

# City of Oak Ridge, Tennessee

## SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT



April 2012

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## SECTION I

### GENERAL

#### A. BACKGROUND

The City of Oak Ridge (City) received Administrative Order No. CWA-04-2010-4772 (Order) from the US Environmental Protection Agency, Region 4 (EPA), effective September 30, 2010. The Order requires a number of actions on the part of the City relative to its wastewater collection and transmission system. Item 16.B of the Order requires that the City prepare a System Evaluation and Rehabilitation Plan consisting of a Capacity Assessment Plan, a Sewer System Evaluation Survey, and a Collection System Remediation Plan. Item 16.B.i of the Order specifies the requirements for the Capacity Assessment Plan. In general, the requirements relate to proposed analysis methodology (e.g., computer modeling), dry and wet weather loading of the system, rainfall and flow monitoring, pump station capacity evaluations, design storm selection, and “worst-case” analysis of sewers affecting critical mini-systems. Item 16.B.ii of the Order specifies that the Capacity Assessment be completed, and that a Capacity Assessment Report be prepared summarizing the results. The requirements for the Capacity Assessment Report generally relate to a description of the computer model, the results of the modeling as they relate to system capacity and the expected effects of rehabilitation, and other items such as overflows and excessive inflow and infiltration. In response to those requirements, a Capacity Assessment Plan was prepared and submitted to EPA in March 2011. The plan was subsequently approved by EPA in May 2011. Following approval, the plan was implemented. The collection of field information and mapping required to define the sewer collection and transmission system, and the collection of rainfall and flow data for modeling purposes, were completed in early 2012. The development of the computer model and the subsequent capacity assessment were completed in March 2012.

#### B. APPROACH

A key task required for the Capacity Assessment was the preparation of a collection and transmission system computer model for use in assessing and optimizing the capacity of the sewer system, and in evaluating the general effects of various rehabilitation measures. Other tasks were associated with documenting historical overflows, identification of critical mini-systems, mapping, etc.

The general approach to the assessment was as follows:

- Define the physical characteristics of the sewer system and service area.
- Document sewer overflows and identify “critical mini-systems”.
- Select and configure a computer model to be used for the system analysis.
- Collect and analyze rainfall data.
- Collect and analyze flow data.
- Collect and evaluate groundwater data.
- Determine the dry weather flow characteristics.
- Determine the wet weather flow characteristics (i.e., determine the influence of rainfall-derived inflow and infiltration).
- Calibrate the model.
- Load the model with design flows.
- Use the model to assess the design capacity of the sewer system, including “worst case” conditions.
- Use the model to assist in the evaluation of the general effects of rehabilitation measures.
- Provide other required information such as system maps, volume of sewage from “Significant Industrial Users”, etc.

## SECTION II

### SANITARY SEWER SYSTEM

#### A. OVERVIEW

The Oak Ridge sanitary sewer collection and transmission system has approximately 1,255,000 linear feet of gravity sewer pipe, approximately 6,850 manholes, three major pumping stations with force mains, 32 smaller pumping stations with force mains, and privately owned laterals. The system is designed and managed to be a separate sanitary sewer system (i.e., as opposed to a combined sanitary and stormwater sewer system). The system flows to the City's Wastewater Treatment Plant (WWTP) which has a hydraulic capacity of 30 million gallons per day (MGD). The WWTP discharges by NPDES permit to East Fork Poplar Creek.

The major axis of the Oak Ridge sanitary sewer system basin is oriented approximately southwest - northeast, conforming to the ridge-and-valley topography of the Oak Ridge area. The system extends from Melton Hill Lake on the east southwestward approximately eleven miles. Along its minor axis, the system extends approximately five miles (at its widest point) southeast of Black Oak Ridge. See Appendix A, Figure A-1. More detailed maps of the sewer basin are provided in Appendix B, Maps B-1 through B-6.

As shown on the diagram in Appendix A, Figure A-2, the sewer system is divided into two divisions, the East Division and the West Division. The East Division and West Division contain 45 and 43 mini-systems, respectively. The northern part of the East Division flows by gravity and force mains to the East Plant Pumping Station. The southern part of the East Division flows by gravity and force mains to the Emory Valley Pump Station. The East Plant and Emory Valley stations pump to force mains that discharge to the gravity interceptor. The West Division flows by gravity and force mains to the gravity interceptor. The main gravity interceptor flows to the Turtle Park Pump Station which pumps directly by force mains to the WWTP. (The diagram shows only the three major pumping stations and associated force mains. For simplicity, the minor pumping stations and associated force mains are not shown on the diagram.)

The major segments of the gravity interceptor are as follows:

- The main 42-inch concrete gravity interceptor extends eastward upstream from the Turtle Park Pump Station to a 36-inch concrete interceptor near the intersection of the Oak Ridge Turnpike and South Illinois Avenue.
- A 27-inch clay gravity interceptor line extends from the 36-inch interceptor southward upstream along South Illinois Avenue, serving primarily commercial and light industrial areas and the United States Department of Energy Y-12 Plant.

- A 24-inch interceptor extends eastward upstream from the 36-inch interceptor near the intersection of the Oak Ridge Turnpike and Illinois Avenue, serving the eastern part of the sewer basin.

## **B. MANHOLE AND SEWER PIPE IDENTIFICATION NOMENCLATURE**

In the discussions that follow, references are made to specific manholes with respect to meter locations, load points, overflows, etc. In addition, references are made to specific sewer pipes with respect to capacity. Therefore, an explanation of the identification nomenclature for manholes and sewer pipes follows:

An example of a manhole identifier is “MH:E5A-J16-30”. The “MH” term is the prefix for all identifiers that represent a manhole. The term “E5A” in the example indicates that the manhole is in the E5A mini-system. The term “J16” in the example indicates that the manhole is in grid J16 of the City of Oak Ridge’s legacy grid system. The last term, “30” in the example, is a sequential number applied to the manhole. Therefore, this manhole is manhole number 30 lying within the J16 grid, lying within mini-system E5A.

An example sewer pipe identifier is “SL:MH:E5A-J16-30,MH:E5A0J16-31”. In this example, “SL” is a prefix used to identify the asset as a sewer line. This is followed by the identifier for the upstream manhole (“MH:E5A-J16-30”), a comma, and then the identifier for the downstream manhole (“MH:E5A-J16-31”).

## **C. HISTORICAL OVERFLOWS**

Appendix A, Table A-1 lists the reported sanitary sewer overflows that occurred during the five year period 2007 through 2011. The overflow locations are shown in Appendix C, Maps C-1 through C-59. As indicated, there were 405 recorded overflows (excluding minor in-house backups) which occurred at 162 different locations.

The overflows were due to a number of causes, such as excessive inflow and infiltration during rain events and blockages of various kinds including roots. The reported cause of 281 of the overflows (69%) was excessive rainfall. The smallest reported rainfall depth causing overflow (in the absence of a corresponding mechanical or electrical failure) was 0.57 inches on March 10, 2011. However, 1.71 inches of rainfall occurred on the previous day, March 9, 2011. Only 19 of the 281 rainfall-related overflows (7%) occurred with less than 2 inches of reported rainfall. Twelve of those had 1.71 inches, four had 1.87 inches, two had 1.8 inches, and as previously mentioned one had 0.57 inches which was preceded by 1.71 inches on the day before.

#### **D. CRITICAL MINI-SYSTEMS**

According to the Order, “critical mini-systems” are defined as those mini-systems that:

- have experienced sanitary sewer overflows within the past five years,
- have, or have had within the past five years, a constructed overflow built, or
- are upstream of areas experiencing sanitary sewer overflows or having constructed overflows.

As previously indicated, overflows have occurred at a number of locations within the system. Those locations include overflows on the main gravity sewer just upstream of the Turtle Park pump station. This is the terminal pump station for the system that discharges directly to the WWTP. Therefore, in accordance with the definition summarized above, all mini-systems within the sewer system are classified as critical mini-systems.

## SECTION III

### OVERVIEW OF COMPUTER MODELING

#### A. MODEL REQUIREMENTS

A key component of the Capacity Assessment was the development of a computer model of the sewer system. The model was used to simulate the operation of the existing system under observed conditions and under prescribed design storm conditions. The overall modeling approach used was generally as recommended in *“Computer Tools for Sanitary Sewer System Capacity Analysis and Planning”* (EPA, 2007).

The model represents the physical characteristics of the system infrastructure (pipes, manholes, and primary pumping stations and force mains), dry weather flow characteristics (wastewater flow and regional groundwater inflow/infiltration), response of the system to wet weather flows (modeled as rainfall dependent inflow/infiltration, or RDII), and local meteorological conditions.

Once the model was calibrated, it was used as a tool to determine the capacity of the existing system, and to predict the effects of general remediation measures to be developed in the Collection System Remediation Plan.

The capacity assessment model was developed at a sufficient level of detail to permit further refinement of selected components for more detailed study during the remediation assessment and design phases.

#### B. SELECTION OF MODEL SOFTWARE

The computer model of the sewer system was developed using SewerGEMS Sanitary software. This is a proprietary computer model developed by Bentley Systems, Incorporated. It is basically a GIS-compatible version of SewerCAD. The program was specifically developed to analyze sanitary sewer systems, and is widely used within the sanitary engineering profession. The program includes a graphical interface, associated databases, and computation engines. The layout of the sewer system network is input using the graphical interface, and the physical attributes of each of the sewer system elements (e.g., pipes, manholes, pumps, etc.) are assigned. The program can analyze both open channel gravity flow, as well as pressure flow (surcharged conditions and force mains). Hydraulic calculations are conducted using standard hydraulic methods. The system may be analyzed in either steady state or extended period simulation modes. For extended period simulations (EPS), flows are routed through the system using the convex method. (The present study used the extended period simulation method.) The sewer system model may be hydraulically loaded (dry weather and wet weather) by a variety of methods.

### C. KEY MODEL ASSUMPTIONS AND SIMPLIFICATIONS

The SewerGEMS Sanitary model uses conventional methodology for performing hydraulic analysis. Key assumptions and simplifications are listed below:

- The system was modeled using the EPS unsteady state, backwater gravity flow and convex routing analysis option in SewerGEMS Sanitary.
- The Manning method was selected for analyzing gravity flow in sewers and for computing losses in surcharged gravity sewers. Pipe roughness coefficients were assigned to the various materials as summarized in Table III-1.

**TABLE III-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
PIPE MANNING ROUGHNESS COEFFICIENTS**

Material	Manning “n” Coefficient
Concrete	0.013
Vitrified Clay	0.013
PVC	0.010
Ductile Iron	0.012
Cast Iron	0.012
Unknown	0.013

- The Hazen-Williams method was used to compute losses in force mains. A Hazen-Williams “C” coefficient of 110 was used.
- Nominal pipe diameters were used without attempting to model individual anomalies such as root penetration or damaged pipes.
- Headlosses at manholes were computed using the “Standard Method” in SewerGEMS Sanitary. With this method, losses through a manhole are computed as the product of the velocity head in the outflowing pipe and a headloss coefficient. In this model, a nominal headloss coefficient of 0.5 was applied at each manhole. Where multiple pipes enter a manhole or where large angles exist between incoming and outflowing pipes, larger coefficients might be justified. However, most manholes in the system have approximately straight-through single runs of pipe, and velocities are relatively small. In addition, the manhole inverts are typically shaped, thus minimizing losses. Therefore, application of a single coefficient to the system of manholes was deemed to be acceptable for general analysis.

(In the rehabilitation design analyses, more detailed treatment of problem areas will be addressed by customizing loss coefficients to specific conditions.)

- The sewer system consists of pipes ranging in size from 8 inches to 42 inches. The computer model targeted 10-inch diameter pipes and larger. This is consistent with the guidelines set forth in “*Computer Tools for Sanitary Sewer System Capacity Analysis and Planning*” (EPA, 2007), and also reduced the model to a more workable size.
- Because of the number of manholes (almost seven thousand), it was not practical to hydraulically load the model at every manhole. Therefore, a number of “load point” manholes were identified and the model was loaded at those locations, creating a step-wise loading. This loading method should be taken into consideration while reviewing the results of the analysis. For example, in some cases the location of a manhole overflow may not coincide with historical information; the simulated overflow location is representative of actual or potential overflows in that area of the system and not necessarily at that specific manhole.

#### **D. MODEL DEVELOPMENT**

The physical characteristics of the sewer system were based on field surveys and inspections of the manholes, gravity sewers, force mains, and pumping stations that comprise the system. The overall model consists of seven separate components:

- East Plant sewershed
- Emory Valley sewershed
- Central City sewershed
- Y-12 sewershed
- Turtle Park sewershed
- West End sewershed
- System “Spine”

The six sewershed components were developed separately for analysis and calibration purposes. Then, the segments of each sewershed model that were included in the hydraulic analysis (see sections VII and VIII) were extracted from the sewershed models and joined to configure a single sewer network model. The East Plant, Emory Valley and Turtle Park pumping stations (and associated force mains) were then added to the network to obtain the resulting “Spine” model. See Appendix A, Figure A-3. The pump stations were modeled based on manufacturers’ performance curves, wet well configurations from record drawings, and applicable pump on-off control logic.

For the East Plant and Emory Valley stations, both pumps in each station were assumed in service to reflect actual existing conditions. For the Turtle Park station, only the two new pumps were considered operable. The Spine model then was used for final calibration/verification, capacity assessment, and design storm analysis.

The Spine model consists primarily of sewers 10 inches in diameter or larger. The Spine model contains approximately 104,020 feet of the 10-inch or larger pipes, which represents approximately 73% of the 10-inch or larger pipes in the entire sewer system. The model includes approximately 87% of the 12-inch or larger pipes. The larger pipes not included in the Spine model were typically at locations where there were single pipe segments 10-inches or larger in diameter sporadically appearing in 8-inch collection systems. These pipes were mostly thought to have been added in flat areas, or point repair situations where larger pipe was available for use in the repair. In addition, in several areas, 10-inch pipes were used in the upper portions of some mini-systems (i.e., the system had been over-sized). The Spine model did not extend up into those areas.

Manholes susceptible to overflows were modeled by including diversion links at those locations. At each such overflow, the model diverted all incoming flows in excess of the product of the downstream pipe “capacity” and an adjustment factor. Nominal pipe “capacity” was defined as Manning “normal” full-pipe gravity (not surcharged) flow. The adjustment factors were used, as appropriate, to empirically account for surcharged and backwater conditions. The adjustments were typically in the range of 1 to 2, but were sometimes less than 1 to account for restricted outflow due to backwater. Approximate adjustments were made in the sewershed calibration models, and were further refined in the final Spine model calibration. The objective of the final adjustments was to achieve hydraulic grade line profiles consistent with the occurrence of overflows and the effect of locked manhole covers.

Rainfall data for calibration were extracted from records of continuous rainfall measurements collected at locations within the sewer basin. Three primary rain gauges were deployed in the basin, strategically located to record data in the northeastern, central and southwestern areas of the basin. Records from an additional existing gauge, installed and operated by the United States Department of Energy, were used to supplement the new primary gauges. Rainfall data collection is discussed in more detail in Section IV of this report.

Flow data for model calibration were extracted from records of flow measurements collected at strategic locations within the system using flow meters. Primary monitoring locations were chosen that best characterized dry weather and wet weather flow patterns. In addition, other flow data collected within the system, including temporary monitors, were used for supplemental analysis. Flow data collection is discussed in more detail in Section V of this report.

## **E. MODEL CALIBRATION**

Using the base infrastructure models (sewershed component models and Spine model), and the observed rainfall and flow data, the model was calibrated. This was accomplished by assigning base flow, sewage flow, and RDII parameters such that computed flows reasonably matched the observed flows, for the selected dry and wet weather calibration events. The analysis of dry and wet weather flows, and model calibration, are discussed in more detail in sections VII, VIII and IX of this report, respectively.

## **F. DEPARTURES FROM ORIGINAL ASSESSMENT PLAN**

As the study and analysis progressed, minor departures from the original assessment plan were necessary. Those departures are summarized in Appendix A, Table A-2.

## SECTION IV

### RAINFALL DATA

#### A. OVERVIEW

Throughout the sewer system, rainfall dependent inflow/infiltration (RDII) is a significant portion of the total sewer flow. Therefore, the study addressed the effects of rainfall on the system. In Section VIII and Section IX of this report, the manner in which the rainfall data was used analytically is reviewed. In this section, the collection and management of the rainfall data is discussed.

Rainfall data was required for two principal uses:

- Data was required to calibrate a computer hydraulic model of the sewer system.
- Data was required to associate reported occurrences of sewer overflows with the magnitude of rainfall events that caused those overflows.

#### B. AVAILABLE RAIN GAUGE DATA

Due to the United States Department of Energy (DOE) facilities and federal research activities in and near Oak Ridge, a number of rainfall gauges have been deployed by others in the area. A search of National Oceanic and Atmospheric Administration (NOAA) web sites and other sources identified multiple gauges at Oak Ridge National Laboratories (ORNL), Y-12, East Tennessee Technology Park (ETTP), Roane State College, and other locations. However, due to spatial concerns and other considerations, the utility of this data for model calibration and overflow/rainfall analysis was limited. Therefore, a decision was made to deploy new rain gauges within the sewer basin specifically selected and managed for the purposes of this assessment.

#### C. NEW RAIN GAUGES AND NETWORK

For systems with significant short-term (inflow) and intermediate term (first infiltration) RDII response, a relatively short recording interval is required for modeling (i.e., 10 to 15 minutes). While short interval depths may be interpolated from long interval (i.e., 1-hour) data, the inflow and first infiltration components of the RDII response may be excessively masked. Therefore, short interval rainfall data was desired. Also, since rainfall depths and intensities can vary significantly over a basin of this size, multiple gauges were required to obtain adequate areal coverage of the sewer basin.

The sewer basin is approximately 11 miles long and 5 miles wide (at its maximum width). All but four of the 88 mini-systems lie in the valley between Black Oak Ridge and Pine Ridge in the central and northeast part of the basin, and between Black Oak Ridge and East Fork Ridge in the southwestern part of the basin. Therefore, three new primary rain gauges were deployed to cover the basin.

- “Turtle Park” (TP) Rain Gauge: This gauge was installed at the City of Oak Ridge Waste Water Treatment Plant. This is a secure area located in the southwestern third of the basin. Approximate location: N35.99008° and W84.31695°.
- “South Gate” (SG) Rain Gauge: This gauge was installed at the City of Oak Ridge Public Works Department complex. This is a secure area located in the central third of the sewer basin. Approximate location: N35.99985° and W84.25148°.
- “East Plant” (EP) Rain Gauge: This gauge was installed at the City of Oak Ridge East Plant Pumping Station. This is a secure area located in the northeastern third of the sewer basin. Approximate location: N36.03983° and W84.21006°.

The locations of the primary gauges are shown on Appendix A, Figure A-1. A photo of the rain gauge at Turtle Park is shown in Appendix A, Figure A-4. The other two installations are similar.

