April 17, 2014

VIA HAND DELIVERY

Ms. Corinne Hill
Library Director
Chattanooga-Hamilton County Public Library
1001 Broad Street
Chattanooga, TN 37402

Re:  United States of America et. al. v. City of Chattanooga, No. 1:12-cv-0024
Consent Decree Public Document Repository
Draft Gravity Line Preventive Maintenance Program

Dear Ms. Hill:

On behalf of the City of Chattanooga, Tennessee (“City”), and in accordance with the consent decree entered by the United States District Court for the Eastern District of Tennessee (Southern Division), on April 24, 2013, in the case styled the United States of America et. al. v. City of Chattanooga, No. 1:12-cv-0024 (“Consent Decree”), we are providing the Chattanooga-Hamilton County Public Library with the Draft Gravity Line Preventive Maintenance Program for submission to the City’s Public Document Repository (“PDR”). The purpose of the Gravity Line Preventive Maintenance is to maximize service and system reliability at minimum cost through routine cleaning and maintenance of the City’s wastewater collection and treatment system (WCTS).

We are providing a copy of the Draft Gravity Line Preventive Maintenance Program to the PDR for public review and comment, prior to final submission of the Draft Gravity Line Preventive Maintenance Program to the EPA and the State of Tennessee. Thus, we ask that you make this document available to the public for review for thirty (30) days. The public can provide comments to the City by sending comments to the following address:

City of Chattanooga: Waste Resources Division
RE: Consent Decree Public Comments
c/o Jacobs Engineering Group
4510 Turntable Road, Suite 110
Chattanooga, TN 37421
An electronic copy of this document is also available for review and comment on the City's Consent Decree website at the following location:


We look forward to receiving comments from the public on this important document.

Sincerely,

Alice L. Cannella, P.E.
Director, Waste Resources Division

Enclosure

cc: Donald L. Norris, Administrator, Public Works, City of Chattanooga
    Mike Marino, PE, Jacobs
    Adam Sowatzka, King & Spalding
Gravity Line Preventive Maintenance Program

Prepared for

Environmental Protection Agency and Tennessee Department of Environment and Conservation

City of Chattanooga

Waste Resources Division
Consent Decree Program

Prepared by

City of Chattanooga
Waste Resources Division

Submitted by

LITTLEJOHN ENGINEERING ASSOCIATES, INC.

Chattanooga, Tennessee

April 9, 2014
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<td>CCTV</td>
<td>Closed-circuit-television</td>
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<td>CFM</td>
<td>Cubic Feet per Minute</td>
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<td>CITY</td>
<td>City of Chattanooga</td>
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<td>CIPP</td>
<td>Cured in Place Pipe</td>
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<td>CM</td>
<td>Corrective Maintenance</td>
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<td>CMMS</td>
<td>Computerized Maintenance and Management System</td>
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<td>CSO</td>
<td>Combined Sewer Overflow</td>
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<td>CSOTF's</td>
<td>Combined Sewer Overflow Treatment Facilities</td>
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<td>gpm</td>
<td>Gallons Per Minute</td>
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<td>MBWWTP</td>
<td>Moccasin Bend Wastewater Treatment Plant</td>
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<td>MOM</td>
<td>Management, Operations and Maintenance</td>
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<td>National Priority List</td>
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<td>NPDES</td>
<td>National Pollutant Discharge Elimination System</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<td>Supervisory Control and Data Acquisition System</td>
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1.0 Introduction

1.1 Purpose

On April 24, 2013, the City of Chattanooga (City) entered into a consent decree with the United States and the State of Tennessee, in the case styled United States of America et. al v. City of Chattanooga, No. 1:12-cv-00245 (“CD”). The City’s Waste Resources Division (WRD) has prepared an updated Gravity Line Preventive Maintenance (GLPM) Program for review and approval by the United States Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC), pursuant to paragraph 20(d) of the CD. This GLPM Program will address protocols for implementing hydraulic and mechanical cleaning of gravity sewer lines (paragraph 20(d)i of the CD), a preventive hydraulic cleaning component (paragraph 20(d)ii of the CD), root control within the gravity sewer lines (paragraph 20(d)(iii) of the CD), manhole preventive maintenance and inspection activities (paragraph 20(d)iv of the CD), and a process for addressing gravity line sewer segments with repeated sanitary sewer overflows (SSOs) (Paragraph 20(d)v of the CD). The purpose of this GLPM Program is to maximize service and system reliability at minimum cost through routine cleaning and maintenance of the City’s wastewater collection and treatment system (WCTS).

1.2 Background

As the regional wastewater utility provider, the City, a Municipal Corporation owns and operates a network of pipes, manholes, pump stations, force mains, Combined Sewer Overflow Treatment Facilities (CSOTFs), and associated appurtenances that transports wastewaters from homes, businesses, and industries to the Moccasin Bend Wastewater Treatment Plant (MBWWTP).

Maintenance activities performed on the gravity sewer system are currently performed by both internal WRD field personnel and through third party subcontractors under the Closed Circuit Television Inspection (CCTV) Annual Blanket Contract and the Annual Blanket Contract for Cleaning Services. Additionally, preconditioning and inspection activities are performed under the Sanitary Sewer Evaluation Studies (SSES) Work Plan. This three-tiered approach was designed to maximize the City’s ability to respond to day-to-day unplanned maintenance activities, while still making progress towards achieving the goals of providing a systematic approach for regular preventive maintenance and inspection activities on priority sections of the Interceptor Sewer System (ISS).

1.3 Authority

Authority for this program is derived from the following:

1. The National Pollutant Discharge Elimination System (NPDES) Permit Number TN0024210;
2. The U.S. Clean Water Act;
3. Tennessee Water Quality Control Act; and
4. The CD.
2.0 General

2.1 Objectives

This GLPM Program is designed to assist the City in developing a proper capacity, management, operations and maintenance (CMOM) program for gravity line preventive maintenance. The key elements of a successful preventive maintenance program are:

- Utility Specific – The program should be based on the needs of the service area and the customer base and provide an efficiently maintained and operated sanitary sewer system and reduce the negative impact on the environment and hazards to public health.

- Purposeful – The program should be designed to maintain the hydraulic capacity of the system while providing a structured and consistent response to reduce SSOs. It should also identify defects that require immediate attention, as well as a uniform assessment of the condition of the assets so that priorities for further investigations and rehabilitation can be prepared. The program, where possible, must provide maintenance to extend the lifecycle of the system assets.

- Goal Oriented – The program should provide structured guidance for the operation, maintenance and performance of the WCTS by developing a list of protocols for establishing the frequencies for assessing and cleaning the gravity collection system.

- Uses Performance Measures – The program should provide performance indicators by which the progress and ultimately the success of the program can be shown.

- Periodically Evaluated – The program should be reviewed annually and amended as appropriate based on the review and assessment of the previous years’ performance.

- Available in Writing – The program should be maintained and kept readily available as a reference for current staff and should be used to train new personnel.

- Implemented by Trained Personnel – The performance expectations for each component of the program are the same for internal and external resources. Internal resources should follow established Standard Operating Procedures (SOPs) that have been developed. Contractors selected to perform outsourced components of the program should follow established written specifications and criteria and meet federal, state and local laws, statutes and regulations.

2.2 Key Elements of the GLPM Program

The key elements of the GLPM Program are addressed individually as follows:

- Section 3.0 MANHOLE PREVENTIVE MAINTENANCE
- Section 4.0 PREVENTIVE HYDRAULIC CLEANING
• Section 5.0  PREVENTIVE MECHANICAL CLEANING
• Section 6.0  ROOT CONTROL PROGRAM
• Section 7.0  SSO REDUCTION PROGRAM
• Section 8.0  DISTRIBUTION AND MAINTENANCE OF GLPM PROGRAM

2.3 Definitions

311 Call Center: The City’s 311 Call Center is the primary contact for customers who have utility questions or need to report a wastewater issue. The 311 Call Center is staffed 10 hours per day, 8:00 AM to 6:00 PM, Monday through Friday. Calls that come in after 4:00 PM and on the weekends revert to a recording with instructions.

Building Backup: A building backup occurs when wastewater backs up into buildings due to blockages or flow conditions in the City’s WCTS (other than a private service lateral). A wastewater backup into a building that is caused by a blockage or other malfunction in a private service lateral is not considered to be a Building Backup for the purposes of this document.

Closed circuit television (CCTV): CCTV used to visually inspect the internal condition of pipes and subsurface structures.

City of Chattanooga: City of Chattanooga, Department of Public Works, Waste Resources Division.

Cleanout: A cleanout is a vertical pipe with a removable cap extending from a private service lateral to the surface of the ground. It is used for access to the private service lateral for inspection and maintenance.

Computerized Maintenance and Management System CMMS: A CMMS, currently Cityworks®, is used to maintain records of ISS assets, including physical properties and any maintenance and repair records. It also generates work orders and facilitates workflow to other WRD sections, or between departments.

Combination Cleaners: Combination cleaners are mechanical equipment with flushing and suction capabilities. This equipment is used to clear or collect wastewater and related debris from the WCTS.

Combined Sewer System (CSS): The combined sewer system shall mean the portion of the City’s WCTS designed to convey municipal sewage (domestic, commercial, and industrial wastewater) and stormwater runoff through a single-pipe system to the WWTP or a CSO Outfall.

Combined Sewer Overflow Treatment Facility (CSOTF): These are permitted primary treatment facilities in the City’s CSS that treat combined stormwater and sanitary sewage and discharge through the CSO Outfalls during heavy wet weather events.

Combined Sewer Overflow Outfall or CSO Outfall: The outfalls currently identified, or identified in the future, as a permitted combined sewer overflow outfall in any Chattanooga NPDES permit from which CSOs are discharged to waters of the United States or the State.
**Combined Sewer Overflow (CSO):** Any discharge from the CSS from any outfall currently identified, or identified in the future, as a permitted combined sewer overflow outfall in any Chattanooga NPDES permit.

**Dispatcher:** A designated City employee who contacts, notifies, and sends a First Responder to respond to possible SSO events.

**Dry Weather SSO:** A discharge of untreated sewage from a SSS due to flow restrictions or system disruptions.

**EPA:** United States Environmental Protection Agency.

**First Responder:** Typically, a designated sewer maintenance employee or any qualified City employee who assumes initial responsibility for responding to an SSO event.

**Force Main:** A pressurized line that conveys wastewater from a pump station.

**Geographic Information System (GIS):** The GIS is a mapping and geographic information system created, owned, and funded by Hamilton County and the City. GIS maintains digital geographic data for all of Hamilton County, Tennessee. The GIS Office manages some of the core mapping information, including topography and aerial photography, while respective City, County, and City departments maintain other map “layers,” such as property, utility information, and address data.

**Gravity Lines:** Gravity or “main” lines represent the largest portion of the WCTS. They use changes in elevation to transport sewage between points (typically manholes or junction boxes).

**Inflow and infiltration (I&I):** I&I, or extraneous surface or ground water, that enters the WCTS.

**Interceptor Sewer System (ISS):** The ISS is the entire sewer system for the City of Chattanooga which includes the WCTS and the MBWWTP, and is described more particularly in Section 2.4 below.

**Impacted Areas:** Impacted areas are sites where sanitary sewage or combined sewage has collected or areas that have been affected as the result of a discharge from the WCTS.

**Infiltration:** As defined by 40 CFR § 35.2005(b)(21), Infiltration shall mean water other than wastewater that enters the WCTS (including sewer service connections) from sources such as, but not limited to, roof leaders, cellar drains, yard drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, and catch basins, cooling towers, storm water, surface runoff, street wash waters, or drainage.

**Inflow:** Inflow is the introduction of extraneous water into the WCTS by direct or inadvertent connections with storm water infrastructure, such as gutters and roof drains, uncapped cleanouts, and cross-connections with storm drains.

**Lateral Assessment and Certification Program (LACP):** LACP is the program developed by NASSCO for the standardization of assessing sewer service laterals.

**Manhole or Junction Box:** A manhole or junction box provides a connection point for gravity lines, private service laterals, or force mains, as well as an access point for maintenance and repair activities.
**Manhole Assessment and Certification Program (MACP):** MACP is a program developed by NASSCO for the standardization of assessing sewer manholes.

**National Association of Sewer Service Companies (NASSCO):** NASSCO is a national organization comprised of utilities, contractors, engineers and software vendors committed to setting industry standards for the assessment and rehabilitation of underground infrastructure.

**Pipeline Assessment and Certification Program (PACP):** PACP is a program developed by NASSCO for the standardization of assessing pipelines and provides a standard code and training and certification of personnel for the assessment and measurement of the condition of pipelines.

**Private Service Lateral:** Private service lateral shall mean that portion of a sanitary sewer pipe, not owned or operated by the City, that extends from a structure to the point at which such pipe connects to the WCTS in the street or right-of-way. Private service laterals include the portion of the customer's service in the public street or right-of-way.

**Public System:** Public system refers to the WCTS, excluding private service laterals and connections with private systems.

**Pump Station:** A pump or lift station is a mechanical method of conveying wastewater to higher elevations.

**Sanitary Sewer Overflow (SSO):** An SSO is any discharge of wastewater to waters of the United States or the State from the City's WCTS through a point source not permitted in the NPDES permit, as well as any overflow, spill, or release of wastewater to public or private property from the sewer system that may not have reached waters of the United States or the State, including Building Backups.

**Sanitary Sewer System (SSS):** A sanitary sewer system collects, conveys, and treats residential, commercial, and industrial wastewaters through a complex network of infrastructure. It is the collection system portion of the WCTS.

**Sewer Overflow Response Protocol (SORP):** The SORP provides structured guidance, including a range of field activities to choose from, for a uniform response to overflows.

**Sewersheds:** Sewersheds or basins are small portions of the sanitary sewer system and combined sewer system defined by boundaries of natural topography or system configuration. Separating the system into sewersheds or basins allows the City to better identify and monitor system performance in those smaller areas.

**Supervisory Control and Data Acquisition System (SCADA):** SCADA is automated sensory control equipment that monitors the operation of the pump stations. The SCADA system will convey alarms when predetermined conditions occur. Monitoring parameters include, but are not limited to, power failures, high wetwell levels, and pump failures that could potentially cause overflows.

