



Capacity, Management, Operations, and Maintenance Program for Sewers

Lehigh County Authority

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1.0 INTRODUCTION

1.1 Capacity, Management, Operations and Maintenance (CMOM) Regulatory Initiators

Under existing federal regulations of 40 Code of Federal Regulations (CFR) 122.41, all NPDES permits must contain two standard conditions addressing operation and maintenance.

- Requirements established by 40 CFR 122.41(e) that mandate proper operation and maintenance of permitted wastewater systems and related facilities to achieve compliance with permit conditions.
- Requirements established by 40 CFR 122.41(d) that direct the Permittee to take all reasonable steps to minimize or prevent any discharge in violation of the permit that has a reasonable likelihood of adversely affecting human health or the environment.

The Lehigh County Authority's (LCA), by extension of the City's NPDES permit, is a satellite system and is subject to these same rules. Additionally, LCA and the Western Lehigh Sewage Partners (Partners) is subject to action by Pennsylvania Department of Environmental Protection (PADEP) under Chapter 94 and by the United States Environmental Protection Agency (USEPA) Compliance Order CWA-03-2009-0313DN (Administrative Order) to all municipal dischargers to the City's Kline's Island Treatment Plant, including LCA and its Partners. These regulatory actions were initially addressed in the 2009 WLSP Sewer Capacity Assurance and Rehabilitation Program (SCARP) Program Approach Outline. Included in the SCARP Program Approach Outline was a commitment for a Long-term Asset Management Plan.

This CMOM pertains to the LCA Suburban Division Western Lehigh Interceptor (WLI) System which includes Upper Milford Township (UMIT), Weisenberg Township and

Lowhill Township systems as well as the WLI, Spring Creek Pump Station (SCPS) and force main (FM) and the Park Pump Station (PPS) and FM.

1.2 LCA CMOM Program Goals

A CMOM Program identifies activities that will help to: better manage, operate, and maintain collection systems; Investigate capacity constrained areas of the collections system; proactively prevent SSOs; and Respond to SSO events. This CMOM program outline describes the various components, organization, and programs comprising LCA's wastewater collection system: operations, maintenance, design, delivery, and management functions. The goal of the LCA CMOM Program is to prevent sanitary sewer overflows, to mitigate the impact of sanitary sewer overflows when they do occur, to provide customer-driven levels of service across all aspects of the wastewater collection operation, and to achieve these goals in the most economically efficient and sustainable manner possible.

To achieve these goals, the following practices are accepted as self-evident best wastewater utility management practices.

- Improving the efficiency of the administration and operation of the sanitary sewer system while providing acceptable levels of service to the sewer service customers.
- Proactively maintaining and upgrading the conveyance systems to minimize failure of critical system components.
- Funding a routine infrastructure rehabilitation and replacement program to sustain LCA's inventory investments.
- Providing adequate capacity to convey base flows and peak flows by:

- Improving the efficiency of the existing sewer system by increasing available capacity through the reduction of infiltration and inflow of storm water, groundwater, and illicit discharges into the sewer system network
- Provide capacity in sewer service areas to reasonably meet demands for existing and additional development

1.3 LCA CMOM Program Purpose

The purpose of this CMOM Program is to document LCA's plans and practices that optimize delivery and cost of sewer collection. The proper and efficient management, operation, and maintenance of the sewer infrastructure are essential to LCA's mission to protect public health and the environment. LCA must take reasonable measures necessary to eliminate or minimize SSOs and to provide adequate system capacity. Inadequate collection system operation and maintenance practices, particularly those that lead to SSOs, violate these permit conditions.

This program documents some of LCA's sewer programs and demonstrates how LCA's various departments and divisions work together to achieve their business goals and objectives.

LCA's CMOM Program serves as an operational guide for LCA's sanitary sewer collection, transmission, treatment, and disposal systems. LCA will conduct a comprehensive review of this CMOM Program annually to review performance, identify needed program improvements, and reflect changing business and customer realities.

1.4 LCA Service Area Description

LCA owns and operates collection sewers, interceptors, pump stations, forcemains, equalization tanks, and a pretreatment facility. Figure 1-1 shows a map of the overall LCA system.

1.4.1 Western Lehigh Interceptor

LCA owns and operates a sanitary sewer interceptor that conveys flows from the sewer collection systems of the other members of the Western Lehigh Sewer Partnership, (namely UMiT, Weisenberg Township, Lower Macungie Township (LMT), Upper Macungie Township (UMT), Lowhill Township, Alburtis, and Macungie), plus portions of the Borough of Emmaus and Salisbury Township, to the City of Allentown's sewer interceptor system and, ultimately, to the Kline's Island Wastewater Treatment Plant in Allentown, PA.

The interceptor system, known as the Western Lehigh Interceptor (WLI), consists of 18 miles of gravity sewers ranging in size from 8 inch to 36 inch diameter pipe, two relief pumping stations and force mains (Spring Creek Pump Station and Park Pump Station), and one Flow Equalization Basin.

1.4.2 Collection Systems

Within portions of Lowhill, Weisenberg, and Upper Milford, LCA additionally owns and operates collections sewer.

Customers' connections consist of a service line (lateral), typically four inches in diameter, which carries wastewater by gravity flow to the sewer main, or in some cases by being pumped into a low pressure system. In LCA owned systems, LCA owns and is responsible for the physical condition of the lateral from the street right of way to the main.

1.4.2.1 Upper Milford Township Sewers

The sanitary sewer system in UMiT is owned and operated by LCA. There are over 800 customers being served in the UMiT sewer system, which consists of 80,600 feet of pipe, including 27,100 lf of low pressure pipe installed to serve the Vera Cruz area. Over 66% of the system is 8 inch and 10 inch pipe, 34% is either 2 inch force main or low pressure force main. The system is 95% PVC, and the remainder is DIP. The majority of the system was constructed in the 1980s with the low pressure systems constructed in 2012-13. The system consists of collection systems discharging into the Emmaus Borough system, into

the Lower Macungie Township system, into the Salisbury Township system and into the LCA WLI Interceptor system.

1.4.2.2 Weisenberg Township Sewers

The sanitary sewer system in Weisenberg Township is owned and operated by the Lehigh County Authority. There are 149 customers being served in Weisenberg Township with a system consisting of 21,000 feet of pipeline which discharge flows through Upper Macungie Township and the WLI Interceptor system. 97% of the system is 8 inch pipe; 4.8% is 2" force main; the system is 99% PVC.

1.4.2.3 Lowhill Township

The sanitary sewer system in Lowhill Township is owned and operated by the LCA. The Lowhill Township system consists of 3661 feet of 8" PVC gravity pipeline and 623 feet is 2" PVC force main through which 43 connections discharge into the Upper Macungie Township collector system and ultimately into the WLI system.

1.5 CMOM Definitions

Applicable standards and limitations – all State, interstate, and federal standards and limitations to which a “discharge,” a “sewage sludge use or disposal practice,” or a related activity is subject under the Clean Water Act (CWA), including “effluent imitations,” water quality standards, standards of performance, toxic effluent standards or prohibitions, “best management practices,” pretreatment standards, and “standards for sewage sludge use or disposal” under sections 301, 302, 303, 304, 306, 307,308, 403 and 405 of CWA.

Average monthly discharge limitation – the highest allowable average of “daily discharges” over a calendar month, calculated as the sum of all “daily discharges” measured during a calendar month divided by the number of “daily discharges” measured during that month.

Average weekly discharge limitation – the highest allowable average of “daily discharges” over a calendar week, calculated as the sum of all “daily discharges” measured during a calendar week divided by the number of “daily discharges” measured during that week.

Best management practices (“BMPs”) – schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of “waters of the United States.” BMPs include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

CMOM - Capacity, Management, Operation and Maintenance (CMOM), the name of a proposed regulation amendment to clarify the requirements of sanitary sewer utilities to meet the “Duty to mitigate” (40 CFR 122.41(d)) and “Proper operation and maintenance” (40 CFR 122.41(e)) requirements under the NPDES permits for all collections systems feeding into permitted treatment plants. This regulation was proposed as 40 CFR 122.41 (f), but was never passed into law. Requirements from the proposed CMOM regulation have been included and enforced as part of EPA Consent Decrees and are a part of many wastewater utilities NPDES permits.

CMOM Program - The documents, procedures, and activities a utility implements as part of a comprehensive plan for overseeing the system’s capacity, management, operation and maintenance.

CWA – the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Public Law 92–500, as amended by Public Law 95–217, Public Law 95–576, Public Law 96–483 and Public Law 97– 117, 33 U.S.C. 1251 *et seq.*

CWA and regulations – the Clean Water Act (CWA) and applicable regulations promulgated thereunder. In the case of an approved State program, it includes State program requirements.

Daily discharge – the “discharge of a pollutant” measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the “daily discharge” is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the “daily discharge” is calculated as the average measurement of the pollutant over the day.

Direct discharge – the “discharge of a pollutant.”

Discharge – when used without qualification means the “discharge of a pollutant.”

Discharge of a pollutant –

- Any addition of any “pollutant” or combination of pollutants to “waters of the United States” from any “point source,” or
- Any addition of any pollutant or combination of pollutants to the waters of the “contiguous zone” or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation.

This definition includes additions of pollutants into waters of the United States from surface runoff collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person, which do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works. This term does not include an addition of pollutants by any “indirect discharger.”

Environmental Protection Agency (EPA) – the United States Environmental Protection Agency.

Hazardous substance – any substance designated under 40 CFR part 116 pursuant to section 311 of CWA.

Indirect discharger – a non-domestic discharger introducing “pollutants” to a “publicly owned treatment works.”

