



City of Lawrence
UTILITIES

**2017 Annual Progress Report
Integrated Municipal Wastewater Plan
Memorandum of Understanding**

I. Overview

On June 5, 2012, the Environmental Protection Agency (EPA) published its Integrated Stormwater and Wastewater Planning Approach Framework for the purpose of assisting "*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*" (Framework).

In July 2012, in consultation with Burns & McDonnell and BG Consultants and following detailed assessment of wastewater infrastructure and future needs, the City of Lawrence, Kansas (City) developed its Integrated 2012 Wastewater Utilities Plan (Integrated Plan) detailing a scope and implementation schedule for infrastructure improvements, enhancements and expansion. The Integrated Plan addresses the City's wastewater capacity, management, operation and maintenance. It further contains an inflow and infiltration reduction program to correct sanitary sewer deficiencies on a prioritized, site-specific basis. In addition to the Integrated Plan, City staff prepared reports on water and wastewater capital improvement plan options and the revenue requirements, annual field maintenance operations, and the capital improvement program.

In January 2014, on advice from and in consultation with the Kansas Department of Health and Environment (KDHE) and following Integrated Plan modifications consistent with Framework goals, the City and KDHE executed a 20-year Memorandum of Understanding (MOU) providing for *inter alia*:

- Adoption of the Integrated Plan as the Initial Integrated Municipal Wastewater Planning document and core document for future modifications.
- Incorporation of the Integrated Plan into the NPDES Permits (Permits) for the Lawrence Kansas River Wastewater Treatment Plant (Kansas WWTP) and the Wakarusa River Wastewater Treatment Plant (Wakarusa WWTP), with provision for Integrated Plan review and modification at each five-year Permit renewal.
- An implementation schedule reflecting the parties' best estimate of improvement projects and respective start dates (Attachment 1).
- Annual City updates on Integrated Plan progress.

This Report provides information about Integrated Plan progress in 2017 and planned activities for 2018. The Report also contains updated information about MOU Attachment 1 and Permits. The below-identified projects are contained in or responsive to Attachment 1. Work continues in 2018 for those projects still in progress, with new projects being identified on an ongoing basis through system assessment.

Between 2014 and 2016 the City of Lawrence completed sanitary sewer flow monitoring and data analysis at 11 locations around the University of Kansas (KU) campus to define the existing base, inflow and infiltration flow rates into the City's sanitary sewer system. Since it is impractical to perform flow monitoring at all 38 KU connections to the City's system, the 11 flow monitors isolated approximately 60% of KU's service area into 9 basins with varying development age and pipe material. Results from the data analysis showed wet weather flow rates that ranged from

similar to the City system in the Western Districts to as much as 4 times higher in the North District. Flow monitoring results were shared with KU each year, extrapolated across all of KU's service area. KU used the results to develop and prioritize a phased sanitary sewer collection system inspection, rehabilitation, and improvement program. A program summary and timeline are discussed in Section IV.

City of Lawrence Stormwater and Farmland Remediation operations have been combined to Utilities Department operations in 2017. In the near future, the City of Lawrence intends to pursue inclusion of many regulatory environmental requirements into the Integrated Plan and under a common management system. This would include pertinent legal requirements for all City held permits and legal responsibilities related to the Farmland Remediation project as well as MS4 Stormwater permits and plans. It is anticipated that the current Integrated Plan's MOU and associated permits will need modification over time. Additional information is contained in Section V and VI.

II. Progress Update

A. UT1304 Wakarusa WWTP and Conveyance Corridor (Attachment 1, Item 2a)



- Project Description – Design and construction of the new Wakarusa River Wastewater Treatment Plant (Wakarusa WWTP), the new Pump Station 10, related force mains, and improvements to the existing Kansas River Wastewater Treatment Plant (Kansas River WWTP). This project provides a second wastewater treatment plant and enhanced operational flexibility, with pump station functionality to divert flows between treatment plants as needed to meet changing operational needs. The project provides for future community growth, meets the regulatory requirements for wet weather treatment and

nutrient removal and increases system reliability and resiliency in transporting and treating wastewater without negatively impacting the community or the environment.

- Project Details – In 2014, after eight years of planning, design and preliminary improvements, the project moved into the construction phase beginning with site fill placement and installation of force mains. In addition to the contractors identified below, qualified department staff is performing various inspection services; designing the automation, integration and programming systems; installing pipeline, and acquiring various equipment both as cost-saving measures and for enhanced in-house operational knowledge of new infrastructure functionality. Recent progress is illustrated in the following timeline.

Kansas River WWTP Improvements – Laboratory expansion started in late 2015 and completed in August 2016. Facility improvements also included final clarifier equipment replacement.

Wakarusa WWTP – Site construction began in June 2015 with structure excavation, placement of below-grade slabs and walls, and installation of site process piping. In 2017, construction surpassed 95 percent completion and remains within budget and on-schedule to be completed in spring of 2018. All buildings, the Peak Flow Storage Basin, the Biological Nutrient Removal (BNR) train and outfall structure were completed. Final grading, roadway, seeding and sidewalks are currently being constructed. Plant startup and occupancy will take place in March 2018.