The three primary rain gauges are new Hach units. Specifications for the gauges and accessories are as follows:

- Hach Data Logging Rain Gauge, Product Number 2459
- Tipping bucket type with 8-inch diameter collector/funnel with SS screen
- 0.01-inch resolution
- 5% accuracy at 0.5-inches per hour
- epoxy coated aluminum and anodized aluminum material
- base mounting plate with 3-point spring-loaded leveling adjustment
- solid state memory pack with battery backing
- capacity of 10,080 reporting readings (e.g., 70 days at 10 minutes)
- replaceable 9 VDC alkaline battery (approximately 6 months life)
- data download to PC via RS232 interface
- software for data download and management

#### **D. CALIBRATION AND MAINTENANCE**

Field calibration of the rain gauges was not required since the gauges were pre-calibrated at the factory. The rain gauges were prepared, installed, operated and maintained in strict accordance with the user manual. The manual provided detailed instructions for the gauges. Each gauge was located in a clear area away from trees and buildings which would block the natural fall of rain. The base plates were mounted on firm, flat surfaces and leveled. Maintenance consisted of routine inspection, cleaning, and replacement of the battery.

#### **E. RAINFALL DATA QA/QC**

The rainfall data downloaded from the gauges were imported to and managed with the *Sanitary Sewer Overflow Analysis and Planning (SSOAP) Toolbox* software (EPA, 2010a). The quality and completeness of the data were evaluated as follows:

- The downloaded data were analyzed in SSOAP to identify individual rainfall events, based on 6-hour inter-event periods.
- The events were compared to events determined for the other two primary gauges to identify any gross inconsistencies in event dates/times, durations and depths.
- The data for each gauge were analyzed, tabulated, and plotted graphically in SSOAP, and reviewed to identify any anomalous readings (missing data points, unexpected spikes, or other inconsistencies).

#### **F. SUPPLEMENTAL RAINFALL DATA (Y-12)**

Data from the three primary rain gauges were supplemented by data obtained from a United States Department of Energy gauge at the Y-12 facility. The gauge is located at approximately N35.98745° and W84.25363°. This is approximately 4,500 feet south of the South Gate rain gauge. Rainfall data for the period October 15, 2011 through October 23, 2011, and December 20, 2011 through January 31, 2012, were obtained from Y-12, subjected to QA/QC review, and subsequently used to supplement the other rain gauge data.

## **G. RAINFALL DATA FILES MANAGEMENT**

As previously mentioned, the rainfall data was managed with SSOAP software. Except for the Y-12 data, rainfall was collected at 10-minute intervals. SSOAP adjusted the actual data interval clock times to the nearest 10-minute clock times (e.g., 8, 18, 28 minutes would be adjusted to 10, 20, 30 minutes). The Y-12 data were in 15-minute clock intervals. All data collected, including the supplemental 15-minute Y-12 data, were converted to the SSOAP database format. For use in the model and other analysis purposes, custom formatted data files were generated by using the export capabilities of SSOAP. Appendix A, Figures A-5 through A-8 show SSOAP summary charts of the incremental rainfall data collected through January 2012. Note that there are some gaps in the data due to either a gauge being out of service for a period of time (e.g., East Plant), or only a selected period of record being needed from a supplemental source (i.e., Y-12). All rainfall data was archived in a SSOAP database.

## **H. RAINFALL MONITORING PERIOD**

The three primary rain gauges were deployed in late April and early May 2011. For modeling purposes, data were collected through January 2012. The gauge initially installed at South Gate experienced recording problems in October 2011 and the remaining rain gauges were moved as necessary to provide data for sewersheds where temporary flow meters were deployed. This approach ensured that rainfall data would be available for the analysis of flows at the temporary flow meters. (See Section V.) Also, as previously mentioned, supplemental rainfall data for the period October 15, 2011 through October 23, 2011, and December 20, 2011 through January 31, 2012, were obtained from Y-12 and used to supplement the other rain gauge data. Appendix A, Table A-3 summarizes the period of record for each of the three primary rain gauges.

## **I. RAINFALL DATA ANALYSIS**

The rainfall data were analyzed in SSOAP. The analysis separated the data into events, using a 6-hour inter-event interval between occurrences of 0.01 inches or more of rainfall. The analysis provided the total rainfall depth, duration, and peak intensity for each event. In addition, the analysis determined the number of dry days between each event. Appendix A, Tables A-4 through A-7 provide the results of the SSOAP analyses of the rain gauge data through January 2012.

As indicated by the rainfall analysis, the Oak Ridge area experienced unusually heavy rainfall during the study period. In September through December 2011, the Turtle Park rain gauge recorded a total of 37.23 inches compared to the long-term average of 17.05 inches. (NWS, 2010.) The largest continuous event began on September 4, 2011. Table IV-1, below, summarizes the event. Note that this storm represented a 25 to 200-year recurrence interval. (NOAA, 2004.) Most of the other rainfall events with depths of 1.5 inches or more had average return intervals of less than 1 year to 2 years, with a few 5 to 10-year events.

**TABLE IV-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
SEPTEMBER 4-5, 2011 RAINFALL EVENT SSOAP ANALYSIS**

<b>Rain Gauge</b>	<b>Depth (Ins)</b>	<b>Duration (Hrs)</b>	<b>Approximate Average Return Interval, Tr (Yrs)</b>
East Plant	7.49	66.17	25-50
South Gate	7.11	26.17	100
Turtle Park	9.36	62.50	200

Note that the South Gate gauge recorded a brief no-rain period during the overall event, thus the total continuous duration was shorter than the other two gauges.

## SECTION V

### FLOW DATA

#### A. OVERVIEW

Wet weather and dry weather flow data were required to calibrate the computer model of the sewer system. Due to the size of the sewer system, it was not economically feasible to monitor flows continuously throughout the entire system. Therefore, a staged approach to monitoring was implemented.

- The three major pumping stations included in the model (East Plant, Emory Valley and Turtle Park) have permanent meters that record continuous effluent flow rates. These data were analyzed for the calibration events and used in the calibration analysis.
- “Semi-Permanent” flow meters were installed at strategic locations specifically for this assessment. The meters were located primarily on the gravity interceptor, and were left in place for the duration of the monitoring period.
- “Temporary” flow meters were deployed on a sewershed-by-sewershed basis, depending on the number of meters available. Meters were placed at locations suitable for using the resulting flow data to estimate flow characteristics throughout the sewershed. Flows for each sewershed were monitored until suitable dry weather and wet weather calibration events had been experienced, and then the meters were moved to the next sewershed to be monitored.

Appendix A, Table A-8 provides a history of semi-permanent and temporary flow meter deployment within the sewer basin.

#### B. FLOW METERS

Continuous flows were measured in the sewers using conventional flow meters. Three types of flow meters were used for the study:

- Marsh-McBirney Flo-Tote Model 260
- Hach Flo-Tote Model 3 Sensor, Mounting Band and Logger
- ISCO Series 2150 Area Velocity Sensor and Flow Module

The Marsh-McBirney, Hach, and ISCO meter installations are similar. (The Hach meter assembly is basically a more recent version of the Marsh-McBirney meter.)

They consist of a debris-shedding transducer sensor, positioned on or near the bottom of the conduit, and held in place by a mounting band. The signal from the sensor is relayed to the primary module by cable. The primary module is usually hung from a ladder rung or other anchor point in the manhole. The primary module has a low voltage operating battery and a backup battery. A storage device in the primary module stores the depth and velocity readings from the sensor. This data is downloaded using a laptop PC via a communications cable interface. For the Flo-Totes, Flo-Ware software installed on a laptop was used to download the data. For the ISCO meters, Flowlink software was used. For these meters, flow is computed as flow area (based on pipe geometry and depth) times average flow velocity. The data may be displayed in tables or graphically, or prepared as file data for export and use in other applications. The units are accompanied by detailed manuals that describe the appropriate setup, calibration, use and maintenance of the equipment.

### **C. CALIBRATION AND MAINTENANCE**

Each unit was field calibrated following the instructions in the manuals accompanying the flow meters. The procedure consists of making independent velocity and depth measurements, and computing flow, then comparing those with the values reported by the units.

The units were maintained in accordance with the manufacturers' manuals. Maintenance was performed following major storm events and when data was downloaded. Maintenance generally consisted of:

- checking the physical stability and security of the installation
- clearing the sensor, band, and cables of any debris
- cleaning the sensor
- checking/replacing desiccant and filters
- checking/replacing the operating and backup batteries
- conducting real-time operating status checks

### **D. FLOW DATA QA/QC**

Flow records retrieved from the flow monitors were imported to Flo-Ware and Flowlink (as applicable) for QA/QC review of selected flow periods.

- High flow periods and low flow periods were compared with rainfall data to ensure that the flow regimes were consistent with the rainfall regimes, and were not the result of blockages or other factors.

- Graphical displays of flow versus time (hydrographs) were reviewed to identify spikes, missing data, or other anomalies that would require additional review.
- Scatter diagrams of depth versus velocity were reviewed to ensure that the data is consistent (Sands and Stevens, 1995) and to identify surcharge events.
- Dry weather flow diurnal patterns were reviewed to identify any anomalous patterns.

#### **E. FLOW DATA FILES MANAGEMENT**

Flow data files were retained and archived in their original format in order that they could be readily reviewed in Flo-Ware and Flowlink. Selected time series of flow data for use in model calibration were generated using the export capabilities of the Flo-Ware and Flowlink software. Those files were also archived.

## SECTION VI

### GROUNDWATER DATA

#### A. GENERAL

High groundwater levels (above the invert of manholes and sewer pipes) create an opportunity for excessive groundwater infiltration into the sewer system. In general, higher levels of groundwater would be expected along creeks and other water bodies, in valley floors, and at the downgrade end of long hill slopes and major surface drainage features. Low groundwater levels would be expected on ridges and steep hill sides, and in some cases highly developed areas with limited recharge opportunity. The purpose of groundwater monitoring was to obtain a general understanding of groundwater levels at representative locations within the sewer system.

#### B. GROUNDWATER MONITORS

For convenience, the groundwater monitoring locations are at manholes. Visual standpipe groundwater monitors were retrofitted to the manholes. At each monitoring location, a hole was drilled through the manhole wall and a pipe with a perforated section was inserted into the adjacent soil, and grout sealed at the penetration. A clear plastic standpipe was then fitted to the horizontal section and extended upward. Locations were selected for each sewershed. Locations were based on observed base flows (from the flow monitoring program), land use, topography and judgment. Groundwater in floodplains and near major creeks will typically be approximately at or above the same level as the creek water surface, so those locations were generally excluded from the groundwater monitoring program.

#### C. GROUNDWATER MONITOR LOCATIONS

All monitoring locations, except those in Emory Valley, were at locations previously included in the flow monitoring program. Table VI-1 and Appendix D, Figures D-1 through D-5, show the locations of the groundwater monitors.

**TABLE VI-1**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**GROUNDWATER MONITORING MANHOLE LOCATIONS**

East Plant	Emory Valley	Y12	Central City	Turtle Park	West End
E10-F20-18 E13A-G19-16 E2-E15-1	E15-K19-2 E5B-K23-5	W19-H11-7 W3-K13-41 W18A-K12-9	W6-E15-52 W8-E12-3	W16-C23-27 W14-E6-29 W13-C7-31 W18D-E9-25	W17-B2W-13 W17-D1W-2

#### **D. GROUNDWATER MONITORING RESULTS**

The sixteen groundwater monitors were read in November and December, 2011, and in January 2012. This period provided representative high groundwater levels due to the unusually large amount of rainfall experienced during the Fall and early Winter. For example, the total monthly depths of rainfall recorded at the Turtle Park rain gauge for September through December were 12.02, 5.25, 13.68 and 6.28 inches, respectively. By comparison, the corresponding mean monthly rainfall depths for Oak Ridge are 3.75, 3.02, 4.86 and 5.42 inches, respectively. (NOAA, 2010.)

The groundwater monitoring logs are included in Appendix A, Tables A-9 through A-24. Each monitor was read between 13 and 18 times during the monitoring period. A total of 240 readings were documented for the monitors. As indicated, two of the 16 locations had one or more reported groundwater levels greater than 2.5 feet above the centerline of the sewer. The remaining 14 locations reported levels less than 2.5 feet above the centerline of the sewer. Seven of those 14 locations reported no groundwater.

The two highest groundwater locations were W3-K13-41 in the Y-12 sewershed and W18D-E9-25 in the Turtle Park sewershed. The former recorded a level of approximately nine feet on November 28, 2011 and approximately four feet on December 7, 2011. These were isolated instances of high groundwater and appear to be mostly rainfall-induced as opposed to seasonal or regional groundwater. The latter recorded multiple instances of groundwater levels of approximately 6 feet. These appear to be related to seasonal or regional high groundwater levels.

The groundwater levels reported at the other seven locations were isolated instances, and appear to be rainfall-induced as opposed to seasonal or regional groundwater.

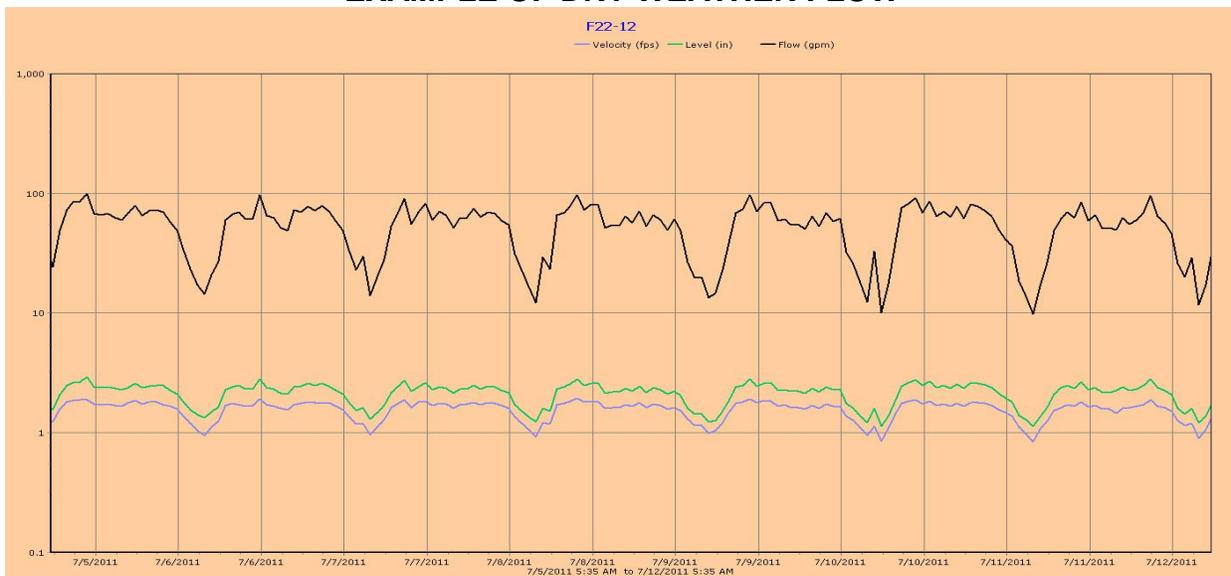
## SECTION VII

### DRY WEATHER FLOW CHARACTERISTICS

#### A. APPROACH

Dry weather flow data were analyzed to estimate the dry weather components of the total hydrograph at each selected metered location. For each selected meter, the rainfall and flow data were reviewed and a representative dry period was identified. The objective was to identify a period with an antecedent dry condition, where the flow was not in significant recession from a previous storm, where meter data was of suitable quality, and where the general flow pattern repeated from day to day. Once a suitable period was determined, the “base flow” at each selected metered location was estimated as the minimum flow occurring during the period. Next, a typical 24-hour day was selected from the period to represent the daily pattern of the flow in excess of the base flow, referred to as the “sewage flow.” For modeling purposes, the average daily sewage flow and the daily pattern of relative sewage flow versus time were computed in a spreadsheet. For example, Figure VII-1 illustrates the hourly average flows used for dry weather flow analysis at meter location E13B-F22-12. (July 9, 2011 was used as the typical pattern at this location.) Appendix A, Table A-25 summarizes the dry weather flow analysis for each selected metered location.

**FIGURE VII-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
EXAMPLE OF DRY WEATHER FLOW**



Since it was not feasible to monitor flows in all of the sewers, it was necessary to estimate the dry weather flow characteristics for other points within the sewershed based on the analysis at “metered points” as discussed above. The additional unmetered locations (called “flow points”) were identified and the dry weather flow characteristics were estimated for those locations.

Base flows were estimated at flow points using the base flows in upstream and/or downstream metered locations, or the general trend for base flows in that area of the system. Base flows were usually relatively small compared to the total of sewage and wet weather flows.

The most useful normalizing parameter for estimating average daily sewage flow was the number of addresses served by the system upstream of a metered location. For each selected metered location, the average daily sewage flow was calculated. The average flow was then divided by the number of upstream addresses. (Please note that mean daily dry weather sewage flows in Oak Ridge are relatively low compared to values typically used in design. A recent water fee rate study indicated water use rates well below typical nominal rates. See Section XII.) These ratios were used to set the average daily sewage flow for each unmetered flow point. Some adjustments were made in commercial and institutional areas when the data so dictated. The daily pattern for each unmetered flow point was based on a suitable nearby metered location.

Please note that the assignment of the base flow and sewage flow parameters in the manner described above was subjected to the calibration and verification process (see Section IX) and was determined to be satisfactory.

## **B. RESULTS**

Of the 53 locations in the sewer basin where flow meters were deployed (excluding pump station meters), 41 were used for dry weather flow calibration purposes. Those meters locations are listed in Appendix A, Table A-25. The flow meter data for the other locations were not used in the dry weather analysis for various quality and/or applicability reasons. The 41 metered points used in the analysis, plus 20 additional assigned flow points, resulted in a total of 61 points where the model was loaded with flows. Those points are referred to herein as “load points.” Appendix A, Table 26 summarizes the load point incremental dry weather flows used as input to the model.

## SECTION VIII

### WET WEATHER FLOW CHARACTERISTICS

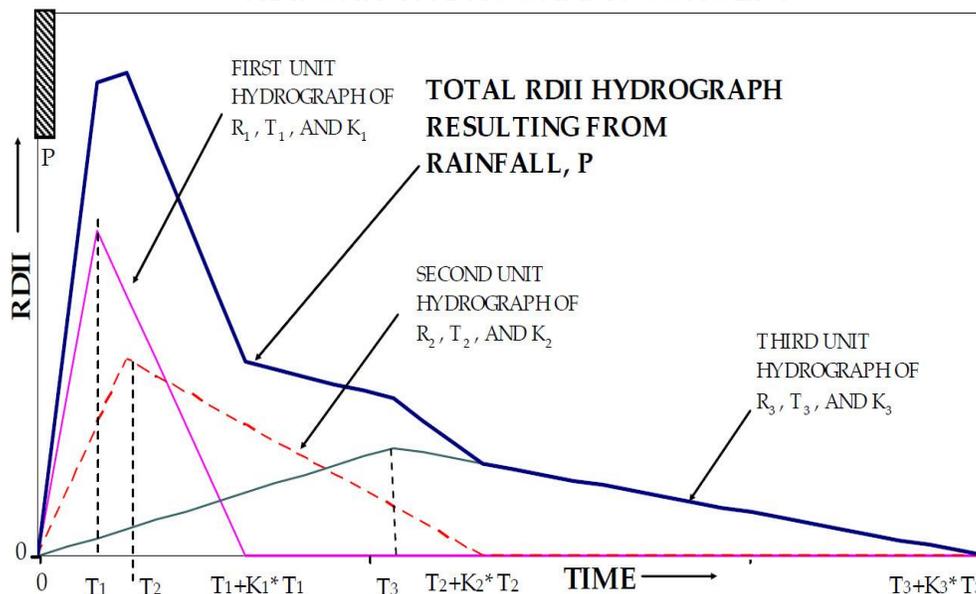
#### A. APPROACH

Wet weather flow data were analyzed to estimate the wet weather inflow and infiltration (I&I) components of the total hydrograph at each selected metered location. For each sewershed, the rainfall and flow data were reviewed and a representative storm event was identified. The objective was to identify a period where a significant rainfall event occurred, preceded by an acceptable dry weather period consistent with the dry weather analysis (see Section VII). After a suitable wet weather event was identified, an analysis was prepared to determine the characteristics of the wet weather component of the hydrograph. For this analysis, the traditional rainfall-dependent inflow and infiltration (RDII) unit hydrograph method was used.

