191,380	207,250	223,130	239,000
8"	297,000	351,000	382,750	414,500	446,250	478,000
10"	445,500	526,500	574,130	621,750	669,380	717,000
12"	653,400	772,200	842,050	911,900	981,750	1,051,600
16"	1,633,500	1,930,500	2,105,130	2,279,750	2,454,380	2,629,000
Combined Utilities						
Residential						
5/8"	3,030	3,270	3,460	3,650	3,830	4,020
1"	5,370	5,660	5,900	6,150	6,390	6,630
1-1/2"	9,270	9,630	9,970	10,310	10,640	10,980
2"	13,950	14,400	14,850	15,300	15,750	16,200
All Other						
5/8"	4,530	5,100	5,460	5,820	6,160	6,520
1"	11,330	12,760	13,640	14,540	15,420	16,300
1-1/2"	22,650	25,500	27,280	29,060	30,820	32,600
2"	36,240	40,800	43,640	46,480	49,320	52,160
3"	(a)	76,500	81,820	87,160	92,480	97,800
4"	(a)	127,500	136,380	145,260	154,120	163,000
6"	(a)	255,000	272,760	290,500	308,260	326,000
8"	(a)	510,000	545,500	581,000	616,500	652,000
10"	(a)	765,000	818,260	871,500	924,760	978,000
12"	(a)	1,122,000	1,200,100	1,278,200	1,356,300	1,434,400
16"	(a)	2,805,000	3,000,260	3,195,500	3,390,760	3,586,000

(a) Determined based on analysis of new customer's anticipated use of the system.

Scenario 3 - Deferred Maintenance/Reliability

System Development Charges

	Existing	2013	2014	2015	2016	2017
	$	$	$	$	$	$
Water Utility						
Residential						
5/8"	1,560	1,590	1,580	1,560	1,550	1,530
1"	3,900	3,980	3,940	3,910	3,870	3,830
1-1/2"	7,800	7,950	7,880	7,800	7,730	7,650
2"	12,480	12,720	12,600	12,480	12,360	12,240
All Other						
5/8"	1,560	1,590	1,580	1,560	1,550	1,530
1"	3,900	3,980	3,940	3,910	3,870	3,830
1-1/2"	7,800	7,950	7,880	7,800	7,730	7,650
2"	12,480	12,720	12,600	12,480	12,360	12,240
3"	23,400	23,850	23,630	23,400	23,180	22,950
4"	39,000	39,750	39,380	39,000	38,630	38,250
6"	78,000	79,500	78,750	78,000	77,250	76,500
8"	156,000	159,000	157,500	156,000	154,500	153,000
10"	234,000	238,500	236,250	234,000	231,750	229,500
12"	343,200	349,800	346,500	343,200	339,900	336,600
16"	858,000	874,500	866,250	858,000	849,750	841,500
Wastewater Utility						
Residential						
All Meters	1,470	1,680	1,860	2,050	2,230	2,410
All Other						
5/8"	2,970	3,510	3,900	4,280	4,670	5,050
1"	7,430	8,780	9,740	10,710	11,670	12,630
1-1/2"	14,850	17,550	19,480	21,400	23,330	25,250
2"	23,760	28,080	31,160	34,240	37,320	40,400
3"	44,550	52,650	58,430	64,200	69,980	75,750
4"	74,250	87,750	97,380	107,000	116,630	126,250
6"	148,500	175,500	194,750	214,000	233,250	252,500
8"	297,000	351,000	389,500	428,000	466,500	505,000
10"	445,500	526,500	584,250	642,000	699,750	757,500
12"	653,400	772,200	856,900	941,600	1,026,300	1,111,000
16"	1,633,500	1,930,500	2,142,250	2,354,000	2,565,750	2,777,500
Combined Utilities						
Residential						
5/8"	3,030	3,270	3,440	3,610	3,780	3,940
1"	5,370	5,660	5,800	5,960	6,100	6,240
1-1/2"	9,270	9,630	9,740	9,850	9,960	10,060
2"	13,950	14,400	14,460	14,530	14,590	14,650
All Other						
5/8"	4,530	5,100	5,480	5,840	6,220	6,580
1"	11,330	12,760	13,680	14,620	15,540	16,460
1-1/2"	22,650	25,500	27,360	29,200	31,060	32,900
2"	36,240	40,800	43,760	46,720	49,680	52,640
3"	(a)	76,500	82,060	87,600	93,160	98,700
4"	(a)	127,500	136,760	146,000	155,260	164,500
6"	(a)	255,000	273,500	292,000	310,500	329,000
8"	(a)	510,000	547,000	584,000	621,000	658,000
10"	(a)	765,000	820,500	876,000	931,500	987,000
12"	(a)	1,122,000	1,203,400	1,284,800	1,366,200	1,447,600
16"	(a)	2,805,000	3,008,500	3,212,000	3,415,500	3,619,000

(a) Determined based on analysis of new customer's anticipated use of the system.

Scenario 4 - Deferred Maintenance/Reliability & Wakarusa WWTP

System Development Charges

	Existing	2013	2014	2015	2016	2017
	$	$	$	$	$	$
Water Utility						
Residential						
5/8"	1,560	1,590	1,580	1,560	1,550	1,530
1"	3,900	3,980	3,940	3,910	3,870	3,830
1-1/2"	7,800	7,950	7,880	7,800	7,730	7,650
2"	12,480	12,720	12,600	12,480	12,360	12,240
All Other						
5/8"	1,560	1,590	1,580	1,560	1,550	1,530
1"	3,900	3,980	3,940	3,910	3,870	3,830
1-1/2"	7,800	7,950	7,880	7,800	7,730	7,650
2"	12,480	12,720	12,600	12,480	12,360	12,240
3"	23,400	23,850	23,630	23,400	23,180	22,950
4"	39,000	39,750	39,380	39,000	38,630	38,250
6"	78,000	79,500	78,750	78,000	77,250	76,500
8"	156,000	159,000	157,500	156,000	154,500	153,000
10"	234,000	238,500	236,250	234,000	231,750	229,500
12"	343,200	349,800	346,500	343,200	339,900	336,600
16"	858,000	874,500	866,250	858,000	849,750	841,500
Wastewater Utility						
Residential						
All Meters	1,470	1,680	1,900	2,120	2,330	2,550
All Other						
5/8"	2,970	3,510	3,970	4,420	4,880	5,330
1"	7,430	8,780	9,920	11,060	12,190	13,330
1-1/2"	14,850	17,550	19,830	22,100	24,380	26,650
2"	23,760	28,080	31,720	35,360	39,000	42,640
3"	44,550	52,650	59,480	66,300	73,130	79,950
4"	74,250	87,750	99,130	110,500	121,880	133,250
6"	148,500	175,500	198,250	221,000	243,750	266,500
8"	297,000	351,000	396,500	442,000	487,500	533,000
10"	445,500	526,500	594,750	663,000	731,250	799,500
12"	653,400	772,200	872,300	972,400	1,072,500	1,172,600
16"	1,633,500	1,930,500	2,180,750	2,431,000	2,681,250	2,931,500
Combined Utilities						
Residential						
5/8"	3,030	3,270	3,480	3,680	3,880	4,080
1"	5,370	5,660	5,840	6,030	6,200	6,380
1-1/2"	9,270	9,630	9,780	9,920	10,060	10,200
2"	13,950	14,400	14,500	14,600	14,690	14,790
All Other						
5/8"	4,530	5,100	5,550	5,980	6,430	6,860
1"	11,330	12,760	13,860	14,970	16,060	17,160
1-1/2"	22,650	25,500	27,710	29,900	32,110	34,300
2"	36,240	40,800	44,320	47,840	51,360	54,880
3"	(a)	76,500	83,110	89,700	96,310	102,900
4"	(a)	127,500	138,510	149,500	160,510	171,500
6"	(a)	255,000	277,000	299,000	321,000	343,000
8"	(a)	510,000	554,000	598,000	642,000	686,000
10"	(a)	765,000	831,000	897,000	963,000	1,029,000
12"	(a)	1,122,000	1,218,800	1,315,600	1,412,400	1,509,200
16"	(a)	2,805,000	3,047,000	3,289,000	3,531,000	3,773,000

(a) Determined based on analysis of new customer's anticipated use of the system.