Municipal separate storm sewer system – is defined at § 122.26 (b)(4) and (b)(7).

New source – any building, structure, facility, or installation from which there is or may be a “discharge of pollutants,” the construction of which commenced:

- After promulgation of standards of performance under section 306 of CWA which are applicable to such source, or
- After proposal of standards of performance in accordance with section 306 of CWA, which are applicable to such source, but only if, the standards promulgate in accordance with section 306 within 120 days of their proposal.

Permit – an authorization, license, or equivalent control document issued by EPA or an “approved State” to implement the requirements of this part and parts 123 and 124. “Permit” includes a NPDES “general permit” (§ 122.28). Permit does not include any permit which has not yet been the subject of final agency action, such as a “draft permit” or a “proposed permit.”

Person – means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point source – any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill-leachate collection system, vessel, or other floating craft from which pollutants discharge. This term does not include return flows from irrigated agriculture or agricultural storm water runoff. (See § 122.3).

Pollutant – dredged spoil, solid waste, incinerator residue, filter back- wash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42

U.S.C. 2011 *et seq.*)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:

- Sewage from vessels; or
- Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well-used either to facilitate production or for disposal purposes is approved by authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

Program Manuals - Documents that relate to the LCA CMOM Program, but are incorporated into LCA's CMOM Program Document by reference rather than directly contained in the Program Document. These are often stand-alone documents outlining procedures and metrics of specific programs (i.e., Pretreatment Program Manual, Gravity Lines Operations and Maintenance Manual).

Process wastewater – any water, which, during manufacturing or processing, comes into direct contact with, or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Schedule of compliance – a schedule of remedial measures included in a “permit”, including an enforceable sequence of interim requirements (actions, operations, or milestone events) leading to compliance with the CWA and regulations.

SCADA (Supervisory Control and Data Acquisition) - a system for remote monitoring and control that operates with coded signals over communication channels (using typically one communication channel per remote station).

Septage – the liquid and solid material pumped from a septic tank, cesspool, similar domestic sewage treatment system, or a holding tank when the system is cleaned or maintained.

Sewage Sludge – any solid, semi-solid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced waste water treatment, scum, septage, portable toilet pumping's, type III marine sanitation device pumping's (33 CFR part 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

Sewage sludge use or disposal practice – the collection, storage, treatment, transportation, processing, monitoring, use, or disposal of sewage sludge.

Site – the land or water area where any “facility or activity” is physically located or conducted, including adjacent land used in connection with the facility or activity.

Sludge-only facility – any “treatment works treating domestic sewage” whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to section 405(d) of the CWA and is required to obtain a permit under § 122.1(b)(2).

Sanitary Sewer Overflow (SSO) - any spill of raw or untreated sewage out of manholes, pump stations, or any other sewage-conveyance system component onto public or private property, including waterways.

Sanitary Sewer Overflow (SSO) Response – Action taken when LCA is notified of the occurrence of an SSO.

Standards for sewage sludge use or disposal – the regulations promulgated pursuant to section 405(d) of the CWA which govern minimum requirements for sludge quality, management practices, and monitoring and reporting applicable to sewage sludge or the use or disposal of sewage sludge by any person.

Toxic pollutant – any pollutant listed as toxic under section 307(a)(1) or, in the case of “sludge use or disposal practices,” any pollutant identified in regulations implementing section 405(d) of the CWA.

Variance – any mechanism or provision under section 301 or 316 of CWA or under 40 CFR part 125, or in the applicable “effluent limitations guidelines” which allows modification to or waiver of the generally applicable effluent limitation requirements or time deadlines of CWA. This includes provisions, which allow the establishment of alternative limitations based on fundamentally different factors or on sections 301(c), 301(g), 301(h), 301(i), or 316(a) of CWA.

Wetlands – those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

2.0 Operation and Maintenance Programs

This section describes the programs necessary to operate and maintain the LCA sanitary sewer system. Some programs are described in general terms and reference their program specific plans, O&M manuals, work plans, etc. for details. Others are described entirely herein.

2.1 Pump Station and Force Main Operation and Maintenance

2.1.1 Purpose

The purpose of the Pump Station and Force Main O&M Program is to provide reliable sewage pumping service by inspecting, operating, and maintaining pumps and other equipment. The Suburban Operations Division (SOD) is responsible for this program.

2.1.2 Overview

SOD operates, and maintains a system of 2 pump stations connected to 2 forcemains encompassing 25,225 linear feet of force mains ranging in size from 20 to 36 inches, with 17 ARVs, 1 system valve, and 0 check valves connected to the Kline's Island Wastewater Collection System. SOD provides O&M necessary to operate these pump stations and force mains optimally while minimizing SSOs, odors, costly repairs, and unnecessary outages. SOD conducts inspections and performs preventative and reactive maintenance as required.

Pump stations are equipped with SCADA systems and alarms to alert operators at LCA Head Quarters and by pager of pump station operating issues. Table 2-2 provides general information on the pump stations and their associated force mains within SOD's area of responsibility. Appendix A provides a copy of LCA's Pump Station and Force Main Operation and Maintenance Manual.

2.1.3 Goals and Performance Measures (Appendix H)

2.1.4 Preventative Maintenance

2.1.4.1 Routine PM and Inspection

All LCA's pump stations are unmanned with remote sensors. Stations listed in Table 2-1 and Figure 2-1 receive standard operations check and regular maintenance weekly by SOD crews. All stations have specific weekly and monthly inspection and maintenance procedures for each pump station. The checklists for these routine inspections and maintenance procedures are show in Figure 2-2, and Figure 2-3. SOD mechanics conducting maintenance or repair work log their work on these reports. These reports track the maintenance history of each station and ensure the maximum lifespan of the equipment.

2.1.4.2 Wet Well Cleaning

Grease, rags, sand, and debris are routinely removed from pump station wet wells. Grease layers are removed from the surface of the water column in the wet well, and then liquid level in the station wet well is manually lowered to allow settled solids to be removed; a dedicated vacuum truck is used for these operations. All removed materials are dumped at the septage dumping station located at the Kline's Island WWTP. The frequency of wet well cleaning varies based on the station. Table 2-4 lists the frequency of wet well cleaning for each station.

2.1.4.3 Odor Control

Odor control measures at Air Relief Valves are conducted at problematic sites. Current odor control locations are listed in Table 2-5 and shown in Figures 2-6 and 2-7.

2.1.4.4 Grinders and Screens

The pump stations shown in Table 2-6 and in Figure 2-4 and Figure 2-5 have grinders, bar screens, or other rag and debris collection mechanisms. Table 2-6 also lists the frequency of O&M and cleaning.

2.1.4.5 Electrical/Mechanical/Structural Systems

SOD technicians keep the pump station electrical and instrumentation in good working order through regular maintenance and handle most electrical repairs at the pump stations. A program to detect loose electrical connections or other incipient electrical failures that produce a heat signature by infrared scan is performed at a frequency once every year.

SOD mechanics service most of the mechanical problems at the pump stations and provide regular maintenance of mechanical items. Utilization of local machine or pump repair shops is preferred for mechanical work outside the scope and/or skill level of the in-house mechanics. The SOD staff address minor structural repairs and maintenance.

2.1.4.6 Air Release Valves

Maintenance of air release valves (ARV) occurs on an annual maintenance schedule based on observed operating conditions. ARV locations are shown in Figures 2-6 and 2-7. The ARV maintenance schedule is shown in Table 2-7. Checklists are used to document the condition of ARVs upon inspection. Maintenance involves: dewatering of the chamber; exercising the isolation valve(s); and testing for the proper activation of the relief valve. Air release valves that show signs of corrosion or other failure pathways are addressed via replacement to reduce the possibility of a failure. The checklist for replacement of an ARV is shown in Figure 2-8.

2.1.4.7 ARV Isolation Valves

Each ARV generally has 2 isolation valves. The 4" gate valves are scheduled to be exercised annually. The 2" isolation ball valves are exercised each time the ARV is maintained. When exercising the valves, ARV crews report valves in need of repair, and schedule those valves for routine or more extensive maintenance as required. The crew records the total number of turns it takes to close a valve, so it is certain when a valve is fully open.

2.1.4.8 Force Main Flow Valves

Table 2-8 lists and Figure 2-9 shows the one force main flow isolation valve in the system. The valve is scheduled to be exercised yearly.

2.1.5 Reactive Maintenance

2.1.5.1 Backup Power

The two pump stations in the system have back-up power provided by stationary emergency generators with automatic transfer switches; the generator specifics and their sites are listed in Table 2-9 and shown in Figures 2-4 and 2-5. The generators are equipped with block heaters to ensure their ability to start during extremely cold weather. To make certain of their viability when needed, the SOD staff manually exercises the pump station generators on a weekly basis. Annual preventative maintenance is performed on the generators through a contract with a local electrical services shop; all deficiencies identified are immediately corrected by either SOD staff or the contractor.

2.1.5.2 Bypass

The LCA pump stations are not constructed with the connections or plumbing necessary to conduct bypass operations through the force main. If mechanical failures occur, flow remains in the interceptor until its capacity is exceeded. At PPS and SCRPS LCA does not have the ability to redirect flow from a pump station and because of the long distance the sewage must be pumped to relieve sewer surcharging, LCA cannot utilize bypass pumping using flexible piping, pumps or generators in an emergency. The volume of wastewater that would need to be hauled during SSO conditions precludes the use of vacuum trucks, and tanker trucks as an option. Dispatched pump station crews investigate and resolve any complaints received or any alarm signals received from the SCADA system. LCA has technicians on call outside of normal business hours to respond to emergencies. Pump station technicians notify their crew leaders of any needed corrective maintenance that's beyond their abilities or expertise. The crew leader then assigns additional personnel to assist in conducting the maintenance.