**TDEC:** Tennessee Department of Environment and Conservation.

**TWRA:** Tennessee Wildlife Resources Agency.
Unpermitted Discharges: A discharge of pollutants from any location within the sanitary sewer system that reaches waters of the State and which are not authorized by an NPDES Permit.

Wastewater Collection and Transmission System (WCTS): The WCTS is the wastewater collection, retention, and transmission systems, including all force mains, gravity sewer lines, pump stations, manholes, and other related appurtenances thereto owned or operated by the City that are designed to collect and convey municipal sewage (domestic, commercial, and industrial) to the City’s WWTP or CSOs. It is comprised of the SSS and CSS.

Waters of the State: Waters of the State (Tennessee) shall have the same meaning as "Waters" defined under TCA § 69-3-103 (33).

Wet Weather SSO: A discharge of untreated sewage from a sanitary sewer system due to excessive flows during rain events or elevated ground and surface water conditions.

WRD: Waste Resources Division.

2.4 Description of the ISS

The ISS serves an area of approximately 148 square miles inside the corporate limits of the City of Chattanooga with a population of approximately 170,000 (61,000 customer accounts). As previously stated, the ISS also transports flow from eight (8) regional or satellite users, including the Hamilton County Water and Wastewater Treatment Authority (WWTA), the City of Collegedale, the City of East Ridge, the Town of Fort Oglethorpe, Georgia, the City of Ringgold, Georgia, Catoosa County, Georgia, Dade County Water and Sewer Authority of Dade County, Georgia, Walker County, Georgia, and the City of Rossville, Georgia. These satellite users consist of approximately 25,000 additional customers.

The assets of the ISS include the following:

- 1,263 miles of gravity sewers (approximate), including 70 miles of combined sewers;
- 30,000 manholes (approximate);
- 71 pump stations;
- 53 miles of force main;
- Eight (8) CSOTFs;
- One (1) Combined Sewer Storage Facility;
- 130 (approximate) residential/grinder pumps; and
- One (1) Moccasin Bend WWTP

The City, through its information management system (IMS), maintains a GIS of the ISS assets in ESRI’s ArcGIS software platform. The GIS contains background information such as streets, contours, parcels, hydrography, building footprints and other data.

The City has started a program to locate and survey manholes and other assets throughout the ISS. To date, approximately 77% of the system manholes have been located and mapped utilizing traditional surveying or survey grade global positioning system techniques. During this
survey effort, pipe diameters, locations and connectivity of the system network was also verified. This information was then combined with the GIS to produce a map of the ISS.

An analysis of the GIS information for the gravity pipelines indicates that approximately 88% of the gravity pipelines within the ISS are between 4-inches and 12-inches in diameter. Figure 2-1 indicates the breakdown and distribution of the pipeline diameters graphically.

Figure 2-1
Gravity Pipe Size Breakdown by Diameter

As part of an assessment program of the ISS, the ISS was broken into 105 distinctive sanitary sewer sub-basins. A total of 108 flow meters and 12 rain gauges were installed during a temporary flow monitoring study between November 2009 and February 2010. The information derived from this study was used to determine average daily dry weather flows and responses to wet weather events in order to calculate rainfall dependent I&I (RDII) for each basin. This information is also utilized to calibrate the hydraulic model of the ISS.

Along with developing a hydraulic model, the City utilizes the Cityworks® computerized maintenance management system (CMMS) to issue and track work orders for various maintenance activities performed in the ISS. SSOs are also tracked and entered into the GIS.

All of this information is utilized to prioritize preventive maintenance activities and rehabilitation projects to reduce the occurrence of SSOs and increase the hydraulic carrying capacity of the ISS.
Figure 2-2
ISS Sub-basin Map

Legend
- Rain Gauges
- Temporary Flow Meters
Pipelines
SubType
- Water
- Sanitary
- Fire
- Unknown
- Collector
- Combined Sewer
- Force Main
- Interceptor
- Interconnect
- Outfall
- Outfall for Combined Sewer
- Relief Main
- Siphon
- WWTP
- Sewer Basins

Sources: ESL, DeLorme, NAVTEQ, TomTom, Intergraph-Increment P Corp., GEECO, USGS, FAO, NPS, NARCAN, GeoBase, CR, Kasten NL, Ordnance Survey, EGIS (IRE, MET), EGIS China (Hong Kong), Swepelko, and the City User Community
2.5 Organization of the ISS

The Director of the WRD is responsible for the operations, maintenance, and management of the ISS. The System Engineer is responsible for the operations, maintenance, and management of the collection sewer portion of the WCTS system. The Plant Manager is responsible for the operations and management of the WWTP, pump stations, and CSOTFs. The Maintenance Manager is responsible for the maintenance of the WWTP, pump stations, and CSOTFs. An organizational chart is provided in Appendix A.

Preventive maintenance activities such as manhole inspections and cleaning and CCTV operations are performed by both WRD internal staff and third party contractors under the direction of the System Engineer. WRD field crews under the Sewer Construction Manager are responsible for the day to day maintenance, responding to customer complaints, sewer investigations and emergency repairs within the ISS. The I&I Work Crews operating under the Sewer Construction Manager are specifically responsible for conducting maintenance activities such as routine hydraulic cleaning and closed circuit television inspections of the gravity sanitary sewers. Information obtained from these investigations by internal WRD crews is uploaded to the CMMS and reviewed by Project Engineers working directly with the System Engineer to develop priority preventive maintenance plans, work orders for repairs and rehabilitation projects.

Additional SSES project areas have been identified and are managed by the City’s Program Manager. Data from this CD work is reviewed and combined with the City’s CMMS system to further provide information about ISS assets to determine future preventive maintenance and rehabilitation priorities.

The System Engineer also works with the WRD Operations Staff to review historical customer complaints, SSOs, flow monitoring data, GIS information and work order history in the CMMS and GIS to perform a priority analysis of where preventive maintenance activities should be concentrated. The determination is made whether the specific maintenance activity can be performed utilizing WRD internal crews and equipment or would be more appropriately handled by outside contractors under one of the annual blanket contracts for CCTV or cleaning services or if the assets are part of the priority basins identified in the CD program. Once this analysis is completed, work orders are prepared and assigned to the appropriate entity. Project Coordinators are assigned to manage and track the work process and perform quality control reviews of the work and ensure that the information is combined into the CMMS and GIS. Figure 2-3 delineates the decision flow chart for this process.
Figure 2-3
Preventive Maintenance Decision Flow Chart
3.0 Manhole Preventive Maintenance

3.1 Objectives

This portion of the GLPM Program has been established to identify specific manholes where inspections and preventive maintenance activities will be concentrated in order to identify structural deficiencies and sources of I&I. An ancillary goal of the program is to verify the location of manhole assets within the ISS and capture additional attribute information about each asset, including size, elevations, materials of construction and general conditions.

3.2 Needs Determination / Priority Establishment

3.2.1 Needs Determination

A manhole is used as an access point for making connections or performing maintenance on buried sanitary sewer assets. They are the primary means of access to pipelines for maintenance, inspection and rehabilitation. As the main access point to the collection system, they should be accessible from the ground surface, and extend from the ground surface to the wastewater pipe connections. The most important aspect relating to performance of a manhole is that it must be structurally watertight, not allowing the entrance of inflow from surface runoff or infiltration from groundwater into the sewer system. The interior of a manhole should also be resistant to powerful deterioration mechanisms such as erosion, abrasion, hydrogen sulfide induced corrosion and other corrosive chemicals that occur naturally or may be introduced into the system from business or industries (NASSCO, Manhole Assessment Certification Program Version 6.0.1 November 2010). Manholes are often a system’s largest source of I&I due to their location and construction. Manholes are typically located at changes in elevation or direction of the wastewater pipeline and are often installed near streams or drainage channels. Because of this they are often sources of significant I&I.

Considering the importance of these structures to the ability of WRD to access and maintain the WCTS, it is imperative that assessment of these structures in priority areas be undertaken. This assessment will lead to a prioritization plan for rehabilitating these structures to ensure the proper operation and maintenance of the gravity portion of the WCTS.

3.2.2 Priority Establishment

In 2007, the WRD began a comprehensive program of locating and surveying manholes within the ISS. As of 2013, approximately 80% of the manholes within the ISS have been located using survey grade GPS or traditional survey methods or were mapped from information obtained from record drawings.

Based upon this updated information, WRD has established an accurate map of the WCTS. Utilizing this information and combining it with other CMMS and GIS background information, priorities will be established for conducting assessments of manholes located within the gravity...
portion of the SSS. Criteria for establishing the priorities include historical SSO locations; results of the flow monitoring and hydraulic modeling program indicating which basins have significant RDII response, and the proximity of manholes within those basins to such features as the 100-year floodplain as determined by FEMA. Additional criteria, such as the proximity of the manhole asset to a stream segment designated as impaired under Section 303(d) of the Clean Water Act due to *Escherichia coli* will also be used to prioritize inspections. This prioritization will be used to concentrate resources on those manholes which have the highest potential to contribute I&I, as well as affect water quality.

### 3.3 Inspection Methods & Approaches

NAASCO has developed two Manhole Assessment and Certification Program (MACP) condition assessment protocols. These are a Level 1 and a Level 2 inspection. Under a Level 1 inspection, basic condition assessment information is gathered to evaluate the general condition of a manhole. Level 1 inspections can be performed without the use of any special equipment or manned entry into the manholes. The purpose of a Level 2 inspection is to gather more detailed information to fully document all existing defects, determine the condition of the manhole and to provide specific information required to recommend or specify corrective actions. Level 2 inspections will require the use of pole-mounted camera units or entry into the manhole to document defects.

WRD internal field crews will complete Level 1 MACP inspections on manholes identified from a review of historical CMMS and GIS information for priority areas. After Level 1 MACP inspections are completed, manholes will be identified where Level 2 MACP inspections will be conducted either through annual blanket contracts for these services or through the SSES Work Plan Projects.

### 3.4 Procedures

The System Engineer will annually develop a list of priority areas where Level 1 MACP inspections will be performed by WRD personnel. This priority list will be based upon information from the CMMS and other historical information such as SSOs, work orders, flow monitoring and the hydraulic model of the sanitary sewer collection system. Emphasis will be placed upon inspecting those manholes that have the highest potential of contributing I&I to the collection system and subsequent SSOs.

Once the priority list has been established, specific work areas will be assigned to WRD field crews to conduct a Level 1 MACP inspection on each manhole. This inspection will gather basic condition assessment information for each manhole. Manholes where structural deficiencies or sources of I&I are evident from the surface investigation will be flagged for a follow up Level 2 MACP investigation. Level 2 MACP inspections will be contracted out to third party subcontractors through an annual blanket contract for these services. Progress towards completing the Level 1 MACP investigations will be tracked weekly and monthly reports will be maintained. Lists on manholes requiring a Level 2 MACP inspection will be compiled quarterly and released to contractors to perform this work. Weekly and monthly progress towards
completing these inspections will be maintained. Figure 3-1 shows the decision matrix for performing these inspections.

Included in Appendix B of this report is a list of required fields with descriptors for Level 1 and Level 2 MACP inspection categories.

Figure 3-1
Manhole Inspection Flowchart

3.5 Standard Forms

For Level 1 MACP inspections conducted by WRD internal field crews, a standard form has been developed listing the required fields for this type of inspection. This manhole inspection form is included in Appendix B-2 of this report. An example of the Level 2 MACP inspection is
also included in Appendix B-3. Level 2 MACP inspections will require the use of specialized equipment and software and will be performed by third party contractors under an annual blanket contract for services. Specifications for how these inspections will be performed are included in Appendix B-4 of this report.

### 3.6 Performance Measures

The performance measures established for this program are based upon an analysis of the current GIS and CMMS information. The preliminary goals for this program are to complete 1,000 Level 1 MACP inspections per year with WRD internal field crews beginning in calendar year 2015. As the program develops and additional areas are identified, this goal will be increased in calendar year 2017 to 2,000 Level 1 inspections per year. The Level 2 MACP inspections will be undertaken through an annual blanket contract with external contractors. The City estimates that Level 2 MACP inspections will be required for approximately 90% of the manholes where Level 1 inspections have been completed through calendar year 2017. Afterwards, the City anticipates that only 60% of the manholes would require a Level 2 MACP inspection. In calendar year 2015, the performance goal will be set at 900 Level 2 inspections per year through calendar year 2017. Beginning in 2017 this goal will be increased to 1,200 Level 2 MACP inspections per year. The calendar year 2020 goal is to have 10,000 Level 1 MACP inspection completed. This represents approximately 33% of the total manholes in the WCTS.

**Table 3-1**

Manhole Inspection Performance Goals

<table>
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<th></th>
<th></th>
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<td>Manhole Inspections</td>
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<td>Number of Manholes in System</td>
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### 3.7 Information Management

Level 1 MACP inspections performed by WRD internal field crews will be captured in hard copy format. Data from these hard copy inspections will be entered into the CMMS and any necessary corrections to the GIS maps will be coordinated through the City’s IMS. Manholes requiring a Level 2 MACP inspection will be flagged in the CMMS and GIS and a scope of work and maps will be prepared for issuance to contractors through the annual blanket contract for manhole inspections. Level 2 MACP inspections will be performed utilizing MACP-certified software. Digital photographs of the exterior and invert of each inspected manhole will be captured. A digital still image of each defect will also be captured. Links to these photos will be tracked within the MACP-certified software as described in the specifications for this work located in Appendix B-4. Final data deliverables will be submitted to the System Engineer via an
external hard drive once final quality control procedures have been completed by the contractor. The Project Coordinator will perform quality assurance reviews on the data prior to upload to the CMMS and GIS.
4.0 Preventive Hydraulic Cleaning

4.1 Objectives

This portion of the GLPM Program has been established to provide regular cleaning maintenance to pipelines and sewer reaches in order to prevent blockages, sanitary sewer overflows, grease build-up, odor and/or corrosion problems or other capacity issues within the collection system. An additional scope of this program is to support CCTV inspection activities so that quality video inspections are captured, as well as expedite inspection of pipelines where flow or debris would prevent the camera from traversing the entire length of the pipe or where visibility cannot be obtained without proper flow control.