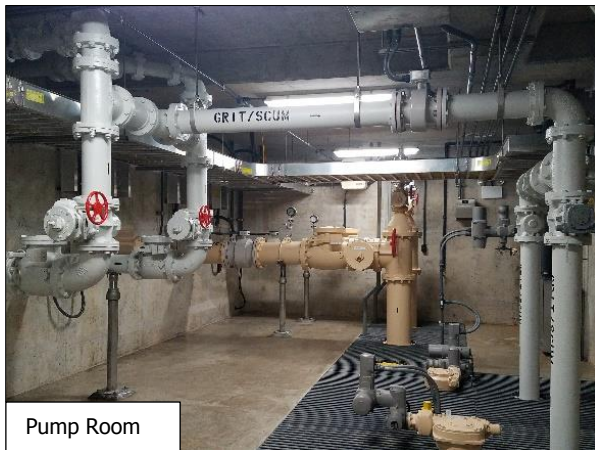


Final Sludge Pump Room



Lab

Pump Station 10 – Construction began with excavation in late 2015 on the pump station located at the northwest corner of 31st and Louisiana Streets. The pump station structure, piping, temporary seeding and access roads are complete. All equipment is installed and tested. Final seeding of the native grasses will take place in spring of 2018.



Pump Room



Pump Station 10

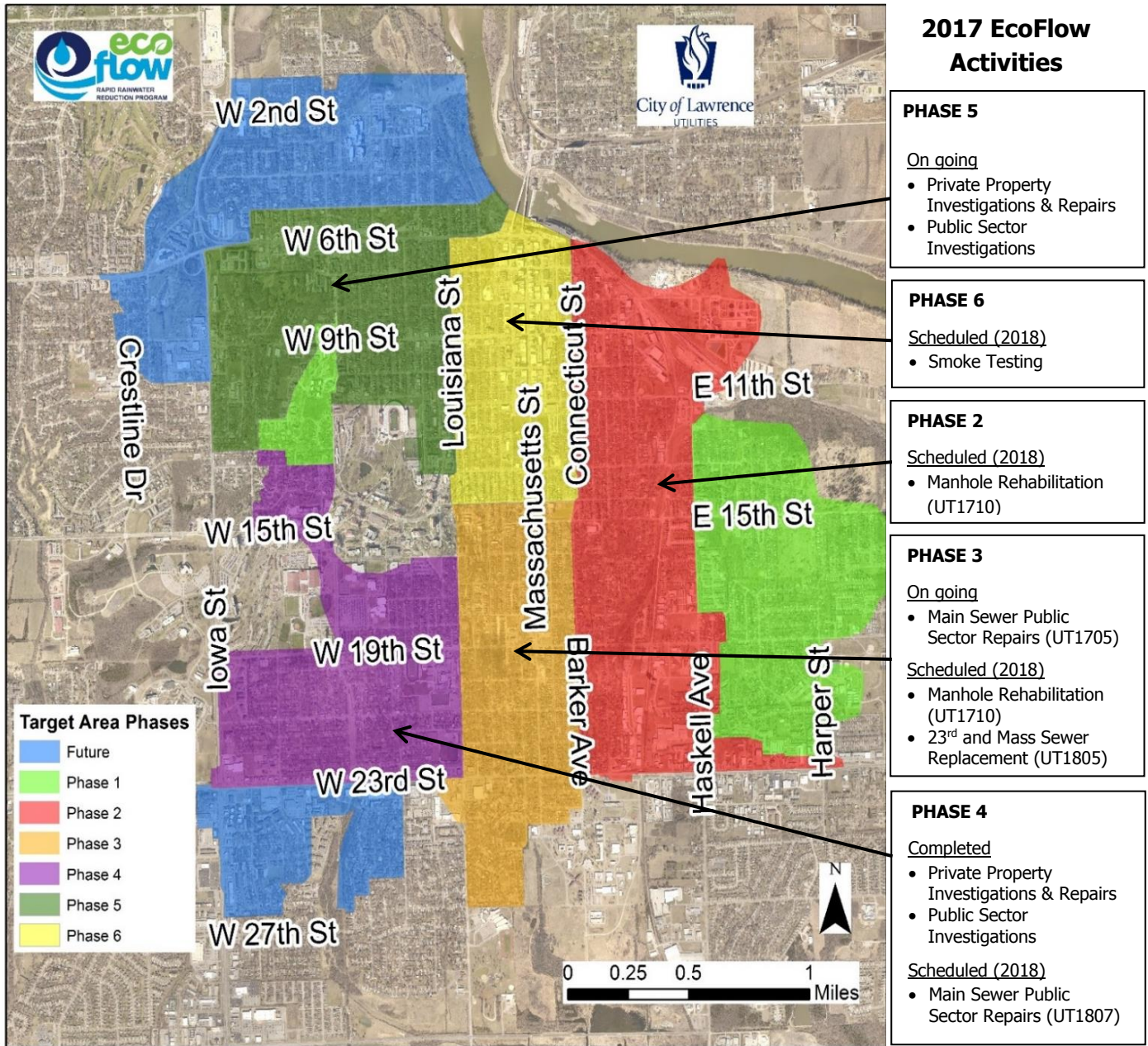
- Design Engineer – Black & Veatch/PEC ENGINEERING/Bartlett & West
- Construction – Garney Construction (Wakarusa WWTP, Pump Station 10, Kansas River WWTP Improvements), Kings Construction (Site Fill) and BRB (Force Mains)
- Status – Project Completion spring 2018
- Project Budget - \$74.1 million (\$11.2 million Design and Construction Phase Services; \$13.6 million Site Fill, Roads and Force Main Contracts; \$45.2 million for Wakarusa WWTP, Pump Station 10, and Kansas River WWTP Improvements; \$600,000 Property Acquisition; \$1.5 million Power/Gas Utility Infrastructure, and \$2 million City-Provided Work and Materials)