2.1.6 SOPs

SOPs for weekly, monthly, and quarterly pump station O&M, wet well cleaning, odor control, and screen and grinder O&M, and for force main inspections above ground, force main inspection below ground, ARV inspections, maintenance, and exercise, and other valve inspections, maintenance, and exercise are contained in Appendix B.

2.1.7 Equipment and Spare Parts

SOD has service trucks, and a vacuum truck to service and maintain their pump stations; the complete inventory of suburban division vehicles can be found in Appendix B. The two pump stations in the system were constructed with redundant pumps therefore the authority does not keep an inventory of spare pumps, impellers, wear rings, seals, and other miscellaneous pump parts. However the SOD does maintain a spare rotor assembly for the pumps at PPS. Spare pipe, valves, and fittings are kept in inventory, along with spare electrical components that are needed at overnight hours, weekends, and holidays when supply houses are closed. Inventory of portable generators, diesel bypass pumps, and spare submersible and dry pit pumps is maintained in the Cityworks database.

2.1.8 Staffing

Figure 1-2 contains the organization chart for SOD. There are 16 staff positions; typically, all positions are filled. Currently, there is no gap between SOD budgeted positions and staffing level.

2.1.8.1 Outsourcing

SOD outsources major equipment repairs and rebuilds. No routine O&M services at the pump stations are outsourced.

2.1.8.2 Required Credentials, Training Programs, and Staff Development

SOD entry positions require a valid driver's license. Newly hired staff are required to pass their Class "A" CDL within 6 months of start of employment or be dismissed. Each subsequent pay grade requires progression through the Pennsylvania Department of

Environmental Protection certification program as well as minimum time in grade and licensure level.

All SOD positions require LCA employees responsible for pump station operations and maintenance complete LCA's required safety and training modules before performing confined space work. Equipment-specific training is provided on an as-needed basis.

SOD crew Foremen are responsible for training new hires. The SOD Division Manager is responsible for training crew Foremen and for identifying any skills that are lacking in the Foremen or their crew members.

Training programs and corresponding certifications available to SOD crews are:

- Collection system Pa DEP certification
- Confined space entry certification
- Commercial driver's license
- Tanker endorsement
- Pump station electricians can enroll for Programmable Logic Controller (PLC), arc flash, and motor control center training.

In addition to skill specific training, staff development opportunities are offered for both the advancement of staff proficiency and for staff who show promise of leadership, management, or professional expertise. The staff development offering is an emergent program.

2.1.9 Information Management

LCA SOD is in the process of implementing a CMMS utilizing Cityworks software. This system will record and keep track of maintenance records to assist staff in identifying what transpired in response to problems, identifying normal maintenance, and scheduling needed maintenance.

LCA's SCADA group additionally provides information management for pump station operation. Information from SCADA are used by SOD to prioritize maintenance and site visits, and react to potential operational failures. The SOD Foreman maintains records of alarms at his office. The pump curves for SCPS and PPS can be found in Appendix A.

Field crews log maintenance and repair details in the CMMS. Examples of work order forms and CMMS work order closeout screenshots are shown in Figure 2-10 and Figure 2-11.

2.2 Gravity Sewer Operations and Maintenance Program

This section describes the programs necessary to operate and maintain the LCA gravity sanitary sewer system. Some programs are described in general terms and reference their program specific plans, O&M manuals, work plans, etc. for details. Others are described entirely herein.

2.2.1 Purpose

The purpose of the work group assigned to maintaining the gravity sewers in the Suburban Operations is to minimize negative impacts to LCA customers and environmental releases from the gravity sewer. The Suburban Operations Division (SOD) is responsible for this program.

2.2.2 Overview

SOD operates the gravity sewer system, performs routine maintenance and cleaning, conducts ongoing routine assessments of the condition of the system, and performs corrective maintenance when required to keep the system operational. This program is driven by the goal to prevent SSOs before they occur. SOD operates and maintains 54 miles of gravity sanitary interceptors ($\geq 24''$), 43 miles of gravity sanitary trunk lines (12"-21"), 9 miles of gravity sanitary collectors (8"-10"), 1,752 sanitary sewer manholes, and 2,369 sanitary sewer laterals. These are shown in Figure 2-1

2.2.3 Goals and Performance Measures (Appendix H)

2.2.4 Preventative Maintenance (PM)

LCA owns and maintains the sanitary sewer system and the portion of laterals in their rights of way and easements serving residents and businesses. Larger-diameter gravity sewer lines do not experience the same problems as the smaller-diameter gravity residential lines. For instance, Fats, Oils and Grease (FOG) accumulation and root intrusion are more of a problem for LCA's smaller diameter lines than their larger diameter lines. Accordingly, practices vary by both diameter and pipe material.

SOD conducts preventative maintenance activities on the gravity system and appurtenances on a proactive basis to identify and resolve problems before they result in failures that can cause overflows. Defined preventative maintenance schedules rest on past system performance and experience.

2.2.4.1 Routine Cleaning

Routine cleaning of sanitary sewers for the most part is done in conjunction with CCTV surveys. LCA provides cleaning and CCTV services to the Partners in the SCARP program including: Alburtis; Lowhill; Macungie, Lower Macungie; Upper Milford; Upper Macungie; and Weisenberg Townships. On an annual basis LCA requests from the Partners the linear footage of sewer pipe they wish to have cleaned and televised in the coming year. From these Partner requests for assistance, the SOD staff develops a tentative schedule of work to be completed. The preliminary cleaning schedule for 2018 can be found in Table 2-13.

Although external to the scope of this program, it should be stated that LCA also owns, operates, and/or provides operations services to several small sanitary sewer systems including: Arcadia; Heidelberg Heights; Sand Springs; Washington Twp.; and Wynnewood Terrace. The SOD staff and resources used to complete the work on the sewer systems contributory to the Western Lehigh Interceptor must also be allocated to these small systems, many of which have serious I&I problems. A map of sanitary sewer systems maintained by LCA is shown in Figure 1-1. Time and resources devoted to these

small systems has negatively impacted the production in sanitary sewer systems covered by this CMOM.

Moreover, preventative maintenance production continues to be constrained by the utilization of sewer system staff for potable water infrastructure emergencies and projects. Additionally, program success has been impeded by customer complaint activities, which take precedence over sewer line preventative maintenance work. To date, 161 miles of sewers have been cleaned since 2002 (last 15 years), and 53 miles have been cleaned since 2012 (last five years). The details of sanitary sewers cleaned and CCTV surveyed in 2017 can be found in Table 2-14

In 2018, SOD will begin an evaluation of the sanitary sewer cleaning program. Subjects to be evaluated will include:

- Crew makeup, staffing level, cleaning equipment needs in relation to production goals.
- Development of GIS-supported work prioritization, cleaning definition, and work order capture tools.
- Cleaning staff work assignments and the possibility of a more dedicated work crew type approach for the cleaning and CCTV crews.

2.2.4.1.1 Frequency and Schedule

SOD has had a cleaning frequency for 8-10 inch diameter pipe in the Western Lehigh System of about 10% annually (10 year return frequency, or about 1.6 miles per year). The all-inclusive cleaning production over the past 5 years (Western Lehigh, Partner, and Small Separate Systems) has averaged about 10.5 miles per year. Mileage cleaned goals for 2018 under the current resources utilization scenario is 17 miles of 8" pipe.

2.2.4.2 Closed Circuit Television (CCTV) Inspection

CCTV operators certified in the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Condition Program (PACP) use the PACP rating system

to identify the severity of the defects found during the inspection process. The PACP defect coding provides a level of consistency in the defect rating; therefore, Capital Works Department staff and others reviewing the inspection records can understand and use the information accordingly.

CCTV inspection is a non-destructive, proactive approach to evaluate the LCA sanitary sewer infrastructure and used when observed data is necessary to assess the condition of the pipeline interior. CCTV inspection functions include:

- Inspecting pipeline condition and determining the location of problem areas such as pipe or joint separations, drops, ruptures, obstructions, deterioration, pipe misalignment, and root intrusions
- Locating infiltration and inflow sources during rain events
- Looking for damage to sewers caused by excavation and construction
- Searching for unrecorded connections, such as illegal or unauthorized tap-ins
- Evaluating effectiveness of pipeline repairs, replacement, and/or rehabilitation within the sewer system
- Assessing pipeline condition of new installation before the warranty period ends

2.2.4.2.1 Frequency and Schedule

The long-term CCTV program has a goal of inspecting all gravity sewer more than 25 years old (or rehabilitated more than 20 years ago) on a ten-year cycle. However, these goals adjust according to the condition of the pipe. Portions of the gravity system that may be more subject to problems such as inverted siphons are inspected every year. Pipes inspected and found to have defects, but that have not yet been replaced or rehabilitated, receive inspections at a 5-year frequency, depending on the nature and number of defects.

Although one of LCA's goals for this program is to assess all gravity segments, some segments are currently inaccessible due to thick vegetative growth in easements. LCA has embarked upon an easement clearing program which removed the vegetation from 4.9 miles of interceptor easements in 2017. The program will be continued in 2018 and 2019 with an additional 1.6 and 2.1 miles of easements identified for clearing respectively. Maps of the easements completed and proposed for clearing are provided in Appendix C. If LCA identifies any inaccessible segments, crews assess the upstream and downstream segments (as they can) to determine if there are any issues. LCA currently plans to inspect approximately 17 miles of pipe per year over the next 5 years.

2.2.4.3 Root Control

Root intrusion not is a significant concern in LCA owned and/or operated systems. However, it is more prevalent in Partner systems. Through CCTV inspections performed, LCA assess the condition of the Partner system's pipes and determines the location of any root intrusion. If roots are present in the system and have the potential to cause an obstruction to the flow, the Partner system typically handles the problem through a chemical root control subcontractor, such as Dukes Root Control.