4.2 Needs Determination / Priority Establishment

The System Engineer, working with the Operations Staff, will identify priority areas for preventive maintenance hydraulic cleaning annually. These priority areas, also referred to as “hot spots,” will be determined from data contained in the CMMS and GIS. Data utilized to determine the location of these hot spots include historical SSO locations, work order history, customer complaint history, fats, oils, and grease (FOG) program information and the results of the flow monitoring and hydraulic modeling program. Priority will be assigned to those areas that have resulted in repeated SSOs during the previous twelve month period.

For this program, both internal WRD field crews and third party contractors working under an annual blanket contract for cleaning services will be utilized to perform cleaning operations in the hot spot areas.

4.3 Hydraulic Cleaning Equipment

Under this program, preventive hydraulic cleaning will be accomplished through the use of high pressure, hydraulic sewer pipeline cleaners. Pressure jetting equipment used will be sufficient for the purposes of attaining the degree of cleanliness in sewers necessary to re-suspend sediments, deposits, grease and other debris and move it downstream where it can be removed from the pipeline via vacuum equipment or other devices. A list of equipment maintained by the I&I field crews is attached to this report in Appendix A-2. The specifications for the Annual Blanket Contract to Supply Sewer Line Cleaning Services are attached in Appendix C-1 and include specifications for equipment required for these annual services.

4.4 Procedures

Once specific areas have been identified for preventive hydraulic cleaning, the System Engineer will assign specific work areas to field crews or third party contractors. Project Coordinators will be assigned to schedule and monitor the work performed by third party contractors. The field crews will receive weekly work orders indicating the areas to be cleaned that have been
identified as hot spots. The field crews will track and report progress on completing each work order assigned weekly through an Activity Work Sheet format as shown in Appendix C-2. This information will be entered into the CMMS in order to track progress towards established performance goals. Third party contractors will submit weekly progress logs as shown in the example in Appendix C-3. This information will be entered into the CMMS in order to track progress towards the established performance goals.

4.5 Standard Forms

Standard forms for tracking work progress include the City’s Activity Work Sheet shown in Appendix C-2 and the contractors cleaning log shown in Appendix C-3 to this report. Hard copy forms will be completed daily and returned to the System Engineer for processing and entry into the CMMS weekly.

4.6 Performance Measures

Under this program, WRD has established an annual hydraulic cleaning preventive maintenance goal of 1,000,000 feet of pipeline performed by the City’s field crews and third party contractors combined. Pipelines identified for preventive hydraulic cleaning will have 95% of their carrying capacity restored as a result of these maintenance activities.

4.7 Information Management

Daily and weekly activity sheets and cleaning logs will be entered into the CMMS weekly by support personnel under the direction of the System Engineer. Reports indicating the progress towards completing cleaning operations in each hot spot area will be compiled and reviewed monthly. This information will be compared to work order and SSO historical information to determine if the frequency or areas cleaned should be increased. This process will also be utilized to identify additional hot spot areas on an ongoing basis. Additional areas identified through this process will be assigned to the City’s field crews or the third party contractors.
5.0 Preventive Mechanical Cleaning

5.1 Objectives

This portion of the GLPM Program has been established to provide preventive maintenance mechanical cleaning to those pipeline segments where routine hydraulic cleaning cannot be performed. The intent of this protocol is to provide cleaning of pipelines where hydraulic methods are ineffective. The City anticipates that mechanical cleaning will be required on those pipelines where the diameters exceed 24-inches and the accumulation of debris has exceeded more than twenty-five percent (25%) of the pipelines hydraulic carrying capacity.

5.2 Needs Determination / Priority Establishment

The System Engineer will review historical work order and SSO information, as well as GIS data and flow monitoring and the results of the hydraulic modeling to prioritize pipelines where mechanical cleaning may be required. Based on this information and the results of the manhole preventive maintenance inspections, specific reaches of large diameter interceptors will be identified where significant debris may have accumulated. Totally Integrated Sonar and CCTV Technique (TISCIT) investigations or acoustic pipe inspections will be performed on these pipelines under the annual blanket contract for CCTV inspection services to determine the extent and depth of debris that may exist in the pipelines. Once specific reaches of sewers have been identified, contracts for cleaning of these pipelines will be developed annually. Priority will be placed on those pipelines and interceptors where repeated SSOs have occurred. Initial investigations will be focused on large diameter interceptors that carry CSS flow or that are immediately upstream of major wastewater pumping stations in the City’s WCTS.

5.3 Mechanical Cleaning Equipment

Mechanical cleaning of sewer pipelines consists of several methods depending on the diameter of the pipelines involved. For pipelines between 15-inches and 48-inches in diameter, mechanical means of cleaning will involve the use of belt driven winches and draglines and attachments such as buckets, scrapers, scoops and brushes to remove debris and sediment without the use of water. This method of cleaning typically does not require the by-pass pumping of wastewater flows during the cleaning process. For larger diameter interceptors (> 60-inches) these devices can also be used, as well as manned entry of the pipelines and the use of hand tools and smaller excavators to remove debris. Specialized hydraulic cleaning equipment mounted on flat bed trailers providing pumping and use of wastewater for hydraulic cleaning utilizing special nozzles can also be utilized. These package units typically have the capability of removing and dewatering debris cleaned from the pipelines. Because of the size and complexity involved with operating this equipment, these package units would also fall under the category of mechanical cleaning devices. Currently, the WRD does not maintain
equipment for mechanical cleaning of large diameter interceptors and will contract with third party contractors to perform mechanical cleaning of large diameter pipelines.

5.4 Procedures

The System Engineer will review historical work order and SSO information, as well as GIS data and flow monitoring and the results of the hydraulic modeling to prioritize pipelines where mechanical cleaning may be required. Based on this information and the results of the manhole preventive maintenance inspections, specific reaches of large diameter interceptors will be identified where significant debris may have accumulated. Additional inspections will be performed on these pipelines under the annual blanket contract for CCTV inspection services to determine the extent and depth of debris that may exist in the pipelines. Annual contracts for mechanical cleaning of these pipelines will be developed and third party contractors hired to perform this work. A Project Coordinator will be assigned to monitor the work while in progress. Weekly cleaning logs will be submitted indicating the footage of pipe cleaned and the total amount and type of debris removed will be captured. The information from these logs will be entered into the CMMS. Once sections of the interceptor have been completed, follow up CCTV or TISCIIT inspections or acoustic pipe inspections will be performed to verify that the pipeline has been restored to 95% carrying capacity.

5.5 Standard Forms

Standard forms for tracking work progress include the City’s Activity Work Sheet shown in Appendix C-2 and the contractors cleaning log shown in Appendix C-3 to this report. Hard copy forms will be completed daily and returned to the System Engineer for processing and entry into the CMMS weekly.

5.6 Performance Measures

Approximately five percent (5%) of the sanitary sewer collection system is comprised of pipelines 24-inch or larger in diameter. Beginning in 2015, the WRD will conduct investigations of large diameter sewers subject to combined sewer flows or immediately upstream of major pumping stations to determine pipelines requiring mechanical cleaning. From these assessments, mechanical cleaning service contracts will be developed to perform the cleaning operations in 2016. The goal of the program is to complete the assessments of the larger diameter interceptors within a five year planning period and to complete mechanical cleaning of pipelines, where required, within two years of the initial assessment.

5.7 Information Management

Daily and weekly activity sheets and cleaning logs will be entered into the CMMS weekly by support personnel under the direction of the System Engineer. Reports indicating the progress towards completing cleaning operations in each priority area will be compiled and reviewed monthly. This information will be compared to work order and SSO historical information to determine if the frequency or areas cleaned should be increased. This process will also be utilized to identify additional priority areas on an ongoing basis.
6.0 Root Control Program

6.1 Objectives

This portion of the GLPM Program has been established to provide chemical root control to those pipeline segments where routine hydraulic cleaning and CCTV inspections have identified significant root issues. The intent of this protocol is to prevent the accumulation of invasive roots into the pipelines and service lateral connections and causing further structural damage to the pipelines, as well as potential sources of blockages and SSOs. This program is designed to provide temporary removal and prevention of root issues until more permanent repairs can be undertaken. The purpose of the chemical root control is to apply a chemical root control agent to portions of the SSS, in order to kill the root growth present in the lines and to inhibit re-growth, without permanently damaging the vegetation producing the roots. The City anticipates that chemical root control will be required on those pipelines where the accumulation of roots has exceeded more than twenty-five percent (25%) of the pipelines internal diameter in more than two locations and CCTV investigations indicate that root intrusion is widespread within the specific areas delineated for treatment.

6.2 Needs Determination / Priority Establishment

The System Engineer will review historical work order and SSO information, as well as GIS data and flow monitoring and the results of the hydraulic modeling to prioritize pipelines where chemical root control may be required. Based on this information and the results of the manhole preventive maintenance inspections, specific reaches of sewers will be identified where significant root intrusion may be prevalent. CCTV investigations or acoustic pipe inspections will be performed on these pipelines under the annual blanket contract for CCTV inspection services to determine the extent of root intrusion that may exist in the pipelines. Once specific reaches of sewers have been identified, contracts for chemical root control services will be developed annually. Priority will be placed on those areas where repeated SSOs have occurred.

6.3 Root Control Methods & Approaches

Small root intrusions discovered during routine CCTV and hydraulic cleaning operations will be removed via root cutter nozzles utilizing hydraulic cleaning equipment by City field crews and third party contractors where necessary to allow CCTV inspection of the pipeline or to restore carrying capacity or prevent future blockages. For those pipelines where significant root intrusions have exceeded more than twenty-five percent (25%) of the pipe’s radius in more than one location or have resulted in an SSO or building backup, chemical root control will be conducted. Because of the complexity involved and the specialized equipment necessary for the successful application of chemical root control agents, third party contractors will be selected to perform this work under annual blanket contracts for services.
6.4 Procedures

The System Engineer will review historical work order and SSO information, as well as GIS data and flow monitoring and the results of the hydraulic modeling to prioritize pipelines where chemical root control may be required. Based on this information and the results of the manhole preventive maintenance inspections, the System Engineer will identify specific reaches of sewers where significant root intrusion may be prevalent. CCTV investigations or acoustic pipe inspections will be performed on these pipelines under the annual blanket contract for CCTV inspection services to determine the extent of root intrusion that may exist in the pipelines.

Once priority areas have been determined, third party contractors will be assigned contracts to perform root control in these areas. A Project Coordinator will be assigned to monitor the progress of the contractor performing the chemical root control agent application. Guidelines for the work include:

- The work should be performed in accordance with label instructions of the chemical agent and in accordance with the best recommended practice for conditions present in the line under treatment.
- Applications should be done by foaming or other methods as provided on product labels.
- The application of the material should be performed in such a way as to contact roots within the primary main line sewer to be treated.
- Applications should penetrate secondary lateral sewers in order to contact roots residing in the “wye” connections.
- The foam should be generated through the use of air injection equipment and the foam should be pumped into the sewer under pressure as foam.
- The foam quality should be sufficient to penetrate “wye” connections and effectively treat large diameter pipelines.
- Applications of chemicals designed to generate foam “chemically” on contact with water should not be used.
- Manholes used to access a main line sewer section for treatment (Access Manholes) should be treated as part of the main line treatment.
- Steps should be taken to prevent adverse effects on wastewater treatment plant processes during large scale treatment projects located immediately upstream of the plant.
- The work under these annual contracts for chemical root control should be performed by certified pesticide applicators licensed with the Tennessee Department of Agriculture.

Weekly cleaning logs should be submitted indicating the footage of pipe treated. The information from these logs should be entered into the CMMS. Once sections of the interceptor have been completed, follow up CCTV inspections or acoustic pipe inspections should be performed to verify that the pipeline has been restored to 95% carrying capacity.
6.5 Standard Forms

Standard forms for tracking work progress include the City's Activity Work Sheet shown in Appendix C-2 and the contractors cleaning log shown in Appendix C-3 to this report. Hard copy forms will be completed daily and returned to the System Engineer for processing and entry into the CMMS weekly.

6.6 Performance Measures

Under this program, the WRD has established an annual chemical root control goal of 50,000 feet of pipeline beginning in 2016. Thereafter, this performance goal will be adjusted annually depending on system conditions.

6.7 Information Management

Daily and weekly activity sheets and cleaning logs will be entered into the CMMS weekly by support personnel under the direction of the System Engineer. Reports indicating the progress towards completing chemical root control operations in priority areas will be compiled and reviewed monthly. This information will be compared to work order and SSO historical information to determine if the frequency or areas treated should be expanded. This process will also be utilized to identify additional priority areas on an ongoing basis.
7.0 SSO Reduction Program

7.1 Objectives
The goal of this portion of the GLPM Program is to establish protocols for identifying and addressing repeated SSOs in the WCTS where preventive maintenance activities can be undertaken to alleviate or eliminate SSOs.

7.2 Needs Determination / Priority Establishment
The System Engineer will review historical SSO locations, work order history and the results of the flow monitoring and hydraulic modeling to determine priority areas where preventive maintenance activities such as hydraulic and mechanical cleaning, CCTV investigations, and manhole inspections will be performed. Based on the results of these investigations, priority areas will be identified where frequent preventive maintenance activities will be performed. When determining the frequency at which preventive maintenance should be undertaken, factors such as the rate of blockage accumulation, pending FOG control enforcement actions, potential for upstream overflows and time since last SSO occurrence will be considered. Depending on these factors and the probability of an overflow occurring, the frequency of preventive maintenance activities will be increased or decreased. These preventive maintenance activities will be considered as short-term proactive steps that will be taken to avoid future system disruptions. These activities will be undertaken until the line segment can be rehabilitated or repaired permanently.