#### B. WET WEATHER COMPONENT ANALYSIS

The RDII unit hydrograph method is well documented in the literature (EPA, 2008). The basic premise is that the response of a sewer to rainfall-derived inflow and infiltration may be represented by three linear triangular unit hydrographs. See Figure VIII-1 (EPA, 2007). The three unit hydrographs are intended to independently represent rapid, intermediate, and delayed flow responses to rainfall occurring over the effective service area upstream of the reference flow location.

**FIGURE VIII-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
RDII UNIT HYDROGRAPH CONCEPT**



At a minimum, each unit hydrograph is defined by three parameters:

- “R” is the ratio of the total volume of rainfall that enters the sewer as I&I to the total rainfall occurring over the effective upstream service area. The sum of the R values for all three unit hydrographs lies between 0 and 1. The area of the effective upstream service area (called the “RDII area” herein) must be defined.
- “T” is the time lapse, in hours, from the beginning of rainfall to the peak of the unit hydrograph. A low value for T implies a rapid response, and a long T implies a delayed response.
- “K” is a parameter that defines the duration of the falling limb of the hydrograph relative to T. The duration equals the product  $T \times K$ . A low value of K implies a hydrograph that rapidly falls after it reaches peak flow. A high value of K indicates that the hydrograph falls slowly after the peak flow occurs.

Other parameters related more specifically to initial abstraction by soil moisture accounting, depression storage, and evapotranspiration may also be used to further define the RDII response. However, for the present analysis the exclusive use of R, T and K were judged to be satisfactory.

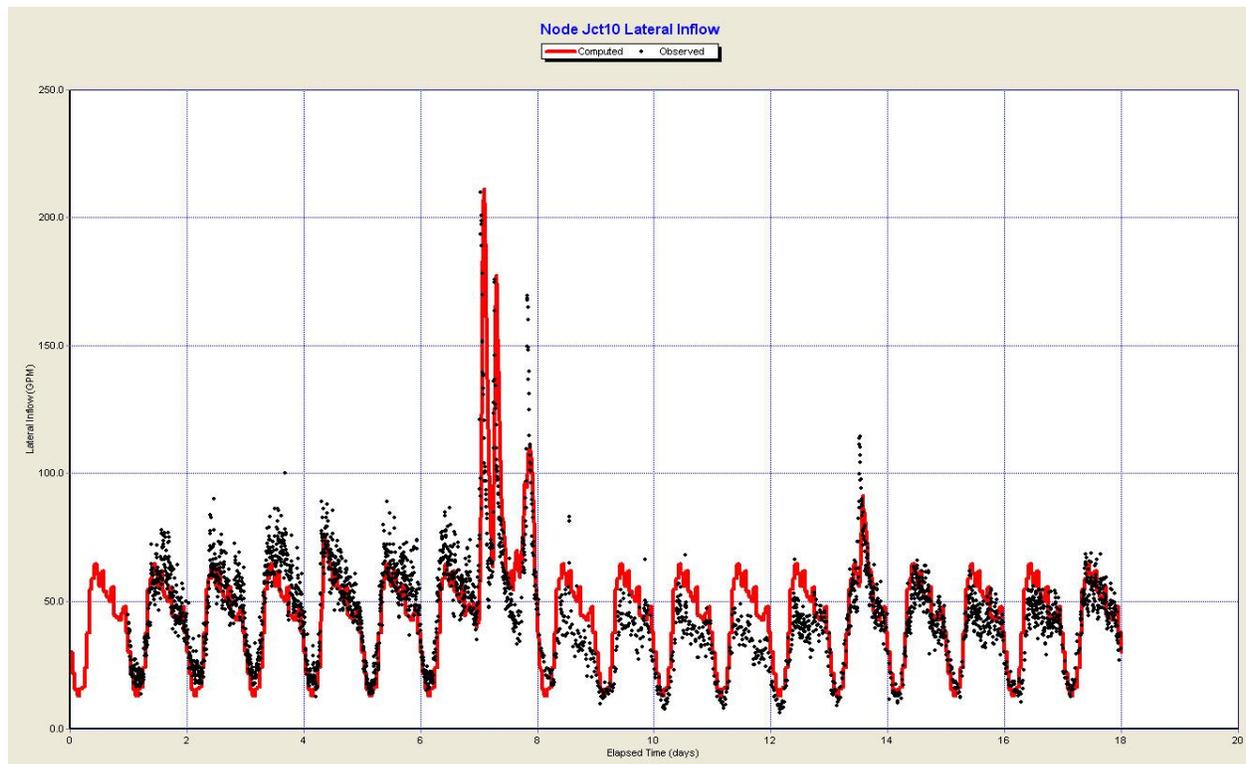
The total combined value of R for all three unit hydrographs at a given metered location was computed by first subtracting the dry weather flows (per the dry weather analysis) from the total wet weather hydrograph to determine RDII flows, computing the corresponding flow volume for the RDII flow, and dividing the RDII volume by the total rainfall volume over the RDII area.

The Stormwater Management Model (SWMM) was used to determine suitable R, T and K parameters for the observed rainfall and corresponding wet weather flows (EPA, 2010b). The calibration procedure for each metered point was as follows:

- A simple node-link-outfall configuration was set up in SWMM wherein the node received inflow.
- The SWMM model was loaded with a time series of the observed rainfall event, and a corresponding rain gauge was set up in the model.
- The observed total hydrograph was loaded into SWMM as a calibration file.
- The inflow at the node was set up to consist of base flow and mean daily sewage flow (with an hourly pattern) as determined from the dry weather flow analysis.

- The inflow at the node was also set up to include RDII hydrographs as defined by the RDII area and R, T and K factors. The distributions of total R between the three unit hydrographs, and the values for the T and K factors for each hydrograph, were determined by trial-and-revision until the computed total hydrograph was a reasonable representation of the observed hydrograph. For example, see Figure VIII-2.

**FIGURE VIII-2**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**TYPICAL RDII CALIBRATION**



See Table A-27 and Table A-28 in Appendix A for a summary of the wet weather flow calibration values determined for the model at each selected metered location. The rainfall events used for calibration are noted in Table A-27 in Appendix A. The SSOAP analyses for these events were used to estimate the approximate average return interval for the SSOAP-defined events. With the exception of the July 2011 calibration event for the East Plant sewershed, all of the calibration events were in the range of less than 1 year to 2 years. The July 2011 calibration event was approximately a 10-year event.

Similar to the approach previously discussed in Section VII for dry weather flows, the characteristics of wet weather flow for unmetered flow points were derived based on the analyses for the metered locations. The R, T and K values were assigned based on the analysis for nearby meters and/or locations deemed suitable for the unmetered location. RDII areas (total or incremental, depending on location) were determined directly for each flow point.

Table A-29 and Table A-30 in Appendix A summarize the load point wet weather flow characteristics used for the model.

## SECTION IX

### MODEL CALIBRATION

#### A. APPROACH

The SewerGEMS Sanitary model for each sewershed was further calibrated by using the dry weather and wet weather RDII flow characteristics estimated as described in Section VII and Section VIII, along with the corresponding rain event, to compute incremental inflows for each load point. Base flow and sewage flows were computed inside SewerGEMS Sanitary using the dry weather flow characteristics. RDII flows were generated in SWMM, extracted and input to SewerGEMS Sanitary. The model was then executed, and the observed peak flows at each metered point were compared to the calculated peak at that location. Adjustments were made to flow characteristics where necessary to obtain an acceptable match between observed and computed flows. This process was repeated for each sewershed.

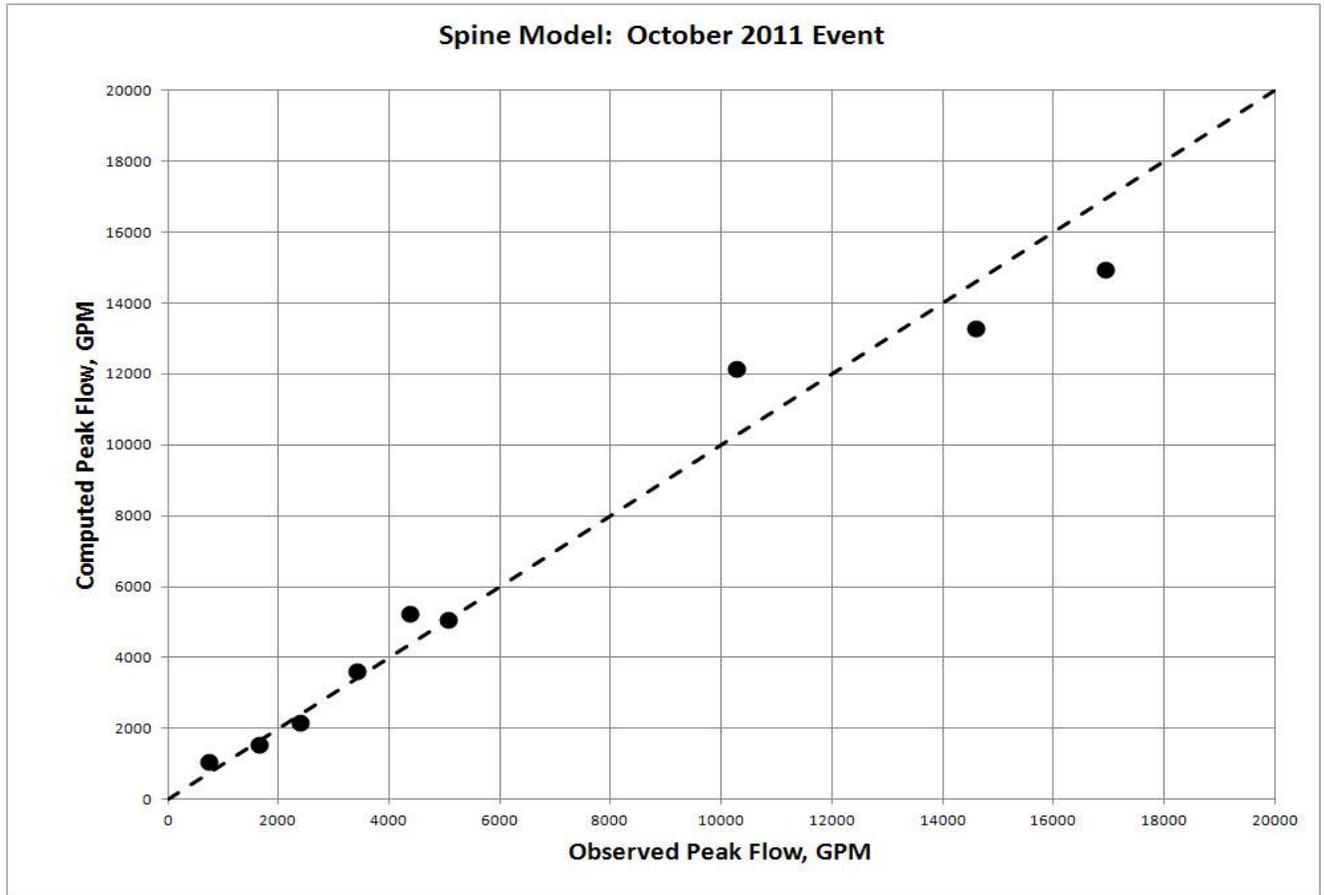
After each sewershed model was completed, the Spine model was prepared (see Section III). New RDII loads were computed in SWMM for the October 18-19, 2011 rain event. This event was selected because it had suitable antecedent conditions and the total rainfall depth and duration were similar to that of a two-year, 24-hour event (see Section X). The RDII hydrographs were extracted from SWMM and imported into the SewerGEMS Sanitary Spine model. The model was executed and the computed results were compared with the observed metered flows at those locations where meters were deployed during the October rain event, and deemed reliable after QA review.

A detailed outline of the model calibration procedure is included in Appendix A, Table A-31.

#### B. RESULTS

The calibration and verification results from the sewershed models and Spine models are illustrated in Figure IX-1 and Table IX-1, and Appendix A, Table A-32. In the sewershed component models, 34 of 39 calibration points had less than 20% difference between computed and observed peak flows. In addition, 31 points had differences of 10% or less. The average difference was 8%. In the Spine model, 8 of 9 calibration/verification points had 20% or less difference. The average difference was 14%. The Spine and sewershed component models all together had only 5 of 48 points with more than 25% difference. Therefore, the overall match between the computed and observed flows was acceptable, and the model was deemed satisfactorily calibrated and verified.

**FIGURE IX-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**



**TABLE IX-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
CALIBRATION/VERIFICATION SPINE MODEL RESULTS  
FOR OCTOBER 19, 2011 EVENT**

Flow Meter Location	Model Peak Flow	Meter Peak Flow	% Difference	Comments
WWTP	21.5 MGD	24.4 MGD	-12	Effluent
W18G-E3-5	13,298 GPM	14,596 GPM	-9	42", Turtle Park
W18F-F7-1	12,144 GPM	10,275 GPM	+18	42", Turtle Park
W5-G14-15	5,255 GPM	4,368 GPM	+20	21", Central City
E25-H15-16	5,076 GPM	5,058 GPM	0	Manhole receiving Emory Valley and East Plant Force Mains
W18A-N13-8	2,158 GPM	2,395 GPM	-10	18", Y-12
East Plant Pump Station	3,631 GPM	3,410 GPM	+6	Effluent
E13B-F22-12	1,065 GPM	737 GPM	+44	10", East Plant
Emory Valley Pump Station	1,551 GPM	1,648 GPM	-6	Effluent

*Notes: (1) Meter data at W18D-F10-1 and E13B-G22-11 were not used for this event. QA review indicated the data was not reliable due to backwater conditions. (2) The most likely cause of the large % difference at E13B-F22-12 is backwater; however, since the absolute difference (328 GPM) was relatively small, the point was not considered in the calibration.*

## SECTION X

### DESIGN FLOWS

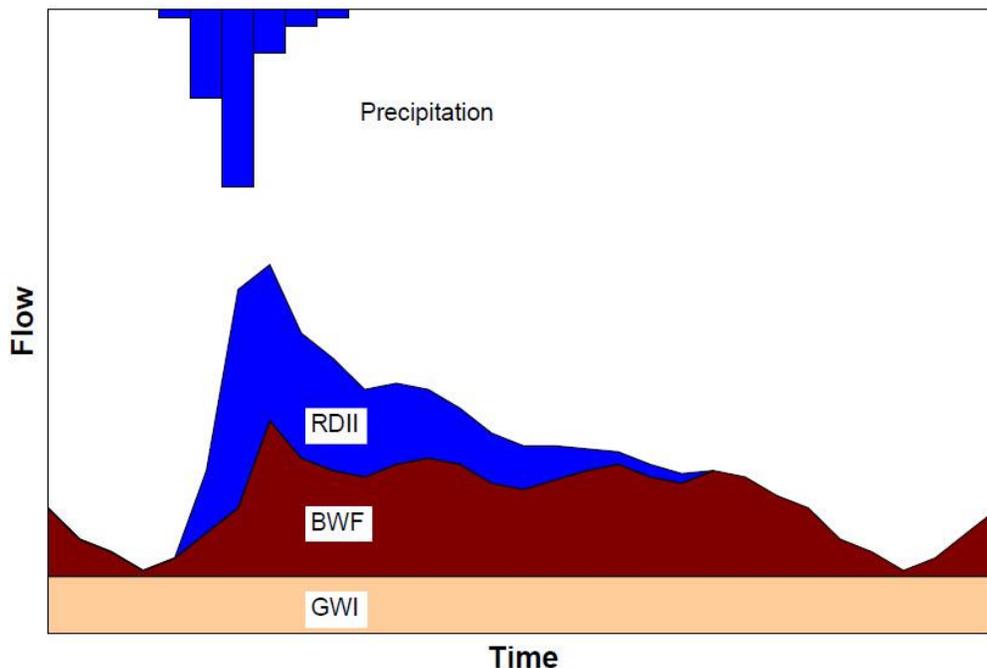
#### A. BASIS OF DESIGN FLOWS

Flow within the sewer system is a combination of:

- Base flow, which is relatively constant and usually represents groundwater infiltration
- Sewage flow, which typically varies according to a daily pattern
- Rainfall derived inflow and infiltration (RDII), which depends on the rainfall characteristics and the condition of the sewer

Figure X-1 (EPA, 2007), illustrates the general relationship between these three flow components.

**FIGURE X-1**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**SEWER FLOW COMPONENTS**



The characterization of base flow and sewage flow were discussed in detail in Section VII. For the purpose of establishing design flows with the system, the base flows and sewage flows developed therein for model calibration were used as the dry weather components of the design flow. The dry weather flow characteristics were transferred directly into the SewerGEMS Sanitary model using the base flow and daily pattern flow capabilities of the program. (Those capabilities are similar to those in SWMM.)

The characterization of wet weather flows was discussed in Section VIII. The RDII areas and the R-T-K values developed in that analysis were used as the basis for computing the RDII component of the design flows in SWMM. The resulting RDII hydrographs were extracted from SWMM and loaded into the SewerGEMS Sanitary model at the model load points. This approach required that a design rainfall event be selected.

**B. HISTORICAL RAINFALL**

Historically, precipitation in Oak Ridge has been heaviest in November through July. During this period, mean monthly precipitation varies from 4.32 inches (April) to 5.72 inches (March). The driest months are August through October, with mean monthly depths ranging from 3.02 inches (October) to 3.75 inches (September). Mean annual precipitation is 55.05 inches. (NWS, 2010.) Table X-1 provides the mean monthly point precipitation for Oak Ridge.

**TABLE X-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
MEAN MONTHLY AND ANNUAL PRECIPITATION (INCHES)  
OAK RIDGE, TN (NWS, 2010)**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
5.13	4.50	5.72	4.32	5.14	4.64	5.16	3.39	3.75	3.02	4.86	5.42	55.05

Table X-2 presents historical point rainfall depth-duration-frequency data (partial duration series) for Oak Ridge, as obtained from the NOAA Atlas 14 Volume 2 (NOAA, 2004) web site.