Scenario 5 - Taste, Odor, & Toxins

System Development Charges

	Existing	2013	2014	2015	2016	2017
	$	$	$	$	$	$
Water Utility						
Residential						
5/8"	1,560	1,590	1,580	1,580	1,570	1,560
1"	3,900	3,980	3,960	3,940	3,920	3,900
1-1/2"	7,800	7,950	7,910	7,880	7,840	7,800
2"	12,480	12,720	12,660	12,600	12,540	12,480
All Other						
5/8"	1,560	1,590	1,580	1,580	1,570	1,560
1"	3,900	3,980	3,960	3,940	3,920	3,900
1-1/2"	7,800	7,950	7,910	7,880	7,840	7,800
2"	12,480	12,720	12,660	12,600	12,540	12,480
3"	23,400	23,850	23,740	23,630	23,510	23,400
4"	39,000	39,750	39,560	39,380	39,190	39,000
6"	78,000	79,500	79,130	78,750	78,380	78,000
8"	156,000	159,000	158,250	157,500	156,750	156,000
10"	234,000	238,500	237,380	236,250	235,130	234,000
12"	343,200	349,800	348,150	346,500	344,850	343,200
16"	858,000	874,500	870,380	866,250	862,130	858,000
Wastewater Utility						
Residential						
All Meters	1,470	1,680	1,860	2,050	2,230	2,410
All Other						
5/8"	2,970	3,510	3,890	4,280	4,660	5,040
1"	7,430	8,780	9,740	10,690	11,650	12,600
1-1/2"	14,850	17,550	19,460	21,380	23,290	25,200
2"	23,760	28,080	31,140	34,200	37,260	40,320
3"	44,550	52,650	58,390	64,130	69,860	75,600
4"	74,250	87,750	97,310	106,880	116,440	126,000
6"	148,500	175,500	194,630	213,750	232,880	252,000
8"	297,000	351,000	389,250	427,500	465,750	504,000
10"	445,500	526,500	583,880	641,250	698,630	756,000
12"	653,400	772,200	856,350	940,500	1,024,650	1,108,800
16"	1,633,500	1,930,500	2,140,880	2,351,250	2,561,630	2,772,000
Combined Utilities						
Residential						
5/8"	3,030	3,270	3,440	3,630	3,800	3,970
1"	5,370	5,660	5,820	5,990	6,150	6,310
1-1/2"	9,270	9,630	9,770	9,930	10,070	10,210
2"	13,950	14,400	14,520	14,650	14,770	14,890
All Other						
5/8"	4,530	5,100	5,470	5,860	6,230	6,600
1"	11,330	12,760	13,700	14,630	15,570	16,500
1-1/2"	22,650	25,500	27,370	29,260	31,130	33,000
2"	36,240	40,800	43,800	46,800	49,800	52,800
3"	(a)	76,500	82,130	87,760	93,370	99,000
4"	(a)	127,500	136,870	146,260	155,630	165,000
6"	(a)	255,000	273,760	292,500	311,260	330,000
8"	(a)	510,000	547,500	585,000	622,500	660,000
10"	(a)	765,000	821,260	877,500	933,760	990,000
12"	(a)	1,122,000	1,204,500	1,287,000	1,369,500	1,452,000
16"	(a)	2,805,000	3,011,260	3,217,500	3,423,760	3,630,000

(a) Determined based on analysis of new customer's anticipated use of the system.

Scenario 6 - Delay Wakarusa WWTP & Accelerate Rapid I/I

System Development Charges

	Existing	2013	2014	2015	2016	2017
	$	$	$	$	$	$
Water Utility						
Residential						
5/8"	1,560	1,590	1,580	1,570	1,560	1,550
1"	3,900	3,980	3,960	3,930	3,910	3,880
1-1/2"	7,800	7,950	7,900	7,850	7,800	7,750
2"	12,480	12,720	12,640	12,560	12,480	12,400
All Other						
5/8"	1,560	1,590	1,580	1,570	1,560	1,550
1"	3,900	3,980	3,960	3,930	3,910	3,880
1-1/2"	7,800	7,950	7,900	7,850	7,800	7,750
2"	12,480	12,720	12,640	12,560	12,480	12,400
3"	23,400	23,850	23,700	23,550	23,400	23,250
4"	39,000	39,750	39,500	39,250	39,000	38,750
6"	78,000	79,500	79,000	78,500	78,000	77,500
8"	156,000	159,000	158,000	157,000	156,000	155,000
10"	234,000	238,500	237,000	235,500	234,000	232,500
12"	343,200	349,800	347,600	345,400	343,200	341,000
16"	858,000	874,500	869,000	863,500	858,000	852,500
Wastewater Utility						
Residential						
All Meters	1,470	1,680	1,880	2,080	2,270	2,470
All Other						
5/8"	2,970	3,510	3,930	4,340	4,760	5,170
1"	7,430	8,780	9,820	10,860	11,890	12,930
1-1/2"	14,850	17,550	19,630	21,700	23,780	25,850
2"	23,760	28,080	31,400	34,720	38,040	41,360
3"	44,550	52,650	58,880	65,100	71,330	77,550
4"	74,250	87,750	98,130	108,500	118,880	129,250
6"	148,500	175,500	196,250	217,000	237,750	258,500
8"	297,000	351,000	392,500	434,000	475,500	517,000
10"	445,500	526,500	588,750	651,000	713,250	775,500
12"	653,400	772,200	863,500	954,800	1,046,100	1,137,400
16"	1,633,500	1,930,500	2,158,750	2,387,000	2,615,250	2,843,500
Combined Utilities						
Residential						
5/8"	3,030	3,270	3,460	3,650	3,830	4,020
1"	5,370	5,660	5,840	6,010	6,180	6,350
1-1/2"	9,270	9,630	9,780	9,930	10,070	10,220
2"	13,950	14,400	14,520	14,640	14,750	14,870
All Other						
5/8"	4,530	5,100	5,510	5,910	6,320	6,720
1"	11,330	12,760	13,780	14,790	15,800	16,810
1-1/2"	22,650	25,500	27,530	29,550	31,580	33,600
2"	36,240	40,800	44,040	47,280	50,520	53,760
3"	(a)	76,500	82,580	88,650	94,730	100,800
4"	(a)	127,500	137,630	147,750	157,880	168,000
6"	(a)	255,000	275,250	295,500	315,750	336,000
8"	(a)	510,000	550,500	591,000	631,500	672,000
10"	(a)	765,000	825,750	886,500	947,250	1,008,000
12"	(a)	1,122,000	1,211,100	1,300,200	1,389,300	1,478,400
16"	(a)	2,805,000	3,027,750	3,250,500	3,473,250	3,696,000

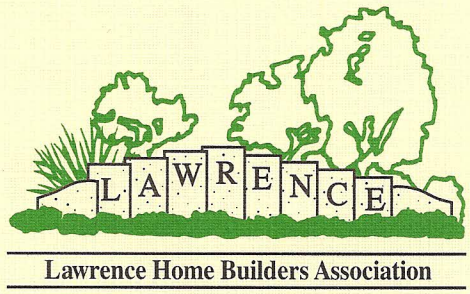
(a) Determined based on analysis of new customer's anticipated use of the system.