7.3 Methods & Approaches
A preventive maintenance program is a proactive activity that restores or maintains the intended function of an asset before failure. The maintenance activity is planned and scheduled periodically based on the asset condition to prevent blockage-related SSOs from occurring or recurring. The WRD has chosen to outsource the program through annual blanket contracts that will be evaluated periodically. WRD personnel will perform corrective maintenance required to mitigate blockages. A corrective maintenance is a reactive activity that occurs in response to an asset failure characterized by the loss of the intended function. Corrective maintenance is event driven, i.e., a failure event occurs before any maintenance activity is scheduled. First Responders and Sewer Maintenance Crews will have the primary responsibility for implementing the SORP, addressing customer requests, removing system disruptions that could result in SSOs, making point repairs, and other unscheduled maintenance activities. Line segments are added to the GLPM Program when its cleaning frequency under the maintenance cycle proves insufficient to prevent overflows. Each line segment included in the GLPM Program is assigned a maintenance frequency dependent upon its condition assessment and other information derived from the CMMS. Also, prescribed maintenance activities determined by the nature of the system problem (i.e. roots, grease, debris, etc.) are assigned to the line segment.
7.4 Procedures

The following procedures will be followed when developing the SSO reduction program:

1. The System Engineer will review historical CMMS information such as SSO and work order history and flow monitoring and hydraulic modeling information to develop a list of priority areas where cleaning and CCTV and manhole investigations will be performed to assess the condition of the pipelines and manhole assets.

2. Based on the condition assessment of the asset, preventive maintenance activities will be assigned at frequencies required to mitigate SSOs.

3. Preventive maintenance activities will be undertaken by City field crews and third party contractors.

4. Logs of the maintenance activities will be entered into the CMMS and GIS.

5. The System Engineer will continually monitor SSOs and customer complaints and work order histories in each priority project area to determine if preventive maintenance activities have resulted in fewer blockages or SSOs. Maintenance frequencies and activities will be increased or decreased depending on the number of SSOs and blockages experienced after maintenance is performed.

6. For those line segments requiring preventive maintenance activities more frequent than every 18-24 months, a corrective action plan will be developed to rehabilitate or repair the pipeline or asset. Depending on the extent of the required repairs, this may be handled by internal City Sewer Maintenance Crews or contracted out as part of a larger rehabilitation or replacement project utilizing third party contractors.

7.5 Performance Measures

The performance measures established for the SSO reduction program is ultimately reduce the number of preventable SSOs caused by the build-up of debris, sediment, roots and grease in the collection system. Because I&I is a significant contributing factor of SSOs, it is important that categorization of the cause of the SSOs be properly performed under the SORP. Another specific performance measure that will be assessed annually will be the linear footage of pipelines and frequency that preventive maintenance hydraulic cleaning is performed. The goal of the program is to keep the total linear footage of pipelines receiving repetitive preventive maintenance hydraulic cleaning to the minimum required to prevent blockages and SSOs. Figure 7-1 outlines the program goals established for this specific preventive maintenance activity.
7.6 Information Management

SSOs will be tracked and historical records maintained as established under the SORP protocols. Preventive maintenance activities will be tracked and integrated into the CMMS as described in each section of this program. The System Engineer will review this information quarterly to determine the progress towards meeting the performance measures established to ensure that preventive maintenance activities are scheduled and performed as necessary to reduce the occurrence of repeat SSOs in the WCTS.
8.0 Distribution and Maintenance of GLPM Program

8.1 GLPM Submittal and Availability

Copies of the GLPM Program and amendments will be distributed to the following WRD sections and/or functional positions:

- Director;
- Deputy Director;
- Plant Manager;
- System Engineer; and
- Maintenance Manager.

Other personnel who may become incidentally involved in conducting maintenance activities under this program should also become familiar with the GLPM Program.

8.2 GLPM Review and Update

The program should be reviewed annually and amended as appropriate. The City will:

- Update the GLPM with the issuance of a revised or new NPDES permit;
- Conduct annual training sessions with appropriate personnel; and
- Review and update, as needed, the various contact person lists included in the SORP.

Those involved with the annual review will include:

- System Engineer;
- Sewer Maintenance General Supervisor;
- Plant manager;
- Plant Operations Supervisor – Pump Stations & CSOTFs;
- Plant Operations Supervisor- Liquids; and
- Maintenance Manager.

8.3 Training

The City will conduct training for the appropriate Dispatchers, First Responders, maintenance crews, and support staff on this GLPM Program. These training sessions will be organized based on the latest version of the program, as well as other pertinent reference materials. Training sessions will be supplemented with a practical hands-on field component so that personnel are familiar with the operation of equipment and procedures necessary to accomplish the specific maintenance activities. Supervisors will conduct refresher sessions annually or when any revisions are made to the GLPM Program. The annual training sessions will be held approximately in August of each calendar year. The System Engineer, Sewer Construction Manager and Sewer Maintenance General Supervisor and ISS General Supervisor will oversee
the GLPM Program implementation and field operations to ensure that the established procedures are being followed.

## 8.4 GLPM Implementation Schedule

The following table delineates the implementation schedule for the various components of the GLPM Program:

**Table 8-1**
GLPM Program Implementation Schedule

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<th>Task</th>
<th>Start</th>
<th>Frequency</th>
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<tr>
<td>Identify Priority Areas for Manhole Preventive Maintenance Inspections</td>
<td>Aug. 2014</td>
<td>Annually</td>
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<tr>
<td>Conduct Staff Training and begin Manhole MACP Level 1 Inspections</td>
<td>Jan. 2015</td>
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<tr>
<td>Conduct Manhole MACP Level 2 Inspections with third party contractors</td>
<td>July 2015</td>
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<tr>
<td>Identify Hot Spot Areas for Preventive Hydraulic Cleaning</td>
<td>Aug. 2014</td>
<td>Semi-Annually</td>
</tr>
<tr>
<td>Identify Priority Areas for Preventive Mechanical Cleaning</td>
<td>Oct. 2014</td>
<td>Annually</td>
</tr>
<tr>
<td>Identify Priority Areas for Preventive Root Control</td>
<td>Oct. 2014</td>
<td>Annually</td>
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<tr>
<td>Review historical SSOs, Work Orders and Preventive Inspections and Cleaning for progress towards reducing SSOs</td>
<td>Ongoing</td>
<td>Quarterly</td>
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Appendix A-1
WRD Organization Charts
WASTE RESOURCES DIVISION
ORGANIZATIONAL CHART
Chart 6
(March, 2014)

Manager, Laboratory Services
(1)

Chemist
(1)

Laboratory Technician 2
(2)

Laboratory Technician 1
(4)

Pretreatment Supervisor
(1)

Pretreatment Inspector
(2)

Monitoring Technician
(4)

Administrative Support Assistant 2
(1)
### ISS List of Available Equipment

#### Sewer Maintenance

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<td>Backhoe</td>
<td>W651</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Bobcat</td>
<td>W6694</td>
<td>W6695</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Equipment Trailer</td>
<td>W644T</td>
<td>W283T</td>
<td>W6656T</td>
<td>W690T</td>
</tr>
<tr>
<td>3</td>
<td>Trailer (small)</td>
<td>No W#</td>
<td>No W#</td>
<td>No W#</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Air Compressor</td>
<td>W687</td>
<td>W8012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Generator</td>
<td>No W#</td>
<td>No W#</td>
<td>No W#</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Pump</td>
<td>W631</td>
<td>No W#</td>
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</tr>
</tbody>
</table>

#### Inflow and Infiltration

<table>
<thead>
<tr>
<th>QTY</th>
<th>Equipment</th>
<th>W#</th>
<th>W#</th>
<th>W#</th>
<th>W#</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Pick Up</td>
<td>W6645</td>
<td>WL6673</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Pipe Hunter</td>
<td>W3839</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CCTV Truck</td>
<td>W6624</td>
<td>W6657</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Vac-Con</td>
<td>W6689</td>
<td>W6692</td>
<td>W7910</td>
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#### Plant Maintenance

<table>
<thead>
<tr>
<th>QTY</th>
<th>Equipment</th>
<th>W#</th>
<th>W#</th>
<th>W#</th>
<th>W#</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Portable Generator</td>
<td>2-at plant</td>
<td>1-at BR#1</td>
<td>1-at Egate</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Permanent Generator (O&amp;C)</td>
<td>No W#</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## APPENDIX B-1

### Level 1 & 2 Required Data Fields

<table>
<thead>
<tr>
<th>Field No.</th>
<th>Field Name</th>
<th>Description</th>
<th>Req'd Level 1</th>
<th>Req'd Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Surveyed By</td>
<td>Name or initials of person completing survey</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Certificate Number</td>
<td>NASSCO Certificate # of person completing survey</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Owner</td>
<td>Owner of Asset (City)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Customer</td>
<td>Who requested survey</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Drainage Area</td>
<td>Common name given to drainage basin</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>Sheet Number</td>
<td>If multiple sheets used for survey</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>P/O Number</td>
<td>Customer's purchase order number</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>Date</td>
<td>Survey date in YYYYMMDD format</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>Time</td>
<td>Time in military format</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>Address</td>
<td>Street name and number</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>11</td>
<td>City</td>
<td>Name of city or town</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>12</td>
<td>Location Details</td>
<td>Further description of location</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>13</td>
<td>Manhole Number</td>
<td>Reference number for manhole</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>14</td>
<td>Rim to Invert</td>
<td>To nearest tenth of a foot on outgoing side</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>15</td>
<td>Grade to Invert</td>
<td>To nearest tenth of a foot on outgoing side</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>16</td>
<td>Rim to Grade</td>
<td>To nearest tenth of a foot on lowest side</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>17</td>
<td>MH Use</td>
<td>List of defined codes showing sanitary, storm, etc.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>18</td>
<td>Year Built</td>
<td>Year Manhole was constructed in YYYY format</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>19</td>
<td>Year Renewed</td>
<td>Year manhole was rehabilitated in YYYY format</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>20</td>
<td>Media Label</td>
<td>If video recorded enter media number where stored</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>21</td>
<td>Purpose</td>
<td>List of defined codes for survey purpose</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>22</td>
<td>Category</td>
<td>Criticality code (A, B, or C) provided by client</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>23</td>
<td>Pre-Cleaning</td>
<td>List of defined codes for pre-cleaning of manhole</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>24</td>
<td>Date Cleaned</td>
<td>Date manhole cleaned in YYYYMMDD format</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>25</td>
<td>Weather</td>
<td>List of defined weather at time of survey</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>26</td>
<td>Location Code</td>
<td>List of defined location codes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>27</td>
<td>Additional Info</td>
<td>Other appropriate details about survey</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>28</td>
<td>Surface Type</td>
<td>List of defined surface types</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>29</td>
<td>Potential for runoff</td>
<td>List of valid MACP surface types</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>30</td>
<td>Access Type</td>
<td>List of appropriate PACP access point types</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>31</td>
<td>Northing</td>
<td>Y Coordinate</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>32</td>
<td>Easting</td>
<td>X Coordinate</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>33</td>
<td>Elevation</td>
<td>Z Coordinate</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>34</td>
<td>Coordinate System</td>
<td>Required if using GPS coordinates</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>35</td>
<td>GPS Accuracy</td>
<td>Degree of accuracy obtained from coordinates</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>36</td>
<td>Inspection Status</td>
<td>List of valid MACP inspection status codes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>37</td>
<td>Evidence of Surcharge</td>
<td>Yes or No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>38</td>
<td>Inspection Level</td>
<td>Level 1 or Level 2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>39</td>
<td>Sketch</td>
<td>Generic Field for sketch of manhole location</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes: Field numbers in red denote mandatory fields under MACP protocols.
## Manhole Component Observation Form Information

<table>
<thead>
<tr>
<th>Field No.</th>
<th>Field Name</th>
<th>Description</th>
<th>Req'd Level 1</th>
<th>Req'd Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>Cover Shape</td>
<td>Geometric Description of Cover</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>41</td>
<td>Cover Size</td>
<td>Measured to nearest tenth of an inch</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>42</td>
<td>Cover Size Width</td>
<td>For non-circular covers</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>43</td>
<td>Cover Material</td>
<td>List of appropriate MACP cover materials</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>44</td>
<td>Cover Type</td>
<td>List of defined MACP cover types</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>45</td>
<td>Hole Diameter</td>
<td>If vent holes, select from list of defined hole ranges</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>46</td>
<td>Hole Number</td>
<td>Number of holes in cover</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>47</td>
<td>Cover Bearing Surface</td>
<td>Diameter where cover rest on frame in inches</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>48</td>
<td>Cover Bearing Width</td>
<td>Width of cover where rests in frame in inches</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>49</td>
<td>Cover/Frame Fit</td>
<td>List of defined MACP cover fits</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>50</td>
<td>Cover Condition</td>
<td>List of valid MACP cover conditions</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>51</td>
<td>Insert Type</td>
<td>List of valid MACP cover inserts</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>52</td>
<td>Insert Condition</td>
<td>List of valid MACP insert conditions</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>53</td>
<td>Adjustment Ring Type</td>
<td>List of valid MACP adjustment ring types</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>54</td>
<td>Adjst Ring Material</td>
<td>List of valid MACP materials</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>55</td>
<td>Ring Condition</td>
<td>List of valid MACP conditions</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>56</td>
<td>Ring Height</td>
<td>From top to bottom of ring in inches</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>57</td>
<td>Frame Material</td>
<td>List of valid MACP materials</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>58</td>
<td>Frame Bearing Width</td>
<td>Width of surface cover sits on</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>59</td>
<td>Frame Bearing Depth</td>
<td>Distance from top of frame to bearing surface</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>60</td>
<td>Frame Opening Diam</td>
<td>Minimum diameter of frame opening</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>61</td>
<td>Frame Condition</td>
<td>List of valid MACP conditions</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>62</td>
<td>Seal Condition</td>
<td>List of valid MACP conditions for frame seal</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>63</td>
<td>Frame Offset</td>
<td>Distance frame offset from cone in inches</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>64</td>
<td>Frame Seal Inflow</td>
<td>List of valid MACP inflow codes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>65</td>
<td>Frame Depth</td>
<td>Distance from top of frame to bottom in inches</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>66</td>
<td>Chimney Material</td>
<td>List of valid MACP materials</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>67</td>
<td>Chimney I/I</td>
<td>List of valid MACP infiltration/inflow codes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>68</td>
<td>Chimney Opening</td>
<td>Diameter of chimney clear opening</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>69</td>
<td>Chimney Depth</td>
<td>Measurement from top of chimney to bottom in inches</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>70</td>
<td>Chimney Lining Interior</td>
<td>List of valid MACP lining materials</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>71</td>
<td>Chimney Lining Exterior</td>
<td>List of valid MACP lining materials</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>72</td>
<td>Cone Type</td>
<td>List of valid MACP cone types</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>73</td>
<td>Cone Material</td>
<td>List of valid MACP materials</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>74</td>
<td>Cone Depth</td>
<td>Depth of cone to nearest tenth of a foot</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>75</td>
<td>Cone Lining Interior</td>
<td>List of valid MACP lining materials</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>76</td>
<td>Cone Lining Exterior</td>
<td>List of valid MACP lining materials</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>77</td>
<td>Wall Diameter</td>
<td>Measured to nearest inch (if box, length by width)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>78</td>
<td>Wall Material</td>
<td>List of valid MACP materials</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>79</td>
<td>Wall Depth</td>
<td>Measured to nearest tenth of a foot</td>
<td>No</td>
<td>Yes</td>
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</table>

Notes: Field numbers in red denote mandatory fields under MACP protocols.
### Manhole Component Observation Form Information Continued...