B. UT1305 Ecoflow Rapid Rainwater Reduction (Attachment 1, Item 4a)

- Project Description – Comprehensive, multiyear, multiphase, “find and fix” program to investigate and reduce rainwater entering the City’s sanitary sewer system from public and private sources. EcoFlow targets discrete geographic areas inside City limits, with six Phase areas identified to date and phasing of the future areas based on data from ongoing flow monitoring. The map below shows 2017 activities and 2018 scheduled activities. Public feedback and participation rates continues to be overwhelmingly positive.
- A. Project Details – Public sector investigation activities completed in 2017 included 264 manhole inspections, approximately 17,000 linear feet of sanitary sewer smoke testing, and approximately 16,000 linear feet of closed-circuit television (CCTV) sewer inspections. Completed public sector sewer repairs included 42 sanitary sewer point repairs, and approximately 10,000 linear feet of cured-in-place pipe (CIPP) rehabilitation. An additional 29,000 linear feet of sanitary sewer is currently under contract to install CIPP in this area as part of the larger Citywide project UT1705. Private sector activities completed in 2017 included over 1,000 private property evaluations. Of the approximately 550 defects identified, department staff repaired approximately 50 minor defects and EcoFlow plumbing contractors repaired 309 defects. Private sector investigations are planned to continue throughout 2018, targeting Phase 5 and Phase 6 in the map above.

Several related sanitary sewer rehabilitation projects were identified in this area during 2017. Planning and design activities have been initiated with construction planned for 2018. These projects include:

- 2018 Manhole Rehabilitation Project (UT1710)
- 2018 Manhole Replacement and Installation Project (UT1802)
- 23rd and Massachusetts St Sanitary Sewer Replacement Project (UT1805)
- 2018 CIPP Sewer Rehabilitation (UT1807)
- Design Engineer – TREKK Design Group
- Construction – Seven Pre-qualified Plumbing Contractors & City Staff
- Status – Initial Program scope to complete 2020, with ongoing evaluation/correction of to-be-identified future areas.
- Project Budget - \$19,400,000 (over the life of the project) (Completed - \$7,138,000)



C. Clay Pipe and Manhole Rehabilitation Program Projects (Attachment 1, Item 4b)

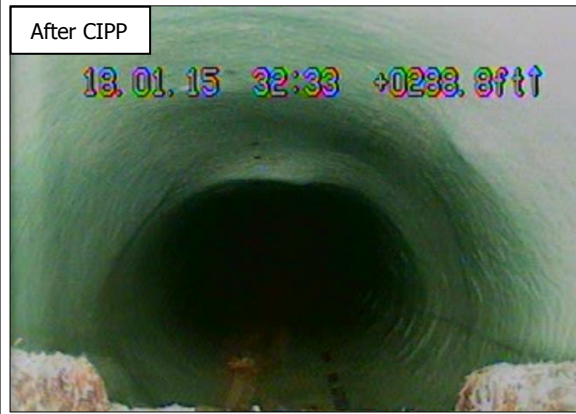
UT1508 CIPP Sewer Rehabilitation

- Project Description – Sewers are identified for rehabilitation through various assessment programs, including EcoFlow and CCTV inspection by city crews, based on such factors as existing defects, pipe age, pipe material, depth, and ground conditions. The CIPP rehabilitation method lines the inside of old, vitrified clay pipe sanitary sewer mains – a more cost-effective rehabilitation method than open-trench excavation and replacement.

- Project Details – Starting in 2016, CIPP rehabilitation of approximately 44,500 linear feet of sanitary sewer ranging in size between 8 inches and 36 inches in diameter (6,500 linear feet completed in 2017). A total of 42 public sector point repairs were completed as part of this project (2 completed in 2017). The project area was throughout the City with a focus on Phase 2 of the Rapid I/I Reduction Program.
- Design Engineer – City Staff
- Construction – SAK Construction (CIPP Installation) and Vito’s Plumbing (Point Repairs)
- Status – Project Completed in April, 2017
- Project Cost - \$1,734,375 (Total), \$279,005 (Point Repairs), \$1,455,370 (CIPP)



Before CIPP



After CIPP

UT1705 CIPP Sewer Rehabilitation

- Project Description – Sewers are identified for rehabilitation through various assessment programs, including EcoFlow and CCTV inspection by city crews, based on such factors as existing defects, pipe age, pipe material, depth and ground conditions. The CIPP rehabilitation method lines the inside of old, vitrified clay pipe sanitary sewer mains – a more cost-effective rehabilitation method than open-trench excavation and replacement.
- Project Details – CIPP rehabilitation of approximately 46,500 linear feet of sanitary sewer ranging in size between 8 inches and 24 inches in diameter. A total of 76 public sector point repairs have been completed on the sewers associated with this project since the start of 2016. It is anticipated that an additional 15-20 point repairs will be required to

complete the project. The project area is throughout the City with a focus on Phase 3 of the Rapid I/I Reduction Program.