Scenario 7 - Roadway Relocations Only - No Wakarusa WWTP

System Development Charges

	Existing	2013	2014	2015	2016	2017
	$	$	$	$	$	$
Water Utility						
Residential						
5/8"	1,560	1,590	1,620	1,650	1,670	1,700
1"	3,900	3,980	4,050	4,120	4,180	4,250
1-1/2"	7,800	7,950	8,090	8,230	8,360	8,500
2"	12,480	12,720	12,940	13,160	13,380	13,600
All Other						
5/8"	1,560	1,590	1,620	1,650	1,670	1,700
1"	3,900	3,980	4,050	4,120	4,180	4,250
1-1/2"	7,800	7,950	8,090	8,230	8,360	8,500
2"	12,480	12,720	12,940	13,160	13,380	13,600
3"	23,400	23,850	24,260	24,680	25,090	25,500
4"	39,000	39,750	40,440	41,130	41,810	42,500
6"	78,000	79,500	80,880	82,250	83,630	85,000
8"	156,000	159,000	161,750	164,500	167,250	170,000
10"	234,000	238,500	242,630	246,750	250,880	255,000
12"	343,200	349,800	355,850	361,900	367,950	374,000
16"	858,000	874,500	889,630	904,750	919,880	935,000
Wastewater Utility						
Residential						
All Meters	1,470	1,680	1,860	2,050	2,230	2,410
All Other						
5/8"	2,970	3,510	3,900	4,280	4,670	5,050
1"	7,430	8,780	9,740	10,710	11,670	12,630
1-1/2"	14,850	17,550	19,480	21,400	23,330	25,250
2"	23,760	28,080	31,160	34,240	37,320	40,400
3"	44,550	52,650	58,430	64,200	69,980	75,750
4"	74,250	87,750	97,380	107,000	116,630	126,250
6"	148,500	175,500	194,750	214,000	233,250	252,500
8"	297,000	351,000	389,500	428,000	466,500	505,000
10"	445,500	526,500	584,250	642,000	699,750	757,500
12"	653,400	772,200	856,900	941,600	1,026,300	1,111,000
16"	1,633,500	1,930,500	2,142,250	2,354,000	2,565,750	2,777,500
Combined Utilities						
Residential						
5/8"	3,030	3,270	3,480	3,700	3,900	4,110
1"	5,370	5,660	5,910	6,170	6,410	6,660
1-1/2"	9,270	9,630	9,950	10,280	10,590	10,910
2"	13,950	14,400	14,800	15,210	15,610	16,010
All Other						
5/8"	4,530	5,100	5,520	5,930	6,340	6,750
1"	11,330	12,760	13,790	14,830	15,850	16,880
1-1/2"	22,650	25,500	27,570	29,630	31,690	33,750
2"	36,240	40,800	44,100	47,400	50,700	54,000
3"	(a)	76,500	82,690	88,880	95,070	101,250
4"	(a)	127,500	137,820	148,130	158,440	168,750
6"	(a)	255,000	275,630	296,250	316,880	337,500
8"	(a)	510,000	551,250	592,500	633,750	675,000
10"	(a)	765,000	826,880	888,750	950,630	1,012,500
12"	(a)	1,122,000	1,212,750	1,303,500	1,394,250	1,485,000
16"	(a)	2,805,000	3,031,880	3,258,750	3,485,630	3,712,500

(a) Determined based on analysis of new customer's anticipated use of the system.



December 17, 2012

Dave Wagner
City of Lawrence Utilities Department
1400 E. 8th Street
Lawrence, KS 66044

Dear Dave,

Thank you and your staff for educating the Lawrence Home Builders Association on the methodology the utility department uses to determine proposed System Development Charges. We appreciated your effort to open the dialogue with us and the Lawrence Board of Realtors on this topic. The result has been a better understanding and acknowledgement of each other's perspective.

As you know, the LHBA fundamentally disagrees with SDC's. New home owners have 'paid their way' through building fees, property and sales taxes, and user fees. On the other hand, it is recognized that no charges exist for the reimbursement of significant costs incurred by the community-at-large for aging infrastructure improvements for existing homes. However, given that SDC's are established in our community, the LHBA has reviewed the seven scenarios presented and will not oppose a fee increase for any of the scenarios that include building the Wastewater Treatment Plant now. If the City determines that population and capacity projections do not necessitate moving forward with the WWTP at this time, then the LHBA supports no change to the current SDC's.

If the 2012 International Building Codes are adopted by the City, there will be cost increases for new homes. The scenarios presented for SDC's will add to that an additional $910 - $1,080 for a 5/8" meter. These combined increases make it more difficult for those trying to buy an affordable new home. As the city adopts new building codes and considers how to best provide water and wastewater services to the community, they should keep in mind how these combined costs will impact housing.

The recently adopted Transfer Policy did not result in the transparency of revenue transferred from the utility fund to the general fund. When the City begins to move forward with the largest utility project in our history, it will be critical for the elected leadership to assure fee payers that the fees paid for water and wastewater services are actually spent for the purposes in which they were collected.

Thank you for facilitating several meetings with us to discuss SDC's.

Sincerely,

Bobbie Flory
Executive Director

P.O. Box 3490 • Lawrence, Kansas 66046 • (785) 748-0612 • fax (785) 748-0622 • www.lhba.net

LAWRENCE BOARD OF REALTORS®
3838 W. SIXTH STREET / LAWRENCE, KANSAS 66049

January 4, 2013

Lawrence City Commission
P.O. Box 708
Lawrence, KS 66044

Subject: Comments on System Development Charges and Water/Wastewater Master Plan

Dear Mayor Schumm and Members of the City Commission,

On November 15, 2012, the Utilities Department submitted a detailed memorandum to the City Commission outlining seven different scenarios for capital improvement projects that are necessary to fully implement the recommendations contained in the city's recently-drafted water and wastewater master plans. First and foremost, the Lawrence Board of REALTORS® (hereinafter "LBOR") would like to commend the leadership and staff of the Utilities Department for the very open and transparent process used to develop these recommendations and their willingness to provide information to industry stakeholders.

As you are well aware, LBOR fundamentally disagrees with the notion that the developers (and ultimately the owners and tenants) of newly-constructed commercial and residential properties should be forced to pay system development charges (or "impact fees") for the right to build in our community. In our opinion, the overall economic and financial benefits the community derives from the construction of commercial and residential properties contribute an overwhelming amount of resources to the local economy and these benefits vastly outweigh any related costs to the community associated with growth.

When a commercial or residential building is constructed in this community, a large number of our citizens are employed and receive decent wages, sales tax revenues increase due to the purchase of building materials, building permit fees are paid to the city to support development services, property tax revenues increase as the value of new structures are added to the city's property tax rolls and the owners and occupants of new structures pay user fees to support the publicly-owned utilities. In our opinion, no truly objective observer could attempt to argue that a newly-constructed commercial or residential building does not make a substantial contribution to economic development and job growth in our community.