<table>
<thead>
<tr>
<th>Field No.</th>
<th>Field Name</th>
<th>Description</th>
<th>Req'd Level 1</th>
<th>Req'd Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>Wall Lining Interior</td>
<td>List of valid MACP lining materials</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>81</td>
<td>Wall Lining Exterior</td>
<td>List of valid MACP lining materials</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>82</td>
<td>Bench Present</td>
<td>Yes, Partial, None</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>83</td>
<td>Bench Material</td>
<td>List of valid MACP materials</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>84</td>
<td>Bench Lining</td>
<td>List of valid MACP lining materials</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>85</td>
<td>Channel Installed</td>
<td>Yes or No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>86</td>
<td>Channel Material</td>
<td>List of valid MACP materials</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>87</td>
<td>Channel Type</td>
<td>Pipe, Formed, Precast, Insert</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>88</td>
<td>Channel Exposure</td>
<td>Fully Opened, Partially Opened, Closed</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>89</td>
<td>Step Number</td>
<td>Number of steps in manhole</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>90</td>
<td>Step Material</td>
<td>Metal, Plastic, Brick, Other</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes: Field numbers in red denote mandatory fields under MACP protocols.

### Manhole Pipe Connection Form Information

<table>
<thead>
<tr>
<th>Field No.</th>
<th>Field Name</th>
<th>Description</th>
<th>Req'd Level 1</th>
<th>Req'd Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>91</td>
<td>Pipe Number</td>
<td>Starting with outgoing moving clockwise</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>92</td>
<td>Clock Position</td>
<td>Outgoing is 6 o'clock</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>93</td>
<td>Rim to Invert</td>
<td>Measured to nearest tenth of a foot</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>94</td>
<td>Direction</td>
<td>In or Out</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>95</td>
<td>Material</td>
<td>List of valid PACP materials</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>96</td>
<td>Shape</td>
<td>List of valid PACP shapes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>97</td>
<td>Diam 1</td>
<td>Diameter or nearest tenth of an inch</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>98</td>
<td>Diam 2</td>
<td>Pipe width is non circular pipe</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>99</td>
<td>Pipe Condition</td>
<td>Sound or Defective</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>100</td>
<td>Seal Condition</td>
<td>Sound or Defective</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>101</td>
<td>Special Condition</td>
<td>List of valid MACP pipe types</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>102</td>
<td>Structure ID</td>
<td>Pipe segment reference</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>103</td>
<td>Additional Info</td>
<td>Any other appropriate details</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
LEVEL 1 MANHOLE INSPECTION FORM

MANHOLE #: _____________________________ DATE _______/_____/_______ SURVEYOR: __________________________

CERTIFICATE #: ___________________________ SHEET #: __________________ CITY: ___________________________

LOCATION: ________________________________

HOUSE NO. __________________ STREET ADDRESS: ______________________________

MANHOLE USE .................................. _______ 1-SANITARY 2-STORM 3-PROCESS 4-COMBINED 5-FORCE MAIN 6-OTHER

PURPOSE ........................................ _______ 1-MAINT 2-I&I 3-POST REHAB 4-PRE REHAB 5-NEW 6-ROUTINE 7-CAP 8-SESSES 9-OTHER

INSPECTION STATUS .......................... _______ 1-SURFACE 2-DESCENT 3-REMOTE 4-NOT FOUND 5-NO ACCESS 6-OTHER

LOCATION ...................................... _______ 1-MAIN HWY 2-LT HWY 3 EASEMENT 4-WOODS 5-SIDEWALK 6-YARD 7-OTHER

SURFACE TYPE ................................... _______ 1-ASPHALT 2-CONCRETE 3-GRAVEL 4-DIRT/GRASS 5-OTHER

ACCESS TYPE ..................................... _______ 1-MANHOLE 2-METER 3-WET WELL 4-CLEAN OUT 5-CATCH BASIN 6-OTHER

EVIDENCE OF SURCHARGE ..................... _______ 1-YES 2-NO

INSPECTION LEVEL ............................. _______ 1-LEVEL 1 2-LEVEL 2

COVER A. SHAPE........................ _______ 1-CIRCULAR 2-OVAL 3-RECTANGULAR 4-SQUARE 5-OTHER

B. SIZE........................_________ (INCHES)

C. WIDTH........................_________ (INCHES) FOR NON-CIRCULAR COVERS

D. MATERIAL ...................... _______ 1-CAST IRON 2-CONCRETE 3-STEEL 4-PVC 5-OTHER

E. COVER TYPE ............ _______ 1-SOLID 2-VENTED 3-GASKETED 4-BOLTED 5-WATER-TIGHT 6-OTHER

F. NUMBER HOLES ....... _______ (NUMBER)

G. HOLE DIAMETER ........ _______ (INCHES)

H. COVER FIT ................ _______ 1-OVERSIZED 2-GOOD 3-UNDERSIZED 4-ROCKS/WOBBLIES

I. CONDITION ............ _______ 1-SOUND 2-CRACKED 3-BROKEN 4-MISSING 5-CORRODED 6-BOLTS MISSING

INSERT A. TYPE .................... _______ 1-PLASTIC 2-METAL 3-OTHER

B. CONDITION ................_______ 1-SOUND 2-POOR FIT 3-LEAKING 4-FALLEN 5-CORRODED

RISER A. TYPE .................... _______ 1-SOLID 2-ADJUSTABLE 3-NONE

B. MATERIAL .................. _______ 1-CAST IRONE 2-CONCRETE 3-PLASTIC 4-STEEL 5-OTHER

C. CONDITION ................_______ 1-CAST IRONE 2-CONCRETE 3-PLASTIC 4-STEEL 5-OTHER

FRAME A. MATERIAL .................. _______ 1-CAST IRONE 2-CONCRETE 3-PLASTIC 4-STEEL 5-OTHER

B. CONDITION ................_______ 1-CAST IRONE 2-CONCRETE 3-PLASTIC 4-STEEL 5-OTHER

C. SEAL CONDITION ...... _______ 1-CAST IRONE 2-CONCRETE 3-PLASTIC 4-STEEL 5-OTHER

D. OFFSET .................... _______ (INCHES)

E. INFLOW ...................... _______ 1-NONE 2-WEEPER 3-DRIPPER 4-RUNNER 5-GUSHER 6-STAINED

CHIMNEY A. MATERIAL .................. _______ 1-BRICK 2-CONCRETE 3-PLASTIC 4-LINED 5-STEEL 6-OTHER

B. INFILTRATION ........... _______ 1-BRICK 2-CONCRETE 3-PLASTIC 4-LINED 5-STEEL 6-OTHER

CONE A. TYPE .................... _______ 1-FLAT TOP 2-CONICAL CENTERED 3-CONICAL OFF CENTERED

B. MATERIAL .................. _______ 1-BRICK 2-CONCRETE 3-PLASTIC 4-METAL 5-LINED 6-OTHER

WALL A. MATERIAL .................. _______ 1-BRICK 2-CONCRETE 3-PLASTIC 4-METAL 5-LINED 6-OTHER

B. DIAMETER ................_______ (INCHES)

C. LENGTH ..................... _______ (FOR RECTANGULAR MANHOLES)

BENCH TYPE ................................ _______ 1-NONE 2-PRECAST 3-3-BRICK 4-BLOCK 5-POURED

CHANNEL TYPE .................... _______ 1-NONE 2-PRECAST 3-POURED 4-VCP 5-PVC

STEPS A. NUMBER .................... _______ (NUMBER OF STEPS IN MH)

B. MATERIAL .................. _______ 1-METAL 2-PLASTIC 3-BRICK 4-OTHER

TOTAL MANHOLE DEPTH ............ _______ (TO NEAREST TENTH OF A FOOT)

ADDITIONAL INFO ___________________________________________________________________________________________

______________________________________________________________________________________________________________

______________________________________________________________________________________________________________

______________________________________________________________________________________________________________

______________________________________________________________________________________________________________

LEVEL 1 MANHOLE INSPECTION FORM
LEVEL 2 MANHOLE INSPECTION FORM (CONTINUED)

MANHOLE #: ___________________________ DATE________/_____/_______ SURVEYOR:__________________________

CERTIFICATE #: ________________________ SHEET #: __________________ CITY: ________________________________

PIPE CONNECTIONS

<table>
<thead>
<tr>
<th>NUMBER (CLOCKWISE FROM OUTGOING)</th>
<th>CLOCK POSITION (STARTING WITH OUTGOING)</th>
<th>DIRECTION (IN/OUT)</th>
<th>MATERIAL</th>
<th>DIAMETER</th>
<th>TYPE (GRAVITY, DROP, SERVICE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

COMMENTS:________________________________________________________________________________________________________________
___________________________________________________________________________________________________________________________
___________________________________________________________________________________________________________________________
___________________________________________________________________________________________________________________________

LEVEL 1 MANHOLE INSPECTION FORM
MACP Inspection Report

**Manhole Number**:  S127C007  
**Access Type**: Manhole  
**Drainage Area**: MB-05  
**MH Use**: Sanitary  
**Owner**: City of Chattanooga, TN  
**Customer**: Littlejohn Eng Assoc, Inc.  

**Year Built**:  
**Year Renewed**:  
**City**: Chattanooga, TN  
**Street Address**: Judd Rd.  
**Location Details**: Easement behind listed address  

**Location Code**: Woods  
**Surface Type**: Asphalt  
**Concrete Pavement**  
**Concrete Collar**  
**Grass/Dirt**  
**Gravel**  
**Other**  

**Surveyor**: ASTUTTS_CES  
**Cert No.**: U-509-8673  
**Project**: 1239  
**Work Order**:  
**PO#**:  
**Purpose**: Sewer System Evaluation Survey  

**Date**: 2013-08-07  
**Time**: 14:04  
**Inspection Level**: Level 2  
**Inspection Status**: Remote Inspection  
**Evidence of Surcharge**: Yes  
**Weather**: Dry  
**Potential for Runoff**: Ponding  

**Pre-Cleaning**: No Pre-Cleaning  
**Date Cleaned**:  
**Rim to Invert**: 11  
**Grade to Invert**: 10.7  
**Rim to Grade**: 0.3  
**Additional Info**: No chimney. Frame sits on precast cone.  

**GPS Accuracy**:  
**Coordinate System**:  
**Northing**:  
**Easting**:  
**Elevation**:  
**Additional Component Info**:  

---

**Cover**

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>Cover Shape</th>
<th>Cover Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td>Circular</td>
<td>Sound</td>
</tr>
<tr>
<td>Vented</td>
<td></td>
<td>Cracked</td>
</tr>
<tr>
<td>Gasketed</td>
<td></td>
<td>Broken</td>
</tr>
<tr>
<td>Bolted</td>
<td></td>
<td>Corroded</td>
</tr>
<tr>
<td>Inner Cover</td>
<td></td>
<td>Bolts Missing</td>
</tr>
<tr>
<td>Locking</td>
<td></td>
<td>Restraint Missing</td>
</tr>
<tr>
<td>Hatch - Single</td>
<td></td>
<td>Restraint Defective</td>
</tr>
<tr>
<td>Hatch - Double</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamphole</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cover Material**: Cast Iron  
**Hole Number**:  
**Hole Diameter**:  
**Cover Bearing Surface Dia**: 26  
**Cover Bearing Surface Width**:  
**Cover/Frame Fit**: Good
### Cover Insert

**Insert Condition**
- Sound
- Poorly Fitting
- Cracked
- Leaking
- Insert Fell
- Corroded

**Insert Type:** Metal

### Adjustment Ring

**Adjustment Ring Condition**
- Ring Type: None
- Ring Material:
- Ring Height:
- Satisfactory Installation

### Frame

**Material:** Cast Iron

**Frame Condition**
- Sound
- Cracked
- Broken
- Corroded
- Loose
- Offset
- Missing

**Frame Depth:** 8
**Frame Bearing Surface Width:** 1
**Frame Bearing Surface Depth:** 1.5
**Frame Clear Open Diam:** 26
**Frame Offset Distance:** 0
**Frame Seal Inflow:** None

**Frame Seal Condition**
- Sound
- Cracked
- Loose

### Chimney

**Chimney Material1:** Other
**Chimney Material2:**

**Chimney I/I:** None
**Chimney Clear Opening:**

**Chimney Depth:** 0.8
**Chimney Lining Interior:** None - No Coating
**Chimney Lining Exterior:**

### Cone

**Cone Type:** Conical centered
**Cone Material:** Concrete (reinforced)
**Cone Depth:** 4

**Cone Lining Interior:** None - No Coating
**Cone Lining Exterior:**
### Wall

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Diameter</td>
<td>48</td>
</tr>
<tr>
<td>Wall By Size</td>
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</tr>
<tr>
<td>Wall Material</td>
<td>Concrete (reinforced)</td>
</tr>
<tr>
<td>Wall Depth</td>
<td>10.2</td>
</tr>
<tr>
<td>Wall Lining Interior</td>
<td>None - No Coating</td>
</tr>
<tr>
<td>Wall Lining Exterior</td>
<td></td>
</tr>
</tbody>
</table>

### Bench

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bench Present</td>
<td>Yes</td>
</tr>
<tr>
<td>Bench Material</td>
<td>Concrete (non-reinforced)</td>
</tr>
<tr>
<td>Bench Lining</td>
<td>None - No Coating</td>
</tr>
</tbody>
</table>

### Channel

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Installed</td>
<td>Yes</td>
</tr>
<tr>
<td>Channel Material</td>
<td>Concrete (non-reinforced)</td>
</tr>
<tr>
<td>Channel Type</td>
<td>Formed</td>
</tr>
<tr>
<td>Channel Exposure</td>
<td>Fully Opened</td>
</tr>
</tbody>
</table>