- Design Engineer – City Staff
- Construction – SAK Construction (CIPP Installation) and Vito’s Plumbing (Point Repairs)
- Status – Completion Spring 2018
- Project Budget - \$2,050,000 (Total), \$700,000 (Point Repairs), \$1,350,000 (CIPP)



Before CIPP



After CIPP



UT1710 Manhole Rehabilitation Project

- Project Description – This project will include the rehabilitation of approximately 350 sanitary sewer manholes. The project area is throughout the City with a focus on Phase 2 and Phase 3 of the Rapid I/I Reduction Program. Rehabilitation methods will vary from location to location. The rehabilitation methods will include cementitious lining, epoxy lining, cured-in-place manhole lining, frame/cover replacement, and frame/cover realignment. The goals of the project is to reduce the amount of rain and groundwater entering the sanitary sewer system through identified manhole defects and to protect the Burroughs Creek and other large sanitary interceptors manholes from hydrogen sulfide deterioration.
- Design Engineer – City Staff
- Contractor – To be determined
- Status – Under Design
- Project Budget - \$1,000,000

UT1807 2018 CIPP Sewer Rehabilitation

- Project Description – Sewers are identified for rehabilitation through various assessment programs, including EcoFlow and CCTV inspection by city crews, based on such factors as existing defects, pipe age, pipe material, depth and ground conditions. The CIPP rehabilitation method lines the inside of old, vitrified clay pipe sanitary sewer mains – a more cost-effective rehabilitation method than open-trench excavation and replacement.
- Project Details – Overall project size and specific sites identified for this project are being finalized and prioritized. The project area will be throughout the City with a focus on Phase 4 of the Rapid I/I Reduction Program.
- Design Engineer – City Staff
- Construction – To be determined
- Status – Under Design
- Project Budget - \$2,000,000

III. Other Sanitary Sewer and Stormwater Projects Completed in 2017 and Underway

UT1505 – 23rd Street and Ousdahl Road Street, Stormwater and Utility Improvements

- Project Description – Street and stormwater improvements at the intersection of 23rd and Ousdahl including over 4,900 linear feet of stormwater collection improvements. The existing storm sewer infrastructure provided capacity for a 2-year or less storm event which results in localized street flooding. Due to infrastructure condition, design life, and utility conflicts; waterline and sanitary sewer were also replaced as part of the project.
- Project Details – New stormwater pipe and reinforced concrete structures ranged in size from 12" to box structures as large as 53-inch by 83-inch box structures. Approximately 1,850 feet of 8-inch cast iron watermain from 1959 was replaced with 8-inch PVC, and 550 feet of 8-inch sanitary sewer was replaced.
- Design Engineer – BG Consultants
- Contractor – RD Johnson
- Status – Project Completed November 2017
- Project Cost – \$3,110,000 (Total cost, including \$523,000 for Utilities)

UT1512 & UT1610 Treatment Plant VFD Replacements

- Project Description – Replacement of VFDs installed on critical treatment process equipment helps ensure system reliability and functionality.
- Project Detail – Replacement of five aging VFDs, four at Kansas River WWTP and one at Kaw Water Treatment Plant.
- Design Engineer – City Staff
- Construction – City Staff
- Status – Project Completed in April, 2017
- Project Cost - \$195,000

UT1513 Sanitary Sewer Replacement (Naismith Drive & Crescent Road)

- Project Description – Replacement of deteriorated sanitary sewers near the intersections of Naismith Drive and Crescent Road and Spencer Drive and Crescent Road.

- Project Details – Rehabilitation or replacement of 900 linear feet of sanitary sewer mains generally located south of Crescent Road and north of the University of Kansas’s Learned Hall. Street and traffic calming improvements at the intersection of Crescent Road and Naismith Drive were also a part of the project.
- Design Engineer – BG Consultants
- Contractor – Freeman Concrete Construction, LLC
- Status – Project Completed in October, 2017
- Project Construction Cost - \$719,000 (Sanitary Sewer Cost - \$382,000)

UT1518 19th Street Utilities Replacement & Relocation (Iowa to Alabama Streets)

