REGION 4
ATLANTA, GA 30303

ELECTRONIC MAIL
CONFIRMATION OF EMAIL RECEIPT REQUESTED

Michael Patrick, P.E.
Executive Director, Hamilton County WWTA
1250 Market Street
Chattanooga, Tennessee 37402
Mpatrick@hamiltontn.gov

Re: Approval of the Sanitary Sewer Evaluation/Rehabilitation Work Plan, Incident Response Plan, and the revised Sewer Overflow Response Plan
Consent Decree Case No. 1:23-cv-00225

Dear Director Patrick:

The U.S. Environmental Protection Agency Region 4, and the Tennessee Department of Environment and Conservation have reviewed and hereby approve the Sanitary Sewer Evaluation/Rehabilitation Work Plan, the revised Sewer Overflow Response Plan, and the Incident Response Plan for the Hamilton County Wastewater Treatment Authority (WWTA), pursuant to paragraphs 22, 28 and paragraph b. of Appendix E of the subject Consent Decree above. The plans were submitted in accordance with the requirements within the Consent Decree.

Please contact Mr. John C. Goodwin at (404) 562-8488 or via email at goodwin.john@epa.gov if you have any questions.

Sincerely,

MICHAEL AMMONS
Digitally signed by MICHAEL AMMONS
Date: 2025.12.04 14:21:44 -05'00'

Brad Ammons, Acting Chief
Wastewater Enforcement Section
Water Enforcement Branch

cc: Jessica Murphy
Tennessee Department of Environment and Conservation
Murphy.jessica@tn.gov

Angela Jones
Tennessee Department of Environment and Conservation
Angela.jones@tn.gov

Copies have been mailed and/or emailed to the following recipients:

EES Case Management
Unit Environment and Natural Resources Division
U.S. Department of Justice
Box 7611
Washington, D.C. 20044-7611

Chief, Clean Water Enforcement Branch
Water Protection Division
US EPA Region 4
61 Forsyth St., SW
Atlanta, GA 30303

Wilson Buntin
Senior Assistant Attorney General
Office of the Attorney General
Environmental Division
P. O. Box 20207
Nashville, TN 37202

Manager of Enforcement and Compliance Section, Division of Water Resources
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, TN 37232-1101

Patrick Parker
Assistant General Counsel
Office of General Counsel
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 2nd Floor
Nashville, TN 37232-1101

Public Library
Mr. Will O'Hearn
Library Executive Director
Chattanooga-Hamilton County Public Library
1001 Broad Street
Chattanooga, TN 37402

By Email:
eescdcopy.enrd@usdoj.gov; Re: DJ # 90-5-1-1-11394
Goodwin.John@epa.gov
Sayre.Dennis@epa.gov
angela.jones@tn.gov
angela.oberschmidt@tn.gov
Ryne.Ruddock@tn.gov
Michael.bascom@tn.gov
Jessica.Murphy@tn.gov

Sanitary Sewer Evaluation/ Rehabilitation (SSER) Work Plan Final

Prepared for

The United States Environmental Protection Agency and Tennessee Department of Environment and Conservation

Case No. 1:23-cv-00225

Prepared by

Hamilton County
Water & Wastewater
Treatment Authority (WWTA)

Submitted by

LJA Engineering, Inc.
1110 Market Street, Suite
314 Chattanooga, TN 37402
August 12, 2025

Table of Contents

Table of Contents i

Acronyms and Abbreviations iv

1 Introduction 2

1.1 Purpose 2

1.2 Authority 2

1.3 Related Documents 2

2 Overview 3

2.1 Description of Wastewater Collection and Transmission System 3

2.2 Sewer Basins 4

2.3 Pump Stations and Force Mains 4

2.4 Key Elements of the SSER Work Plan 4

2.5 Definitions 4

3 Flow Monitoring Program and Capacity Assessment 6

3.1 Flow Monitoring Program 6

3.1.1 Initial Flow Monitoring Program 6

3.2 Rainfall Data 6

3.3 Flow Monitoring 7

3.3.1 Need for Analysis 7

3.3.2 Flow Monitoring Locations 7

3.3.3 Site Selection 8

3.3.4 Flow Monitoring Periods 9

3.3.5 Monitoring Equipment 9

3.3.6 Flow Monitoring Resources 9

3.4 Basin Delineation 10

3.4.1 Basins 10

3.4.2 Sub-Basins 10

3.5 Flow Analysis 10

3.5.1 Dry Weather Flow 10

3.5.2 Wet Weather Flow 10

3.6 Capacity Assessment 11
4 Developing SSER Project Priorities 12
4.1 Initial RDII Analysis 12
4.1.1 Normalized Net RDII 12
4.2 Initial Priority Ranking 12
4.2.1 Early Action Groups Project Priorities 13
4.2.2 Groups 1-5 SSER Project Priorities 14
4.3 Continual Priority Analysis 14
4.3.1 SSOs 14
4.3.2 Impaired Streams TDEC CWA Section 303(d) 15
4.3.3 Environmental Justice Areas 15
4.3.4 Preliminary Sewer Assessments 15
4.3.5 Customer Complaints and Work Orders 15
4.3.6 Underway Remedial Measures 15
4.3.7 Flow Isolation Studies 15
4.4 Prioritization Analysis Matrix 16
5 WCTS Condition Assessment and Rehabilitation 17
5.1 Information Management System 17
5.1.1 SSER, Gravity Sewer, and Manhole Data 17
5.1.2 GIS Data 17
5.1.3 Pump Station and Force Main Data 17
5.2 Manhole Condition Assessment and Rehabilitation 18
5.2.1 Standard Procedures for the Condition Assessment of Manholes 18
5.2.2 Standard Procedures for Manhole Rehabilitation 18
5.3 Gravity Sewer Line Defect Analysis and Rehabilitation 18
5.3.1 Standard Procedures for Analysis of Gravity Sewer Line Defects 18
5.3.2 Gravity Sewer Line Rehabilitation 20
5.3.3 Private Lateral Investigations 21
5.4 Force Main Condition Assessment and Rehabilitation 21
5.4.1 Standard Procedures for Analysis of Force Mains 21
5.4.2 Force Main Defect Grading and Analysis 22

5.4.3 Force Main Rehabilitation 22
5.4.4 Force Main Rehabilitation Effectiveness 23
5.4.5 Air Release Valve (ARV) Program 23
5.5 Pump Station Performance and Rehabilitation 23
5.5.1 Evaluation of Pump Station Performance 23
5.5.2 Evaluation of Pump Station Design and Equipment 25
5.5.3 Evaluation of Pump Station Condition 26
5.5.4 Rehabilitation Priority Setting 26
6 Assessment Methods and Components 28
6.1 Corrosion Defect Identification 28
6.1.1 Corrosion Defect Identification Inspections for Force Mains 28
6.1.2 Corrosion Defect Identification Inspections for Pump Stations 29
6.2 Closed Circuit Television (CCTV) Inspection 29
6.2.1 Standard Procedures CCTV Cleaning, CCTV, and Sonar Inspection 30
6.3 Smoke Testing 30
7 Analysis of Completed Rehabilitation Effectiveness 31
7.1 Pre- and Post-Rehab Flow Monitoring 31
7.2 SSO Trending 31
Appendix A – SSER Basin Map ..... A
Appendix B – CD Groups for Sewer Rehabilitation ..... B
Appendix C – Pump Stations and Force Mains C
Appendix D – Flow Monitoring Maps and Schematics ..... D
Appendix E – Rain Gauge Map ..... E
Appendix F – Priority Ranking Matrix (Initial and Proposed) ..... F
Appendix G – Impaired Streams and Environmental Justice Aeras ..... G
Appendix H – WWTA Standard SSER Specifications ..... H
Appendix I – Pump Station and Force Main Assessment Forms I
Appendix J – Rehabilitation Data Dictionary ..... J

Acronyms and Abbreviations

CCTV	Closed-Circuit Television
CFR	Code of Federal Regulations
CMMS	Computerized Maintenance and Management System
CMOM	Capacity, Management, Operations, and Maintenance
DMR	Discharge Monitoring Report
EPA	United States Environmental Protection Agency
GIS	Geographic Information System
GPM	Gallons Per Minute
HAZMAT	Hazardous Material
I/I	Infiltration and Inflow
ISS	Interceptor Sewer System
MBEC	Moccasin Bend Environmental Campus
MGD	Million Gallons Per Day
MOR	Monthly Operating Report
NPDES	National Pollution Discharge Elimination System
O&M	Operation and Maintenance
RDII	Rainfall-Derived Infiltration and Inflow
SCADA	Supervisory Control and Data Acquisition System
SOP	Standard Operating Procedures
SORP	Sewer Overflow Response Protocol
SSO	Sanitary Sewer Overflow
SSS	Sanitary Sewer System
TDEC	Tennessee Department of Environment and Conservation
TWRA	Tennessee Wildlife Resources Agency
WD	Wastewater Department
WWTA	Water and Wastewater Treatment Authority
WWTP	Wastewater Treatment Plant

1 Introduction

1.1 Purpose

The Hamilton County Water and Wastewater Treatment Authority ("WWTA") 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. Hamilton County Water and Wastewater Treatment Authority, No. 1:23cv-00225* ("CD"), which became effective on July 16th 2024. Pursuant to Section VII, Paragraph 22 of the CD, WWTA is required to submit a Sanitary Sewer Evaluation/Rehabilitation ("SSER") Work Plan to the Environmental Protection Agency ("EPA") and Tennessee Department of Environment and Conservation ("TDEC").

The purpose of this SSER Work Plan is to provide for the continual assessment, analysis, and rehabilitation of the entire Wastewater Collection and Transmission System ("WCTS"). This SSER Work Plan will establish the procedures for setting priorities and expeditious schedules for undertaking the WCTS assessment and rehabilitation throughout the duration of the Consent Decree. This document will determine how WWTA will assess, analyze, and rehabilitate the WCTS infrastructure to, among other things, reduce Inflow and Infiltration ("I/I"), eliminate structural defects, and other conditions causing, or that are likely to cause, sanitary sewer overflows ("SSOs") and/or prohibited bypasses.

1.2 Authority

The WWTA's legal authority for the development and implementation of this SSER Work Plan is:

- The U.S. Clean Water Act
- National Pollutant Discharge Elimination System (NPDES) Permit Number TN0021211 (Signal Mountain Service Area) and TDEC State Operating Permit (SOP) 89044 (Remainder of the WWTA Collection System)
- Tennessee Water Quality Control Act
- The CD

1.3 Related Documents

The WWTA has several CD documents that are critical and referenced throughout this SSER Work Plan. The documents and the status of the documents are shown in Table 1-1 below.

Table 1-1
CD Related Documents

Document	Location
Sewer Overflow Response Program (SORP)	CD Public Document Repository
Gravity Line Preventative Maintenance Program (GLPMP)	CD Public Document Repository
Pump Station Operations and Preventative Maintenance Program	CD Public Document Repository

2 Overview

2.1 Description of Wastewater Collection and Transmission System

As a wastewater utility, the WWTA operates, maintains, and manages a network of pipes, manholes, pump stations, force mains, and associated appurtenances that transport wastewater from homes, businesses, and industries to the Moccasin Bend Environmental Campus (MBEC) and Signal Mountain Wastewater Treatment Plan (WWTP). All infrastructure is part of the Wastewater Collection and Transmission System (WCTS), as defined in the CD and herein. Property owners own the private service laterals from the served residential, commercial, and industrial structures to the public right of way or to the edge of the WWTA permanent easement (typically 10 feet from the centerline of the main sewer line) for those connections not located within streets or roads.

WWTA's Signal Mountain System (NPDES Permit TN0021211) serves approximately 4,000 customers and is comprised of the following:

- 1 Wastewater Treatment Facility
- Collection Lines
    - 29 miles of Gravity Pipelines
    - 9.5 miles of Pressurized Pipelines
- 1 Pump Station
- 57 Grinder Pumps
- 58 STEP/STEG Systems

The remainder of WWTA's WCTS (SOP 89044) serves 34,145 customers within the county and wastewater discharging to the City of Chattanooga and MBEC for treatment. The WCTS is composed of approximately:

- 431 miles of Gravity Pipelines
- 116 miles of Pressurized Mains
- 58 Pump Stations
- 945 Grinder Pumps
- 235 STEP/STEG Systems
- 1 Equalization Tank of 3 million gallons (MG)

2.2 Sewer Basins

The following incorporated communities are served by the WWTA: East Ridge, Lakesite, Lookout Mountain, Red Bank, Ridgeside, Signal Mountain and Soddy Daisy. WWTA also serves the unincorporated portions of Hamilton County, which includes Ooltewah. There are 7 Service Areas designated in the CD: East Ridge, Hamilton County, Lookout Mountain, Ooltewah, Red Bank, Signal Mountain, and Soddy Daisy, which can be seen in Appendix A. Within those service areas, the WCTS is divided into 159 sub-basins which are classified into priority groupings which include Early Action, Groups 1 through 5, and the Residual Sewer Basin groups. The sub-basins and groupings are available in Appendix B of the Consent Decree and Appendix B of this document.

2.3 Pump Stations and Force Mains

A full detailed list of the wastewater pump stations is available in Appendix C, along with a map of the pump station and force main locations.

2.4 Key Elements of the SSER Work Plan

The key elements of the SSER Work Plan are addressed individually as follows:

- Section 3 Flow Monitoring Program and Capacity Assessment
- Section 4 Developing SSER Project Priorities
- Section 5 WCTS Condition Assessment and Rehabilitation
- Section 6 Assessment Methods and Components
- Section 7 Analysis of Completed Rehabilitation

2.5 Definitions

Executive Director: The Executive Director of the WWTA is responsible for the oversight and management of the WWTA.

User: Any person that contributes, causes, or permits the contribution or introduction of wastewater or pollutants into the WCTS, whether intentional or unintentional, and whether direct or indirect.

Wastewater Collection and Transmission System (WCTS): The WCTS is the wastewater collection, retention, and transmission systems, including all gravity sewer lines, force mains, pump stations, manholes, and other related appurtenances designed to collect and convey domestic, commercial, industrial wastewaters, and sewer to the WWTP.

WWTA: The Water and Wastewater Treatment Authority is responsible for the planning, management, operation, and maintenance of the WCTS and WWTP for unincorporated areas of Hamilton County, Tennessee and the surrounding municipalities of East Ridge, Lakesite, Lookout Mountain, Red Bank, Ridgeside, Signal Mountain, and Soddy Daisy.

Wastewater Treatment Plant or WWTP: WWTP shall mean devices or systems used in the storage, treatment, recycling, and reclamation of municipal wastewater at the Signal Mountain WWTP.

3 Flow Monitoring Program and Capacity Assessment

The SSER Work Plan is based on an initial analysis of the entire WCTS utilizing flow data for the sub-basins. The WWTA's flow monitoring program is divided into two parts. The initial flow monitoring was conducted starting in 2014 through early 2015 to support the prioritization of projects and was used to determine the Early Action projects and Groups 1-5. The second part of the flow monitoring program is an ongoing effort to support model validation, evaluation of pre- and post- conditions of rehabilitation projects, and continued analysis of the system.

3.1 Flow Monitoring Program

3.1.1 Initial Flow Monitoring Program

The WWTA implemented the initial flow monitoring program to support the development of a prioritization matrix and computer model of the sanitary sewer system. As part of this program, the WWTA 's Engineering Consultant installed and maintained 92 flow monitors and 7 rain gauges. The flow monitoring period occurred from September 2014 to April 2015. The data from this period was used to determine the initial basin priorities based on observed Net Normalized Rainfall Dependent Inflow & Infiltration (RDII) as further discussed in Section 4. WWTA's Flow Monitoring Schematics for each service area can be found in Appendix D.

The additional flow monitoring program will continue to assess changing flow conditions and provide continued insight to the system's response to a larger number of storms. Hydraulic models will be created for the subbasins as condition assessment is completed. The ongoing efforts associated with future monitoring represent a long-term flow monitoring program that provides the data necessary for subsequent model creation and validation, as well as evaluation of the pre- and post-conditions of the rehabilitation projects.

3.2 Rainfall Data

The flow monitoring data is supplemented by 4 rain gauges, which are distributed throughout the service area to record the spatial variation in rainfall events and correlate rainfall volume to RDII. A map of the 4 rain gauges is available in Appendix E. Multiple gauges are required to obtain adequate coverage given the unpredictability associated with the rainfall distribution over such a large service area. The rainfall data is recorded in 5-minute time intervals, which provided the resolution necessary to capture the effects of inflow (short-term response) and first infiltration (intermediate-term response).

The rain gauges are ADS Rain Alert III units or similar. Rain gauges are to be installed, operated, and maintained by contracted personnel and per manufacturer's specifications. Each gauge was mounted on a level, flat surface and located away from obstructions (e.g., trees, buildings) in a clear area to capture the natural rainfall distribution.

Rain gauges should be installed to provide adequate coverage of the sewer basins being studied. Gauges are installed within the study area with one in Lookout Mountain, East Ridge,

Ooltewah and Soddy Daisy. Each rain gauge should allow for accuracy within 0.01 inch and have the ability to record rainfall in 5-minute increments. Each rain gauge should be assigned to a designated area and linked to flow monitors within that area for analysis.

Additional rain gauges may be added as necessary.

3.3 Flow Monitoring

Flow monitoring, as it relates to this SSER Work Plan, includes performing routine flow monitoring during dry and wet weather to support engineering analysis related to sewer system capacity and peak flow rates. The following sections describe the need and the general methodology to be used by the WWTA when implementing a flow monitoring program for SSER.

3.3.1 Need for Analysis

Flow monitoring, for the purposes of SSER, is used to:

- Determine volume and variation of flow for specific areas in the sewer system;
- Understand collection system responses during wet-weather events;
- Isolate areas of high RDII contributions during wet-weather events to determine its magnitude and plan subsequent remedial measures; and
- Assess the Sewer System Capacity as outlined in Section 3.6

Flow monitoring analyses are dependent upon flow and rainfall data collected by flow monitors and rainfall gauges within the system. Flow data is classified as dry weather or wet weather. This flow classification is determined through analysis of rainfall data into periods of significant rainfall or without significant rainfall.

3.3.2 Flow Monitoring Locations

The permanent monitors for the WWTA's collection system are located at the discharge location to the City of Chattanooga Interceptor Sewer System (ISS). The City of Chattanooga maintains these permanent monitors, and the WWTA plans to make quarterly requests to Chattanooga for flow data at these locations. While these monitors were not selected for use in SSER prioritization, they will be used to supplement the monitors deployed specifically for SSER. The permanent regional metering locations are available in Table 3-1.

Table 3-1
Permanent Flow Monitoring Locations

Service Area	Regional Meter Names
East Ridge	East_Ridge_M158P601; East_Ridge_ER02; East_Ridge_ER03
Lookout Mountain	Lookout_Mtn_01; Lookout_Mtn_02
Ooltewah	LeeHwy
Red Bank	Red Bank

Signal Mountain	SM7A_1
Soddy Daisy	M082P006; M082P008
Unincorporated Hamilton County	Ramsgate; VAAP PS; Hurricane Creek

3.3.3 Site Selection

Site selection for the WWTA's flow monitoring program was performed with a high-resolution monitoring program. Ideally, basins should be equitable in size and of common performance due to material, construction methods, and age. Studies have shown the recommended optimal basin sizes per flow meter range from approximately 20,000 – 50,000 LF of gravity piping per flow monitor based on per linear foot unit cost comparisons of flow monitoring, SSER, and remedial measures. Thus, the WWTA delineated existing basins into subbasins normalizing them to fall within the stated range above. As such, it is financially advantageous to maximize the number of flow monitors for similar size areas during these studies.

Flow monitors for the SSER should isolate individual sewer sub-basins and be placed along the primary trunk sewers and interceptors. Additional site selection considerations include:

- SSO locations;
- Pump stations;
- Treatment facilities;
- Large Industrial Discharges that don't have typical diurnals; and
- Net flows/Subtraction of Monitors.

Ideally, monitors should be located upstream of SSO locations, at critical points along trunk interceptors, influent lines to treatment facilities, distant from pump station discharge points, and have the ability to isolate large Industrial customers.

Another important consideration in site selection is the potential additive of computation errors that can occur when subtracting an upstream monitor from a downstream monitor to isolate net flow contributions. The lower the net flow contribution of the basin is to the total flow, the higher the percent error is for the flow calculation. Subtraction of rates from flow monitors to generate small net basin contributions should be minimized to allow for higher accuracy flow calculations.

Final site selection should consist of thorough site investigations to ensure field conditions are suitable for installation and calibration of the monitor. Site specific conditions include evaluation of velocity, turbulence, uneven flows, accelerating flows, silt, and depth to reduce the monitoring errors.

Post rehabilitation flow monitoring locations will align – when feasible – with initial monitoring locations to provide comparable data.

3.3.4 Flow Monitoring Periods

3.3.4.1 Duration

Ideally, the monitoring period should continue until there are three (3) or more storms ranging in size from a minimum of 0.5 inches to 3.66 inches over a 24-hour period, which is the 2-year 24-hour design storm. Furthermore, a period without significant rainfall should be measured during the monitoring period, allowing the system to return to dry weather flow status, for the determination of base flows. The dry weather period should be dependent upon the location of the system and sensitivity to rainfall.

Based on historical rainfall for Hamilton County, a temporary flow monitoring program is expected to last for 6 to 9 months. Also, where possible, gathering more flow data allows for higher resolution and a more detailed regression analysis of RDII to total rainfall.

3.3.4.2 Seasonality

Flow monitoring should be conducted as part of an SSER program generally during a wet and dry period. Historically, December to May has been the time period with the highest RDII contributions due to increased groundwater I/I.

Seasonal SSER flow monitoring programs may not characterize true base flow rates due to a seasonally higher groundwater table; however, the monitoring program will consider this and review periods of distinct separation in time from wet-weather events to determine base flows used in estimating RDII volumes.

3.3.5 Monitoring Equipment

The objective of the monitoring equipment is to obtain quality data from the selected sites. The equipment selected should have a history of proven performance. Several equipment technologies are available, and each site should be evaluated on a site-by-site basis with a flow monitoring equipment/technology company to obtain the best site-specific solution. Currently, the WWTA utilizes ADS TRITON+ flow monitors to collect data.

3.3.6 Flow Monitoring Resources

Proper maintenance procedures are required to improve meter performance for the duration of the flow monitoring portion of the SSER. Site visits are typically performed on a monthly basis for SSER studies. Remote data acquisition can be used in lieu of site visits to collect data and provide operational checks. If remote data acquisition is used, site visits should still be performed as necessary.

3.4 Basin Delineation

3.4.1 Basins

The WWTA's WCTS is comprised of 7 service areas. The boundary for each service area is based on the municipality that it serves and the corresponding watershed boundary. Each sub-basin is delineated based on the gravity pipelines and wastewater customers that contribute to each corresponding flow monitor.

3.4.2 Sub-Basins

The basins were divided into sub-basins to implement a comprehensive flow monitoring program that provides an accurate assessment of the system-wide conditions and SSER (See Appendix A). The sub-basin boundaries were developed to maintain a comparable length of piping and a similar number of linear feet of pipe in each sub-basin. The geographic information system (GIS) database for the sewer system included system connectivity, pipe sizes, and flow direction, which were evaluated to identify potential flow monitoring sites. The number of sub-basins in each service area is summarized in Table 3-2.

Table 3-2
Number of Sub-Basins per Service Area

Service Area	Number of Sub-Basins
East Ridge	26
Lookout Mountain	12
Signal Mountain	25
Red Bank	12
Soddy Daisy	14
Hamilton County	70
Total:	**159**

3.5 Flow Analysis

Flow data analysis consists of classifying and quantifying wastewater as dry weather flow or wet weather flow. Flow analysis requires engineering judgment and consideration of antecedent conditions, regression of wet weather flows, as well as seasonal impacts associated with the WCTS.

3.5.1 Dry Weather Flow

Dry weather flows directly reflect the water usage of the community and consequently fluctuate hourly, daily, and seasonally. This wastewater flow component includes domestic, commercial, institutional, and industrial sewage and specifically excludes I/I.

3.5.2 Wet Weather Flow

Wet-weather events were analyzed based on the system response and the hydrologic characteristics associated with excess precipitation and the resulting runoff. In general, there

are three response types associated with RDII, which are characterized as slow, intermediate, and fast. The slow response represents runoff that percolates through the soil before entering the collection system (i.e., infiltration). The fast response is characterized as runoff that enters the collection system immediately following a rainfall event via direct inflow through illegal connections, or below grade manholes. RDII volume and peak factors are determined through comparison of flows measured during periods with precipitation and dry weather flows.

3.6 Capacity Assessment

The WWTA assesses capacity of the WCTS by evaluating the results of flow monitoring, frequency of SSOs, and hydraulic modeling where applicable. Areas which may have future sewer needs will also be considered. Initial scoring for capacity issues was given based on the WWTA's institutional knowledge about each basin.

As the SSER plan is implemented, areas contributing to or that are likely to contribute to SSOs in the future are identified based on high scores in the prioritization matrix: in categories regarding Net RDII, Peak and Average flow, as well as SSOs. These factors are explained and scored within the prioritization matrix outlined in Section 4 and Appendix F. An additional score will be given for a Capacity Issue that will address concerns regarding future changes in the WCTS.

4 Developing SSER Project Priorities

The first part of SSER work involves flow monitoring of the WCTS to determine which areas of the WCTS have excessive RDII and need further assessment and SSER work. The SSER rehabilitation prioritization is split up into two parts which are described throughout this section. All Early Action SSER projects were completed prior to CD execution in July 2024. Rehabilitation of Groups 1-5 is scheduled to be completed within 223 months of the Consent Decree Effective Date. The later portion of the SSER involves the continual reassessment of the basins based on the KPIs laid out in the Consent Decree.

4.1 Initial RDII Analysis

4.1.1 Normalized Net RDII

RDII is defined as the portion of I/I that is directly influenced by the intensity and duration of a storm event. The response generated by this component of I/I is an increase in the system flow during and after a rainfall event. This extraneous water enters the sewer system in direct response to rainfall through storm drains and other sources, such as leaky manhole covers and defective sewers.

The Net RDII is defined as each sub-basin's specific contribution to the cumulative RDII volume. The Net RDII is determined by calculating the volume of RDII measured at each flow monitor and by removing the volume of RDII measured at upstream flow monitors. The Net RDII for each sub-basin is then normalized by dividing the net RDII by the total linear footage within each respective sub-basin. Normalization of the RDII allows for comparison of each basin against one another by providing a unit volume rather than an overall volume of RDII.

4.2 Initial Priority Ranking

Subbasins were initially ranked by several factors including: Net RDII, Normalized Net RDII, Normalized Net RDII Rank in Basin, Ratio of Hourly Average to Peak, Upstream Chronic SSOs, Downstream Chronic SSOs, and whether there was a Capacity Issue.

Appendix F contains an example of the priority ranking matrix with the weighted columns highlighted in orange. Each considered metric was given a ranking between 0 and 5 with the lowest need being 0 and highest being 5. Metrics that the WWTA found to have particular importance were given more weight than the others, with a high score of 6. The factors used to determine the score given can be found in Table 4-1 and an example of the matrix used can be found in Appendix F.

Table 4-1
KPIs Used for Initial Basin Priority Ranking

KPIs Used	Value Assigned					
	0	**1**	**2**	**3**	**4**	**5**
Net RDII (MG)	≤0.050	N/A	>0.050	>0.100	>0.150	>0.200
Normalized Net RDII (gal/LF)	≤4.0	N/A	>4.0	>10.0	>15.0	>20.0
Normalized Net RDII Rank in Basin	N/A	N/A	2nd Highest in Basin	N/A	N/A	1st Highest in Basin
Ratio of Hourly Average to Peak	≤5:1	N/A	>5:1	>10:1	>20:1	>30:1
Upstream Chronic SSOs (#)	≤4	N/A	>4	>6	>8	>10*
Downstream Chronic SSOs (#)	≤5	N/A	>5	>10	>15	>20
Capacity Issue	No	N/A	N/A	N/A	N/A	Yes

*6 Points given

4.2.1 Early Action Groups Project Priorities

Utilizing the initial flow monitoring program, the sub-basins were ranked by Normalized Net RDII and several other factors which can be seen in Table 4-1 and Appendix F. The areas with the highest infiltration and most need were used to create the Early Action Projects. Work on these projects will be completed within 36 months of the Consent Decree Effective Date; July 16th, 2024.

Table 4-2
Early Action Groups SSER Priority Sub-Basins

Soddy-Daisy Equalization Station
East Ridge Sub-basins 3C and 4B Rehab
Lookout Mountain Sub-Basins 2,5, 6 and 9 Rehab
Redbank Sub-basin 5 Rehabilitation
Redbank Sub-basin 6 Rehabilitation
Redbank Sub-basin 7 Rehabilitation

4.2.2 Groups 1-5 SSER Project Priorities

Groups 1-5 were determined using the same metrics as the Early Action Projects. These groups of sewer basins have significant need and were included in the Consent Decree. Utilizing the initial flow monitoring program, the sub-basins were ranked by Normalized Net RDII and several other factors which can be seen in Table 4-1 and Appendix F.

The Group 1-5 projects include the sub-basins shown in Table 4-3. These basins are shown geographically in Appendix B-3 of the Consent Decree.

Table 4-3
Groups 1-5 SSER Priority Sub-Basins

Groups 1-5 SSER Priority Sub-Basins	
East Ridge	Appendix B-3-1
Lookout Mountain	Appendix B-3-2
Signal Mountain	Appendix B-3-3
Red Bank	Appendix B-3-3
Soddy-Daisy	Appendix B-3-4
Hamilton County	Appendix B-3-4
Unincorporated Hamilton County	Appendix B-3-5

4.3 Continual Priority Analysis

Groups 1-5 and Residual Basin Analysis includes several prioritization parameters for use in evaluating subbasins which include these KPIs: RDII, SSOs, risk to impaired streams, relative age, environmental justice area concerns, and other factors as described below. The prioritization criteria is incorporated into a scoring matrix. These scores are normalized and weighted to ensure comparability and relative importance of each parameter in relation to the other parameters. The application of this methodology to the WWTA's system results in a priority list for performing SSER investigation and rehabilitation for these projects. The residual basins, basins not a part of the Early Action Projects or Groups 1-5, will continue to be monitored and evaluated using these same KPIs. RDII data will be gathered for the WWTA's annual flow monitoring program.

4.3.1 SSOs

The WWTA maintains a database of SSOs throughout the WCTS that is tracked and reviewed in a database. The recorded SSO data includes location, date, duration, cause, discharge location, estimated volume, and other supplemental information. SSOs within the sewer basin and downstream of the sewer basin will be considered. The quantity of wet weather SSOs for both major and minor events will be totaled for each sub-basin and then weighted for comparison in the prioritization matrix.

4.3.2 Impaired Streams TDEC CWA Section 303(d)

Impaired streams in the Hamilton County area are identified from the EPA's "303(d)" list. The sub-basins will be scored in the prioritization matrix based on the length of impaired stream contained within the sub-basin. A map of the impaired streams in relation to the sub-basins is available in Appendix G.

4.3.3 Environmental Justice Areas

Environmental justice areas will be compared with the sub-basins and considered when ranking basins. The percentages based on low-income and minority population densities will be averaged to obtain a combined "severity level" of environmental justice concerns for each sub-basin. The sub-basins will then be ranked in order of severity with the most severe ranking receiving a ranking of five. A map of the environmental justice concerns delineated by sub-basin is available in Appendix G.

Low-income and minority areas were determined using the EPA's definition. Low income is defined as a household income that is less than or equal to twice the federal poverty level and minority as people who are not single-race white and not Hispanic. Minority percentages were determined using the 2020 census data, and low-income using the average household size of 2.6 people to determine the poverty line.

4.3.4 Preliminary Sewer Assessments

Preliminary sewer assessments will analyze the existing sewer capacities from the hydraulic model areas in need of repeat maintenance, due to excess silt or debris, or other studies resulting from the WWTA based assessment.

4.3.5 Customer Complaints and Work Orders

Customer complaints will be recorded through the WWTA's Work Order System currently being implemented. Any complaints resulting from SSOs will be included in this analysis represented in the SSO criteria.

4.3.6 Underway Remedial Measures

The WWTA has been rehabilitating basins within the Early Action Projects, while additionally focusing on customer complaints, emergency repairs, field work orders, and other known concerns throughout the system. The priority determination will be used as a basis for scheduling future measures, and measures already in process will be removed from the rankings.

4.3.7 Flow Isolation Studies

Flow isolation studies may be performed as necessary to specifically target significant sources of I/I. This data may be utilized to prioritize specific study areas where the entire sub-basin may not have been determined to be a priority but other factors show signs of significant I/I.

4.4 Prioritization Analysis Matrix

The purpose of the matrix will be to utilize the priority criteria listed in Section 4.3 to group the sub-basins into priorities and to assist the WWTA in determining the order of SSER investigation.

Initially, each parameter will be scored differently, e.g., using count of structural and service defects, value of peak to average ratio for RDII, total length of water bodies, etc.

All scores will be divided by the total linear footage of sewer in the respective sub-basins, so scores are independent of basin size. Furthermore, the scores will be normalized on a scale of 1 to 5 so that they can be compared equally across the different parameters. This will be a continuation of the Initial Priority Ranking matrix used to set the initial priority groupings, including the additional metrics set forth in the Consent Decree. The factors used to determine the score given can be found in Table 4-4 and an example of the matrix is found in Appendix F.

Table 4-4
KPIs Used for Basin Priority Ranking Conforming to CD Requirements

KPIs Used	Value Assigned					
	0	**1**	**2**	**3**	**4**	**5**
Net RDII (MG)	≤0.050	N/A	>0.050	>0.100	>0.150	>0.200
Normalized Net RDII (gal/LF)	≤4.0	N/A	>4.0	>10.0	>15.0	>20.0
Normalized Net RDII Rank in Basin	N/A	5th Highest in Basin	4th Highest in Basin	3rd Highest in Basin	2nd Highest in Basin	1st Highest in Basin
Ratio of Hourly Average to Peak	≤5:1	N/A	>5:1	>10:1	>20:1	>30:1
Chronic SSOs (Yes or No)	No	N/A	N/A	N/A	N/A	Yes
Chronic SSOs (#)	≤5	N/A	>5	>10	>15	>20
Capacity Issue (Yes or No)	No	N/A	N/A	N/A	N/A	Yes
Impaired Stream in Basin (LF)	≤3,000	≤6,000	≤9,000	>9,000	N/A	N/A
Environmental Justice	≤20%	≤30%	≤40%	>40%	N/A	N/A
Work Orders and Customer Complaints (#)	Low	Rarely	Minor	Moderate	High	Extremely High
Remedial Measures Already Undertaken	Excellent	Very Good	Good	Satisfactory	Average	Unsatisfactory

*6 Points given

5 WCTS Condition Assessment and Rehabilitation

5.1 Information Management System

5.1.1 SSER, Gravity Sewer, and Manhole Data

The WWTA has developed standard requirements for the collection of data for condition assessments. This includes conformity to NASSCO standards for Pipeline Assessment & Certification Program (PACP) and Manhole Assessment and Certification Program (MACP) inspections, delivery of a compliant NASSCO exchange database format, and specific media file (video, photo, PDF reports) naming conventions. The WWTA requires that smoke test inspection records be submitted in a consistent standard data structure. Selected vendors are required to collect data as described throughout Section 5 of this document. See Attachment 2 Field Data Delivery Format Requirements located in Appendix I for an overview of how SSER data is to be provided to the WWTA.

Upon receipt of the SSER data deliverable, the WWTA and its Program Manager will conduct a systematic QA\QC audit on the data submittal to assess the level of compliance with the specifications. Approved data, including databases, CCTV videos, inspection field reports, observation photographs, and other supplemental files related to the SSER, are stored on a network share drive that is maintained and archived by the WWTA.

All pipeline and manhole rehabilitation data will be collected and maintained on a list in the WWTA's database server to allow querying and reporting of the records and viewing in GIS maps.

5.1.2 GIS Data

The WWTA's sewer asset inventory is stored in a GIS database, which is maintained and archived by the WWTA.

SSER inspection records will be compared to the WWTA's GIS asset inventory. This includes resolving any data conflicts or discrepancies. This includes, but is not limited to, asset ID, pipe lengths, diameters, shape, and materials. WWTA will update the GIS asset inventory to include structures identified during SSER inspections that were previously undocumented.

All SSER inspection and observation records, when feasible, are integrated into the WWTA's GIS asset inventory. Inspection records and respective media files can be accessed directly and have associated a geographic location.

5.1.3 Pump Station and Force Main Data

Pump Station and Force Main Data is comprised of checklists, work order history, and inspection reports. Maintenance of this data will be described in greater detail in the Pump Station Preventive Maintenance Program. The data is contained in the WWTA's Asset Management System and managed and populated by maintenance staff through work orders. Pump Station

and Force Main rehabilitation will be tracked through the WWTA's Asset Management System and GIS.

5.2 Manhole Condition Assessment and Rehabilitation

5.2.1 Standard Procedures for the Condition Assessment of Manholes

Manhole inspections will be performed on accessible manholes in the sub-basins as determined by the project prioritization. Assessment of manholes will be conducted following NASSCO's MACP guidelines.

5.2.2 Standard Procedures for Manhole Rehabilitation

Manholes located within the project priority areas will be reviewed for defects. Manholes with defects will be reviewed more thoroughly to develop the required rehabilitation techniques necessary to remove I/I and repair any structural defects. The assessment of which defects are to be corrected are described in 5.2.2.1 and 5.2.2.2. Manhole rehabilitation will be divided into 2 categories: 1) subsurface manhole rehabilitation; or 2) surface manhole rehabilitation. Once rehabilitation has been competed rehabilitation data will be provided in the appropriate format (See Appendix I - Field Data Delivery Format Requirements).

5.2.2.1 Subsurface Manhole Rehabilitation

Subsurface manhole rehabilitation includes non-destructive manhole rehabilitation utilizing either epoxy or polymer resin-based products.

Standard methods and procedures for subsurface manhole rehabilitation will follow NASSCO's Manhole Rehabilitation Performance Specification Guideline dated December 2013.

5.2.2.2 Surface Manhole Rehabilitation

Surface manhole rehabilitation includes the use of manhole inflow dish inserts or manhole frame chimney seals to reduce I/I from entering the manhole.

Standard methods and procedures for surface manhole rehabilitation will follow NASSCO's Manhole Rehabilitation Performance Specification Guideline dated December 2013.

5.3 Gravity Sewer Line Defect Analysis and Rehabilitation

5.3.1 Standard Procedures for Analysis of Gravity Sewer Line Defects

NASSCO-standard databases contain records for each CCTV inspection run and the condition observed by the operating crew. These conditions (observations) are electronically coded and include data that will be leveraged for analysis. Such data generally includes:

- Pipe reference and associated manhole references;
- Observation type (crack, infiltration, water level reading, general photograph, etc.);
- Distance from end of pipe;
- Clock position in pipe;
- Standardized severity codes; and

- Associated photographs.

Condition records will be checked for quality by using the database information to import them into GIS. Erroneous data will be highlighted by this process, such as typographical errors in reference fields (pipe, manhole, etc.) or inspections being performed in a pipe other than the one labeled. Databases with such errors will be rejected until the errors can be addressed. Once data are updated and the spatially referenced conditions exist as points in GIS, manual quality control of captured data is facilitated. Quality control consists of scanning a plan view of the SSER project area and accessing pictures and video though hyperlinks. This enables the quick identification of assets in need of rehabilitation relative to adjacent assets.

5.3.1.1 Defect identification procedures and guidelines

Most observation codes are identifiable as defects worthy of evaluation for rehabilitation. Some codes, however, are intended for structural features or general observations, and these will not be considered as defects for purposes of rehabilitation evaluation. Codes that are not considered defects include:

- Access points (manholes, cleanouts, etc.);
- Taps that are not defective or intruding;
- Point repairs that are not defective;
- Several miscellaneous codes, including:
    - General observations and photographs;
    - Changes in joint length, lining, pipe material, pipe size, or pipe shape;
    - Water levels not caused by sags; and
    - Abandoned survey codes (which should always be paired with a corresponding defect code that is the cause of the abandoned survey).
- Lining failures for abandoned connections.

All remaining codes will be considered as defects and will be considered for rehabilitation, utilizing a logical assessment process.

5.3.1.2 Cataloging Defects

NASSCO provides a mechanism for scoring internal pipe defects based on their type and severity. Defects are assigned a grade of 1 through 5, with 1 being a minor defect and 5 being the most significant defect grade. These grades alone are insufficient to select rehabilitation measures but are a critical input to the assessment logic. There are two types of defects that are considered: 1) structural and 2) operations & maintenance (O&M).

In general, structural defects represent damage or failure of the pipe which can only be addressed through rehabilitation measures. These measures may include point repairs, lining, or replacement through pipe bursting or open excavation. Some examples of structural defects are cracks, holes, or exposed concrete aggregate. Structural defects receive a “structural grade” indicating severity. On the other hand, O&M defects consist of foreign materials in the pipe that may reduce the system capacity, such as gravel or roots. These defects are commonly addressed

through cleaning. O&M defects receive an "O&M Grade". For rehabilitation assessment, only structural defects and their associated structural grades are considered.

The structural grade of each defect is calculated based on the standard mechanism called for in the NASSCO PACP standards. These grades are used to compose a structural pipe rating that offers a quick glimpse into the severity of any pipe.

5.3.2 Gravity Sewer Line Rehabilitation

5.3.2.1 Rehabilitation Prioritization

Utilizing the CCTV and sonar inspection data, the rehabilitation of the piping will be prioritized to reduce I/I and reduce the risk of future SSOs. NASSCO-approved databases containing inspection and defect information will be analyzed to produce rehabilitation recommendations on the associated pipes. The analysis will consist of integration of the SSER data into the GIS (as described in Section 5.1.2), followed by the application of a rehabilitation support tool built to apply rehabilitation selection logic to each inspected pipe.

5.3.2.2 Initial Rehabilitation Recommendations

Following the collection and quality control of defect coding, the pipe segments within each sub-basin will be processed through the initial rehabilitation recommendation procedures. This process is a standard method for analyzing the system uniformly to target piping necessary for rehabilitation. The rehabilitation assessment tool will be automated utilizing the following five basic principles:

1. Focus on grade 4 and 5 defects in addition to infiltration defects.
2. Address significant hydraulic restrictions in the pipe.
3. Assess relative location of defects and facilitate full vs. partial segmental rehabilitation.
4. Address mains, manholes, and laterals in relation to each other.
5. Eliminate insignificant defects.

The results from the initial rehabilitation assessment will then be reviewed for constructability. This evaluation includes a review for anomalies in the data, a spot check of "no rehabilitation" sections, as well as the recommended lateral and manhole rehabilitation methodologies.

5.3.2.3 Final Rehabilitation Recommendations

Once all initial rehabilitation assessment has been completed, the piping will then be analyzed for final design and construction. All initial assessments will be reviewed and verified to determine that the correct methods of rehabilitation have been chosen based on constructability, full vs. partial rehabilitation, environmental concerns, and cost.

5.3.2.4 Gravity Sewer Line Rehabilitation Procedures

The WWTA will generally utilize the following rehabilitation techniques to perform the gravity sewer line rehabilitation:

- Cured-in-Place Pipe (CIPP)

- CIPP Lateral Rehabilitation
- Pipe Bursting
- Open Cut Replacement
- External Point Repair
- Internal Point Repair

Standard procedures for CIPP, CIPP lateral rehabilitation, and Pipe Bursting will follow NASSCO's Performance Specification Guidelines. Consultants and WWTA will develop these specifications to meet project specifics.

Additional techniques may be utilized if deemed necessary and the WWTA will review and approve these rehabilitation techniques on a case-by-case basis.

5.3.3 Private Lateral Investigations

Private lateral investigations will be completed through main line CCTV or through smoke testing (Section 6) inspections in sub-basins as determined by the project prioritization. The WWTA will analyze smoke testing anomalies that occur on private property and split them into the following three categories:

- Lateral line anomalies
- Cleanouts
- Other (new lines with unbuilt homes, public owned property, home gutters or home storm drainage connections, etc.).

5.4 Force Main Condition Assessment and Rehabilitation

Force mains will be identified for condition assessment or rehabilitation based on several factors including SSOs, age, work orders, master planning, and capacity. Once assessment or rehabilitation is deemed necessary for a force main, the WWTA will determine the necessary techniques to be utilized and may perform the assessment or rehabilitation through its maintenance program or by a contractor.