**TABLE X-2**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**OAK RIDGE POINT RAINFALL DEPTH (INCHES)**  
**DURATION FREQUENCY DATA (NOAA ATLAS 14, VOLUME 2)**

Average Tr	15 min	1 hr	6 hr	12 hr	24 hr	2 days	7 days
1-year	0.67	1.14	1.82	2.28	2.78	3.40	4.75
2-year	0.80	1.38	2.17	2.71	3.32	4.06	5.67
5-year	0.95	1.72	2.64	3.29	4.06	4.95	6.81
10-year	1.07	2.02	3.06	3.79	4.64	5.67	7.69
25-year	1.24	2.45	3.66	4.49	5.47	6.66	8.83
50-year	1.38	2.82	4.17	5.08	6.14	7.45	9.71
100-year	1.52	3.22	4.71	5.70	6.83	8.27	10.60
200-year	1.67	3.64	5.29	6.35	7.57	9.12	11.40

### C. DESIGN RAINFALL EVENT

The nominal design storm used for the analysis was the 2-year 24-hour event. As indicated in Table X-2, this represents a 3.32-inch rainfall in 24-hours. The 2-year 24-hour event was synthesized using the balanced frequency storm method (USACE, 2010). This method generates a storm that retains all depth-duration relationships for any span of time within the event. A similar method was used to develop the well-known original generalized Natural Resources Conservation Service/Soil Conservation Service twenty-four hour rainfall patterns (USDA, 1986). The method used here tailored this approach to Oak Ridge, and was based on more recent rainfall analyses than that used in the development of the NRCS/SCS distributions. The depths and durations used for the development of the pattern were extracted from NOAA Atlas 14, Volume 2 (NOAA, 2004) (See Table X-3). For convenience, the pattern was developed using the US Army Corps of Engineers computer program, HEC-HMS (USACE, 2010) and extracted for use in analysis.

**TABLE X-3**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**OAK RIDGE DEPTH DURATION DATA FOR 2 YEAR EVENT**  
**(NOAA ATLAS 14, VOLUME 2)**

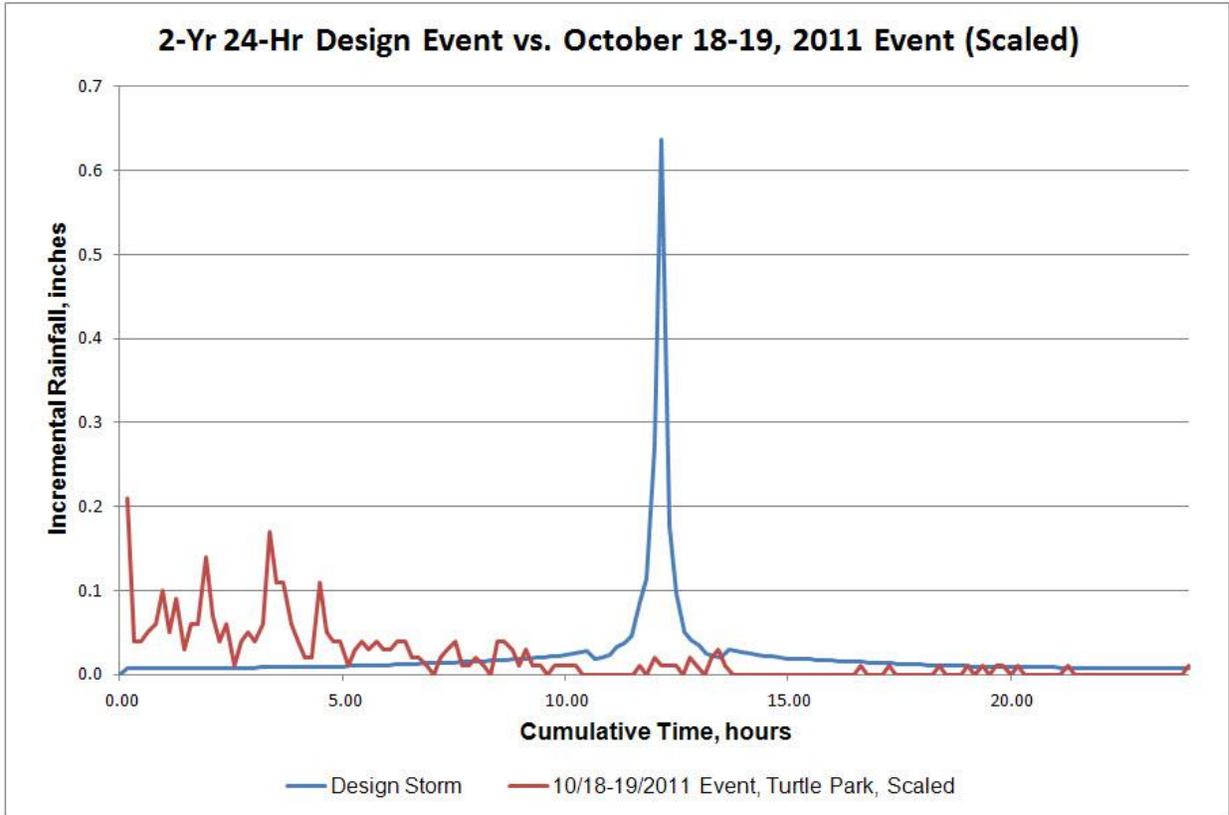
Average Tr	5 min	10 min	15 min	30 min	1 hr	2 hr	3 hr	6 hr	12 hr	24 hr
2 -year	0.40	0.63	0.80	1.10	1.38	1.62	1.75	2.17	2.71	3.32

A review of the SSOAP analysis of the rainfall data indicates one recorded event that approximated the 2-year 24-hour depth-duration criteria. The event of October 18-19, 2011 resulted in 3.01 inches in 25 hours at the Turtle Park rain gauge, and 2.71 inches in 25-hours at the Y-12 rain gauge. The Turtle Park gauge data were scaled to match the 3.32-inch and 24-hour criteria of the design storm, and compared to the design storm (See Figure X-1 and Figure X-2). The comparison shows that most of the rainfall for the observed event occurred in the first 10 hours of the storm. For the actual (unscaled) event, the maximum 10-hour depth was 2.75 inches. The scaled depth was 3.03 inches. These depths are slightly greater than the 2-year, 10-hour depths. In fact, the scaled depth is approximately the 5-year, 10-hour depth. For the synthesized storm, the maximum 10 hour depth is 2.56 inches, which is by definition the 2-year, 10-hour depth. Note also that the peak intensity of the observed event is less than that of the synthesized storm. Observed flow data (see Section VIII) suggests that rapid RDII response (e.g., inflow) is significant, and the system is sensitive to rainfall intensity. Therefore, based on the above considerations, the synthesized 2-year, 24-hour rainfall event was used as the design storm for capacity analysis.

**FIGURE X-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
SPINE MODEL CALIBRATION**



**FIGURE X-2  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**



## SECTION XI

### CAPACITY OF SYSTEM

#### A. SEWER PIPES CAPACITIES

The Spine model was used to evaluate the capacity of the sewer pipes. This scenario was based on the present condition of the sewer system, subject to the assumptions outlined in Section III.

The pipe capacities were defined as full pipe flow under gravity (non-pressure) conditions. These values are computed by SewerGEMS Sanitary using the Manning equation, and are based solely on the slope, roughness, and diameter of the pipe.

The design condition flows were based on the 2-year, 24-hour rainfall event computed as previously described. Table XI-1 summarizes the results of the analysis by comparing nominal capacities with computed peak flows. As indicated, 142 of the 520 sewer pipes in the Spine model (27%) had peak flows in excess of their full pipe gravity flow capacity. A more detailed list is provided in Appendix A, Table A-33.

**TABLE XI-1**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**SUMMARY OF PIPES WITH FLOWS**  
**IN EXCESS OF FULL PIPE GRAVITY FLOW CAPACITY**  
**(2 YEAR, 24-HOUR DESIGN EVENT)**

Sewershed	Turtle Park	East Plant	Emory Valley	Central City	Y12	West End
No. of Pipes	126	97	68	118	98	13
No. of Pipes Over Capacity (OC)	49	32	7	21	27	6
8" Pipes: OC/Total No.	11/26	2/5	2/3	0/18	3/7	4/5
10" Pipes: OC/Total No.	2/17	11/22	1/44	0/28	0/6	0/0
12" Pipes: OC/Total No.	3/17	0/21	0/1	1/9	4/26	2/8
15" Pipes: OC/Total No.	0/0	0/1	3/18	0/10	0/11	0/0
16" Pipes: OC/Total No.	0/5	0/0	1/2	0/0	0/0	0/0
18" Pipes: OC/Total No.	0/0	11/38	0/0	0/0	2/12	0/0
20" Pipes: OC/Total No.	0/0	0/0	0/0	4/6	0/1	0/0

**TABLE XI-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**SUMMARY OF PIPES WITH FLOWS**  
**IN EXCESS OF FULL PIPE GRAVITY FLOW CAPACITY**  
**(2 YEAR, 24-HOUR DESIGN EVENT)**

Sewershed	Turtle Park	East Plant	Emory Valley	Central City	Y12	West End
21" Pipes: OC/Total No.	0/0	7/9	0/0	16/38	3/12	0/0
24" Pipes: OC/Total No.	0/0	1/1	0/0	5/8	6/20	0/0
27" Pipes: OC/Total No.	0/0	0/0	0/0	0/0	2/3	0/0
36" Pipes: OC/Total No.	30/42	0/0	0/0	1/1	0/0	0/0
42" Pipes: OC/Total No.	3/19	0/0	0/0	0/0	0/0	0/0

A direct comparison of sewer pipe capacities versus computed peak flows under design storm conditions does have some limitations as an assessment method. Overflows and surcharging upstream of a particular pipe may sufficiently limit the flow directed to the pipe to result in partial flow, thus erroneously indicating that the pipe has sufficient capacity to pass “design” flows without surcharging. Also, downstream backwater restriction effects may limit the flow in a pipe to less than its capacity. For example, the simulation indicated that 234 of the 520 pipes in the Spine were flowing full, or 47%. Therefore, approximately 20% (i.e., 47% minus 27%) of the pipes were flowing full but at less than gravity capacity due to backwater restriction, (See Table XI-2). Therefore, these comparisons were considered along with manhole surcharging and hydraulic grade line analyses to formulate the overall assessment.

**TABLE XI-2  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
PIPES IN SPINE MODEL FLOWING FULL  
(2-YEAR, 24 HOUR DESIGN EVENT)**

<b>Sewershed</b>	<b>Pipes in Spine Model</b>	<b>Pipes Flowing Full</b>	<b>% Flowing Full</b>
Turtle Park	126	69	55%
Central City	118	50	42%
Y12	98	44	45%
East Plant	97	55	57%
Emory Valley	68	10	15%
West End	13	6	46%

A dry weather condition (i.e., no rainfall-induced inflow and infiltration) was also analyzed and is summarized in Table XI-3. More detailed results are in Appendix A, Table A-34.

**TABLE XI-3  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
DRY WEATHER CAPACITY ANALYSIS  
SPINE MODEL**

Number of Pipes	Sewershed						
	Total Sewer Basin	Turtle Park	Central City	Y12	East Plant	Emory Valley	West End
Total Pipes in Spine	520	126	118	98	97	68	13
$Q_d > 0.25 Q_c$	130	48	47	13	19	1	2
$Q_d > 0.50 Q_c$	24	4	11	4	3	0	2
$Q_d > 0.75 Q_c$	4	0	1	2	0	0	1
$Q_d > 1.00 Q_c$	2	0	0	1	0	0	1
$Q_d > 1.25 Q_c$	2	0	0	1	0	0	1
$Q_d > 1.50 Q_c$	1	0	0	0	0	0	1
$Q_d > 1.75 Q_c$	1	0	0	0	0	0	1
$Q_d > 2.00 Q_c$	0	0	0	0	0	0	0

As indicated, 24 of the 520 pipes in the Spine model (5%) have peak dry weather flows ( $Q_d$ ) in excess of 50% of the pipe capacities ( $Q_c$ ). However, only four exceed 75% of capacity.

## B. MANHOLES

Surcharged manholes represent segments of the system that are loaded beyond nominal design capacity. The Spine model was used to identify surcharged manholes under present conditions. Table A-35 in Appendix A summarizes locations where manholes in the Spine model overflowed in the simulation. As indicated, 19 of the 518 manholes in the Spine model (4%) overflowed. Table XI-4 summarizes the overflows by sewershed.

**TABLE XI-4  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
SUMMARY OF OVERFLOWS BY SEWERSHED – SPINE MODEL  
(2-YEAR, 24 HOUR DESIGN EVENT)**

<b>Sewershed</b>	<b>Number of Overflows</b>	<b>Overflow Volume (Gallons)</b>
Turtle Park	6	683,261
Central City	3	1,209,648
Y12	1	36,194
Emory Valley	0	0
East Plant	9	306,917
West End	0	0
<b>Total</b>	<b>19</b>	<b>2,236,020</b>

Table XI-5, below, provides the percentage of manholes in the Spine model that had peak water surface elevations greater than the indicated value. This provides an overall indication of manhole surcharging. (The largest pipe in the system is 42 inches or 3.5 feet.)

**TABLE XI-5  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
WATER DEPTHS IN MANHOLES  
2-YEAR, 24 HOUR SPINE MODEL**

<b>Depth of Water in Manhole</b>	<b>% of Manholes</b>
> 1 ft	55
> 2 ft	41
> 3 ft	33
> 4 ft	25
> 5 ft	18
> 6 ft	13
> 7 ft	8
> 8 ft	5
> 9 ft	0

The most significant indication of potential overflow is in the vicinity of manhole W5-F11-4 where the main gravity line from Y12 intersects the main trunk line. The overflow volume indicated by the analysis is indicative of the potential for overflows along that area of the Y12 line and the main trunk.

### **C. HYDRAULIC GRADE LINES**

Figures E-1 through E-7 in Appendix E illustrate hydraulic grade line profile plots for the primary gravity sewers in the Spine model. The plots show two conditions. The maximum hydraulic grade line under design rainfall conditions is indicated by the horizontal tick marks at each manhole. The dry weather flow hydraulic grade line is shown as the solid line. (See Figure A-3 for profile manhole reference locations).

As indicated, much of the system is surcharged under design rainfall conditions. Note that wherever the hydraulic grade line intersects the ground surface at a manhole, overflow occurs unless the manhole cover is bolted. (Instances where the hydraulic grade line is significantly above the top of a manhole indicate that the cover is bolted and the manhole pressurizes.)

### **D. VOLUME DELIVERED TO WWTP**

The design event consisted of an 11 day simulation with the 2-year, 24-hour design rainfall event occurring at the beginning of that period. As indicated in Table A-35 in Appendix A, the total computed volume of flow transmitted to the WWTP in the Spine simulation was 68.78 million gallons. The total of all overflows (losses) was 2.24 million gallons. Therefore, approximately 97% of the total volume of 71.02 million gallons was transmitted to the WWTP and approximately 3% of the total volume was not treated. Therefore, the amount of increased flow to the WWTP, if all overflows are eliminated in the Spine, would be on the order of 2.24 million gallons for the design event.

### **E. PUMPING STATIONS**

The Turtle Park pump station collects all sewage flow from the sewer basin and pumps it through force mains to the WWTP. The capacity of the station is 30 MGD (20,833 gpm). In addition to the Turtle Park station, the sewer basin contains 33 other pumping stations, varying in rated capacity from less than 50 gpm up to 2,800 gpm. Table A-36 in Appendix A summarizes the names and capacities of the pumping stations.

In order to evaluate the capacities of the pumping stations, peak unrestricted inflows to selected stations were estimated. (Sufficient inflow and/or capacity data for 7 of the 33 pumping stations are not currently available for this analysis.) The number of addresses upstream of the pumping stations were determined from the sewer system maps, and multiplied by 2.26 to estimate the equivalent capita.

The peak flows (including base, sewage and RDII components) were then estimated by multiplying the equivalent capita by 250 gallons per capita per day and converting to gallons per minute. (TDEC, 1989.)

In addition, the limiting value of inflows to selected stations were determined by evaluating the capacities of the incoming sewer pipes. The capacity of each pipe was computed as the full-pipe gravity flow (i.e., not surcharged) based on the pipe diameter, roughness and slope.

Table A-36 in Appendix A lists the peak unrestricted inflow (modified as applicable when the capacities of upstream pumping stations were included) as well as the pipe-restricted capacity values for selected pumping stations. As indicated, the rated capacities of 6 of the pumping stations are exceeded by the computed limiting peak incoming flows. These are: Whippoorwill, Palisades #2 and #4, Scarboro, Rivers Run, and Oak Hills. However, two of the six are within 5% or less (Rivers Run and Palisades #2).

**SECTION XII****SUPPLEMENTAL ANALYSIS****A. EFFECT OF ELIMINATING CONSTRUCTED OVERFLOWS**

The effect of eliminating constructed overflows was analyzed. Present and previous constructed overflows are listed in Table XII-1 below. Of the eight present constructed overflows, seven of them are in the Spine model. Those overflows were theoretically removed and the analysis was repeated. The results of the analysis for the 2-year, 24-hour design event are presented in Table A-37 in Appendix A. As indicated, the removal of the constructed overflows resulted in an increase of 4,400 to 5,000 gallons of overflow or 0.2% and a corresponding net decrease in flows to the WWTP. The elimination of the constructed overflows resulted in increased overflows elsewhere in the system.

**TABLE XII-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
CONSTRUCTED OVERFLOW LOCATIONS**

<b>Manhole</b>	<b>Address</b>	<b>Sewershed</b>
Christian Outreach (Belgrade)	MH:E13A-G20-27	East Plant
100 Dresden Road	MH:E13A-G20-36	East Plant
119 Athens Road	MH:E11-E22-32	East Plant
Providence Road	MH:W6-F13-9 MH:W6-F13-10	Central City
Nebraska Avenue at ORTP	Removed during roadway construction	---
165 Louisiana Avenue	MH:W13-E7-1	Turtle Park
Belgrade Road	MH:E13A-F21-1	East Plant
120 Porter Road	Removed	---
143 Iroquois Road	Removed when sewer was rehabbed	---
Marina at Pump Station (695 Melton Lake Drive)	MH:E20-L24-1*	Emory Valley
(* indicates MH not included in the Spine model)		

**B. “WORST CASE” SCENARIO**

A “worst case” scenario was analyzed under design flow conditions:

- A review of pump station flow records indicates that the occurrence of simultaneous effluent peaks at the East Plant and Emory Valley pumping stations is likely under some conditions, especially for larger storm events. This is the case for the 2-year, 24-hour design storm event wherein the simulated peak flows from the two pumping stations basically occurred simultaneously, requiring no further adjustment for a worst case simulation.
- In some areas of the sewer system high groundwater conditions exist. Base flows in areas subject to high groundwater were increased to reflect increased inflow and infiltration under unusual groundwater conditions. The selection of load points for increasing the base flow component was based on location relative to streams and topography, and groundwater monitoring. See Table XII-2.