Having said that, LBOR recognizes that system development charges are firmly established in our community and that now is the time for the City of Lawrence to take action to ensure that we have adequate water and wastewater capacity to service future real estate development and growth in our community, which will be vital to leading our community's economy out of this recession in future years. LBOR is very concerned that the City Commission may not take the necessary steps to adopt the full recommendations of the Utilities Department and immediately address our community's water and wastewater infrastructure needs.

If the system development charges are going to be increased as recommend by the Utilities Department, then LBOR strongly believes that the City Commission must follow the full recommendations of the department and our water and wastewater master plan consultants by adopting Scenario #1 and immediately taking those recommended steps to increase the capacity and fully fund the maintenance of our water and wastewater systems. If these steps are not taken in full, including the immediate commencement of the construction of the Wakarusa Wastewater Treatment Plant (WWTP), then LBOR sees little justification for increasing the system development charges and opposes any increase at this time.

If the City Commission fails to follow the professional recommendations of the Utilities Department and the water and wastewater master plan consultants, then our community will not be adequately prepared to service new growth that will generate economic development and job growth in our community in future years. LBOR strongly believes that now is not the time for the City Commission to foolishly "kick the can" down the road by adopting one of the reduced and less effective capital improvement scenarios.

The argument behind the implementation of system development charges was that additional revenue was needed from the developers (and ultimately the owners and tenants) of newly-constructed commercial and residential properties in order to pay for the related infrastructure costs associated with growth. However, this argument will be severely undermined if the city decides to increase the system development charges while at the same time failing to undertake capital improvement projects that will actually provide adequate infrastructure for growth and new real estate development opportunities in our community.

Finally, LBOR continues to be extremely concerned that the city has not instituted a plan for funding the infrastructure needed to accommodate growth with transparency, so that all funds actually collected by the Utilities Department are exclusively devoted to the actual cost of constructing and maintaining infrastructure to service new and existing development. Until the city properly accounts for the cost of providing services to the utilities department and ensures that all utilities funds are not being improperly transferred to cover other city costs that should be covered by other city funds, we cannot in good faith conclude that the city is being transparent with funds swept from the water and wastewater enterprise funds.

In conclusion, LBOR strongly opposes any increase in the system development charges at this time unless the City Commission agrees to follow the full recommendations of the Utilities Department and our water and wastewater master plan consultants by adopting Scenario #1 and immediately taking those recommended steps to increase the capacity and fully fund the maintenance of our water and wastewater systems. If these steps are not taken in full, including the immediate commencement of the construction of the Wakarusa Wastewater Treatment Plant (WWTP), then LBOR sees little justification for increasing the system development charges and opposes any increase of the system development charges at this time.

Thank you for the opportunity to provide public comments on this issue. We look forward to continuing this discussion with you as the City Commission discusses the recommendations of the Utilities Department.

Sincerely,

Luke Bell
Governmental Affairs Director
Lawrence Board of REALTORS®
3838 W. 6th St.
Lawrence, KS 66049
lbell@kansasrealtor.com

Attachment 6

City of Lawrence

CITY COMMISSION MEETING AGENDA

March 12, 2013 – 6:35 p.m.

(Posted on webpage at 4:50 p.m. on 03/07/13)

(10MB files take approximately 45 seconds to open)

UPDATES:

03/11/13 @ 2:00 p.m.:

- **Added a proclamation for Sunshine Week.**

A. RECOGNITION/PROCLAMATION/PRESENTATION:

1. Proclaim the week of March 10 – 16, 2013 as Sunshine Week.

B. CONSENT AGENDA:

NOTE: All matters listed below on the Consent Agenda are considered under one motion and will be enacted by one motion. There will be no separate discussion on those items. If discussion is desired, that item will be removed from the Consent Agenda and will be considered separately.

1. Approve City Commission meeting minutes from 02/12/13, 02/19/13, and 02/26/13.

2. Receive minutes from various boards and commissions:

   Public Health Board meeting of 12/17/12
   Sister Cities Advisory Board meeting of 01/16/13
   Traffic Safety Commission meeting of 01/07/13

3. Approve all claims. The list of approved claims will be posted to the agenda the day after the City Commission meeting.

4. Bid and purchase items:

   a) Award bid for contract mowing the landscape areas 1 and 2 for the Parks and Recreation Department to Golden Rules Lawn Care for $85,760. Bid Memo

   b) Award City Bid No. B1307: Eight (8) 2013 Ford Police utility Interceptors to Shawnee Mission Ford in the amount of $205,600. Bid Memo & Attachments

c) Award City Bid No. B1311, Project No. PW1318 - 2013 Microsurfacing Program, to Bettis Asphalt & Construction, Inc., in the total amount of $474,300.50. Bid Memo & Attachments

5. Adopt on first reading the following ordinances:

a) Ordinance No. 8843, amending Sections 6-108.16 and 6-804 of the City Code regarding solicitor/peddler license fees. Staff Memo & Attachments

b) Ordinance No. 8852, prohibiting the possession of glass bottles and other glass containers in the downtown district from 12:00 p.m. on Saturday, March 30 through 12:00 p.m. on Monday, April 1 and 12:00 p.m. on Saturday, April 6 through 12:00 p.m. on Tuesday, April 9, 2013. Staff Memo & Attachments

6. Adopt on second and final reading, the following ordinances:

a) Ordinance No. 8848, providing for the dedication of public right-of-way on the east side of Park West Subdivision and Glenwood Addition No. 2, additions to the City of Lawrence, Douglas County, Kansas (along Eisenhower Drive on the Northwest side of City park property generally located at Wakarusa Drive and Overland Drive).

b) Ordinance No. 8849, providing for the dedication of public right-of-way on the south side of Lot 3A, Lot Split of Lot 2 and Lot 3, University Corporate and Research Park Subdivision No. 1, an addition to the City of Lawrence, Douglas County, Kansas (along Bob Billings Parkway adjacent to the Investigation and Training Center).

c) Ordinance No. 8850, providing for the dedication of public right-of-way on the south side of Tract A of the amended plat of Quail Run No. 2, an addition to the City of Lawrence, Douglas County, Kansas (along Bob Billings Parkway adjacent to the McGrew Nature Trail).

7. Adopt Resolution No. 7018, City support of Poehler Phase II's development of affordable housing in the City of Lawrence. Staff Memo & Attachments

8. Approve a Special Event, SE-13-00041, for antique auto show parking May 3-5, 2013, to be located on the western portion of the Farmland property, adjacent to the Douglas County Fairgrounds. Submitted by Ralph Reschke, for the Antique Automobile Club of America. Staff Report

9. Approve vacation of existing utility, drainage, and pedestrian easements and dedication of new utility, drainage and pedestrian easements to accommodate the reduced number of lots and larger lot sizes included in the Minor Subdivision, MS-13-00026, for Landon Court Addition, located at 200-266 Landon Court. Staff Memo Staff Report Site Plan Vacated Easements Final Plat

10. Approve Comprehensive Plan Amendment, CPA-5-5-11, to Chapter 6 of Horizon 2020 to add policies for the Auto-Related Commercial Centers designation. Adopt on first reading, Joint City Ordinance No. 8841/County Resolution No. ____, for Comprehensive Plan Amendment (CPA-5-5-11) to Chapter 6 of Horizon 2020 to add policies for the Auto-Related Commercial Centers designation. (PC Item 4; approved 9-0 on 1/28/13) Staff Report Truck Stop Staff Memo Correspondence PC Minutes

11. Approve temporary use of right-of-way permit for the Lawrence Art Guild to close Massachusetts Street from North Park Street to South Park Street on Sunday, May 5 from 6:00 a.m. – 7:30 p.m. for the 2013 Art in the Park Art Fair. Staff Memo

12. Approve the following related Kansas Relays events to be held in downtown Lawrence on 4/17/13 and

4/18/13: Staff Memo & Attachments

a) Approve a Temporary Use of Public Right-of-Way Permit for the closure of the 100 block of E 8th St and the intersection of 8th St and New Hampshire St from 6:00 a.m., 4/17/13 to 6:00 a.m. 4/18/13, and the closure of the 100 block of W 8th St from 11:00 a.m. to midnight on 04/18/13.

b) Adopt on first reading, Ordinance No. 8845, authorizing the possession and consumption of alcoholic liquor on the 100 block of E 8th St and the intersection of 8th St and New Hampshire St from 4:00 p.m. – 10:00 p.m. on 04/17/13, and on the 100 block of W 8th St from 4:00 p.m. – 10:00 p.m. on 04/18/13.