2.2.4.3.1 Frequency and Schedule

LCA does not monitor Partner system's chemical root control treatments, but merely provides information regarding chronically root-impacted sewers requiring treatment, to the Partner system's engineer.

2.2.4.4 Fats, Oils, and Grease Control

LCA has not experienced sewer line blockages resulting from grease accumulation on the wall of sewer lines, therefore does not have a formalized FOG program. LCA provided sampling for selected customers for the Partners who are responsible for FOG control in their own systems

2.2.5 SOPs

SOD maintains Gravity Sewer O&M SOPs (See Appendix C) describing many of their regular procedures in running a gravity sanitary sewer system, including:

- Manhole Ring and Cover
- Routine Operating
- Overtime
- Sewer Blockage
- Smoke and Dye Testing
- CCTV
- Walk Around Inspection
- Cleaning

SOD personnel formally review the existing SOPs every 3 years and revise as necessary.

The SOD supervision has daily meetings with the field staff to discuss any issues and concerns. These meetings allow for a discussion of any problems arising from implementing the above-mentioned SOPs and procedures. These procedures present the general work sequence and adequately document details to maintain a repeatable standard.

Currently, SOD maintains numerous forms, checklists, and reports for gravity sewer O&M. See Appendix C for the checklists and forms used for manhole and gravity sewer inspections. Foremen review these forms and procedures every 3 years based on operational experience or process changes.

2.2.6 Reactive Maintenance

Reactive maintenance takes place when an unanticipated problem occurs in the system because of a break, blockage, construction activities, or an act of vandalism. Reactive maintenance utilizes the same equipment and techniques used in the preventative maintenance activities. If the problem results in a release from the collection system, the

responding crews can follow steps outlined in the SSO Response Plan. Crews record the locations of overflows to document causes and patterns of failures that may require additional investigation and preventative maintenance activities.

SOD provides project data sheets for the LCA Capital Improvement Program (CIP) based on known problems, equipment obsolescence, or known improvement opportunities. The Capital Works Department collects, develops, and analyzes CIP data sheets using an established set of criteria to establish the relative priority of each proposed item.

2.2.6.1 Response to Complaints

Typically, the Customer Services Department receives complaints. These complaints then go to the appropriate department foremen. These foremen respond either during normal work hours or a technician on call responds after hours. LCA maintains both a nighttime answering service and a weekend answering service that records complaints and forwards them to the technician on duty. An on-call staff member responds to complaints promptly. Standby crews are available 24 hours a day to respond to any problem requiring additional maintenance action. Other crews are available, if required, or private contractors, if necessary.

2.2.6.2 Root Cause Analysis

SOD utilizes root cause analysis protocol for all reactive maintenance issues. The protocol is implemented by the Suburban Operations Foreman and the first step is a thorough investigation of the incident. Findings from the root cause analysis are used to upgrade procedures and standards of practice. A copy of a blank cause and effect form can be found in Appendix C.

2.2.7 Equipment and Spare Parts

SOD has standardized on Vactor cleaning equipment, IBak CCTV equipment, and WinCam CCTV data capture software. SOD has numerous vehicles used in maintaining the gravity sewer system including: pickup trucks; utility trucks; a jet/vac truck; a camera trucks; and an off-road Kubota. Table 2-10 lists the primary cleaning and inspection

equipment: make, model, and VIN number. SOD also has the heavy equipment and bypass pumping required to excavate and replace any malfunctioning line, manhole, valve, or other appurtenance. Table 2-11 lists the heavy equipment for excavation and replacement: make, model, and VIN number. Table 2-12 lists the bypass equipment, make, model, and relevant operating specifications. Years of useful service or until replacement of any piece of equipment is determined by the Fleet Manager. Spare gravity sewer parts such as manhole covers, barrels and cones, and pipe of various materials and diameters are stored at LCA headquarters. Spare parts inventory is logged on Cityworks software.

2.2.8 Staffing

Figure 1-2 contains the organization chart for SOD. There are 16 staff positions; typically, all positions are filled. Currently, there may be a gap between SOD budgeted positions and the staffing requirements to dedicate a crew strictly to cleaning and CCTV inspection of sanitary sewers.

2.2.8.1 Outsourcing

SOD outsources: major sewer line repairs; bypass pumping greater than 1000 gpm; large interceptor inspections, heavy cleaning, pipe joint grouting; and emergency excavation and replacement. In 2017 LCA awarded a contract for the cleaning, inspection, testing and grouting of 10.4 miles of sanitary sewers including pipe segments in: Alburdis, Macungie, Breinigsville and portions of the Western Lehigh Interceptor. An invoice listing work completed can be found in Appendix C.

2.2.8.2 Required Credentials, Training Programs, and Staff Development

SOD entry positions require a valid driver's license. Newly hired staff are required to pass their Class "A" CDL within 6 months of start of employment or be dismissed. Each subsequent pay grade requires progression through the Pennsylvania Department of

Environmental Protection certification program as well as minimum time in grade and licensure level.

All SOD positions require LCA employees responsible for gravity sewer operations and maintenance to complete LCA's required safety and training modules before performing confined space work. Equipment-specific training is provided on an as-needed basis.

SOD crew Foremen are responsible for training new hires. The SOD Division Manager is responsible for training crew Foremen and for identifying any skills that are lacking in the Foremen or their crew members. Vendor and equipment training is provided on an as-needed basis. Operators of the CCTV system receive NASSCO PACP, MACP, and LACP certification.

Training programs and corresponding certifications available to SOD crews are:

- Collection system PA DEP certification
- Confined space entry certification
- Commercial driver's license
- Tanker endorsement

In addition to skill specific training, staff development opportunities are offered for both staff knowledge enhancement and for staff who show promise of leadership, management, or professional expertise. The staff development offering is an emergent program.

SOD employees responsible for gravity sanitary sewer operations and maintenance complete required safety and training modules. Employees train while on-the-job and in the classroom training when necessary.

2.2.9 Information Management

Field crews log maintenance and repair details on field maps and in hard copy note books. The senior wastewater technician inputs this hard copy information into the computerized

maintenance management system (CMMS). Examples of work orders and CMMS tracking of completed work orders are shown in Figure 2-10 and Figure 2-11.

SOD is in the process of implementing a CMMS using Cityworks software. This system will record and keep track of maintenance records to assist staff in identifying what transpired in response to problems, identifying normal maintenance, and scheduling needed maintenance. Inventory capability will be part of this system.

Each CCTV evaluation yields reports and videos. Camera crews file reports and videos by line segment number and manhole numbers. Bi-annually, these videos, reports, and jpegs are downloaded to the NAS01 server and hyperlinked in Lehigh County Authority's GIS System. These data are saved on this server indefinitely. Annually, these same files are transferred to the "Company" server for backup; these files are also retained indefinitely. Along with reports and inspection videos, crews keep an updated record of progress made against the normal inspection schedule. An up-to-date copy of CCTV inspection status spreadsheet is located at:

G:\Operations\Wastewater\TVINSPCT on the "**Company**" server.

2.3 Sanitary Sewer Lateral Maintenance

LCA does not have a formal sanitary sewer lateral maintenance program, but it is in the process of being developed. Currently lateral work/maintenance is based upon either identification of problems during main sewer CCTV surveys (such as identification of structural defects or clear water flow) or receipt of a customer complaint.

2.3.1 Overview

LCA owns and maintains that part of the gravity sanitary sewer system service laterals from the sewer main to a point at or near the street right-of-way line; there are 2,369 sanitary sewer laterals in LCA's inventory. These laterals can be a source of significant ground water infiltration into LCA's sanitary sewer system, especially in areas with deep sewers, areas that have seasonally elevated groundwater table, or pipes backfilled with

crushed stone. Maintaining these laterals up to the street right-of-way line can reduce infiltration, while providing the customer with better service. The SOD is responsible for these activities.

2.3.2 Goals and Performance Measures (Appendix H)

The primary goal of the sanitary sewer lateral maintenance program will be to eliminate basement and house backups due to blockages in the service. A secondary goal is to reduce ground water infiltration into the sanitary sewer system. Metrics for this program include yearly quantities of maintenance, such as number of laterals inspected and how often each lateral should receive each type of maintenance. Structurally deteriorated laterals have replacement/rehabilitated metrics.

2.3.3 Program Description / Components

This section identifies lateral maintenance tasks performed and frequency of performance, including cleaning, blockage identification and removal, and inspection. Historically, LCA used contractors to rehabilitate deficient laterals; these contractors will continue to be relied upon into the unforeseeable future for lateral work. LCA's operations department purchased a CCTV truck that is equipped with a lateral launcher which is capable of televising sanitary sewer lines, as well as the connecting laterals. Additionally, LCA owns a lateral push camera and uses it under circumstances where launching from the sewer main does not produce the desired results. In some instances the staff has found it easier to enter through the cleanout and push towards the main. NASSCO LACP guidelines are used to document the condition of the lateral. These tools allow the SOD to identify and prioritize laterals for rehabilitation. LCA expects to advertise for an annual lateral lining contract sometime in 2019 to address known areas that have deficient sewer laterals.

2.3.4 Preventative Maintenance (PM)

Limited preventive maintenance or inspection is currently conducted for LCA's laterals. During CCTV surveys of main sewers all connections are inspected for structural defects

or clear water flow. In the Western Lehigh System, lateral deficiencies identified are further investigated utilizing the tools previously described. During Partner systems' sewer TV Inspections all structural and O&M defects are called out and coded on the video which is then turned over to the township's engineer. Preventive maintenance or inspection of "Customer" laterals is not currently being considered by LCA because of the inherent risk and the high cost of universal lateral maintenance.