**TABLE XII-2  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
INCREASED BASE FLOW FOR WORST CASE ANALYSIS**

<b>Model Load Point</b>	<b>Increase</b>	<b>Sewershed</b>
E10-F20-18	50%	East Plant
W19-H11-7	50%	East Plant
W3-K13-41	50%	Y-12
W6-E15-52	50%	Central City
W14-E6-29	50%	Turtle Park
W13-C7-31	50%	Turtle Park
W18D-E9-25	50%	Turtle Park
W18G-E3-5	50%	Turtle Park
W18F-F7-1	50%	Turtle Park
W18D-F10-1	50%	Turtle Park
W18D-E9-25	Increased from 0 to 1 gpm	Turtle Park
W3-K13-41	100%	Y-12
W18G-E3-5	100%	Turtle Park
W18F-F7-1	100%	Turtle Park

The results in the analysis are summarized in Table A-38 in Appendix A. The table compares the overflows for the base design storm model with overflows under the worst case scenario. The results indicate a total increase in overflows of approximately 15,484 gallons or 0.7%. Flow to the WWTP is increased by 3,132,670 gallons or 4.6%. Total flow increased by 3,148,154 gallons or 4.4%.

### **C. EXCESS INFLOW AND INFILTRATION**

Paragraph IV.16.iii.f of the Order requires that the absence of excess inflow and infiltration be demonstrated for any mini-system identified for exclusion from the detailed I&I analysis. The Order excludes critical mini-systems from this requirement. Since all mini-systems have been identified as critical mini-systems, the detailed inflow and infiltration investigation and analysis have been completed for the entire system. Therefore, the calculation of excess inflow and infiltration under the referenced paragraph of the Order was not required.

### **D. PER CAPITA USAGE CALCULATIONS**

Paragraph IV.16.ii.d of the Order requires that per capita sewage use be computed for each critical mini-system based on Appendix 2-A of the *Tennessee Design Criteria for Sewage Works* (TDEC, 1989).

The flow monitoring data collected during the study period indicate that the domestic sewage flows for Oak Ridge are significantly lower than typical nominal design values such as those included in the referenced criteria. The dry weather flow model loading shown in Table A-26 in Appendix A, as derived in the dry weather flow analysis, indicates relatively low values for sewage flow per address. This analysis was independently supported by water use data for sewer customers in Oak Ridge.

During the fiscal year July 1, 2010 through June 30, 2011, the 12,287 sewer customers used an average of approximately 200 gallons of water per customer address per day. Based on an average of 2.26 persons per address, the use rate is approximately 88 gallons per capita per day. Approximately 93% of the sewer customers used 10,000 gallons or less of water each month. The per address average rate for these customers was only 87 gallons per day, or 38 gallons per capita per day.

Based on these considerations, per capita usage calculations using the published criteria were not performed. Instead, the sewage flow monitoring results, which were consistent with the water use history for sewer customers, were used to reflect design daily average and peak sewage flow rates in the sewer pipe capacity assessment. However, as previously discussed, the TDEC criteria was used to estimate unrestricted inflows for the pump station capacity assessments.

## **E. SIGNIFICANT INDUSTRIAL USERS**

In 2011, the total volume of significant industrial user sewage transmitted to, and treated by, the WWTP was 182,034,430 gallons. This total is the sum of the certified self-reporting volumes for all industrial users.

## SECTION XIII

### CONCLUSIONS

Based on the results of the assessment of the hydraulic capacity of the system under current conditions, the following are concluded:

1. The sewer system has adequate capacity for dry weather flows.
2. The Turtle Park pump station has adequate capacity for the 2-year, 24-hour design rainfall event.
3. In its present condition, the sewer collection system is generally inadequate for wet weather flows.
4. The gravity interceptor between the confluence of the East Plant and Emory Valley pump station force mains, and the area of the Oak Ridge Turnpike and Illinois Avenue intersection, experiences wet weather capacity issues.
5. The gravity interceptor in the area of the intersection of Oak Ridge Turnpike and Illinois Avenue experiences wet weather capacity issues.
6. The hydraulic capacity model developed in this study will be a valuable tool in the development of the sanitary sewer I&I rehabilitation program.

## SECTION XIV

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# City of Oak Ridge, Tennessee

## SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT

### APPENDIX



April 2012

## APPENDIX

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**APPENDIX B:**

SEWER BASIN MAPS B-1 THROUGH B-6

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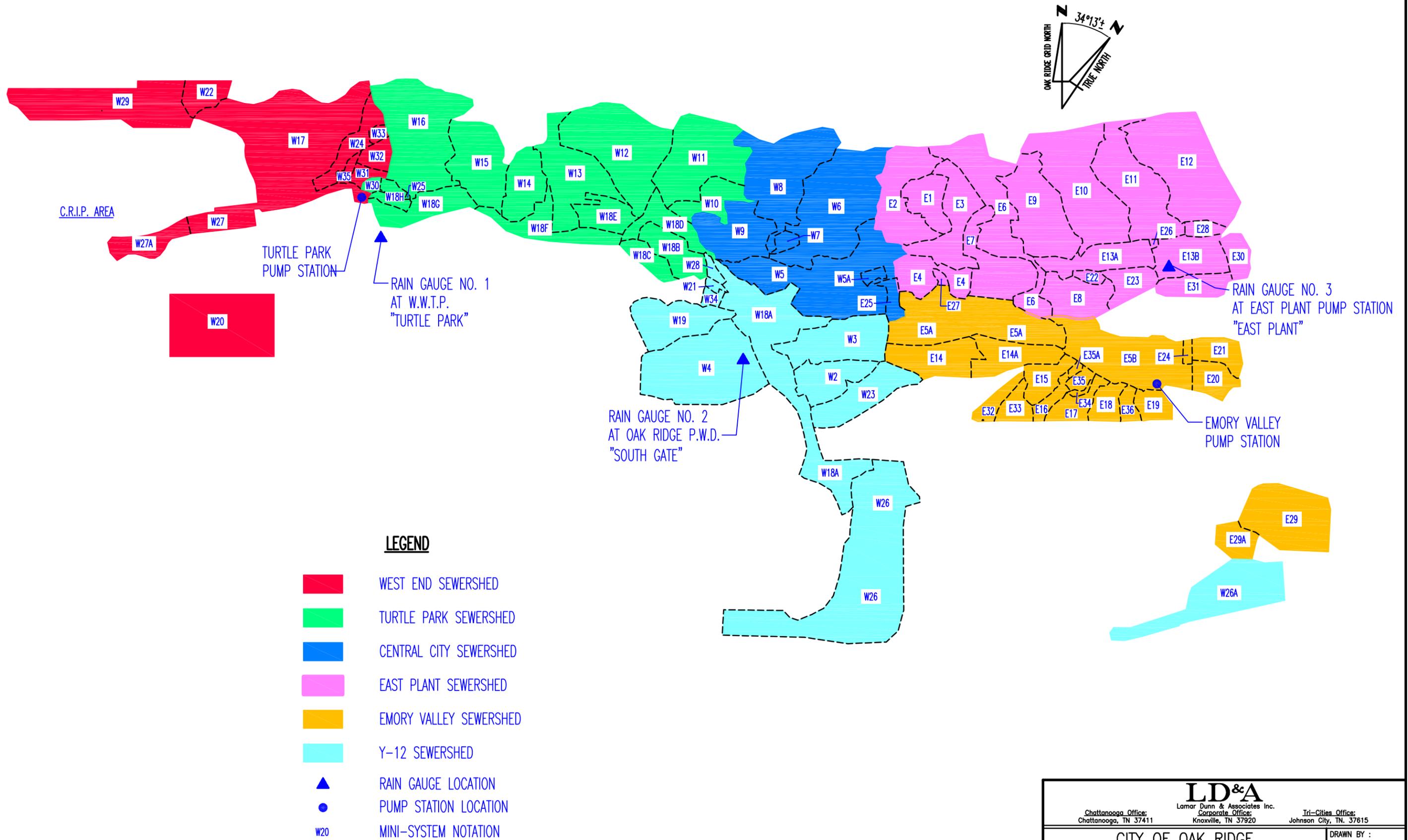
HISTORICAL OVERFLOW LOCATION MAPS C-1 THROUGH C-59

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GROUNDWAER MONITOR LOCATION MAPS D-1 THROUGH D-5

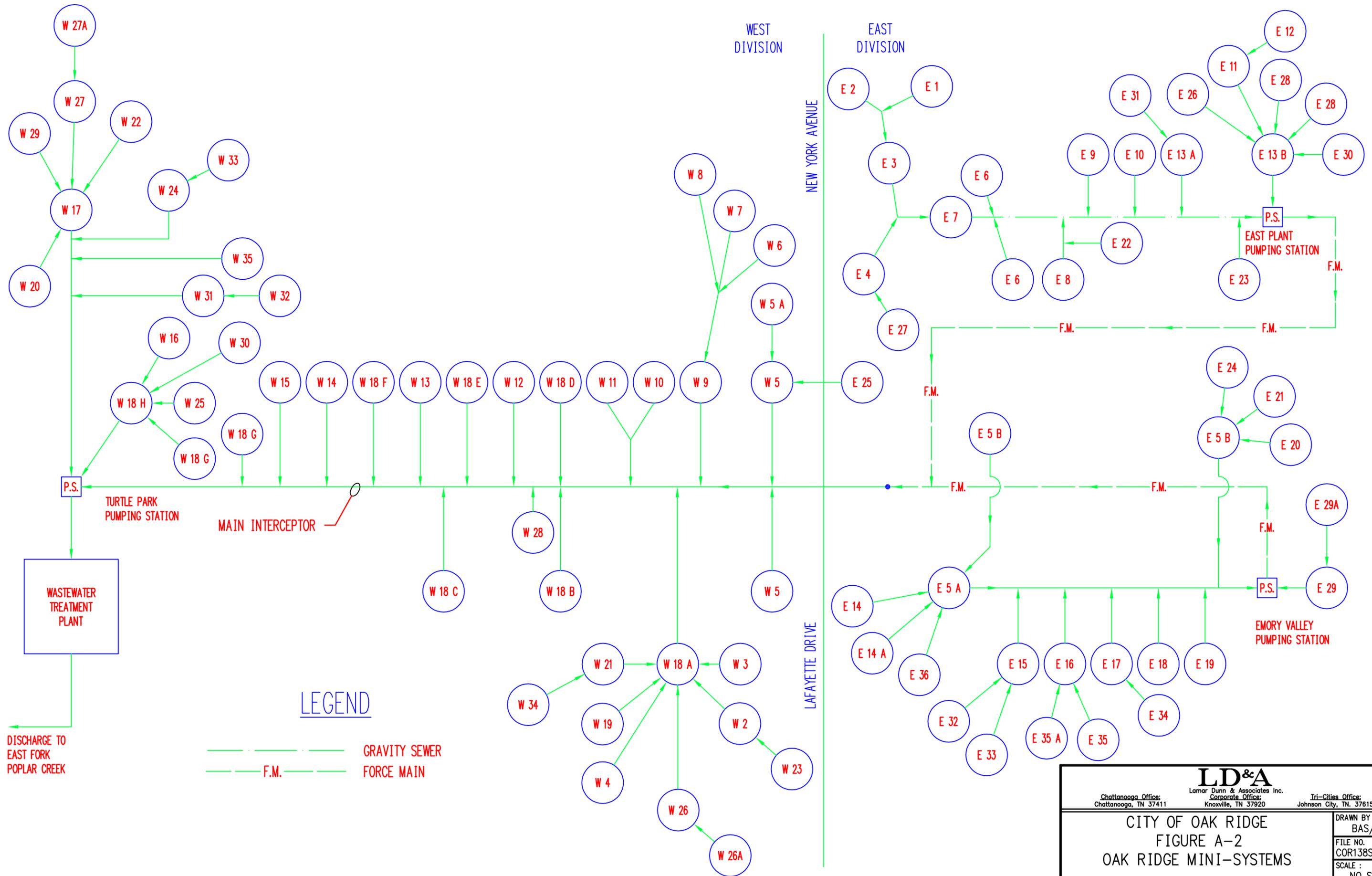
**APPENDIX E:**

HGL PROFILE #1 THROUGH #7



<b>LD&amp;A</b> Lamar Dunn & Associates Inc.	
Chattanooga Office: Chattanooga, TN 37411	Corporate Office: Knoxville, TN 37920
Tri-Cities Office: Johnson City, TN, 37615	
CITY OF OAK RIDGE FIGURE A-1 OAK RIDGE SEWER BASIN	
DRAWN BY : BAS/MLG	FILE NO. COR138SE06SC11
SCALE : 1"=4000'	
DATE: 3-2012	

P:\COR138\AUTOCAD DWGS\12.3.19 image 1022 Figure A-2 COR04002.dwg, 5/3/2012 8:29:57 AM, jgibson, 1:1.05



**LEGEND**

 GRAVITY SEWER  
 F.M. FORCE MAIN

DISCHARGE TO EAST FORK POPLAR CREEK

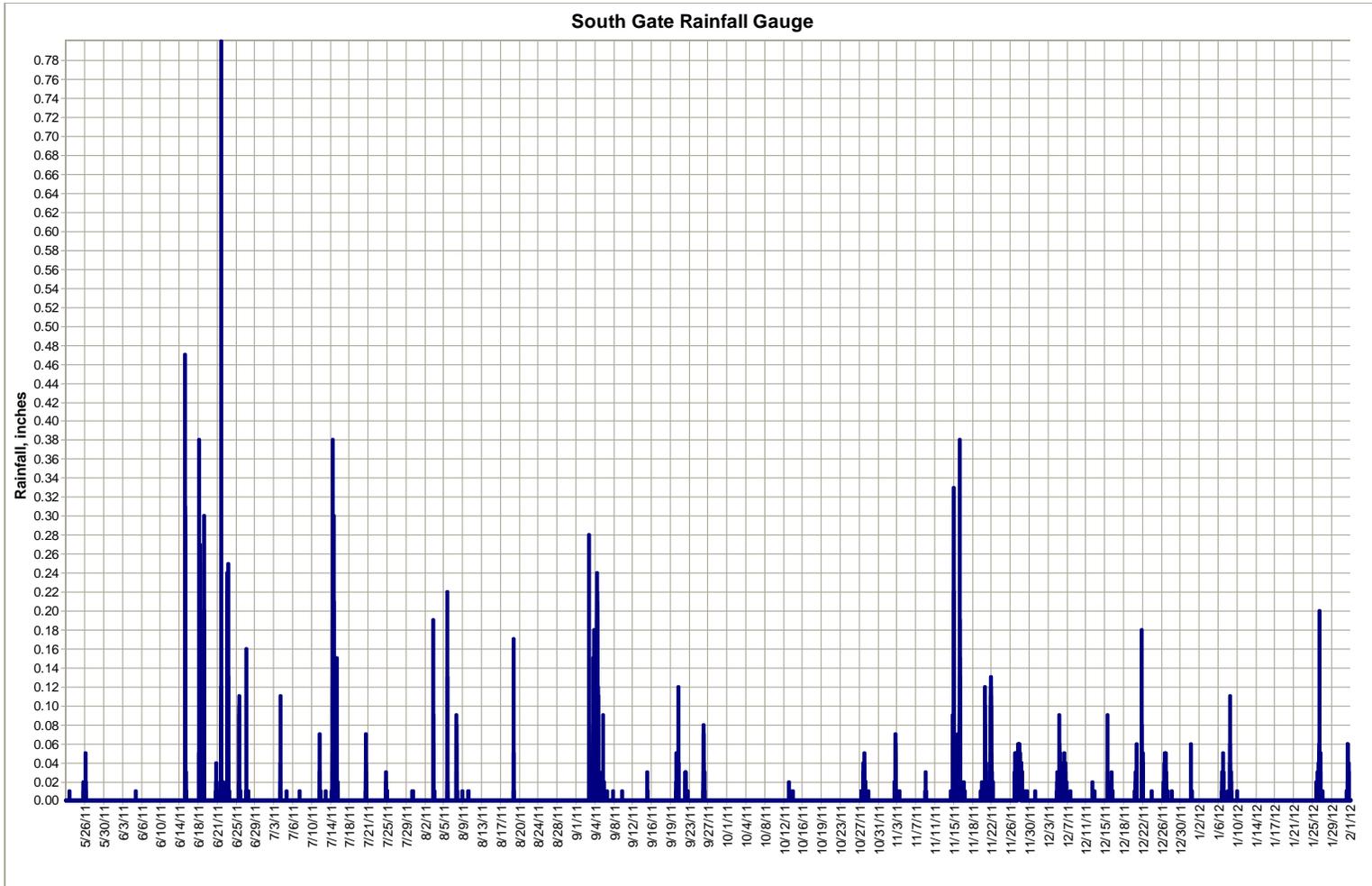
<b>LD&amp;A</b> Lamar Dunn & Associates Inc.	
Chattanooga Office: Chattanooga, TN 37411	Tri-Cities Office: Johnson City, TN 37615
CITY OF OAK RIDGE FIGURE A-2 OAK RIDGE MINI-SYSTEMS	
DRAWN BY : BAS/MLG	
FILE NO. COR138SE06SC11	
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DATE: 3-2012	



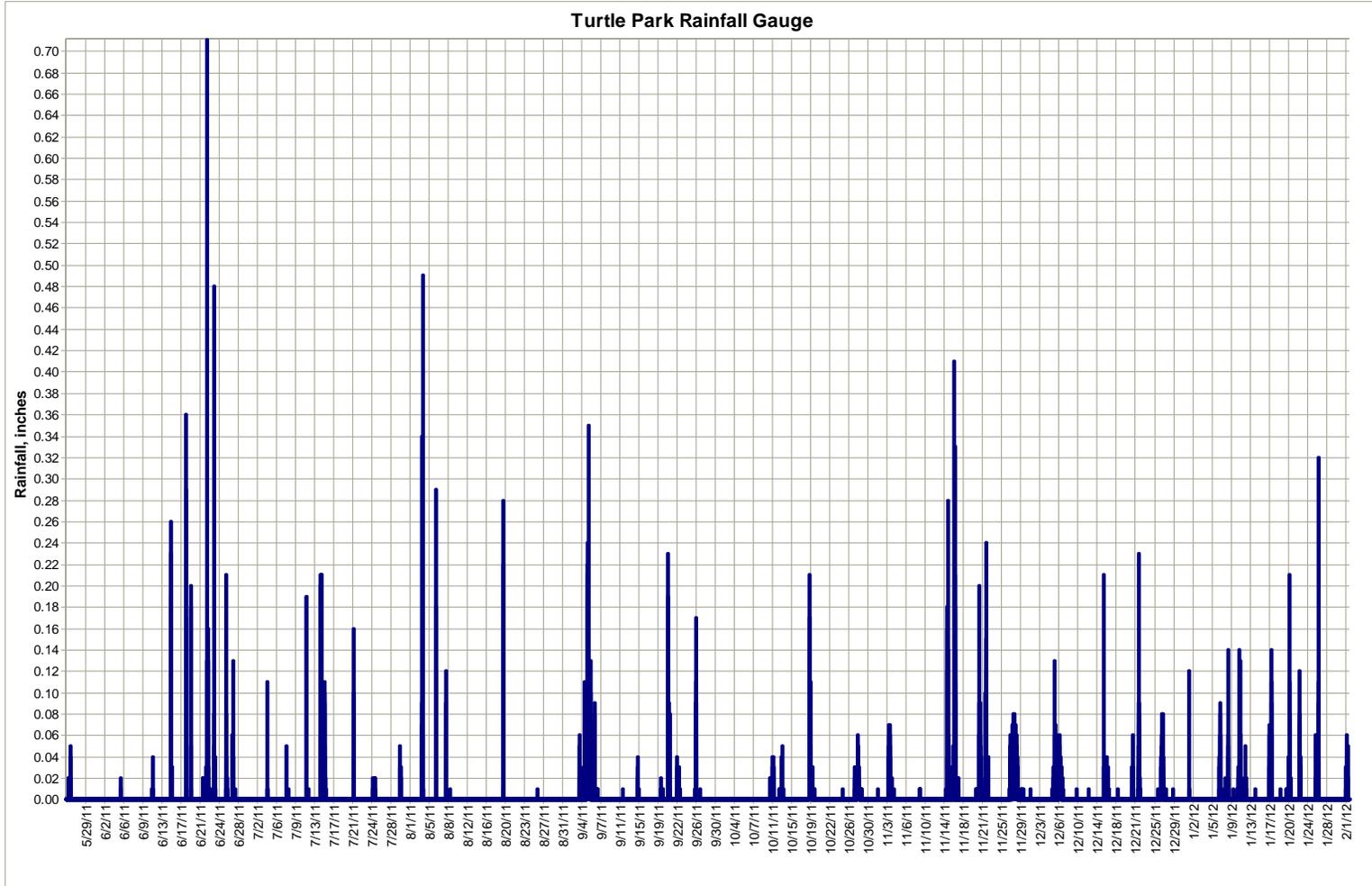
**FIGURE A-4  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
TURTLE PARK RAINFALL GAUGE**