- Project Description – Replacement of aging, smaller-sized waterline with PVC pipe from Iowa Street to Alabama Street and replacement of existing sanitary sewer from Naismith Drive to Stewart Avenue to accommodate the reconstruction of 19th Street
- Project Details – Existing waterline is primarily 6-inch and 8-inch cast iron or transite pipe from the late 1940’s to mid-1950. Replacement pipe will be 8-inch and 12-inch PVC. Existing 10-inch and 12-inch clay sanitary sewer from Naismith Drive to Stewart Avenue will be relocated to accommodate project improvements. Agreement with KU provides for cost sharing of identified water main adjacent to the KU Central District Project.
- Design Engineer – PEC Engineering
- Contractor – RD Johnson (Phase 1), Miles Excavating (Phase 2), To Be Determined (Phase 3)
- Status – 19th Street and Ousdahl construction completed August 2016 (Phase 1). 19th Street from Alabama to Naismith construction completed August 2017 (Phase 2). 19th Street west of Naismith (excluding Ousdahl) currently under design; anticipated construction completion August 2018 (Phase 3)
- Project Budget - \$1,300,000 (estimated)

UT1603 Pump Station 5 Electrical and Mechanical Improvements

- Project Description – Evaluation and improvements to major electrical equipment as needed to ensure critical infrastructure is fully functional to meet operational needs.
- Project Detail – Replacement of obsolete and damaged electrical switchgear and motor control centers; installation of variable frequency drives for pump operation; installation of a backup generator connection and transfer switch; installation of dual electrical transformers; new HVAC equipment and emergency bypass pumping connection. The new transformers and variable frequency drives were put into service in December 2016. During 2017, the following items were completed; the pump station roof, HVAC system and ductwork, site grading and final punch list completion items.
- Design Engineer – Black & Veatch
- Construction – Crossland Heavy
- Status – Project Completed in April, 2017
- Project Cost - \$871,000



UT1605 Wastewater Flow Optimization

- Project Description – Develop a real time decision support system (RT-DSS) to optimize flow distribution through the current wastewater collection system, with specific focus on the operations of existing Pump Station 9, Pump Station 5, and the Kansas River Wastewater Treatment Plant (KRWWTP) as well as currently under construction Wakarusa WWTP and Pump Station 10.
- Project Details – EmNet developed an RT-DSS that City staff are implementing throughout the collection system to operate the collection system and wastewater treatment facilities to maximize efficiency.
- Design Engineer – EmNet
- Contractor – City Staff
- Status – City Implementation in 2017 and 2018
- Project Budget - \$234,000

UT1608 Lower Naismith Valley Interceptor

- Project Description – The Lower Naismith Valley Interceptor was planned for replacement with the Pump Station 8 abandonment project in 2018 – 2019. Development plans for residential construction where the Lower Naismith Valley Interceptor is located places the interceptor in future residential backyards. Constructing this portion of the interceptor prior to residential construction of the homes allowed for easier and likely cheaper construction.
- Project Details – The Lower Naismith Valley Interceptor replaced approximately 1,400 linear feet of 24-inch and 36-inch Interceptor sewer into Pump Station 10 with 36-inch and 48-inch Interceptor. The pipes are designed to have sufficient capacity for the future Naismith Valley Interceptor that will be installed when Pump Station 8 is taken out of service.
- Design Engineer – PEC ENGINEERING
- Contractor – RD Johnson
- Status – Project Completed August 2017
- Project Cost - \$640,000

UT1611 OSI Software Analytics

- Project Description – Developing software for compiling/analyzing wastewater and water treatment plant processes and laboratory data. The data will be used with OSISoft PI software for data analytics, chemical and electrical costs/usage, and performance analysis.
- Project Details – Black & Veatch will deliver the following with the development of the OSI PI software; Data Integration Services – gathering of data from multiple sources to be analyzed, Software Services Provided – OSISoft PI System Tools, Asset360 Performance Analyst, Asset360 Activated Sludge Treatment Application; Setup and Training; Reporting – a quarterly report B&V process engineers will review plant data and trends. The data is analyzed for producing a performance report that summarizes overall plant performance. Recommendations are provided for treatment improvements or operational changes that may result in energy or chemical savings.
- Design Engineer – Black & Veatch
- Contractor – Black & Veatch
- Status – Since spring of 2017, department staff have utilized the OSISoft PI and Asset360 software for Kansas River Wastewater Treatment Plant. Black & Veatch gives weekly reviews of process, quarterly reports and presentations to Department Staff outlining their observations, and provides recommendations for improvements in process performance and potential cost savings. The software implementation for the Kaw Water Treatment Plant will begin in spring 2018. Clinton Reservoir Water Treatment Plant will implement the software in fall 2018, following the software development and execution at the Kaw Water Treatment Plant. Software for the Wakarusa River Wastewater Treatment Plant is under development, with plans for implementation in spring 2018.
- Project Cost - \$88,000

UT1714 Kansas River WWTP Chemical Storage & Feed and Excess Flow Building Protective Maintenance Coatings

- Project Description – Protective coatings applied to mechanical equipment and other structures prevent corrosion, maintain functionality, and extend useful life.
- Project Details – Protective coating applications to the interiors of and equipment in the Chemical Storage Building, Excess Flow Building and the Crane and Gantry at the Kansas River WWTP including walls, floors, stairs, pipes, pumps, and other appurtenances, with appropriate preparatory work. During 2017, the exterior piping and Excess Flow Building areas were complete, reaching 50% of project completion.
- Design Engineer – City Staff
- Construction – MVP Painting
- Status – Project Completion April 2018
- Project Budget - \$160,000 (Completed - \$112,357)