5.4.1 Standard Procedures for Analysis of Force Mains

Prior to performing field inspections, a force main will be assessed through an initial review utilizing typical data gathering activities. An example inspection form of data to be analyzed and collected is available in Appendix I. The inspection form also describes the typical field preparation activities conducted during force main analysis. The inspection of force mains will comply with the Water Environment Research Foundation's (WERF) *Inspection Guidelines for Wastewater Force Mains.* Field inspections will utilize the Force Main Inspection Form, or similar format, available in Appendix I.

5.4.1.1 Inspection Methods

Preliminary drawdown tests of pump stations will be conducted to evaluate if there is a capacity issue with a force main. Pump efficiency will be used to determine if defects may be present in

the force main. Additionally, the WWTA will utilize additional methods, if necessary, to further investigate the condition of a force main:

Pressure Testing – Leak Detection

Free-Swimming Inspection Tools – "SmartBall" Leak and Gas Pocket Detection

Acoustic Leak Detection - Leak and Gas Pocket Detection

If these methods are determined to be inadequate, NASSCO's Pressure Pipe Guideline Matrix for Selection of Pressure Pipe Assessment Tech may be implemented.

5.4.1.2 Corrosion Defect Identification Inspections

FMs may be investigated for evidence of corrosion and corrosion potential using. Corrosion defect analysis is described in Section 6.1.

5.4.2 Force Main Defect Grading and Analysis

Following inspection of the force main, identified defects will be reviewed according to severity along with other information collected depending on the inspection techniques utilized. This data will be used to determine further assessment and/or rehabilitation and schedule further maintenance and future work orders if necessary.

The components below will be ranked on a 1-5 basis using information gathered prior to testing, during inspection, and after testing. (Refer to Appendix I.) Two major components will be considered: 1) the Likelihood of Failure and 2) the Consequence of Failure.

Likelihood of Failure:

- Operational History
- Age and Material of FM
- Presence of Defects:
    - Material Degradation
    - Structural Defects

Consequence of Failure:

- Location of FM – Proximity to:
    - Homes
    - Tennessee River
    - Impaired Streams
    - Environmental Justice areas
- Size of FM – Capacity

5.4.3 Force Main Rehabilitation

NASSCO's Pressure Pipe Material Matrix lists techniques for rehabilitation of force mains as well as notable considerations regarding these methods.

Methods include:

- Segmental/Continuous/Loose Fit Slip lining
- Inversion or Pull In Place CIPP
- Spray in Place
- Wet Lay-up
- Insitu Pipe Replacement

These may be considered by the WWTA and consultants on a case-by-case basis. In some cases, a parallel force main pipe may be necessary rather than using one of the methods listed above.

5.4.4 Force Main Rehabilitation Effectiveness

In addition to post-construction flow monitoring, rehabilitated force mains will be scheduled for periodic physical inspections – generally, a baseline after construction and "in service" of rehabilitated pipe followed by periodic monitoring based on an accepted duration criteria estimated from the mean expected remaining useful life of the refurbished FM. Inspection will consist of visual checks and spot wall thickness measurements. The post-rehabilitation data collection shall comply with the Field Data Delivery Format Requirements in Appendix H.

5.4.5 Air Release Valve (ARV) Program

Identification and inspection of all ARVs will be performed by the WWTA as a continuous improvement effort in the Pump Station Operations and Preventive Maintenance Program. Most of the ARVs are in manholes and inspections can be performed without interruption to pumping operations. Location coordinates will be logged using GPS and the information will be imported into GIS. An initial inspection will be conducted when the ARVs are located. The WWTA will develop a plan for ongoing maintenance and replacement of ARVs, which will be included in the Pump Station Operations and Preventative Maintenance Program. Preventive maintenance work orders will be tracked in the WWTA's asset management database. When feasible, the WWTA will utilize specifications to standardize ARVs to simplify valve maintenance and pre-purchase an inventory of ARVs for replacements.

5.5 Pump Station Performance and Rehabilitation

Pump capacity and performance may be evaluated utilizing various methods depending on the layout of the station.

5.5.1 Evaluation of Pump Station Performance

Controls Evaluation

Pump run time meters will be used at all wastewater collection pump stations. During routine operational visits, PS operators will collect flow meter readings and pump runtime readings. Pump runtime readings are recorded in the station logbook for operator review. WWTA utilizes remote telemetry systems (Mission SCADA), and pump start counters at 13 of the larger pump stations. Currently, any issues identified by operators are reported to the appropriate work

center. However, the WWTA is in the process of implementing a new work order system through GIS, so maintenance issues will be documented in a digital format in the future.

The following pump stations have a Mission Communications monitoring system installed: Green Gap, Hurricane Creek, Lake Carolyn, Lee Highway, London Woods, Rhinehart Valley, Rodgers Branch, Roy Lane, Short Tail Springs, Snow Hill Road, Soddy Industrial, Soddy EQ Basin and Pottery Lane.

Additionally, a Mission Communications monitoring system is scheduled to be installed at the following three pump stations: Durham Street, Amos Road, and Amos East.

Nominal Average Pump Operating Time

The NAPOT will be computed by using runtime data over a 1-year assessment period for the stations with fixed speed pumps. The total run time in hours for a station will be summed over the assessment period. The sum will be divided by the number of days in the assessment period and the result in hours/day will be divided by the sum of the total pumps in the station minus one. This value will be considered the NAPOT. If the NAPOT is greater than 10 hours/day, the station will be identified as needing additional investigation. The NAPOT for stations with variable frequency drives will be computed using records of power consumption over the assessment period.

Root Cause Failure Analysis

A Root Cause Failure Analysis may be conducted for pump stations with a history of operational failures. This analysis will begin with a data collection investigation to determine the events that have led to pump station failures and their consequences. The assessment protocol will document the individual components of the pump station to determine the failure modes, failure causes, and the failure consequences for each. Through this assessment, patterns of events will be recognized and recommendations for early detection and corrective actions can be made.

Capacity

Pump station capacity will be evaluated using methods described in the Water Environment Federation's (WEF) Manual of Practice FD-4, *Design of Wastewater and Stormwater Pumping Stations*. Parcel data from GIS will be used to estimate the number of connections, current land use, available land for development, and existing infrastructure. Utilizing these available tools with existing master planning documents, the current and future theoretical capacity of each pump station can be estimated and compared against design capacity and actual field results. In instances where the flow values are not in alignment, those pump stations can be identified for upgrades.

The pump station capacity evaluation will use the hydraulic model and draw-down tests to confirm pump performance and wet well capacity in various operating scenarios. The capacity evaluation may also include temporary flow monitoring:

- Magnetic or Doppler flow monitors on force mains; and
- Open channel flow monitors on influent sewers (paddle or ultrasonic type).

Critical Response Time

The WWTA will evaluate critical response times by calculating the time from the high-level alarm in the wet wells to the first SSO in the system that would begin under peak flow conditions. The critical response time under peak wet weather conditions may be evaluated using the hydraulic model and existing system operation procedures, such as:

- Pump operation – sequence, lead-lag, any real time control data to "early start" or select pumps of different capacities based on expected or modeled flow;
- Wet well levels – activation (start/stop) of pumps and sequence for pumps of varying capacities, including pumps operated under variable speed (VS) conditions; and
- Estimated time to overflows – predicted time to overflow wet well and/or surcharge upstream manholes based on surveyed inverts or grades and hydraulic model geometry.

$$Critical\ Responce\ Time\ (min) = \frac{Storage\ Volume\ (gal)}{Peak\ Flow\ In\ (gpm)}$$

Storage Volume = Volume from high-level alarm to rim of wet well + storage volume in upstream pipes

Peak Flow In = Peak flow to pump station based on pump rated capacity, known peak flow, or hydraulic model depending on available information

Maintenance Corrective Action Evaluation

The WWTA will evaluate the ability of its maintenance personnel to take corrective action within the critical response time. WWTA personnel for on-call response to pump station issues reside throughout the WWTA service area. To minimize response time, personnel are assigned pump stations based on the proximity to their residence. The travel time from personnel's location to each pump station is compared to the pump station's critical response time to determine if action can be taken by an operator within that time. As staffing and critical response times change or are modified this metric will be reevaluated.

5.5.2 Evaluation of Pump Station Design and Equipment

Pump stations will also be evaluated for conformance with the design guidelines established in "Ten States Standards". For example, the "Ten States Standards" require each pump station to be capable of handling the peak flow with the largest pump out of service. The actual peak pumping rates will be compared to the design rate and system curve. Pump modifications or upgrades may be recommended when actual peak pumping rate is less than the design rate.

Station Reliability Assessment

This assessment will be conducted by comparing the PS with the design standards in the Ten State Standards. The WWTA will utilize the information from pump station assessments to determine deficiencies in equipment and electrical components that affect the overall reliability of the station.

The assessment will generally include the following components:

- Pump Station Design – redundancy of pumps, electrical power supply, etc.
- Pump Station Equipment – pumps, controls, valves, etc.

5.5.3 Evaluation of Pump Station Condition

The WWTA will assess pump stations utilizing the Pump Station Inspection Form, see example located in Appendix I. Operational assessment procedures will be included in the Pump Station Operations and Preventative Maintenance Program.

The assessment will generally include the following components:

- Structural – Physical inspections will be conducted to evaluate the structural integrity of the pump stations. This will include assessing the condition of the wet well, valve vault, and associated components, as well as examining the overall site conditions. Ragging, debris, and signs of spalling in wet wells and valve vaults will be of particular interest.
- Equipment – Mechanical and electrical inspections will be conducted to evaluate the condition of the pump stations' equipment. The mechanical inspections will focus on the observation of the pumps, pump control systems, valves, and support guide rails. The electrical inspections will concentrate on the condition of the electric panels and control instrumentation. Additionally, backup power, backup pumps, types of levels, and controls will be specifically noted. Each piece of equipment within the station will be assigned a specific preventative maintenance (PM) schedule, which will be programmed into the WWTA's asset management system for tracking and compliance.
- O&M history

Corrosion Defect Identification

Corrosion of structures and systems will be identified primarily by visual inspection. Functional design and operation that might lead to corrosion will also be reviewed. This inspection will generally include the items described in Section 6.1.2.

5.5.4 Rehabilitation Priority Setting

Inspection

Pump station inspections will be documented by collecting data from field observations into a standard inspection form. As inspections are completed, items requiring urgent remediation will be identified. Urgent remediation will be required when a failure has occurred or when an impending failure that will compromise facility operation is evident, such that an SSO could occur or that personnel safety is at risk. Prior to inspection, background and field data will be collected to the best of the workers' ability, with past work orders and SSOs being considered.

Ranking

Following the field inspections, pump stations will be ranked based on their structural, mechanical, and electrical components, as well as their overall site conditions. The highest priority sites will have the lowest critical response time and the highest consequence of failure.

Additionally, rankings may be further refined based on the nature and severity of specific defects, with particular emphasis on defects that impact the operational functionality of the pump stations.

Rehabilitation

The WWTA will use the methods listed above to determine the Pump Stations with the greatest need for rehabilitation. Pump Station rehabilitation items may include:

- Pump and motor upgrades;
- Valve and piping improvements;
- Level and controls upgrades;
- Structural repairs and coating systems;
- Screening improvements; and
- Redundancy plans (bypass connections, generators).

Rehabilitation Effectiveness

The effectiveness of rehabilitation can be determined by comparing pre- and post- rehabilitation pump station performance values outlined in Sections 5.5.1 and 5.5.2. This data will be tracked through GIS and rehabilitation measures will be catalogued in the work order system using the Data Dictionary available in Appendix J.

6 Assessment Methods and Components

6.1 Corrosion Defect Identification

6.1.1 Corrosion Defect Identification Inspections for Force Mains

Force mains may be investigated for evidence of corrosion and corrosion potential using non-destructive testing (NDT), external (non-pipe), external (pipe surface), and/or internal (inside the pipe) means. Limited destructive testing may also be utilized.

6.1.1.1 External (non-pipe) Surveys

External surveys may consist of the following:

- Close Interval Potential (CIP) – pipe to soil surveys on cathodically protected or electrically continuous pipelines.
- Geotechnical information review – evaluation of geotechnical data from prior construction or other investigations looking for foundation issues, unsuitable soils and high or fluctuating ground water table in the pipe bedding zone.
- Soil and water chemistry – soil conductivity and resistivity sampling employing Wenner 4 Pin Method, 2 Pin Method and Soil Box Method for total soil acidity and soil pH; ground water sampling for chlorides, sulfates, and Langelier Index.
- Adjacent utilities review – identify utilities with cathodic protection (CP) systems that may create stray current corrosion potential affecting ferrous pipes.

6.1.1.2 External (pipe surface) Surveys

Surveys conducted on the pipe surface or on pipe appurtenances may consist of the following:

- Acoustic average wall thickness – ferrous, PCCP/RCP, PVC and asbestos cement (AC) materials.
- Acoustic emissions testing (AET) – detect wire breaks and wire/pipe related events in PCCP, BWP.
- Ultrasonic (UT) thickness – ferrous materials.
- Magnetic flux leakage (MFL) – external or internal measure of ferrous wall thickness and defect identification, 360-degrees axial direction along pipe.
- Broadband Electro-Magnetic (BEM) - external or internal measure of ferrous wall thickness and defect identification, 360-degrees axial direction along pipe.

6.1.1.3 Destructive Testing

Destructive testing may consist of the following:

- Coupons - Removal of pipe wall samples for metallurgical and/or radiographic inspection. This can be done with operating assets, stock or removed pipe material and is typically ferrous or AC materials.

- Continuity testing – Removal of outer layer of concrete on PCCP and BWP to test wires/bars for electrical continuity and observe corrosion or other material distress that might result in loss of hoop stress in pipe.

6.1.2 Corrosion Defect Identification Inspections for Pump Stations

6.1.2.1 Structural integrity

- Wet wells, influent structures, terminal manholes, splitter boxes (any structures exposed to raw wastewater flow) – concrete and metal components. Exposed reinforcing bars, spalling, rust.
- Above-grade facilities, dry wells, buildings (structures that might be exposed to hydrogen sulfide or other corrosives gases from raw wastewater as well as normal age-related deterioration) – concrete and metal components. Exposed rebars, spalling, rust, corroded fasteners, anchorages, crane rails and frames (other lifting apparatus).

6.1.2.2 Electrical and Mechanical Systems

(Components exposed to raw wastewater flow or off-gas constituents)

- Main switchboard, motor starters/VFDs, panelboards, transformers, lights, conduit. Presence of conduit seal-offs, coated conduit, NEMA 4/4X and 7 (explosion-proof) enclosures, conductor attachment, grounding wires, corroded windings. Standby power fixed generators and “plug-in” facilities.
- Instrumentation & control components. Similar to general electrical considerations for corrosion and functionality – especially note devices that immersed or otherwise exposed to raw wastewater (floats, venturi and other meters).
- Mechanical process equipment (handling raw wastewater). Pump supports, couplings, anchorages/bases, motors and associated electrical devices. Solids handling (macerators/grinders/comminutors, mechanical screens). Odor control and chemical feed equipment.
- Mechanical building equipment. HVAC components (fans, heaters, air conditioning, louvers), plumbing and fire protection sprinklers. Elevators, lifts, cranes (overhead, rail, jib). Standby power fueling and genset enclosures, fuel tanks and piping.

6.2 Closed Circuit Television (CCTV) Inspection

CCTV Inspection will be performed on accessible piping in the sub-basins as determined by the project prioritization. Generally, pipes less than 24 inches in diameter will have preconditioning and cleaning and CCTV inspections performed. Pipes with sizes 24 inches in diameter and greater will have a combination CCTV and sonar inspection performed.

6.2.1 Standard Procedures CCTV Cleaning, CCTV, and Sonar Inspection

Standard methods and procedures for cleaning and inspection will follow the Hamilton County WWTA's standard specifications for sewer pipeline inspections. The following specifications are available in Appendix H:

- 33 01 30.14 – Preconditioning and Cleaning of Underground Sewer Pipelines
- 33 01 30.16 – Close Circuit TV Inspection of Existing Underground Sewer Pipelines

6.3 Smoke Testing

Smoke testing will be performed, where feasible, in sub-basins as determined by the project prioritization. The smoke testing will be performed as described in the standard specification and will be utilized to assess the system for significant sources of I/I. The smoke testing procedures were developed to include private lateral investigations to identify sources of I/I.

The methods and procedures for smoke testing of underground sewer pipelines will follow the Hamilton County WWTA's standard specification for smoke testing of sewer pipelines. The following specification is available in Appendix H:

- 33 01 30.24 – Smoke Testing of Underground Sewer Pipelines

7 Analysis of Completed Rehabilitation Effectiveness

The effectiveness of completed rehabilitation will be assessed with data collected prior to and following rehabilitation efforts. The main goals of the rehabilitation efforts include Rainfall-Derived Infiltration and Inflow (RDII) removal and SSO reduction. The effectiveness of rehabilitation will be analyzed both on a project-by-project basis and on an overall CD program basis as described throughout this section.

7.1 Pre- and Post-Rehab Flow Monitoring

The WWTA will continue their program to monitor flows within Group 1-5 sub-basins and Residual basins to establish flows prior to performing SSER and for a comparison following rehabilitation efforts.

The WWTA will install flow monitors for a minimum duration of 6 months, when feasible, prior to SSER and rehabilitation efforts. The flow monitors should be removed at the start of construction as data is not valid during bypassing scenarios and due to the possibility of being damaged while working. Following construction, flow monitors will be replaced when feasible and will record data over a comparable period.

The flow monitoring for pre- and post-rehabilitation monitoring should follow the following plan:

Where: (Overall Basins)

- A monitor at the exit of the sub-basin; and
- A monitor at any entrance points to the sub-basin.

Project Rehab Specific:

- Downstream of rehabilitation and as close to the rehabilitation as possible to eliminate as much of the non-rehabbed sewer as possible.
- Upstream of rehabilitation and as close to the rehabilitation as possible; and
- Pre-rehabilitation monitors will be placed as soon as rehabilitation areas are identified (likely 30%). Utilizing the pre- and post-flow monitoring data, the WWTA will perform an RDII analysis as described in Sections 3 and 4 of this document.

Comparing post-rehabilitation base flows and RDII volumes with pre-rehabilitation, along with actual RDII, will assist the WWTA in determining the overall and project performance of the rehabilitation efforts.

7.2 SSO Trending

As discussed in Section 4.3.1, SSOs in the WCTS are reported and data is collected into a complete database. Wet weather SSOs will be trended on a regular basis to review project results. This trending will be developed utilizing charts and GIS maps to represent SSO quantity

and volume and rainfall data trending over time. The WWTA will review the SSOs reported during the condition assessment and rehabilitation periods to like rainfall events during post-SSER and rehabilitation periods and make representative comparisons as a factor in evaluating the performance of the constructed rehabilitation. The WWTA will also review wastewater surcharging and customer complaint data that may be available in the same manner.

Appendix A – SSER Basin Map

WWTA SSER Basins

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA AND ESRI. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

- East Ridge
- Hamilton County
- Lookout Mountain
- Red Bank
- Signal Mountain
- Soddy Daisy
- Hamilton County Boundary

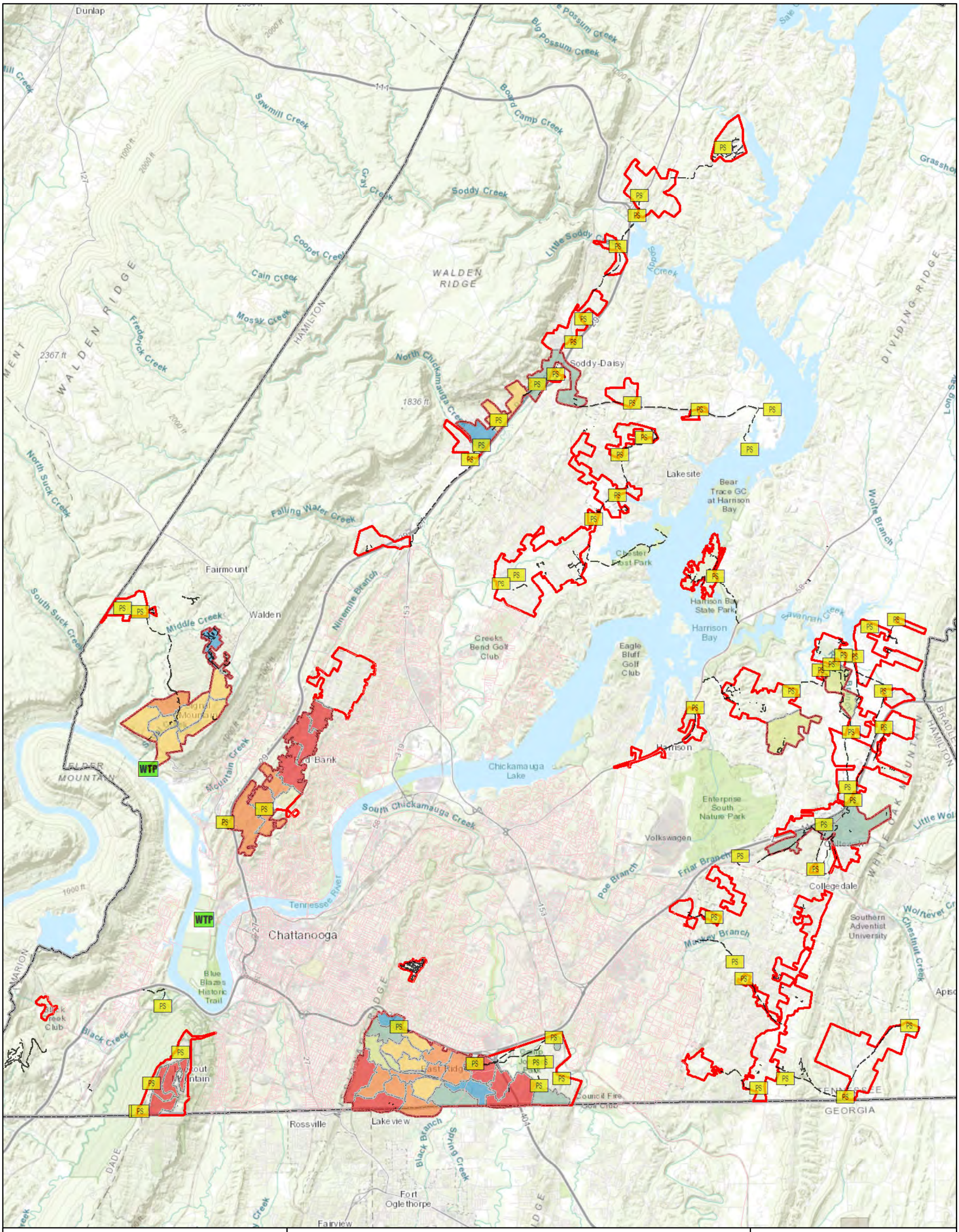
LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

N

1 inch = 12,000 feet

Feet
0 6,000 12,000

Appendix B – CD Groups for Sewer Rehabilitation



Legend

SSES Basins Updated

Basin Grouping

- EA
- 1
- 2
- 3
- 4
- 5
- Hamilton County Boundary
- Service Boundary
- PS Lift Station
- WTP Treatment Plant
- Pressurized Main
- Pipes

APPENDIX B-3
WWTA SUB BASIN GROUPS

FOR:

HAMILTON COUNTY WATER & WASTEWATER TREATMENT AUTHORITY

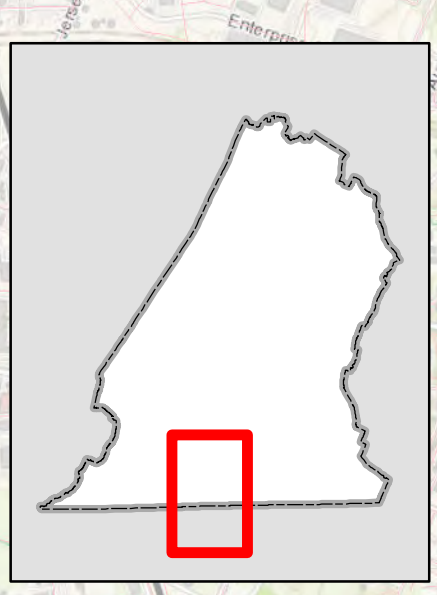
LJA ENGINEERING

LJA Engineering 1110 Market Street, Suite 300 Chattanooga, TN 37402
www.lja.com

N
W E
S

0 5,000 10,000 20,000 Feet

PROJECT NUMBER 2015-0759



ER11B
ER11A
ER06
ER09
ER08B
ER08A
ER07
ER08C
ER01B
ER01A
ER10
ER04B
ER04A
ER03B
ER05
ER02A
BP02
BP01
ER12D
ER12A
ER02B
ER03C
ER03A

Note: Residual Basins are those sub basins included within the Service Boundary or Specified Service Area and not part of the Basin Groups (Early Action through Group 5).

Legend

SSES Basins Updated

Basin Grouping

- EA
- 1
- 2
- 3
- 4
- 5
- Service Boundary
- Hamilton County Boundary

- WTP Treatment Plant
- Gravity Main
- Pressurized Main
- Pipes

APPENDIX B-3-1
WWTA SUB BASIN GROUPS
EAST RIDGE

FOR:

HAMILTON COUNTY WATER & WASTEWATER TREATMENT AUTHORITY

LJA ENGINEERING

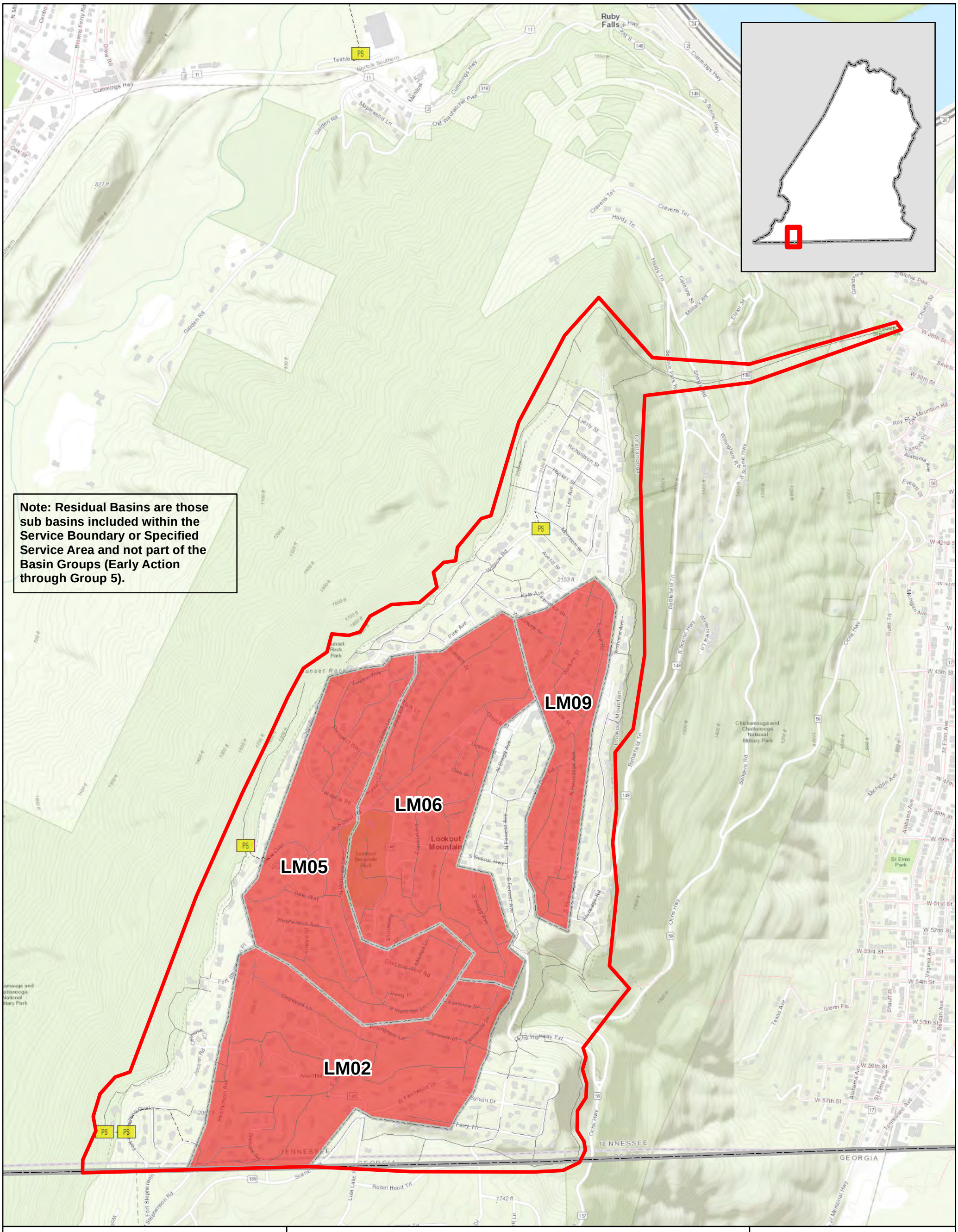
LJA Engineering 1110 Market Street, Suite 300 Chattanooga, TN 37402
www.lja.com

N
W E
S

0 1,250 2,500 5,000 Feet

#:

PROJECT NUMBER 2015-0759



Note: Residual Basins are those sub basins included within the Service Boundary or Specified Service Area and not part of the Basin Groups (Early Action through Group 5).

Legend

SSES Basins Updated

Basin Grouping

- EA
- 1
- 2
- 3
- 4
- 5
- Service Boundary
- Hamilton County Boundary

- WTP — Treatment Plant
- Gravity Main
- Pressurized Main
- Pipes
- PS — Lift Station

APPENDIX B-3-2
WWTA SUB BASIN GROUPS
LOOKOUT MOUNTAIN

FOR:

HAMILTON COUNTY WATER & WASTEWATER TREATMENT AUTHORITY

N
W E
S

0 500 1,000 2,000 Feet

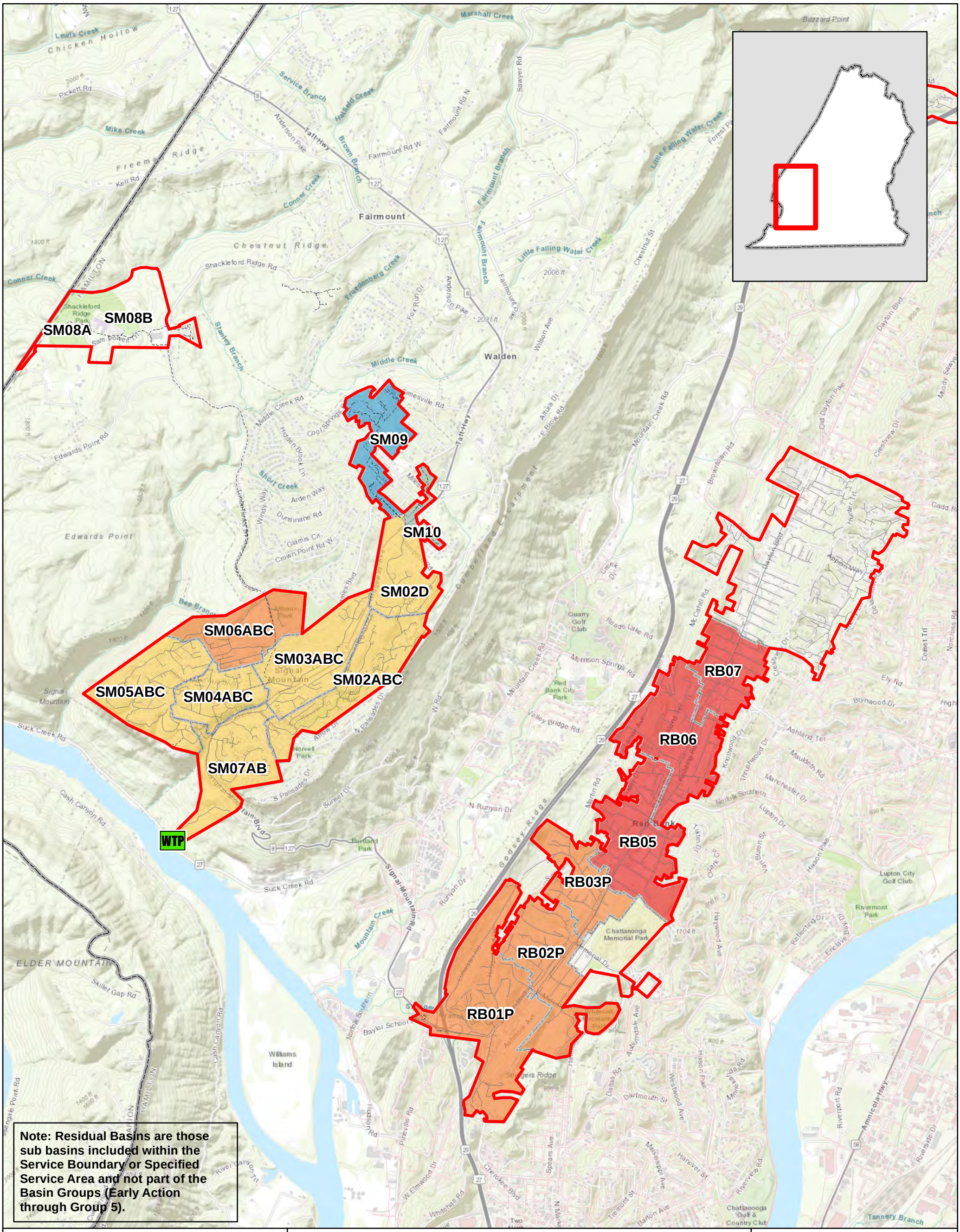
LJA ENGINEERING

LJA Engineering 1110 Market Street, Suite 300 Chattanooga, TN 37402
www.lja.com

PROJECT NUMBER 2015-0759

Date: 1/9/2023

C:\Users\wmcdonald\OneDrive - LJA Engineering\Work\WWTA\CD\Appendices\1-6-23\GIS\Appendix B-3-2 - WWTA CD Service Basin Groups 11x17 Rev2.mxd



Legend

SSES Basins Updated

Basin Grouping

- EA
- 1
- 2
- 3
- 4
- 5
- Service Boundary
- Hamilton County Boundary

- WTP Treatment Plant
- Gravity Main
- Pressurized Main
- Pipes

APPENDIX B-3-3
WWTA SUB BASIN GROUPS
SIGNAL MOUNTAIN AND RED BANK

FOR:

HAMILTON COUNTY WATER & WASTEWATER TREATMENT AUTHORITY

N W E S

0 1,250 2,500 5,000 Feet

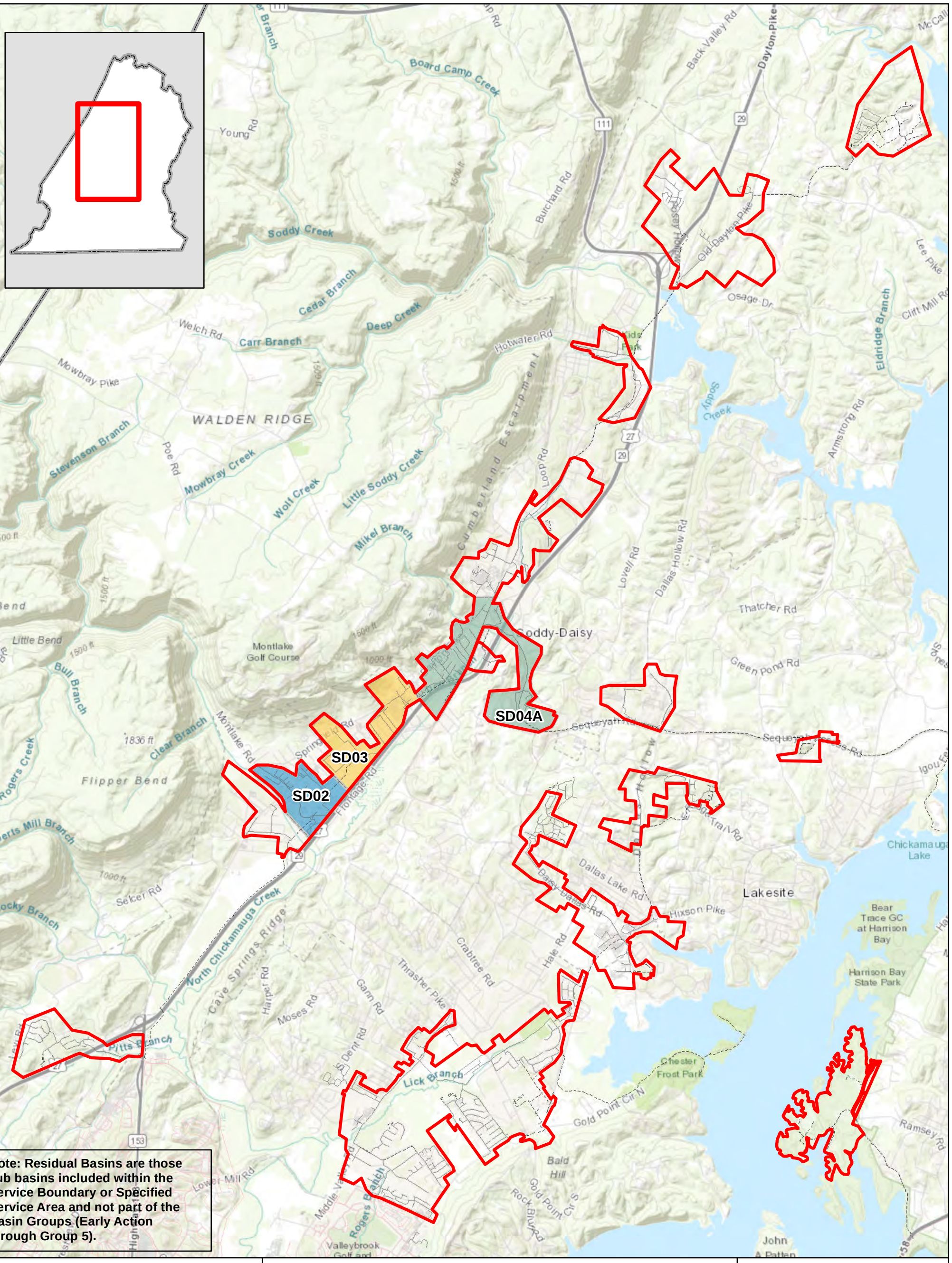
LJA ENGINEERING

LJA Engineering 1110 Market Street, Suite 300 Chattanooga, TN 37402
www.lja.com

PROJECT NUMBER 2015-0759

Date: 2/7/2023

C:\Users\wmcdonald\OneDrive - LJA Engineering\Work\WWTA\CD\Appendices\1-6-23\GIS\Appendix B-3-3 - WWTA CD Service Basin Groups 11x17 Rev2.mxd



Note: Residual Basins are those sub basins included within the Service Boundary or Specified Service Area and not part of the Basin Groups (Early Action through Group 5).

Legend

SSES Basins Updated

Basin Grouping

- EA
- 1
- 2
- 3
- 4
- 5
- Service Boundary
- Hamilton County Boundary

- WTP Treatment Plant
- Gravity Main
- Pressurized Main
- Pipes

APPENDIX B-3-4
WWTA SUB BASIN GROUPS
SODDY-DAISY AND HAMILTON COUNTY

FOR:

HAMILTON COUNTY WATER & WASTEWATER TREATMENT AUTHORITY

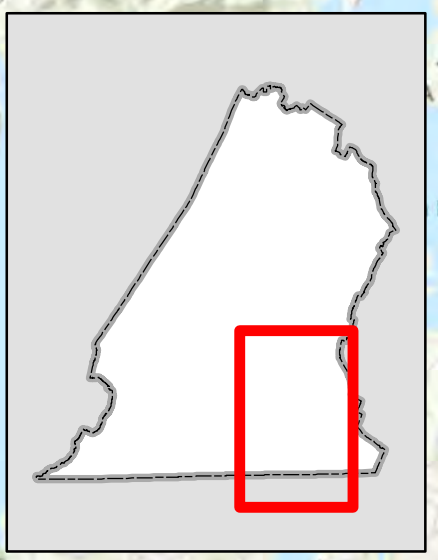
LJA ENGINEERING

LJA Engineering 1110 Market Street, Suite 300 Chattanooga, TN 37402
www.lja.com

N W E S

0 2,000 4,000 8,000 Feet

PROJECT NUMBER 2015-0759



HC17B

HC20C

HC26C

HC26A

Note: Residual Basins are those sub basins included within the Service Boundary or Specified Service Area and not part of the Basin Groups (Early Action through Group 5).