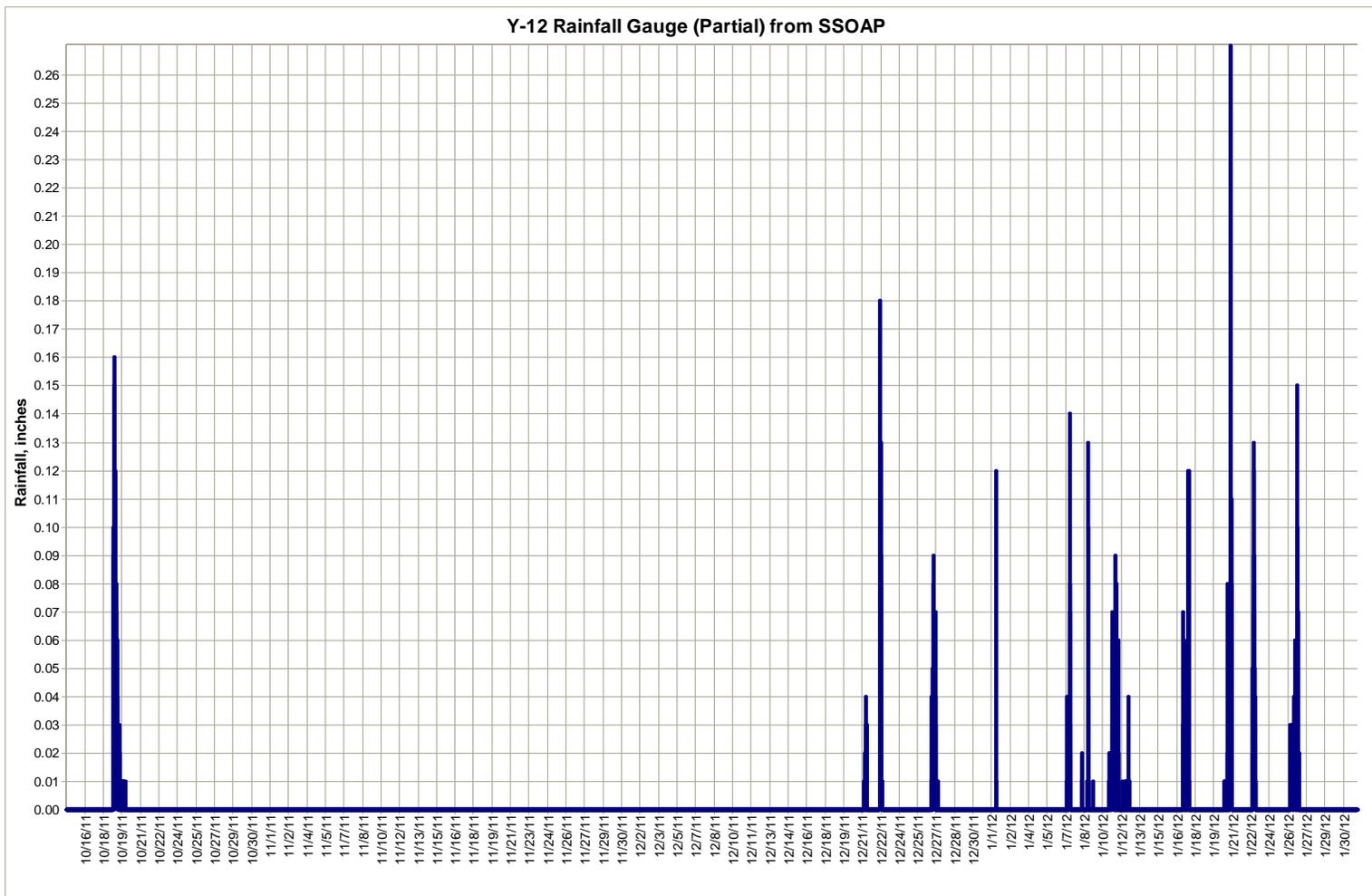
**FIGURE A-5**  
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**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**SOUTH GATE RAINFALL GAUGE CHART**



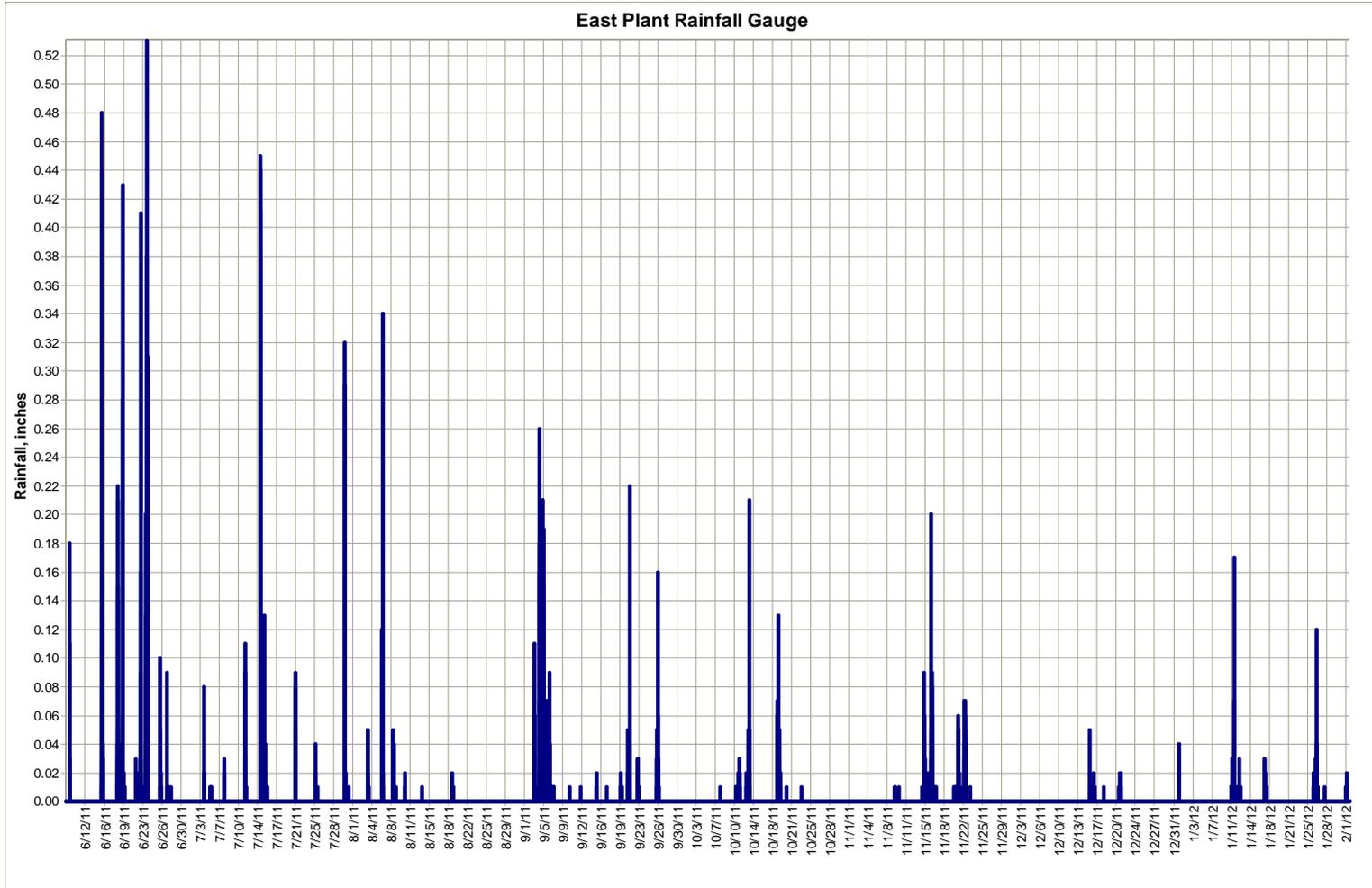
**FIGURE A-6  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
TURTLE PARK RAINFALL GAUGE CHART**



**FIGURE A-7  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
Y-12 RAINFALL GAUGE CHART**



**FIGURE A-8  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT  
EAST PLANT RAINFALL GAUGE CHART**



**TABLE A-1  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
1	MH:W12-C8-13	TURTLE PARK	341 JEFFERSON AVE	1/11/2007	OTHER	WASH DOWN RD	60
2	MH:E2-E16-32	EAST PLANT	160 E TENNESSEE AVE	1/30/2007	OTHER	RAN IN CREEK	135
3	MH:W17-B1W-6	WEST END	113 NEWRIDGE RD	2/22/2007	OTHER	WASH DOWN RD	60
4	MH:W4-K10-10	Y12	223 S DILLARD AVE	2/25/2007	GREASE		50
5	MH:W13-C7-18	TURTLE PARK	106 REGENT CIR	3/18/2007	OTHER		120
6	MH:W13-D7-21	TURTLE PARK	451/449 ROBERTSVILLE RD	3/19/2007	OTHER		120
7	MH:E10-F20-22	EAST PLANT	101 DELAWARE AVE	3/24/2007	OTHER	SEWER BYPASS THROUGH MAIN PIPE NOT MH	300
8	MH:W13-B7-7	TURTLE PARK	307 LOUISIANA AVE	4/3/2007	OTHER	WASH DOWN DRIVEWAY	40
9	MH:W18A-G12-21	Y12	120 BADGER RD	4/3/2007	OTHER		60
10	MH:W14-C6-2	TURTLE PARK	110 STANTON LN	4/13/2007	ROOTS	SEWER IN BASEMENT/ROOTS IN MAIN	30
11	MH:W5-G15-13	CENTRAL CITY	131 MARQUETTE	4/14/2007	BYPASS	UNKNOWN TIME	36,000
12	---		HORIZON CENTER	4/21/2007	PUMP	PUMPS WERE OFF	600
13	MH:E1-E17-44	EAST PLANT	111 E MADISON RD	5/3/2007	OTHER	WILL TV	22
14	MH:E8-H19-31	EAST PLANT	19 CONVERSE LN	5/29/2007	OTHER		180
15	MH:E11-C21-3	EAST PLANT	190 CALIFORNIA AVE	6/10/2007	DEBRIS	TISSUE	30
16	MH:E5A-J19-4	EMORY VALLEY	EMORY VALLEY@EMORY IN	6/27/2007	OTHER		120
17	MH:W10-D11-11	TURTLE PARK	22/220 HILLSIDE RD	8/2/2007	OTHER		60
18	MH:W12-D9-15	TURTLE PARK	242 JEFFERSON AVE	8/5/2007	DEBRIS	STICKS AND RAGS	45
19	MH:E9-E19-30	EAST PLANT	107 TILDEN RD	10/15/2007	OTHER	CLEANED ROAD	176
20	MH:E5B-K22-9	EMORY VALLEY	136 BALBOA CIR	12/3/2007	OTHER		30
21	MH:E13B-G22-18	EAST PLANT	E SEWER PLANT	12/4/2007	OTHER		451
22	MH:W12-C9-42	TURTLE PARK	113 JARRETT LN	12/31/2007	OTHER		3
23	MH:E9-E19-2	EAST PLANT	102 THAYER LN	1/11/2008	RAIN	2.3" RAIN/CLEANED ROAD	300

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
24	MH:E2-F16-30	EAST PLANT	140 W TENNESSEE AVE	1/11/2008	OTHER	STOP UP BEFORE MH D 315	375
25	MH:E9-E19-1	EAST PLANT	100 THAYER RD	2/4/2008	OTHER		600
26	MH:W15-D5-8	TURTLE PARK	103 BRIAR RD	2/4/2008	OTHER		300
27	MH:W16-D3-32	TURTLE PARK	110 BRADLEY AVE	2/6/2008	OTHER		220
28	MH:W5-G15-13	CENTRAL CITY	117 N PURDUE AVE	2/6/2008	OTHER	RAN IN CREEK	15
29	MH:W12-D9-3	TURTLE PARK	253 JEFFERSON AVE	2/8/2008	OTHER		UNK
30	MH:W16-B3-12	TURTLE PARK	MONTANA AVE(HOLLOW)	3/6/2008	OTHER		240
31	MH:W12-D9-6	TURTLE PARK	215 JEFFERSON AVE	3/19/2008	OTHER		30
32	MH:W2-L13-14	Y12	102,104,108 PARIS LN	4/4/2008	OTHER		UNK
33	MH:E10-E20-2	EAST PLANT	101 DALLAS LN	5/3/2008	OTHER	SLIPLINED/ WILL TV TO FIND PROB	900
34	MH:W17-D1W-15	WEST END	2760 ORTP	5/20/2008	OTHER		180
35	MH:E6-E18-35	EAST PLANT	117 GORGAS LN	7/2/2008	OTHER		120
36	MH:E1-E16-1	EAST PLANT	85 E MADISON LN	7/8/2008	OTHER	RAN IN CREEK	180
37	MH:W12-B8-34	TURTLE PARK	367 JEFFERSON AVE	7/13/2008	ROOTS	ROOTS MAIN/ OVERFLOW HOMEOWNER S CO	300
38	MH:W10-D11-7	TURTLE PARK	105 N HICKORY LN	7/13/2008	OTHER		180
39	MH:E7-F17-33	EAST PLANT	82 E TENNESSEE AVE	7/30/2008	OTHER		90
40	MH:E2-F15-52	EAST PLANT	990 E TENN AVE (HOSPITAL)	8/17/2008	OTHER	WASHED PARKING LOT	60
41	MH:W6-E13-13	CENTRAL CITY	110 HILLSIDE RD	8/17/2008	OTHER		270
42	MH:E9-F20-22	EAST PLANT	422 E TENN AVE	9/23/2008	BROKE	ENCASEMENT BROKE AT CREEK	720
43	MH:W6-E14-49	CENTRAL CITY	93 E PASADENA RD	9/30/2008	ROOTS	SAW	30
44	MH:W11-D9-37	TURTLE PARK	212 IROQUOIS RD	10/30/2008	ROOTS	3.5 GAL ROOTS MAIN LINE	180
45	MH:W18A-J11-16	Y12	216 S ILLNOIS AVE(BIGLOTS)	12/10/2008	RAIN	1.8"	600
46	MH:W5-G15-13	CENTRAL CITY	117 N PURDUE AVE	12/10/2008	RAIN	1.8"	1,250
47	MH:W18A-J11-16	Y12	216 S ILLNOIS AVE	12/11/2008	RAIN	2.2"	1,350
48	MH:W18A-J12-11	Y12	322 S ILLNOIS	12/11/2008	RAIN	2.2"	120

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
49	MH:W5-G15-13	CENTRAL CITY	117 N PURDUE AVE	12/11/2008	RAIN	2.2"	2,650
50	MH:E19-M22-5	EMORY VALLEY	105 BELLE CREEK DR	12/26/2008	COLLAPSE	DUG UP MAIN	360
51	MH:E8-H19-31	EAST PLANT	19 CONVERSE LN	12/27/2008	ROOTS	ROOTS AND RAGS	90
52	MH:W18A-J11-16	Y12	216 S ILLNOIS AVE(BIGLOTS)	1/7/2009	RAIN	UNK	1,050
53	MH:W18G-D5-40	TURTLE PARK	127 SANFORD LN	1/7/2009	RAIN	ROOTS AND GREASE	180
54	MH:W5-G15-13	CENTRAL CITY	117 N PURDUE AVE	1/7/2009	RAIN	1.53"	4,500
55	MH:W16-B3-9	TURTLE PARK	144 MONTANA AVE	2/18/2009	ROOTS	RAN SAW	60
56	MH:W18B-F10-19	TURTLE PARK	VILLANOVA RD	2/23/2009	CONTRACTOR	CONTRACTOR BROKE 8" SEWER	180
57	MH:W18D-D9-45	TURTLE PARK	298 ROBERTSVILLE RD	2/23/2009	ROOTS	ROOTS AND GREASE	120
58	MH:E5A-J18-1	EMORY VALLEY	100 ELMHURST DR	2/25/2009	ROOTS		600
59	MH:E6-D18-5	EAST PLANT	155 GEORGIA AVE	3/11/2009	ROOTS		60
60	MH:W12-D9-25	TURTLE PARK	137 JARRETT LANE	3/26/2009	ROOTS	BLOCKED LINE	240
61	MH:E12-E23-4	EAST PLANT	130 ATHENS ROAD	4/11/2009	ROOTS	BLOCKED LINE	33
62	MH:W15-D5-8	TURTLE PARK	103 BRIAR RD	4/23/2009	ROOTS	ROOTS AND GREASE	110
63	MH:E10-E21-28	EAST PLANT	141 ARROWWOOD ROAD WEST	5/3/2009	ROOTS	RAN SAW	900
64	MH:W14-E6-43	TURTLE PARK	123 SENECA ROAD SOUTH	5/6/2009	GREASE	CLEANED AREA	120
65	MH:W29-A4W-9	WEST END	112 WHIPPORWILL DR	7/19/2009	GREASE		1,500
66	MH:W13-D7-34	TURTLE PARK	135 LAWTON RD	8/24/2009	ROOTS		135
67	MH:W8-C13-18	CENTRAL CITY	360 OUTER DR WEST	9/26/2009	ROOTS	RAN SAW	375
68	MH:W6-E14-2	CENTRAL CITY	94 E. PASADENA RD	10/15/2009	ROOTS	RAN SAW	2,700
69	PS:E13B-G22	EAST PLANT	EAST PLANT PUMP STA	10/15/2009	RAIN	#2 DOWN FOR REPAIR	76,750
70	MH:W26-S14-2	Y12	SCARBORO RD	10/27/2009	MECHANICAL	#2 PUMP STOPPED WORKING	29,250
71	MH:W17-C1W-10	WEST END	123 NORMANDY RD	10/30/2009	ROOTS	RAN SAW	90
72	PS:E13B-G22	EAST PLANT	EAST PLANT PUMP STA	11/4/2009	PUMP	PUMP FAILURE/ 1 DOWN FOR	84,000