UT1802 2018 Manhole Replacement and Installation Project

- Project Description – The purpose of this project is to add or replace manholes on existing sanitary sewers with limited access, blind turns, blind connections, and other atypical situations at 12 separate sites. The existing configurations of this sites does not allow for standard maintenance, inspection or rehabilitation activities.
- Design Engineer – BG Consultants
- Contractor – To be determined
- Status – Anticipated Bid Opening in 2nd Quarter 2018
- Project Budget - \$278,000

UT1803 20th and Kasold Drive Sanitary Sewer Replacement Project

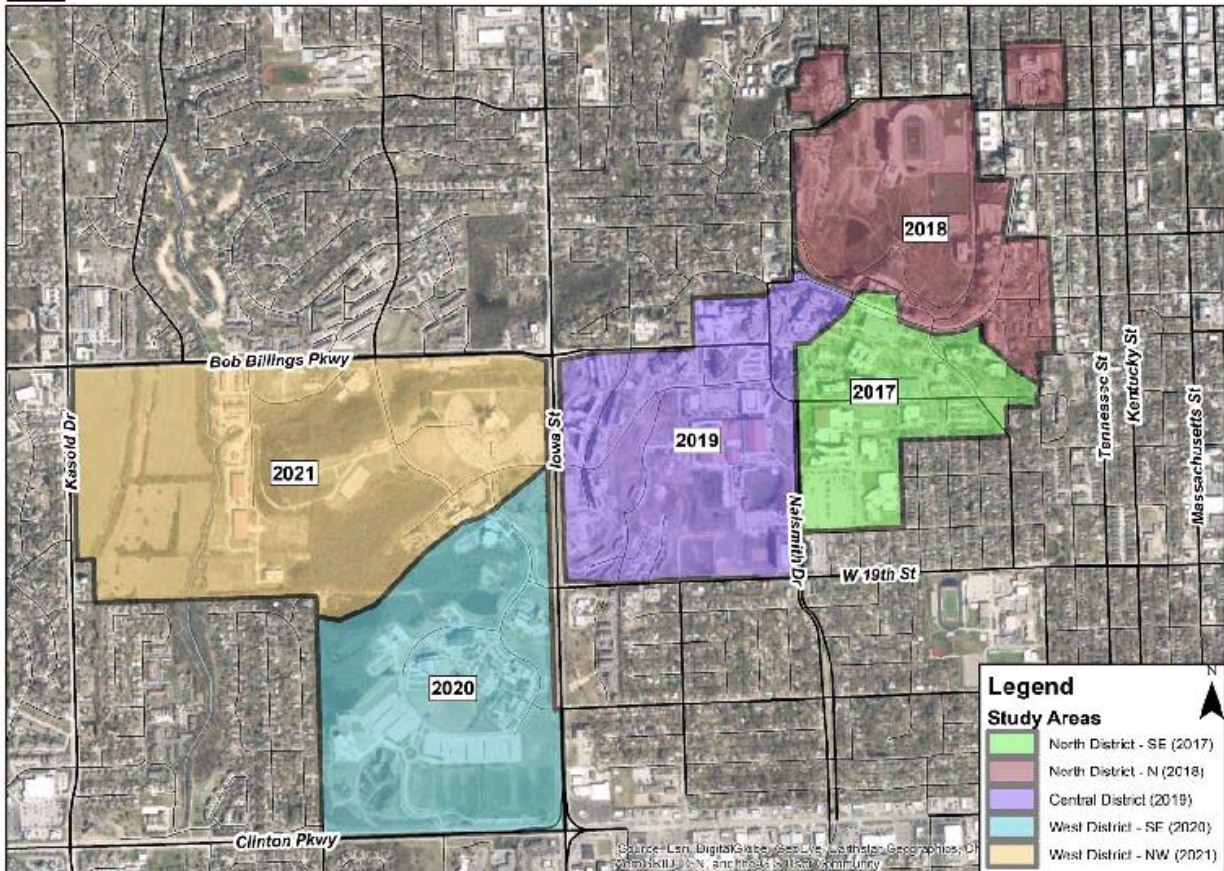
- Project Description – Replacement of approximately 880 feet of 8-inch diameter verified clay sanitary sewer from the 1960's with 8-inch PVC.
- Design Engineer – BG Consultants
- Contractor – To be determined
- Status – Anticipated Bid Opening in 2nd Quarter 2018
- Project Budget - \$150,000

UT1805 23rd and Massachusetts St Sanitary Sewer Replacement Project

- Project Description – Replacement of approximately 900 feet of 6-inch diameter verified clay sanitary sewer from the early 1900's with 8-inch PVC.
- Design Engineer – BG Consultants
- Contractor – To be determined
- Status – Anticipated Bid Opening in 2nd Quarter 2018
- Project Budget - \$625,000