### Steps

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step Number</td>
<td>6</td>
</tr>
<tr>
<td>Step Material</td>
<td>Metal</td>
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</table>

### MH Connections

<table>
<thead>
<tr>
<th>Pipe #</th>
<th>Clock</th>
<th>Rim to Invert</th>
<th>Direction</th>
<th>Material</th>
<th>Shape</th>
<th>Dia 1</th>
<th>Dia 2</th>
<th>Pipe Condition</th>
<th>Special Condition</th>
<th>Pipe ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>11</td>
<td>Out</td>
<td>Concrete Pipe (non-reinforced)</td>
<td>Circular</td>
<td>15</td>
<td></td>
<td>Sound</td>
<td>Gravity Relief Connection</td>
<td>S127C0009</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>5.9</td>
<td>In</td>
<td>Polyvinyl Chloride</td>
<td>Circular</td>
<td>6</td>
<td></td>
<td>Sound</td>
<td>Lateral to Building</td>
<td></td>
</tr>
<tr>
<td>Pipe #: 3</td>
<td>Clock: 3</td>
<td>Rim to Invert: 10.9</td>
<td>Direction: In</td>
<td>Material: Concrete Pipe (non-reinforced)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Shape: Circular</td>
<td>Dia 1: 12</td>
<td>Dia 2</td>
<td>Pipe Condition: Sound</td>
<td>Seal Condition: Sound</td>
<td>Special Condition: Gravity Relief Connection</td>
<td></td>
<td></td>
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<tr>
<td>Comments:</td>
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</tbody>
</table>

MH Conditions

<table>
<thead>
<tr>
<th>Distance 11</th>
<th>MH Component: Channel</th>
<th>MACP Code: Surface Aggregate Visible</th>
<th>Continuous: Joint</th>
<th>Continuous: Step</th>
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</thead>
<tbody>
<tr>
<td>1st Dimension:</td>
<td>2nd Dimension:</td>
<td>Percent:</td>
<td>At/From: 6</td>
<td>To: 3</td>
</tr>
<tr>
<td>Remarks:</td>
<td></td>
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</tbody>
</table>

Comments:  

![Image of Pipe #3 clock 3 rim to invert 10.9 direction in material concrete pipe (non-reinforced) shape circular dia 12 dia 2 pipe condition sound seal condition sound special condition gravity relief connection comments. MH Conditions: distance 11 mh component channel macp code surface aggregate visible continuous joint step. Remarks: Image of MH component channel].
Part 1 General

1.01 Scope

(This section has been renumbered in the 2012 CSI format – the previous 1995 CSI format section number is 13334.) The work covered by this Section includes furnishing all labor, material, equipment and services required for performing sanitary sewer manhole inspection services, authorized by the Engineer, as shown on the Drawings and/or specified herein. The objective of manhole inspection is to detect sources of inflow and infiltration, as well as determine the structural condition of the manholes.

1.02 General Provisions

A. The Contractor will provide all equipment and tools necessary to safely access and inspect the manholes.

B. The Contractor shall perform inspections of the project manholes and record any defect discovered. The inspection shall include, at a minimum, surface, manhole cover and frame, chimney, walls, invert and all appurtenances. Unless specified otherwise, all manhole inspections shall be fully-conforming to National Association of Sewer Service Companies (NASSCO) MACP standards.

C. The Contractor shall use a digital camera to capture all images of manhole components, defects, inflow and infiltration and observations. The Contractor may use a combination of CCTV camera equipment and field data collection software for the manhole inspections with approval by the Engineer. If a standard digital camera is used, the camera must be equipped with a strobe flash and be capable of producing high resolution digital images with minimum of 5 mega pixel resolution.

D. The Contractor will provide current certification that operators have undergone NASSCO MACP training prior to undertaking manhole condition assessment work for Owner. Unless specified otherwise, all defect coding used throughout the project will conform to NASSCO MACP standards version 6.0.1.

E. A diligent effort shall be made to locate all structures. Metal detectors shall be used to locate buried manholes. Once a buried manhole has been located, it shall be marked with paint and/or flagging, if necessary. All pertinent information available shall be recorded including area photo, address, etc. Contractor shall notify the Engineer weekly with a list of those manholes that could not be fully inspected due to being buried, surcharged, could not open, or otherwise unable to locate.

F. The Contractor’s personnel conducting inspections must have at least 5 years experience in the coding of the manhole condition assessments and must have reported upon more than 1,000 individual manhole inspections. Proof of such experience will be submitted prior to start of work. The Contractor must use
NASSCO certified data collection software (MACP version 6.0.1), with final approval by the Engineer prior to the start of the Contract.

G. A GPS unit capable of sub-meter accuracy (horizontal +/- 3 feet) shall be used for documenting location of manholes not shown on the Owner’s system maps.

Part 2 Execution

2.01 Manhole Inspection

A. All sanitary sewer manholes in the Project Area will be visually inspected to determine sources of inflow and infiltration and structural defects. The Contractor shall conduct a Level 1 surface inspection for every manhole and a Level 2 internal inspection shall be completed for select manholes at the direction of the Engineer. Inspections shall be done by completing MACP inspection forms as outlined in Part 3, Section 3.03 of this specification.

B. Level 2 inspections shall be conducted for every manhole showing visible signs of infiltration or defects. If a manhole cannot be determined to be free of defects or infiltration, then a Level 2 inspection shall be performed.

C. The Contractor shall provide for the pumping down of any surcharged manhole section and provide all bypass pumping, if required, during the inspection. The Contractor shall receive Engineer's approval prior to bypass pumping.

D. The Contractor shall submit a comprehensive equipment list to the Engineer before commencement of the Work. The complete list, which shall include all backup and standby equipment, shall be broken down into the following categories (at a minimum):

1. Safety equipment
2. Flow diversion and flow control equipment
3. Traffic control equipment
4. All other equipment necessary for the completion of the Work

E. Blockages in the system shall be reported to the Engineer immediately.

F. A responsible representative of the Contractor shall be present on the site of the work, or other location approved by the Engineer, to provide supervision of the work. At all times, and especially when a change of work location is underway, the Contractor’s representative shall keep the Engineer continuously aware of the location, progress, planned execution of the work, and problems encountered.

G. Should the Contractor encounter a buried manhole during the course of inspection that cannot be readily accessed, the Contractor shall notify the Engineer.

2.02 Precautions
A. The Contractor shall take all necessary precautions to ensure that water used does not flood property or buildings served by the sewer pipeline being inspected.

B. A valved air line will be attached to bags or plugs used to control flow so that they may be deflated from the surface.

C. The water level within structures will be observed and the minimum level that will cause flow to back up into buildings and cause property damage will be determined prior to initiating operations so that flooding of buildings and property will not occur.

D. Remove all plugs when a setup is complete. Failure to do this may result in backup and property damage.

E. The Contractor shall provide, operate, maintain and subsequently remove on completion, adequate ventilation apparatus in the form of blowers and/or fans. The ventilation apparatus shall introduce a fresh air supply to support a safe environment for Work in sewers, manholes and all other confined spaces, which shall be kept free from dangerous, toxic and/or explosive gases, whether generated from sewage, soil strata or other source.

F. The Contractor shall employ the “best practicable means” to minimize and mitigate noise as well as vibration resulting from operations. Mitigation measures shall include the utilization of sound suppression devices on all equipment and machinery particularly in residential areas and in the near vicinity of hospitals and schools, especially at night.

G. The Contractor shall inform the Engineer before the commencement of any portion of the work of any significant change in the methods of noise attenuation from those previously approved.

H. All pumps, generators, combination cleaners or other noise emitting equipment be shall be suitably screened to minimize nuisance and noise pollution. This requirement shall not be taken as preventing or prohibiting the execution of work necessary for the saving of life, protection of property, or safety of the personnel and/or facilities. The Contractor shall notify the Engineer of such use of plant or equipment in an emergency situation as soon as practicable.

3.03 Data Collection

A. The Contractor shall complete a separate Manhole Inspection Header Form, Manhole Component Observation Form, and Manhole Pipe Connection Form for each manhole inspected, both Level 1 and Level 2 inspections.

1. Level 1 inspections record observations of the manhole’s condition as seen from the ground surface outside of the manhole.

2. In addition to the surface observations of Level 1 inspection, Level 2 inspections will identify defects of the manhole through a confined space entry of the manhole.
3. Manhole Inspection Header Forms, Manhole Component Observation Forms, and Manhole Pipe Connection Forms shall be filled out containing, at a minimum, the mandatory information required for Level 1 and/or Level 2 inspections per MACP (version 6.0.1).

B. For all Level 2 inspections, the Contractor must complete a Level 2 – Manhole Component Defect Form for each manhole inspected as directed by MACP (version 6.0.1).

   1. This form shall be used to record all defects for the chimney, cone, wall, bench and channel only. All other manhole component defects shall be recorded in the Manhole Component Observation Form.
   2. When inspecting manholes all applicable PACP coding shall be utilized, except for tap codes, camera underwater code, and line direction codes.

C. All inspections shall be recorded on standard manhole forms provided by or approved by the Engineer.

D. Unless an alternative system is approved by the Engineer, all inspections data shall be entered, by the Contractor, into a NASSCO Manhole Assessment Certification Program (MACP) compliant database (version 6.0.1 minimum).

E. If inspection forms are filled out manually, all forms shall be scanned to Portable Document Format (PDF), with the file name being the MH identification number (example: AB123.pdf).

F. Inspections database shall be fully cross-referenced to all videos, images and reports. All media file names and relative path locations shall be present in the NASSCO MACP database.

G. Digital photographs shall be captured of the exterior and the invert of each inspected manhole. All digital photographs captured from the exterior of the manhole shall be oriented so that the outgoing pipe connection is at the 6 o'clock position with respect to the camera view orientation.

H. A digital still image shall be captured for each defect. All digital still images shall be in JPEG file format. If inspections are recorded in the field electronically into a NASSCO MACP database, all digital still images of defects shall be generated using a concatenation of standard MACP database fields in the format "Manhole ID_Condition ID_MACP Code". If inspections are recorded manually in the field, file names of defect digital still images shall follow the convention "Manhole ID_[sequential number]_MACP Code".

I. Contractor shall maintain a copy of all report material. The contractor shall provide comments as necessary to fully describe the existing condition of the manhole on the inspection forms.

J. Contractor shall be responsible for modifications to equipment and/or inspection procedures to achieve reporting requirements identified in these specifications.
K. No work shall commence prior to approval of the submitted material by the Engineer. Once accepted, the report material shall serve as a standard for the remaining work.

L. When an unmapped manhole is discovered during an inspection, the Contractor shall assign a temporary field-assigned ID to the manhole. This temporary field ID shall be entered into the appropriate PACP database field (either "Upstream_MH" or "Downstream_MH"), and the comment "Unmapped MH" shall be entered in the PACP database field "Additional_Info". The inspection shall be terminated and a new inspection shall begin, so that the unexpected manhole effectively divides the pipe into two segments. The "Total_Length" field for the terminated inspection shall be populated with the distance in feet at which the unexpected manhole was discovered during inspection. The pipe segment receiving the next inspection shall be assigned a temporary field ID, and the newly-discovered manhole ID shall be entered into the corresponding “Upstream_MH” or “Downstream_MH” field. The proposed naming scheme for unmapped manholes and pipes shall be approved by the Engineer prior to start of inspections. The Contractor shall ensure that each newly-discovered manhole and pipe is given an ID that is not already assigned to another manhole or pipe. The contractor shall also ensure that the field-assigned ID of each newly-discovered manhole is consistent between PACP and MACP submittals.

M. If the Contractor uses a Global Positioning System device (GPS), then coordinates of all uncharted manholes shall be collected with device using a coordinate system and file format approved by the Engineer prior to the start of the Contract. For recording of all uncharted manholes, coordinates and coordinate system shall be required on the Manhole Inspection Header Form at the time of inspection.

N. The inspection photographs, report documents, and inspections database shall be in accordance with NASSCO MACP.

O. The comments area on the Header Form can be used to record observations and information such as:
   1. Previous and existing weather conditions.
   2. Soil conditions.
   3. Access for future maintenance or rehabilitation.
   4. Unusual conditions in the sanitary system and difficulties incurred in performing the inspection.
   5. Catalog of photographs and videos of manhole.
   6. Any other remarks/comments not covered under any form headings.

P. The Contractor must have an internal quality assurance/quality control system (QA/QC) in place, and all inspection data shall be subjected to the procedures prior to submittal to the Engineer. The Engineer will perform QA/QC audits on submitted data. Any data or files not meeting these specifications or NASSCO MACP standards will be returned to the Contractor for correction. The Contractor shall present their proposed QA/QC system to the Engineer prior to the start of the Contract.

3.04 Manhole Inspection Deliverables
A. All the supplied data and information will become the property of the Owner.

B. Sample Submittal: An example of a typical Manhole Inspection final deliverable will be submitted for approval by the Engineer prior to the start of the Contract. The example deliverable will contain the following:

1. A sample NASSCO MACP Standard Exchange Database (version 6.0.1) in Microsoft Access file format (.mdb), as exported from the Contractor's data collection software (if inspections are to be recorded electronically).

2. A proprietary database as generated by the Contractor's data collection software (if inspections were recorded electronically).

3. Example GPS data files of all uncharted manholes (if GPS will be used for geographic reference).

4. Example media files, including observation photos, videos, and reports; with all files consistently utilizing the required file naming conventions.

5. The proposed viewing software to be used with the proprietary inspections database and related media.

6. NASSCO MACP validation report in PDF format, demonstrating the sample is fully conforming to NASSCO MACP standards and conventions (if inspections are to be recorded electronically). Validation reports can be obtained by submitting a sample database to:

   http://www.nassco.org/training_edu/te_database_upload.aspx

7. Inspections database(s) shall be fully cross-referenced to the videos, images, and reports.

8. Example reports will be presented in both hard copy and in PDF format, and all other sample data will be presented in digital format on an external hard drive.

C. Intermediate Submittals: No later than fourteen (14) days following the completion of a manhole inspection, the Contractor will submit the following:

1. Two (2) hard copies of full details report for each inspection.

2. An overall summary report detailing major defects, uncharted manholes including field-assigned ID and geographic reference, and inspections that require attention.