Legend

- Ooltewah Service Area
- WTP Treatment Plant
- Service Boundary
- Gravity Main
- Pressurized Main
- Pipes

Basin Groups

- EA
- 1
- 2
- 3
- 4
- 5

APPENDIX B-3-5
WWTA SUB BASIN GROUPS
UNINCORPORATED HAMILTON COUNTY

FOR:

HAMILTON COUNTY WATER & WASTEWATER TREATMENT AUTHORITY

LJA ENGINEERING

LJA Engineering 1110 Market Street, Suite 300 Chattanooga, TN 37402
www.lja.com

N W E S

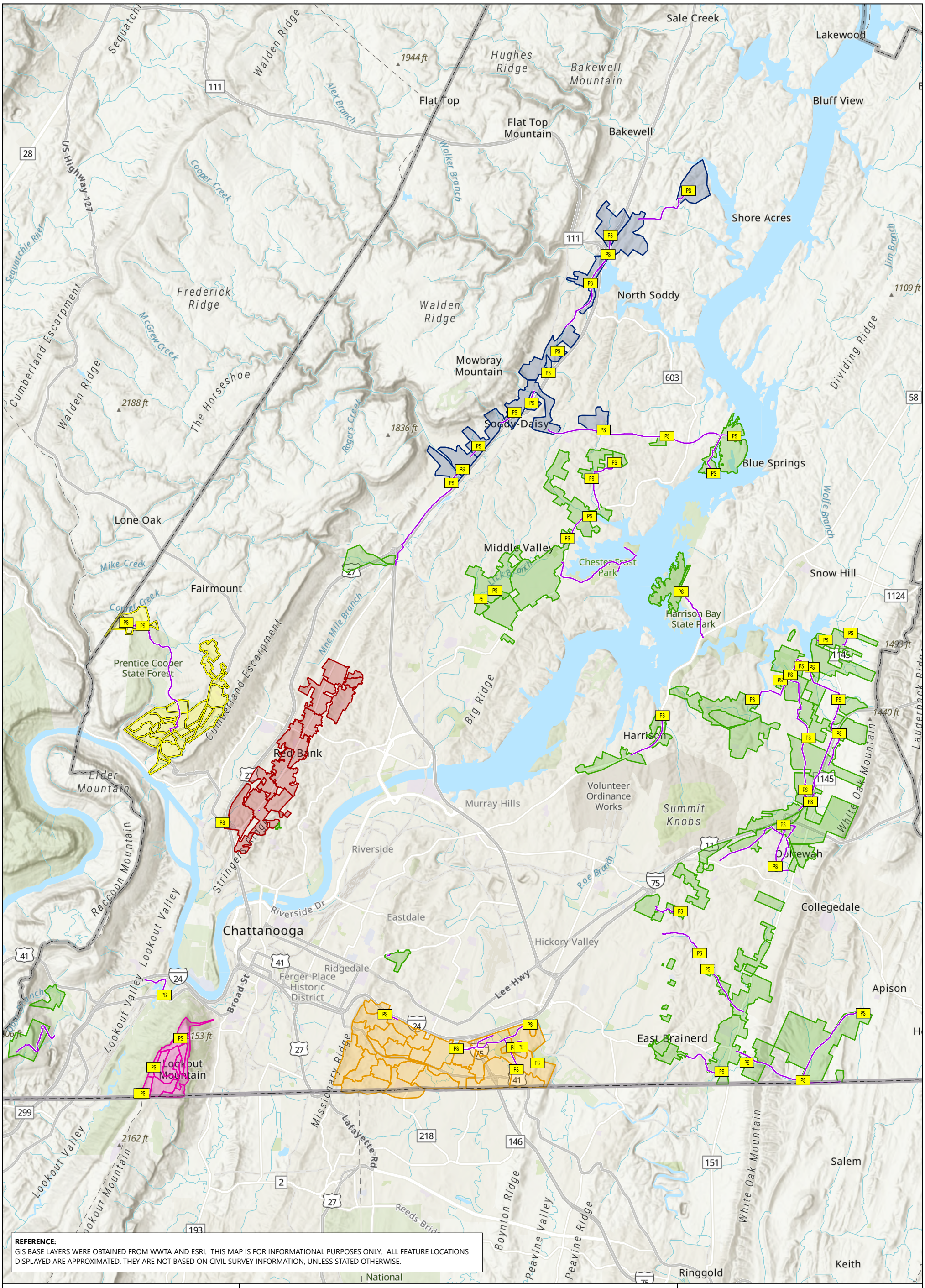
0 1,950 3,900 7,800 Feet

PROJECT NUMBER 2015-0759

Date: 1/9/2023

C:\Users\wmcdonald\OneDrive - LJA Engineering\Work\WWTA\CD\Appendices\1-6-23\GIS\Appendix B-3-5 - WWTA CD Service Basin Groups 11x17 Rev2.mxd

Appendix C – Pump Stations and Force Mains



REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA AND ESRI. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

- WWTA Pump Station
- Force Main
- East Ridge
- Hamilton County
- Lookout Mountain
- Red Bank
- Signal Mountain
- Soddy Daisy
- Hamilton County Boundary

WWTA Pump Stations and Force Mains

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

N

1 inch = 12,000 feet

Feet
0 6,000 12,000

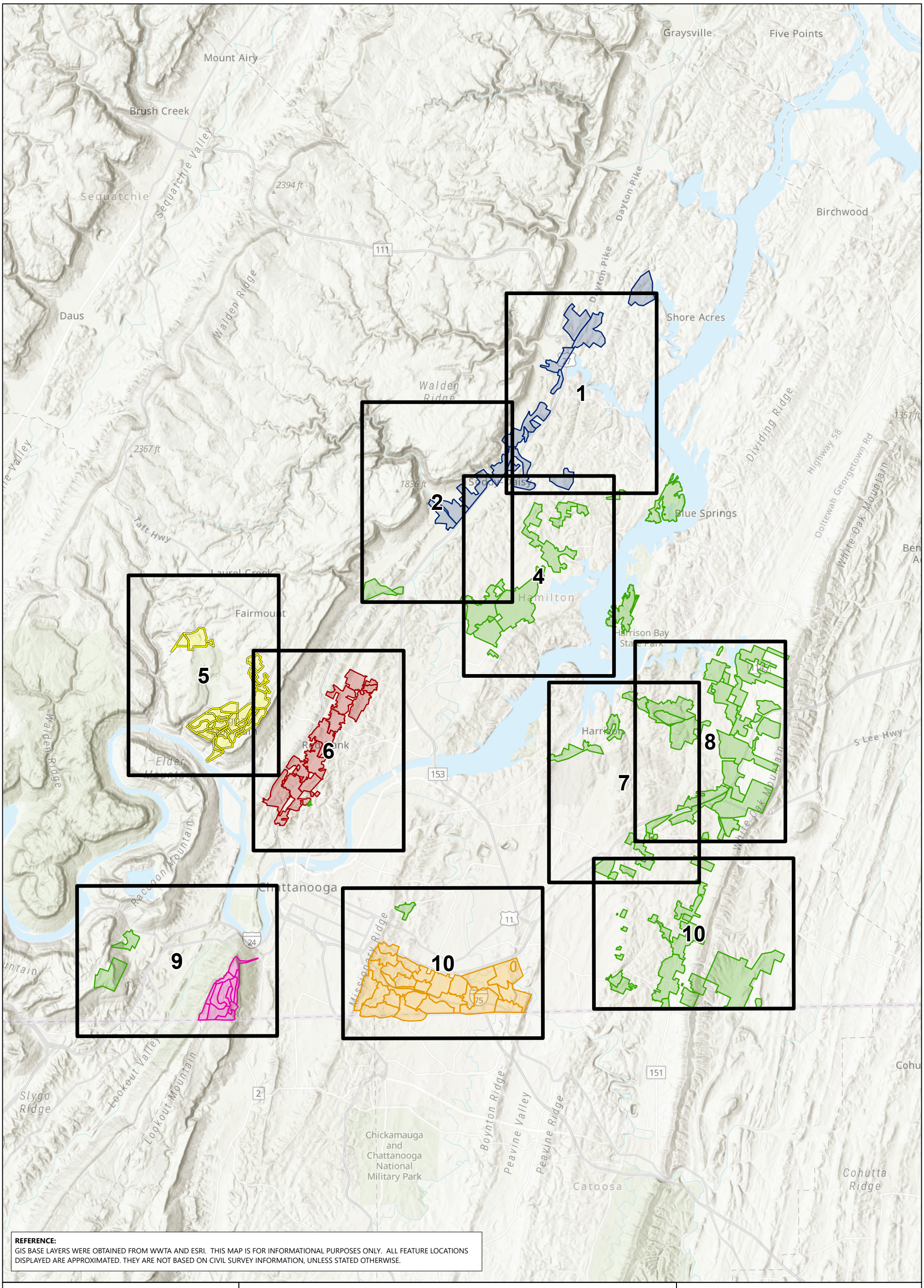
Drawing Path: Z:\SoutheastRegion\Clients\WWTA\Consent Decree\SSER\SSER_Pro_Doc_Updated.aprx plotted by blundberg 05-14-2025

No.	PS NAME	ADDRESS	BASIN
1	Amos	9125 Amos Road	HC 25
2	Amos Road East	9200 Amos Road	HC 26
3	Bainbridge	7334 Ooltewah Georgetown Rd	<Null>
4	Bluebird	503 Bluebird Circle	ER 12
5	Brock Pointe	8020 Burgundy Circle	HC 30
6	Camp Columbus	1809 Albermarle Drive (loc on)	HC 08
7	Camp Jordan	317 Camp Jordan Pkwy	ER 12
8	Card	326 Maple Street	SD 07
9	Cedar Glen	311 Camp Jordan Parkway	ER 12
10	Country Oaks	9043 Dallas Hollow Road	HC 09
11	Dallas Hollow	9607 Dallas Hollow Road (row east of)	SD 06
12	Dayton Pike	NW of 11904 Dayton Pike (in row)	SD 11
13	Durham	Dayton Pike & Durham Street (on TVA)	SD 09
14	East Boy Scout	1605 East Boy Scout Road	HC 06
15	East Ridge	1018 Yale Street	ER 10
16	Frawley 1	533 Frawley Road	ER 12
17	Ft Stephenson Lower	1219 Ft Stephenson Oval (loc on)	LM 01
18	Ft Stephenson Upper	1219 Ft Stephenson Oval (loc on)	LM 01
19	Georgetown	8370 Gracie Mac Lane	HC 13
20	Germantown	594 Bonnie Lassie Avenue	ER 11
21	Green Gap	7526 Ooltewah Georgetown Road	HC 19
22	Hampton Creek	8215 Double Eagle Court	HC 16
23	Harrison Bay	8321 Harrison Bay Road	<Null>
24	Harrison Ooltewah	6383 Harrison Ooltewah Road	HC 23
25	Holland Johnson	1060 Holland Johnson Road (in row)	SD 01
26	Hurricane Creek	1425 Ooltewah Ringgold Road	HC 37
27	Igou Ferry	209 Igou Ferry Road	SD 05
28	Integra Hills	5227 LITTLE DEBBIE PKWY	HC 48

No.	PS NAME	ADDRESS	BASIN
29	Kings Valley	7602 Prince Drive	HC 18
30	Lake Carolyn	9015 Lake Carolyn Drive (loc on)	SD 03
31	Lakes of Standifer	8410 Standifer Gap Road	HC 36
32	Lakeside Circle	8250 West Lakeside Circle	HC 07
33	Laurel Cove	7260 Autumn Lake Trail (loc on)	HC 05
34	Lee	8844 Old Lee Highway	HC 26
35	London Woods	London Woods Sewer Extension, Force Main, & Pump Station	<Null>
36	Nature Trail	611 Hatch Trail	SD 12
37	Nolan	2521 Sam Powell Trail	SM 08B
38	Oak Brook	9810 East Brainerd Rd	HC 43
39	Posey Hollow	12101 Posey Hollow Road (loc on)	SD 10
40	Pottery Lane	146A Pottery Lane	SD 04
41	Prairie Pass	10916 East Brainerd Road	HC 45
42	Rhinehart Valley	10211 London Lane	HC 45
43	Ridgeside	300 Shepherd Ave	<Null>
44	Rogers Branch	8501 Rancho Drive	HC 21
45	Roy	8210 Roy Lane (loc on)	HC 14
46	SD EQ Storage PS	220 Industrial Park Drive (loc on)	SD 02
47	Sequoyah Access	1915 Sequoyah Access Road (south of)	HC 11
48	Short Tail Springs	7634 Short Tail Springs Road	HC 20
49	Signal Mountain Road	245 Signal Mountain Road	RB 01
50	Snow Hill	7600 Snow Hill Road	HC 17
51	Soddy Daisy Ind Park	220 Industrial Park Drive (loc on)	SD 02
52	Summit Springs (Fed-Ex)	5054 SUMMIT SPRING WAY	HC 50
53	Sunset Ridge	8330 Ooltewah Georgetown Road	HC 12
54	Sylar	7276 Sylar Road	HC 22
55	Textile Lane	87 Textile Lane	<Null>
56	Timber Ridge	8830 East Ridge Trail Road	HC 10

No.	PS NAME	ADDRESS	BASIN
57	West Brow	West Brow	LM 12
58	West Brow Oval	231 West Brow Oval	LM 04

Appendix D – Flow Monitoring Maps and Schematics



REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA AND ESRI. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

- Index
- East Ridge
- Hamilton County
- Lookout Mountain
- Red Bank
- Signal Mountain
- Soddy Daisy

WWTA SSER Flow Monitors

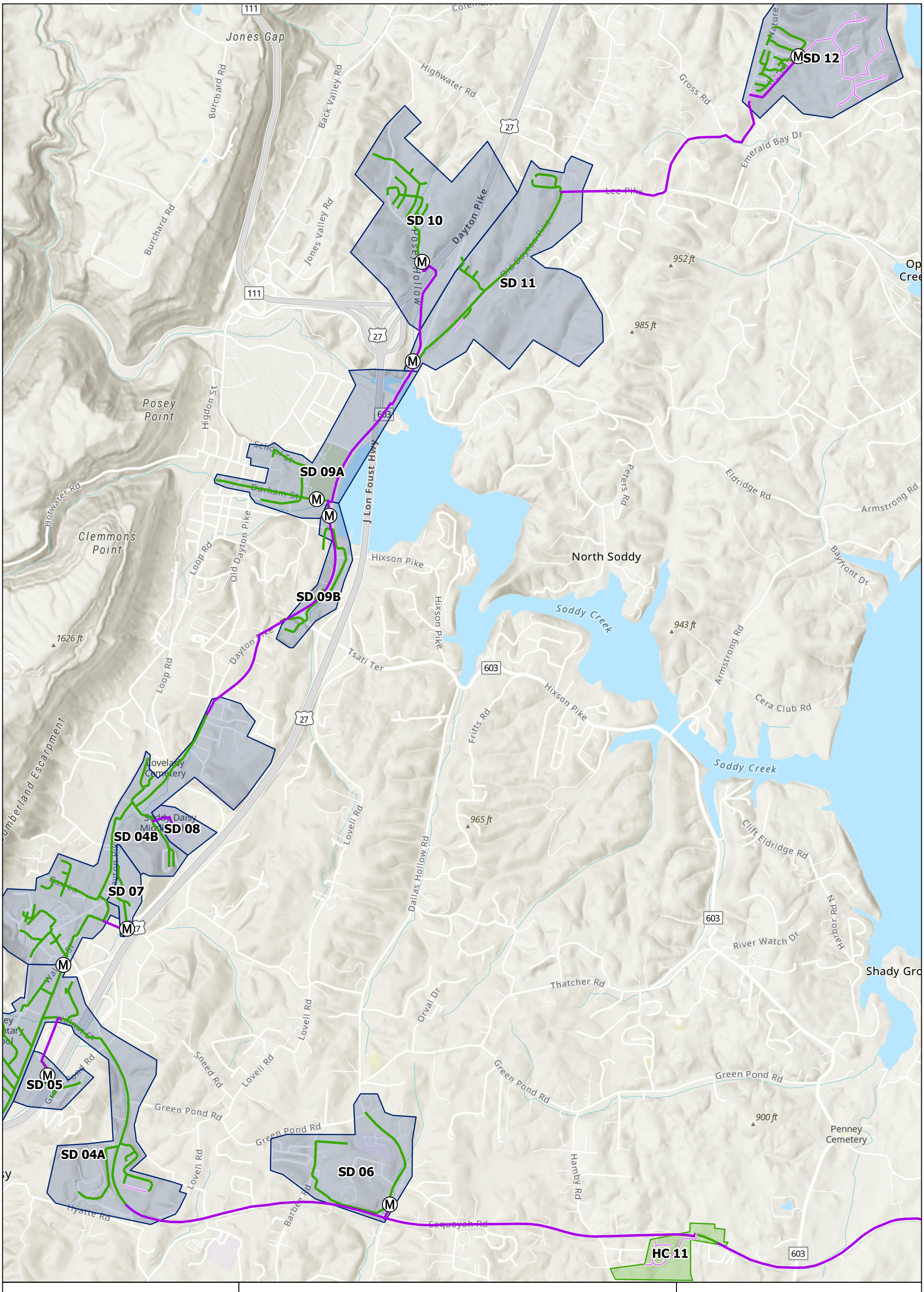
ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

N

1 inch = 15,000 feet

0 7,500 15,000 Feet

Index



Permanent Flow Meter
Rain Gauge
Temporary Flow Meter
Force Main
Low Pressure Main
Gravity Main
East Ridge
Hamilton County
Lookout Mountain
Red Bank
Signal Mountain
Soddy Daisy

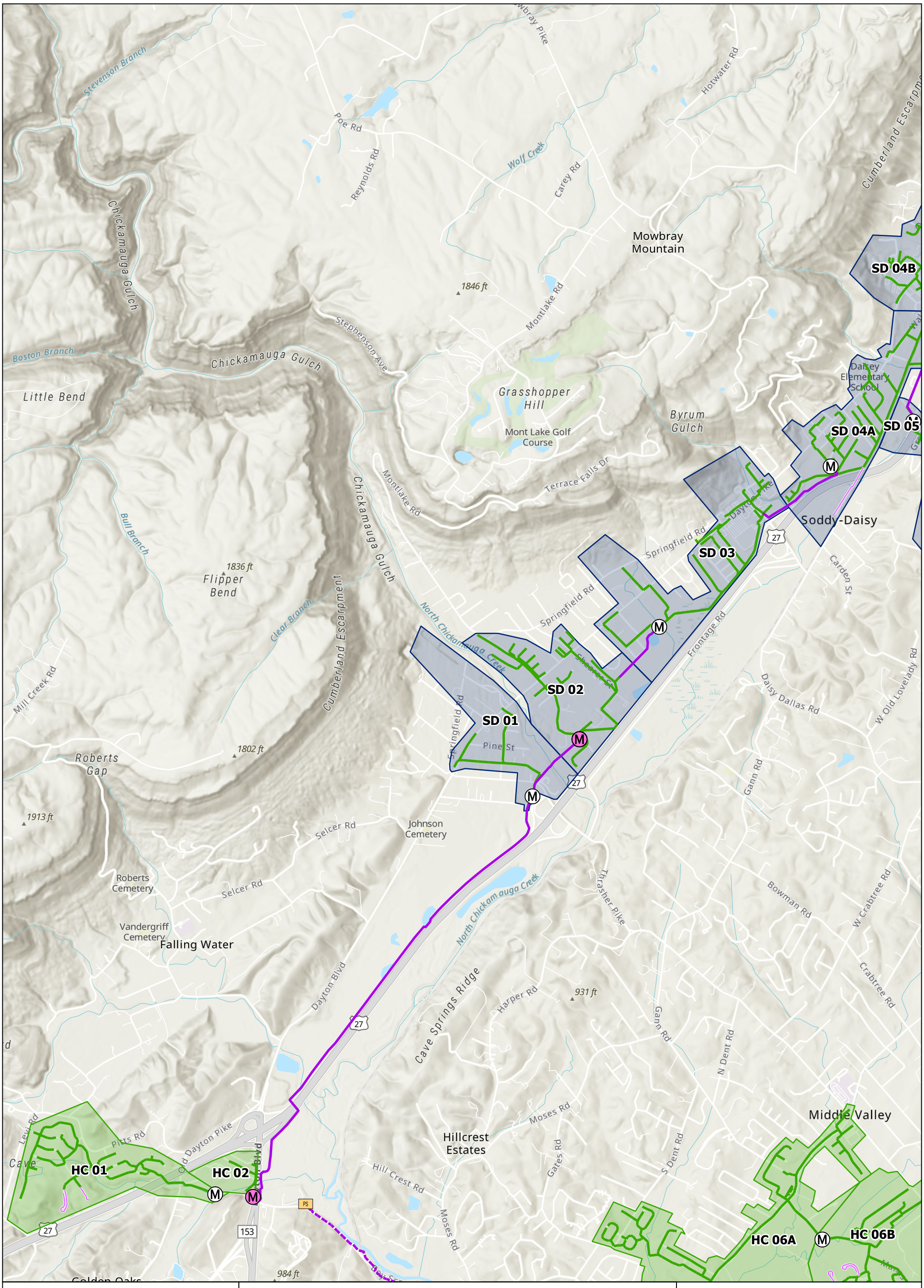
WWTA SSER Flow Meters

1 inch = 2,500 feet
0 1,250 2,500 Feet
N

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

Drawing Path: Z:\SoutheastRegion\Clients\WWTA\Consent Decree\SSER\SSER_Pro_Doc.aprx plotted by tcatlett 05-14-2025



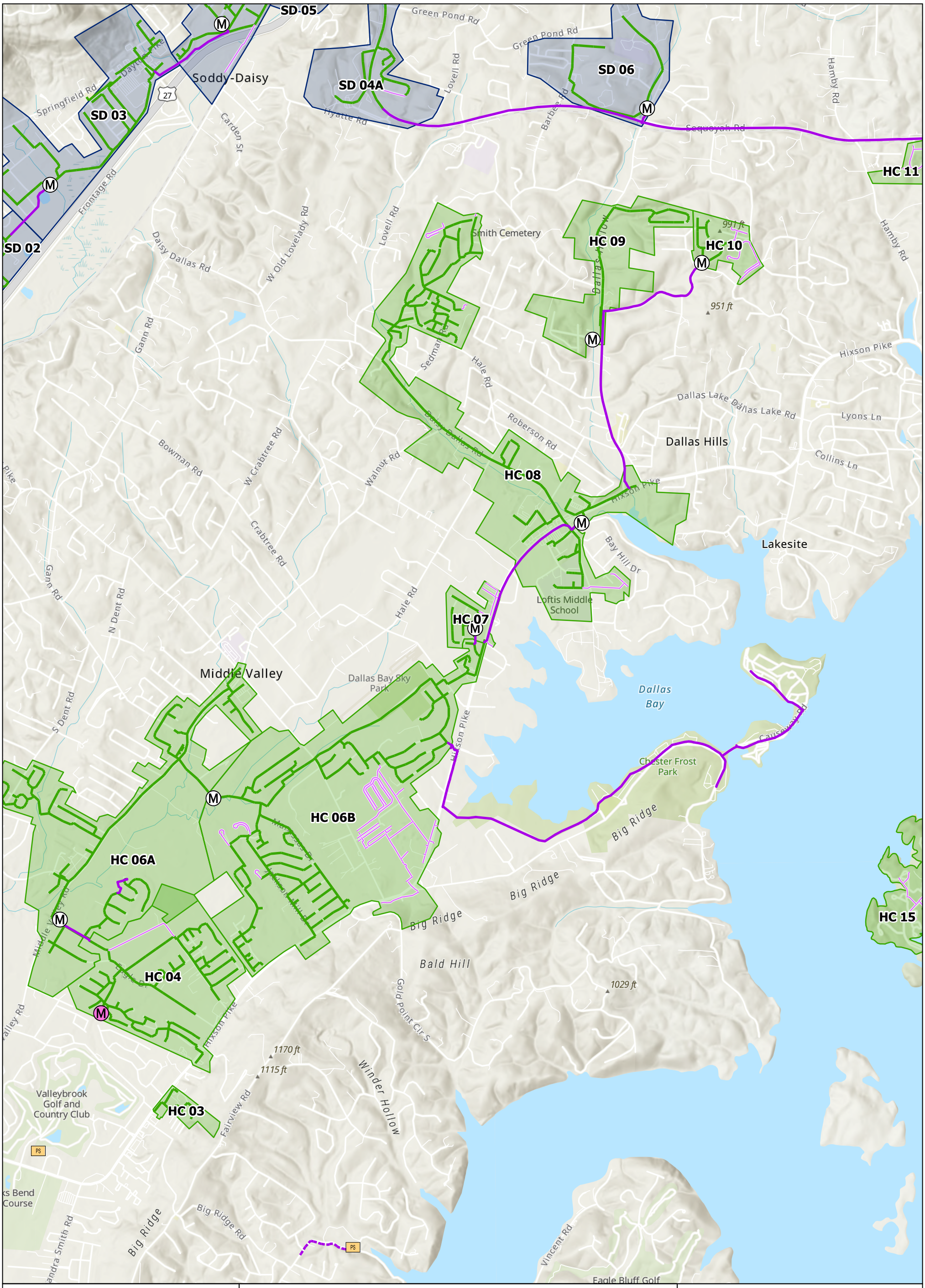
Permanent Flow Meter
Rain Gauge
Temporary Flow Meter
Force Main
Low Pressure Main
Gravity Main
East Ridge
Hamilton County
Lookout Mountain
Red Bank
Signal Mountain
Soddy Daisy

WWTA SSER Flow Meters

1 inch = 2,500 feet
Feet
0 1,250 2,500
N

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com



Permanent Flow Meter
Rain Gauge
Temporary Flow Meter
Force Main
Low Pressure Main
Gravity Main

East Ridge
Hamilton County
Lookout Mountain
Red Bank
Signal Mountain
Soddy Daisy

WWTA SSER Flow Meters

1 inch = 2,500 feet

0 1,250 2,500 Feet

N

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

Permanent Flow Meter
Rain Gauge
Temporary Flow Meter
Force Main
Low Pressure Main
Gravity Main

East Ridge
Hamilton County
Lookout Mountain
Red Bank
Signal Mountain
Soddy Daisy

WWTA SSER Flow Meters

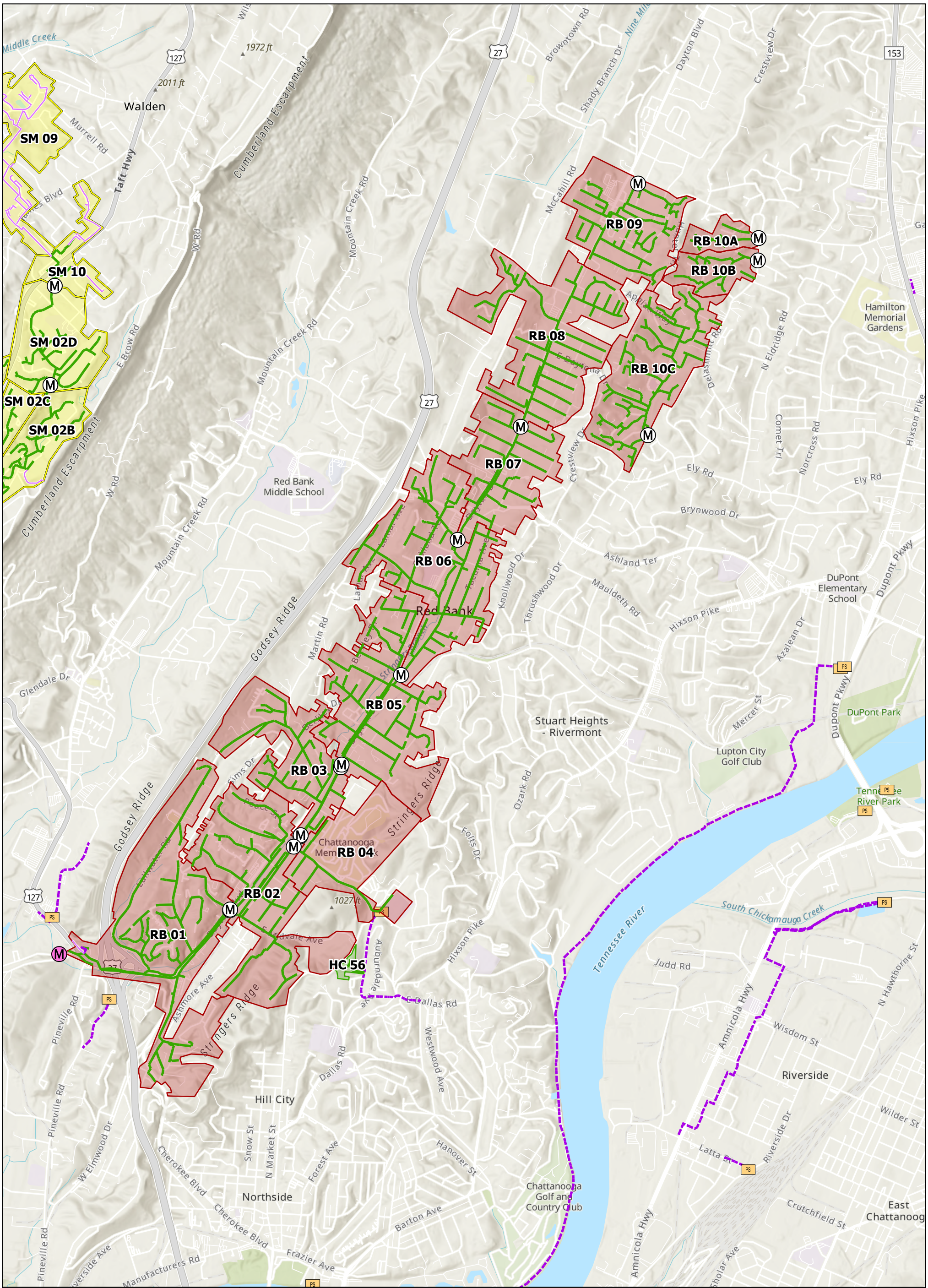
1 inch = 2,500 feet

Feet
0 1,250 2,500

N

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com



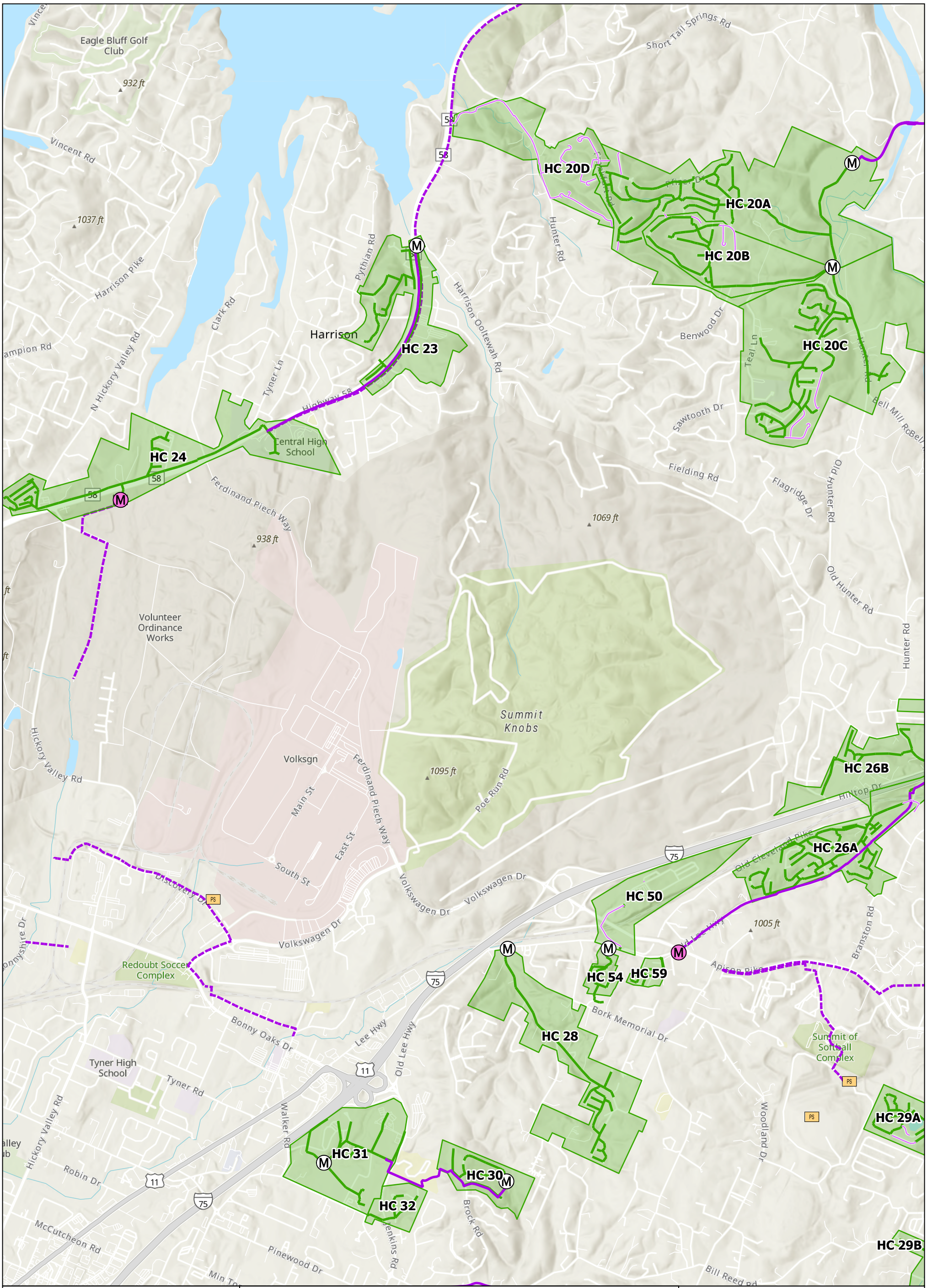
Permanent Flow Meter
Rain Gauge
Temporary Flow Meter
Force Main
Low Pressure Main
Gravity Main
East Ridge
Hamilton County
Lookout Mountain
Red Bank
Signal Mountain
Soddy Daisy

WWTA SSER Flow Meters

1 inch = 2,500 feet
Feet
0 1,250 2,500
N

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com



Permanent Flow Meter
Rain Gauge
Temporary Flow Meter
Force Main
Low Pressure Main
Gravity Main

East Ridge
Hamilton County
Lookout Mountain
Red Bank
Signal Mountain
Soddy Daisy

WWTA SSER Flow Meters

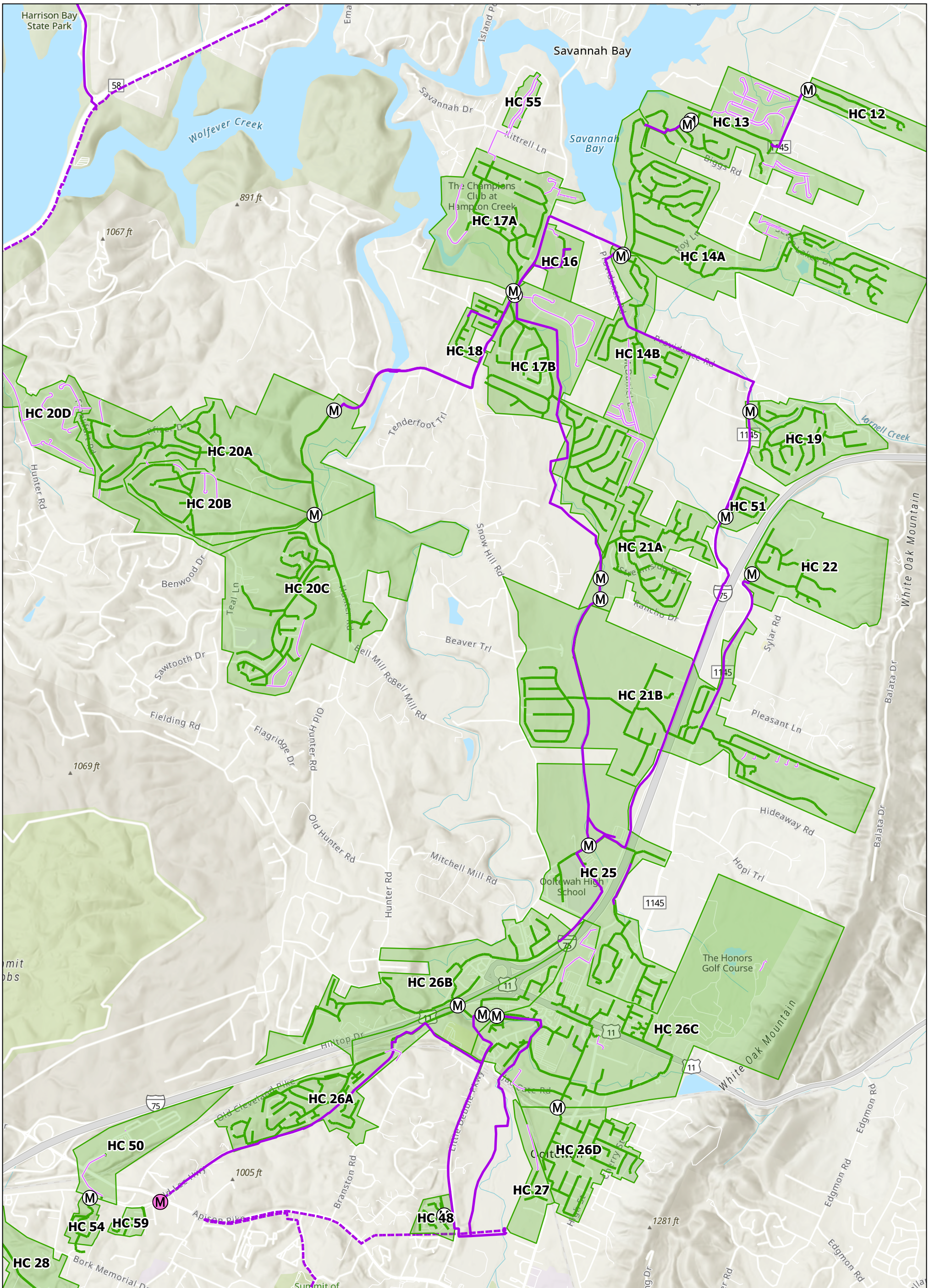
1 inch = 2,500 feet

0 1,250 2,500 Feet

N

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com



Drawing Path: Z:\SoutheastRegion\Clients\WWTA\Consent Decree\SSER\SSER_Pro_Doc.aprx plotted by tcatlett 05-14-2025

- Permanent Flow Meter
- Rain Gauge
- Temporary Flow Meter
- Force Main
- Low Pressure Main
- Gravity Main
- East Ridge
- Hamilton County
- Lookout Mountain
- Red Bank
- Signal Mountain
- Soddy Daisy

WWTA SSER Flow Meters

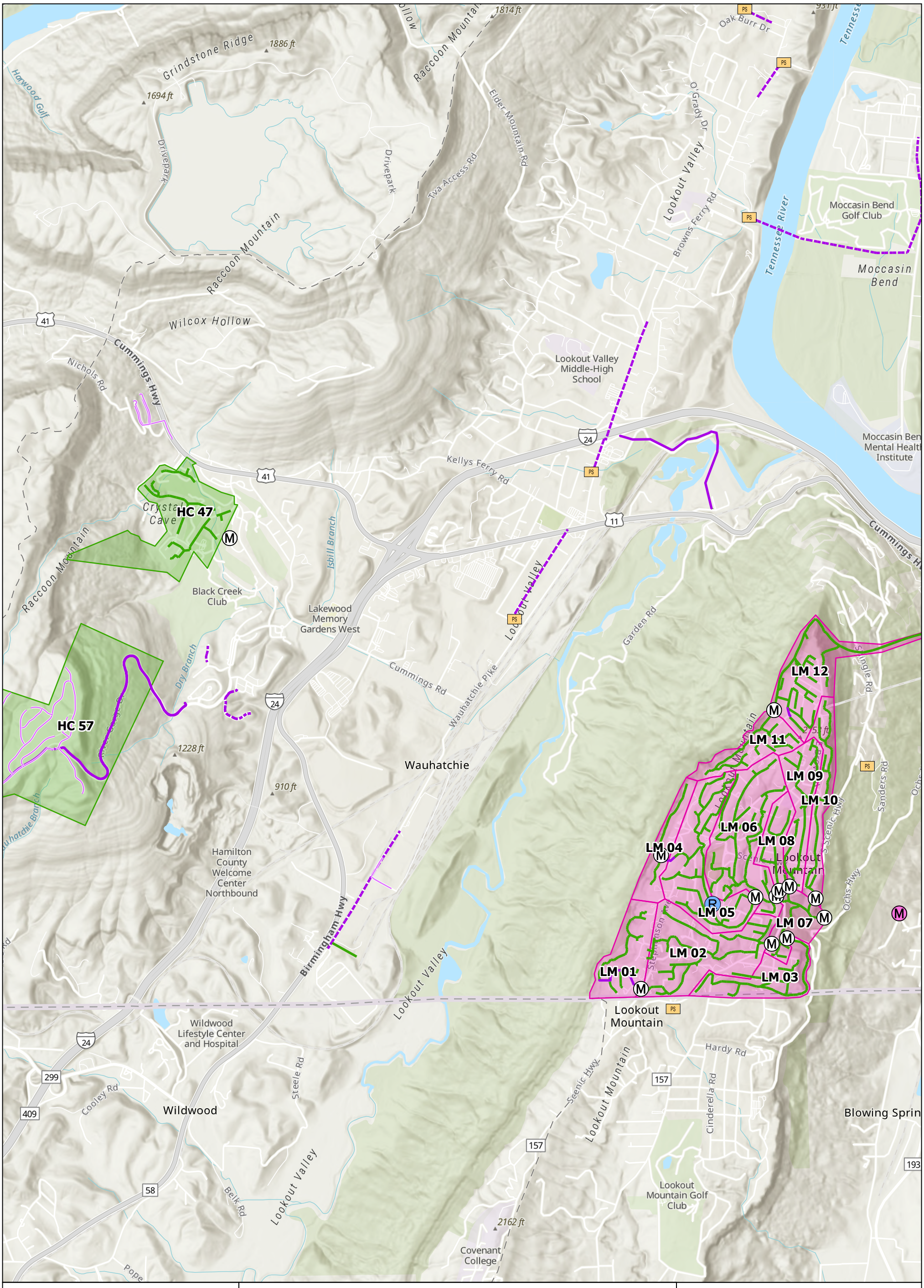
1 inch = 2,500 feet

0 1,250 2,500 Feet

N

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com



Permanent Flow Meter
Rain Gauge
Temporary Flow Meter
Force Main
Low Pressure Main
Gravity Main
East Ridge
Hamilton County
Lookout Mountain
Red Bank
Signal Mountain
Soddy Daisy

WWTA SSER Flow Meters

1 inch = 2,500 feet

0 1,250 2,500 Feet

N

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

WWTA SSER Flow Meters

Legend

- Permanent Flow Meter
- Rain Gauge
- Temporary Flow Meter
- Force Main
- Low Pressure Main
- Gravity Main
- East Ridge
- Hamilton County
- Lookout Mountain
- Red Bank
- Signal Mountain
- Soddy Daisy

1 inch = 2,500 feet

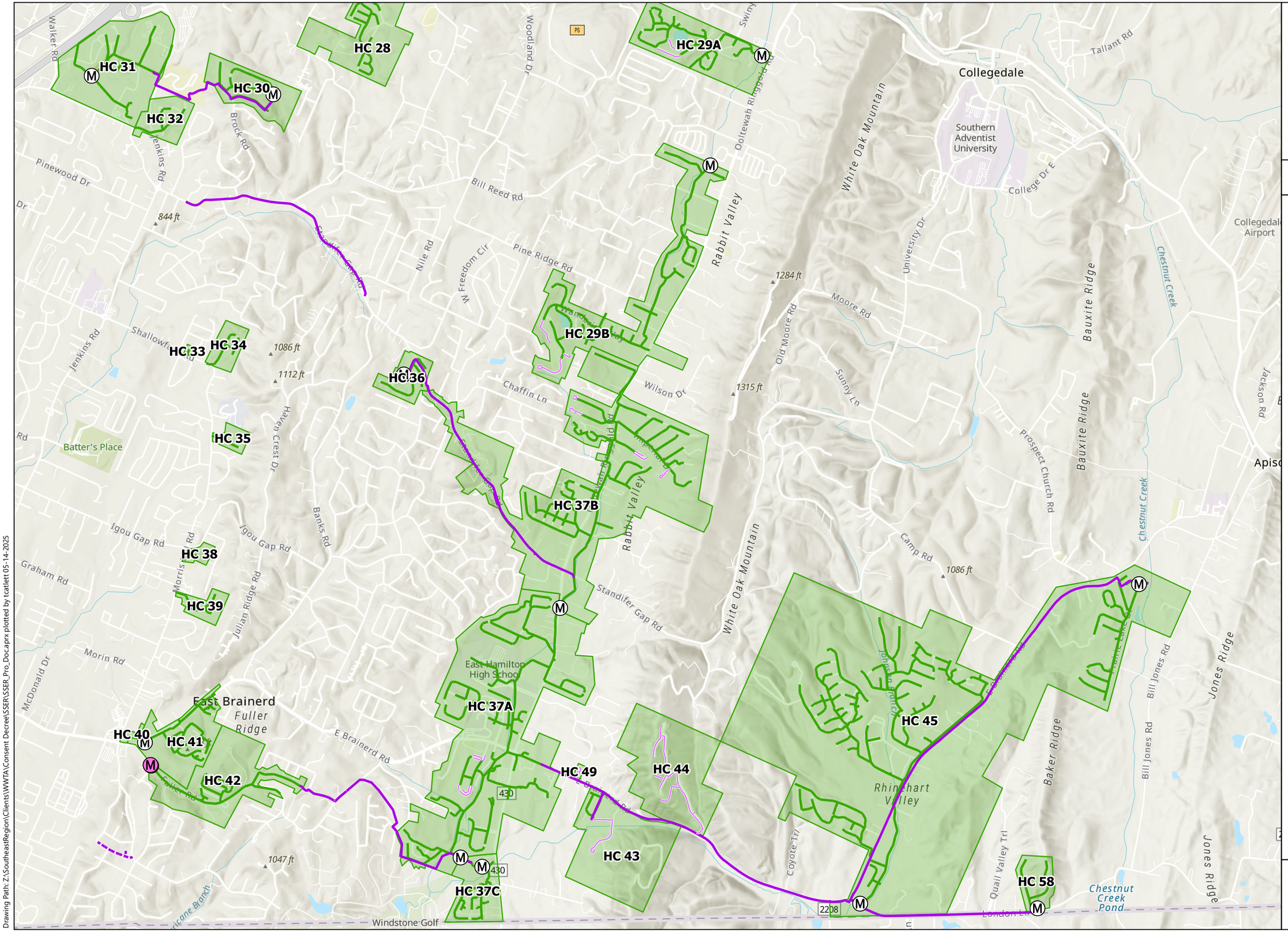
0 1,250 2,500 Feet

N

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

WWTA SSER Flow Meters



Legend

- Permanent Flow Meter
- Rain Gauge
- Temporary Flow Meter
- Force Main
- Low Pressure Main
- Gravity Main
- East Ridge
- Hamilton County
- Lookout Mountain
- Red Bank
- Signal Mountain
- Soddy Daisy