2.3.5 Reactive Maintenance

Reactive maintenance takes place when an unanticipated problem occurs in the lateral because of a break, blockage, or construction activity. If the problem results in a release from the collection system, the responding crews can follow steps outlined in the SSO Response Plan. Crews record the locations of overflows to document causes and patterns of failures that may require additional investigation and preventative maintenance activities.

SOD assists in development project data sheets for the LCA Capital Improvement Program (CIP) based on known problems, equipment obsolescence, or known improvement opportunities. The Capital Works Department collects and analyzes CIP data sheets using an established set of criteria to establish the relative priority of each proposed item.

2.3.5.1 Cleaning

Typically LCA does not clean laterals reactively to remove chokes identified by customers occurring between the house and the sewer main. LCA staff checks manholes, jets the main, or CCTV survey's the line to ensure that a blockage does not exist at the point of connection between the customer's lateral and the main sewer. At that point in time the customer is directed to call a plumber to relieve the blockage. Most customers don't have property line-mounted cleanouts to provide access for using snakes, jetters, and cutters mounted on small diameter sewer cleaning jets or rods. LCA doesn't have the capability of cleaning laterals from the main line sewer which do not have cleanouts located at the street right of way.

2.3.5.2 Closed Circuit Television (CCTV) Inspection

LCA conducts lateral inspections in the Western Lehigh System following the identification of a structural lateral defects or clear water flow during main sewer TV inspections. CCTV operators certified in the National Association of Sewer Service Companies (NASSCO) Lateral Assessment Condition Program (LACP) use the LACP rating system to identify the severity of the defects found during the lateral inspection process. The LACP defect coding provides a level of consistency in the defect rating; therefore, Capital Works Department staff and others reviewing the inspection records can understand and use the information accordingly.

LCA also has the capability of inspecting laterals from the cleanout using a mini-camera and from the main line sewer using a side launched mainline transported camera for laterals that do not have exterior cleanouts.

CCTV inspection is a non-destructive approach to evaluate the laterals and used when observed data is necessary to assess the condition of the pipeline interior. CCTV inspection functions include:

- Locating sources of chokes and blockages
- Inspecting pipeline condition and determining the location of problem areas such as pipe or joint separations, drops, ruptures, obstructions, deterioration, pipe misalignment, and root intrusions
- Locating infiltration and inflow sources following rain events
- Looking for damage to laterals caused by excavation and construction
- Searching for unrecorded connections, such as illegal or unauthorized tap-ins
- Evaluating effectiveness of pipeline repairs, replacement, and/or rehabilitation within the sewer system

- Assessing lateral condition of new installation before the warranty period ends

2.3.5.3 Root Control

LCA does not have a lateral chemical root control program. Any roots found are removed mechanically by a plumber.

2.3.5.4 Response to Complaints

Typically, the Customer Services Department receives complaints. These complaints then go to the appropriate department foremen. These foremen respond either during normal work hours or the on-call technician responds after hours. LCA maintains both a nighttime answering service and a weekend answering service that records complaints and forwards them to the technician on duty. An on-call staff member responds to complaints promptly. Standby crews are available 24 hours a day to respond to any problem requiring additional maintenance action. Other crews are available, if required, or private contractors, if necessary.

2.3.5.5 Root Cause Analysis

SOD utilizes root cause analysis protocol for all reactive maintenance issues. The protocol is implemented by the Suburban Operations Foreman and the first step is a thorough investigation of the incident. Findings from the root cause analysis are used to upgrade procedures and standards of practice. A copy of a blank cause and effect form can be found in Appendix C.

2.3.6 SOPs

SOD MAINTAINS LATERAL O&M SOPS (SEE

Appendix D) that include:

- Lateral inspection
- Lateral replacement

2.4 Low Pressure Sewer Operation and Maintenance

2.4.1 Purpose

The purpose of the low pressure sewer O&M Program is to provide reliable low pressure sewage pumping service by inspecting, operating, and maintaining valves, forcemains, and other equipment associated with the system. The SOD is responsible for this program.

2.4.2 Overview

SOD operates, and maintains a network of low pressure sewers connected to the Vera Cruz low pressure system encompassing 27,140 linear feet of low pressure force mains ranging in size from 1 to 6 inches, with 5 ARVs, 0 system valves, and 232 check valves. SOD provides O&M necessary to operate these low pressure sewers and low pressure force mains optimally while minimizing SSOs, odors, costly repairs, and unnecessary outages. SOD conducts inspections and performs preventative and reactive maintenance as required.

Additionally there are small diameter low pressure forcemains in Lowhill and Weisenberg townships. Because of their short lengths there are no ARV's or odor control devices that must be maintained. Appendix E contains a copy of LCA's Low Pressure Sewer Operation and Maintenance Manual.

2.4.3 Goals and Performance Measures (Appendix H)

2.4.4 Preventative Maintenance

2.4.4.1 Routine PM and Inspection

LCA's Vera Cruz low pressure system was constructed with no utility owned lift stations; the Authority purchased and supplied at no cost to the property owner the on-lot grinder pump systems and ancillary equipment. The complete grinder pumps systems became property of the Homeowner at time of delivery. It was the Property Owner's responsibility

to have the equipment installed in accordance with local codes by a licensed plumber. The Property Owners are responsible for maintenance, malfunction and replacement of the pumping system when necessary.

2.4.4.2 Odor Control

Odor control measures at low pressure sewers are conducted at Air Relief Valves sites if needed. Current odor control locations are listed in Table 2-16 and shown in Figure 2-12.

2.4.4.3 Mechanical/Structural Systems

SOD mechanics service most of the mechanical problems at the low pressure sewers and provide regular maintenance of mechanical items. SOD address minor structural repairs and maintenance.

2.4.4.4 Low Pressure Sewer Air Release Valves

Maintenance of low pressure sewer air release valves occurs on an annual maintenance schedule based on observed operating conditions. Low pressure sewer ARV locations are shown in Figure 2-12. The low-pressure sewer ARV maintenance schedule is shown in Table 2-17. Maintenance involves cleaning and testing in place on the low pressure sewer system. Low pressure sewer air release valves that show signs of corrosion or other failure pathways are addressed via replacement to reduce the possibility of a failure.

2.4.5 Reactive Maintenance

2.4.5.1 Bypass

The LCA low pressure sewers were designed with plumbing necessary to conduct bypass operations through the forcemain. Portions of the forcemain can be bypassed to allow for repair of failures. If mechanical failures occur the SOD responds quickly to the situation. In responding to low pressure sewer system failures, LCA utilizes its vac-truck to prevent releases from reaching a waterway.

Dispatched low pressure sewer crews investigate and resolve any received complaints or any alarm signals received from the SCADA system. LCA has personnel and crews outside of normal business hours to respond to emergencies. Low pressure sewer crews notify their foremen of any tasks needed to perform corrective maintenance. The foremen then assigns personnel to conduct the maintenance.

2.4.6 SOPs

SOPs for annual low pressure sewer O&M, and odor control for low pressure force main inspections above ground, ARV inspections, maintenance, and exercise, and other valve inspections, maintenance, and exercise are contained in Appendix E.

2.4.7 Equipment and Spare Parts

SOD keeps an inventory of spare pipe, valves, and fittings along with other components that are needed at overnight hours, weekends, and holidays when supply houses are closed.

2.4.8 Staffing

Figure 1-2 contains the organizational chart for SOD. There are 16 staff positions; typically, all positions are filled. Currently, there is no gap between SOD budgeted positions and staffing level.

2.4.8.1 Outsourcing

SOD outsources major equipment repairs and rebuilds. No routine O&M services are outsourced.

2.4.8.2 Required Credentials, Training Programs, and Staff Development

SOD entry positions require a valid driver's license. Newly hired staff are required to pass their Class "A" CDL within 6 months of start of employment or be dismissed. Each subsequent pay grade requires progression through the Pennsylvania Department of

Environmental Protection certification program as well as minimum time in grade and licensure level.

All SOD positions require LCA employees responsible for low pressure sewer operations and maintenance complete LCA's required safety and training modules before performing confined space work. Equipment-specific training is provided on an as-needed basis.

SOD crew Foremen are responsible for training new hires. The SOD Division Manager is responsible for training crew Foremen and for identifying any skills that are lacking in the Foremen or their crew members.

Training programs and corresponding certifications available to SOD crews are:

- Collection system PADEP certification
- Confined space entry certification
- Commercial driver's license
- Tanker endorsement

In addition to skill specific training, staff development opportunities are offered for both the advancement of staff proficiency and for staff who show promise of leadership, management, or professional expertise. The staff development offering is an emergent program.

2.4.9 Information Management

Field crews log maintenance and repair details utilizing the Cityworks CMMS.

3.0 Support Programs

3.1 Design and Construction

3.1.1 Purpose

The LCA Capital Works Department ensures that the design of new or improved LCA infrastructure is in accordance with applicable standards, codes, and guidelines, and is inspected and built to the specified standards set forth in LCA's General Specifications for Sanitary Sewer Construction (dated September 1989).

3.1.2 Goals and Performance Measures (Appendix H)

The general goal of the Capital Works Design and Construction program is to minimize repair costs to the utility by ensuring the assets will meet all necessary functions over their lifetime. To achieve this, LCA's Capital Works Design and Construction Program identified the following specific goals:

- Design and construct new and rehabilitated infrastructure projects that comply with design standards, laws, rules, and regulations set forth in the General Specifications
- Perform new and rehabilitation projects in an effective and efficient manner that protects the environment during construction
- Create a prioritized CIP based on a comprehensive set of criteria to support capital planning and spending

3.1.3 Standards

Supervision and inspection of LCA's construction and rehabilitation projects usually occur through a contractual arrangement with an engineering firm. In-house staff inspects smaller construction and rehabilitation projects. As part of the plans and specifications for new projects, the design engineer, the LCA Capital Works-staff project manager, and the inspector implement strict procedures for testing the facilities. LCA has the authority to

ensure the proper installation, inspection, and testing of new and rehabilitated sewers in all parts of the LCA WLI systems.