3. GPS data files of all uncharted manholes and/or pipe segments that were identified during inspections but were not shown on field maps. This list shall include the field-assigned ID and a geographic reference or description (street address, intersection, etc.).

4. At regular agreed intervals, an external hard drive will be submitted to the Engineer containing a single NASSCO MACP Standard Exchange Database
(version 6.0.1) containing all inspections to date, encoded videos, observation photos, inspection reports in PDF format, and support files. The supplied data and information will become the property of the Owner.

D. Final Submittal: At the completion of all inspections, the Contractor will supply the following to the Engineer on an external hard drive:

1. A single, consolidated NASSCO MACP Standard Exchange Database (version 6.0.1) in Microsoft Access file format (.mdb) containing all inspections for the Contract.

2. NASSCO MACP validation report for the consolidated database (See Section 3.04.B.6.).

3. All encoded inspection videos, observation photos, and inspection reports using required file naming formats.

4. A single, consolidated proprietary database containing all inspections for the Contract, as generated by the Contractor’s data collection software.

5. Free-issue software to be used for the viewing of the proprietary inspections database and related media from within the database.

6. Four (4) hours training in the use of any supplied free-issue software.

E. NASSCO MACP Compliance

The submitted database(s) should consist of, at a minimum, the NASSCO MACP standard data fields, formats, and conventions as set forth in this specification and Attachment A – Field Data Delivery Format Requirements.
# PACP®"Inspections" Table - Required Fields, Formats, and Conventions

All field names, data types, and descriptions are from PACP v6.0.2 unless otherwise noted. PACP fields not required by City of Chattanooga have been omitted.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Description of Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>InspectionID</td>
<td>AutoNumber</td>
<td>This field is automatically populated when any inspection information is entered. The number generated must be entered in the InspectionID field of the Conditions table for all conditions recorded during the inspection</td>
</tr>
<tr>
<td>SurveyedBy</td>
<td>Text</td>
<td>Name of individual conducting survey</td>
</tr>
<tr>
<td>CertificateNumber</td>
<td>Text</td>
<td>NASSCO PACP # of Surveyor</td>
</tr>
<tr>
<td>Owner</td>
<td>Text</td>
<td>Owner of collection system surveyed</td>
</tr>
<tr>
<td>Customer</td>
<td>Text</td>
<td>Entity commissioning the survey</td>
</tr>
<tr>
<td>Drainage_Area</td>
<td>Text</td>
<td>Common name of drainage area - If field maps are provided and include drainage basins, populate this field with the drainage basin name/ID</td>
</tr>
<tr>
<td>PO_Number</td>
<td>Text</td>
<td>Customer's Purchase Order Number</td>
</tr>
<tr>
<td>Pipe_SegmentReference</td>
<td>Text</td>
<td>Client provided segment number - If pipe segment number is not provided, use the convention &quot;Upstream Manhole ID_DownstreamManhole ID&quot;</td>
</tr>
<tr>
<td>Date</td>
<td>Date/Time</td>
<td>Inspection Date</td>
</tr>
<tr>
<td>Time</td>
<td>Date/Time</td>
<td>Time of inspection</td>
</tr>
<tr>
<td>Street</td>
<td>Text</td>
<td>Street Number and Name</td>
</tr>
<tr>
<td>City</td>
<td>Text</td>
<td>City name where sewer located</td>
</tr>
<tr>
<td>Location_Details</td>
<td>Text</td>
<td>Descriptive explanation of sewer location</td>
</tr>
<tr>
<td>Upstream_MH</td>
<td>Text</td>
<td>Client provided designation for upstream manhole</td>
</tr>
<tr>
<td>Up_Rim_to_Invert</td>
<td>Number</td>
<td>Distance (ft and tenths of ft) or (meters to 2 decimal places max) from rim to invert of upstream manhole</td>
</tr>
<tr>
<td>Up_Grade_to_Invert</td>
<td>Number</td>
<td>Distance (ft and tenths of ft) or (meters to 2 decimal places max) from average grade to invert of upstream manhole</td>
</tr>
<tr>
<td>Up_Rim_to_Grade</td>
<td>Number</td>
<td>Distance (ft and tenths of ft) or (meters to 2 decimal places max) from rim to average grade of upstream manhole</td>
</tr>
<tr>
<td>Downstream_MH</td>
<td>Text</td>
<td>Client provided designation for downstream manhole</td>
</tr>
<tr>
<td>Down_Rim_to_Invert</td>
<td>Number</td>
<td>Distance (ft and tenths of ft) or (meters to 2 decimal places max) from rim to invert of downstream manhole</td>
</tr>
<tr>
<td>Down_Grade_to_Invert</td>
<td>Number</td>
<td>Distance (ft and tenths of ft) or (meters to 2 decimal places max) from average grade to invert of downstream manhole</td>
</tr>
<tr>
<td>Field Name</td>
<td>Data Type</td>
<td>Description of Field</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Down_Rim_to_Grade</td>
<td>Number</td>
<td>Distance (ft and tenths of ft) or (meters to 2 decimal places max) from rim to average grade of downstream manhole</td>
</tr>
<tr>
<td>Sewer_Use</td>
<td>Text</td>
<td>Purpose of sewer</td>
</tr>
<tr>
<td>Direction</td>
<td>Text</td>
<td>Direction of survey, Upstream or Downstream</td>
</tr>
<tr>
<td>Flow_Control</td>
<td>Text</td>
<td>Type restriction of flow used</td>
</tr>
<tr>
<td>Height</td>
<td>Number</td>
<td>Diameter of sewer (or height if non-circular) to nearest inch(999) or nearest mm(99999)</td>
</tr>
<tr>
<td>Width</td>
<td>Number</td>
<td>Width of non-circular sewer to nearest inch(999) or nearest mm(99999)</td>
</tr>
<tr>
<td>Shape</td>
<td>Text</td>
<td>Sewer shape</td>
</tr>
<tr>
<td>Material</td>
<td>Text</td>
<td>Type of pipe material</td>
</tr>
<tr>
<td>Lining_Method</td>
<td>Text</td>
<td>Type of process used to line the host pipe</td>
</tr>
<tr>
<td>Pipe_Joint_Length</td>
<td>Number</td>
<td>Length of pipe joint sections measured to one decimal place whether in feet or meters</td>
</tr>
<tr>
<td>Total_Length</td>
<td>Number</td>
<td>Distance between the exit of the start manhole and the entrance of the finish measured to one decimal place whether it is feet or meters -If field maps are provided for the project area and include a total length, then this value will be entered into the field &quot;Total_Length&quot;.</td>
</tr>
<tr>
<td>Length_Surveyed</td>
<td>Number</td>
<td>If the survey is abandoned, enter the actual length surveyed to one decimal place whether it is feet or meters</td>
</tr>
<tr>
<td>Year_Laid</td>
<td>Number</td>
<td>Year sewer surveyed was constructed</td>
</tr>
<tr>
<td>Year_Renewed</td>
<td>Number</td>
<td>Year sewer surveyed was renewed</td>
</tr>
<tr>
<td>Media_Label</td>
<td>Text</td>
<td>Unique identifier for tape/media</td>
</tr>
<tr>
<td>Purpose</td>
<td>Text</td>
<td>Reason for conducting survey</td>
</tr>
<tr>
<td>Sewer_Category</td>
<td>Text</td>
<td>Importance of sewer, to be provided by client</td>
</tr>
<tr>
<td>Pre-Cleaning</td>
<td>Text</td>
<td>Type of preparatory cleaning conducted prior to survey</td>
</tr>
<tr>
<td>Date_Cleaned</td>
<td>Date/Time</td>
<td>Date when sewer was cleaned prior to survey</td>
</tr>
<tr>
<td>Weather</td>
<td>Text</td>
<td>Weather conditions when survey conducted</td>
</tr>
<tr>
<td>Location_Code</td>
<td>Text</td>
<td>General description of ground cover of surveyed segment</td>
</tr>
<tr>
<td>Additional_Info</td>
<td>Text</td>
<td>Supplemental info regarding survey or segment</td>
</tr>
<tr>
<td>Reverse_Setup</td>
<td>Number</td>
<td>Specifies that a second survey has been done on the pipe segment--use inspection ID from matching survey</td>
</tr>
<tr>
<td>Sheet_Number</td>
<td>Number</td>
<td>Number used to identify individual surveys done within a group -If field maps are provided, this field must be populated with the map number/ID</td>
</tr>
<tr>
<td>IsImperial</td>
<td>Yes/No</td>
<td>Used to identify whether units are metric or imperial. Defaults to imperial.</td>
</tr>
<tr>
<td>PressureValue</td>
<td>Number</td>
<td>Grouting pressure value</td>
</tr>
<tr>
<td>WorkOrder</td>
<td>Text</td>
<td>Work order or Project reference for Asset Management</td>
</tr>
<tr>
<td>Project</td>
<td>Text</td>
<td>Project Title or reference for Asset Management</td>
</tr>
</tbody>
</table>
Appendix C
Preventive Hydraulic Cleaning
Support Information
Appendix C-1
Specifications for Annual Blanket Contract for Sewer Line Cleaning Services
SPECIFICATIONS FOR
ANNUAL BLANKET CONTRACT
TO SUPPLY
SEWER LINE CLEANING SERVICES FOR THE
INTERCEPTOR SEWER SYSTEM
AND RELATED FACILITIES

WASTE RESOURCES DIVISION
CITY OF CHATTANOOGA, TENNESSEE

1.0 GENERAL

1.1 SCOPE OF SERVICES

The Scope of Services included in these Specifications shall be for the provision of sanitary sewer, combined sewer, storm sewer, pump station, and tank cleaning labor services and related materials and equipment on an as-needed basis for the Moccasin Bend Wastewater Treatment Plant (MBWWTP) and related facilities of the Waste Resources Division, including Combined Sewer Overflow Treatment Facilities (CSOTF), Sanitary and Stormwater Pump Stations, and the City Landfills. The Moccasin Bend Wastewater Treatment Plant (MBWWTP) is located at 455 Moccasin Bend Road, Chattanooga, Tennessee 37405.

It is the responsibility of each bidder to visit the Moccasin Bend Wastewater Treatment Plant and the related Waste Resources Division facilities to determine the types of structures for which these services may be required, the associated work areas and conditions, the sizes and types of equipment and parts, the safety requirements, and any other circumstances associated with the provision of these services.

Any questions or comments related to the services described in these Specifications may be directed to Mr. Geoff Hipp, Buyer, Department of General Services, phone 423-757-4758.

1.2 BASIS OF BIDDING

The Vendor shall submit one (1) bid on the City’s Standard Bid Form. The Bid shall include the labor cost per hour for the various personnel and equipment. Please refer to Appendix A for a list of these items for which costs shall be provided.

The cost per hour shall include any and all costs for wages, benefits, indirect costs, overhead and profit, insurance, and any other related direct or indirect cost. The cost per hour shall be for the services for a two-person crew and truck of the stated classification and any and all equipment necessary to perform the work described herein.
The Vendor shall also provide hourly rates for overtime for the various work described herein and as indicated in Appendix A. Emergency work as described in Section 2.2.1.D of these specifications shall be paid for at the stated overtime rate.

The bid shall be awarded on the basis of the unit cost per hour of the personnel as well as an evaluation of the Vendor’s qualifications, experience, capabilities and other factors specified in the City Code.

_The City of Chattanooga reserves the right to reject any and/or all bids, to waive any information in Bids received, and to accept any Bid which in its opinion may be in the best interest of the city._

1.3 SUBMITTALS

1.3.1 Bid Bond

None.

1.3.2 Performance Bond

$10,000.

1.3.3 References and Experience

The Vendor shall provide the following regarding qualifications:

A. The Vendor shall provide description of capabilities and recent experience in providing sewer line cleaning services of the type contemplated under this request.

B. The Vendor shall provide a list of municipal sewer line cleaning projects as follows:

1. At least two (2) municipal project(s) for which the Vendor is providing, or has within the past five (5) years provided long term, high volume sewer line cleaning services (minimum 500,000 feet per year) of sewer line cleaning of lines greater than 6 inches in diameter.

2. At least two (2) municipal projects for which the Vendor has provided within the past five (5) years, high volume cleaning services (minimum 5,000 feet per year) of sewer line cleaning of lines greater than 24 inches in diameter.

3. At least one (1) municipal project for which the Vendor has provided within the past five (5) years, high volume cleaning services (minimum 5,000 feet per year) of sewer line cleaning of lines in easements.
This list of projects shall contain the following information for each project listed:

a. Name, address, and phone number of the Municipality.
b. Name, fax number, and phone number of a representative of the Municipality who is knowledgeable about the project.
c. Brief description of the services provided, sewer line footage cleaned, the duration of the contract, and bid basis of contract ($/ft, $/hr, etc.)
d. A statement of the approximate value of the contract.
e. A statement of when the contract was completed.

C. The Vendor shall provide resumes of the Vendor’s Project Manager and key technical and operations personnel.

D. Experience

1. The Vendor shall provide a description of its work force including number of skilled personnel and their length of service with the company.

1.4 GENERAL CONDITIONS AND INSTRUCTIONS TO BIDDERS

The Vendor shall comply with rules and conditions found in the City of Chattanooga Purchasing Department’s “General Conditions and Instructions to Bidders” that are a part of the invitation to Bid for the equipment or services specified herein.

1.5 LENGTH OF CONTRACT

The Contract for services described herein shall be for a period of one (1) year beginning the effective date of the award of the Contract. The Vendor shall provide a firm hourly rate for the first year of the Contract.

The City shall have the option of extending the Contract for four (4) additional one (1) year periods.

Hourly rates shall be subject to adjustment by mutual agreement based on the Southern States CPI as published by the US Department of Labor.