1 inch = 2,500 feet

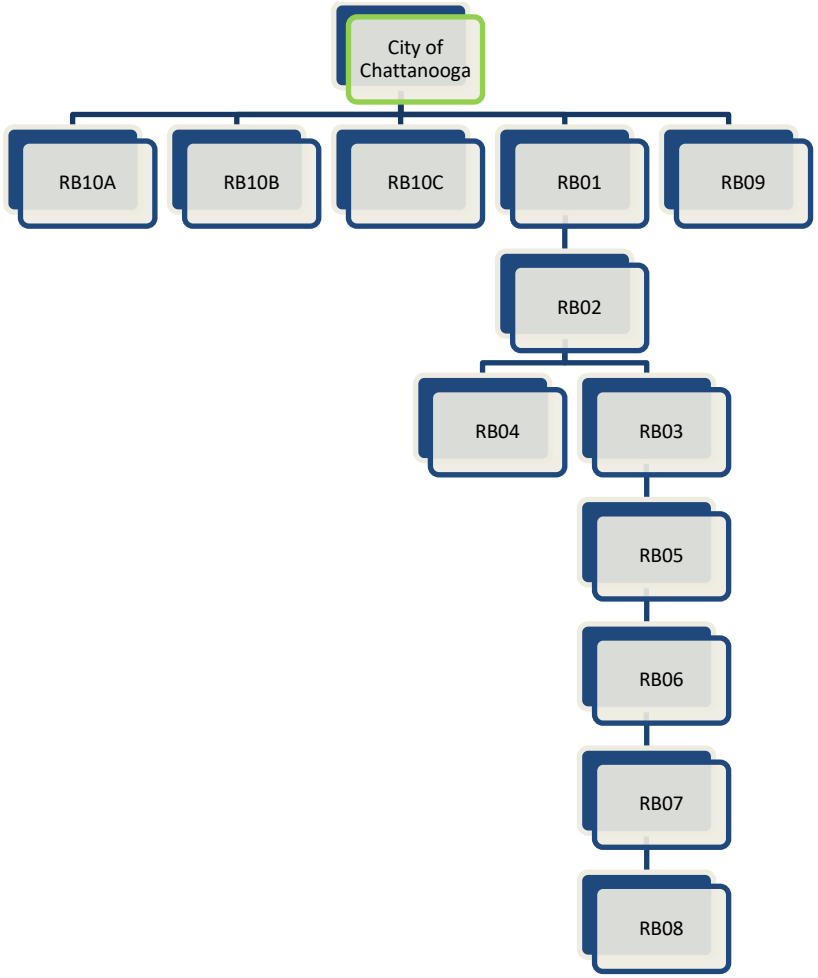
0 1,250 2,500 Feet

N

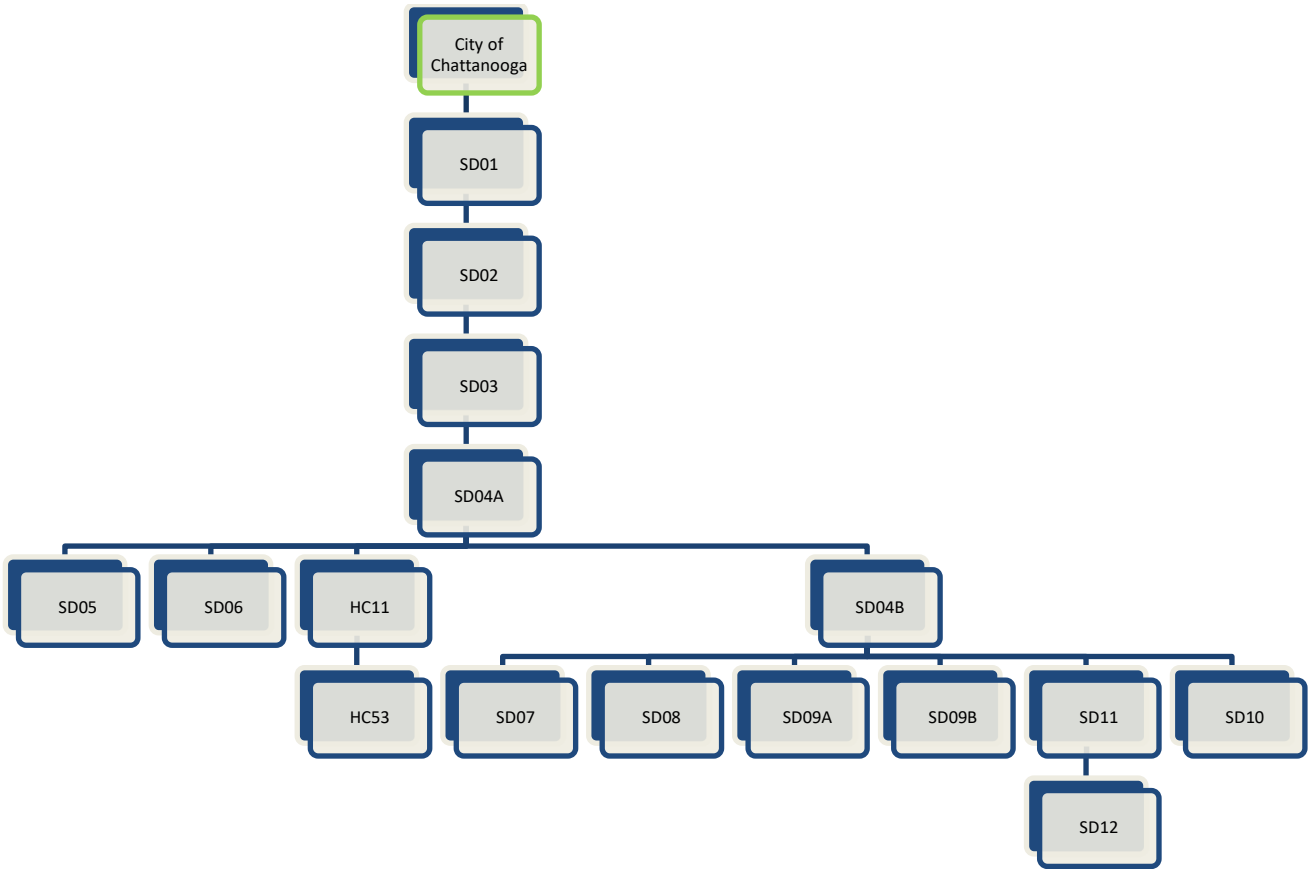
REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

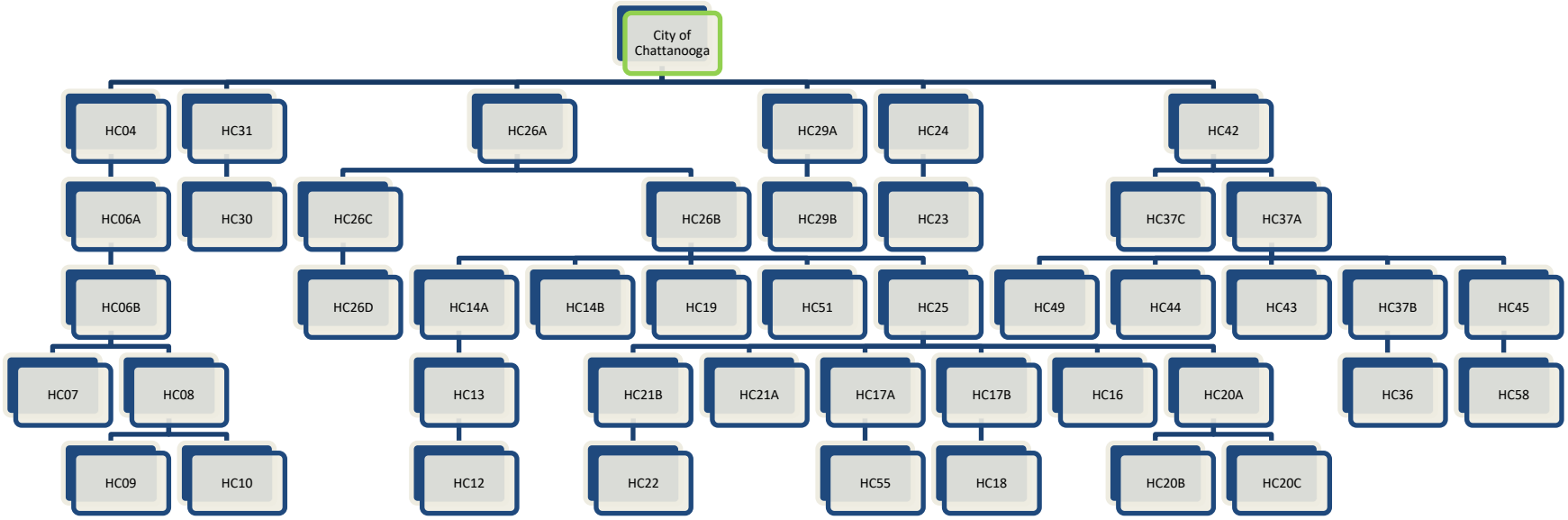
Red Bank
Flow Monitoring Connectivity Schematic



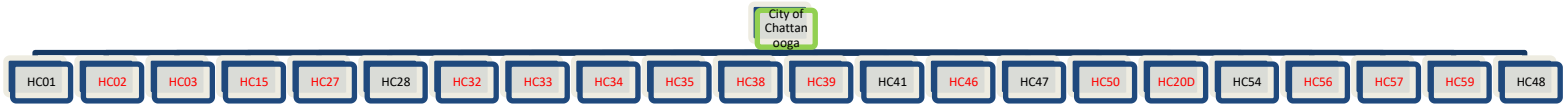
Soddy Daisy
Flow Monitoring Connectivity Schematic



Hamilton County
Flow Monitoring Connectivity Schematic

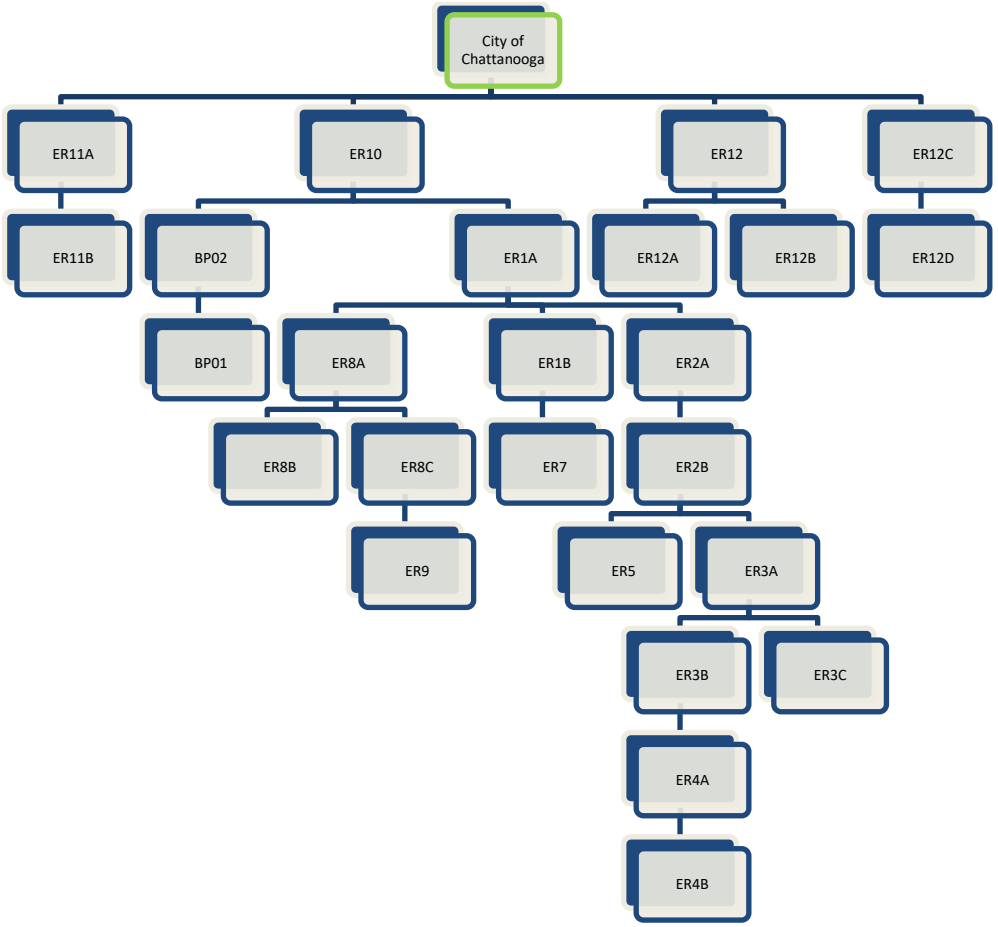


Hamilton County
Flow Monitoring Connectivity Schematic

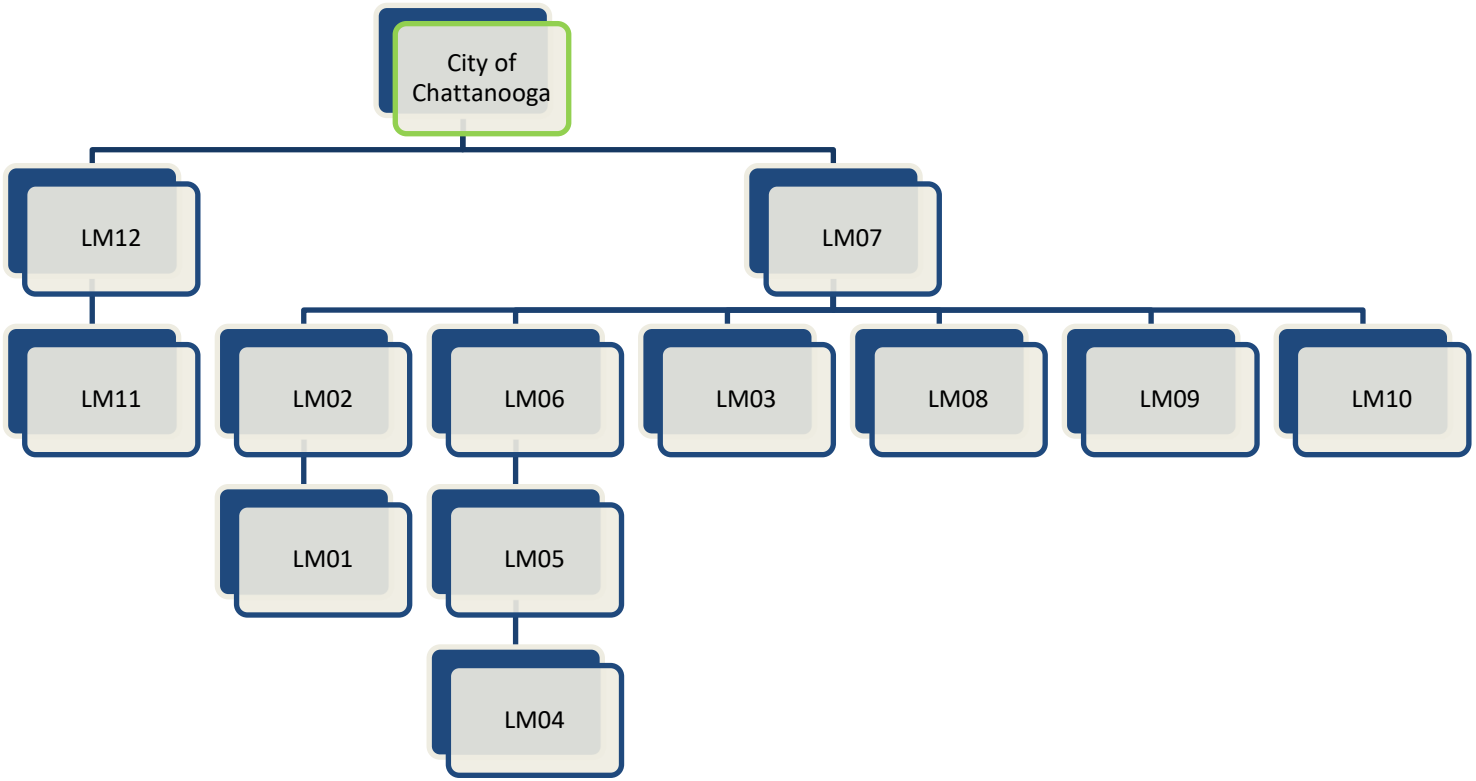


RED = Not Monitored

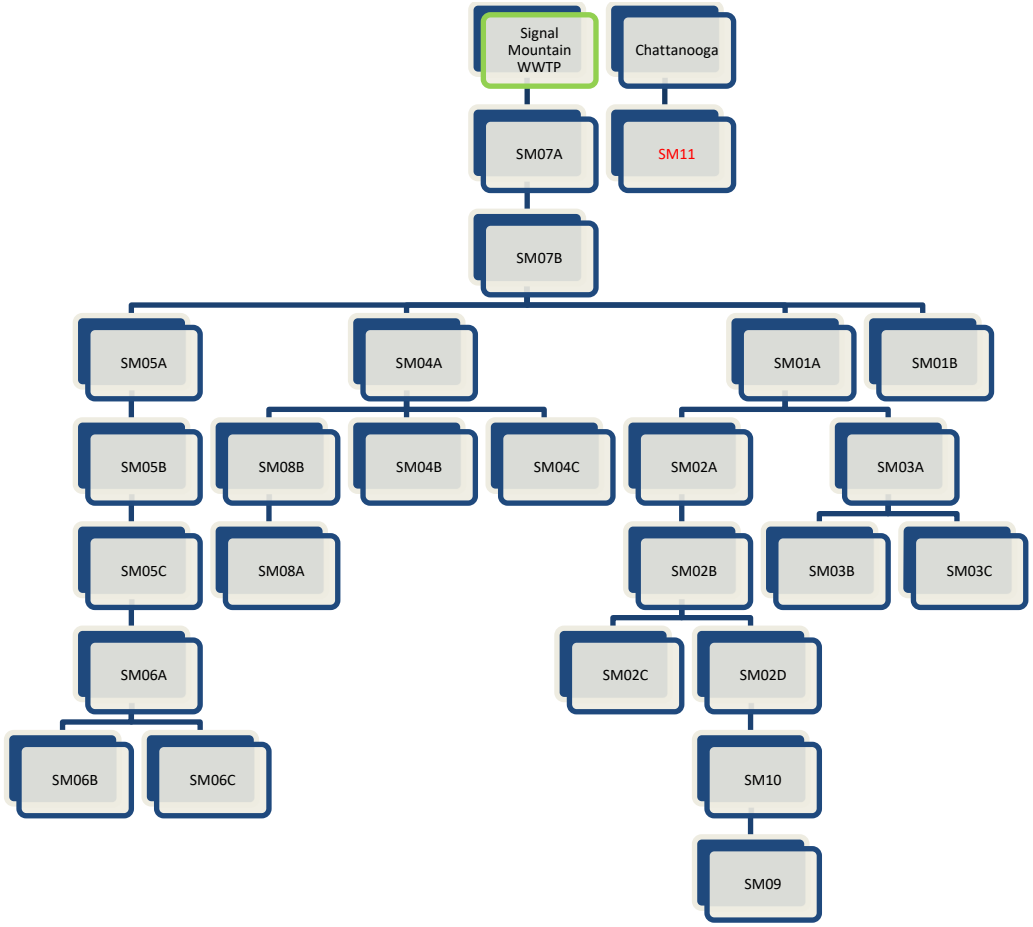
East Ridge
Flow Monitoring Connectivity Schematic

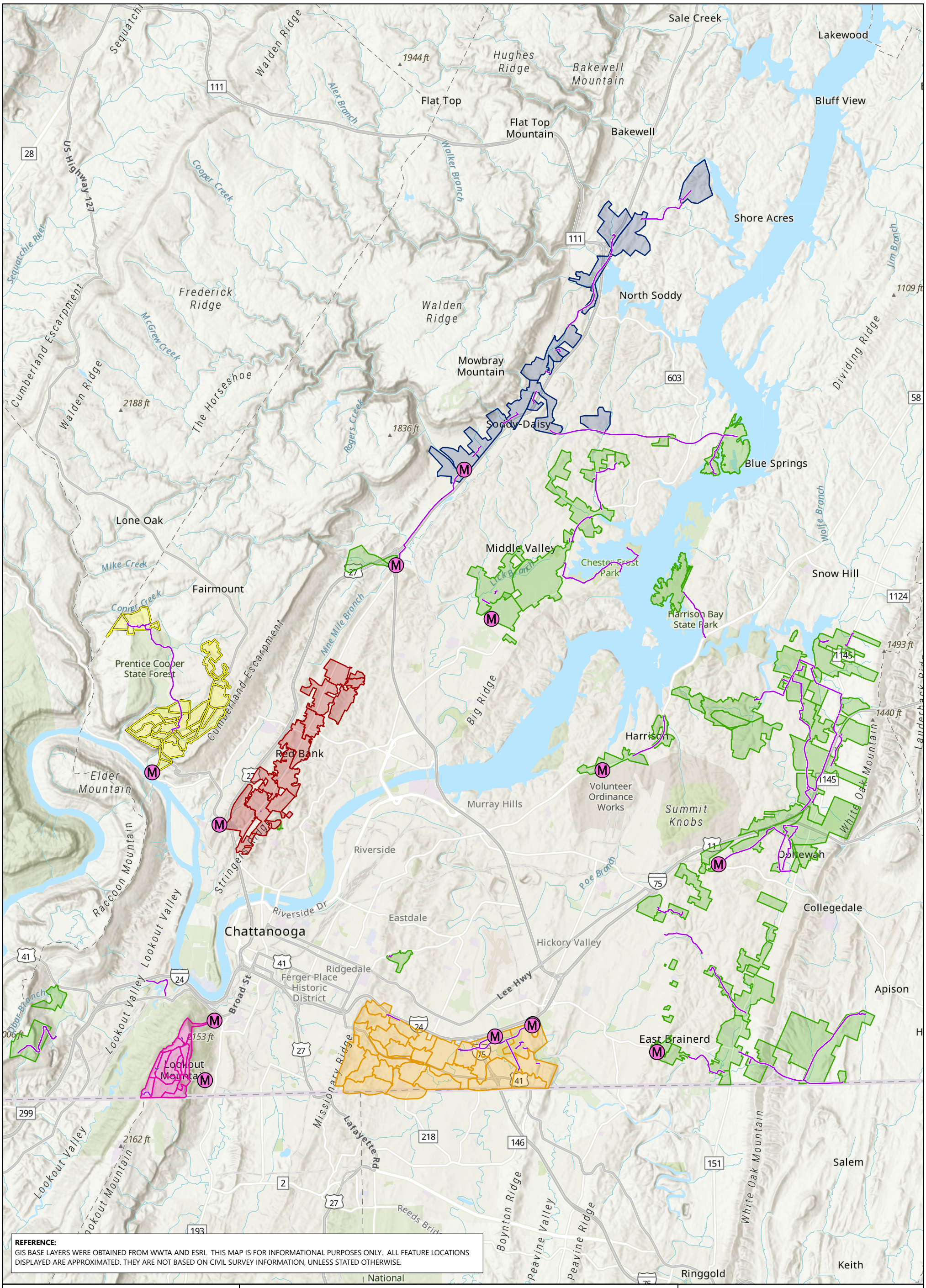


Lookout Mountain
Flow Monitoring Connectivity Schematic



Signal Mountain
Flow Monitoring Connectivity Schematic





REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA AND ESRI. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

- Permanent Meter
- Force Main
- East Ridge
- Hamilton County
- Lookout Mountain
- Red Bank
- Signal Mountain
- Soddy Daisy
- Hamilton County Boundary

WWTA Permanent Flow Meters

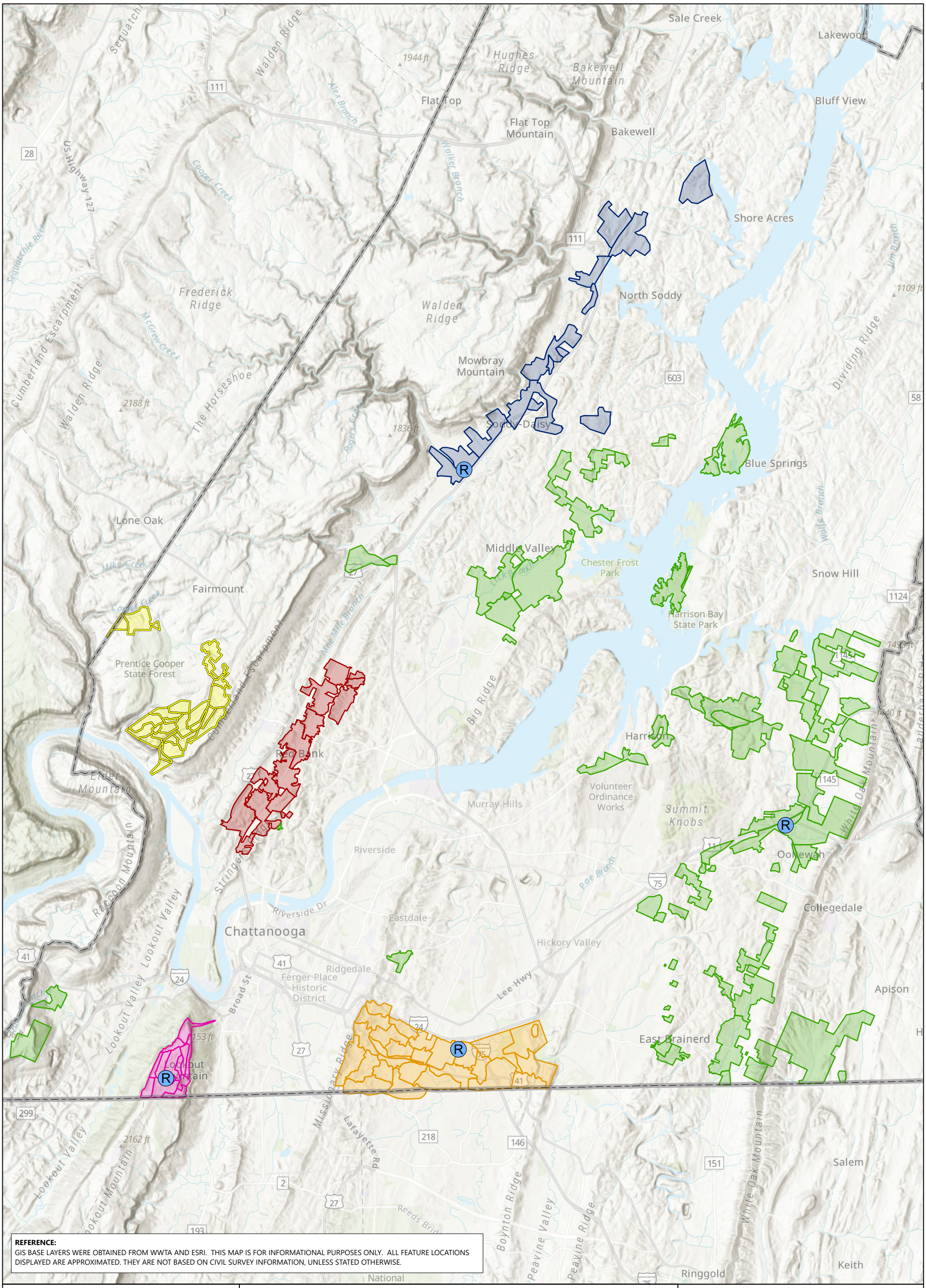
LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

N

1 inch = 12,000 feet

Feet
0 6,000 12,000

Appendix E – Rain Gauge Map



REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA AND ESRI. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

- Rain Gauge
- East Ridge
- Hamilton County
- Lookout Mountain
- Red Bank
- Signal Mountain
- Soddy Daisy
- Hamilton County Boundary

WWTA Rain Gauges

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

N

1 inch = 12,000 feet

Feet
0 6,000 12,000

Drawing Path: Z:\SoutheastRegion\Clients\WWTA\Consent Decree\SSER\SSER_Pro_Doc_Updated.aprx plotted by blundberg 05-14-2025

Appendix F – Priority Ranking Matrix (Initial and Proposed)

Initial

East Ridge Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if >8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Total Score	Rank	Group
BP1	1	East Ridge	130	31,674	12	124.8	0.231	0.35	1.49	5.00	47.02	5.00		0	1.48	1.43	6.18	2.00		Y			43		7	3	13	3	Y	5	24.00	5	EA
BP2	1	East Ridge	63	18,380	15	151.2	0.365	0.58	0.32	3.00	17.40	4.00		0	1.91	1.83	5.01	2.00		Y			12		7	3	6	2	Y	5	20.00	10	EA
ER10	1	East Ridge	62	15,981	15	202.8	0.397	0.56	0.92	4.00	57.37	5.00	2	2	3.03	2.96	7.45	2.00		Y			25		6	2		0	Y	5	21.00	9	EA
ER11A	1	East Ridge	108	21,103	8	75.6	0.074	0.15	0.55	4.00	25.92	5.00		0	0.81	0.77	10.48	3.00								0		0		0	13.00	38	4
ER11B	1	East Ridge	38	7,956	8	79.2	0.049	0.09	0.18	2.00	22.36	5.00		0	0.59	0.56	11.42	3.00								0		0		0	11.00	45	5
ER12A	1	East Ridge	103	19,510	12	10.9	0.068	0.16	0.40	3.00	20.45	5.00		0	0.80	0.72	10.57	3.00								0		0		0	12.00	41	4
ER12B	1	East Ridge	64	31,368	8	8.9	0.073	0.13	0.27	3.00	8.69	2.00		0	0.98	0.54	7.37	2.00								0		0		0	8.00	57	
ER12C	1	East Ridge	50	17,717	8	14.1	0.069	0.13	0.11	0.00	6.49	2.00		0	0.47	0.34	4.89	0.00								0		0		0	3.00	85	
ER12D	1	East Ridge	92	17,760	10	22.2	0.025	0.07	0.28	3.00	15.80	4.00		0	0.58	0.53	21.65	4.00								0		0		0	12.00	42	4
ER1A	1	East Ridge	67	31,386	37	136.8	1.478	2.28	2.55	5.00	81.25	5.00	1	5	16.71	16.59	11.23	3.00								0		0		0	19.00	17	1
ER1B	1	East Ridge	127	30,335	14	109.2	0.288	0.46	1.43	5.00	47.16	5.00	3	4	3.51	3.43	11.91	3.00								0		0		0	18.00	22	2
ER2A	1	East Ridge	138	34,181	29	91.2	1.070	1.36	0.81	4.00	23.71	5.00		0	8.95	8.75	8.18	2.00		Y						0		0		0	12.00	43	4
ER2B	1	East Ridge	97	37,617	38	150	0.560	0.88	0.76	4.00	20.22	5.00		0	6.67	6.17	11.02	3.00		Y			12		2	0		0		0	13.00	39	4
ER3A	1	East Ridge	76	17,591	21	108	0.338	0.56	1.00	5.00	56.68	5.00		0	4.34	4.30	12.71	3.00								0	2	0	Y	5	19.00	18	1
ER3B	1	East Ridge	83	18,159	18	94.8	0.247	0.41	0.59	4.00	32.47	5.00		0	4.36	3.90	15.82	3.00								0		0	Y	5	18.00	20	2
ER3C	1	East Ridge	185	40,054	12	94.8	0.079	0.17	1.86	5.00	46.44	5.00	5	0	2.76	2.34	29.82	4.00								0		0	Y	5	20.00	11	1
ER4A	1	East Ridge	165	35,169	12	98.4	0.153	0.28	0.73	4.00	20.73	5.00		0	2.99	2.89	18.88	3.00		Y			20		2	0	2	0	Y	5	18.00	21	2
ER4B	1	East Ridge	163	34,129	10	81.6	0.070	0.14	1.24	5.00	36.47	5.00		0	1.85	1.67	23.94	4.00								0	4	0	Y	5	20.00	12	1
ER5	1	East Ridge	106	25,482	10	126	0.061	0.11	0.86	4.00	33.89	5.00		3	1.23	1.20	19.73	3.00								0	2	0		0	16.00	26	2
ER6	1	East Ridge	111	23,697	10	66	0.057	0.12	0.65	4.00	27.25	5.00		0	1.47	1.33	23.21	4.00								0		0		0	14.00	31	3
ER7	1	East Ridge	93	17,620	10	86.4	0.036	0.06	0.44	3.00	25.03	5.00		0	0.93	0.90	25.20	4.00								0		0		0	13.00	36	3
ER8A	1	East Ridge	81	20,069	15	109.2	0.212	0.38	0.44	3.00	22.16	5.00		0	3.12	3.05	14.36	3.00		Y			35		11	6		0		0	18.00	21	1
ER8B	1	East Ridge	111	21,068	10	96	0.071	0.15	0.73	4.00	34.53	5.00		0	1.30	1.23	17.38	3.00								0	11	3		0	16.00	24	2
ER8C	1	East Ridge	110	22,977	12	115.2	0.127	0.20	0.59	4.00	25.59	5.00		0	2.08	2.03	16.02	3.00		Y			13		4	0	11	3		0	16.00	27	2
ER9	1	East Ridge	129	23,056	10	115.2	0.073	0.13	0.78	4.00	33.92	5.00		0	1.25	1.19	16.19	3.00								0	15	3		0	16.00	25	2
			2,552	**614,040**			**0.726**	**1.243**	**19.98**						**8.446**	**7.999**	**11.0**															

PF Theory

Red Bank Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if >8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Total Score	Rank	Group
RB5P	1	Red Bank	135	119,917	N/A	N/A	0.324	0.59	2.55	5.00	21.23	5.00		1	5.49	4.65	14.37	3.00							13	6	22	5		0	26.00	2	1
RB07	1	Red Bank	89	50,473	15	85.2	0.235	0.34	1.16	5.00	22.96	5.00	1	5	2.13	1.97	8.38	2.00								0	35	5		0	23.00	4	1
RB3P	1	Red Bank	76	14,938	N/A	N/A	0.392	0.64	1.24	5.00	83.07	5.00		0	5.11	5.10	12.99	3.00							22	6		0		0	20.00	13	1
RB06	1	Red Bank	148	36,668	21	66	0.340	0.52	0.74	4.00	20.16	5.00		2	2.93	2.82	8.28	2.00		Y			39			0	35	5		0	19.00	14	1
RB2P	1	Red Bank	133	39,892	N/A	N/A	0.527	0.82	1.69	5.00	42.30	5.00		0	5.74	5.39	10.22	3.00		Y			14			0		0		0	14.00	32	3
RB1P	1	Red Bank	236	37,991	N/A	N/A	0.607	0.99	0.90	4.00	23.78	5.00		0	6.35	6.26	10.32	3.00								0		0		0	13.00	33	3
RB10B	1	Red Bank	43	6,453	8	69.6	0.004	0.01	0.01	0.00	2.02	0.00		0	0.08	0.07	16.13	3.00								0		0		0	4.00	76	
RB10A	1	Red Bank	19	2,949	8	61.2	0.002	0.01	0.002	0.00	0.51	0.00		0	0.05	0.03	18.92	3.00								0		0		0	4.00	79	
RB10C	1	Red Bank	189	28,413	8	124.8	0.057	0.12	0.13	0.00	4.48	2.00		0	0.23	0.21	3.72	0.00								0		0		0	3.00	86	
			1,068	**337,694**			**0.607**	**0.993**	**8.42**						**6.353**	**6.258**	**10.3**															

Lookout Mtn Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if >8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Total Score	Rank	Group
LM02	1	Lookout Mountain	144	18,469	8	98.4	0.077	0.15	0.62	4.00	33.70	5.00	2	2	1.47	1.30	16.98	3.00								0	42	5	Y	5	25.00	3	EA
LM05	1	Lookout Mountain	152	20,868	8	86.4	0.088	0.19	0.65	4.00	31.01	5.00	3	0	1.27	1.22	13.84	3.00								0	42	5	Y	5	23.00	6	EA
LM09	1	Lookout Mountain	63	9,394	8	147.6	0.046	0.09	0.48	3.00	51.27	5.00	1	5	0.75	0.69	15.15	3.00								0	42	5		0	22.00	7	EA
LM06	1	Lookout Mountain	144	19,977	6	124.8	0.137	0.22	0.24	2.00	1.01	0.00		0	0.72	3.98	29.07	4.00							42	6	42	5	Y	5	23.00	8	EA
LM07	1	Lookout Mountain	77	10,959	8	73.2	0.518	0.77	0.24	2.00	22.10	5.00		0	2.58	5.52	10.66	3.00								0		0		0	11.00	48	5
LM11	1	Lookout Mountain	71	8,637	8	48	0.030	0.06	0.14	0.00	16.25	4.00	4	0	0.30	2.50	82.22	5.00								0		0		0	10.00	50	5

LM03	1	Lookout Mountain	70	9,993	8	76.8	0.015	0.03	0.14	1.00	14.31	3.00		0	0.25	0.71	47.88	5.00								0		0		0	10.00	55	5
LM10	1	Lookout Mountain	34	7,944	8	62.4	0.020	0.04	0.11	0.00	13.60	3.00		0	0.51	0.45	23.04	4.00								0		0		0	8.00	56	
LM12	1	Lookout Mountain	49	14,908	8	82.8	0.034	0.06	0.09	0.00	5.92	2.00	5	0	0.53	2.42	71.67	5.00								0		0		0	8.00	59	
LM08	1	Lookout Mountain	21	4,098	8	68.4	0.014	0.04	0.02	0.00	3.73	0.00		0	0.11	0.71	48.97	5.00								0		0		0	6.00	65	
			825	**125,247**			**0.518**	**0.765**	**2.73**						**2.578**	**5.520**	**10.7**																
			580	79,667																													

Signal Mtn Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 51 x3 if > 101 x4 if > 201 x5 if > 301	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if > 8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Total Score	Rank	Group
SM6ABC	1	Signal Mountain	85	15,388	12	130.8	0.019	0.03	0.30	3.00	12.86	3.00	1	5	1.55	1.48	77.01	5.00								0		22	5	Y	5	27.00	1	1
SM7AB	1	Signal Mountain	163	25,364	12	69.6	0.340	0.47	1.38	4.00	20.95	5.00		0	3.48	3.29	9.68	2.00								0			0	Y	5	17.00	23	2
SM2D	1	Signal Mountain	93	29,309	10	84	0.049	0.09	0.46	3.00	8.96	2.00	4	0	1.65	1.53	31.19	5.00								6	2	6	2		0	15.00	28	2
SM2ABC	1	Signal Mountain	190	32,368	10	57.6	0.157	0.26	1.25	5.00	9.16	2.00	3	0	1.38	1.26	8.02	2.00		Y			42			6	2		0	Y	5	17.00	29	2
SM5ABC	1	Signal Mountain	178	28,925	11	27.6	0.068	0.14	0.34	3.00	4.92	2.00		0	1.65	1.56	23.00	4.00		Y			163			22	6		0		0	16.00	34	3
SM4A	1	Signal Mountain	113	22,597	10	63.6	0.031	0.06	0.16	2.00	7.02	2.00	5	0	2.53	2.10	68.03	5.00											0	Y	5	15.00	30	3
SM3ABC	1	Signal Mountain	105	19,400	9	54	0.029	0.06	0.38	3.00	10.02	3.00	2	2	1.36	1.10	37.67	5.00											0		0	14.00	35	3
			927	**173,351**			**0.340**	**0.471**	**4.27**						**3.478**	**3.293**	**9.7**																
			356	73,622																													

Hamilton County Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 51 x3 if > 101 x4 if > 201 x5 if > 301	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if > 8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Total Score	Rank	Group
HC25	1	Hamilton County	10	2,757	8	124.8	0.009	0.06	0.07	0.00	25.03	5.00	1	5	0.19	0.12	12.16	3.00		Y			7						0		0	19.00	15	1
HC26A	1	Hamilton County	129	23,768	15	96	0.037	0.09	0.31	3.00	13.13	3.00	2	2	0.37	0.35	9.51	2.00											0	Y	5	16.00	16	1
HC26D	1	Hamilton County	74	17,404	8	103.2	0.011	0.03	0.09	0.00	5.24	2.00		0	0.44	0.35	31.35	5.00											0	Y	5	13.00	37	4
HC26C	1	Hamilton County	150	32,887	10	238.8	0.197	0.49	0.33	3.00	9.91	2.00		0	1.08	0.85	4.32	0.00											0	Y	5	11.00	44	4
HC28	1	Hamilton County	51	11,054	10	61.2	0.021	0.04	0.09	0.00	8.14	2.00		0	0.26	0.26	12.11	3.00											0	Y	5	11.00	46	5
HC23	1	Hamilton County	58	11,434	8	154.8	0.018	0.04	0.08	0.00	7.11	2.00		0	0.29	0.25	14.00	3.00											0	Y	5	11.00	47	5
HC20C	1	Hamilton County	134	30,452	10	84	0.050	0.11	0.15	0.00	4.87	2.00		0	0.37	0.29	5.80	2.00											0	Y	5	10.00	51	5
HC21B	1	Hamilton County	96	28,059	12	124.8	0.044	0.13	0.13	0.00	4.75	2.00		0	0.54	0.27	6.11	2.00											0	Y	5	10.00	52	5
HC29A	1	Hamilton County	112	44,629	15	116.4	0.137	0.29	0.15	2.00	3.43	0.00		0	1.16	1.01	7.36	2.00											0	Y	5	10.00	53	5
HC6B	1	Hamilton County	201	90,114	24	76.8	0.180	0.36	0.75	4.00	8.32	2.00		0	2.14	2.01	11.14	3.00											0		0	10.00	54	5
HC37B	1	Hamilton County	115	23,308	12	82.8	0.053	0.12	0.15	2.00	6.62	2.00		0	0.98	0.83	15.55	3.00											0		0	8.00	58	
HC29B	1	Hamilton County	73	17,086	10	130.8	0.030	0.07	0.04	0.00	2.42	0.00		0	0.21	0.17	5.55	2.00											0	Y	5	8.00	60	
HC42	1	Hamilton County	47	9,530	12	144	0.194	0.46	0.10	0.00	10.65	3.00	5	0	1.10	1.09	5.59	2.00											0		0	6.00	61	
HC6A	1	Hamilton County	87	20,828	28	163.2	0.210	0.53	0.14	0.00	6.63	2.00		0	2.99	2.25	10.74	3.00		Y			6						0		0	6.00	62	
HC37A	1	Hamilton County	154	80,966	18	170.4	0.177	0.35	0.32	3.00	3.98	0.00		0	1.11	0.94	5.31	2.00											0		0	6.00	63	
HC9	1	Hamilton County	47	8,036	10	102	0.030	0.10	0.04	0.00	4.69	2.00		0	0.67	0.51	16.93	3.00											0		0	6.00	64	
HC17A	1	Hamilton County	72	19,841	14	115.2	0.020	0.07	0.01	0.00	0.35	0.00		0	0.25	0.16	7.87	2.00		Y			4			6	2		0		0	5.00	67	
HC27	1	Hamilton County	14	8,825	8	114	0.009	0.03	0.01	0.00	1.26	0.00		0	0.34	0.28	30.99	5.00											0		0	6.00	68	
HC8	1	Hamilton County	129	25,352	12	182.4	0.034	0.08	0.12	0.00	4.92	2.00		0	0.24	0.21	6.34	2.00											0		0	5.00	69	
HC36	1	Hamilton County	24	3,782	8	123.6	0.015	0.09	0.02	0.00	5.27	2.00		0	0.24	0.10	6.42	2.00											0		0	5.00	72	
HC41	1	Hamilton County	50	8,484	8	85.2	0.097	0.15	0.11	0.00	13.05	3.00	3	0	0.40	0.36	3.70	0.00											0		0	4.00	73	
HC37C	1	Hamilton County	43	6,364	15	142.8	0.083	0.17	0.07	0.00	11.17	3.00	4	0	0.36	0.28	3.33	0.00											0		0	4.00	74	
HC4	1	Hamilton County	156	41,362	24	138	0.289	0.71	0.08	0.00	1.85	0.00		0	3.53	2.96	10.23	3.00				x5 if >5							0		0	4.00	75	
HC1	1	Hamilton County	70	18,587	9	97.2	0.010	0.03	0.02	0.00	0.87	0.00		0	0.40	0.19	19.57	3.00	Y=5			x2 if < 5							0		0	4.00	77	
HC10	1	Hamilton County	21	8,916	8	67.2	0.005	0.02	0.00	0.00	0.50	0.00		0	0.09	0.05	11.55	3.00											0		0	4.00	80	
HC17B	1	Hamilton County	76	17,755	12	126	0.032	0.08	0.05	0.00	2.65	0.00		0	0.35	0.25	7.68	2.00											0		0	3.00	81	
HC20B	1	Hamilton County	63	15,967	8	84	0.013	0.06	0.03	0.00	1.95	0.00		0	0.17	0.13	9.50	2.00											0		0	3.00	82	
HC19	1	Hamilton County	91	16,102	8	54	0.013	0.05	0.02	0.00	1.09	0.00		0	0.10	0.08	6.70	2.00											0		0	3.00	83	
HC22	1	Hamilton County	53	8,893	10	126	0.005	0.02	0.01	0.00	0.71	0.00		0	0.05	0.04	7.51	2.00										3	0		0	3.00	84	
HC21A	1	Hamilton County	110	23,475	12	98.4	0.051	0.12	0.05	0.00	2.20	0.00		0	0.37	0.24	4.64	0.00		Y			48			3	0		0		0	1.00	89	
HC20A	1	Hamilton County	150	29,157	10	134.4	0.121	0.26	0.05	0.00	1.75	0.00		0	0.49	0.44	3.67	0.00											0		0	1.00	90	
HC26B	1	Hamilton County	89	85,013	21	172.8	0.496	1.01	0.06	0.00	0.66	0.00		0	1.30	1.22	2.45	0.00											0		0	1.00	91	
			2,749	**790,187**			**1.205**	**2.690**	**3.65**						**8.383**	**7.082**	**5.9**																
							WWTP	0.804	1.864						4.038	3.099																		
		Ooltewah					**0.766**	**1.660**	**1.347**						2.881	2.537	3.761																		