13. Authorize the Mayor to sign Subordination Agreements for Arthur and Shirley Tarpy, 625 Lake Street; James Martinez, 2471 Brookside Drive; and Ruth Townsend, 1061 Home Circle. Staff Memo

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C. CITY MANAGER'S REPORT: CM Report & Attachments

ADDRESSING THE COMMISSION: The public is allowed to speak to any regular agenda item or give public comment after first being recognized by the Mayor. Individuals are asked to come to the microphone, sign in, and state their name and address. Speakers should address all comments/questions to the Commission.

D. REGULAR AGENDA ITEMS:

1. Conduct public hearing to consider the vacation of a right-of-way on Redbud Lane, south of 26th Street in Southridge Addition No. 3, as requested by property owner Bluejay Apartments, Inc. Staff Memo & Attachments

ACTION: Conduct public hearing and approve the Order of Vacation of right-of-way on Redbud Lane, south of 26th Street in Southridge Addition, if appropriate.

2. Consider the following items related to Water and Wastewater master plan: 02/12/13 Study Session Materials

a) Receive update on 2010 Census challenge and impact to water and wastewater master plan. Census Staff Memo & Attachments Wastewater Capacity Staff Memo

b) Consider adopting the 2012 Water and Wastewater Master Plans. Staff Memo & Attachments

c) Consider adopting the 2013–2017 Capital Improvement Program (CIP) for Scenario 5 – Taste, Odor, & Microtoxins.

d) Consider adopting on first reading, Ordinance No. 8846, adopting the 2013 Water and Wastewater Rates.

e) Consider adopting on first reading, Ordinance No. 8847, adopting the 2013–2017 Water and Wastewater System Development Charges (SDCs).

f) Consider authorizing the City Manager to execute Supplemental Agreement No.1 to the existing Engineering Services Agreement with Burns & McDonnell for Project UT0701DS – Kaw WTP Water Transmission Main Redefining the Project Scope and reducing the contract amount by $343,996 to $787,658. Staff Memo & Attachments

g) Consider authorizing the City Manager to execute an Engineering Services Agreement with Burns & McDonnell in the amount of $137,128 for Project UT1209 – Taste and Odor, and Algal Toxin Water Treatment Process Evaluation. Staff Memo

h) Consider authorizing staff to negotiate a Supplemental Agreement to the existing Engineering Services Contract with Black & Veatch for Engineering Services for Project UT1102KA Kaw WTP Raw Water Intake Replacement. Staff Memo & Attachments

i) Consider setting a bid date of April 9, 2013 for Bid No. B1314; UT1212-2013 Sanitary Sewer Cured-In-Place-Pipe Rehabilitation Project. Staff Memo

j) Consider authorizing staff to advertise Request for Proposals R1308 for Engineering Services for Project UT1304 Wakarusa Wastewater Treatment Plant, and Request for Proposals R1309 for Engineering Services for Project UT1306 Wakarusa Conveyance Corridor Facilities, and consider authorizing staff to negotiate with the Kansas Biological Survey for a Biota Study on the Wakarusa River. Staff Memo

k) Consider authorizing staff to advertise Request for Proposals R1307 for Engineering Services for Project UT1305 – Rapid Inflow and Infiltration Reduction. Staff Memo

l) Consider awarding the construction contract for Bid No. B1305 to the low bidder, Garney Construction, in the amount of $1,967,967 and consider authorizing the City Manager to execute the construction contract; consider authorizing the City Manager to execute Supplemental Agreement No. 2 with Wilson and Company in the amount of $33,800 for construction phase engineering services for project UT1206DS O'Connell Road Waterline. Bid Memo & Attachments

m) Consider authorizing staff to distribute Request for Proposals for Oread Tank and Pump Station replacement project. Staff Memo & Attachments

ACTION: Approve water and wastewater items, if appropriate.

E. PUBLIC COMMENT:

F. FUTURE AGENDA ITEMS: Staff Memo & Attachments

G. COMMISSION ITEMS:

H. CALENDAR: Meeting List

- Rental Registration Stakeholder meeting, Wednesday, March 13, 3:00 p.m. Location: City Commission Room. Stakeholder List
- City Commission meeting scheduled for Tuesday, March 19 is canceled due to Spring Break.
- Commissioners are invited to attend a retirement reception for Captain Allen Johnson of the Lawrence Douglas County Fire Medical Department, Tuesday, March 19, 2:30 – 4:00 p.m. Location: Fire Administration, 1911 Stewart Avenue. Invitation
- Commissioners are invited to attend a retirement reception for Margene Swarts, Wednesday, March 20, 4:00 – 6:00 p.m. Location: Lawrence Arts Center. Invitation
- Joint Economic Development Council meeting, Friday, April 12, 7:30 a.m. Location: City Commission Room, First Floor, City Hall.
- City Commission meeting scheduled for Tuesday, April 30 is canceled due to it being the fifth Tuesday.

March 2013						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	**5**	6	7	8	9
10	11	**12**	13	14	15	16
17	18	19	20	21	22	23
24	25	**26**	27	28	29	30
31						

April 2013						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	**2**	3	**4**	5	6
7	8	**9**	10	11	12	13
14	15	**16**	17	18	19	20
21	22	**23**	24	25	26	27
28	29	30				

***City Commission meeting dates are in black bold print**

I. CURRENT VACANCIES – BOARDS/COMMISSIONS:

Listed below are existing and upcoming vacancies on City of Lawrence Boards and Commissions. If interested in serving on a board, citizens should visit the website at http://www.lawrenceks.org/boards to volunteer online, or send a letter of interest to the Mayor, P.O. Box 708, Lawrence, KS 66044.

150th Anniversary Advisory Committee:
This is a new committee that shall have nine (9) members and will be tasked with advising the City Commission on the implementation of the 150th Anniversary schedule of events and to recognize the 150th Anniversary of the August 21, 1863 raid on the City of Lawrence by Quantrill and his followers.

Community Development Advisory Committee:
One vacancy for a position that expired 09/30/12. Eligibility requirements exist for this board.

Cultural District Task Force:
This is a newly formed task force charged with identifying three models that combine private, public, and grant funds to support improvements to the district and start a broader community wide cultural arts plan. The task force will be appointed by the City Commission with membership recommendations from the Lawrence Cultural Arts Commission, East Lawrence Neighborhood Association, Lawrence Arts Center, and Downtown Lawrence, Inc.

Electrical Code Board of Appeals:

One vacancy for a position that expired 03/31/12. Eligibility requirements exist for this board.

Historic Resources Commission:
One position will become vacant on 03/01/13. Eligibility requirements exist for this board.

Human Relations Commission:
Two vacancies for positions that expired 09/30/12. One vacancy for a position that expires 09/30/14.