IV. University of Kansas Sewer Rehabilitation Project

 Figure 1: Preliminary Sewersheds



- Project Description – The University of Kansas (KU) has initiated a 5-year recurring program in which 20% of the University’s sanitary sewer collection system will be cleaned and inspected each year. At the conclusion of each study phase, recommendations for improvements are to be made and designs developed for implementation the following summer in an “identify – design – fix” procedure. At the end of the 5th year, it is anticipated that 100% of the University’s collection system will have been cleaned and inspected. The program will then begin repeating in its 6th year.
- Project Details – Field investigations in this inaugural year were focused within the North District – SE Basin. The study area includes University property east of Naismith Drive and south of Jayhawk Boulevard as shown in Figure 1. In total, 10,455-feet of gravity sewer main was inspected to a degree to which an analysis could be performed. An additional 641-feet may likely be inspected without excavation of buried manholes or access points.
- Design Engineer – PEC
- Contractor – PEC
- Status – In 2018, field investigations and inspections will continue in the North District – North Basin. It is estimated that approximately 12,800-feet of sewer main and 92 manholes are located within this basin. Field activities are scheduled to begin in May 2018.

V. FL1701 Farmland Remediation



- Project Description – Site improvements and updated remediation efforts for the Farmland remediation area. The scope of the project is to provide a comprehensive solution to manage site contamination and outline the capital cost, environmental impact, and long term operational costs for proposed remediation systems.
- Project Details – The project aim is to develop a new remediation strategy for groundwater contaminated with nitrogenous compounds during the operation of the old Farmland fertilizer plant. Utilities Department has opted to contract with a qualified consultant to develop a new long term remediation plan with selection and implementation in 2018.

Interim Infrastructure Improvements – Since the Farmland Remediation efforts were transferred from the Public Works Department to the Utilities Department in April of 2017, efforts have been made to improve site infrastructure and operations to ensure that land application of nitrogen rich water is reliable.

- Approximately 1,000 feet of new waterline will be laid by public works and utilities field operations crews to replace a failed carbon steel pipeline installed in the 1950's and used throughout operation of the Farmland fertilizer plant.
- The existing structures on site will be inspected to ensure structural integrity and adequate contaminant storage.



Remediation Plan Development – A Request for Proposals was issued by the City in December of 2017 for qualified firms to submit a new or supplemental remediation plan to address the containment, storage, and disposal of nitrogen rich groundwater at the Farmland site. With continued communication between the public, the Kansas Department

of Health and Environment, the contracted consulting firm, and City staff, a new plan will be developed and implemented by the end of 2018.

- Design Engineer – City Staff/TBD (through RFP process)
- Contractor – City Staff/TBD (through RFP process)
- Status – Consulting firm to be under contract in March 2018, plan development and implementation by the end of 2018
- Project Budget - \$1.2 million for capital improvement

VI. NPDES Permit Status

a. Permit Background

Starting in 2004, the City's Utilities Department began using an enhanced high rate clarification (EHRC) process to mitigate sewage releases during wet weather through ACTIFLO, an auxiliary, chemical ballasted, treatment system. ACTIFLO-treated effluent is combined with effluent from the Kansas River WWTP activated sludge train prior to discharge. EHRC is a critical treatment process to prevent the discharge of raw sewage on wet weather days in which influent flows exceed the 25 million gallons per day (MGD) capacity of the Kansas River WWTP biological process.

KDHE reviews and renews the City's NPDES permits every five years. In 2008, KDHE drafted a revised permit as part of that renewal process. EPA objected to aspects of the KDHE draft permit based on their 2005 interpretation of blending. EPA contended that EHRC and Lawrence's practice of blending was a "bypass" and thus illegal, despite the lack of material change to related provisions in the 2008 permit when compared to permits for the prior ten years. In 2014, after six years of discussions with EPA, KDHE (with assistance from the National Association of Clean Water Agencies and City staff) proposed a compromise permit that allows EPA to keep its position that blending constitutes a bypass, while allowing Lawrence to contend it does not.¹ The Kansas River WWTP permit was then issued on August 1, 2014, followed by the Wakarusa River WWTP permit on September 1, 2014, with both Permits currently active and in force.

The City's original Municipal Separate Storm Sewer System (MS4) Permit became effective on October 1, 2004. The City of Lawrence is a Phase II Community as designated by the National Pollutant Discharge Elimination System (NPDES). 2017 represented the City's thirteenth permitted year, and second issuance term of a MS4 Permit. The most recent permit was issued by the Kansas Department of Health and Environment (KDHE) and became effective February 1, 2014.

The City of Lawrence acquired the 467-acre former Farmland Industries site in 2010, with a commitment to manage nitrogen-laden water on the property. The primary contaminants of concern are nitrate and ammonia. These contaminants are elevated in groundwater, soil, sediments, and surface and storm water. To staff's knowledge, a

¹ The Kansas River and Wakarusa Permits were both administratively extended during this period to allow for detailed discussion on EHRC, including an ACTIFLO demonstration and review of 10 years of performance data.