North Ooltewah (Lee Hwy PS) Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 51 x3 if > 101 x4 if > 201 x5 if > 301	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if > 8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Total Score	Rank	Group
HC25	1	Hamilton County	10	2,757	8	124.8	0.009	0.06	0.07	0.00	25.03	5.00	1	5	0.19	0.12	12.16	3.00		Y			7						0		0	19.00	15	1
HC26A	1	Hamilton County	129	23,768	15	96	0.037	0.09	0.31	3.00	13.13	3.00	2	2	0.37	0.35	9.51	2.00											0	Y	5	16.00	16	1
HC26D	1	Hamilton County	74	17,404	8	103.2	0.011	0.03	0.09	0.00	5.24	2.00		0	0.44	0.35	31.35	5.00											0	Y	5	13.00	37	4
HC26C	1	Hamilton County	150	32,887	10	238.8	0.197	0.49	0.33	3.00	9.91	2.00		0	1.08	0.85	4.32	0.00											0	Y	5	11.00	44	4
HC20C	1	Hamilton County	134	30,452	10	84	0.050	0.11	0.15	0.00	4.87	2.00		0	0.37	0.29	5.80	2.00											0	Y	5	10.00	51	5

HC21B	1	Hamilton County	96	28,059	12	124.8	0.044	0.13	0.13	0.00	4.75	2.00		0	0.54	0.27	6.11	2.00								0		0	Y	5	10.00	52	5
HC17A	1	Hamilton County	72	19,841	14	115.2	0.020	0.07	0.01	0.00	0.35	0.00		0	0.25	0.16	7.87	2.00		Y			4		6	2		0		0	5.00	67	
HC17B	1	Hamilton County	76	17,755	12	126	0.032	0.08	0.05	0.00	2.65	0.00		0	0.35	0.25	7.68	2.00								0		0		0	3.00	81	
HC20B	1	Hamilton County	63	15,967	8	84	0.013	0.06	0.03	0.00	1.95	0.00		0	0.17	0.13	9.50	2.00								0		0		0	3.00	82	
HC19	1	Hamilton County	91	16,102	8	54	0.013	0.05	0.02	0.00	1.09	0.00		0	0.10	0.08	6.70	2.00								0		0		0	3.00	83	
HC22	1	Hamilton County	53	8,893	10	126	0.005	0.02	0.01	0.00	0.71	0.00		0	0.05	0.04	7.51	2.00								0	3	0		0	3.00	84	
HC21A	1	Hamilton County	110	23,475	12	98.4	0.051	0.12	0.05	0.00	2.20	0.00		0	0.37	0.24	4.64	0.00		Y			48		3	0		0		0	1.00	89	
HC20A	1	Hamilton County	150	29,157	10	134.4	0.121	0.26	0.05	0.00	1.75	0.00		0	0.49	0.44	3.67	0.00								0		0		0	1.00	90	
HC26B	1	Hamilton County	89	85,013	21	172.8	0.496	1.01	0.06	0.00	0.66	0.00		0	1.30	1.22	2.45	0.00								0		0		0	1.00	91	
			1,297	**351,531**			**0.766**	**1.660**	**1.347**						**2.744**	**2.537**	**3.3**															
						WWTP	0.489	0.994	0.709						1.279	1.199	2.5															
						Lee	0.241	0.587	0.639						1.465	1.217	5.1	0.479838773														

Soddy Daisy Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/ft)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 51 x3 if > 101 x4 if > 201 x5 if > 301	Chronic SSOs Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if > 6 x4 if > 8 x5 if > 10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Total Score	Rank	Group
SD3	1	Soddy Daisy	114	21,347	15	142.8	0.312	0.64	0.34	3.00	15.90	4.00	1	2	2.03	1.88	6.05	2.00								4	0			0	12.00	40	5
SD4B	1	Soddy Daisy	121	25,480	15	108	0.128	0.25	0.32	3.00	12.44	3.00	2	0	1.38	1.31	10.26	3.00									0			0	10.00	49	5
SD9B	1	Soddy Daisy	26	5,090	8	152.4	0.002	0.02	0.01	0.00	2.88	0.00	5	0	0.17	0.12	51.22	5.00									0			0	6.00	66	
SD4A	1	Soddy Daisy	172	43,613	15	144	0.292	0.47	0.21	2.00	4.83	2.00	4	0	1.65	1.45	4.96	0.00					5				0			0	5.00	70	
SD9A	1	Soddy Daisy	27	6,329	8	106.8	0.022	0.04	0.04	0.00	5.76	2.00	3	0	0.23	0.19	8.49	2.00									0			0	5.00	71	
SD1	1	Soddy Daisy	28	6,138	8	92.4	0.002	0.01	0.00	0.00	0.55	0.00		0	0.05	0.03	16.27	3.00									0			0	4.00	78	
SD10	1	Soddy Daisy	41	8,958	8	129.6	0.009	0.02	0.01	0.00	1.26	0.00		0	0.07	0.06	7.03	2.00									0			0	3.00	87	
SD11	1	Soddy Daisy	22	21,245	8	129.6	0.010	0.02	0.01	0.00	0.53	0.00		0	0.07	0.06	6.09	2.00									0			0	3.00	88	
SD12	1	Soddy Daisy	47	7,925	10	57.6	0.011	0.02	0.01	0.00	0.76	0.00		0	0.07	0.04	3.46	0.00									0			0	1.00	92	
			598	**146,124**			**0.606**	**1.113**	**0.95**						**3.727**	**3.362**	**5.6**															
							0.733	1.358	0.871						5.103	4.674																

Proposed

East Ridge Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if > 8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Impaired Stream in Basin (LF)	Impaired Stream Score x0 if ≤ 3,000LF x1 if ≤ 6,000LF x2 if ≤ 9,000LF x3 if > 9,000LF	Minority Population (%)	Per Capita Income Classified as Low Income (%)	Environmental Justice Severity Level (Minority*Income)	Environmental Justice Score x0 if ≤ 500 x2 if ≤ 1,500 x3 if > 2,000	Work Orders and Customer Complaints	Work Order and Complaint Score	Remedial Measures	Remedial Measures Score	Total Score	Rank
BP1	0	East Ridge	130	31,674	12	124.8	0.231	0.35	1.49	5.00	47.02	5.00	4	2.00	1.48	1.43	6.18	2.00	Y	5	43		7	3	13	3	Y	5		0	23.97%	20.10%	482	0		1.00		5.00	31.00	3
BP2	0	East Ridge	63	18,380	15	151.2	0.365	0.58	0.32	3.00	17.40	4.00	21	0.00	1.91	1.83	5.01	2.00	Y	5	12		7	3	6	2	Y	5		0	25.51%	57.19%	1459	2		1.00		5.00	27.00	12
ER10	0	East Ridge	62	15,981	15	202.8	0.397	0.56	0.92	4.00	57.37	5.00	2	4.00	3.03	2.96	7.45	2.00	Y	5	25		6	2		0	Y	5	3,130.38	1	31.92%	61.29%	1956	0		2.00		5.00	30.00	7
ER11A	0	East Ridge	108	21,103	8	75.6	0.074	0.15	0.55	4.00	25.92	5.00	12	0.00	0.81	0.77	10.48	3.00		0				0		0		0		0	37.13%	45.98%	1707	0		-		1.00	13.00	52
ER11B	0	East Ridge	38	7,956	8	79.2	0.049	0.09	0.18	2.00	22.36	5.00	16	0.00	0.59	0.56	11.42	3.00		0				0		0		0	384.09	0	36.15%	38.50%	1392	2		-		-	12.00	54
ER12A	0	East Ridge	103	19,510	12	10.9	0.068	0.16	0.40	3.00	20.45	5.00	19	0.00	0.80	0.72	10.57	3.00		0				0		0		0		0	24.28%	41.90%	1017	2		2.00		1.00	16.00	45
ER12B	0	East Ridge	64	31,368	8	8.9	0.073	0.13	0.27	3.00	8.69	2.00	23	0.00	0.98	0.54	7.37	2.00		0				0		0		0		0	23.97%	41.83%	1003	2		2.00		-	11.00	59
ER12C	0	East Ridge	50	17,717	8	14.1	0.069	0.13	0.11	0.00	6.49	2.00	24	0.00	0.47	0.34	4.89	0.00		0				0		0		0	6,950.98	2	35.94%	55.76%	2004	3		2.00		-	9.00	68
ER12D	0	East Ridge	92	17,760	10	22.2	0.025	0.07	0.28	3.00	15.80	4.00	22	0.00	0.58	0.53	21.65	4.00		0				0		0		0		0			0	0		-		1.00	12.00	54
ER1A	0	East Ridge	67	31,386	37	136.8	1.478	2.28	2.55	5.00	81.25	5.00	1	5.00	16.71	16.59	11.23	3.00		0				0		0		0	9,407.17	3	34.16%	61.59%	2104	3		-		4.00	28.00	9
ER1B	0	East Ridge	127	30,335	14	109.2	0.288	0.46	1.43	5.00	47.16	5.00	3	3.00	3.51	3.43	11.91	3.00		0				0		0		0		0	25.69%	37.59%	966	1		1.00		4.00	22.00	24
ER2A	0	East Ridge	138	34,181	29	91.2	1.070	1.36	0.81	4.00	23.71	5.00	15	0.00	8.95	8.75	8.18	2.00	Y	5				0		0		0	2,723.12	0	27.25%	57.87%	1577	0		1.00		-	12.00	54
ER2B	0	East Ridge	97	37,617	38	150	0.560	0.88	0.76	4.00	20.22	5.00	20	0.00	6.67	6.17	11.02	3.00	Y	5	12		2	0		0		0	6,266.22	2	23.97%	51.05%	1224	2		1.00		1.00	18.00	39
ER3A	0	East Ridge	76	17,591	21	108	0.338	0.56	-1.00	0.00	-56.68	0.00	25	0.00	4.34	4.30	12.71	3.00		0				0	2	0	Y	5		0	25.12%	57.84%	1453	2		1.00		4.00	15.00	47
ER3B	0	East Ridge	83	18,159	18	94.8	0.247	0.41	0.59	4.00	32.47	5.00	10	0.00	4.36	3.90	15.82	3.00		0				0		0	Y	5		0	26.32%	35.55%	936	1		1.00		4.00	23.00	21
ER3C	0	East Ridge	185	40,054	12	94.8	0.079	0.17	1.86	5.00	46.44	5.00	5	1.00	2.76	2.34	29.82	4.00		0				0		0	Y	5		0	22.68%	40.38%	916	1		1.00		5.00	27.00	12
ER4A	0	East Ridge	165	35,169	12	98.4	0.153	0.28	0.73	4.00	20.73	5.00	18	0.00	2.99	2.89	18.88	3.00	Y	5	20		2	0	2	0	Y	5		0	25.94%	30.66%	795	1		1.00		4.00	23.00	21
ER4B	0	East Ridge	163	34,129	10	81.6	0.070	0.14	1.24	5.00	36.47	5.00	6	0.00	1.85	1.67	23.94	4.00		0				0	4	0	Y	5		0	31.03%	47.22%	1465	2		1.00		5.00	27.00	12
ER5	0	East Ridge	106	25,482	10	126	0.061	0.11	0.86	4.00	33.89	5.00	9	0.00	1.23	1.20	19.73	3.00		0				0	2	0		0	2,289.78	0	23.60%	39.37%	929	1		1.00		3.00	17.00	44
ER6	0	East Ridge	111	23,697	10	66	0.057	0.12	0.65	4.00	27.25	5.00	11	0.00	1.47	1.33	23.21	4.00		0				0		0		0		0	35.65%	57.28%	2042	3		-		2.00	18.00	39
ER7	0	East Ridge	93	17,620	10	86.4	0.036	0.06	0.44	3.00	25.03	5.00	14	0.00	0.93	0.90	25.20	4.00		0				0		0		0		0	16.09%	28.57%	460	0		-		2.00	14.00	50
ER8A	0	East Ridge	81	20,069	15	109.2	0.212	0.38	0.44	3.00	22.16	5.00	17	0.00	3.12	3.05	14.36	3.00	Y	5	35		11	6		0		0	4,408.27	1	26.72%	49.14%	1313	2		-		4.00	24.00	18
ER8B	0	East Ridge	111	21,068	10	96	0.071	0.15	0.73	4.00	34.53	5.00	7	0.00	1.30	1.23	17.38	3.00		0				0	11	3		0	2,436.30	0	25.96%	38.46%	999	1		-		3.00	19.00	30
ER8C	0	East Ridge	110	22,977	12	115.2	0.127	0.20	0.59	4.00	25.59	5.00	13	0.00	2.08	2.03	16.02	3.00	Y	5	13		4	0	11	3		0	1,723.38	0	17.82%	36.94%	658	1		-		3.00	19.00	30
ER9	0	East Ridge	129	23,056	10	115.2	0.073	0.13	0.78	4.00	33.92	5.00	8	0.00	1.25	1.19	16.19	3.00		0				0	15	3		0	2,414.25	0	28.87%	36.22%	1046	2		1.00		3.00	21.00	26
			2,552	614,040			0.726	1.243	17.99						8.446	7.999	11.0																						

Red Bank Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if > 8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Impaired Stream in Basin (LF)	Impaired Stream Score x0 if ≤ 3,000LF x1 if ≤ 6,000LF x2 if ≤ 9,000LF x3 if > 9,000LF	Minority Population (%)	Per Capita Income Classified as Low Income (%)	Environmental Justice Severity Level (Minority*Income)	Environmental Justice Score x0 if ≤ 500 x2 if ≤ 1,500 x3 if > 2,000	Number of Work Orders and Substantiated Complaints	Work Order and Complaint Score	Remedial Measures	Remedial Measures Score	Total Score	Rank
RB05	0	Red Bank	135	119,917	N/A	N/A	0.324	0.59	2.55	5.00	21.23	5.00	4	2.00	5.49	4.65	14.37	3.00		0			13	6	22	5		0	3,044.19	1	18.87%	41.51%	783	1		-		5.00	33.00	1
RB07	0	Red Bank	89	50,473	15	85.2	0.235	0.34	1.16	5.00	22.96	5.00	3	3.00	2.13	1.97	8.38	2.00		0				0	35	5		0	3,794.71	1	15.12%	39.78%	602	1		-		5.00	27.00	12
RB03	0	Red Bank	76	14,938	N/A	N/A	0.392	0.64	-1.24	0.00	-83.07	0.00	9	0.00	5.11	5.10	12.99	3.00		0			22	6		0		0	2,640.02	0	21.69%	58.47%	1268	2		2.00		5.00	18.00	39
RB06	0	Red Bank	148	36,668	21	66	0.340	0.52	0.74	4.00	20.16	5.00	5	1.00	2.93	2.82	8.28	2.00	Y	5	39			0	35	5		0	4,472.78	1	17.61%	47.51%	837	1		-		5.00	24.00	18
RB02	0	Red Bank	133	39,892	N/A	N/A	0.527	0.82	1.69	5.00	42.30	5.00	1	5.00	5.74	5.39	10.22	3.00	Y	5	14			0		0		0	3,088.42	1	20.30%	57.75%	1172	2		2.00		4.00	27.00	12
RB01	0	Red Bank	236	37,991	N/A	N/A	0.607	0.99	0.90	4.00	23.78	5.00	2	4.00	6.35	6.26	10.32	3.00		0				0		0		0	5,194.46	1	19.38%	53.19%	1031	2		1.00		4.00	24.00	18
RB10B	0	Red Bank	43	6,453	8	69.6	0.004	0.01	0.01	0.00	2.02	0.00	7	0.00	0.08	0.07	16.13	3.00		0				0		0		0	1,390.85	0	16.96%	53.38%	905	1		-		-	4.00	90
RB10A	0	Red Bank	19	2,949	8	61.2	0.002	0.01	0.002	0.00	0.51	0.00	8	0.00	0.05	0.03	18.92	3.00		0				0		0		0		0			0	0		-		-	3.00	94
RB10C	0	Red Bank	189	28,413	8	124.8	0.057	0.12	0.13	0.00	4.48	2.00	6	0.00	0.23	0.21	3.72	0.00		0				0		0		0		0	18.36%	36.40%	668	1		-		-	3.00	94
			1,068	337,694			0.607	0.993	5.94						6.353	6.258	10.3																						

Lookout Mtn Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if >8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Impaired Stream in Basin (LF)	Impaired Stream Score x0 if ≤ 3,000LF x1 if ≤ 6,000LF x2 if ≤ 9,000LF x3 if > 9,000LF	Minority Population (%)	Per Capita Income Classified as Low Income (%)	Environmental Justice Severity Level (Minority*Income)	Environmental Justice Score x0 if ≤ 500 x1 if ≤ 1,000 x2 if ≤ 1,500 x3 if > 2,000	Number of Work Orders and Substantiated Complaints	Work Order and Complaint Score	Remedial Measures	Remedial Measures Score	Total Score	Rank
LM02	0	Lookout Mountain	144	18,469	8	98.4	0.077	0.15	0.62	4.00	33.70	5.00	2	4.00	1.47	1.30	16.98	3.00		0				42	5	Y	5			5.58%	8.89%	50	0		-		5.00	31.00	3
LM05	0	Lookout Mountain	152	20,868	8	86.4	0.088	0.19	0.65	4.00	31.01	5.00	3	3.00	1.27	1.22	13.84	3.00		0				42	5	Y	5	289.28	0	5.21%	11.11%	58	0		1.00		5.00	31.00	3
LM09	0	Lookout Mountain	63	9,394	8	147.6	0.046	0.09	0.48	3.00	51.27	5.00	1	5.00	0.75	0.69	15.15	3.00		0				42	5		0		0	5.35%	12.12%	65	0		-		5.00	26.00	17
LM06	0	Lookout Mountain	144	19,977	6	124.8	0.137	0.22	0.24	2.00	1.01	0.00	9	0.00	0.72	3.98	29.07	4.00		0			42	6	42	5	Y	5	2,700.25	0	5.54%	11.68%	65	0		1.00		5.00	28.00	9
LM07	0	Lookout Mountain	77	10,959	8	73.2	0.518	0.77	-0.24	2.00	-22.10	5.00	10	0.00	2.58	5.52	10.66	3.00		0				0	0	0		0	1,591.38	0	12.50%	0.00%	0	0		-		-	10.00	63
LM11	0	Lookout Mountain	71	8,637	8	48	0.030	0.06	0.14	0.00	16.25	4.00	4	2.00	0.30	2.50	82.22	5.00		0				0	0	0		0		0	5.38%	12.90%	69	0		-		-	11.00	59
LM03	0	Lookout Mountain	70	9,993	8	76.8	0.015	0.03	0.14	1.00	14.31	3.00	5	1.00	0.25	0.71	47.88	5.00		0				0	0	0		0		0	5.41%	8.33%	45	0		-		-	10.00	63
LM10	0	Lookout Mountain	34	7,944	8	62.4	0.020	0.04	0.11	0.00	13.60	3.00	6	0.00	0.51	0.45	23.04	4.00		0				0	0	0		0		0	5.05%	11.00%	56	0		1.00		-	8.00	70
LM12	0	Lookout Mountain	49	14,908	8	82.8	0.034	0.06	0.09	0.00	5.92	2.00	7	0.00	0.53	2.42	71.67	5.00		0				0	0	0		0		0	4.88%	10.75%	52	0		1.00		-	8.00	70
LM08	0	Lookout Mountain	21	4,098	8	68.4	0.014	0.04	0.02	0.00	3.73	0.00	8	0.00	0.11	0.71	48.97	5.00		0				0	0	0		0		0	6.67%	4.00%	27	0		1.00		-	6.00	81
			825	**125,247**			**0.518**	**0.765**	**2.25**						**2.578**	**5.520**	**10.7**																					
			580	79,667																																		

Signal Mtn Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if >8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Impaired Stream in Basin (LF)	Impaired Stream Score x0 if ≤ 3,000LF x1 if ≤ 6,000LF x2 if ≤ 9,000LF x3 if > 9,000LF	Minority Population (%)	Per Capita Income Classified as Low Income (%)	Environmental Justice Severity Level (Minority*Income)	Environmental Justice Score x0 if ≤ 500 x1 if ≤ 1,000 x2 if ≤ 1,500 x3 if > 2,000	Number of Work Orders and Substantiated Complaints	Work Order and Complaint Score	Remedial Measures	Remedial Measures Score	Total Score	Rank
SM6ABC	0	Signal Mountain	85	15,388	12	130.8	0.019	0.03	0.30	3.00	12.86	3.00	1	5.00	1.55	1.48	77.01	5.00		0				22	5	Y	5	3,601.41	1	6.35%	30.86%	196	0		2.00		4.00	33.00	1
SM7AB	0	Signal Mountain	163	25,364	12	69.6	0.340	0.47	-1.38	4.00	-20.95	5.00	7	0.00	3.48	3.29	9.68	2.00		0				0	0	Y	5	720.23	0	0.00%	0.00%	0	0		-		3.00	19.00	30
SM2D	0	Signal Mountain	93	29,309	10	84	0.049	0.09	0.46	3.00	8.96	2.00	4	2.00	1.65	1.53	31.19	5.00		0		6	2	6	2		5		0	6.89%	11.40%	79	0		5.00		4.00	30.00	7
SM2ABC	0	Signal Mountain	190	32,368	10	57.6	0.157	0.26	1.25	5.00	9.16	2.00	3	3.00	1.38	1.26	8.02	2.00	Y	5	42	6	2		0	Y	5	#########	3	6.22%	11.63%	72	0		5.00		4.00	31.00	3
SM5ABC	0	Signal Mountain	178	28,925	11	27.6	0.068	0.14	0.34	3.00	4.92	2.00	6	0.00	1.65	1.56	23.00	4.00	Y	5	163	22	6		0		0	562.30	0	5.48%	28.92%	158	0		-		3.00	18.00	39
SM4A	0	Signal Mountain	113	22,597	10	63.6	0.031	0.06	0.16	2.00	7.02	2.00	5	1.00	2.53	2.10	68.03	5.00		0				0	0	Y	5	33.11	0	0.00%	0.00%	0	0		-		3.00	18.00	39
SM3ABC	0	Signal Mountain	105	19,400	9	54	0.029	0.06	0.38	3.00	10.02	3.00	2	4.00	1.36	1.10	37.67	5.00		0				0	0		0	5,383.95	1	6.90%	20.36%	140	0		-		3.00	19.00	30
			927	**173,351**			**0.340**	**0.471**	**1.51**						**3.478**	**3.293**	**9.7**																					
			356	73,622																																		

Hamilton County Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if >8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Impaired Stream in Basin (LF)	Impaired Stream Score x0 if ≤ 3,000LF x1 if ≤ 6,000LF x2 if ≤ 9,000LF x3 if > 9,000LF	Minority Population (%)	Per Capita Income Classified as Low Income (%)	Environmental Justice Severity Level (Minority*Income)	Environmental Justice Score x0 if ≤ 500 x1 if ≤ 1,000 x2 if ≤ 1,500 x3 if > 2,000	Number of Work Orders and Substantiated Complaints	Work Order and Complaint Score	Remedial Measures	Remedial Measures Score	Total Score	Rank
HC25	0	Hamilton County	10	2,757	8	124.8	0.009	0.06	0.07	0.00	25.03	5.00	1	5.00	0.19	0.12	12.16	3.00	Y	5	7				0		0	Y	5	6,967.29	2	13.53%	39.44%	534	1		-		-	21.00	26
HC26A	0	Hamilton County	129	23,768	15	96	0.037	0.09	0.31	3.00	13.13	3.00	2	4.00	0.37	0.35	9.51	2.00		0					0		0	Y	5	1,190.47	0	28.01%	24.36%	682	1		-		1.00	19.00	30
HC26D	0	Hamilton County	74	17,404	8	103.2	0.011	0.03	0.09	0.00	5.24	2.00	13	0.00	0.44	0.35	31.35	5.00		0					0		0	Y	5		0	22.45%	39.29%	882	1		-		-	13.00	52
HC26C	0	Hamilton County	150	32,887	10	238.8	0.197	0.49	0.33	3.00	9.91	2.00	6	0.00	1.08	0.85	4.32	0.00		0					0		0	Y	5	#########	3	13.93%	39.72%	553	1		-		1.00	15.00	47
HC28	0	Hamilton County	51	11,054	10	61.2	0.021	0.04	0.09	0.00	8.14	2.00	8	0.00	0.26	0.26	12.11	3.00		0					0		0	Y	5		0	29.04%	38.96%	1132	2		-		-	12.00	54
HC23	0	Hamilton County	58	11,434	8	154.8	0.018	0.04	0.08	0.00	7.11	2.00	9	0.00	0.29	0.25	14.00	3.00		0					0		0	Y	5		0	34.88%	23.31%	813	1		-		-	11.00	59
HC20C	0	Hamilton County	134	30,452	10	84	0.050	0.11	0.15	0.00	4.87	2.00	15	0.00	0.37	0.29	5.80	2.00		0					0		0	Y	5	#########	3	18.98%	7.82%	148	0		5.00		2.00	19.00	30
HC21B	0	Hamilton County	96	28,059	12	124.8	0.044	0.13	0.13	0.00	4.75	2.00	16	0.00	0.54	0.27	6.11	2.00		0					0		0	Y	5	#########	3	13.87%	28.85%	400	0		-		-	12.00	54
HC29A	0	Hamilton County	112	44,629	15	116.4	0.137	0.29	0.15	2.00	3.43	0.00	19	0.00	1.16	1.01	7.36	2.00		0					0		0	Y	5		0	17.78%	32.57%	579	1		1.00		-	11.00	59
HC6B	0	Hamilton County	201	90,114	24	76.8	0.180	0.36	0.75	4.00	8.32	2.00	7	0.00	2.14	2.01	11.14	3.00		0					0		0	Y	5		0	13.26%	28.50%	378	0		5.00		4.00	23.00	21
HC37B	0	Hamilton County	115	23,308	12	82.8	0.053	0.12	0.15	2.00	6.62	2.00	11	0.00	0.98	0.83	15.55	3.00		0					0		0		0		0	20.20%	23.53%	475	0		1.00		-	8.00	70
HC29B	0	Hamilton County	73	17,086	10	130.8	0.030	0.07	0.04	0.00	2.42	0.00	21	0.00	0.21	0.17	5.55	2.00		0					0		0	Y	5		0	19.37%	24.12%	467	0				-	7.00	77
HC42	0	Hamilton County	47	9,530	12	144	0.194	0.46	0.10	0.00	10.65	3.00	5	1.00	1.10	1.09	5.59	2.00		0					0		0		0	3,929.78	1	26.28%	22.14%	582	1		-		-	8.00	70
HC6A	0	Hamilton County	87	20,828	28	163.2	0.210	0.53	0.14	0.00	6.63	2.00	10	0.00	2.99	2.25	10.74	3.00	Y	5	6				0		0	Y	5		0	12.26%	8.60%	105	0		5.00		4.00	19.00	30
HC37A	0	Hamilton County	154	80,966	18	170.4	0.177	0.35	0.32	3.00	3.98	0.00	18	0.00	1.11	0.94	5.31	2.00		0					0		0		0		0	18.71%	9.83%	184	0				-	5.00	86
HC9	0	Hamilton County	47	8,036	10	102	0.030	0.10	0.04	0.00	4.69	2.00	17	0.00	0.67	0.51	16.93	3.00		0					0		0		0		0	6.52%	34.62%	226	0		1.00		-	6.00	81
HC17A	0	Hamilton County	72	19,841	14	115.2	0.020	0.07	0.01	0.00	0.35	0.00	32	0.00	0.25	0.16	7.87	2.00	Y	5	4		6		2		0		0	1,789.75	0	11.19%	3.88%	43	0		4.00		-	8.00	70
HC27	0	Hamilton County	14	8,825	8	114	0.009	0.03	0.01	0.00	1.26	0.00	26	0.00	0.34	0.28	30.99	5.00		0					0		0		0		0	22.71%	39.38%	894	1		-		-	6.00	81
HC8	0	Hamilton County	129	25,352	12	182.4	0.034	0.08	0.12	0.00	4.92	2.00	14	0.00	0.24	0.21	6.34	2.00		0					0		0		0		0	8.91%	30.33%	270	0		3.00		-	7.00	77
HC36	0	Hamilton County	24	3,782	8	123.6	0.015	0.09	0.02	0.00	5.27	2.00	12	0.00	0.24	0.10	6.42	2.00		0					0		0		0		0	21.89%	5.26%	115	0		1.00		-	5.00	86
HC41	0	Hamilton County	50	8,484	8	85.2	0.097	0.15	0.11	0.00	13.05	3.00	3	3.00	0.40	0.36	3.70	0.00		0					0		0		0	1,601.06	0	25.68%	18.18%	467	0		-		-	6.00	81
HC37C	0	Hamilton County	43	6,364	15	142.8	0.083	0.17	0.07	0.00	11.17	3.00	4	2.00	0.36	0.28	3.33	0.00		0					0		0		0		0	16.72%	12.06%	202	0				-	5.00	86
HC4	0	Hamilton County	156	41,362	24	138	0.289	0.71	0.08	0.00	1.85	0.00	24	0.00	3.53	2.96	10.23	3.00		0					0		0		0	1,524.43	0	13.34%	20.14%	269	0				-	3.00	94
HC1	0	Hamilton County	70	18,587	9	97.2	0.010	0.03	0.02	0.00	0.87	0.00	28	0.00	0.40	0.19	19.57	3.00		0					0		0		0	3,239.62	1	8.14%	27.13%	221	0				-	4.00	90

HC10	0	Hamilton County	21	8,916	8	67.2	0.005	0.02	0.00	0.00	0.50	0.00	31	0.00	0.09	0.05	11.55	3.00		0				0		0		0		0	0.00%	0.00%	0	0		2.00		-	5.00	86
HC17B	0	Hamilton County	76	17,755	12	126	0.032	0.08	0.05	0.00	2.65	0.00	20	0.00	0.35	0.25	7.68	2.00		0				0		0		0	7,526.80	2	14.91%	12.73%	190	0		4.00		2.00	10.00	63
HC20B	0	Hamilton County	63	15,967	8	84	0.013	0.06	0.03	0.00	1.95	0.00	23	0.00	0.17	0.13	9.50	2.00		0				0		0		0		0	25.79%	15.00%	387	0		5.00		-	7.00	77
HC19	0	Hamilton County	91	16,102	8	54	0.013	0.05	0.02	0.00	1.09	0.00	27	0.00	0.10	0.08	6.70	2.00		0				0		0		0		0	15.98%	31.40%	502	1				-	3.00	94
HC22	0	Hamilton County	53	8,893	10	126	0.005	0.02	0.01	0.00	0.71	0.00	29	0.00	0.05	0.04	7.51	2.00		0			3	0		0		0		0	0.00%	0.00%	0	0				-	2.00	104
HC21A	0	Hamilton County	110	23,475	12	98.4	0.051	0.12	0.05	0.00	2.20	0.00	22	0.00	0.37	0.24	4.64	0.00	Y	5	48		3	0		0		0	5,348.82	1	18.57%	28.02%	520	1		-		-	2.00	104
HC20A	0	Hamilton County	150	29,157	10	134.4	0.121	0.26	0.05	0.00	1.75	0.00	25	0.00	0.49	0.44	3.67	0.00		0				0		0		0	#########	3	25.16%	17.41%	438	0		5.00		-	8.00	70
HC26B	0	Hamilton County	89	85,013	21	172.8	0.496	1.01	0.06	0.00	0.66	0.00	30	0.00	1.30	1.22	2.45	0.00		0				0		0		0	4,338.71	1	11.43%	7.69%	88	0				-	1.00	106
			2,749	**790,187**			**1.205**	**2.690**	**3.65**						**8.383**	**7.082**	**5.9**																							
						WWTP	0.804	1.864							4.038	3.099																									
		Ooltewah					**0.766**	**1.660**	**1.347**						2.881	2.537	3.760964343																							

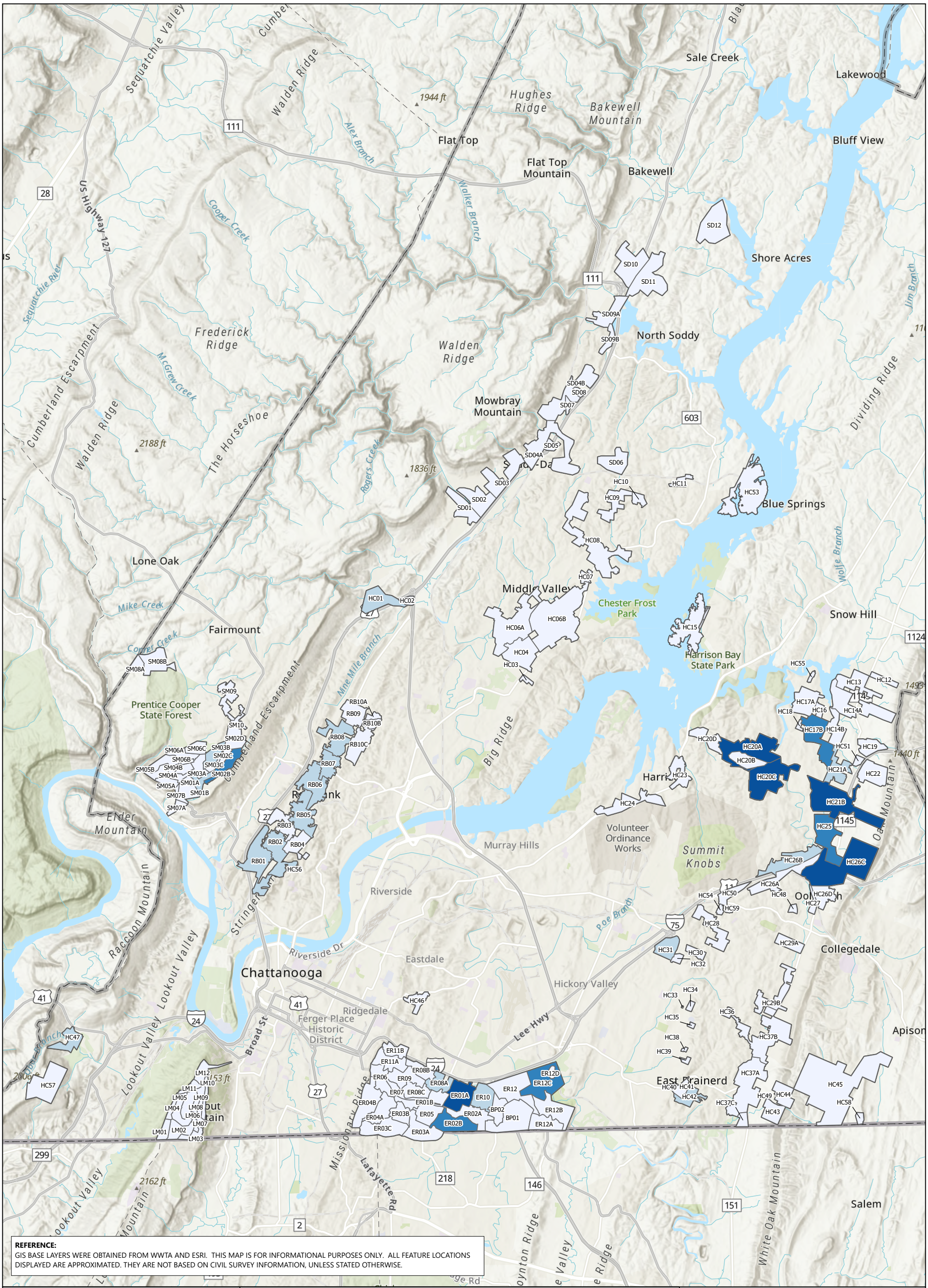
North Ooltewah (Lee Hwy PS) Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if >8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Impaired Stream in Basin (LF)	Impaired Stream Score x0 if ≤ 3,000LF x1 if ≤ 6,000LF x2 if ≤ 9,000LF x3 if > 9,000LF	Minority Population (%)	Per Capita Income Classified as Low Income (%)	Environmental Justice Severity Level (Minority*Income)	Environmental Justice Score x0 if ≤ 500 x2 if ≤ 1,500 x3 if > 2,000	Number of Work Orders and Substantiated Complaints	Work Order and Complaint Score	Remedial Measures	Remedial Measures Score	Total Score	Rank
HC25	0	Hamilton County	10	2,757	8	124.8	0.009	0.06	0.07	0.00	25.03	5.00	1	5.00	0.19	0.12	12.16	3.00	Y	5	7				0		0	Y	5	6,967.29	2	13.53%	39.44%	534	1		1.00		-	22.00	24
HC26A	0	Hamilton County	129	23,768	15	96	0.037	0.09	0.31	3.00	13.13	3.00	2	4.00	0.37	0.35	9.51	2.00		0				0		0		0	Y	5	1,190.47	0	28.01%	24.36%	682	1		1.00		1.00	20.00	28
HC26D	0	Hamilton County	74	17,404	8	103.2	0.011	0.03	0.09	0.00	5.24	2.00	4	2.00	0.44	0.35	31.35	5.00		0				0		0		0	Y	5		0	22.45%	39.29%	882	1		1.00		-	16.00	45
HC26C	0	Hamilton County	150	32,887	10	238.8	0.197	0.49	0.33	3.00	9.91	2.00	3	3.00	1.08	0.85	4.32	0.00		0				0		0		0	Y	5	#########	3	13.93%	39.72%	553	1		1.00		1.00	19.00	30
HC20C	0	Hamilton County	134	30,452	10	84	0.050	0.11	0.15	0.00	4.87	2.00	5	1.00	0.37	0.29	5.80	2.00		0				0		0		0	Y	5	#########	3	18.98%	7.82%	148	0		4.00		2.00	19.00	30
HC21B	0	Hamilton County	96	28,059	12	124.8	0.044	0.13	0.13	0.00	4.75	2.00	6	0.00	0.54	0.27	6.11	2.00		0				0		0		0	Y	5	#########	3	13.87%	28.85%	400	0		2.00		-	14.00	50
HC17A	0	Hamilton County	72	19,841	14	115.2	0.020	0.07	0.01	0.00	0.35	0.00	14	0.00	0.25	0.16	7.87	2.00	Y	5	4		6	2		0				0	1,789.75	0	11.19%	3.88%	43	0		4.00		-	8.00	70
HC17B	0	Hamilton County	76	17,755	12	126	0.032	0.08	0.05	0.00	2.65	0.00	7	0.00	0.35	0.25	7.68	2.00		0				0		0		0		0	7,526.80	2	14.91%	12.73%	190	0		4.00		2.00	10.00	63
HC20B	0	Hamilton County	63	15,967	8	84	0.013	0.06	0.03	0.00	1.95	0.00	9	0.00	0.17	0.13	9.50	2.00		0				0		0		0		0		0	25.79%	15.00%	387	0		4.00		-	6.00	81
HC19	0	Hamilton County	91	16,102	8	54	0.013	0.05	0.02	0.00	1.09	0.00	11	0.00	0.10	0.08	6.70	2.00		0				0		0		0		0	15.98%	31.40%	502	1		1.00		-	4.00	90
HC22	0	Hamilton County	53	8,893	10	126	0.005	0.02	0.01	0.00	0.71	0.00	12	0.00	0.05	0.04	7.51	2.00		0			3	0		0		0		0	0.00%	0.00%	0	0		1.00		-	3.00	94
HC21A	0	Hamilton County	110	23,475	12	98.4	0.051	0.12	0.05	0.00	2.20	0.00	8	0.00	0.37	0.24	4.64	0.00	Y	5	48		3	0		0		0	5,348.82	1	18.57%	28.02%	520	1		2.00		-	4.00	90
HC20A	0	Hamilton County	150	29,157	10	134.4	0.121	0.26	0.05	0.00	1.75	0.00	10	0.00	0.49	0.44	3.67	0.00		0				0		0		0	#########	3	25.16%	17.41%	438	0		4.00		-	7.00	77
HC26B	0	Hamilton County	89	85,013	21	172.8	0.496	1.01	0.06	0.00	0.66	0.00	13	0.00	1.30	1.22	2.45	0.00		0				0		0		0	4,338.71	1	11.43%	7.69%	88	0		2.00		-	3.00	94
			1,297	**351,531**			**0.766**	**1.660**	**1.347**						**2.744**	**2.537**	**3.3**																							
						WWTP	0.489	0.994	0.709						1.279	1.199	2.5																							
						Lee	0.241	0.587	0.639						1.465	1.217	5.1	0.479838773																						

Soddy Daisy Service Area

Site	Starting Score	Basin	Manholes	Footage	Diameter	MH Depth	ADDF	Peak Hourly DWF	Net RDII (MG)	Net RDII Score x2 if > 0.050 x3 if > 0.100 x4 if > 0.150 x5 if > 0.200	Normalized Net RDII (gal/lf)	Normalized Net RDII Score x2 if > 4.0 x3 if > 10.0 x4 if > 15.0 x5 if > 20.0	Normalized Net RDII Rank within Service Area	Normalized Net RDII Rank Score x2 if ranked 2nd in basin x5 if ranked 1st in basin	15-min WW Peak Flow	Hourly WW Peak Flow	Hourly Ave to Peak Ratio	Hourly Ave to Peak Ratio Score x2 if > 5:1 x3 if > 10:1 x4 if > 20:1 x5 if > 30:1	Chronic SSOs-Previous 5 Yrs (Y/N)	Chronic SSOs Previous 5 Years Score	Number of Chronic SSOs (Previous 5 Yrs)	Number of Chronic SSOs (Previous 6 Yrs) Score	Total Upstream Periodic SSOs (last 18 months)	Total Upstream Periodic SSOs (last 12 months) Score x2 if >4 x3 if >6 x4 if >8 x6 if >10	Total Downstream Periodic SSOs (last 18 months)	Total Downstream Periodic SSOs (last 12 months) Score x2 if >5 x3 if >10 x4 if >15 x5 if >20	Capacity Issue (Y/N)	Capacity Issue Score	Impaired Stream in Basin (LF)	Impaired Stream Score x0 if ≤ 3,000LF x1 if ≤ 6,000LF x2 if ≤ 9,000LF x3 if > 9,000LF	Minority Population (%)	Per Capita Income Classified as Low Income (%)	Environmental Justice Severity Level (Minority*Income)	Environmental Justice Score x0 if ≤ 500 x2 if ≤ 1,500 x3 if > 2,000	Number of Work Orders and Substantiated Complaints	Work Order and Complaint Score	Remedial Measures	Remedial Measures Score	Total Score	Rank
SD3	0	Soddy Daisy	114	21,347	15	142.8	0.312	0.64	0.34	3.00	15.90	4.00	1	5.00	2.03	1.88	6.05	2.00		0			4	0		0		5	0	8.49%	49.06%	416	0		5.00		4.00	28.00	9
SD4B	0	Soddy Daisy	121	25,480	15	108	0.128	0.25	0.32	3.00	12.44	3.00	2	4.00	1.38	1.31	10.26	3.00		0				0		0		0	0	0	8.86%	48.20%	427	0		2.00		-	15.00	47
SD9B	0	Soddy Daisy	26	5,090	8	152.4	0.002	0.02	0.01	0.00	2.88	0.00	5	1.00	0.17	0.12	51.22	5.00		0				0		0		0	0	0	5.08%	50.00%	254	0		3.00		-	9.00	68
SD4A	0	Soddy Daisy	172	43,613	15	144	0.292	0.47	0.21	2.00	4.83	2.00	4	2.00	1.65	1.45	4.96	0.00		0	5			0		0		5	0	0	9.88%	46.79%	462	0		5.00		4.00	20.00	28
SD9A	0	Soddy Daisy	27	6,329	8	106.8	0.022	0.04	0.04	0.00	5.76	2.00	3	3.00	0.23	0.19	8.49	2.00		0				0		0		0	0	0	7.47%	54.88%	410	0		3.00		-	10.00	63
SD1	0	Soddy Daisy	28	6,138	8	92.4	0.002	0.01	0.00	0.00	0.55	0.00	8	0.00	0.05	0.03	16.27	3.00		0				0		0		0	2,421.51	0	8.40%	26.09%	219	0		-		-	3.00	94
SD10	0	Soddy Daisy	41	8,958	8	129.6	0.009	0.02	0.01	0.00	1.26	0.00	6	0.00	0.07	0.06	7.03	2.00		0				0		0		0		0	5.45%	23.81%	130	0		1.00		-	3.00	94
SD11	0	Soddy Daisy	22	21,245	8	129.6	0.010	0.02	0.01	0.00	0.53	0.00	9	0.00	0.07	0.06	6.09	2.00		0				0		0		0		0	6.58%	23.61%	155	0		1.00		-	3.00	94
SD12	0	Soddy Daisy	47	7,925	10	57.6	0.011	0.02	0.01	0.00	0.76	0.00	7	0.00	0.07	0.04	3.46	0.00		0				0		0		0		0	4.44%	6.25%	28	0		3.00		-	3.00	94

Appendix G – Impaired Streams and Environmental Justice Aeras



REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA AND ESRI. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

Impaired Streams in Basin

Section 303(d)

- ≤ 3000 LF
- ≤ 6000 LF
- ≤ 9000 LF
- > 9000 LF

WWTA SSER Basins with Impaired Streams

LJA ENGINEERING

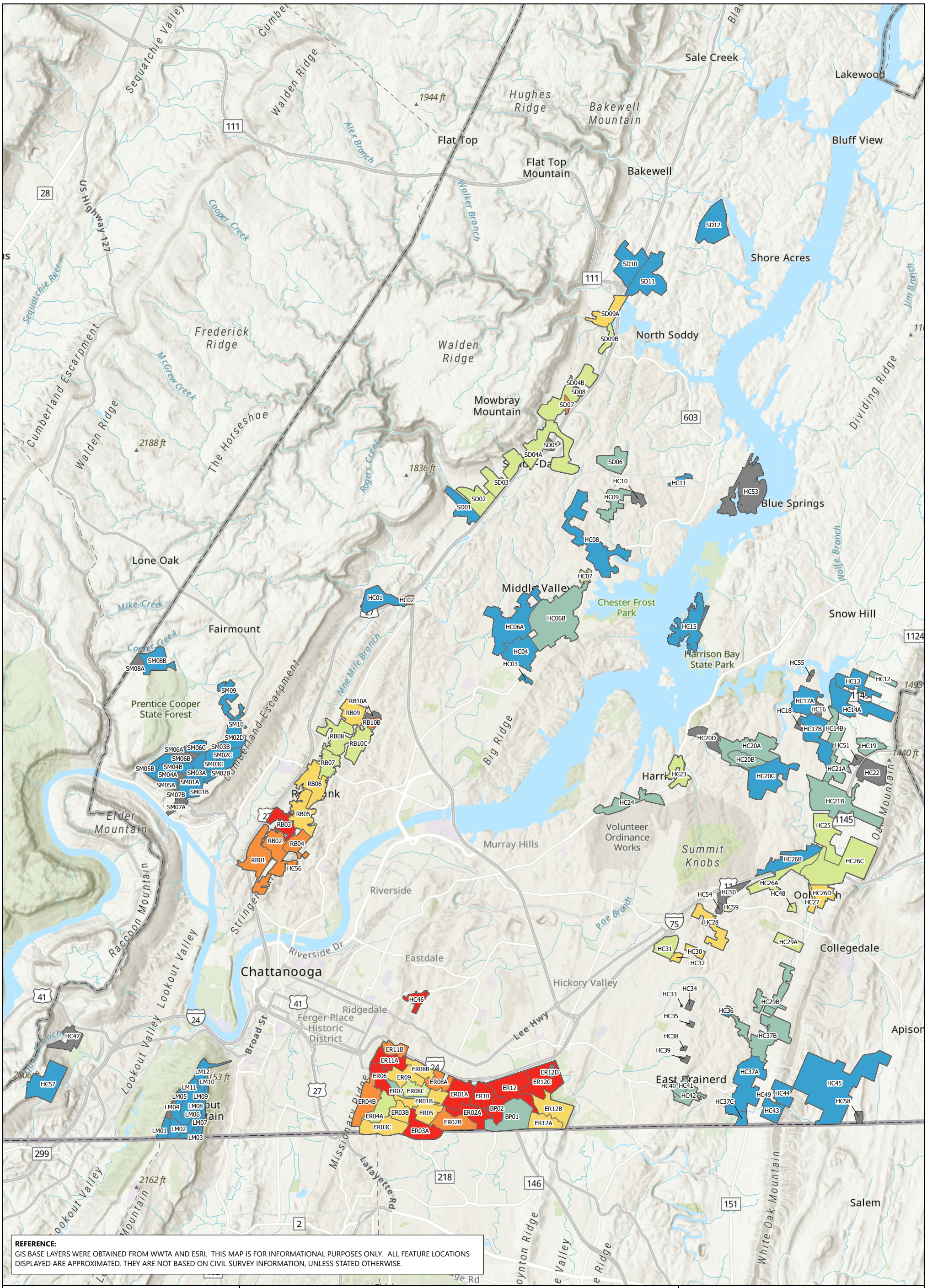
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

N

1 inch = 12,000 feet

Feet
0 6,000 12,000

Drawing Path: Z:\SoutheastRegion\Clients\WWTA\Consent Decree\SSER\SSER_Pro_Doc_Updated.aprx plotted by blundberg 05-14-2025



REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM WWTA AND ESRI. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

Enviornmental Justice Score

SSER Basins

- ≤ 20%
- ≤ 25%
- ≤ 30%
- ≤ 35%
- ≤ 40%
- > 40%
- No Data

WWTA SSER
Environmental Justice

LJA ENGINEERING
LJA Engineering | 1110 Market Street, Suite 314
Chattanooga, TN 37402 | www.lja.com

N

1 inch = 12,000 feet

Feet
0 6,000 12,000

Drawing Path: Z:\SoutheastRegion\Clients\WWTA\Consent Decree\SSER\SSER_Pro_Doc_Updated.aprx plotted by blundberg 05-14-2025

Appendix H – WWTA Standard SSER Specifications

SSER STANDARD SPECIFICATIONS

Part 1 General

1.01 Scope

The work covered by this Section includes furnishing all labor, material, equipment and services required for cleaning all sewer pipelines, prior to inspection of the sewers, by closed circuit television, authorized by the Engineer, as shown on the Drawings and/or specified herein. The objective of preconditioning and cleaning is to maximize sewer and manhole service efficiency and effectiveness. Preconditioning and cleaning involves removal of silt, which is defined as any and all solid or semi-solid materials, including fine and granular material, such as sand, grit, gravel, and rock as well as debris, grease, oil, sludge, slime, or any other loose material or encrustation lodged in the manhole or sewer. Preconditioning and cleaning also involves removal of invading roots, corroded concrete, intruding laterals and any other extraneous debris.