Jayhawk Area Agency on Aging:
One vacancy on the Advisory Council for a position that expires 09/30/14.

Lawrence Cultural Arts Commission:
One vacancy for a position that expired 01/31/13.

Lawrence Douglas County Advocacy Council on Aging:
One vacancy on this board.

Lawrence Douglas County Metropolitan Planning Commission:
Two positions expire 05/31/13, with one being eligible for reappointment to an additional term and one position becoming vacant.

Sales Tax Audit Committee:
One vacancy for a position that expires 04/30/14.

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City of Lawrence

CITY COMMISSION

MAYOR
ROBERT J. SCHUMM

COMMISSIONERS
MICHAEL DEVER
HUGH CARTER
MIKE AMYX
ARON E. CROMWELL

DAVID L. CORLISS
CITY MANAGER

City Offices
PO Box 708 66044-0708
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6 East 6th St
785-832-3000
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March 12, 2013

The Board of Commissioners of the City of Lawrence met in regular session at 6:35 a.m., in the City Commission Chambers in City Hall with Mayor Schumm presiding and members Amyx, Carter, Cromwell and Dever present.

A. RECOGNITION/PROCLAMATION/PRESENTATION:

Proclaimed the week of March 10 – 16, 2013 as Sunshine Week.

B. CONSENT AGENDA

It was moved by Amyx, seconded by Cromwell, to approve the consent agenda as below. Motion carried unanimously.

1. Approved the City Commission meeting minutes from February 12, 2013, February 19, 2013, and February 26, 2013.

2. Received the Public Health Board meeting minutes of December 17, 2013; the Sister Cities Advisory Board meeting minutes of January 16, 2013; and the Traffic Safety Commission meeting minutes of January 17, 2013.

3. Approved claims to 224 vendors in the amount of $2,467,808.98 and payroll from February 24, 2013 – March 9, 2013, in the amount of $1,876,103.56.

4. Bid and purchase items:

    a) Awarded the bid for contract mowing the landscape areas 1 and 2 for the Parks and Recreation Department to Golden Rules Lawn Care for $85,760.

    b) Awarded City Bid No. B1307: Eight (8) 2013 Ford Police utility Interceptors to Shawnee Mission Ford in the amount of $205,600.

    c) Awarded City Bid No. B1311, Project No. PW1318 - 2013 Microsurfacing Program, to Bettis Asphalt & Construction, Inc., in the total amount of $474,300.50.

5. Adopted on first reading the following ordinances:

a) Ordinance No. 8843, amending Sections 6-108.16 and 6-804 of the City Code regarding solicitor/peddler license fees.

b) Ordinance No. 8852, prohibiting the possession of glass bottles and other glass containers in the downtown district from 12:00 p.m. on Saturday, March 30 through 12:00 p.m. on Monday, April 1 and 12:00 p.m. on Saturday, April 6 through 12:00 p.m. on Tuesday, April 9, 2013.

6. Adopted on second and final reading, the following ordinances:

a) Ordinance No. 8848, providing for the dedication of public right-of-way on the east side of Park West Subdivision and Glenwood Addition No. 2, additions to the City of Lawrence, Douglas County, Kansas (along Eisenhower Drive on the Northwest side of City park property generally located at Wakarusa Drive and Overland Drive).

b) Ordinance No. 8849, providing for the dedication of public right-of-way on the south side of Lot 3A, Lot Split of Lot 2 and Lot 3, University Corporate and Research Park Subdivision No. 1, an addition to the City of Lawrence, Douglas County, Kansas (along Bob Billings Parkway adjacent to the Investigation and Training Center).

c) Ordinance No. 8850, providing for the dedication of public right-of-way on the south side of Tract A of the amended plat of Quail Run No. 2, an addition to the City of Lawrence, Douglas County, Kansas (along Bob Billings Parkway adjacent to the McGrew Nature Trail).

7. Adopted Resolution No. 7018, City support of Poehler Phase II's development of affordable housing in the City of Lawrence.

8. Approved a Special Event, SE-13-00041, for antique auto show parking May 3-5, 2013, to be located on the western portion of the Farmland property, adjacent to the Douglas County Fairgrounds. Submitted by Ralph Reschke, for the Antique Automobile Club of America.

9. Approved vacation of existing utility, drainage, and pedestrian easements and dedication of new utility, drainage and pedestrian easements to accommodate the reduced number of lots and larger lot sizes included in the Minor Subdivision, MS-13-00026, for Landon Court Addition, located at 200-266 Landon Court.

10. Approved Comprehensive Plan Amendment, CPA-5-5-11, to Chapter 6 of Horizon 2020 to add policies for the Auto-Related Commercial Centers designation. Adopted on first reading, Joint City Ordinance No. 8841/County Resolution No. ____, for Comprehensive Plan Amendment (CPA-5-5-11) to Chapter 6 of Horizon 2020 to add policies for the Auto-Related Commercial Centers designation. (PC Item 4; approved 9-0 on 1/28/13)

11. Approved temporary use of right-of-way permit for the Lawrence Art Guild to close Massachusetts Street from North Park Street to South Park Street on Sunday, May 5 from 6:00 a.m. – 7:30 p.m. for the 2013 Art in the Park Art Fair.

12. Approved the following related Kansas Relays events to be held in downtown Lawrence on 4/17/13 and 4/18/13:

    a) Approved a Temporary Use of Public Right-of-Way Permit for the closure of the 100 block of E 8th St and the intersection of 8th St and New Hampshire St from 6:00 a.m., 4/17/13 to 6:00 a.m. 4/18/13, and the closure of the 100 block of W 8th St from 11:00 a.m. to midnight on 04/18/13.

    b) Adopted on first reading, Ordinance No. 8845, authorizing the possession and consumption of alcoholic liquor on the 100 block of E 8th St and the intersection of 8th St and New Hampshire St from 4:00 p.m. – 10:00 p.m. on 04/17/13, and on the 100 block of W 8th St from 4:00 p.m. – 10:00 p.m. on 04/18/13.

13. Authorized the Mayor to sign Subordination Agreements for Arthur and Shirley Tarpy, 625 Lake Street; James Martinez, 2471 Brookside Drive; and Ruth Townsend, 1061 Home Circle.

C. CITY MANAGER'S REPORT:

David Corliss, City Manager, presented the report. In addition to the report, he said that on the March 26th City Commission agenda, staff was planning on setting a bid date for the Rec Center and a public open house on that day from 4:00 – 6:00 p.m., regarding the plans for the Rec Center. Staff would be posting renderings of the facility on the website tomorrow.

D. REGULAR AGENDA ITEMS:

1. ***Conducted a public hearing to consider the vacation of a right-of-way on Redbud Lane, south of 26th Street in Southridge Addition No. 3, as requested by property owner Bluejay Apartments, Inc.***

Mike Amyx said he owned the property directly south of the project on the east side and he was also representing his mother who also owned property in that area. He said he thought it was wise for him not to vote on the item. At 6:50 p.m. he left the City Commission dais.

David Cronin, City Engineer, presented the staff report.

Moved by Carter, seconded by Cromwell, to open the public hearing. Motion carried 4-0 with Amyx abstaining.

Mike Amyx said his question was that part of the restaurant development that had been requested nearby involved a vacation of right-of-way. He asked about the access to the property to the west.

Moved by Carter, seconded by Cromwell, to close the public hearing. Motion carried 4-0 with Amyx abstaining.