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
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Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
						REPAIR	
73	MH:W6-F14-2	CENTRAL CITY	103 VISTA RD	11/13/2009	ROOTS	1 GAL	60
74	MH:E5B-K20-8	EMORY VALLEY	107 COLUMBIA DR	11/23/2009	ROOTS	RAN SAW	240
75	MH:E13B-G22-14	EAST PLANT	E PLANT PUMP STATION	12/8/2009	PUMP	#2 PUMP DOWN FOR REPAIR	52,500
76	MH:W18D-E10-19	TURTLE PARK	IROQUIOS RD AT ROBERTSVILLE RD	12/9/2009	RAIN	3"	UNK
77	MH:W11-E10-20	TURTLE PARK	270 ROBERTSVILLE RD	12/9/2009	RAIN	3"	UNK
78	MH:W18A-J11-16	Y12	BEHIND BIG LOTS	12/9/2009	RAIN	3"	UNK
79	MH:W5-B11-8	CENTRAL CITY	A K BISSELL PARK	12/9/2009	RAIN	3"	18,500
80	MH:W6-E14-1	CENTRAL CITY	88 PASADENA RD	12/9/2009	RAIN	3", OVERFLOW IN HOUSE	UNK
81	MH:E12-BYPASS	EAST PLANT	119 ATHENS RD	12/9/2009	MECHANICAL	PROBLEM AT EAST PLANT	9,000
82	MH:W2-L13-8	Y12	103 PARIS LANE	12/9/2009	ROOTS	BLOCKED LINE	150
83	MH:E11-E22-32	EAST PLANT	119 ATHENS RD	12/18/2009	BLOCKED LINE	RAN IN CREEK	16,500
84	MH:E13B-G-22-14	EAST PLANT	OLD EAST PLANT PUMP STA	12/18/2009	PUMP	NEW PUMPS ORDERED	20,080
85	MH:W5-G11-8	CENTRAL CITY	A K BISSELL PARK	12/19/2009	BLOCKED LINE	SIGNS OF OVERFLOW BUT WASN'T NEXT MORN	UNK
86	MH:W13-D7-21	TURTLE PARK	451-449 ROBERTSVILLE RD	12/21/2009	ROOTS	RAN SAW	60
87	MH:W17-B2W-3	WEST END	1037 WEST OUTER DR	12/22/2009	ROOTS	RAN SAW	720
88	MH:W3-K14-41	Y12	235 MANHATTAN AVE	12/23/2009	ROOTS	RAN SAW	130
89	PS:E13B-G22	EAST PLANT	EAST PLANT PUMP STA	12/25/2009	RAIN	1.1" 1 PUMP DOWN	7,200
90	MH:W16-A3-5	TURTLE PARK	103 WOODRIDGE LN	12/26/2009	ROOTS		1,200
91	J:W17,E2		200 MONTEREY RD	1/21/2010	SCREENS		10,000
92	MH:W18A-J11-16	Y12	216 S ILLINOIS AVE	1/22/2010	RAIN	SIGNS OF OVERFLOW BUT WASN'T NEXT MORN	UNK
93	MH:EW6-E13-14		101 HUNTER CIRCLE	1/22/2010	GREASE		1,000

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
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Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
94	PS:E13B-G22	EAST PLANT	EAST PLANT PUMP STA	1/22/2010	RAIN	1 PUMP OUT	157,500
95	MH:E10-E20-2	EAST PLANT	103 DALLAS LN	1/24/2010	RAIN	2.81"	450
96	MH:E11-E23-64	EAST PLANT	115 ATHENS RD	1/24/2010	RAIN	2.81"	3,540
97	MH:E11-E22-32	EAST PLANT	119 ATHENS RD	1/24/2010	RAIN	2.81"	58,350
98	MH:E11-F20-19	EAST PLANT	106 CALIFORNIA AVE	1/24/2010	RAIN	2.81"	9,450
99	MH:E13A-F20-5	EAST PLANT	100 DRESDEN ROAD	1/24/2010	RAIN	2.81"	12,130
100	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	1/24/2010	RAIN	2.81"	47,240
101	MH:E13B-G22-13	EAST PLANT	151 CAIRO LN	1/24/2010	RAIN	2.81"	327,750
102	MH:E9-F20-6	EAST PLANT	550 OAK RIDGE TURNPIKE	1/24/2010	RAIN	2.67"	14,400
103	MH:W14-D6-37	TURTLE PARK	121 SENECA RD SOUTH	1/24/2010	RAIN	IN HOUSE	14,400
104	MH:W18A-J11-16	Y12	216 ILLINOIS AVE SOUTH	1/24/2010	RAIN	2.81"	16,200
105	MH:W18A-J12-11	Y12	324 ILLINOIS AVE SOUTH	1/24/2010	RAIN	2.81"	5,100
106	MH:W18D-E9-25	TURTLE PARK	IROQUOIS RD	1/24/2010	RAIN	2.81"	4,200
107	MH:W4-K10-2	Y12	503 TUSKEGEE DR	1/24/2010	RAIN	2.81"	4,800
108	MH:W6-E14-7	CENTRAL CITY	116 NEWKIRK LN EAST	1/24/2010	RAIN	2.81"	3,846
109	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	1/24/2010	RAIN	2.81"	UNK
110	MH:W6-E14-1	CENTRAL CITY	88 PASADENA RD	1/24/2010	RAIN	2.81"	600
111	MH:W6-E14-3	CENTRAL CITY	PROVIDENCE RD	1/24/2010	RAIN	2.81"	26,680
112	MH:W16-C3-25	TURTLE PARK	103 MOHAWK RD	1/24/2010	BLOCKED LINE	IN HOUSE	1,500
113	MH:E12-C23-26	EAST PLANT	319 EAST DRIVE	1/24/2010	ROOTS	BLOCKED LINE	1,350
114	MH:E2-E15-7	EAST PLANT	103 NEWKIRK LN EAST	1/24/2010	ROOTS	BLOCKED LINE	1,080
115	MH:E6-D18-3	EAST PLANT	149 GEORGIA AVE	1/24/2010	ROOTS	BLOCKED LINE	300
116	MH:W14-C6-11	TURTLE PARK	124 NORTH SENECA RD	1/24/2010	ROOTS	IN HOUSE	100
117	MH:W14-C6-2	TURTLE PARK	110 STANTON LN	1/27/2010	ROOTS	RAN SAW	30
118	MH:W11-D10-19	TURTLE PARK	ILLINOIS AVE NORTH	1/31/2010	DEBRIS	ROOTS AND RAGS	7,250
119	MH:E6-F18-34	EAST PLANT	133 TENN AVE WEST	3/1/2010	ROOTS	GREASE AND TOWELS	275
120	MH:W12-C8-8	TURTLE PARK	365 JEFFERSON AVE	3/8/2010	ROOTS	ROOTS AND RAGS	360

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
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**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
121	MH:W12-B7-12	TURTLE PARK	100 LEHIGH AVE	3/20/2010	CONTRACTOR	DID NOT TIE TAP BACK IN, OVERFLOW IN HOUSE	30
122	MH:W12-C8-8	TURTLE PARK	365 JEFFERSON AVE	3/20/2010	ROOTS	ROOTS AND RAGS	1,800
123	J:W17,E2		200 MONTEREY RD	4/5/2010	SCREEN	SCREEN DID NOT START	200
124	MH:E11-C21-1	EAST PLANT	105 CLARION RD	4/12/2010	ROOTS	RAN SAW	60
125	MH:E13A-F20-5	EAST PLANT	100 DRESDEN ROAD	5/2/2010	RAIN	2.67"	66
126	MH:W11-E10-20	TURTLE PARK	270 ROBERTSVILLE RD	5/2/2010	RAIN	2.67"	84
127	MH:W18A-J11-16	Y12	216 ILLINOIS AVE SOUTH	5/2/2010	RAIN	2.67"	56
128	MH:W18D-E10-19	TURTLE PARK	IROQUIOS RD	5/2/2010	RAIN	2.67"	78
129	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	5/2/2010	RAIN	2.67"	145
130	MH:E11-E22-35	EAST PLANT	119 ATHENS RD	5/3/2010	RAIN	2.71"	5,540
131	MH:E13A-F20-3	EAST PLANT	100 DRESDEN ROAD	5/3/2010	RAIN	2.71"	312
132	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	5/3/2010	RAIN	2.71"	2,520
133	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN	5/3/2010	RAIN	2.71"	15,200
134	MH:W19-H11-3	Y12	189 TUSCULUM DR	5/3/2010	RAIN	2.17"	85
135	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	5/3/2010	RAIN	2.71"	810
136	MH:W5-G15-13	CENTRAL CITY	117 N PURDUE AVE	5/3/2010	RAIN	2.71"	6,140
137	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN	5/6/2010	EQUIPMENT	CLOGGED TRANSDUCER	800
138	MH:E11-E23-64	EAST PLANT	ATHENS RD	5/6/2010	UNKNOWN	SIGNS OF OVERFLOW BUT WASN'T WHEN CHECKED	150
139	MH:W29-A5W-3	WEST END	106 WILLIAM LN	5/9/2010	GREASE	RAN SAW	90
140	MH:E4-G16-17	EAST PLANT	360 LABORATORY RD	5/11/2010	ROOTS	RAN SAW	90
141	MH:W20-H2W-4	WEST END	111 GRACELAND RD	5/21/2010	BROKEN	BROKEN FM	11,580
142	MH:W5-E15-40	CENTRAL CITY	101 NEWCOMB RD WEST	5/28/2010	ROOTS	RAN SAW	45
143	MH:W3-K14-16	Y12	107 MORRIS LN	7/6/2010	ROOTS	JET RODDED	30
144	MH:E10-F21-21	EAST PLANT	126 ASPEN LN	7/26/2010	ROOTS	RAN SAW	45
145	MH:W5A(W5)-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	10/25/2010	RAIN	2.2"	500

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
146	MH:E1-D16-40	EAST PLANT	101 MARION RD.	10/30/2010	ROOTS		150
147	MH:E1-E17-42 (44)	EAST PLANT	111 E. MADISON RD.	11/1/2010	OTHER	RAGS AND PLASTIC BAGS	750
148	MH:E31-G24-8	EAST PLANT	100 MELTON LAKE PENINSULA	11/11/2010	POWER	POWER GLITCH	600
149	MH:E11-E23-64	EAST PLANT	ATHENS RD AT E ARROWWOOD RD	11/30/2010	RAIN	3.91"	180,000
150	MH:E11-E22-32	EAST PLANT	119 ATHENS RD	11/30/2010	RAIN	3.91"	319,200
151	MH:E13A-F21-1	EAST PLANT	BELGRADE RD	11/30/2010	RAIN	3.91"	1,050
152	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	11/30/2010	RAIN	3.91"	218,400
153	MH:E13A-F20-5	EAST PLANT	100 DRESDEN RD	11/30/2010	RAIN	3.91"	134,460
154	MH:E13B-G22-13	EAST PLANT	151 CAIRO LN	11/30/2010	RAIN	3.91"	198,000
155	MH:E2-F16-42	EAST PLANT	160 W TENNESSEE	11/30/2010	RAIN	3.91"	39,000
156	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR	11/30/2010	RAIN	3.91"	129,480
157	MH:E8-G20-3	EAST PLANT	COE RD LIFT STATION	11/30/2010	RAIN	3.91"	15,000
158	MH:W11-D9-42	TURTLE PARK	143 IROQUOIS RD	11/30/2010	RAIN	3.91"	9,250
159	MH:W11-E10-20	TURTLE PARK	270 ROBERTSVILLE RD	11/30/2010	RAIN	3.91"	40,500
160	MH:W18D-E10-19	TURTLE PARK	IROQUIOS RD AT ROBERTSVILLE RD	11/30/2010	RAIN	3.91"	175,500
161	MH:W18A-J12-11	Y12	324 S ILLINOIS AVE	11/30/2010	RAIN	3.91"	90,000
162	MH:W18A-J11-16	Y12	216 S ILLINOIS AVE	11/30/2010	RAIN	3.91"	195,000
163	MH:W18G-E2-5	TURTLE PARK	200 HERMITAGE BLVD	11/30/2010	RAIN	3.91"	2,850
164	MH:W18G-D2-3	TURTLE PARK	MONTEREY RD	11/30/2010	RAIN	3.91"	395,000
165	MH:W19-H11-3	Y12	191 TUSCULUM DR	11/30/2010	RAIN	3.91"	117,000
166	MH:W20-H2W-5	WEST END	211 GUM HOLLOW RD	11/30/2010	RAIN	3.91"	27,000
167	MH:W5-G13-12	CENTRAL CITY	1284 MAIN STREET	11/30/2010	RAIN	3.91"	180,000
168	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/30/2010	RAIN	3.91"	283,500
169	MH:W5A-G15-13	CENTRAL CITY	117 PURDUE AVE	11/30/2010	RAIN	3.91"	214,500
170	MH:W6-F13-DA-22	CENTRAL CITY	110 PROVIDENCE RD	11/30/2010	RAIN	3.91"	180,000

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
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**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
171	MH:E3-F17-7	EAST PLANT	23 E TENNESSEE AVE	12/7/2010	UNKNO WN	SMALL AMOUNT ON GROUND	5
172	MH:E10-E20-8	EAST PLANT	104 E DARWIN RD	12/11/2010	DEBRIS	RAIN SAW	900
173	MH:W20-H2W-5	WEST END	211 GUM HOLLOW RD	12/14/2010	ROOTS	RAN SAW	3,000
174	MH:W17-B1-6	WEST END	147 NEBRASKA AVE	12/19/2010	ROOTS	RAN SAW	60
175	MH:E11-E23-64	EAST PLANT	ATHENS @ E. ARROWOOD	1/1/2011	RAIN	2.6"	1,250
176	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	1/1/2011	RAIN	2.6"	110,000
177	MH:E5B-L22-4	EMORY VALLEY	108 BAY PATH DR.	1/1/2011	RAIN	2.6"	12,500
178	MH:13B-F22-13	EAST PLANT	151 CAIRO LN.	1/1/2011	RAIN	2.6"	180,000
179	MH:E13A-F20-36	EAST PLANT	100 DRESDEN	1/1/2011	RAIN	2.6"	42,500
180	MH:W18A-J12-11	Y12	324 S. ILLINOIS AVE.	1/1/2011	RAIN	2.6"	1,095
181	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	1/1/2011	RAIN	2.6"	122,800
182	MH:W11-E10-19	TURTLE PARK	IROQUOIS RD. @ ROBERTSVILLE RD.	1/1/2011	RAIN	2.6"	44,000
183	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	1/1/2011	RAIN	2.6"	123,000
184	MH:W5-G13-12	CENTRAL CITY	1289 OAK RIDGE TURNPIKE	1/1/2011	RAIN	2.6"	38,250
185	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	1/1/2011	RAIN	2.6"	32,500
186	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	1/1/2011	RAIN	2.6"	46,500
187	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	1/1/2011	RAIN	2.6"	142,000
188	MH:E10-F20-16	EAST PLANT	480 OAK RIDGE TURNPIKE	1/1/2011	RAIN	2.6"	6,750
189	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	1/1/2011	RAIN	2.6"	61,250
190	MH:W5A(W5)-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	1/1/2011	RAIN	2.6"	42,500
191	MH:W10-E10-20	TURTLE PARK	270 ROBERTSVILLE RD.	1/1/2011	RAIN	2.6"	4,830
192	MH:W19-H11-4	Y12	191 TUSCULUM DR.	1/1/2011	RAIN	2.6"	80,575
193	MH:W4-J11-3	Y12	215 UTICA CIR.	1/8/2011	OTHER	GREASE	240
194	MH:E2-C15-45	EAST PLANT	191 OUTER DR	1/14/2011	ROOTS	BLOCKED LINE	34
195	MH:W18G-D4-37	TURTLE PARK	212 BYRON LN.	2/5/2011	ROOTS		20
196	MH:E9-E19-29	EAST PLANT	1071/2 THELMA RD.	2/7/2011	OTHER	SHOP TOWEL	1,125

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
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**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
197	WWTP		200 MONTEREY	2/25/2011	OTHER	POWER OUTAGE TO SCREEN BLDG	3,470
198	MH:E11-E23-64	EAST PLANT	ATHENS @ E. ARROWWOOD	2/28/2011	RAIN	2.5"	1,300
199	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	2/28/2011	RAIN	2.5"	179,500
200	MH:E5B-L22-4	EMORY VALLEY	108 BAY PATH DR.	2/28/2011	RAIN	2.5"	25,300
201	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	2/28/2011	RAIN	2.25"	55,650
202	MH:E13A-F20-36	EAST PLANT	100 DRESDEN	2/28/2011	RAIN	2.5"	28,900
203	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	2/28/2011	RAIN	2.5"	120,575
204	MH:W18A-J12-11	Y12	324 S. ILLINOIS AVE.	2/28/2011	RAIN	2.5"	21,600
205	MH:W11-E10-19	TURTLE PARK	IROQUOIS RD. @ ROBERTSVILLE RD.	2/28/2011	RAIN	2.5"	52,500
206	MH:W12-C9-10	TURTLE PARK	109 JAY LN.	2/28/2011	RAIN	2.5"	298
207	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	2/28/2011	RAIN	2.5"	124,250
208	MH:W6-E14-7	CENTRAL CITY	116 W. NEWKIRK LN.	2/28/2011	RAIN	2.5"	1,800
209	MH:W5-G13-12	CENTRAL CITY	1289 OAK RIDGE TURNPIKE	2/28/2011	RAIN	2.5"	6,400
210	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	2/28/2011	RAIN	2.5"	52,000
211	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	2/28/2011	RAIN	2.5"	52,000
212	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	2/28/2011	RAIN	2.5"	158,000
213	MH:E10-F20-16	EAST PLANT	470 OAK RIDGE TURNPIKE	2/28/2011	RAIN	2.5"	8,800
214	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	2/28/2011	RAIN	2.5"	43,200
215	MH:W6-F13-10	CENTRAL CITY	110 PROVIDENCE RD.	2/28/2011	RAIN	2.5"	12,000
216	MH:W5A(W5)-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	2/28/2011	RAIN	2.5"	138,875
217	MH:W2-L14-26	Y12	106 QUINCY AVE.	2/28/2011	RAIN	2.5"	1,560
218	MH:W10-E10-20	TURTLE PARK	270 ROBERTSVILLE RD.	2/28/2011	RAIN	2.5"	24,750
219	MH:W13-D7-21	TURTLE PARK	451 ROBERTSVILLE RD.	2/28/2011	RAIN	2.5"	36,250
220	MH:W19-H11-4	Y12	191 TUSCULUM DR.	2/28/2011	RAIN	2.5"	39,000
221	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	3/6/2011	RAIN	2.44"	195,000