1.02 Definitions

A. The term "clean" as used in this Section, shall mean removing all sand, dirt, roots, cobwebs, grease and all other solid or semi-solid materials from the sewer pipelines, so that a closed circuit television camera can be used in the internal pipeline inspection for the purpose of discerning structural defects, misalignment and infiltration/inflow sources.

B. “Heavy Cleaning” shall be defined as the pipe being more than 25% full of debris or requiring the use of apparatus other than normal high-pressure jetting equipment (i.e. buckets, “pigs”, power-rod machines, grinders, or dragging devices). The Contractor shall be paid for “Heavy Cleaning” on the basis of the distance loosened debris is moved to the nearest point of extrication from the sewer. Payment shall be calculated on a lineal foot basis and be paid in addition to the normal cleaning rate shown on the bid form. ”Heavy Cleaning” must be pre-approved by the Engineer.

Part 2 Products

2.01 General

A. The Contractor shall certify that sufficient cleaning units can be provided, including standby units in the event of breakdown, in order to complete the work within the contract period. Further, the Contractor shall certify that standby or back-up equipment can be delivered to the site within 24 hours in the event of equipment breakdown.

B. Prior to the commencement of work, the Contractor shall coordinate access to water with the local water utility. Water will not be furnished by the Owner.

C. All details of the point of water connection, backflow protection, conveyance methods, draw-off rates, times and all local conditions regarding the use of water

shall be approved by the Engineer and the utility providing the water prior to commencement of work. All equipment, labor, and material required for obtaining water for the work shall be provided by the Contractor. The Contractor must ensure that a 6 inch minimum air gap is maintained at the water supply point on de-silting/cleaning/jetting equipment or any other receiving apparatus used to obtain water from the utility's hydrants.

Part 3 Execution

3.01 Cleaning

A. Cleaning will be accomplished by utilizing a high pressure, hydraulic sewer pipeline cleaner. Pressure jetting equipment used shall be sufficient for the purposes of attaining the degree of cleanliness in sewers as specified without exceeding the maximum pressures indicated below and damaging the pipelines.

B. The cleaning unit(s) shall be capable of operating routinely, up to a minimum of 500 feet from the point of access to the sewer; minimal hose diameter shall be 1 inch.

C. The Contractor's rates specified in the Proposal Forms shall be for jetting in sewers both upstream and downstream.

D. Successive passes using constantly moving pressure jetting techniques shall be applied to sewers until they are cleaned to the level specified. Nozzle hold-time (stationary time), for any particular location, shall not be more than 60 seconds in order to forestall damage to the pipe being cleaned. Ideally nozzles shall have jet angles of between 130° to 145°. "High efficiency nozzles" (discharging "pencil jets") with jet angles lower than this figure shall not be allowed to be stationary at any time. The maximum pressure applied utilizing a stationary jet nozzles shall not exceed 3,000 psi in PVC and HDPE pipelines and shall not exceed 2,500 psi in vitrified clay pipelines. The maximum pressure applied utilizing rotary jet nozzles shall not exceed 3,500 psi in VCP pipelines, 5,500 psi in PVC pipelines and 7,000 psi in HDPE pipelines.

E. Cleaning shall be done immediately prior to the internal inspection to preclude the build-up of debris from infiltration/inflow sources and upstream manhole sections. Should television inspection reveal that a sewer pipeline is not clean; the cleaning operations shall be repeated until the sewer pipeline is clean. This additional cleaning shall be done at the expense of the Contractor, at no additional cost to the Owner.

F. During preconditioning and cleaning work and all other associated Contract operations, sewer services shall be maintained at all times. This requirement may be relaxed only with the written approval of the Engineer.

G. The manholes and sewers to be preconditioned and cleaned convey sanitary sewage or combined sewage. In many instances such sewers are subject to high flows, either continuously or in a periodically varying cycle, due to rainfall, infiltration, and/or pumping operations. The Contractor shall include in his proposal

provisions for dealing with such variations, and where necessary, schedule Work to accommodate such variation in flows.

H. Cleaning shall include the trapping and removal of all sediments and residual wastes from successive manholes as the cleaning progresses. When hydraulic cleaning equipment is used, a suitable weir or dam shall be constructed in the downstream manhole, in such a manner, that the solids and water are trapped. Under no circumstances shall sewage or solids removed there from, be dumped onto streets, in catch basins or in storm drains. Material which could cause pipeline stoppages, accumulations of sand in wet wells, or damage to pumps, shall not be permitted to pass from manhole section to manhole section. The cost of trapping, removing, hauling and disposing of the residual wastes shall be included in the cost of cleaning. Disposal of residual wastes shall be in accordance with, and at a location approved by the Engineer and the Owner.

I. The Contractor shall provide for the pumping down of any surcharged manhole section and provide all bypass pumping, if required, during the cleaning operation. All bypass pumping shall be approved by the Engineer.

J. 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. Manhole preconditioning and cleaning equipment
3. Sewer preconditioning and cleaning equipment
4. Flow diversion and flow control equipment
5. Traffic control equipment
6. All other equipment necessary for the completion of the work.

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

L. 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.

3.02 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 cleaned.

B. No fire hydrant shall be obstructed, in case of a fire in the area served by the hydrant.

C. The Contractor shall take all necessary precautions to protect the sewer pipelines from damage that might be inflicted by improper use of cleaning equipment and shall repair, at no cost to the Owner, any damage caused by the cleaning operation.

D. The Contractor shall furnish, to the Owner, certification of the accuracy of the automatic counter before any work shall begin on this Project. If, at any time, the Engineer has reason to believe that the counter is inaccurate; the calibration of the counter will be checked before any more work progresses.

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 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 cleaning report for each sewer segment cleaned. A .csv file of this report shall be furnished on a biweekly basis to the Engineer. The information required on the cleaning report shall be as follows:

1. Asset ID, location, size and condition of sewer line. Location will be indicated by road name or intersection(s). Size will be indicated by nominal internal diameter.

2. Length of sewer cleaned.

3. Estimated amount and types of debris and sediment removed. Indicate approximate location

4. Grease build-ups. Indicate approximate location.

5. Structural failures. Indicate approximate location.

6. Blockages. Indicate percent blockage or free area,

7. Method and man hours actually expended for cleaning.

END OF SECTION

Part 1 General

1.01 Scope

The work covered by this Section includes furnishing all labor, materials, equipment and services required to perform the closed circuit television (CCTV) inspection of the specific sewer pipelines authorized by the Engineer.

1.02 Definition

"Internal inspection" shall consist of using a closed circuit television within a designated sewer pipeline segment to detect point sources of infiltration/inflow or exfiltration and to determine the physical condition of the sewer pipeline.

1.03 CCTV Camera Operator Certification Requirements

A. The Contractor will provide current certification that operators conducting CCTV inspections have undergone National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP®) training prior to commencement of inspection activities. Defect coding, as well as material, shape, and lining coding used throughout the project will conform to most current NASSCO PACP standard version.

B. Each operator must have at least 1 year's experience in the coding of NASSCO CCTV inspections and must have reported upon more than 150,000 feet of CCTV. The Contractor must use NASSCO certified data collection software (most current PACP version), with final approval by the Engineer prior to the start of the Contract.

Part 2 Products

2.01 Television Equipment

A. The camera unit shall be a color pan and tilt unit. The television camera shall have a resolution of at least 500 lines minimum and shall have a source of illumination attached to it. With the monitor adjusted for correct saturation, the six colors plus black and white shall be clearly resolved with the primary and complementary colors in order of decreasing luminance. The gray scale shall appear in contrasting shades of gray with no tint. To ensure the camera shall provide similar results when used with its own illumination source, the lighting shall be fixed in intensity prior to commencing the inspection. In order to ensure color constancy, no variation in illumination shall take place during the inspection. The televised image shall be displayed on a monitor, located in an enclosed space in the television inspection vehicle.

B. CCTV Focus/Iris/Illumination: The adjustment of focus and iris shall allow optimum picture quality to be achieved and shall be remotely operated. The adjustment of focus and iris shall provide a minimum focal range from 6 inches in front of the camera's lens to infinity. The distance along the sewer in focus from the initial point of observation shall be a minimum of twice the vertical height of the sewer. The illumination must allow an even distribution of the light around the sewer perimeter without the loss of contrast picture, flare out or shadowing.

C. The camera shall be self-propelled or mounted on skids and drawn through the sewer by winches for pipelines with an equivalent diameter from 6 to 36 inches. The use of winches and skids shall be approved by the Engineer prior to CCTV inspection services. The inspecting equipment shall be capable of inspecting a length of sewer up to at least 1,000 ft. when entry into the sewer may be obtained at each end and up to 750 feet where a self- propelled unit is used, where entry is possible at one end only. The Contractor shall maintain this equipment in full working order and shall satisfy the Engineer at the commencement of each working shift that all items of equipment have been provided and are in full working order.

D. Each inspection unit shall contain a means of transporting the CCTV camera equipment in a stable condition through the sewer under inspection. Such equipment shall ensure the maintained location of the CCTV camera on or near to the central axis of a circular shaped sewer when required in the prime position.

E. Where the CCTV camera head is towed by winch and bond through the sewer, all winches shall be stable with either lockable or ratcheted drums. All bonds shall be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera and/or Sonar equipment. All winches shall be inherently stable under loaded conditions.

F. Each unit shall carry sufficient numbers of guides and rollers such that, when inspecting, all bonds are supported away from pipe and manhole structures and all CCTV cables and/or lines used to measure the CCTV camera's head location within the sewer are maintained in a taut manner and set at right angles where possible, to run through or over the measuring equipment.

G. The Contractor shall use a suitable metering device, which enables the cable length to be accurately measured; this shall be accurate to within +/- 2 inches. When requested by the Engineer in writing at any time during a survey or inspection, the Contractor shall demonstrate compliance with the above tolerance. The device used by the Contractor to measure the footage along the sewer will be compared with a standard tape measure. The results will be noted. If the Contractor fails to meet the required standard of accuracy, the designated Engineer shall instruct the Contractor to provide a new device to measure the footage.

H. The in-sewer photographic/video camera system and suitable illumination shall be capable of providing an accurate, uniform and clear record of the sewer's internal condition. In-sewer lighting standards shall meet the requirements of the designated Engineer and applicable codes regarding safety and power.

I. A reserve television camera shall be available to replace the regular television camera in the event of a breakdown. Should the reserve equipment malfunction, another camera shall be provided within 24 hours.

J. Suitable flow control devices shall be plugs designed and manufactured for use in sanitary sewers. Sand bags or other types of devices shall not be used within sanitary sewer pipelines or manholes.

2.02 Television Equipment Operation

Operation of the television inspection equipment shall be controlled from above ground, with a skilled technician at the control panel in the television inspection van controlling the movement of the television camera. The technician shall have the capability to: adjust the brilliance of the built-in lighting system; change the focus of the television camera by remote control; control the pan and tilt feature of the camera; control the forward and reverse motion of the camera; and determine the camera's position, at any time. Operators of the television inspection equipment shall meet the requirements stated in Section 1.03 of this Specification.

Part 3 Execution

3.01 Procedure

Prior to starting each inspection, the operator shall pan and tilt the surrounding above ground area of the entrance manhole. The CCTV video shall include the view of the camera as it is placed within the manhole and shall show which pipe in which the CCTV camera is inserted. Prior to entering the pipeline, the camera shall be tilted upwards and pan the interior of the manhole. A measuring rod shall be placed at the mouth of the pipe (and included on video) to verify the diameter of the pipeline being inspected. The diameter shall be noted in the inspection database and on the inspection video. The television inspection shall be performed in one section of the sewer pipeline at a time, between adjacent manholes. A complete inspection as per NASSCO standards shall be conducted. The inspection shall be performed by pulling or propelling the television camera through the section of the sewer along the centerline axis of the pipeline. A position tolerance of ± 10% of the vertical sewer pipeline diameter dimension will be allowed (i.e. for an 8-inch diameter pipeline the camera shall be centered within +/- 0.8-inches of the center of the pipeline). The inspection shall be performed in a forward and/or backward direction, as dictated by the pipeline conditions at the time of the inspection. During the inspection of the sewer pipeline, every possible means shall be taken to ensure total viewing of the inside periphery of the pipeline. The inspection shall be conducted in such a manner as to determine that the line is clean and to locate all leaking joints, breaks, defects and faults in the pipeline. The operator shall bring the camera to a complete stop and the television camera movement shall be temporarily halted at each defect/observation/tap in order to pan or tilt the camera head and observe the full extent of the defect/observation/tap in full detail, and to allow for a clear photograph. Camera movement will not resume with visible point sources of infiltration/inflow

until the leakage rate from the source is quantified. The camera shall also be stopped at service connections where flow is discharging. If the discharge persists, the property involved shall be checked, at the ground surface level, to determine whether or not the discharge is wastewater. If checking determines that the discharge is not wastewater, it shall be considered infiltration/inflow. The leakage rate of each infiltration/ inflow source shall be estimated in gallons per day (gpd), when possible. When reaching an end point manhole, the camera should be maneuvered to the center of the manhole and tilted upward and slowly panned in order to view the interior of the manhole.

3.02 Provisions

A. The Contractor shall maintain on site at all times a competent field supervisor in charge of the inspection. The field supervisor shall be responsible for the safety of all site workers and site conditions as well as ensuring that all work is conducted in conformance with these specifications and to the level of quality specified.

B. The Contractor shall provide bypass pumping, where necessary, to prevent flooding or sanitary sewer overflows.

C. The Contractor shall provide for the pumping down of any surcharged manhole section, if required, before television inspection commences. Bypass pumping must be approved by the Engineer prior to set up.

D. The Contractor shall furnish, to the Owner, certification of the accuracy of the automatic counter before any work shall begin on the Project. If, at any time, the Engineer has reason to believe that the counter is inaccurate, the calibration of the counter will be checked before any more work progresses.

E. CCTV Camera Head Speed: The speed of the CCTV camera in the sewer shall be limited to 30 feet per minute for inspections to enable all details to be extracted from the final video recording.

F. At the start of each sewer length being surveyed or inspected and each reverse set- up, the length of pipeline from zero footage (middle of the man) up to the cable calibration point shall be recorded and reported in order to obtain a full record of the sewer length. Only one inspection shall be indicated in the final report. All reverse set-ups, blind manholes, and buried manholes shall be logged on a separate log. Each log shall make reference to a start (ST) and finish (FH) manhole unless abandonment took place because of blockage. **Prior to initiating the survey, the contractor shall make sure that the camera is outside of the pipeline to be inspected and a full panoramic video of the pipe entry or exit into the manhole is captured. A grade rod shall be inserted into the manhole so that the diameter of the pipeline to be inspected is accurately measured and shown in the video and documented in the PACP database.** The grade rod shall be shown at the beginning manhole survey and again at the end of the pipeline survey. Any leaks or infiltration sources shall be thoroughly videoed and annotated in the PACP form.

G. Should the Contractor encounter a buried manhole during the course of inspection that cannot be readily accessed, the Contractor shall notify the Engineer, and shall make note of such in the appropriate field on the inspection header.

H. If during the course of CCTV Inspection, a protruding tap is discovered in the pipeline that will not allow the passage of a CCTV inspection camera and a reverse setup cannot be completed, then the Contractor will be required to remove the protruding tap via a remotely controlled robotic cutting device. Prior to removing the protruding tap, the Contractor must receive approval from the Engineer.

I. If for any reason the camera becomes disabled inside the sewer and cannot further proceed, the Contractor shall be responsible for retrieving the camera at no additional cost to the Owner.

J. All digital video shall be continuous with no evidence of missed footages or “blink-outs.” That the entire pipeline segment was traversed and inspected shall be obvious on the final video recording.

K. Prior to inspection, each length of sewer shall be cleaned pursuant to Specification 33 01 30.14. All inspected pipe should be free of debris to allow for a complete, unobstructed view of the pipe. If upon viewing a final inspection, the Engineer deems that the view is obstructed, the pipe will be cleaned and re-televised at no cost to the Owner.

L. All mainline CCTV surveys must be full PACP surveys, continuous from a starting manhole or access point to a finishing manhole, access point, or utility feature where possible. Any line that is not televised from a starting manhole, access point, or utility feature to a finishing manhole, access point, or ending utility feature will be considered as a partial or incomplete survey and will be rejected unless specified to do so otherwise or if the camera cannot not pass through the entire line due to an obstacle or other defect.

M. Each CCTV survey shall televise the pipeline completely and shall pan the upstream and downstream manholes or access points and document all notable observations found in them.

N. While in motion, the CCTV camera is to be fully zoomed out and fixed to what is known as “home position” where the camera head is kept at the level horizon and is centered and pointed true down the alignment of the pipe for the duration of each CCTV survey.

O. During CCTV inspection, lighting intensity shall be adjusted as necessary to minimize glare and maximize viewing ability to provide an in-focus picture of the entire periphery of the pipeline for all conditions encountered.

P. If during a normal flow CCTV survey the televising camera cannot pass through the entire pipe section due to a defect, anomaly, or obstruction in the pipe, the

contractor perform a reverse set up in order that an inspection can be performed from the opposite manhole, wet well, or access point.

Q. If the camera lens becomes covered with sewage, grease, deposits etc. resulting in poor picture quality then the inspection shall be suspended and the camera shall be removed and cleaned. The inspection can then be resumed at the last clear camera location.

R. Prior to beginning a CCTV inspection, the operator shall verify the diameter of the pipeline to be inspected by inserting a surveying rod into the manhole and measuring the pipeline diameter to the nearest $1/10^{th}$ foot.

3.03 Data Collection

A. The Contractor shall furnish all equipment and software required for taking photographs and videos of the view which appears on the monitor. Digital Video will be used to record all point sources and defects, severe leaks, holes, collapses, misalignments, etc. Still pictures shall be taken of all coded observations. Only one still photo of each defect should be included. Additional photos of a defect shall be coded as a “General Observation” for each additional photo taken. Data logging and defect coding conforming to the NASSCO PACP will be required as part of all pipeline inspections.

B. All inspection information shall be captured utilizing NASSCO certified data collection software and following all NASSCO PACP (most current version) standard data fields, formats, and conventions provided by the Engineer.

C. All inspection media file naming formats and folder organizational structures must remain consistent throughout all internal inspections. See naming conventions in Section 3.04, Part E.

D. A digital encoded inspection video shall be continuously captured for the entire length of each inspection. All digital encoded inspection video files shall be in .wmv file format. For all digital encoded inspection videos, the file naming format shall be generated using a concatenation of standard PACP database fields in the format "Upstream_MH"_"Downstream_MH"_"Direction"_”Date”_”Time”. CCTV inspections in which the camera lens is or becomes obstructed, dirty, greasy, etc. during the inspection, and remains so for up to two (2) feet, will not be accepted.

E. A digital still image shall be captured for each coded observation. All digital still images shall be in JPEG file format. For all digital still images, the file naming format shall be generated using a concatenation of standard PACP database fields in the format "InspectionID"_"ConditionID"_"Distance"_"PACP_Code".

F. Each digital encoded inspection video shall begin with the camera facing towards the bottom of the manhole and oriented so that the outgoing sewer connection is at the 6 o’clock position. This position shall be held during video recording for a minimum of five (5) seconds prior to lowering the camera to the bottom of the manhole. Once the camera has been lowered into the manhole and oriented in its

direction of travel, the camera shall be directed towards the top of the manhole, with this position held during video recording for a minimum of five (5) seconds prior to advancement into the sewer.

G. A comprehensive summary inspection report shall be generated for each inspection, and shall be in Portable Document Format (PDF). The report shall include the findings on major defects, including but not limited to fractures, displaced joints, deformation, corrosion, lateral intrusions, and dominant surface features including encrustation and silt depths. All pdf report files shall be in a dedicated folder called “PACP_Reports”

H. Each sewer length (the length of the sewer between two (2) consecutive manholes) will be entered into the PACP database field "Total_Length". If field maps are provided for the project area and include a total length, then this value will be entered into the field "Total_Length".

I. When a length of sewer between two (2) consecutive manholes cannot be inspected for practical reasons, the reason for abandonment shall be described in the PACP database field "Additional_Info". At unmapped manholes, a new inspection will be started and the footage re-set to zero (0.0).

J. When the Contractor elects to “pull through” a manhole during a CCTV and/or Sonar Inspection, a new inspection will be started at the manhole “pulled through”, and the footage re-set to zero (0.0) at the manhole wall where the pipe exits/enters the manhole.

K. When a reverse or second inspection is required to complete the inspection of a sewer, the PACP database field "Reverse_Setup" shall be populated with corresponding inspection number. The "Reverse_Setup" field shall be null for all inspections that are not reverse or follow-up inspections.

L. When an unmapped manhole is discovered during an inspection, the Contractor shall assign a temporary field-assigned ID to the manhole. This temporary manhole ID shall be the upstream manhole ID plus a letter designation beginning with the letter “X”. For example if inspecting from upstream manhole ID “61” to downstream manhole ID “48”, a new manhole is discovered, this manhole will be identified as manhole ID “48X”. If an additional line is entering the new manhole ID “48X”, the next upstream manhole shall be identified as manhole ID “48X1”. 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. At the start of each sewer length, a data generator shall electronically generate and clearly display on the viewing monitor and subsequently on the final recording a record of data in alpha-numeric form containing the following minimum information:

1. Automatic update of the camera's footage position in the sewer line from adjusted zero.
2. Sewer dimensions in inches
3. Manhole numbers (must conform to Owner's identification number)
4. Date of survey
5. Road name (nearest)/location
6. Direction of survey, i.e., downstream or upstream
7. Time of start of survey
8. Material of construction of the pipe
9. Contractor
10. Engineer

N. The size and position of the data display shall be such as not to interfere with the main subject of the picture.

O. Once the survey of the pipeline is under way, the following minimum information shall be continually displayed:

1. Automatic update of the camera's footage position in the sewer line from adjusted zero.
2. Sewer dimensions in inches
3. Manhole numbers (must conform to Owner's identification number)
4. Direction of survey, i.e., downstream or upstream

P. At each defect of any kind, the camera movement shall be halted, and the camera shall be tilted and panned as necessary to observe the full extent of the defect before it is electronically coded.

Q. At each coded observation, the following minimum information shall be displayed:

1. The PACP code and/or PACP code description.
2. The footage position of the defect.
3. The "Additional_Info" field in any cases where it is utilized.

R. The actual field work will be monitored by the Engineer. A Project representative will be available during internal television inspection, and no work shall be performed without the Engineer's Project representative present, unless authorized by the Engineer.

S. The contractor shall take caution to ensure that the pipe ID's and manhole ID's entered into the PACP database are correct, free from typos, and consistent with the data

supplied by the Engineer. Databases with substantial rates of error in these fields will not be accepted.

T. 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 standards will be returned to the Contractor for correction at no additional cost to the Owner/Engineer. Contractor shall present their proposed QA/QC system to the Engineer prior to the start of the Contract.

3.04 CCTV Inspection Deliverables

A. All the supplied data and information will become the property of the Owner.

B. The Contractor shall request the schema from the Owner. All deliverables shall conform to the schema provided by the Owner.

B. Sample Submittal: The Contractor shall request from the Owner an example of a typical CCTV Inspection final deliverable prior to the start of work. The Contractor shall confirm compatibility with the Owner's example, then submit a sample deliverable for review. The example deliverable will contain the following:

1. A sample NASSCO PACP Standard Exchange Database, most current version, in Microsoft Access file format (.mdb), as exported from the Contractor's data collection software.

2. A proprietary database as generated by the Contractor's data collection software.

3. Example media files, including observation photos, CCTV videos, and reports; with all files consistently utilizing the required file naming conventions and folder structures as listed in Section 3.04.E.

4. Identify the proposed viewing software to be used with the proprietary inspections database and related media.

5. NASSCO PACP validation report in PDF format, demonstrating the sample is fully conforming to NASSCO PACP standards and conventions. Validation reports can be obtained by submitting a sample database to:

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

6. Inspections database(s) shall be fully cross-referenced to the videos, images, and reports using a geodatabase and schema as provided by the Owner.

7. 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 every fourteen (14) days following the

completion of a pipeline inspection, the Contractor will submit the following:

1. Digital copies of full details report for each inspection, showing the position and full text of each defect encountered and their grades.

2. An overall summary report detailing major defects and inspections that require attention.

3. A list of unmapped 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. A statistical report showing lengths of sewers inspected and a breakdown of sizes and lengths inspected.

5. At regular agreed intervals, an external hard drive will be submitted to the Engineer containing a single NASSCO PACP Standard Exchange Database (most current version) 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 inspection work, the Contractor will supply the following to the Engineer on an external hard drive:

1. A single, consolidated NASSCO PACP Standard Exchange Database (version compatible with the Owner's software) in Microsoft Access file format (.mdb) containing all inspections.

2. NASSCO PACP validation report for the consolidated database (See Section 3.04.B.5.).

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 will be included in the rates.

E File Formatting and Naming Conventions: All submittals shall have the following file formatting and naming conventions, unless otherwise approved by the Engineer.

SUBMITTAL DESCRIPTION	FILE NAMING CONVENTION	FILE FORMAT

Digital encoded videos	”Upstream_MH”_”Downstream_MH”_”Direction”_”Date”_”Time”	.mpg and .mp4
Digital still images of all observations	“InspectionID”_”ConditionID”_”Distance”_”PACP_Code” (multiple digital still images may have “-01”, “-02”, “-03” at end of file name)	.jpg or .jpeg
Color, Hi-res Laser profiling image of pipe 50’ cross-sections	"InspectionID"_"ConditionID"_"Distance"_"PACP_Code"	.jpg or .jpeg
Pipe Segment Cleaning Report	CR-"Pipe_Segment_Reference"	.pdf
Pipe Segment Inspection Report	”Upstream_MH”_”Downstream_MH”_”Direction”_”Date”_”Time”	.pdf
NASSCO PACP Validation Report	"yyyymmdd(date of submittal)"_"Project Name"_"Validation Report"	.pdf
NASSCO PACP Exchange Database	"yyyymmdd(date of submittal)"_"Project Name"_"StandardPACPExchange"	.mdb

F. External Hard Drive Requirements

External hard drives shall be a minimum of 500 Gigabytes (GB) in capacity, shall have a USB 3.0 compliant connection, and shall be powered either through the host USB connection or have an external power adapter provided. All external hard drives for the duration of work will become property of the Owner and not returned to the Contractor. At the conclusion of the project, the final submittal external hard drive will become the property of the Owner for use in archival of data. The Contractor shall keep a copy of final submitted external hard drives for up to 3 years.

G. NASSCO PACP Compliance

The submitted database(s) should consist of, at a minimum, all NASSCO PACP data fields, formats, and conventions as set forth in this specification and Attachment 2– Field Data Delivery Format Requirements.

END OF SECTION

ATTACHMENT 2 - 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 project have been omitted.

Field Name	Data Type	Description of Field
InspectionID	AutoNumber	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
Surveyed_By	Text	Name of individual conducting survey
Certificate_Number	Text	NASSCO PACP # of Surveyor
Owner	Text	Owner of collection system surveyed
Customer	Text	Entity commissioning the survey
Drainage_Area	Text	Common name of drainage area - If field maps are provided and include drainage basins, populate this field with the drainage basin name/ID
PO_Number	Text	Customer's Purchase Order Number
Pipe_Segment_Reference	Text	Client provided segment number - If pipe segment number is not provided, use the convention "Upstream Manhole ID_DownstreamManhole ID"
Date	Date/Time	Inspection Date
Time	Date/Time	Time of inspection
Street	Text	Street Number and Name
City	Text	City name where sewer located
Location_Details	Text	Descriptive explanation of sewer location
Upstream_MH	Text	Client provided designation for upstream manhole
Up_Rim_to_Invert	Number	Distance (ft and tenths of ft) or (meters to 2 decimal places max) from rim to invert of upstream manhole
Up_Grade_to_Invert	Number	Distance (ft and tenths of ft) or (meters to 2 decimal places max) from average grade to invert of upstream manhole
Up_Rim_to_Grade	Number	Distance (ft and tenths of ft) or (meters to 2 decimal places max) from rim to average grade of upstream manhole
Downstream_MH	Text	Client provided designation for downstream manhole
Down_Rim_to_Invert	Number	Distance (ft and tenths of ft) or (meters to 2 decimal places max) from rim to invert of downstream manhole
Down_Grade_to_Invert	Number	Distance (ft and tenths of ft) or (meters to 2 decimal places max) from average grade to invert of downstream manhole

PACP®"Inspections" Table - Required Fields, Formats, and Conventions
(CONTINUED)

Field Name	Data Type	Description of Field
Down_Rim_to_Grade	Number	Distance (ft and tenths of ft) from rim to average grade of downstream manhole
Sewer_Use	Text	Purpose of sewer
Direction	Text	Direction of survey, Upstream or Downstream
Flow_Control	Text	Type restriction of flow used
Height	Number	Diameter of sewer (or height if non-circular) to nearest inch(999) or nearest mm(99999)
Width	Number	Width of non-circular sewer to nearest inch(999) or nearest mm(99999)
Shape	Text	Sewer shape
Material	Text	Type of pipe material
Lining_Method	Text	Type of process used to line the host pipe
Pipe_Joint_Length	Number	Length of pipe joint sections measured to one decimal place whether in feet or meters
Total_Length	Number	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 "Total_Length".**
Length_Surveyed	Number	If the survey is abandoned, enter the actual length surveyed to one decimal place whether it is feet or meters
Year_Laid	Number	Year sewer surveyed was constructed
Year_Renewed	Number	Year sewer surveyed was renewed
Media_Label	Text	Unique identifier for tape/media
Purpose	Text	Reason for conducting survey
Sewer_Category	Text	Importance of sewer, to be provided by client
Pre-Cleaning	Text	Type of preparatory cleaning conducted prior to survey
Date_Cleaned	Date/Time	Date when sewer was cleaned prior to survey
Weather	Text	Weather conditions when survey conducted
Location_Code	Text	General description of ground cover of surveyed segment
Additional_Info	Text	Supplemental info regarding survey or segment
Reverse_Setup	Number	Specifies that a second survey has been done on the pipe segment--use inspection ID from matching survey
Sheet_Number	Number	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**
IsImperial	Yes/No	Used to identify whether units are metric or imperial. Defaults to imperial.
PressureValue	Number	Grouting pressure value
WorkOrder	Text	Work order or Project reference for Asset Management
Project	Text	Project Title or reference for Asset Management

ATTACHMENT 2 - FIELD DATA DELIVERY FORMAT REQUIREMENTS

Inspections Extended Table in separate non password protected Microsoft Access Database (v. 2007 or higher)		
Field Name	**Data Type**	**Description of Field**
Date	Date/Time	Inspection Date
Time	Date/Time	Inspection Time
InspectionID		Software provided designation for the inspection (THIS FIELD USED TO JOIN TABLES)
Pipe_Segment_Reference	Text	Client provided segment number (Use Upstream Manhole ID_Downstream Manhole ID)
STRNumber	Number	Number of Pipe Structural Defects
STRPipeRating	Number	Total Sum of all Pipe Structural Defects (Grade x Quantity of Defects with that Grade)
STRIndex	Number	Average Pipe Structural Defect Score (STRPipeRating / STRNumber)
STRQuickRating	Text	4 digit code providing the quick rating
OMNumber	Number	Number of Pipe Operation & Maintenance Defects
OMPipeRating	Number	Total Sum of all Pipe Pipe Operation & Maintenance Defects (Grade x Quantity of Defects with that Grade)
OMIndex	Number	Average Pipe Pipe Operation & Maintenance Defect Score (OMPipeRating / OMNumber)
OMQuickRating	Text	4 digit code providing the quick rating
CBNumber	Number	Number of Pipe Combined Structural & Operation & Maintenance Defects
CBPipeRating	Number	Total Sum of all Pipe Combined Structural & Operation & Maintenance Defects (Grade x Quantity of Defects with that Grade)
CBIndex	Number	Average Pipe Combined Structural & Operation & Maintenance Score (STRPipeRating / STRNumber)
CBQuickRating	Text	4 digit code providing the quick rating

ATTACHMENT 2 - FIELD DATA DELIVERY FORMAT REQUIREMENTS

PACP® "Conditions" 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 Project have been omitted.

Field Name	Data Type	Description of Field
ConditionID	AutoNumber	This field is automatically populated when any condition information is entered.
InspectionID	AutoNumber	Software provided designation for this inspection (THIS FIELD USED TO JOIN TABLES)
Distance	Number	Distance is measured to one decimal place to feature location in feet
Counter	Number	Time into the video of the identified condition, in seconds
PACP_Code	Text	Combination of Group/Descriptor and Modifier/Severity in a single data field
Continuous	Text	Continuous defect number with start (S) and finish (F) matching to denote beginning and ending of defect
Value_1st_Dimension	Number	Dimensions of defects to nearest Inch or mm
Value_2nd_Dimension	Number	Used for intrusion of tap or width of non-circular connecting pipe to nearest inch or mm
Value_Percent	Number	Used to express percentage value of defects
Joint	Yes/No	Indicates a defect located near a joint
Clock_At_From	Number	Clock At/From Position of defect/observation
Clock_To	Number	Clock To Position of defect/observation
Remarks	Text	Additional info to describe defect/coding
VCR_Time	Text	Time into the video of the identified condition in HHMMSS format with 0 used as space holder.

PACP® "Conditions Extended" Table - Required Fields, Formats, and Conventions

All field names, data types, and descriptions are from PACP v6.0.2 unless otherwise noted.

Field Name	Data Type	Description of Field
ConditionID	Number	Software provided designation for this inspection (THIS FIELD USED TO JOIN TABLES)
Grade	Number	PACP Score or Grade assigned to the Defect (from 0 to 5)
InspectionID	Number	Software provided designation for this inspection (THIS FIELD USED TO JOIN TABLES)

PACP® "Media 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 Project have been omitted.

Field Name	Data Type	Description of Field
MediaID	AutoNumber	This field is automatically populated when any media (picture or movie file) is saved.
InspectionID	Number	Software provided designation for this inspection (THIS FIELD USED TO JOIN TABLES)
Video_Name	Text	The name of the video file corresponding to data file **-video file naming format shall be "InspectionID"_"Upstream_MH"_"Downstream_MH"_"Direction"**
Video_Location	Text	For digital recordings, path of video file relative to corresponding data file
Report_Name (custom field)	Text	**The name of the PDF report file for the inspection. File naming format shall be "InspectionID"_"Upstream_MH"_"Downstream_MH"_"Direction"**
Report_Location (custom field)	Text	**path of the PDF report file relative to corresponding data file**

Part 1 General

1.01 Scope

The work covered by this Section includes work furnishing all labor, material, equipment and services required for performing smoke testing inspection services, authorized by the Owner, as shown on the Drawings and/or specified herein. The objective of smoke testing is to detect sources of inflow such as storm sewer cross connections and point source inflow leaks in drainage paths or ponding areas, roof leaders, cellar, yard and area drains, fountain drains, abandoned building sewers, and faulty service connections. Smoke testing will also detect overflow points in the sewer systems if groundwater is below the sewer. It also will be used to determine the specific reaches of sewer that have excessive infiltration so that further action, i.e. internal inspection, may then be performed.

1.02 Communication and Supervision of Work

A. A responsible representative of the Contractor shall be present on the site of the work to provide supervision at all times. The Contractor shall provide to the Owner the name and phone number of the on-site superintendent(s) who can be reached at any time that work is being performed. At all times, and especially when a change of work location is underway, the Contractor's representative shall keep the Owner continuously aware of the location, progress, planned execution of the work, and problems encountered. The field supervisor shall be responsible for the safety of all site workers and site conditions as well as ensuring that all work is conducted in conformance with these Specifications and to the level of quality specified.

B. The Owner shall be given advanced notice of, and the opportunity to witness, all field work Performed.

C. Blockages in the system shall be reported to the Owner immediately.

D. Should the Contractor encounter a buried manhole that cannot be readily accessed, the Owner shall be immediately notified. Detailed directions to the location of the buried manhole shall be provided by the Contractor to the Owner

1.03 Traffic Control Plans

It is the Contractor's responsibility to prepare, submit and obtain approval for any required traffic control plan. The Contractor is to coordinate with local traffic department of the city or county which determines when traffic control plans are required, reviews and provides approval of traffic control plans. The Owner will provide to the Contractor the contact information for the appropriate traffic control plan representative(s).

1.04 Submittals

The Contractor shall submit a comprehensive equipment list to the Owner 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):

A. Safety Equipment

B. Smoke producing equipment devices and techniques to be used

C. Equipment to be used for the collection of location data

D. Equipment to be used for digital image capture

E. Flow diversion and flow control equipment

F. Traffic control equipment

G. All other equipment necessary for the completion of the Work

Part 2 Products

2.01 General

A. Smoke bombs, canisters, or other sources capable of generating nontoxic, odorless, and non- staining smoke.

B. An air blower used to force the smoke into the sewer pipes; the air blower should have a minimum capacity of 53 cubic feet per second (cfs).

C. Digital image capture device used to document smoke coming out of the ground, catch basins, pipes, and other sources during the test. Camera and/or camcorder shall be capable of at least 5 mega pixel resolution.

D. Flyers and/or door hangers for notifying residents and businesses of testing.

E. GPS unit capable of survey grade accuracy (horizontal +/- 0.1 feet; vertical +/- 0.2 feet) for documenting location of smoke observations.

Part 3 Execution

3.01 Smoke Testing

A. Smoke Testing Procedure:

1. The Contractor shall attend a stakeholder coordination meeting scheduled by

the Owner which will occur at least two (2) weeks prior to conducting smoke testing operations. The Contractor shall be represented at this meeting with both the Contractor's project manager and on-site superintendent who will be present during any smoke testing operations. The purpose of this meeting is to familiarize stakeholders with the smoke testing operations and discuss locations that smoke testing will occur and the anticipated schedule for such operations. During this meeting Contractor will provide directions for lines of communication and be provided points of contact information. The Contractor shall submit a plan for approval by the Owner regarding notification and coordination of smoke testing.

2. Seventy-two (72) hours prior to conducting smoke testing operations, the Contractor shall notify the Owner of the location of the segments to be tested. The Owner will ensure that the local media is contacted and notified to inform residents and proper authorities have been contacted to obtain approval for the activity. The Contractor shall assist the Owner as necessary in their coordination with the local media and the authorities.

3. Twenty-Four (24) hours prior to conducting smoke testing operations, the Contractor shall place door hangers at all residential homes and/or businesses in the area that could be affected by smoke testing operations informing residents that smoke testing will be conducted in their area within the next 24 hours. While conducting notification, The Contractor shall contact the local fire and police departments and inform them of upcoming smoke testing operations. The Contractor shall submit a plan for approval by the Owner regarding notification and coordination of smoke testing.

4. Each day of smoke testing, prior to any smoke testing activities, the Contractor shall contact the local fire and police departments and inform them of the times and locations of smoke testing operations.

5. Prior to initiating smoke testing, the Contractor shall isolate any line sections providing service to any hospital, assisted-living facility, school, or daycare facility. The Contractor shall coordinate with the Owner to test these facilities at times that are least disruptive to the community.