3.1.4 Oversizing

Section 6 of the LCA Main Extension Policy requires a developer to construct facilities of such size, length and/or depths to not only serve the proposed development, but service the areas of anticipated growth. Incorporation of this design and construction oversizing is part of the development's water and sewer design.

LCA reimburses the developer for the difference in the design and construction costs of the original designed development plan and the LCA required oversize development plan. The reimbursement amount estimated during the design phase originates from the developer's engineer and goes to LCA for confirmation. The actual project design and construction cost, as submitted by the developer and approved by LCA, determines the final reimbursement.

3.2 Pennsylvania One Call / Pennsylvania811

3.2.1 Purpose

This section identifies the legal requirements and basis for LCA to locate sewer lines for construction projects conducted by others, enforcement of this program, and the identification of responsibility of the workers to repair lines if damaged due to mismarking or failure to locate.

State law (Section 5 of Act 287) specifies the legal responsibility for damage to the utilities. If an entity does not call for locates or damage occurs from a properly marked utility, the entity causing the damage is responsible for the repairs and subsequent impacts. If the utility is mismarked, the marker is responsible for repair costs and subsequent impacts. If information supplied to the marker was incorrect, the supplier of the information is responsible for repairs and subsequent impacts.

LCA staff perform locate responsibilities. LCA identified this work as a major use of time and budget for the SOD staff. Developing and documenting a line location program should help SOD determine budget needs and the amount of staff required for this work.

This program exists to ensure that third parties doing work unrelated to LCA's system do not damage LCA assets, and are responsible for adequate repairs if they do. LCA participates in PA One Call to prevent damage to its underground assets by locating and marking underground lines prior to construction or other excavations that may occur. LCA follows PA One Call standards, which use Common Ground Alliance Best Practices 14.0 for Temporary Marking (ANSI standard Z535). White is used for proposed excavation; Pink for temporary survey markings; Red for electric power lines, cables, conduits and lighting cables; Yellow for gas, oil, steam, petroleum or gaseous materials; Orange for communication, alarm or signal lines, cables or conduits and traffic loops; Blue for potable water; Purple for reclaimed water, irrigation and slurry lines; and, Green for sanitary and storm sewer lines. This program educates LCA employees regarding excavation laws and responsibilities and prevents and/or reduces damage/interruption of service to LCA's as well as other utilities lines and/or customers.

3.2.2 Goals and Performance Measures (Appendix H)

The goal of this program is to provide that no damage occurs to LCA assets by third parties. Responsibilities of repairs lies with LCA if there are no line locates delineated. Metrics include number of calls responded to, turnaround time for standard calls, turnaround time for emergency calls, turnaround time for design calls, and number of assets damaged due to in accurate mark outs.

LCA has the goal of accurately marking the underground lines to ensure that no damage occurs to LCA facilities. LCA responds to several types of PA One Call (KARL) tickets within the designated time required by the program.

3.2.3 Components

Pennsylvania state law requires that LCA, as a utility owner, to participate in PA One Call. Anyone preparing to excavate must place a call to PA One Call (KARL) to have all underground utilities located and marked before digging. Pennsylvania811 coordinates the calls and notifies all utilities of possible conflicts. Pennsylvania811 issues a ticket depending on the type of job or excavation. Pennsylvania811 designates tickets as designer, regular, update, emergency, meeting, or special project tickets.

LCA is required to respond to all tickets received and is typically required to mark its utilities within 3-10 business days (or sooner depending on the type of ticket) of the notification. If the project is under design and someone requests a physical survey of the utilities, this “designer” ticket allows LCA up to 10 working days to mark the utilities in conflict and/or provide record drawings. The marking crew utilizes record drawings, tracer wire, line of sight, and other location technologies to provide the location of the underground utility.

3.2.3.1 Standards

Standards, set by legislation, include:

- Minimum Notice between mark out request and work
- Maximum response time
- Requirements for “emergency” excavation and excavation priority
- Required action by contractor if line is damaged
 - When marked correctly
 - When mismarked
 - When not marked out by LCA within the required period

- When work is conducted without notice

3.2.3.2 SOPs

Written procedures for the Line Location Program focus on field procedures and include:

- Responding to calls
 - Identifying where no field work is needed
 - Marked out lines
 - Special situations
 - “Emergency” excavations
- Locating lines
 - Using mapping
 - Using land marks such as cleanouts and manholes
 - Using dousing rods
 - Using sondes
- Marking Lines
 - Mains
 - Service Connections

3.2.3.3 Enforcement Program

If a contractor works near LCA facilities and LCA did not receive the proper notification, the contractor must stop working. The contractor, while performing work, is liable for any repairs to damaged LCA infrastructure, if the work was improperly marked or not called

in to PA One Call. LCA may file an insurance claim to recover repair expenses not assumed by the contractor.

3.2.3.4 Line Location for Third Parties

LCA may own pipes in areas where the PA One Call does not apply or a contractor may be working on or near a plant or pump station and request that underground utilities be marked. Upon request, LCA may mark the utilities in these areas. This service ensures the integrity of LCA pipelines and structures.

3.3 Flow Acceptance

This section identifies the legal requirements and basis for control of flow contents, peak volume, and normal volume from satellite systems. It cites the authority by which LCA monitors these flows and, if necessary, prohibit flows and/or enforce compliance.

3.3.1 Purpose

LCA has developed a flow acceptance process for reviewing proposed new connections or major modifications to existing connections to the WLI system. The process allows for the orderly and consistent review of new service requests and coordinates the review process between LCA's various departments. These new flows primarily consist of new developments (usually sub-divisions), but can be from existing larger customers.

3.3.2 Connection Management Program

LCA and all of the Partners were required to develop a Correction Action Plan (CAP) to address hydraulic overloads in the WLI system. The CAP developed is referred to as the Sewer Capacity Assurance and Rehabilitation Program (SCARP). The SCARP defines the formal methodology of the Partners from planning, evaluating, prioritizing, and conducting sewer rehabilitation.

The SCARP includes a program for control of new connections. New connections within the WLI system are allowed as reductions in flow are achieved. Development flow credits are gained through Infiltration and Inflow reductions, sump pump removals, capacity

increases, or storage. The development flow credits are used as new connections are made to the WLI system. LCA tracks the development flow credits account for the Partners and prepares and submits a report to the PADEP annually.

3.3.3 Goals and Performance Measures (Appendix H)

No goals or performance measures identified at the current time. However, the below goals could be used for the program. The proposed goals of the Flow Acceptance Program are to:

- Allow for adequate long term capacity planning in the system
- Track new connections and provide for adequate planning
- Provide an opportunity for LCA to ensure developments meet LCA's design criteria, which are in the LCA General Specifications for Sanitary Sewer Construction

3.3.4 Components

LCA has the legal authority to accept, reject, and control flows from satellite systems through planning module approvals. It is LCA's responsibility to maintain an effective flow acceptance process.

There are two classifications of sanitary sewer flow acceptance: single service connections and system extension. Single service connections encompass new individual meters and service lines. System extensions encompass new sources of large flow, usually housing sub-divisions.

3.4 Service Connection/Disconnection

3.4.1 Purpose

LCA inspects connections and disconnections to make sure there are not any illegal connections, improper connections, and lapses in recording connections/disconnections.

The purpose of LCA's Service Connection/Disconnection Program is to:

- Prepare accurate and detailed records of new work
- To ensure LCA qualified and approved contractors perform work on service connects/disconnects
- Provide information to the Billing Department on new service connections/disconnections

3.4.2 Goals and Performance Measures (Appendix H)

LCA inspects connections and disconnections to make sure there are no illegal connections, improper connections, and lapses in recording connections/disconnections.

The overall goal of the Service Connection/Disconnection Program is to eliminate clear water and structural problems arising from poor connections.

Accomplishment of this overall goal is by LCA providing:

- Installation of all new residential connections to ensure LCA standards are meet
- Inspection of all new industrial connections to ensure LCA standards are meet
- Efficient turnaround time for new tap installations

3.4.3 Components

The Service Connection/Disconnection Program is responsible for projects that connect to an existing LCA valve, projects that require a new tap connection, or projects with proposed gravity connections to the WLI. For all three scenarios, LCA oversees the new connection processes. Responsibility lies with the property owner and/or their contractor to provide LCA with proper notification. An LCA designated inspector is required to be present at the location of the connection. All materials used in constructing the service must be new and meet LCA standards.

Connecting to an existing force main valve requires pressure testing the connection prior to use. Tapping a new connection into a force main requires advance approval of the saddle and tapping valve used. Only LCA approved tapping contractors may perform line tapping. In-place pressure testing of the saddle and tapping valve (according to manufacturer's procedures is required and only LCA personnel may operate LCA valves.

Connections to LCA's gravity main sanitary sewer system must met all LCA standards. These procedures allow LCA to control the connection process, to preserve system integrity, and to practice due diligence while supporting appropriate service inspection.