1.6 INSURANCE

The Vendor shall, prior to the award of the Contract, furnish proof and maintain in
force the following types of insurance at the minimum limits specified below:

<table>
<thead>
<tr>
<th>COVERAGES</th>
<th>LIMITS OF LIABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workmen’s Compensation</td>
<td>Statutory</td>
</tr>
<tr>
<td>Employer’s Liability</td>
<td>$750,000</td>
</tr>
<tr>
<td>Bodily Injury Liability</td>
<td>$750,000 each occurrence</td>
</tr>
<tr>
<td>Except Automobile</td>
<td>$1,500,000 aggregate</td>
</tr>
<tr>
<td>Property Damage Liability</td>
<td>$750,000 each occurrence</td>
</tr>
<tr>
<td>Except Automobile</td>
<td>$750,000 aggregate</td>
</tr>
<tr>
<td>Automobile Bodily Injury Liability</td>
<td>$750,000 each person</td>
</tr>
<tr>
<td>Automobile Property Damage</td>
<td>$750,000 each occurrence</td>
</tr>
<tr>
<td>Excess Umbrella Liability</td>
<td>$1,500,000 each occurrence</td>
</tr>
<tr>
<td></td>
<td>$3,000,000 each occurrence</td>
</tr>
</tbody>
</table>

Copies of the current insurance certificate(s) shall be provided to the City prior to any work being performed. Insurance shall be kept in force during the entire length of the contract.

2.0 SERVICES AND OTHER REQUIREMENTS

2.1 GENERAL

2.1.1 Subcontractors

The Vendor shall not subcontract the services or assign the contract to others without the written consent of the City of Chattanooga.

2.1.2 Compliance with Applicable Regulations

All of the services provided by the Vendor shall be completed in a good and workmanlike manner. All services provided shall be in compliance with all applicable statues, rules, ordinances and regulations of, but not limited to, the USEPA, TDEC, TDOT, OSHA, and any similar federal, state, and local laws or regulations applicable to the Vendor or to the services described herein.

The Vendor’s personnel shall comply with all City, Waste Resources Division, and Moccasin Bend WWTP work rules and regulations when on site.

2.1.3 Inspection
The services furnished by the Vendor shall be subject to inspection and approval by the City’s designated representative, but the manner and method of providing the services shall be the responsibility of the Vendor.

2.1.4 Failure to Provide Services and Termination of Contract

In the event the Vendor:

a. Fails to initiate services on the date specified or otherwise agreed to;
b. Fails to provide all of the required documentation for his personnel, insurance, and any other documentation required by these Specifications at the specified times;
c. After having begun services, abandons them for any reason;
d. Suspends or refuses to continue services; or
e. Defaults in any manner in the performance under the terms of the Contract for a period of two (2) consecutive working days (unless the Vendor is prevented from continuing for reasons beyond its control);

The City of Chattanooga shall have the right to terminate the Contract immediately upon the written notification by the City for the reasons listed above and the City shall complete the Contract or have the services completed by another vendor in any reasonable manner at the Vendor’s expense.

The City shall have the right to terminate the Contract after giving a thirty-day (30) written notice to the Vendor.

2.2 DESCRIPTION OF CONTRACTED SERVICES

2.2.1 General

A. The Vendor shall provide equipment and labor services for the line cleaning and root removal for sanitary and combined sewer lines and structures throughout the City-owned and operated wastewater collection system, the Moccasin Bend Wastewater Treatment Plant, the City Landfill and related Waste Resources Division facilities. The Vendor shall provide all labor, benefits, tools, equipment, fuel, materials and other related expenses necessary to provide these services.

B. The Vendor shall provide the services on an “as needed” basis as requested by the City. The City will attempt to schedule the work to optimize the use of the Vendor’s personnel and equipment when it is needed.

C. Vendor shall perform work on straight time, i.e., non-emergency, unless otherwise noted. Overtime, weekend, or holiday work shall only be performed at the City’s direction.
D. Vendor shall perform emergency work when requested by the City. Response to the need for emergency work shall be within four (4) hours of notification. Emergency work will be paid at the overtime rates. Vendor shall supply an after-hours contact name and phone number through which notification of the need for emergency work shall be made.

2.2.2 Vendor Services

A. The Vendor shall provide trained personnel to perform various tasks requested by the City in accordance with the agreed hourly rates (reference Appendix A). Hourly rate shall include all typical hand tools and equipment used by sanitary sewer line cleaning crews. Root cutters up to 15-inch diameter and general cleaning nozzles shall be considered incidental to the work and shall be supplied by the Vendor. Specialized equipment shall be as listed in Appendix A and shall have separate hourly rates (see Paragraph 2.2.2-C below).

B. The Vendor shall provide the services of a superintendent or project manager as needed to review the various projects and assignments with City personnel, to determine labor, materials, and equipment needed, and to provide any other planning, sketches, drawings, product research, or other requirements of the work.

C. The Vendor shall provide, as applicable to the various work assignments, available equipment owned by Vendor and listed in Appendix A. Hourly rates for use of Vendor’s equipment shall be provided.

D. The Vendor shall provide personnel time sheets for all work performed, indicating the personnel classification, hours of work, use of specialized equipment, and/or use of approved subcontractors. Upon completion of each project or assignment, vendor shall obtain the signature of the responsible City supervisor on the time sheets, and provide a copy of the signed time sheets to the City supervisor.

E. The Vendor shall ensure that upon completion of work assignments, all materials and equipment are cleaned up and/or removed, all materials requiring disposal are removed, all equipment is properly stored, and the work area is completely cleaned. The City supervisor shall review and sign off on the completion of these tasks, giving final approval of the work.

F. Vendor cleaning equipment shall meet the following minimum specifications:

1. Jetter and Combination Jetter/Vacuum trucks shall be late model (no more than three model years old). Combination trucks shall be minimum 9 yard dump body with a vacuum system capable of 3600 CFM free air at
16” of Mercury vacuum, 80 GPM@2500 PSI delivered through 500’ of 1” diameter hose. Combination Cleaning water capacity shall be at least 1000 gallons. Jetter trucks shall be capable of a minimum 50 GPM @2500 PSI delivered through 500’ of 1” diameter hose. Cleaning water capacity shall be at least 750 gallons.

G. The truck price per hour shall include one complete crew, consisting of, as a minimum, one truck operator and one laborer to operate the Vendor’s equipment. The crew shall be trained in the operation of all of the above equipment, traffic control procedures and OSHA safety rules and regulations associated with sewer line cleaning services.

H. The Vendor shall provide a resume or work history for all personnel being provided for this contract prior to beginning the work. If personnel change during the course of the work, work histories or resumes shall be provided prior to commencement of the work. The Vendor shall provide all labor, equipment, materials, fuel, utilities, insurance, and other related services required in connection with the contract for sewer line cleaning services for the removal and disposal of all dirt, silt, gravel, sand, wood, roots, leaves, grease, rags, sewage solids, various types of chemical scales, semi-solids, and any other debris that may be found in municipal sewer systems including interceptor sewers, sanitary and combined collection systems, related manholes, junction boxes, and other sewers and sewer structures as designated by the City.

Included, but not limited to, are the following specific items of work:

1. Clean and remove debris and roots from up to 200± miles of sewers annually. Clean up to an average of 2500 feet per day (±10 percent) of small sewer lines over the duration of the project. The quantity of large line cleaning and easement cleaning will be mutually agreed upon by the City and the Vendor as needed.

2. Re-clean any sewer lines found to be deficient as a result of City’s inspection at no charge to the City.

3. Actual amount of work performed will be based on the amount of City funding available. Work in excess of the quantity listed above may be increased in future years, if additional City funding is available and both City and Vendor are in agreement.

I. The Vendor shall obtain all necessary permits and approvals from all regulatory agencies and provide the City with proof of same.

J. The Vendor shall furnish labor, including as a minimum, the following:
1. Provide one (1) complete and independent Crew, consisting of, as a minimum, one (1) operator and one (1) laborer/flagman to operate the Vendor’s equipment to wash, collect, remove and dispose of debris from sanitary system.

2. Provide a Crew thoroughly trained in the operation all of the above equipment, traffic control procedures, and OSHA safety rules and regulations associated with sewer line cleaning services.

3. Provide Crew Leader that is a properly licensed CDL operator. Provide copy of CDL license to City before beginning work. If Crew Leader is replaced or reassigned, a copy of his replacement’s CDL license shall be provided before he can begin work.

4. Provide to the City a resume or work history for all personnel being provided for this contract prior to beginning the work. If personnel changes during the course of performing the work, provide to the City a resume or work history for the new personnel being provided prior to beginning the work.

K. The Vendor shall provide normal traffic control measures during execution of the work.

L. The Vendor shall provide a communication device to the City in order to have reliable communications between the Vendor and the City. (i.e. two-way radio, cell phone, etc).

M. The Vendor shall schedule work to be performed during City’s normal work hours Monday through Friday, 7:30 am till 4:00 pm, unless otherwise mutually agreed upon by the City and the Vendor (no work shall be scheduled for holidays not worked by the City).

The Vendor shall schedule work to begin when the City provides the work orders and project instructions to the Vendor and to end 0.5 hour after completing the final job of the day to allow the Vendor to return to the project base location.

N. The Vendor shall coordinate the contract for specified sewer line cleaning services with the City’s operating schedule.

O. The Vendor shall conduct the contract for sewer line cleaning services in compliance with all applicable federal, state, and local laws, regulations, permits, and approvals.

P. The Vendor shall provide adequate supervision and technical and managerial oversight of the Vendor’s employees, subcontractors, and agents.

Q. The Vendor shall provide a written Contingency Plan that addresses, as a minimum, the following circumstances:
1. Abnormal weather conditions that could interrupt the sewer line cleaning services.

2. Changes in personnel that could disrupt the sewer line cleaning services.

3. Malfunction of equipment items related to the sewer line cleaning services.

4. Damage to private property during the performance of the sewer line cleaning services.

5. Emergency cleaning services.

6. Re-cleaning of sewer lines found to be deficient as a result of City's inspection.

R. The Vendor shall conduct operations so as not to cause a nuisance to the public involving odors, dust, vectors, or noise.

S. The Vendor shall obtain all necessary permits and approvals from all regulatory agencies, and furnish copies of all required permits and approvals to the City.

T. The Vendor shall provide and submit reports and certifications as required by all applicable EPA and/or State regulations, and furnish copies of all required reports to the City in a timely manner.

U. The Vendor shall complete the service work assigned in a good and workmanlike manner. The Vendor and Vendor's personnel shall comply with all applicable statutes, rules, ordinances and regulations of, but not limited to, the USEPA, TDOT, OSHA, and any similar federal, state, and local laws or regulations applicable to the Proposer or to the services described herein.

V. The Vendor's personnel shall comply with all City, Waste Resources Division, and Moccasin Bend WWTP work rules and regulations when on site.

W. The Vendor's services shall be subject to inspection and approval by the City's designated representative, but the manner and method of providing the services shall be the responsibility of the Vendor.

### 2.2.3 City Supplied Services

A. The City will designate a Project Coordinator and Inspector to oversee the Vendor's work.
B. The City will designate line segments to be cleaned by means of work orders and project lists.

C. The City will provide all water and disposal necessary for cleaning operations.

D. The City will identify the locations for disposal of debris from cleaning operations.

3.0 EXECUTION

3.1 CONTRACT STARTING DATE

The Contract for the full services shall begin immediately on the effective date of the award of the Contract.

3.2 PAYMENT OF SERVICES

The quantity of hours will be determined from the work order and inspection reports prepared by the City assigned inspector. Only hours worked on project shall be applicable.

Downtime for equipment, personnel, or other problems shall not be charged against the project. Representatives of the Vendor and the City will review the time sheets at the end of each workweek to determine the hours of work performed during that period.

Payment shall be made in accordance with City procedures. Payment requests should be submitted to the Moccasin Bend Wastewater Treatment Plant, 455 Moccasin Bend Road, Chattanooga, Tennessee 37405.
APPENDIX A

**RATES**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
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<td>Combination Jetter/Vacuum Truck</td>
<td>Hour</td>
</tr>
<tr>
<td>Combinations Jetter/Vacuum Truck (Emergency)</td>
<td>Hour</td>
</tr>
<tr>
<td>Jetter Truck per section</td>
<td>Hour</td>
</tr>
<tr>
<td>Jetter Truck per section (Emergency)</td>
<td>Hour</td>
</tr>
<tr>
<td>Wheeled easement machine</td>
<td>Hour</td>
</tr>
<tr>
<td>Tracked easement machine</td>
<td>Hour</td>
</tr>
</tbody>
</table>
City of Chattanooga

Public Works Department-Waste Resource Division

Activity Sheet:

<table>
<thead>
<tr>
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<th>Time Arrived:</th>
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Crew Workers Names:

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<th>Material:</th>
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Call Response: Repairs Cleaning and TV:

- Stoppage in City Line O Point Repair O Feet Cleaned ______
- Stoppage in Customer Line O MH Repaired O Feet TVed: ______
- Water or Stormwater Problem O MH Installed O Tanks of Water _____
- MH overflow from weather O Tap O Meter Reading ______
- Locate MH/Line O Located/Marked Lines or MH O Cut Out Roots O
- MH-Lid problem O Feet of Line Replaced ___ Cleaned Wet Well O
- Odor Complaint O Easement Clearing Footage ______ Equipment Downtime ______
- Mileage Day Begin:________ Cut Asphalt/Concrete O Training or School time_______
- Mileage End Day: ___________ Temporary Patch O Work order #_________________
- Final Patch O

Equipment Used:_______________________________________________________________________________________________
________________________________________________________________________________________________________________

Material Used:________________________________________________________________________________________________
________________________________________________________________________________________________________________

Work Comments:________________________________________________________________________________________________
________________________________________________________________________________________________________________

Crew Supervisor Signature:_______________________ General Supervisor Signature:___________________________

I hereby certify that the information presented above has been reviewed by me and to the best of my knowledge to be true, accurate, and complete. I am aware there is a significant disciplinary action up to and including dismissal for submitting false information.
Appendix C-3
Contractor Cleaning Log
## Sewer Line Cleaning Services
### CITY OF CHATTANOOGA, TN
#### Annual Blanket Contract

**PROJECT SUMMARY - 2013-1**

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<th>CCTV Length</th>
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### CLEAN & CCTV INSPECTIONS

**S. Chickamauga Creek 1 50E3**

**SUMMARY**

- **CCTV FOOTAGE**: 0
- **CLEANING FOOTAGE**: 7294.8
- # OF REVERSES: 0
- # OF ROOT CUTS: 0
- # OF TAP CUTS: 0
- # OF BY - PASS PUMPS: 0