Scott McCullough, Planning Director, said that this development had an approved preliminary plat that involved vacating ten feet of the existing 60 feet, with clear intention to access that property. This property, as he recalled, was a developable lot that would need access to Redbud Lane in the future. The preliminary plat had not expired, and 50 feet was adequate for access.

Schumm asked if the property owners had to pay for the street construction.

McCullough said yes.

Schumm asked if it would be a cul-de-sac.

McCullough said yes.

Schumm asked if a cul-de-sac could be constructed in 50 feet.

David Corliss, City Manager, said additional right-of-way dedication might be needed from the property owners.

Moved by Dever, seconded by Carter, to approve the Order of Vacation of right-of-way on Redbud Lane, south of 26th Street in Southridge Addition. Motion carried 4-0 with Amyx abstaining.

Amyx returned to the dais at 6:56 p.m.

2. ***Considered the following items related to Water and Wastewater master plan:***

a) Received update on 2010 Census challenge and impact to water and wastewater master plan.

b) Considered adopting the 2012 Water and Wastewater Master Plans.

c) Considered adopting the 2013–2017 Capital Improvement Program (CIP) for Scenario 5 – Taste, Odor, & Microtoxins.

d) Considered adopting on first reading, Ordinance No. 8846, adopting the 2013 Water and Wastewater Rates.

e) Considered adopting on first reading, Ordinance No. 8847, adopting the 2013–2017 Water and Wastewater System Development Charges (SDCs).

f) Considered authorizing the City Manager to execute Supplemental Agreement No.1 to the existing Engineering Services Agreement with Burns & McDonnell for Project UT0701DS – Kaw WTP Water Transmission Main Redefining the Project Scope and reducing the contract amount by $343,996 to $787,658.

g) Considered authorizing the City Manager to execute an Engineering Services Agreement with Burns & McDonnell in the amount of $137,128 for Project UT1209 – Taste and Odor, and Algal Toxin Water Treatment Process Evaluation.

h) Considered authorizing staff to negotiate a Supplemental Agreement to the existing Engineering Services Contract with Black & Veatch for Engineering Services for Project UT1102KA Kaw WTP Raw Water Intake Replacement.

i) Considered setting a bid date of April 9, 2013 for Bid No. B1314; UT1212-2013 Sanitary Sewer Cured-In-Place-Pipe Rehabilitation Project.

j) Considered authorizing staff to advertise Request for Proposals R1308 for Engineering Services for Project UT1304 Wakarusa Wastewater Treatment Plant, and Request for Proposals R1309 for Engineering Services for Project UT1306 Wakarusa Conveyance Corridor Facilities, and consider authorizing staff to negotiate with the Kansas Biological Survey for a Biota Study on the Wakarusa River.

k) Considered authorizing staff to advertise Request for Proposals R1307 for Engineering Services for Project UT1305 – Rapid Inflow and Infiltration Reduction.

l) Considered awarding the construction contract for Bid No. B1305 to the low bidder, Garney Construction, in the amount of $1,967,967 and consider authorizing the City Manager to execute the construction contract; consider authorizing the City Manager to execute Supplemental Agreement No. 2 with Wilson and Company in the amount of $33,800 for construction phase engineering services for project UT1206DS O'Connell Road Waterline.

m) Consider authorizing staff to distribute Request for Proposals for Oread Tank and Pump Station replacement project.

David Corliss, City Manager, presented the staff report.

Amyx said Corliss had talked about the new sewer plant and the potential growth in the future. He said even if this City didn't have growth, due to the wet weather events, this plant was necessary to deal with problems the city was currently experiencing.

Corliss said that is correct, those problems were occurring now. The city was fortunate that the EPA was working us on that, largely because of our work on the master plan.

Amyx asked if sand was one of the major problems with the Kaw intakes.

Corliss said staff had a pretty good confidence level that they wanted the intakes roughly in the area those intakes were now. Staff had looked at other options and costs, including wells.

Amyx said he was always under the impression that sand was our enemy there, and the pumps were quite expensive.

Philip Ciesielski, Assistant Director of Utilities, said staff did bathometric surveys of the river bed. A consultant did the modeling of how sand moves during events and staff found that the same general area was a viable long term solution.

Amyx said in talking to Corliss, he concluded it was a great deal of money to address the taste and odor. It seemed like the cost per gallon was quite high, but as part of the study, the study included an extensive look several other options.

Corliss said that was his understanding.

Dave Wagner, Utilities Director, said the study would look at multiple options at both treatment plants. The cost estimates were hopefully a maximum. At worst, staff could learn through the study how to improve the City's processes with current capabilities. The study would provide the real costs of the treatment options.

Amyx said he assumed other communities had dealt with the same problem and Lawrence couldn't possibly be the first to deal with this type of issue.

Wagner said no. Every community was different though.

Carter said on page 23 of the presentation at the study session, the recommendations with the three bullet points were in scenario 5. All of those actions addressed those points plus scenario 5 added the taste and odor issues.

Corliss said all of the scenarios responded to the need for a WWTP facility. The difference was that the scenario that had the biggest rate impact had the taste and odor component.

Carter said the plan still required annual commitments and approvals for aspects.

Corliss said yes. He said at this time he would like to have staff address the census issue and the issues of how quickly the City was growing.

Amy Miller, Planner, presented the staff report regarding the census numbers.

Schumm said it seemed like an unbelievable number to be off.

Cromwell said in looking at growth and wondering about the numbers, it matters more on how they figured in the 2000 housing figures, and the City needed to have a consistent way of counting.

Miller said they had all of the City's housing unit numbers to the 50's. Going back to 1980s staff was able to corroborate the 2000 housing figures and felt those figures were more accurate.

Carter asked if the census committed to changes to the methodology for future census counts.

Miller said they didn't explicitly address it. Staff was able to confirm that the LUCA numbers on housing units submitted before the census survey were correct.

Schumm asked if surveys just weren't mailed.

Miller said the census said it was a pre-survey error.

Amyx asked if there was a similar problem in 2005.

Corliss said staff based a lot of work in 2006-2008 on a growth rate that was much more rapid than what staff experienced. It was hard to sustain the growth rate, certainly in the past few years.

Amyx said he thought it was better to work with the numbers from staff rather than the census.

Dever asked about the American Community Survey.

Miller said it was based on a smaller sample size.

Dever asked who did that survey.

Miller said the Census Bureau.

Dever asked what kind of growth the City had between 2010 and now.

Miller said she hadn't calculated that growth.

Dever asked what number was the most up to date.

Miller said the estimate was based on the 2000 census.

Dever said Miller took the 2000 census and benchmarked from that point, added the numbers of housing units, and came up with the 94,000 number.

Miller said yes.

Corliss said he would like to have Wagner talk about the population's relevance to Utilities.

Wagner said what staff knew for sure was the organic load. If they used the organic loading and the historic per capita load, it validated Planning's estimates. They had approximately 2,000 lbs. available that could be treated in addition to what they had currently done. The utilities could handle a 12,000 population increase equivalent, but industrial uses might change that. The bottom line was that no matter which number was accurate, they knew how much more capacity they had for wastewater treatment. The census estimate didn't change their recommendation.

Dever said for the purpose of finding population, he asked if the US Census included all of the students living in housing at the university or not.

Corliss said it included students claiming Lawrence as their residence on April 1.

Dever said there was this institutional use with plans to construct housing on campus, with more people in the city or in the community in Lawrence without living Lawrence. He asked if they could effectively plan for those types of institutional uses. This City was a unique community with a lot of moving parts with the university commuters and labs.

Wagner said the wastewater treatment plant data could detect the impact.