3.4.3.1 Unauthorized Connections

Infiltration and inflow (I/I) of extraneous stormwater and groundwater to sanitary sewers can overwhelm the conveyance capacity of sewers and is a significant cause of system overflows. Sewer laterals, which connect buildings on private properties to sewer mains, are often a significant source of I/I. Clean water is frequently directed into the sanitary sewer system through unauthorized private connections. The need to remove sources of non-wastewater "inflow" into the sanitary sewer system from private property is a concern for SOD managers. These inflow sources can include connections from roof leaders, area drains, and basement sump pumps. Although LCA does not have a formalized program of house to house inspections of private property, if clear water flow from a lateral is observed during CCTV surveys the SOD staff responds in the following manner:

- Foreman contacts the property owner
- If permission is granted, the property is inspected for the inflow source. This may require the use of the lateral launcher from the sewer main or push camera from the property cleanout
- If the source identified is of the type that does not require repair of the lateral such as a sump pump or roof leader, the homeowner is directed to disconnect the inflow source
- If the source involves the connection between the LCA owned and private property lateral. The connection is scheduled for repair by a LCA contractor

The issue of systemized private property inspections to identify unauthorized connects in order to facilitate clear water flow removal from the collection system is one that requires further evaluation by the Authority as well as a program of general public outreach and communications.

3.4.3.2 Standards

Standards for the Service Connection/Disconnection Program typically focus on legal connections to the system and appropriate material standards. With the assistance of the legal support staff, connection standards (including enforcement provisions) are now legal code. LCA's General Specifications contains piping material standards and mirrors the plumbing code.

3.4.3.3 SOPs

LCA staff does not have Service Connection/Disconnection Program written procedures for field work since this is the responsibility of the developer however, SOPs will be developed for inspection service LCA does perform.

4.0 Sanitary Sewer Overflow (SSO) Response, Reporting, and Recordkeeping Program

4.1 Purpose

LCA has the responsibility under State law to respond, report, and keep records on releases from their sanitary sewer system. The purpose of the SSO Response, Reporting, and Recordkeeping Program is to prevent or reduce the environmental and/or public health impact of SSOs by providing structured guidance for release response, compliant reporting of SSOs, and accurate recordkeeping of SSOs. LCA ensures program compliance by:

- Correctly identifying overflows
- Responding, tracking, documenting, and resolving overflows
- Reporting to the appropriate governmental agencies and other affected groups
- Properly training employees who respond, report, and record SSO's
- Providing emergency operations
- Meeting reporting and recordkeeping requirements

LCA reports all unauthorized releases or spills of untreated wastewater or treated wastewater where endangerment of public health or the environment is likely, as soon as practical, but no later than 4 hours from the time LCA's Suburban Operations Department becomes aware of the discharge. LCA notifies the PA DEP of sewage spills of any volume and if the spill reached a body of water.

4.2 Goals and Performance Measures

Goals and performance measures can be found in tables provided in Appendix H.

4.3 Methods for Calculating Spill Volumes

LCA employs various methods to calculate spill volume during a SSO event. See Appendix F for guidance on calculating SSO spill volumes. This is dependent on the nature and origin of the spill, the method or methods used to remediate the spill, the characteristics of the area receiving the spill, the operational data available, and actual observations of the spill.

4.4 Methods for Tracking Spills and Complaints

LCA's Sanitary Sewer Overflow (Spill) Compliance Report notes the specific details of an SSO. Figure 4-1 shows an example SSO compliance report. During normal business hours, a work order is initiated for SOD field personnel to respond to the occurring SSO. Once the SSO has been neutralized, SOD field crews will complete the SSO Compliance Report. The report will then be forwarded to LCA's Compliance Department. The Compliance Department reviews the SSO Compliance Report and offers comments. The SOD Operations Foreman submits the final document to PADEP. The SOD retains the SSO Compliance Reports for record keeping purposes. Completed SSO reports for each SSO go into Compliance Department's management system for proper accounting and recording.

4.5 Spill Responses/Remediation Practices

The response and remediation taken in response to a SSO are dependent on several factors. To the extent possible, LCA's collection system receives back any captured discharged wastewater resulting from an SSO. Hand tools, such as rakes and shovels, and vacuum trucks (operated by either LCA or LCA's contractor) are used to return the discharged wastewater to the collection system. After every gravity system SSO, SOD field crew will inspect the sewer mains using a closed circuit television (CCTV) camera within 5 days to determine the root cause or underlying exacerbating cause for the dry weather SSO. These results are used to determine if additional cleaning is needed or if

any other remedial or corrective actions should be taken, and by whom. Other procedures developed by the sewer maintenance staff specific to SSO's are:

1. Sewer Main and Sewer Service Blockage
2. SSO Investigation

These SOP's are maintained by SOD.

Disinfection of the spill area occurs using one of several products approved by PADEP. A listing of disinfection products, by preference, is below:

- Sodium Hypochlorite
- Hydrated Lime (granular).

4.6 Failure Impact Evaluation and Risk Management

Assessment of potential impacts from potential sanitary sewer failures, and subsequent SSOs to identify the areas of the system that will have the greatest impact if a failure occurs and focus asset management resources to minimize the risk. LCA uses the KISS hydraulic model for their sanitary sewer system. While the purposes of this model are manifold, the model is used to identify which areas have current hydraulic capacity limited sections and are likely to experience wet weather SSOs. Knowing the locations of hydraulic capacity limited sections allows the delegation of appropriate resources, which can mitigate any possible SSOs.

4.7 Scheduled Flow Control Plan

When LCA has a pending construction project that has the potential to trigger an overflow or potential problem, a contingency flow control plan is developed and implemented by LCA's Operations Department. When implementing the diversion plan, the appropriate personnel are notified of the temporary changes to the collection system.

4.8 Wet Weather Flow Control Plan

When there is an impending significant wet-weather event that has the potential to trigger an overflow, LCA implements a structured wet-weather flow control plan. LCA infrastructure constructed to handle storm flows is operated based on the Wet-Weather Relief Facilities Operating Logic (WWRFOL); a copy of the logic can be found in Appendix G. The WWRFOL defines the timing for early activation of the Spring Creek Road and Park Pumping Stations in order to provide storage in the interceptor system in order to attenuate collection system surcharging resulting from Rain Derived Inflow & Infiltration (RDII). Defined by means of the logic tree is the trigger point for activation of the Flow Equalization Basin (FEB), located at the LCA WTP. The FEB is capable of storing 3 million gallons of stormwater during a significant wet-weather event and returning it to the collection system after peak storm flows have subsided.

4.9 SSO Performance Data

Table 4-1 through 4-4 provide a quick, but thorough, summary of pertinent LCA SSO data. This summary allows for the identification and review of multi-year trends. Table 4-1 contains the physical characteristics of LCA sanitary sewer collection system. Table 4-2 provides evaluation metrics for the collection system. Table 4-3 presents data on the number and causes of SSOs. Table 4-4 lists data pertaining to the volume of overflows by cause.

| Table 4-1: SSO Performance Assessment Report Part 1 | | | | |
|---|---------|---------|------|------|
| Sanitary Sewer System Characteristics | 2016 | 2017 | 2018 | 2019 |
| Total length of gravity sewers (ft.) | 206,306 | 206,306 | | |
| Total length of force mains (ft.) | 25,225 | 25,225 | | |

| | | | | |
|-------------------------------|------|------|--|--|
| Total number of manholes | 1752 | 1752 | | |
| Total number of pump stations | 2 | 2 | | |

| Table 4-2: SSO Performance Assessment Report Part 2 | | | | |
|--|-------------|-------------|-------------|-------------|
| Sanitary Sewer System Metrics | 2016 | 2017 | 2018 | 2019 |
| Total sewer main inspected by CCTV (lf.) | 32,552 | 29,532 | | |
| Total number of sewer main point repairs (ea.) | 0 | 0 | | |
| Total sewer main rehabilitated (lf.) | 0 | 0 | | |
| Total sewer main replaced (lf.) | 0 | 0 | | |
| Total number of manholes inspected (ea.) | 44 | 0 | | |
| Total number of manholes rehabilitated (ea.) | 12 | 1 | | |
| Total number of manholes replaced (ea.) | 4 | 0 | | |
| Total force main inspected (lf.) | 0 | 0 | | |
| Total number of force main point repairs (ea.) | 0 | 1 | | |
| Total force main rehabilitated (lf.) | 0 | 0 | | |
| Total force main replaced (lf.) | 0 | 0 | | |
| Total number of Utility Tickets issued (ea.) | 3,346 | 6,516 | | |

| Table 4-3: SSO Performance Assessment Report Part 3 | | | | |
|--|-------------|-------------|-------------|-------------|
| Sanitary Sewer System SSO Evaluation | 2016 | 2017 | 2018 | 2019 |
| | | | | |



Sanitary Sewer Overflow (SSO) Response, Reporting, and Recordkeeping Program

| | | | | |
|--|---|---|--|--|
| SSOs (# or %) caused by: | | | | |
| Maintenance – Roots | 0 | 0 | | |
| Maintenance – Debris | 0 | 0 | | |
| Maintenance – Grease | 0 | 0 | | |
| Power Loss | 0 | 0 | | |
| Damage by others (third party actions) | 1 | 0 | | |
| Capacity – wet weather related | 1 | 0 | | |
| Infrastructure – gravity main failure | 0 | 0 | | |
| Infrastructure – force main failure | 3 | 1 | | |
| Infrastructure – pump station failure | 0 | 0 | | |
| Total Number of SSOs: | 5 | 1 | | |