6. Prior to initiating smoke testing, the Contractor may request a layer from the Owner's Geographic Information System (GIS) to utilize during smoke testing activities and resubmit this layer as a final deliverable with a field for the status and comments (i.e. status = incomplete, comments = unable to smoke due to roots).

7. The Contractor shall provide blowers necessary to ensure the line sections are adequately pressurized to force smoke into service laterals and potential defect locations.

8. Smoke will be generated continuously throughout the visual inspection and cataloguing period.

9. The Contractor shall conduct a visual inspection of the test area to include front and back yards, around buildings and house foundations. If the visual inspection requires the Contractor to leave public right-of-way or the Owner's easement, permission to access those areas shall first be granted by the property owner.

10. The Contractor shall capture the exact location of each positive smoke observation using one or more Global Positioning System (GPS) receiver(s) capturing coordinates (Northing and Easting coordinate in NAD 1983 (2011), Feet, State Plane Coordinate System format approved by the Owner) with mapping grade accuracy (+/- 1 feet). The unique identifier of the recorded GPS locations for each smoke observation shall also be included in a geodatabase (.gdb) or shapefile (.shp) as described under paragraph 6 above.

11. A photograph shall be taken of each positive smoke observation. All Photographs shall be captured with a digital camera capable of at least five (5) megapixel resolution. The photo shall be taken from a perspective that shows the maximum amount of smoke from the leak. It shall be taken close enough to show the exact location of the leak, but far enough back to include the general location of the smoke relative to adjacent structures and other landmarks. In some situations, it may be necessary to capture multiple photographs of the smoke observation so that both a close-up view and panoramic view of the smoke observation can be provided. All photos shall be labeled with a naming convention which includes, at a minimum, the unique ID of the corresponding smoke observation.

12. Once all smoke observations have been properly documented, the Contractor shall extinguish and properly dispose of any used smoke bombs, canisters, or other smoke sources and remove all flow control devises from the sanitary sewer system. Removal of plus and dams will be accomplished in a controlled manner to avoid any downstream surcharging or flooding.

13. The Contractor shall report any surcharged manholes identified during smoke testing operations to the Owner.

3.02 Precautions

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

B. A valved air line will be attached to any bag or plug so that it may be deflated from the surface.

C. The water level within structures shall be observed and the minimum level that will cause flow to back up into buildings and cause property damage shall .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. Cleaning shall include the trapping and removal of all sediments and residual wastes from successive manholes as the cleaning progresses. When hydraulic cleaning equipment is used, a suitable weir or dam shall be constructed in the downstream manhole, in such a manner, that the solids and water are trapped. Under no circumstances shall sewage or solids removed from the pipeline or manhole, be dumped onto streets, in catch basins or in storm drains. Material which could cause pipeline stoppages, accumulations of sand in wet wells, or damage to pumps, shall not be permitted to pass from manhole section to manhole section. Residual wastes shall be removed and transported to the Moccasin Bend Wastewater Treatment Plant or other pre-approved disposal facility in a manner approved by the Owner.

G. The Contractor shall inform the Owner 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 Owner of such use of plant or equipment in an emergency situation as soon as practicable:

3.03 Data Collection

The Contractor shall document minimum smoke test information digitally in a .gdb or .csv file. Inspection files shall be furnished to the Owner once smoke testing efforts are completed. The submitted database(s) should consist of, at a minimum, the data fields, formats, and conventions as set forth in this specification and Attachment 2 – Smoke Testing Field Data Delivery Format Requirements.

A. Digital photographs shall be captured for each positive smoke observation using a digital camera capable of a minimum of five (5) megapixel resolution. The photograph shall be taken from an angle or observation point so that any reference features (such

as house, driveway, or street intersection) are visible. All photographs shall be in Joint Photographic Experts Group (JPG or JPEG) file format and shall utilize a consistent file naming convention that corresponds to each smoke testing defect.

B. 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 Owner. The Owner will perform QA/QC audits on submitted data. Any data or files not meeting the requirements of Attachment 2 – Smoke Testing Field Data Delivery Format Requirements, these specifications, and NASSCO MACP standards will be returned to the Contractor for correction. Contractor shall present their proposed QA/QC system to the Owner prior to the start of the Contract.

3.04 Smoke Testing Deliverables

A. At the completion of work, The Contractor shall provide all data collected during smoke testing as a .gdb or .csv file. The database shall include a minimum of one record to correspond to each smoke test. The database shall include for each record, at a minimum, all items listed in Attachment B – Smoke Testing Field Data Delivery Requirements. The database shall be structured so that appropriate relationships are established between inspection records and their related information, such as inspected manholes and inspected sewer pipe segments, in order to provide referential integrity between worksheets or tables. The format used by The Contractor shall be reviewed and approved by the Owner prior to the start of Work.

B. The Contractor shall submit an inspection report for each positive smoke observation that shall include the following information: date inspected, address, upstream manhole, downstream manhole, property type, source, smoke intensity, I&I rating, photo of the smoke leak, and an aerial map locating the smoke leak.

C. The Contractor shall submit a shapefile (.shp), showing the location, date/time, and status (e.g. complete, incomplete, etc.) of each smoke testing operation. The Contractor shall include a comments field for additional clarifications regarding the status (e.g. unable to smoke test due to a high water level).

D. Positive smoke observations recorded by GPS equipment shall be provided to the Owner in a geodatabase (.gdb) or shapefile (.shp) with Northing and Easting identified in the schema.

E. All observation digital photographs of each smoke test setup and all positive smoke observations delivered electronically in JPG or JPEG format, in an approved naming convention as including, at a minimum, a unique positive smoke observation ID.

F. All deliverables shall be submitted on an external hard drive with a minimum of 500 gigabytes (GB) capacity, shall have a minimum USB 3.0 compliant connection, and shall be powered either through the host USB connection or have an external power adapter provided. At the conclusion of the project, the final submittal external hard

drive will become the property of the Owner for use in archival of data. The Contractor shall maintain a copy of the final deliverables for up to 3 years.

G. NASSCO PACP Compliance

The submitted database(s) should consist of, at a minimum, the NASSCO PACP standard data fields, formats, and conventions as set forth in this specification and Attachment B – Smoke Testing Field Data Delivery Format Requirements.

END OF SECTION

Smoke_Leak - FeatureClass

Name Smoke_Leak
ShapeType Point
FeatureType Simple
HasM FALSE
HasZ FALSE
HasAttachments TRUE
Description Smoke Leak Instances found during Sanitary Sewer Smoke Testing

Field	DataType	Length	Description	Domain
SetupNum	SmallInteger	2	SetupNum	
Date	Date	8	Date	
Collected_By	String	50	Collected_By	Collected_By
USMH	String	50	USMH	
DSMH	String	50	DSMH	
General_Location	String	50	General_Location	
Source	String	50	Source	Source
Smoke_Intensity	String	50	Smoke_Intensity	Intensity
II_Rating	String	50	II_Rating	II_Rating
Comments	String	255	Comments	
GlobalID	GlobalID	38	GlobalID	
created_user	String	255	created_user	
created_date	Date	8	created_date	
last_edited_user	String	255	last_edited_user	
last_edited_date	Date	8	last_edited_date	
Northing	Double		Northing	
Easting	Double		Easting	
Address	String	256	Address	
LEAK_ID	String	15	LEAK_ID	
Report_Path	String	100	Report_Path	
Report_Name	String	50	Report_Name	
Report_Link	String	200	Report_Link	
GPS_Accuracy	Double		GPS Accuracy	
WWTA_Project_No	String	20	WWTA Project Number	

Collected_By - Domain

DomainName Collected_By
FieldType String
Domain Type CodedValue

Code	Name
XX (Crew Member Initials)	Firstname Lastname (Crew Member Name)
Other	Other

II_Rating - Domain

DomainName II_Rating
FieldType String
Domain Type CodedValue

Code	Name
None	None
Mild	Mild
Moderate	Moderate
Severe	Severe

Intensity - Domain

DomainName Intensity
FieldType String
Domain Type CodedValue

Code	Name
Light	Light
Medium	Medium
Heavy	Heavy

Source - Domain

DomainName Source
FieldType String
Domain Type CodedValue

Code	Name
ServiceLateral	Service Lateral
AbandonedService	Abandoned Service
DrivewayDrain	Driveway Drain
RoofDrain	Roof Drain
StairwellDrain	Stairwell Drain
AreaDrain	Area Drain
FoundationDrain	Foundation Drain
InsidePlumbing	Inside Plumbing
CatchBasin	Catch Basin
StormDitch	Storm Ditch
StormManhole	Storm Manhole
SewerMainline	Sewer Mainline
Cleanout	Service Cleanout
SewerManhole	Sewer Manhole
Other	Other-See Comments

Part 1 General

1.01 Scope

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 Owner, 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 smoke observation 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) modified MACP standards for a Level 2 inspection.

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 Owner. 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 modified MACP standards as indicated in Attachment C – Manhole Inspection Field Data Delivery Requirements.

E. A diligent effort shall be made to locate all structures. Metal detectors shall be used to locate buried manholes. Once aburied 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 Owner 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.

G. A GPS unit capable of survey grade accuracy (horizontal +/- 0.1 feet, vertical +/- 0.2 feet) shall be used for documenting the location of each manhole.

Part 2 Products

Part 3 Execution

3.01 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 surface inspection for every manhole. Inspections shall be done by completing modified MACP inspection forms as outlined in Part 3, Section 3.03 of this specification.

B. The Contractor shall submit a comprehensive equipment list to the Owner 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. Traffic control equipment
3. All other equipment necessary for the completion of the Work

C. Blockages in the system shall be reported to the Owner immediately.

D. A responsible representative of the Contractor shall be present on the site of the work, or other location approved by the Owner, 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 Owner continuously aware of the location, progress, planned execution of the work, and problems encountered.

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

3.02 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 Owner 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 Owner 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 entry for each manhole in the contract.

1. Inspections record observations of the manhole’s condition as seen from the ground surface outside of the manhole and conditions captured through the use of a pole camera from the surface.

2. A pole camera shall be utilized from the surface to provide digital image capture of defects on the interior of the manhole, manhole pipe connections, and pipe defects.

3. All conditions, materials, and defects observed from the surface or through use of the pole camera should be recorded in accordance with Section 3.04. below.

4. When inspecting manholes all applicable PACP and MACP coding shall be utilized, except for tap codes, camera underwater code, and line direction codes.

B. All measurements shall be documented in imperial units. Invert measurements shall be in decimal feet. Pipe sizes shall be in inches. Chimney heights shall be in inches.

C. All inspections data shall be entered, by the Contractor, into a NASSCO Manhole Assessment Certification Program (MACP) compliant database (most current version used by the Owner).

D. 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.

E. 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 with recognizable features in the manhole proximity. All digital still images shall be in JPEG file format. File names of each digital still image shall follow the convention "Manhole ID_[Exterior or Interior]_Location Code".

F. A digital still image shall be captured for each defect. All digital still images shall be in JPEG file format. File names of defect digital still images shall follow the convention "Manhole ID_[sequential number]_MACP Code".

G. 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.

H. Contractor shall be responsible for modifications to equipment and/or inspection procedures to achieve reporting requirements identified in these specifications.

I. No work shall commence prior to approval of the submitted material by the Owner. Once accepted, the report material shall serve as a standard for the remaining work.

J. When an unmapped manhole is discovered during an inspection, the Contractor shall assign a temporary field-assigned ID to the manhole. This temporary manhole ID shall be the downstream manhole ID plus a letter designation beginning with the letter “X”. For example; if, after inspecting upstream manhole ID “61”, on the way to downstream manhole ID “48”, a new manhole is discovered, this manhole will be identified as manhole “48X”. If an additional line is entering the new manhole ID “48X” the next upstream manhole shall be identified as manhole ID “48X1”. This temporary field ID shall be entered as a new MACP database entry, and the comment "Unmapped MH" shall be entered in the MACP database field "Comments". 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.

K. The Contractor shall use a Global Positioning System device (GPS) to provide location coordinates of all manholes using the following format: Northing and Easting coordinate in NAD 1983 (2011), Feet, Tennessee State Plane Coordinate System with survey grade accuracy (+/- 0.1 feet horizontal, +/- 0.2 feet vertical).

L. The inspection photographs, report documents, and inspections database shall be in accordance with the NASSCO MACP format (most current version).

M. 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 Owner. The Owner 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. Contractor shall present their proposed QA/QC system to the Owner 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: The Owner will provide the schema required for the Manhole Inspection final deliverable. The Contractor shall submit an example of a typical Manhole Inspection final deliverable for approval by the Owner prior to the start of the Contract that complies with the Owner's schema. The example deliverable will contain the following:

1. A sample NASSCO MACP Standard Exchange Database (version used by the Owner) in .gdb or .csv file format as exported from the Contractor's data collection software.

2. Example GPS data files of all manholes

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

4. Inspections database shall be fully cross-referenced to the videos, images, and reports.

5. Example reports will be presented 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 thirty (30) days following the substantial completion of all manhole inspections, the Contractor will submit the following:

1. A final version of the overall summary report detailing major defects, uncharted manholes, including field-assigned ID and geographic reference, and

inspections that require attention or unable to be completed with comments added.

2. At regular agreed intervals, an external hard drive will be submitted to the Owner containing a single NASSCO MACP Standard Exchange Database (most current version) 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 Owner on an external hard drive:

1. A single, consolidated NASSCO MACP Standard Exchange Database (most current version) with the requirements of Attachment C, in .gdb or .csv file format (.mdb) containing all inspections for the Contract.

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

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

E. NASSCO MACP Compliance

The submitted database(s) should consist of, at a minimum, the modified NASSCO MACP standard data fields, formats, and conventions as set forth in this specification and Attachment C – Manhole Inspection Field Data Delivery Format Requirements.

END OF SECTION

Name Manhole_Inspections
ShapeType Point
FeatureType Simple
HasM FALSE
HasZ FALSE
Description Data Dictionary for Detailed Manhole Inspections Used for Sanitary Sewer Inspection Surveys

Field	DataType	Length	Description	Domain
globalid	GlobalID	38	globalid	
ManholeID	String	255	ManholeID	
Inspection_Crew	String	5	Inspection_Crew	cvd_Inspection_Crew
General_Location	String	255	General_Location	
County	String	255	County	
House_Num	String	255	House_Num	
Street	String	255	Street	
Full_Address	String	255	Full_Address	
Weather_Conditions	String	9	Weather_Conditions	cvd_Weather_Conditions
Inspection_Type	String	8	Inspection_Type	cvd_Inspection_Type
Structure_Type	String	8	Structure_Type	cvd_Structure_Type
Structure_Type_other	String	255	Structure_Type_other	
Location	String	10	Location	cvd_Location
Surface_Type	String	9	Surface_Type	cvd_Surface_Type
Cover_Type	String	13	Cover_Type	cvd_Cover_Type
Cover_Fit	String	13	Cover_Fit	cvd_Cover_Fit
Cover_Num_Holes	Integer	4	Cover_Num_Holes	
Riser_Present	String	3	Riser_Present	cvd_Riser_Present
Riser_Height	Integer	4	Riser_Height	
Ponding_Type	String	9	Ponding_Type	cvd_Ponding_Type
Ponding_Depth	Integer	4	Ponding_Depth	
Grade	Double	8	Grade	
Inflow_Dish	String	3	Inflow_Dish	cvd_Inflow_Dish
Frame_Offset	Double	8	Frame_Offset	
Chimney_Material	String	14	Chimney_Material	cvd_Chimney_Material
Chimney_Height	Double	8	Chimney_Height	
Cone_Material	String	14	Cone_Material	cvd_Cone_Material
Cone_Shape	String	10	Cone_Shape	cvd_Cone_Shape
Wall_Material	String	14	Wall_Material	cvd_Wall_Material
Wall_Liner	String	12	Wall_Liner	cvd_Wall_Liner
Wall_Diameter	Double	8	Wall_Diameter	
Wall_Length_if_box	String	255	Wall_Length_if_box	
Bench_Material	String	14	Bench_Material	cvd_Bench_Material
Trough_Material	String	14	Trough_Material	cvd_Trough_Material
Step_Material	String	7	Step_Material	cvd_Step_Material

Step_Condition	String	10	Step_Condition	cvd_Step_Condition
Manhole_Depth	Double	8	Manhole_Depth	
Defect_Component_Select	String	255	Defect_Component_Select	
Cover_Defects	String	255	Cover_Defects	
Cover_Inflow	String	8	Cover_Inflow	cvd_Cover_Inflow
Cover_Crack	String	2	Cover_Crack	cvd_Cover_Crack
Cover_Fracture	String	2	Cover_Fracture	cvd_Cover_Fracture
Cover_Broken	String	3	Cover_Broken	cvd_Cover_Broken
Cover_Roots	String	2	Cover_Roots	cvd_Cover_Roots
Cover_Surface_Damage	String	3	Cover_Surface_Damage	cvd_Cover_Surface_Damage
Frame_Defects	String	255	Frame_Defects	
Frame_Infiltration	String	8	Frame_Infiltration	cvd_Frame_Infiltration
Frame_Crack	String	2	Frame_Crack	cvd_Frame_Crack

Frame_Fracture	String	2	Frame_Fracture	cvd_Frame_Fracture
Frame_Broken	String	3	Frame_Broken	cvd_Frame_Broken
Frame_Hole	String	3	Frame_Hole	cvd_Frame_Hole
Frame_Roots	String	2	Frame_Roots	cvd_Frame_Roots
Frame_Joint	String	3	Frame_Joint	cvd_Frame_Joint
Frame_Surface_Damage	String	3	Frame_Surface_Damage	cvd_Frame_Surface_Damage
Frame_Lining_Failure	String	4	Frame_Lining_Failure	cvd_Frame_Lining_Failure
Frame_Deposits	String	4	Frame_Deposits	cvd_Frame_Deposits
FrameSeal_Defects	String	255	FrameSeal_Defects	
FrameSeal_Infiltration	String	8	FrameSeal_Infiltration	cvd_FrameSeal_Infiltration
FrameSeal_Crack	String	2	FrameSeal_Crack	cvd_FrameSeal_Crack
FrameSeal_Fracture	String	2	FrameSeal_Fracture	cvd_FrameSeal_Fracture
FrameSeal_Broken	String	3	FrameSeal_Broken	cvd_FrameSeal_Broken
FrameSeal_Hole	String	3	FrameSeal_Hole	cvd_FrameSeal_Hole
FrameSeal_Roots	String	2	FrameSeal_Roots	cvd_FrameSeal_Roots
FrameSeal_Joint	String	3	FrameSeal_Joint	cvd_FrameSeal_Joint
FrameSeal_SurfaceDamage	String	3	FrameSeal_SurfaceDamage	cvd_FrameSeal_SurfaceDamage
FrameSeal_LiningFailure	String	4	FrameSeal_LiningFailure	cvd_FrameSeal_LiningFailure
FrameSeal_Deposits	String	4	FrameSeal_Deposits	cvd_FrameSeal_Deposits
FrameSeal_Brickwork	String	3	FrameSeal_Brickwork	cvd_FrameSeal_Brickwork
Chimney_Defects	String	255	Chimney_Defects	
Chimney_Infiltration	String	8	Chimney_Infiltration	cvd_Chimney_Infiltration
Chimney_Crack	String	2	Chimney_Crack	cvd_Chimney_Crack
Chimney_Fracture	String	2	Chimney_Fracture	cvd_Chimney_Fracture
Chimney_Broken	String	3	Chimney_Broken	cvd_Chimney_Broken
Chimney_Hole	String	3	Chimney_Hole	cvd_Chimney_Hole

Chimney_Roots	String	2	Chimney_Roots	cvd_Chimney_Roots
Chimney_Joint	String	3	Chimney_Joint	cvd_Chimney_Joint
Chimney_Surface_Damage	String	3	Chimney_Surface_Damage	cvd_Chimney_Surface_Damage
Chimney_Lining_Failure	String	4	Chimney_Lining_Failure	cvd_Chimney_Lining_Failure
Chimney_Deposits	String	4	Chimney_Deposits	cvd_Chimney_Deposits
Chimney_Brickwork	String	3	Chimney_Brickwork	cvd_Chimney_Brickwork
Cone_Defects	String	255	Cone_Defects	
Cone_Infiltration	String	8	Cone_Infiltration	cvd_Cone_Infiltration
Cone_Crack	String	2	Cone_Crack	cvd_Cone_Crack
Cone_Fracture	String	2	Cone_Fracture	cvd_Cone_Fracture
Cone_Broken	String	3	Cone_Broken	cvd_Cone_Broken
Cone_Hole	String	3	Cone_Hole	cvd_Cone_Hole
Cone_Roots	String	2	Cone_Roots	cvd_Cone_Roots
Cone_Joint	String	3	Cone_Joint	cvd_Cone_Joint
Cone_Surface_Damage	String	3	Cone_Surface_Damage	cvd_Cone_Surface_Damage
Cone_Lining_Failure	String	4	Cone_Lining_Failure	cvd_Cone_Lining_Failure
Cone_Deposits	String	4	Cone_Deposits	cvd_Cone_Deposits
Cone_Brickwork	String	3	Cone_Brickwork	cvd_Cone_Brickwork
Wall_Defects	String	255	Wall_Defects	
Wall_Infiltration	String	8	Wall_Infiltration	cvd_Wall_Infiltration
Wall_Crack	String	2	Wall_Crack	cvd_Wall_Crack
Wall_Fracture	String	2	Wall_Fracture	cvd_Wall_Fracture
Wall_Broken	String	3	Wall_Broken	cvd_Wall_Broken
Wall_Hole	String	3	Wall_Hole	cvd_Wall_Hole
Wall_Roots	String	2	Wall_Roots	cvd_Wall_Roots
Wall_Joint	String	3	Wall_Joint	cvd_Wall_Joint
Wall_Surface_Damage	String	3	Wall_Surface_Damage	cvd_Wall_Surface_Damage

Wall_Lining_Failure	String	4	Wall_Lining_Failure	cvd_Wall_Lining_Failure
Wall_Deposits	String	4	Wall_Deposits	cvd_Wall_Deposits
Wall_Brickwork	String	3	Wall_Brickwork	cvd_Wall_Brickwork
Bench_Defects	String	255	Bench_Defects	
Bench_Infiltration	String	8	Bench_Infiltration	cvd_Bench_Infiltration
Bench_Crack	String	2	Bench_Crack	cvd_Bench_Crack
Bench_Fracture	String	2	Bench_Fracture	cvd_Bench_Fracture
Bench_Broken	String	3	Bench_Broken	cvd_Bench_Broken
Bench_Hole	String	3	Bench_Hole	cvd_Bench_Hole
Bench_Roots	String	2	Bench_Roots	cvd_Bench_Roots
Bench_Joint	String	3	Bench_Joint	cvd_Bench_Joint
Bench_Surface_Damage	String	3	Bench_Surface_Damage	cvd_Bench_Surface_Damage
Bench_Lining_Failure	String	4	Bench_Lining_Failure	cvd_Bench_Lining_Failure

Bench_Deposits	String	4	Bench_Deposits	cvd_Bench_Deposits
Bench_Brickwork	String	3	Bench_Brickwork	cvd_Bench_Brickwork
Trough_Defects	String	255	Trough_Defects	
Trough_Infiltration	String	8	Trough_Infiltration	cvd_Trough_Infiltration
Trough_Crack	String	2	Trough_Crack	cvd_Trough_Crack
Trough_Fracture	String	2	Trough_Fracture	cvd_Trough_Fracture
Trough_Broken	String	3	Trough_Broken	cvd_Trough_Broken
Trough_Hole	String	3	Trough_Hole	cvd_Trough_Hole
Trough_Roots	String	2	Trough_Roots	cvd_Trough_Roots
Trough_Joint	String	3	Trough_Joint	cvd_Trough_Joint
Trough_Surface_Damage	String	3	Trough_Surface_Damage	cvd_Trough_Surface_Damage
Trough_Lining_Failure	String	4	Trough_Lining_Failure	cvd_Trough_Lining_Failure
Trough_Deposits	String	4	Trough_Deposits	cvd_Trough_Deposits
Trough_Brickwork	String	3	Trough_Brickwork	cvd_Trough_Brickwork
Trough_Obstacle	String	2	Trough_Obstacle	cvd_Trough_Obstacle
Manhole_Surcharge	String	3	Manhole_Surcharge	cvd_Manhole_Surcharge
Evidence_of_Surcharge	Double	8	Evidence_of_Surcharge	
Comments	String	255	Comments	
Date_Text	String	50	Date_Text	
Report_Filename	String	255	Report_Filename	
Report_Hyperlink	String	255	Report_Hyperlink	
Northing_Y	Double	8	Northing_Y	
Easting_X	Double	8	Easting_X	
Elevation_Z	Double	8	Elevation_Z	
Position_Type	String	50	Position_Type	
PerformedBy	String	50	PerformedBy	
WWTA_Project_Number	String	20	WWTA Project Number	

Manhole_Inspections_Pipes - Table

Name Manhole_Inspections_Pipes
Description Related Table Representing Each Pipe connected into a Manhole

Field	DataType	Length	Description	Domain
globalid	GlobalID	38	globalid	
PipeNumber	Integer	4	PipeNumber	
UpstreamMH	String	255	UpstreamMH	
DownstreamMH	String	255	DownstreamMH	
Clock_Position	Integer	4	Clock_Position	
Pipe_Shape	String	10	Pipe_Shape	cvd_Pipe_Shape
Diameter_in	Integer	4	Diameter_in	
Material	String	5	Material	cvd_Material
DropPipe	String	12	DropPipe	cvd_DropPipe
Rim_Invert_ft	Double	8	Rim_Invert_ft	
Flow_Depth_in	Integer	4	Flow_Depth_in	
PipeComments	String	255	PipeComments	
parentglobalid	GUID	38	parentglobalid	
CreationDate	Date	8	CreationDate	
Creator	String	50	Creator	
EditDate	Date	8	EditDate	
Editor	String	50	Editor	
Manhole_ID	String	50	Manhole_ID	

Manhole_Inspections_P_Defects - Table

Name Manhole_Inspections_P_Defects

Description Related Table Representing Each Defect Found Inside Pipe or at Pipe Connection

Field	DataType	Length	Domain	Description
globalid	GlobalID	38	globalid	
PipeNumber_Defect	Integer	4	PipeNumber_Defect	
PipeDefect_Type	String	255	PipeDefect_Type	
PipeDefect_Location	String	14	PipeDefect_Location	cvd_PipeDefect_Location
PipeDefect_Comments	String	255	PipeDefect_Comments	
parentglobalid	GUID	38	parentglobalid	
CreationDate	Date	8	CreationDate	
Creator	String	50	Creator	
EditDate	Date	8	EditDate	
Editor	String	50	Editor	
Manhole_ID	String	50	Manhole_ID	

cvd_Bench_Brickwork - Domain

DomainName cvd_Bench_Brickwork
FieldType String
Domain Type CodedValue

Code	Name
DB	Displaced Brick
MB	Missing Brick
MMS	Mortar Missing Small
MMM	Mortar Missing Medium
MML	Mortar Missing Large

cvd_Bench_Broken - Domain

DomainName cvd_Bench_Broken
FieldType String
Domain Type CodedValue

Code	Name
B	Broken
BSV	Soil Visible
BVV	Void Visible

cvd_Bench_Crack - Domain

DomainName cvd_Bench_Crack
FieldType String
Domain Type CodedValue

Code	Name
CC	Circumferential
CL	Longitudinal
CM	Multiple
CS	Spiral

cvd_Bench_Deposits - Domain

DomainName cvd_Bench_Deposits
FieldType String

Domain Type	CodedValue

Code	Name
DAE	Attached - Encrustation
DAGS	Attached - Grease
DAR	Attached - Ragging
DAZ	Attached - Other
DSC	Settled - Compact
DSF	Settled - Fine
DSGV	Settled - Gravel
DSZ	Settled - Other

cvd_Bench_Fracture - Domain

DomainName	cvd_Bench_Fracture
FieldType	String
Domain Type	CodedValue

Code	Name
FC	Circumferential
FL	Longitudinal
FM	Multiple
FS	Spiral

cvd_Bench_Hole - Domain

DomainName	cvd_Bench_Hole
FieldType	String
Domain Type	CodedValue

Code	Name
H	Hole
HSV	Soil Visible
HVV	Void Visible

cvd_Bench_Infiltration - Domain

DomainName	cvd_Bench_Infiltration
FieldType	String

Domain Type	CodedValue

Code	**Name**
Staining	Staining
Weeper	Weeper
Dripper	Dripper
Runner	Runner
Gusher	Gusher

cvd_Bench_Joint - Domain

DomainName	cvd_Bench_Joint
FieldType	String
Domain Type	CodedValue

Code	**Name**
JOM	Offset Medium
JOL	Offset Large
JSM	Separated Medium
JSL	Separated Large
JAM	Angular Medium
JAL	Angular Large

cvd_Bench_Lining_Failure - Domain

DomainName	cvd_Bench_Lining_Failure
FieldType	String
Domain Type	CodedValue

Code	**Name**
LFAS	Annular Space
LFB	Blistered Lining
LFD	Detached
LFDE	Defective End
LFDL	Delamination
LFRS	Resin Slug
LFW	Wrinkled LFZ Other

cvd_Bench_Material - Domain

DomainName	cvd_Bench_Material
FieldType	String
Domain Type	CodedValue

Code	Name
None	None
PreCast	Pre-Cast
Brick	Brick
Poured	Poured
Plastic	Plastic
Block Block Metal Metal	
BrickWithLiner	Brick with Liner
Other	Other

cvd_Bench_Roots - Domain

DomainName	cvd_Bench_Roots
FieldType	String
Domain Type	CodedValue

Code	Name
RF	Roots Fine
RM	Roots Medium
RB	Root Ball
RT	Tap Root

cvd_Bench_Surface_Damage - Domain

DomainName	cvd_Bench_Surface_Damage
FieldType	String
Domain Type	CodedValue

Code	Name
SRI	Roughness Increased
SSS	Spalling
SSC	Spalling Coating
SAV	Aggregate Visible
SAP	Aggregate Projecting

SAM	Aggregate Missing
SRV	Reinforcement Visible
SRP	Reinforcement Projecting
SRC	Reinforcement Corroded
SMW	Missing Wall

cvd_Chimney_Brickwork - Domain

DomainName	cvd_Chimney_Brickwork
FieldType	String
Domain Type	CodedValue

Code	**Name**
DB	Displaced Brick
MB	Missing Brick
MMS	Mortar Missing Small
MMM	Mortar Missing Medium
MML	Mortar Missing Large

_Broken - Domain

	cvd_Chimney_Broken
	String
Domain Type	CodedValue

Code	**Name**
B	Broken
BSV	Soil Visible
BVV	Void Visible

cvd_Chimney_Crack - Domain

DomainName	cvd_Chimney_Crack
FieldType	String
Domain Type	CodedValue

Code	**Name**
CC	Circumferential
CL	Longitudinal
CM	Multiple
CS	Spiral

cvd_Chimney_Deposits - Domain

DomainName	cvd_Chimney_Deposits
FieldType	String
Domain Type	CodedValue

cvd_Chimney

DomainName
FieldType

Code	Name
DAE	Attached - Encrustation
DAGS	Attached - Grease
DAR	Attached - Ragging
DAZ	Attached - Other
DSC	Settled - Compact
DSF	Settled - Fine
DSGV	Settled - Gravel
DSZ	Settled - Other

cvd_Chimney_Fracture - Domain

DomainName cvd_Chimney_Fracture
FieldType String
Domain Type CodedValue

Code	Name
FC	Circumferential
FL	Longitudinal
FM	Multiple
FS	Spiral

_Hole - Domain

cvd_Chimney_Hole
String
Domain Type CodedValue

Code	Name
H	Hole

HSV	Soil Visible
HVV	Void Visible

cvd_Chimney_Infiltration - Domain

DomainName	cvd_Chimney_Infiltration
FieldType	String
Domain Type	CodedValue

Code	**Name**
Staining	Staining
Weeper	Weeper Dripper	Dripper Runner	Runner
Gusher	Gusher

cvd_Chimney

DomainName
FieldType

_Joint - Domain

	cvd_Chimney_Joint
	String
Domain Type	CodedValue

Code	Name
JOM	Offset Medium
JOL	Offset Large
JSM	Separated Medium
JSL	Separated Large
JAM Angular Medium JAL Angular Large	

cvd_Chimney_Lining_Failure - Domain

DomainName	cvd_Chimney_Lining_Failure
FieldType	String
Domain Type	CodedValue

Code	Name
LFAS	Annular Space
LFB	Blistered Lining
LFD	Detached
LFDE	Defective End
LFDL	Delamination
LFRS	Resin Slug
LFW	Wrinkled
LFZ	Other

_Material - Domain

	cvd_Chimney_Material
	String
Domain Type	CodedValue

Code	**Name**
None	None
PreCast	Pre-Cast
Brick	Brick
Poured	Poured
Plastic	Plastic
Block	Block
Metal	Metal
BrickWithLiner	Brick with Liner
Other	Other

cvd_Chimney_Roots - Domain

DomainName	cvd_Chimney_Roots
FieldType	String
Domain Type	CodedValue

Code	**Name**
RF	Roots Fine
RM	Roots Medium
RB	Root Ball
RT	Tap Root

cvd_Chimney_Surface_Damage - Domain

DomainName	cvd_Chimney_Surface_Damage
FieldType	String
Domain Type	CodedValue

cvd_Chimney

DomainName
FieldType

Code	Name
SRI	Roughness Increased
SSS	Spalling
SSC	Spalling Coating
SAV	Aggregate Visible
SAP	Aggregate Projecting
SAM	Aggregate Missing
SRV	Reinforcement Visible
SRP	Reinforcement Projecting
SRC	Reinforcement Corroded
SMW	Missing Wall

cvd_Cone_Brickwork - Domain

DomainName cvd_Cone_Brickwork
FieldType String
Domain Type CodedValue

Code	Name
DB	Displaced Brick
MB	Missing Brick
MMS	Mortar Missing Small
MMM	Mortar Missing Medium
MML	Mortar Missing Large

cvd_Cone_Broken - Domain

DomainName cvd_Cone_Broken
FieldType String
Domain Type CodedValue

Code	Name
B	Broken
BSV	Soil Visible
BVV	Void Visible

cvd_Cone_Crack - Domain

DomainName cvd_Cone_Crack
FieldType String
Domain Type CodedValue

Code	Name
CC	Circumferential
CL	Longitudinal
CM	Multiple
CS	Spiral

cvd_Cone_Deposits - Domain

DomainName cvd_Cone_Deposits
FieldType String
Domain Type CodedValue

Code	Name
DAE	Attached - Encrustation
DAGS	Attached - Grease
DAR	Attached - Ragging
DAZ	Attached - Other
DSC	Settled - Compact
DSF	Settled - Fine
DSGV	Settled - Gravel

DSZ	Settled - Other

cvd_Cone_Fracture - Domain

DomainName	cvd_Cone_Fracture
FieldType	String
Domain Type	CodedValue

Code	Name
FC	Circumferential
FL	Longitudinal
FM	Multiple
FS	Spiral

cvd_Cone_Hole - Domain

DomainName	cvd_Cone_Hole
FieldType	String
Domain Type	CodedValue

Code	Name
H	Hole
HSV	Soil Visible
HVV	Void Visible

cvd_Cone_Infiltration - Domain

DomainName	cvd_Cone_Infiltration
FieldType	String
Domain Type	CodedValue

Code	Name
Staining	Staining
Weeper	Weeper
Dripper	Dripper
Runner	Runner
Gusher	Gusher

cvd_Cone_Joint - Domain

DomainName cvd_Cone_Joint
FieldType String
Domain Type CodedValue

Code	Name
JOM	Offset Medium
JOL	Offset Large
JSM	Separated Medium
JSL	Separated Large
JAM	Angular Medium
JAL	Angular Large

cvd_Cone_Lining_Failure - Domain

DomainName cvd_Cone_Lining_Failure
FieldType String
Domain Type CodedValue

Code	Name
LFAS	Annular Space
LFB	Blistered Lining
LFD	Detached
LFDE	Defective End
LFDL	Delamination
LFRS	Resin Slug
LFW	Wrinkled
LFZ	Other

cvd_Cone_Material - Domain

DomainName cvd_Cone_Material
FieldType String
Domain Type CodedValue

Code	Name
None	None
PreCast	Pre-Cast
Brick	Brick
Poured	Poured
Plastic	Plastic
Block	Block

Metal	Metal
BrickWithLiner	Brick with Liner
Other	Other

cvd_Cone_Roots - Domain

DomainName	cvd_Cone_Roots
FieldType	String
Domain Type	CodedValue

Code	**Name**
RF	Roots Fine
RM	Roots Medium
RB	Root Ball
RT	Tap Root

cvd_Cone_Shape - Domain

DomainName	cvd_Cone_Shape
FieldType	String
Domain Type	CodedValue

Code	**Name**
Concentric	Concentric
Eccentric	Eccentric
FlatTop	Flat Top

cvd_Cone_Surface_Damage - Domain

DomainName	cvd_Cone_Surface_Damage
FieldType	String
Domain Type	CodedValue

Code	**Name**
SRI	Roughness Increased
SSS	Spalling
SSC	Spalling Coating
SAV	Aggregate Visible
SAP	Aggregate Projecting
SAM	Aggregate Missing
SRV	Reinforcement Visible
SRP	Reinforcement Projecting

SRC	Reinforcement Corroded
SMW	Missing Wall

cvd_Cover_Broken - Domain

DomainName	cvd_Cover_Broken
FieldType	String
Domain Type	CodedValue

Code	**Name**
B	Broken
BSV	Soil Visible
BVV	Void Visible

cvd_Cover_Crack - Domain

DomainName	cvd_Cover_Crack
FieldType	String
Domain Type	CodedValue

Code	**Name**
CC	Circumferential
CL	Longitudinal
CM	Multiple
CS	Spiral

cvd_Cover_Fit - Domain

DomainName	cvd_Cover_Fit
FieldType	String
Domain Type	CodedValue

Code	**Name**
Good	Good
Loose	Loose
BoltsMissing	Bolts Missing
GasketMissing	Gasket Gone/Missing

cvd_Cover_Fracture - Domain

DomainName	cvd_Cover_Fracture
FieldType	String
Domain Type	CodedValue

Code	Name
FC	Circumferential
FL	Longitudinal
FM	Multiple
FS	Spiral

cvd_Cover_Inflow - Domain

DomainName	cvd_Cover_Inflow
FieldType	String
Domain Type	CodedValue

Code	Name
Staining	Staining
Weeper	Weeper
Dripper	Dripper
Runner	Runner
Gusher	Gusher

cvd_Cover_Roots - Domain

DomainName	cvd_Cover_Roots
FieldType	String
Domain Type	CodedValue

Code	Name
RF	Roots Fine
RM	Roots Medium
RB	Root Ball
RT	Tap Root

cvd_Cover_Surface_Damage - Domain

DomainName	cvd_Cover_Surface_Damage

FieldType	String
Domain Type	CodedValue

Code	Name
SRI	Roughness Increased
SSS	Spalling
SSC	Spalling Coating
SAV	Aggregate Visible
SAP	Aggregate Projecting
SAM	Aggregate Missing
SRV	Reinforcement Visible
SRP	Reinforcement Projecting
SRC	Reinforcement Corroded
SMW	Missing Wall

cvd_Cover_Type - Domain

DomainName	cvd_Cover_Type
FieldType	String
Domain Type	CodedValue

Code	Name
Solid	Solid
Pick	Pick
ConcealedPick	Concealed Pick
BoldDown	Bolt Down
Vented	Vented
WaterTight	Water Tight
Shield	Shield

cvd_DropPipe - Domain

DomainName	cvd_DropPipe
FieldType	String
Domain Type	CodedValue

Code	Name
UpperOutside	Upper Outside Drop Pipe
LowerOutside	Lower Outside Drop Pipe
UpperInside	Upper Inside Drop Pipe

LowerInside	Lower Inside Drop Pipe

cvd_Frame_Broken - Domain

DomainName	cvd_Frame_Broken
FieldType	String
Domain Type	CodedValue

Code	**Name**
B	Broken
BSV	Soil Visible
BVV	Void Visible

cvd_Frame_Crack - Domain

DomainName	cvd_Frame_Crack
FieldType	String
Domain Type	CodedValue

Code	**Name**
CC	Circumferential
CL	Longitudinal
CM	Multiple
CS	Spiral

cvd_Frame_Deposits - Domain

DomainName	cvd_Frame_Deposits
FieldType	String
Domain Type	CodedValue

Code	**Name**
DAE	Attached - Encrustation
DAGS	Attached - Grease
DAR	Attached - Ragging
DAZ	Attached - Other
DSC	Settled - Compact
DSF	Settled - Fine