Schumm said if doing the simple math with the load available and the population, if increasing the population more services such as restaurants and stores could be added. He said he thought it was wrong to leave this meeting thinking there was plenty of space.

Wagner said 12,000 population equivalents didn't necessary mean 12,000 people could move to town and the City could absorb their waste load inclusive of everything they might do with jobs and commercial operations.

Cater said if looking at 5 years lead time and 12,000 people, that's not a long time anyway.

Amyx said in 2005 and 2006 when they were trying to find a location for a new plant along the Wakarusa River, Wagner indicted that there was population equivalents of 10,000 to 12,000. He said there might be additional capacity of an extra 10,000, but it seemed like the City used that 10,000 capacity and now the City was down to the critical 10,000 to 12,000 population equivalents.

Wagner said that was accurate information. He said there were several ways to look at capacity at wastewater plants accurately. One way was by wet weather loading at 125% of the existing load. If he looked at the boiler plate of the wastewater treatment plant, he would give a number that was less than 12,000. However, staff thought they could go beyond 100% on organic load as well and still meet all of the regulatory requirements as well as doing a good job

of meeting the needs of the community beyond the boiler plate and could run 100%. He said they were using some of the reserves and some of the flexibility that was built into the plant and made good choices to extend it beyond what staff thought could be done.

Amyx said he didn't recall the real emphasis 7-8 years ago on the wet weather events being as critical an issue. So that was a change that made the decision tonight even more critical.

Wagner said staff had significantly more information, and also on our actual infrastructure, than they had 7-8 years ago. This master plan model was a lot more accurate than the tools they previously had.

McCullough said regarding Cromwell's question about the annual growth rate since 2010 to 2013 was 0.9% per year.

Mayor Schumm called for public comment. None was received.

Schumm said the question was whether the City needed to take on the full palette. The city was taking on some projects that were going to lead to growth in our community – the Rec Center, K10 Completion, Farmland, and a hotel downtown. He said for the city not to be able to accommodate that growth would be penny wise and dollar foolish. On the question of taste and odor, 1 in 5 people that had issues with it didn't seem like much, but at his restaurant if 20% of the people were dissatisfied with the taste of the food, he would be horrified. The community had to figure out that it could get worse. It could get more difficult to treat and last for a more sustained time. It just doesn't speak to the kind of quality of life the city was trying to provide in Lawrence.

Carter said he would echo Schumm comments. There was nothing sexy about it, but this was a core service with a lot of good things happening. He said he felt pretty comfortable knowing that it needed to be done. This wasn't a Band-Aid solution, but would allow the city to capitalize on good things happening and set this community up for future success. He said he was ready to move forward on Scenario 5.

Cromwell said with Scenario 5, they were just talking about money for a study on taste and odor, but not money to do anything about it.

Corliss said that was correct. That report would indicate to staff, with good detail, what things the city could do operationally and the best capital improvements needed. It wouldn't be the design of the facility, but it would be enough detail to decide whether to move forward on solutions. Staff thought it would cost $8-9 million per plant to address it and the city wasn't funding that now.

Cromwell said he wanted to make a clarification, because it sounded like scenario 5 was solving our taste and odor problems, and he wanted it clarified.

Corliss said this was a necessary step, but not the end solution.

Amyx said this city had been living a little on the dangerous side with the river intakes. The City was fortunate not to have a major eruption with the Oread tanks. Scenario 5 would take care of maintenance that was needed. When looking at the location of the WWTP, they weren't talking about the wet weather events. That issue had escalated and become more critical. The city didn't want to spend all the money or raise rates, but sometimes decisions needed to be made for the future. The city had several things that needed to be addressed at this time, even if the city didn't have any growth. He said as the city looked at the basic core services, this was one of them. He said he was ready to go.

Schumm said he recalled this summer all of the broken water mains. A large portion of this plan was water main replacement. This plan addressed the whole host of issues the city needed to take care of.

Moved by Dever, seconded by Amyx to adopt the 2012 Water and Wastewater Master Plans. Motion carried unanimously.

Moved by Amyx, seconded by Carter, to adopt the 2013–2017 Capital Improvement Program (CIP) for Scenario 5 – Taste, Odor, & Microtoxins. Motion carried unanimously.

Moved by Carter, seconded by Cromwell, to adopt on first reading, Ordinance No. 8846, adopting the 2013 Water and Wastewater Rates. Motion carried unanimously.

Moved by Dever, seconded by Amyx, to adopt on first reading, Ordinance No. 8847, adopting the 2013–2017 Water and Wastewater System Development Charges (SDCs). Motion carried unanimously.

Moved by Cromwell, seconded by Carter to authorize the City Manager to execute Supplemental Agreement No.1 to the existing Engineering Services Agreement with Burns & McDonnell for Project UT0701DS – Kaw WTP Water Transmission Main Redefining the Project Scope and reducing the contract amount by $343,996 to $787,658. Motion carried unanimously.

Moved by Amyx, second by Dever, to authorize the City Manager to execute an Engineering Services Agreement with Burns & McDonnell in the amount of $137,128 for Project UT1209 – Taste and Odor, and Algal Toxin Water Treatment Process Evaluation. Motion carried unanimously.

Moved by Amyx, seconded by Cromwell, to authorize staff to negotiate a Supplemental Agreement to the existing Engineering Services Contract with Black & Veatch for Engineering Services for Project UT1102KA Kaw WTP Raw Water Intake Replacement. Motion carried unanimously.

Moved by Carter, seconded by Cromwell, to set a bid date of April 9, 2013 for Bid No. B1314; UT1212-2013 Sanitary Sewer Cured-In-Place-Pipe Rehabilitation Project. Motion carried unanimously.

Moved by Amyx, seconded by Cromwell to authorize staff to advertise Request for Proposals R1308 for Engineering Services for Project UT1304 Wakarusa Wastewater Treatment Plant, and Request for Proposals R1309 for Engineering Services for Project UT1306 Wakarusa Conveyance Corridor Facilities, and to authorize staff to negotiate with the Kansas Biological Survey for a Biota Study on the Wakarusa River. Motion carried unanimously.

Moved by Dever, seconded by Amyx to authorize staff to advertise Request for Proposals R1307 for Engineering Services for Project UT1305 – Rapid Inflow and Infiltration Reduction. Motion carried unanimously.

Moved by Carter, seconded by Cromwell to award the construction contract for Bid No. B1305 to the low bidder, Garney Construction, in the amount of $1,967,967 and to authorize the City Manager to execute the construction contract; to authorize the City Manager to execute Supplemental Agreement No. 2 with Wilson and Company in the amount of $33,800 for construction phase engineering services for project UT1206DS O'Connell Road Waterline. Motion carried unanimously.

Moved by Amyx, seconded by Dever to authorize staff to distribute Request for Proposals for Oread Tank and Pump Station replacement project. Motion carried unanimously.

E. PUBLIC COMMENT: None.

F. FUTURE AGENDA ITEMS:

David Corliss, City Manager, outlined potential future agenda items.

G: COMMISSION ITEMS: None.

H: CALENDAR:

David Corliss, City Manager, reviewed calendar items.

I: CURRENT VACANCIES – BOARDS/COMMISSIONS:

Existing and upcoming vacancies on City of Lawrence Boards and Commissions were listed on the agenda.

Moved by Cromwell, seconded by Dever, to adjourn at 8:09 p.m. Motion carried unanimously.

MINUTES APPROVED BY THE CITY COMMISSION ON MARCH 26, 2013.

Jonathan M. Douglass, City Clerk