Table 4-4: SSO Performance Assessment Report Part 3B

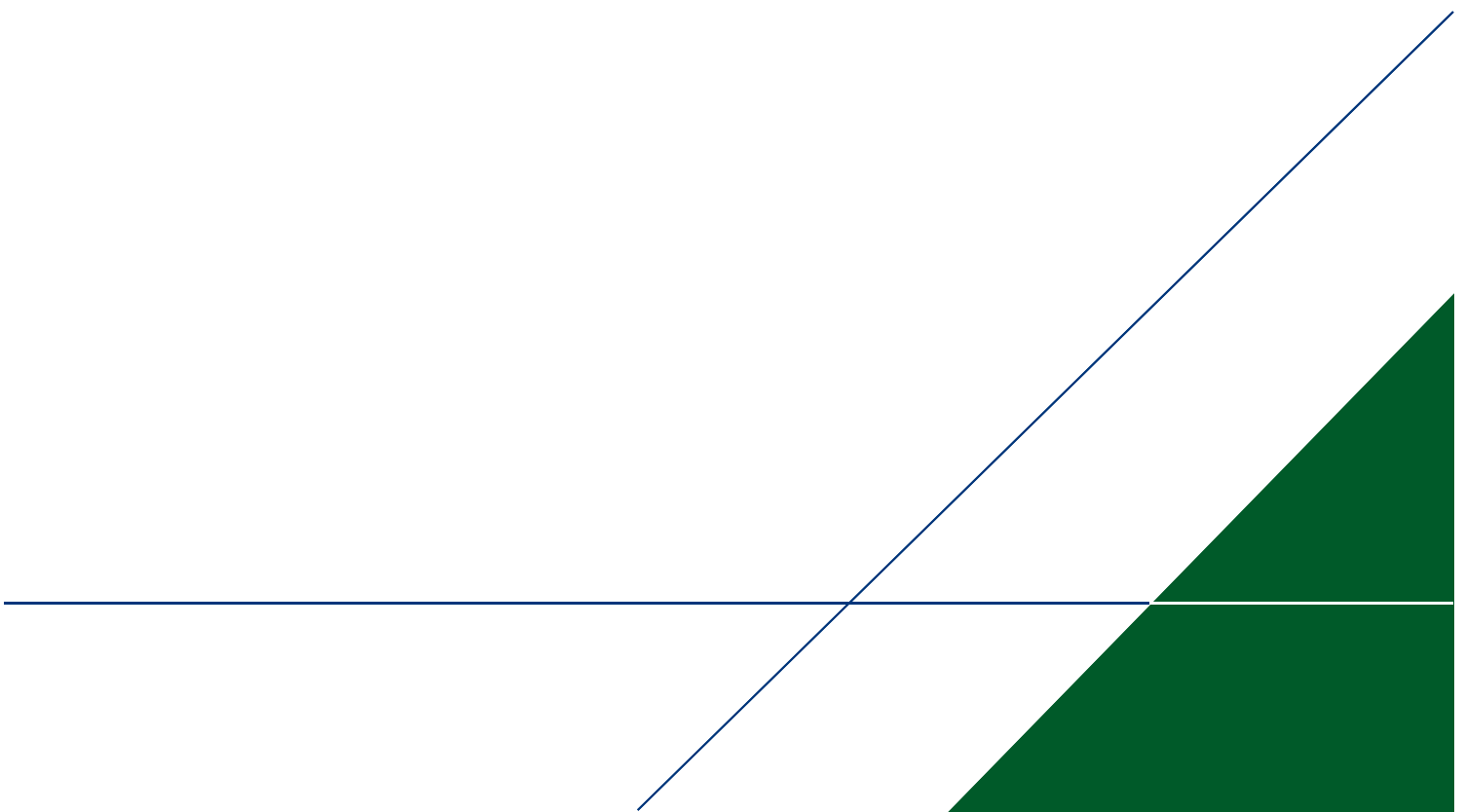
| Sanitary Sewer System SSO Evaluation | 2016 | 2017 | 2018 | 2019 |
|--|-----------|------|------|------|
| Overflow volume (gal.) by: | | | | |
| Maintenance – Roots | 0 | 0 | | |
| Maintenance – Debris | 0 | 0 | | |
| Maintenance – Grease | 0 | 0 | | |
| Power Loss | 0 | 0 | | |
| Damage by others (third party actions) | 7,000 | 0 | | |
| Capacity – wet weather related | 1,000,000 | 0 | | |
| Infrastructure – gravity main failure | 0 | 0 | | |



Sanitary Sewer Overflow (SSO) Response, Reporting, and Recordkeeping Program

| | | | | |
|---------------------------------------|-----------|----|--|--|
| Infrastructure – force main failure | 83,000 | 50 | | |
| Infrastructure – pump station failure | 0 | 0 | | |
| Total Overflow Volume (gal.): | 1,090,000 | 50 | | |





APPENDIX A: LCA'S PUMP STATION AND FORCE MAIN OPERATIONS MANUAL

AVAILABLE UPON REQUEST:

www.lehighcountyauthority.org/contact-us/



APPENDIX B: LCA PUMP STATION AND FORCE MAIN SOP'S, CHECKLISTS, AND FORMS

AVAILABLE UPON REQUEST:

www.lehighcountyauthority.org/contact-us/



APPENDIX C: LCA GRAVITY SEWER O&M SOP'S, CHECKLISTS, AND FORMS

AVAILABLE UPON REQUEST:

www.lehighcountyauthority.org/contact-us/



APPENDIX D: LCA LATERAL O&M SOP'S, CHECKLISTS, AND FORMS

AVAILABLE UPON REQUEST:

www.lehighcountyauthority.org/contact-us/



APPENDIX E: LCA LOW PRESSURE SEWER O&M SOP'S, CHECKLISTS, AND FORMS

AVAILABLE UPON REQUEST:

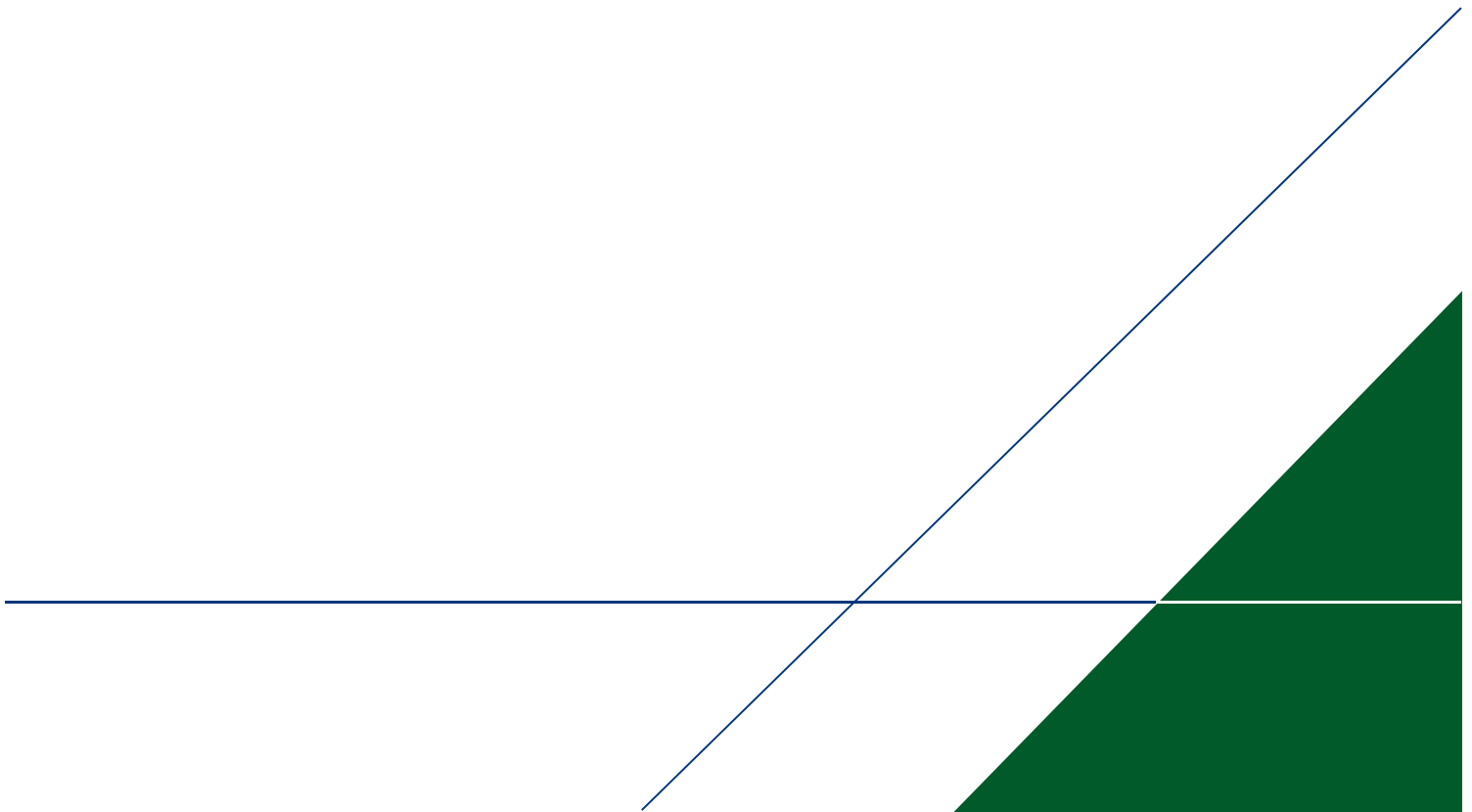
www.lehighcountyauthority.org/contact-us/



APPENDIX F: METHODS FOR CALCULATING SSO SPILL VOLUMES

AVAILABLE UPON REQUEST:

www.lehighcountyauthority.org/contact-us/



APPENDIX G: SSO EMERGENCY RESPONSE

AVAILABLE UPON REQUEST:
www.lehighcountyauthority.org/contact-us/



APPENDIX H: KPI'S/GOALS/MEASURES

AVAILABLE UPON REQUEST:
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