National Pollutant Discharge Elimination System (NPDES) permit has been maintained for this site since 1972.

b. Integrated Plan Incorporation

Section (F) *Supplemental Information* of each Permit incorporates by reference the Integrated Plan and the MOU and further acknowledges the Integrated Plan's adoption as the initial Integrated Municipal Stormwater and Wastewater Planning document for wastewater system improvements. Using Integrated Plan principles, the Permits provide a coordinated, phased-in approach for future expansions, wet weather flows, and nutrient removal requirements. The Kansas WWTP Permit requires efforts to reduce nitrogen and phosphorus through mechanical methods and report the results to KDHE by February 1, 2017. The Wakarusa WWTP Permit outlines a phased-in approach for future plant expansion. The City was also required to complete a biota study on the Wakarusa River as the receiving stream for the Wakarusa WWTP effluent.

c. Permit Update

A study to reduce nitrogen and phosphorus at the Kansas WWTP through existing mechanical methods was conducted, with collaborative input and review from Dr. Belinda Sturm, a KU professor and civil engineer whose research emphasis is water sustainability and resource recovery. A final report was submitted to KDHE January 30, 2017.

VII. MOU Attachment 1 - Project Changes

a. Modified/Clarified

1. All items were updated to 2017 Cost Opinion at an estimated inflation rate of 4.0% per year.
2. Item 1(k) Collection System Field Operations Building – new projected start date of 2018.

b. New

1. Item 2(b) New Wakarusa WWTP expansion to 5 MGD – new improvement project meets growth needs, with a projected start date of 2030 cost opinion of \$26,850,000.

Attachment 1 (updated)

Memorandum of Understanding, Kansas Department of Health and Environment and the City of Lawrence, Kansas

| | Item | Reason for Improvement Project | 2017 Cost Opinion | Currently Projected Start Date * |
|-----------------|--|---------------------------------------|--------------------------|--|
| 1 | Collection System** | | | |
| a | PS 9 expansion to 15 MG (2) | 1, 3 | \$3,280,000 | 2021 |
| b | PS 32 expansion to 1.7 MGD, 8" force main | 1 | \$0 | Not needed in foreseeable future, will monitor |
| c | PS 25 expansion to 4 MG, Add 3rd Pump (2) | 1 | \$260,000 | 2025 |
| d | PS 25 expansion to 6 MG, parallel 12" force main (2) | 1 | \$2,920,000 | 2030 |
| e | 21" gravity sewer to eliminate PS 8 | 3 | \$4,610,000 | 2018 |
| f | KR-5C 12" relief sewer | 3 | \$1,390,000 | 2026 |
| g | KR-6B 21" relief sewer | 3 | \$1,270,000 | 2027 |
| h | PS 23 submersible expansion to 0.1 MGD | 1, 3 | \$0 | Not needed in foreseeable future, will monitor |
| i | PS 48 expansion to 6.4 MGD (2) | 1 | \$640,000 | 2031 |
| j | PS 04 Redundant Forcemain *** | 2, 3 | \$1,644,000 | Completed September 2014 |
| k | Collection System Field Operations Building | 3 | \$3,680,000 | 2018 |
| l | PS 49 to Wakarusa WWTP | 1, 2 | \$2,850,000 | 2025 |
| m | Lower Yankee Tank Capacity - YTC-1-1 (2) | 1 | \$8,650,000 | 2022 |
| n | PS 16 Upstream Interceptor Rehabilitation | 1, 3 | \$1,320,000 | 2021 |
| o | PS 9 Forcemain to PS 10 | 1, 3 | \$6,330,000 | 2021 |
| Subtotal | | | \$38,844,000 | |
| 2 | Wakarusa WWTP | | | |
| a | New 2.5MGD Wakarusa WWTP - Completed all structures | 1,2 | \$74,100,000 | Under Construction |
| b | Wakarusa Expansion to 5MGD | 1, 2 | \$26,850,000 | 2030 |
| Subtotal | | | \$100,950,000 | |
| 3 | Kansas River WWTP - Maintaining 12.5 MGD | | | |
| a | Nutrient Removal | 2 | \$0 | Nutrient Removal now Pilot & Modification |
| b | Co-generation & Backup Power | 3 | \$2,200 | 2014 - Not feasible/cost-effective |
| c | Nutrient Removal/Deammonification Pilot | 2 | \$610,000 | 2020 |

| | | | | |
|-----------------------|---|------|----------------------|--------------------------------------|
| d | Nutrient Removal/Deammonification Modification | 2 | \$36,610,000 | 2022 |
| e | Side Stream Treatment - Ammonia from Belt Press | 2 | \$8,310,000 | 2022 |
| Subtotal | | | \$45,532,200 | |
| 4 | Collection System Rehabilitation Plan | | | |
| a | Rapid I/I Reduction Program | 2, 3 | \$45,902,205 | 2013 & Ongoing (annual expenditures) |
| b | Clay Pipe and Manhole Rehabilitation Program | 2, 3 | \$17,202,000 | 2013 & Ongoing (annual expenditures) |
| Subtotal | | | \$63,104,205 | |
| Combined Total | | | \$248,430,405 | |

- * Parties' Best Projection for Start of Design or Construction
- ** Development Related Growth Projects Are Not Included in CIP
- *** Actual Cost

Reason for Improvement Project

- 1 - Growth
- 2 - Regulatory
- 3 - Reliability