DSGV	Settled - Gravel
DSZ	Settled - Other

cvd_Frame_Fracture - Domain

DomainName	cvd_Frame_Fracture
FieldType	String
Domain Type	CodedValue

Code	**Name**
FC	Circumferential
FL	Longitudinal
FM	Multiple
FS	Spiral

cvd_Frame_Hole - Domain

DomainName	cvd_Frame_Hole
FieldType	String
Domain Type	CodedValue

Code	**Name**
H	Hole
HSV	Soil Visible
HVV	Void Visible

cvd_Frame_Infiltration - Domain

DomainName	cvd_Frame_Infiltration
FieldType	String
Domain Type	CodedValue

Code	**Name**
Staining	Staining
Weeper	Weeper
Dripper	Dripper
Runner	Runner
Gusher	Gusher

cvd_Frame_Joint - Domain

DomainName	cvd_Frame_Joint
FieldType	String
Domain Type	CodedValue

Code	Name
JOM	Offset Medium
JOL	Offset Large
JSM	Separated Medium
JSL	Separated Large
JAM	Angular Medium
JAL	Angular Large

cvd_Frame_Lining_Failure - Domain

DomainName	cvd_Frame_Lining_Failure
FieldType	String
Domain Type	CodedValue

Code	Name
LFAS	Annular Space
LFB	Blistered Lining
LFD	Detached
LFDE	Defective End
LFDL	Delamination
LFRS	Resin Slug
LFW	Wrinkled
LFZ	Other

cvd_Frame_Roots - Domain

DomainName	cvd_Frame_Roots
FieldType	String
Domain Type	CodedValue

Code	Name
RF	Roots Fine
RM	Roots Medium

RB	Root Ball
RT	Tap Root

cvd_Frame_Surface_Damage - Domain

DomainName	cvd_Frame_Surface_Damage
FieldType	String
Domain Type	CodedValue

Code	Name
SRI	Roughness Increased
SSS	Spalling
SSC	Spalling Coating
SAV	Aggregate Visible
SAP	Aggregate Projecting
SAM	Aggregate Missing
SRV	Reinforcement Visible
SRP	Reinforcement Projecting
SRC	Reinforcement Corroded
SMW	Missing Wall

cvd_FrameSeal_Brickwork - Domain

DomainName	cvd_FrameSeal_Brickwork
FieldType	String
Domain Type	CodedValue

Code	Name
DB	Displaced Brick
MB	Missing Brick
MMS	Mortar Missing Small
MMM	Mortar Missing Medium
MML	Mortar Missing Large

cvd_FrameSeal_Broken - Domain

DomainName	cvd_FrameSeal_Broken
FieldType	String

Domain Type	CodedValue

Code	**Name**
B	Broken
BSV	Soil Visible
BVV	Void Visible

cvd_FrameSeal_Crack - Domain

DomainName	cvd_FrameSeal_Crack
FieldType	String
Domain Type	CodedValue

Code	**Name**
CC	Circumferential
CL	Longitudinal
CM	Multiple
CS	Spiral

cvd_FrameSeal_Deposits - Domain

DomainName	cvd_FrameSeal_Deposits
FieldType	String
Domain Type	CodedValue

Code	**Name**
DAE	Attached - Encrustation
DAGS	Attached - Grease
DAR	Attached - Ragging
DAZ	Attached - Other
DSC	Settled - Compact
DSF	Settled - Fine
DSGV	Settled - Gravel
DSZ	Settled - Other

cvd_FrameSeal_Fracture - Domain

DomainName	cvd_FrameSeal_Fracture

FieldType	String
Domain Type	CodedValue

Code	**Name**
FC	Circumferential
FL	Longitudinal
FM	Multiple
FS	Spiral

cvd_FrameSeal_Hole - Domain

DomainName	cvd_FrameSeal_Hole
FieldType	String
Domain Type	CodedValue

Code	**Name**
H	Hole
HSV	Soil Visible
HVV	Void Visible

cvd_FrameSeal_Infiltration - Domain

DomainName	cvd_FrameSeal_Infiltration
FieldType	String
Domain Type	CodedValue

Code	**Name**
Staining	Staining
Weeper Weeper Dripper Dripper Runner Runner	
Gusher	Gusher

cvd_FrameSeal_Joint - Domain

DomainName	cvd_FrameSeal_Joint
FieldType	String
Domain Type	CodedValue

Code	**Name**

JOM	Offset Medium
JOL	Offset Large
JSM	Separated Medium
JSL	Separated Large
JAM Angular Medium JAL Angular Large	

cvd_FrameSeal_LiningFailure - Domain

DomainName	cvd_FrameSeal_LiningFailure
FieldType	String
Domain Type	CodedValue

Code	**Name**
LFAS	Annular Space
LFB	Blistered Lining
LFD	Detached
LFDE	Defective End
LFDL	Delamination
LFRS	Resin Slug
LFW	Wrinkled
LFZ	Other

cvd_FrameSeal_Roots - Domain

DomainName	cvd_FrameSeal_Roots
FieldType	String
Domain Type	CodedValue

Code	**Name**
RF	Roots Fine
RM	Roots Medium
RB	Root Ball
RT	Tap Root

cvd_FrameSeal_SurfaceDamage - Domain

DomainName	cvd_FrameSeal_SurfaceDamage

FieldType	String
Domain Type	CodedValue

Code	**Name**
SRI	Roughness Increased
SSS	Spalling
SSC	Spalling Coating
SAV	Aggregate Visible
SAP	Aggregate Projecting
SAM	Aggregate Missing
SRV	Reinforcement Visible
SRP	Reinforcement Projecting
SRC	Reinforcement Corroded
SMW	Missing Wall

cvd_Inflow_Dish - Domain

DomainName	cvd_Inflow_Dish
FieldType	String
Domain Type	CodedValue

Code	**Name**
Yes	Yes
No	No

cvd_Inspection_Crew - Domain

DomainName	cvd_Inspection_Crew
FieldType	String
Domain Type	CodedValue

Code	**Name**
XX(Crew Member Initials)	First Name Last Name (Crew Member Name)
other	Other

cvd_Inspection_Type - Domain

DomainName	cvd_Inspection_Type

FieldType	String
Domain Type	CodedValue

Code	**Name**
Internal	Internal
Surface	Surface

cvd_Location - Domain

DomainName	cvd_Location
FieldType	String
Domain Type	CodedValue

Code	**Name**
Street	Street
Alley	Alley
Sidewalk	Sidewalk
Driveway	Driveway
Highway	Highway
Grass	Grass
StormDitch	Storm Ditch
Woods	Woods
ParkingLot	Parking Lot
other	Other

cvd_Manhole_Surcharge - Domain

DomainName	cvd_Manhole_Surcharge
FieldType	String
Domain Type	CodedValue

Code	**Name**
Yes	Yes
No	No

cvd_Material - Domain

DomainName	cvd_Material
FieldType	String
Domain Type	CodedValue

Code	Name
PVC	PVC
RCP	RCP
VCP	VCP
DIP	DIP
HDPE	HDPE
CIPP	CIPP
ABS	ABS
AC	AC
CI	CI
CMP	CMP
CPP	CPP
Brick	Brick
CND	CND
Other	Other

cvd_Pipe_Shape - Domain

DomainName	cvd_Pipe_Shape
FieldType	String
Domain Type	CodedValue

Code	Name
Round	Round
Elliptical	Elliptical
Other	Other

cvd_PipeDefect_Location - Domain

DomainName	cvd_PipeDefect_Location
FieldType	String
Domain Type	CodedValue

Code	Name
InsidePipe	Inside Pipe
PipeConnection	MH-Pipe Connection
Other	Other

cvd_Ponding_Type - Domain

DomainName	cvd_Ponding_Type
FieldType	String
Domain Type	CodedValue

Code	Name
SheetFlow	Sheet Flow
LowPoint	Low Point
None	None

cvd_Riser_Present - Domain

DomainName	cvd_Riser_Present
FieldType	String
Domain Type	CodedValue

Code	Name
Yes	Yes
No	No

cvd_Step_Condition - Domain

DomainName	cvd_Step_Condition
FieldType	String
Domain Type	CodedValue

Code	Name
Good	Good
Corroded	Corroded
Misaligned	Misaligned
Broken	Broken
Missing	Missing

cvd_Step_Material - Domain

DomainName	cvd_Step_Material

FieldType	String
Domain Type	CodedValue

Code	**Name**
None	None
Metal	Metal
Plastic	Plastic

cvd_Structure_Type - Domain

DomainName	cvd_Structure_Type
FieldType	String
Domain Type	CodedValue

Code	**Name**
Standard	Standard
Cleanout	Cleanout
other	Other

cvd_Surface_Type - Domain

DomainName	cvd_Surface_Type
FieldType	String
Domain Type	CodedValue

Code	**Name**
Asphalt	Asphalt
Concrete	Concrete
Gravel	Gravel
DirtGrass	Dirt/Grass

cvd_Trough_Brickwork - Domain

DomainName	cvd_Trough_Brickwork
FieldType	String
Domain Type	CodedValue

Code	Name
DB	Displaced Brick
MB	Missing Brick
MMS	Mortar Missing Small
MMM	Mortar Missing Medium
MML	Mortar Missing Large

cvd_Trough_Broken - Domain

DomainName cvd_Trough_Broken
FieldType String
Domain Type CodedValue

Code	Name
B	Broken
BSV	Soil Visible
BVV	Void Visible

cvd_Trough_Crack - Domain

DomainName cvd_Trough_Crack
FieldType String
Domain Type CodedValue

Code	Name
CC	Circumferential
CL	Longitudinal
CM	Multiple
CS	Spiral

cvd_Trough_Deposits - Domain

DomainName cvd_Trough_Deposits
FieldType String
Domain Type CodedValue

Code	Name

DAE	Attached - Encrustation
DAGS	Attached - Grease
DAR	Attached - Ragging
DAZ	Attached - Other
DSC	Settled - Compact
DSF	Settled - Fine
DSGV	Settled - Gravel
DSZ	Settled - Other

cvd_Troug

DomainName
FieldType

h_Fracture - Domain

cvd_Trough_Fracture
String

Domain Type CodedValue

Code	Name
FC	Circumferential
FL	Longitudinal
FM	Multiple
FS	Spiral

cvd_Trough_Hole - Domain

DomainName cvd_Trough_Hole
FieldType String
Domain Type CodedValue

Code	Name
H	Hole
HSV	Soil Visible
HVV	Void Visible

cvd_Trough_Infiltration - Domain

DomainName cvd_Trough_Infiltration
FieldType String
Domain Type CodedValue

Code	Name
Staining	Staining

cvd_Troug

DomainName	
FieldType	
Weeper	Weeper
Dripper	Dripper
Runner	Runner
Gusher	Gusher

h_Joint - Domain

	cvd_Trough_Joint
	String
Domain Type	CodedValue

Code	**Name**
JOM	Offset Medium
JOL	Offset Large
JSM	Separated Medium
JSL	Separated Large
JAM Angular Medium	JAL Angular Large

cvd_Trough_Lining_Failure - Domain

DomainName	cvd_Trough_Lining_Failure
FieldType	String
Domain Type	CodedValue

Code	**Name**
LFAS	Annular Space
LFB	Blistered Lining
LFD	Detached
LFDE	Defective End
LFDL	Delamination
LFRS	Resin Slug
LFW	Wrinkled
LFZ	Other

h_Material - Domain

cvd_Troug

DomainName	cvd_Trough_Material
FieldType	String
Domain Type	CodedValue

Code	Name
None	None
PreCast	Pre-Cast
Brick	Brick
Poured	Poured
Plastic	Plastic
Block	Block
Metal	Metal
BrickWithLiner	Brick with Liner
Other	Other

cvd_Trough_Obstacle - Domain

DomainName	cvd_Trough_Obstacle
FieldType	String
Domain Type	CodedValue

Code	Name
30	< 30%
31	> 30%

h_Roots - Domain

DomainName	cvd_Trough_Roots
FieldType	String
Domain Type	CodedValue

Code	Name
RF	Roots Fine
RM	Roots Medium
RB	Root Ball
RT	Tap Root

cvd_Troug

DomainName
FieldType

cvd_Trough_Surface_Damage - Domain

DomainName	cvd_Trough_Surface_Damage
FieldType	String
Domain Type	CodedValue

Code	Name
SRI	Roughness Increased
SSS	Spalling
SSC	Spalling Coating
SAV	Aggregate Visible
SAP	Aggregate Projecting
SAM	Aggregate Missing
SRV	Reinforcement Visible
SRP	Reinforcement Projecting
SRC	Reinforcement Corroded
SMW	Missing Wall

cvd_Wall_Brickwork - Domain

DomainName cvd_Wall_Brickwork
FieldType String
Domain Type CodedValue

Code	Name
DB	Displaced Brick
MB	Missing Brick
MMS	Mortar Missing Small
MMM	Mortar Missing Medium
MML	Mortar Missing Large

cvd_Wall_Broken - Domain

DomainName cvd_Wall_Broken
FieldType String
Domain Type CodedValue

Code	Name
B	Broken
BSV	Soil Visible
BVV	Void Visible

cvd_Wall_Crack - Domain

DomainName cvd_Wall_Crack
FieldType String
Domain Type CodedValue

Code	Name
CC	Circumferential
CL	Longitudinal
CM	Multiple
CS	Spiral

cvd_Wall_Deposits - Domain

DomainName cvd_Wall_Deposits
FieldType String
Domain Type CodedValue

Code	Name
DAE	Attached - Encrustation
DAGS	Attached - Grease
DAR	Attached - Ragging
DAZ	Attached - Other
DSC	Settled - Compact
DSF	Settled - Fine
DSGV	Settled - Gravel
DSZ	Settled - Other

cvd_Wall_Fracture - Domain

DomainName cvd_Wall_Fracture
FieldType String
Domain Type CodedValue

Code	Name
FC	Circumferential
FL	Longitudinal
FM	Multiple
FS	Spiral

cvd_Wall_Hole - Domain

DomainName cvd_Wall_Hole
FieldType String
Domain Type CodedValue

Code	Name
H	Hole
HSV	Soil Visible

HVV	Void Visible

cvd_Wall_Infiltration - Domain

DomainName	cvd_Wall_Infiltration
FieldType	String
Domain Type	CodedValue

Code	**Name**
Staining	Staining
Weeper	Weeper
Dripper	Dripper
Runner	Runner
Gusher	Gusher

cvd_Wall_Joint - Domain

DomainName	cvd_Wall_Joint
FieldType	String
Domain Type	CodedValue

Code	**Name**
JOM	Offset Medium
JOL	Offset Large
JSM	Separated Medium
JSL	Separated Large
JAM	Angular Medium
JAL	Angular Large

cvd_Wall_Liner - Domain

DomainName	cvd_Wall_Liner
FieldType	String
Domain Type	CodedValue

Code	**Name**
Cementitious	Cementitious

CastInPlace	Cast-In-Place
CuredInPlace	Cured-In-Place
Epoxy	Epoxy
Polymer	Polymer
None	None

cvd_Wall_Lining_Failure - Domain

DomainName	cvd_Wall_Lining_Failure
FieldType	String
Domain Type	CodedValue

Code	Name
LFAS	Annular Space
LFB	Blistered Lining
LFD	Detached
LFDE	Defective End
LFDL	Delamination
LFRS	Resin Slug
LFW	Wrinkled
LFZ	Other

cvd_Wall_Material - Domain

DomainName	cvd_Wall_Material
FieldType	String
Domain Type	CodedValue

Code	Name
None	None
PreCast	Pre-Cast
Brick	Brick
Poured	Poured
Plastic	Plastic
Block	Block
Metal	Metal
BrickWithLiner	Brick with Liner
Other	Other

cvd_Wall_Roots - Domain

DomainName cvd_Wall_Roots
FieldType String
Domain Type CodedValue

Code	Name
RF	Roots Fine
RM	Roots Medium
RB	Root Ball
RT	Tap Root

cvd_Wall_Surface_Damage - Domain

DomainName cvd_Wall_Surface_Damage
FieldType String
Domain Type CodedValue

Code	Name
SRI	Roughness Increased
SSS	Spalling
SSC	Spalling Coating
SAV	Aggregate Visible
SAP	Aggregate Projecting
SAM	Aggregate Missing
SRV	Reinforcement Visible
SRP	Reinforcement Projecting
SRC	Reinforcement Corroded
SMW	Missing Wall

cvd_Weather_Conditions - Domain

DomainName cvd_Weather_Conditions
FieldType String
Domain Type CodedValue

Code	Name
Dry	Dry
HeavyRain	Heavy Rain
LightRain	Light Rain

Snow
DryWet

Snow
Dry Weather/Wet Ground

Appendix I – Pump Station and Force Main Assessment Forms

Pump Station Inspection Report

Short Tail Springs

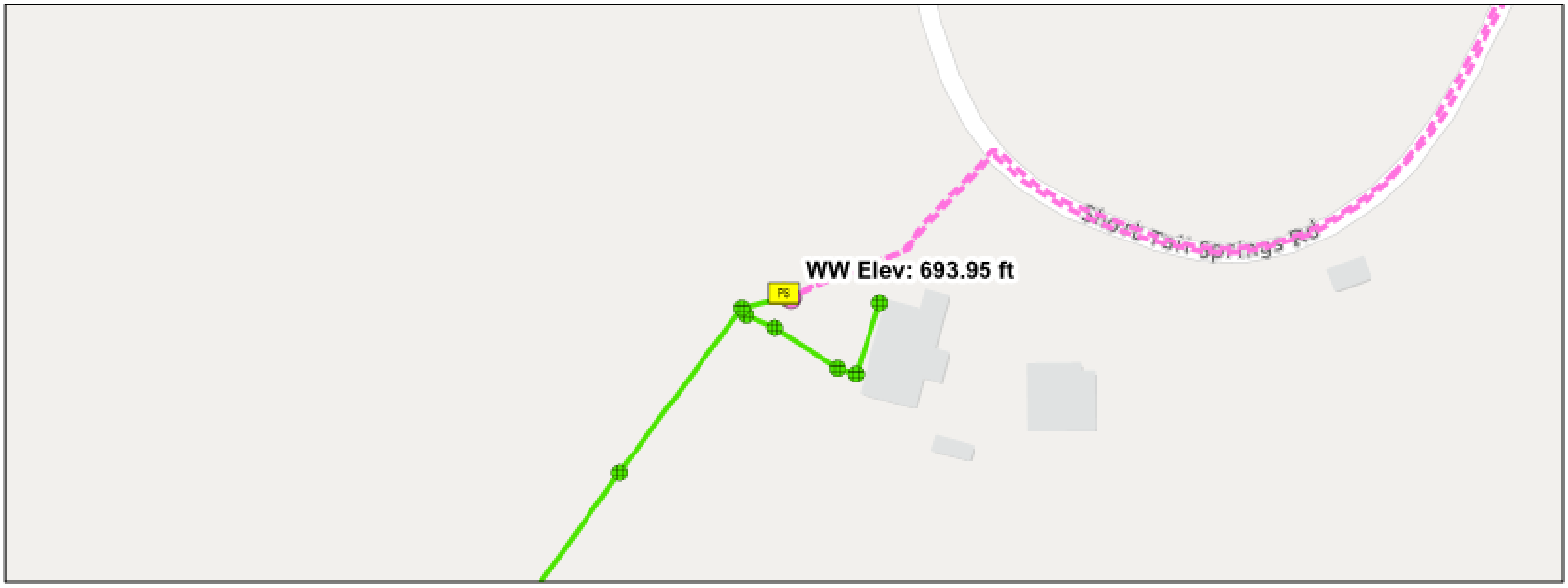
Inspected September 12, 2024

Address: 7634 Short Tail Springs Road
Station Type: Submersible
Comments: Bypass has an 8" suction and 6" discharge pipe

Pump Model ID: EMU FA10.78Z
Pump Manufacturer: Wilo
Latitude: 35.13107791
Longitude: -85.08342993
Wet Well Depth (ft): 24.5

360 Video Link: https://pioneer.sewerai.com/dashboard/review/88258e84-39db-4887-ba53-9d0179cd6e71?

Pump Station Vicinity Map (Scale: 1"= 30')



General Site Photos

Pump Station Inspection Report

Site Assessment

Access: Paved Road
Site Condition: Well Graded/No Erosion/Vegetation
Security: Security Fence Around All Equipment
Overall Assessment: Nothing to Address
Signs of Overflow: No
Adjacent Facilities Condition: No Visible Defects
Site Comments: None

Building on Site?: No
Roof Condition:
Interior Condition:
Building Security:
Overall Building Assessment:
Building Comments: None

Structural Assessment

Wet Well Assessment: No I/I, Debris, Rags Observed
WW Access Hatch: Firm and Lockable
Valve Vault: No I/I, Debris, Rags Observed
VV Access Hatch: Firm and Lockable
Comments: None

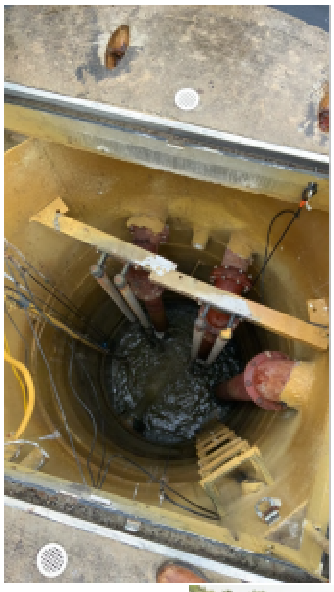
Fall Protection at WW:
Fall Protection Condition:
Overall Assessment: Nothing to Address

Pump Station Inspection Report

Mechanical Assessment

Number of Pumps: 2
Pump Condition: No Defects
WW Discharge Piping: No Defects
WW Supports/Guide Rails: No Defects
Valve Condition: Accessible, Working
VV Discharge Piping: No Defects
VV Supports/Guide Rails: No Defects
Onsite Water: Yes
Water Working?:
Hose Bib Provided?: Yes
Washdown Pad?: Yes
Backflow Preventer?:
Overall Assessment: Nothing to Address
Comments: One pump was taken out and bypass pump is connected.

Structural/Mechanical Photos



Pump Station Inspection Report

Electrical Assessment

Onsite Backup Generator: Yes
Portable Generator Hookup?: Yes
Onsite Backup Pumps?: Yes
Discharge Pipe Bypass?: Yes
Comments: None

WW Bypass (Suction)?: Yes
Control Panel and Instrumentation: No Defects, Equipped With Current WWTA "Standard"
Overall Assessment: Nothing to Address

Electrical and Instrumentation Photos

FORCE MAIN CONDITION AND INSPECTION FORM

GENERAL AND LOCATION

Asset Name/ID _____

Date of Inspection: _____ **Inspection Personnel:** _____ **Contact Phone/E-mail:**_____

Facility Type : ☐ Pipe ☐ Valve ☐ Other (describe) _____ **Facility Coordinates (N/E):** _____

Development / System Owner *(if applicable):* _____ **GPS (long/lat):** _____

Municipality / Facility Name: _____ **Pipe Material:**

☐ DI ☐ CI ☐ AC
☐ PVC ☐ HDPE ☐ RCP
☐ PCCP ☐ ST ☐ OTHER

Pipe Size (in): _____ **Date of Construction (if known)** _____

Nearest Cross Streets: _____ **Approx. Crossing Length:** _____ **LF**

Pipe Underground – ☐**No Survey Conducted , Inspection Method:** ☐ Pressure Testing ☐ Acoustic Detection ☐ Free-Swimming Tool

Pipe Crossing: ☐ Stream (name)_____ ☐ Road/Rail (name) _____ **Supports:** ☐ Piers ☐ Bridge ☐ Other (describe/photo)

FACILITY CONDITION (check all that apply) *Describe in more detail under Comments* **Pipe is** ☐ in service ☐ out of service

Pipe/Structure

☐ Excessive Corrosion
☐ Delaminated Steel
☐ Pipe Damaged
☐ Cracks
☐ Concrete Spalls
☐ Lacks Insulation

Joints

☐ Leaking
☐ Failed/Separated
☐ Restraint damaged

Supports

☐ Deficient Support
☐ Support Damage / Corrosion
☐ Inadequate Support Spacing

Valves ☐ accessible, working ☐ accessible, non-working
Approx. operating Pressure _____ psi

Environment

☐ Hazardous Location
☐ Debris Build-up
☐ Submerged in Water
☐ Exposed to Vehicle Impact
☐ Not Secured from Public

FACILITY ASSESSMENT

☐ Poor (Immediate Action Required) ☐ Poor (No Immediate Action Required) ☐ Good ☐ Excellent

Adjacent Facilities Condition: ☐ Erosion ☐ Structure Collapse/Damage ☐ Pavement Failure ☐ Overhead Power /Utilities Down ☐ Property Damage ☐ Other (describe) _____

COMMENTS

Use the following space for general observations and to comment on any selected conditions

SKETCH

SKETCH COMPONENTS

- ☐ Cross Streets
- ☐ Pipe Size
- ☐ ARV and Other Valve/vault Locations
- ☐ Support Locations
- ☐ Deficiency Locations
- ☐ Sketch Orientation
- ☐ Site Access

GIS MAP AND/OR AERIAL

PHOTOS

Appendix J – Rehabilitation Data Dictionary

Mainline Point Repairs

Point Feature Class

Point feature representing center of point performed on mainline

Field Name	Alias	Description	Sample Values	Data Type
OBJECTID	OBJECTID	ESRI required unique ID field automatically generated in ArcGIS	1,2,3	Object ID
Shape	Shape	Geometric shape automatically generated in ArcGIS	Point	Geometry
FacililtyID	FacililtyID	Gravity Main unique asset ID maintained by WWTA	GM14311-10	Text
PipeID	PipeID	PACP Pipe ID assigned to mainline using upstream and downstream manhole Facility ID	GM14311-10_GM14311-09	Text
US_MH	Upstream Manhole	Facility ID of upstream manhole	MH14311-09, 100, LM120, RB8969	Text
DS_MH	Donwstream Manhole	Facility ID of downstream manhole	MH14311-09, 100, LM120, RB8969	Text
Rehab_Distance_From_UpstMH	Rehab Distance From Upstrm MH	Distance to point repair measured from upstream manhole	22.5	Double
Rehab_Complete	Rehab Completed Date	Date the rehab was completed	9/7/2018, 12/3/2019, 6/10/2020, etc.	Date
Rehab_Description	Rehab Description	Type of point repair (Sectional Open Cuts are longer than 20')	External Point Repair, Internal Point Repair, Sectional Open Cut, Other	Text
Additional_Comments	Additional Comments	Space for additional rehab comments if necessary		Text
Rehab_Contractor	Rehab Contractor	Name of construction company that performed rehab	Insituform, SAK Construction, BLD, Brown Brothers, Inc., etc.	Text
Rehab_Eng_Consultant	Rehab Engineering Consultant	Name of consulting firm that designed rehab	LJA, Cannon & Cannon, Burns & McDonnell	Text
Consultant_Project_Number	Project Number	Project number assigned by consultant		Text
WWTA_Project_Number	WWTA Project Number	Project number assigned by WWTA	16-317, 17-316, 20-329, etc.	Text
Pre_Rehab_Photo_Filename	Pre Rehab Photo Filename	Local or web link to photo documenting pre-rehab pipe status	GM14311-10_GM14311-09.jpg	Text
Pre_Rehab_Photo_Link	Pre Rehab Photo Link	Pre-rehab photo file name (including file type, i.e., .jpg, .png)	D:/16317_SewerRehabServices/MainlinePointRepair/Pre_Rehab/Media/Photos/GM14311-10_GM14311-09.jpg	Text
Pre_Rehab_CCTV_Filename	Pre Rehab CCTV Filename	Pre-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	GM14311-10_GM14311-09.wmv	Text
Pre_Rehab_CCTV_Link	Pre Rehab CCTV Link	Local or web link to CCTV video documentin pre-rehab pipe status	D:/16317_SewerRehabServices/MainlinePointRepair/Pre_Rehab/Media/Videos/GM14311-10_GM14311-09.wmv	Text
Pre_Rehab_Report_Filename	Pre Rehab Report Filename	Pre-rehab report file name (including file type, i.e., .pdf)	GM14311-10_GM14311-09.pdf	Text
Pre_Rehab_Report_Link	Pre Rehab Report Link	Local or web link to report documenting pre-rehab pipe status	D:/16317_SewerRehabServices/MainlinePointRepair/Pre_Rehab/Reports/MainlinePointRepairReports/GM14311-10_GM14311-09.pdf	Text
Post_Rehab_Photo_Filename	Post Rehab Photo Filename	Post-rehab photo file name (including file type, i.e., .jpg, .png)	GM14311-10_GM14311-09.jpg	Text
Post_Rehab_Photo_Link	Post Rehab Photo Link	Local or web link to photo documenting post rehab pipe status	D:/16317_SewerRehabServices/MainlinePointRepair/Post_Rehab/Media/Photos/GM14311-10_GM14311-09.jpg	Text
Post_Rehab_CCTV_Filename	Post Rehab CCTV Filename	Post-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	GM14311-10_GM14311-09wmv	Text
Post_Rehab_CCTV_Link	Post Rehab CCTV Link	Local or web link to CCTV video documentin post-rehab pipe status	D:/16317_SewerRehabServices/MainlinePointRepair/Post_Rehab/Media/Videos/GM14311-10_GM14311-09_2.wmv	Text
Post_Rehab_CCTV_Filename2	Post Rehab CCTV Filename2	Post-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	GM14311-10__GM14311-09_2.wmv	Text
Post_Rehab_CCTV_Link2	Post Rehab CCTV Link2	Local or web link to CCTV video documentin post-rehab pipe status	D:/16317_SewerRehabServices/MainlinePointRepair/Post_Rehab/Media/Vidoes/GM14311-10_2.wmv	Text
Post_Rehab_Report_Link	Post Rehab Report Link	Post-rehab report file name (including file type, i.e., .pdf)	GM14311-10_GM14311-09.pdf	Text
Post_Rehab_Report_Filename	Post Rehab Report Filename	Local or web link to report documenting post-rehab pipe status	D:/16317_SewerRehabServices/MainlinePointRepair/Post_Rehab/MainlinePointRepairReports/GM14311-10_GM14311-09.pdf	Text
Post_Rehab_Approval_Filename	Post Rehab Approval Filename	Post-rehab approval document file name (including file type, i.e., .pdf)	GM14311-10_GM14311-09.pdf	Text
Post_Rehab_Approval_Link	Post Rehab Approval Link	Local or web link to approval documenting post-rehab pipe status	D:/16317_SewerRehabServices/MainlinePointRepair/Post_Rehab/Reports/ApprovalReports/GM14311-10_GM14311-09.pdf	Text
Project_Specs_Link	Project Specs Link	Local or web link to project plans and specifications	D:/16317_SewerRehabServices/Project_Specs&Documents/Agreement.pdf	Text
Rehab_Proj_Cost	Rehab Proj Cost	Total cost of rehab project		Double
Basin_Number	Basin ID	WWTA Basin ID	ER10, LM02, RB06	Text

Mainline Rehab
Polyline Feature Class

Field Name	Alias	Description	Sample Values	Data Type
OBJECTID	OBJECTID	ESRI required unique ID field automatically generated in ArcGIS	1,2,3	Object ID
Shape	Shape	Geometric shape automatically generated in ArcGIS	Point	Geometry
FacilityID	FacilityID	Gravity Main unique ID maintained by WWTA	GM14311-10	Text
PipeID	PipeID	PACP pipe ID assigned to mainline using upstream and downstream manholes	100_99	Text
US_MH	Upstream Manhole	Facility ID of upstream manhole	MH14311-09, 100, LM120, RB8969	Text
DS_MH	Donwstream Manhole	Facility ID of downstream manhole	MH14311-09, 100, LM120, RB8969	Text
Rehab_Description	Rehab Description	Type of rehab performed on mainline	Cured-In-Place Pipe, Ex Sanitary - Removed, Ex Sanitary -Retired In Place, Ex Sanitary - Retired In Place with Fill, New Interceptor, Open Cut, Pipe Burst, Pipe Burst HDPE, Reconnected Existing Collector, Other	Text
Rehab_Completed	Date Rehab Completed	Date the Rehab was completed	9/7/2018, 12/3/2019, 6/10/2020, etc.	Date
Additional_Comments	Additional Comments	Space for additional rehab comments if necessary		Text
Host_Pipe_Material	Host Pipe Material	Material of the pipe that has been lined	CP, DIP, HDPE, NCP, PE, Polyethylene, PVC, VCP, etc.	Text
CIPP_Size	CIPP Size	Thickness of Cured-In-Place pipe measured in millimeters	6, 7.5	Double
Rehab_Contractor	Rehab Contractor	Name of construction company that performed rehab	Insituform, SAK Construction, BLD, Brown Brothers, Inc., etc.	Text
Rehab_Eng_Consultant	Rehab Engineering Consultant	Name of consulting firm that designed rehab	LJA, Cannon & Cannon, Burns & McDonnell	Text
Consultant_Project_Number	Project Number	Project number assigned by consultant		Text
WWTA_Project_Number	WWTA Project Number	Project number assigned by WWTA	16-317, 17-316, 20-329, etc.	Text
Pre_Rehab_Photo_Filename	Pre Rehab Photo Filename	Local or web link to photo documenting pre-rehab pipe status	GM14311-10.jpg	Text
Pre_Rehab_Photo_Link	Pre Rehab Photo Link	Pre-rehab photo file name (including file type, i.e., .jpg, .png)	D:/16317_SewerRehabServices/MainlineRepair/Pre_Rehab/Media/Photos/GM14311-10.jpg	Text
Pre_Rehab_CCTV_Filename	Pre Rehab CCTV Filename	Pre-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	GM14311-10.wmv	Text
Pre_Rehab_CCTV_Link	Pre Rehab CCTV Link	Local or web link to CCTV video documentin pre-rehab pipe status	D:/16317_SewerRehabServices/MainlineRepair/Pre_Rehab/Media/Videos/GM14311-10.wmv	Text
Pre_Rehab_Report_Filename	Pre Rehab Report Filename	Pre-rehab report file name (including file type, i.e., .pdf)	GM14311-10.pdf	Text
Pre_Rehab_Report_Link	Pre Rehab Report Link	Local or web link to report documenting pre-rehab pipe status	D:/16317_SewerRehabServices/MainlineRepair/Pre_Rehab/Reports/MainlineRepairReports/GM14311-10.pdf	Text
Post_Rehab_Photo_Filename	Post Rehab Photo Filename	Post-rehab photo file name (including file type, i.e., .jpg, .png)	GM14311-10.jpg	Text
Post_Rehab_Photo_Link	Post Rehab Photo Link	Local or web link to photo documenting post rehab pipe status	D:/16317_SewerRehabServices/MainlineRepair/Post_Rehab/Media/Photos/GM14311-10.jpg	Text
Post_Rehab_CCTV_Filename	Post Rehab CCTV Filename	Post-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	GM14311-10.wmv	Text
Post_Rehab_CCTV_Link	Post Rehab CCTV Link	Local or web link to CCTV video documentin post-rehab pipe status	D:/16317_SewerRehabServices/MainlineRepair/Post_Rehab/Media/Videos/GM14311-10.wmv	Text
Post_Rehab_CCTV_Filename2	Post Rehab CCTV Filename2	Post-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	GM14311-10_2.wmv	Text
Post_Rehab_CCTV_Link2	Post Rehab CCTV Link2	Local or web link to CCTV video documentin post-rehab pipe status	D:/16317_SewerRehabServices/MainlineRepair/Post_Rehab/Media/Vidoes/GM14311-10_2.wmv	Text
Post_Rehab_Report_Filename	Post Rehab Report Filename	Local or web link to report documenting post-rehab pipe status	D:/16317_SewerRehabServices/MainlineRepair/Post_Rehab/MainlineRepairReports/GM14311-10.pdf	Text
Post_Rehab_Report_Link	Post Rehab Report Link	Post-rehab report file name (including file type, i.e., .pdf)	GM14311-10.pdf	Text
Post_Rehab_Approval_Filename	Post Rehab Approval Filename	Post-rehab approval document file name (including file type, i.e., .pdf)	GM14311-10.pdf	Text
Post_Rehab_Approval_Link	Post Rehab Ap[proval Link	Local or web link to approval documenting post-rehab pipe status	D:/16317_SewerRehabServices/MainlineRepair/Post_Rehab/Reports/ApprovalReports/GM14311-10.pdf	Text
Project_Specs_Link	Project Specs Link	Local or web link to project plans and specifications	D:/16317_SewerRehabServices/Project_Specs&Documents/Agreement.pdf	Text
Rehab_Proj_Cost	Rehab Proj Cost	Total cost of rehab project		Double
Basin_Number	Basin ID	WWTA Basin ID	ER10, LM02, RB06	Text
Shape_Length	Shape_Length	ESRI required field automatically generated in ArcGIS	100.23	Double

Manhole Rehab
Point Feature Class

Field Name	Alias	Description	Sample Values	Data Type
OBJECTID	OBJECTID	ESRI required unique ID field automatically generated in ArcGIS	1,2,3	Object ID
Shape	Shape	Geometric shape automatically generated in ArcGIS	Point	Geometry
ManholeID	ManholeID	Manhole unique ID maintained by WWTA	MH14311-10	Text
Rehab_Description	Rehab Description	Type of rehab performed on manhole	Retired in Place, Grout Connections, Install Boltdown Cover, Install Chimney Seal, Install Inflow Dish, Install Watertight Cover, Lining - Full, Lining - Full and Grout Connections, Lining -Full and Plug Abandoned Lines, Lining - Full and Repair Bench and Invert (Lining - Full_Repair Bench and Invert), New Manhole, Raise to Grade, Realign and Seal, Replace Cover, Replace Frame and Cover, Watertight Cover and Raise to Grade	Text
Rehab_Complete	Date Rehab Completed	Date the rehab was completed	9/7/2018, 12/3/2019, 6/10/2020, etc.	Date
Additional_Comments	Additional Comments	Space for additional rehab comments if necessary		Text
Rehab_Contractor	Rehab Contractor	Name of construction company that performed rehab	Insituform, SAK Construction, BLD, Brown Brothers, Inc., etc.	Text
Rehab_Eng_Consultant	Rehab Engineering Consultant	Name of consulting firm that designed rehab	LJA, Cannon & Cannon, Burns & McDonnell	Text
Consultant_Project_Number	Consultant Project Number	Project number assigned by consultant		Text
WWTA_Project_Number	WWTA Project Number	Project number assigned by WWTA	16-317, 17-316, 20-329, etc.	Text
Pre_Rehab_Photo_Filename	Pre Rehab Photo Filename	Local or web link to photo documenting pre-rehab manhole status	MH14311-10.jpg	Text
Pre_Rehab_Photo_Link	Pre Rehab Photo Link	Pre-rehab photo file name (including file type, i.e., .jpg, .png)	D:/16317_SewerRehabServices/ManholeRepair/Pre_Rehab/Media/Photos/MH14311-10.jpg	Text
Pre_Rehab_CCTV_Filename	Pre Rehab CCTV Filename	Pre-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	MH14311-10.wmv	Text
Pre_Rehab_CCTV_Link	Pre Rehab CCTV Link	Local or web link to CCTV video documentin pre-rehab manhole status	D:/16317_SewerRehabServices/ManholeRepair/Pre_Rehab/Media/Videos/MH14311-10.wmv	Text
Pre_Rehab_Report_Filename	Pre Rehab Report Filename	Pre-rehab report file name (including file type, i.e., .pdf)	MH14311-10.pdf	Text
Pre_Rehab_Report_Link	Pre Rehab Report Link	Local or web link to report documenting pre-rehab manhole status	D:/16317_SewerRehabServices/ManholeRepair/Pre_Rehab/Reports/ManholeRepairReports/MH14311-10.pdf	Text
Post_Rehab_Photo_Filename	Post Rehab Photo Filename	Post-rehab photo file name (including file type, i.e., .jpg, .png)	MH14311-10.jpg	Text
Post_Rehab_Photo_Link	Post Rehab Photo Link	Local or web link to photo documenting post rehab manhole status	D:/16317_SewerRehabServices/ManholeRepair/Post_Rehab/Media/Photos/MH14311-10.jpg	Text
Post_Rehab_CCTV_Filename	Post Rehab CCTV Filename	Post-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	MH14311-10.wmv	Text
Post_Rehab_CCTV_Link	Post Rehab CCTV Link	Local or web link to CCTV video documentin post-rehab manhole status	D:/16317_SewerRehabServices/ManholeRepair/Post_Rehab/Media/Videos/MH14311-10.wmv	Text
Post_Rehab_CCTV_Filename2	Post Rehab CCTV Filename2	Post-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	MH14311-10_2.wmv	Text
Post_Rehab_CCTV_Link2	Post Rehab CCTV Link2	Local or web link to CCTV video documentin post-rehab manhole status	D:/16317_SewerRehabServices/ManholeRepair/Post_Rehab/Media/Vidoes/MH14311-10_2.wmv	Text
Post_Rehab_Report_Link	Post Rehab Report Link	Post-rehab report file name (including file type, i.e., .pdf)	MH14311-10.pdf	Text
Post_Rehab_Report_Filename	Post Rehab Report Filename	Local or web link to report documenting post-rehab manhole status	D:/16317_SewerRehabServices/ManholeRepair/Post_Rehab/ManholeRepairReports/MH14311-10.pdf	Text
Post_Rehab_Approval_Filename	Post Rehab Approval Filename	Post-rehab approval document file name (including file type, i.e., .pdf)	MH14311-10.pdf	Text
Post_Rehab_Approval_Link	Post Rehab Ap[proval Link	Local or web link to approval documenting post-rehab manhole status	D:/16317_SewerRehabServices/ManholeRepair/Post_Rehab/Reports/ApprovalReports/MH14311-10.pdf	Text
Project_Specs_Link	Project Specs Link	Local or web link to project plans and specifications	D:/16317_SewerRehabServices/Project_Specs&Documents/Agreement.pdf	Text
Rehab_Proj_Cost	Rehab Proj Cost	Total cost of rehab project		Double
Basin_Number	Basin ID	WWTA Basin ID	ER10, LM02, RB06	Text

Lateral Rehab

Polyline Feature Class

Short ~20' line intersecting the mainline at the connection point representing a lateral that was rehabbed

Field Name	Alias	Description	Sample Values	Data Type
OBJECTID	OBJECTID	ESRI required unique ID field automatically generated in ArcGIS	1,2,3	Object ID
Shape	Shape	Geometric shape automatically generated in ArcGIS	Point	Geometry
LateralID	LateralID	PACP Pipe ID assigned to mainline using upstream and downstream manholes with lateral number, letter indicating upstream and downstream direction, and clock position. Each lateral must have a unique Id.	100_99_L273_U@1	Text
PipeID	PipeID	PACP pipe ID assigned to mainline using upstream and downstream manholes	GM14311-10-GM14311-09	Text
Rehab_Complete	Date Rehab Completed	Date the rehab was completed	9/7/2018, 12/3/2019, 6/10/2020, etc.	Date
Rehab_Description	Rehab Description	Type of rehab performed on mainline	Capped Do Not Reinstate, Clean Out Installation, Cured-In-Place Pipe, Electrofuse, No Action, No Action Abandoned, No Action Capped, Open Cut Lateral Replacement (OCLR), OCLR and Shorty, Other	Text
Additional_Comments	Additional Comments	Space for additional rehab comments if necessary		Text
Rehab_Contractor	Rehab Contractor	Name of construction company that performed rehab	Insituform, SAK Construction, BLD, Brown Brothers, Inc., etc.	Text
Rehab_Eng_Consultant	Rehab Engineering Consultant	Name of consulting firm that designed rehab	LJA, Cannon & Cannon, Burns & McDonnell	Text
Consultant_Project_Number	Consultant Project Number	Project number assigned by consultant		Text
WWTA_Project_Number	WWTA Project Number	Project number assigned by WWTA	16-317, 17-316, 20-329, etc.	Text
Pre_Rehab_Photo_Filename	Pre Rehab Photo Filename	Local or web link to photo documenting pre-rehab lateral status	LA14311-10.jpg	Text
Pre_Rehab_Photo_Link	Pre Rehab Photo Link	Pre-rehab photo file name (including file type, i.e., .jpg, .png)	D:/16317_SewerRehabServices/LateralRepair/Pre_Rehab/Media/Photos/LA14311-10.jpg	Text
Pre_Rehab_CCTV_Filename	Pre Rehab CCTV Filename	Pre-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	LA14311-10.wmv	Text
Pre_Rehab_CCTV_Link	Pre Rehab CCTV Link	Local or web link to CCTV video documentin pre-rehab lateral status	D:/16317_SewerRehabServices/LateralRepair/Pre_Rehab/Media/Videos/LA14311-10.wmv	Text
Pre_Rehab_Report_Filename	Pre Rehab Report Filename	Pre-rehab report file name (including file type, i.e., .pdf)	LA14311-10.pdf	Text
Pre_Rehab_Report_Link	Pre Rehab Report Link	Local or web link to report documenting pre-rehab lateral status	D:/16317_SewerRehabServices/LateralRepair/Pre_Rehab/Reports/LateralRepairReports/LA14311-10.pdf	Text
Post_Rehab_Photo_Filename	Post Rehab Photo Filename	Post-rehab photo file name (including file type, i.e., .jpg, .png)	LA14311-10.jpg	Text
Post_Rehab_Photo_Link	Post Rehab Photo Link	Local or web link to photo documenting post rehab lateral status	D:/16317_SewerRehabServices/LateralRepair/Post_Rehab/Media/Photos/LA14311-10.jpg	Text
Post_Rehab_CCTV_Filename	Post Rehab CCTV Filename	Post-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	LA14311-10.wmv	Text
Post_Rehab_CCTV_Link	Post Rehab CCTV Link	Local or web link to CCTV video documentin post-rehab lateral status	D:/16317_SewerRehabServices/LateralRepair/Post_Rehab/Media/Videos/LA14311-10.wmv	Text
Post_Rehab_CCTV_Filename2	Post Rehab CCTV Filename2	Post-rehab CCTV file name (including file type, i.e., .mp4, .mpg, .wmv)	LA14311-10_2.wmv	Text
Post_Rehab_CCTV_Link2	Post Rehab CCTV Link2	Local or web link to CCTV video documentin post-rehab lateral status	D:/16317_SewerRehabServices/LateralRepair/Post_Rehab/Media/Vidoes/LA14311-10_2.wmv	Text
Post_Rehab_Report_Link	Post Rehab Report Link	Post-rehab report file name (including file type, i.e., .pdf)	LA14311-10.pdf	Text
Post_Rehab_Report_Filename	Post Rehab Report Filename	Local or web link to report documenting post-rehab lateral status	D:/16317_SewerRehabServices/LateralRepair/Post_Rehab/LateralRepairReports/LA14311-10.pdf	Text
Post_Rehab_Approval_Filename	Post Rehab Approval Filename	Post-rehab approval document file name (including file type, i.e., .pdf)	LA14311-10.pdf	Text
Post_Rehab_Approval_Link	Post Rehab Ap[proval Link	Local or web link to approval documenting post-rehab lateral status	D:/16317_SewerRehabServices/LateralRepair/Post_Rehab/Reports/ApprovalReports/LA14311-10.pdf	Text
Project_Specs_Link	Project Specs Link	Local or web link to project plans and specifications	D:/16317_SewerRehabServices/Project_Specs&Documents/Agreement.pdf	Text
Rehab_Proj_Cost	Rehab Proj Cost	Total cost of rehab project		Double
Basin_Number	Basin ID	WWTA Basin ID	ER10, LM02, RB06	Text
Shape_Length	Shape_Length	ESRI required field automatically generated in ArcGIS	100.23	Double

Repair Status Database

(Feature Class for Each Repair Type)

Field Name	Alias	Description	Sample Values	Data Type	Domain
OBJECTID	OBJECTID	ESRI required unique ID field automatically generated in ArcGIS	1, 2, 3	Object ID	
Shape	Shape	Geometric shape automatically generated in ArcGIS	Point	Geometry	
FacilityID	FacilityID	WWTA Maintained Asset ID	GM14311-10, MH14311-09	Text	
Insp_Status	Inspection Status	Current status of the inspection	Not Started, In Progress, Complete, Unable to Inspect, Scheduled Start Date, Other	Text	Inspection_Status
Comments	Comments	Comments as per the status of the inspection	Unable to complete inspection due to burried manhole.	Text	
Status_Date	Status Date	Date the Inspection Status Field is updated		Date	
Insp_CompletedDate	Inspection Completed Date	Date the inspection was completed		Date	
Insp_EstimatedStartDate	Inspection Estimated Start Date	Estimated date that the inspection will be started		Date	