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
222	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	3/6/2011	RAIN	2.44"	106,500
223	MH:E13A-F20-36	EAST PLANT	100 DRESDEN	3/6/2011	RAIN	2.44"	108,000
224	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	3/6/2011	RAIN	2.44"	104,000
225	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	3/6/2011	RAIN	2.44"	86,100
226	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	3/6/2011	RAIN	2.44"	134,000
227	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	3/6/2011	RAIN	2.44"	132,000
228	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	3/6/2011	RAIN	2.44"	132,000
229	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	3/6/2011	RAIN	2.44"	166,500
230	MH:W5A(W5)-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	3/6/2011	RAIN	2.44"	180,400
231	MH:W19-H11-4	Y12	191 TUSCULUM DR.	3/6/2011	RAIN	2.44"	26,250
232	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	3/9/2011	RAIN	1.71"	31,500
233	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	3/9/2011	RAIN	1.71"	17,250
234	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	3/9/2011	RAIN	1.71"	54,000
235	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	3/9/2011	RAIN	1.71"	26,500
236	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	3/9/2011	RAIN	1.71"	64,625
237	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	3/9/2011	RAIN	1.71"	14,000
238	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	3/9/2011	RAIN	1.71"	14,000
239	MH:E10-F20-16	EAST PLANT	470 OAK RIDGE TURNPIKE	3/9/2011	RAIN	1.71"	1,750
240	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	3/9/2011	RAIN	1.71"	27,900
241	MH:W5A(W5)-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	3/9/2011	RAIN	1.71"	105,000
242	MH:W19-H11-4	Y12	191 TUSCULUM DR.	3/9/2011	RAIN	1.71"	18,100
243	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	3/9/2011	RAIN	1.71"	34,000
244	MH:W5A(W5)-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	3/10/2011	RAIN	0.57"	50,500
245	MH:E6-E18-64	EAST PLANT	102 E. GENVEA LN.	3/28/2011	ROOTS		15
246	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	4/5/2011	RAIN	1.87"	26,100
247	MH:W11-E10-19	TURTLE PARK	IROQUOIS RD. @ ROBERTSVILLE RD.	4/5/2011	RAIN	1.87"	2,460

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
248	MH:W5A(W5)-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	4/5/2011	RAIN	1.87"	47,400
249	MH:W19-H11-4	Y12	191 TUSCULUM DR.	4/5/2011	RAIN	1.87"	3,050
250	MH:E10-E20-9	EAST PLANT	104 EAST DARWIN RD.	4/12/2011	ROOTS		900
251	MH:E10-E20-8	EAST PLANT	104 EAST DARWIN RD.	4/12/2011	ROOTS		180
252	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	4/16/2011	RAIN	3.44"	36,200
253	MH:E5B-L22-4	EMORY VALLEY	108 BAY PATH DR.	4/16/2011	RAIN	3.44"	9,500
254	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	4/16/2011	RAIN	3.44"	15,300
255	MH:E13A-F20-36	EAST PLANT	100 DRESDEN	4/16/2011	RAIN	3.44"	4,750
256	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	4/16/2011	RAIN	3.44"	10,800
257	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	4/16/2011	RAIN	3.44"	116,750
258	MH:W5-G13-12	CENTRAL CITY	1289 OAK RIDGE TURNPIKE	4/16/2011	RAIN	3.44"	1,760
259	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	4/16/2011	RAIN	3.44"	14,600
260	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	4/16/2011	RAIN	3.44"	14,400
261	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	4/16/2011	RAIN	3.44"	30,400
262	MH:E10-F20-16	EAST PLANT	470 OAK RIDGE TURNPIKE	4/16/2011	RAIN	3.44"	6,800
263	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	4/16/2011	RAIN	3.44"	36,800
264	MH:W5A(W5)-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	4/16/2011	RAIN	3.44"	134,000
265	MH:W19-H11-4	Y12	191 TUSCULUM DR.	4/16/2011	RAIN	3.44"	3,000
266	MH:E11-E23-64	EAST PLANT	ATHENS @ E. ARROWWOOD	4/28/2011	RAIN	2.95"	4,000
267	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	4/28/2011	RAIN	2.95"	17,000
268	MH:E5B-L22-4	EMORY VALLEY	108 BAY PATH DR.	4/28/2011	RAIN	2.95"	8,000
269	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	4/28/2011	RAIN	2.95"	13,000
270	MH:E13A-F20-36	EAST PLANT	100 DRESDEN	4/28/2011	RAIN	2.95"	3,000
271	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	4/28/2011	RAIN	2.95"	18,000
272	MH:W11-E10-19	TURTLE PARK	IROQUOIS RD. @ ROBERTSVILLE RD.	4/28/2011	RAIN	2.95"	12,500
273	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	4/28/2011	RAIN	2.95"	40,000
274	MH:W5-G13-12	CENTRAL CITY	1289 OAK RIDGE TURNPIKE	4/28/2011	RAIN	2.95"	4,000

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
275	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	4/28/2011	RAIN	2.95"	17,000
276	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	4/28/2011	RAIN	2.95"	18,000
277	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	4/28/2011	RAIN	2.95"	17,000
278	MH:E10-F20-16	EAST PLANT	470 OAK RIDGE TURNPIKE	4/28/2011	RAIN	2.95"	4,500
279	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	4/28/2011	RAIN	2.95"	18,000
280	MH:W5A(W5)-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	4/28/2011	RAIN	2.95"	65,000
281	MH:W10-E10-20	TURTLE PARK	270 ROBERTSVILLE RD.	4/28/2011	RAIN	2.95"	10,000
282	MH:W19-H11-4	Y12	191 TUSCULUM DR.	4/28/2011	RAIN	2.95"	4,500
283	MH:W18G-D4-36	TURTLE PARK	109 BEVERLY CIR.	5/24/2011	ROOTS		3,000
284	MH:W18G-E4-6	TURTLE PARK	117 BEVERLY CIR.	5/24/2011	ROOTS		2,500
285	MH:W8-E12-11	CENTRAL CITY	130 PROVIDENCE RD.	6/5/2011	ROOTS		7,000
286	MH:W12-D9-12	TURTLE PARK	264 JEFFERSON AVE.	6/8/2011	ROOTS		85
287	MH:W5-F15-16	CENTRAL CITY	110 W. VANCE RD.	6/9/2011	ROOTS		20
288	MH:W5-F15-21	CENTRAL CITY	114 W. VANCE RD.	6/9/2011	ROOTS		20
289	MH:W16-D3-43	TURTLE PARK	220 BUTLER RD.	6/15/2011	OTHER	ROOTS & PLASTIC BAG	1
290	MH:E5B-L22-4	EMORY VALLEY	108 BAY PATH DR.	6/24/2011	RAIN	2.08"	8,000
291	MH:E10-F20-35	EAST PLANT	470 OAK RIDGE TURNPIKE	6/24/2011	RAIN	2.08"	4,000
292	MH:E11-E23-64	EAST PLANT	ATHENS RD. @ E. ARROWWOOD RD.	6/24/2011	RAIN	2.08"	4,000
293	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	6/24/2011	RAIN	2.08"	39,800
294	MH:W5A-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	6/24/2011	RAIN	2.08"	16,000
295	MH:W26-U14-10	Y12	PUMPHOUSE RD.	6/24/2011	RAIN	POWER OUTAGE	13,000
296	MH:W26-U14-11	Y12	PUMPHOUSE RD.	6/24/2011	RAIN	POWER OUTAGE	26,000
297	MH:E11-E23-64	EAST PLANT	ATHENS RD. @ E. ARROWWOOD RD.	7/15/2011	RAIN	2.15"	5,000
298	MH:W5A-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	7/15/2011	RAIN	2.15"	1,500

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
299	MH:E5B-L22-4	EMORY VALLEY	108 BAY PATH DR.	9/5/2011	RAIN	7.45"	475,600
300	MH:E10-F20-35	EAST PLANT	470 OAK RIDGE TURNPIKE	9/5/2011	RAIN	7.45"	115,700
301	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	9/5/2011	RAIN	7.45"	175,200
302	MH:E11-E23-64	EAST PLANT	ATHENS RD. @ E. ARROWWOOD RD.	9/5/2011	RAIN	7.45"	175,800
303	MH:E13A-F20-36	EAST PLANT	100 DRESDEN RD.	9/5/2011	RAIN	7.45"	236,400
304	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	9/5/2011	RAIN	7.45"	293,500
305	MH:E13A-F21-1	EAST PLANT	BELGRADE RD.	9/5/2011	RAIN	7.45"	59,550
306	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	9/5/2011	RAIN	7.45"	299,750
307	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	9/5/2011	RAIN	7.45"	407,500
308	MH:W5A-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	9/5/2011	RAIN	7.45"	546,800
309	MH:W5-G13-12	CENTRAL CITY	1289 OAK RIDGE TURNPIKE	9/5/2011	RAIN	7.45"	170,250
310	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	9/5/2011	RAIN	7.45"	394,200
311	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	9/5/2011	RAIN	7.45"	113,100
312	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	9/5/2011	RAIN	7.45"	168,900
313	MH:W10-E10-20	TURTLE PARK	270 ROBERTSVILLE RD.	9/5/2011	RAIN	7.45"	51,400
314	MH:W11-E10-19	TURTLE PARK	IROQUOIS RD@ROBERTSVILLE RD.	9/5/2011	RAIN	7.45"	204,400
315	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	9/5/2011	RAIN	7.45"	292,250
316	MH:W18A-J12-11	Y12	324 S. ILLINOIS AVE.	9/5/2011	RAIN	7.45"	310,500
317	MH:W19-H11-4	Y12	191 TUSCULUM DR.	9/5/2011	RAIN	7.45"	109,500
318	MH:W12-D9-15	TURTLE PARK	244 JEFFERSON AVE.	9/7/2011	RAIN	7.45" previous	1,000
319	MH:W12-D9-15	TURTLE PARK	244 JEFFERSON AVE	9/7/2011	OTHER	SIGNS OF OVERFLOLW	1,000
320	MH:W12-D9-3	TURTLE PARK	253 JEFFERSON AVE	9/12/2011	OTHER	ROOTS, GREASE, RAGS	500
321	MH:E22-G20-4	EAST PLANT	105 CLARK LANE	9/29/2011	POWER OUTAGE	LIFT STATION POWER TURNED OFF	360
322	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	10/19/2011	RAIN	2"	19,100
323	MH:W5A-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	10/19/2011	RAIN	2"	1,000

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
324	MH:E5B-L22-4	EMORY VALLEY	108 BAY PATH DR.	11/16/2011	RAIN	3.02"	6,500
325	MH:E10-F20-35	EAST PLANT	470 OAK RIDGE TURNPIKE	11/16/2011	RAIN	3.02"	39,600
326	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	11/16/2011	RAIN	3.02"	40,800
327	MH:E11-E23-64	EAST PLANT	ATHENS RD. @ E. ARROWWOOD RD.	11/16/2011	RAIN	3.02"	41,000
328	MH:E13A-F20-36	EAST PLANT	100 DRESDEN RD.	11/16/2011	RAIN	3.02"	22,900
329	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	11/16/2011	RAIN	3.02"	44,400
330	MH:E13A-F21-1	EAST PLANT	BELGRADE RD.	11/16/2011	RAIN	3.02"	11,250
331	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	11/16/2011	RAIN	3.02"	14,300
332	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	11/16/2011	RAIN	3.02"	26,900
333	MH:W5A-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	11/16/2011	RAIN	3.02"	182,500
334	MH:W5-G13-12	CENTRAL CITY	1289 OAK RIDGE TURNPIKE	11/16/2011	RAIN	3.02"	13,600
335	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/16/2011	RAIN	3.02"	122,500
336	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/16/2011	RAIN	3.02"	6,150
337	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/16/2011	RAIN	3.02"	6,000
338	MH:W6-F13-10	CENTRAL CITY	110 PROVIDENCE RD.	11/16/2011	RAIN	3.02"	4,600
339	MH:W6-E14-7	CENTRAL CITY	116W. NEWKIRK LN.	11/16/2011	RAIN	3.02"	19,000
340	MH:W10-E10-20	TURTLE PARK	270 ROBERTSVILLE RD.	11/16/2011	RAIN	3.02"	1,000
341	MH:W11-E10-19	TURTLE PARK	IROQUOIS RD@ROBERTSVILLE RD.	11/16/2011	RAIN	3.02"	15,700
342	MH:W12-D9-6	TURTLE PARK	215 JEFFERSON AVE.	11/16/2011	RAIN	3.02"	2,000
343	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	11/16/2011	RAIN	3.02"	80,500
344	MH:W18A-J12-11	Y12	324 S. ILLINOIS AVE.	11/16/2011	RAIN	3.02"	3,300
345	MH:W18G-D2-2	TURTLE PARK	MONTEREY RD.	11/16/2011	RAIN	3.02"	165,000
346	MH:W19-H11-4	Y12	191 TUSCULUM DR.	11/16/2011	RAIN	3.02"	16,000
347	MH:E5B-L22-4	EMORY VALLEY	108 BAY PATH DR.	11/22/2011	RAIN	2.06"	19,100
348	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	11/22/2011	RAIN	2.06"	14,600
349	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	11/22/2011	RAIN	2.06"	17,000

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
350	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	11/22/2011	RAIN	2.06"	40,600
351	MH:W5A-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	11/22/2011	RAIN	2.06"	65,000
352	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/22/2011	RAIN	2.06"	12,000
353	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/22/2011	RAIN	2.06"	12,000
354	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/22/2011	RAIN	2.06"	11,900
355	MH:W12-D9-6	TURTLE PARK	215 JEFFERSON AVE.	11/22/2011	RAIN	2.06"	75
356	MH:W12-E9-15	TURTLE PARK	ROBERTSVILLE RD. @ JEFFERSON AVE.	11/22/2011	RAIN	2.06"	4,500
357	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	11/22/2011	RAIN	2.06"	5,000
358	MH:W18G-D2-2	TURTLE PARK	MONTEREY RD.	11/22/2011	RAIN	2.06"	90,000
359	MH:E5B-L22-4	EMORY VALLEY	108 BAY PATH DR.	11/28/2011	RAIN	4.8"	450,000
360	MH:E5B-L21-5A	EMORY VALLEY	99 BRIARCLIFF AVE.	11/28/2011	RAIN	4.8"	2,040
361	MH:E9-E19-3	EAST PLANT	103 TAYLOR RD.	11/28/2011	RAIN	4.8"	144,300
362	MH:E10-F20-19	EAST PLANT	106 CALIFORNIA AVE.	11/28/2011	RAIN	4.8"	143,700
363	MH:E10-F20-35	EAST PLANT	470 OAK RIDGE TURNPIKE	11/28/2011	RAIN	4.8"	388,500
364	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	11/28/2011	RAIN	4.8"	362,400
365	MH:E12-E23-4	EAST PLANT	130 ATHENS RD.	11/28/2011	RAIN	4.8"	2,000
366	MH:E13A-F20-36	EAST PLANT	100 DRESDEN RD.	11/28/2011	RAIN	4.8"	288,000
367	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	11/28/2011	RAIN	4.8"	392,250
368	MH:E13A-F21-1	EAST PLANT	BELGRADE RD.	11/28/2011	RAIN	4.8"	144,100
369	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	11/28/2011	RAIN	4.8"	370,400
370	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	11/28/2011	RAIN	4.8"	375,000
371	MH:W4-K10-9	Y12	500 TUSKEGEE DR.	11/28/2011	RAIN	4.8"	2,920
372	MH:W5A-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	11/28/2011	RAIN	4.8"	573,000
373	MH:W5-G13-12	CENTRAL CITY	1289 OAK RIDGE TURNPIKE	11/28/2011	RAIN	4.8"	286,400
374	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/28/2011	RAIN	4.8"	430,500
375	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/28/2011	RAIN	4.8"	68,300
376	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	11/28/2011	RAIN	4.8"	136,300

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

Item	Location	Sewershed	Address	Start Date	Cause	Comments	Volume (gal)
377	MH:W6-F13-9	CENTRAL CITY	110 PROVIDENCE RD.	11/28/2011	RAIN	4.8"	134,400
378	MH:W6-F13-10	CENTRAL CITY	110 PROVIDENCE RD.	11/28/2011	RAIN	4.8"	134,400
379	MH:W6-E14-7	CENTRAL CITY	116W. NEWKIRK LN.	11/28/2011	RAIN	4.8"	287,200
380	MH:W6-E14-35?	CENTRAL CITY	103 UMBRIA LN.	11/28/2011	RAIN	4.8"	150
381	MH:W10-E10-20	TURTLE PARK	270 ROBERTSVILLE RD.	11/28/2011	RAIN	4.8"	131,600
382	MH:W11-D9-43	TURTLE PARK	143 IROQUOIS RD.	11/28/2011	RAIN	4.8"	UNK
383	MH:W11-D9-42	TURTLE PARK	143 IROQUOIS RD.	11/28/2011	RAIN	4.8"	4,640
384	MH:W11-E10-19	TURTLE PARK	IROQUOIS RD@ROBERTSVILLE RD.	11/28/2011	RAIN	4.8"	322,500
385	MH:W12-D9-6	TURTLE PARK	215 JEFFERSON AVE.	11/28/2011	RAIN	4.8"	191,700
386	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	11/28/2011	RAIN	4.8"	323,250
387	MH:W18A-J12-11	Y12	324 S. ILLINOIS AVE.	11/28/2011	RAIN	4.8"	258,800
388	MH:W18G-D2-2	TURTLE PARK	MONTEREY RD.	11/28/2011	RAIN	4.8"	376,200
389	MH:W19-H11-4	Y12	191 TUSCULUM DR.	11/28/2011	RAIN	4.8"	193,650
390	MH:W19-H11-7	Y12	196 TUSCULUM DR.	11/28/2011	RAIN	4.8"	9,600
391	MH:W11-D9-42	TURTLE PARK	143 IROQUOIS RD.	11/28/2011	RAIN	4.8"	100
392	MH:E11-E23-64	EAST PLANT	ATHENS RD. @ E. ARROWWOOD RD.	12/2/2011	RAIN	4.8" previous	286,800
393	MH:E10-F20-35	EAST PLANT	470 OAK RIDGE TURNPIKE	12/7/2011	RAIN	2.1"	3,850
394	MH:E11-E22-32	EAST PLANT	119 ATHENS RD.	12/7/2011	RAIN	2.1"	7,140
395	MH:E13A-F20-36	EAST PLANT	100 DRESDEN RD.	12/7/2011	RAIN	2.1"	312
396	MH:E13A-G20-27	EAST PLANT	535 OAK RIDGE TURNPIKE	12/7/2011	RAIN	2.1"	12,500
397	MH:E13B-G22-14	EAST PLANT	151 CAIRO LN.	12/7/2011	RAIN	2.1"	26,900
398	MH:E20-L24-1	EMORY VALLEY	695 MELTON LAKE DR.	12/7/2011	RAIN	2.1"	55,800
399	MH:W5A-G15-13	CENTRAL CITY	117 N. PURDUE AVE.	12/7/2011	RAIN	2.1"	83,400
400	MH:W5-G11-8	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	12/7/2011	RAIN	2.1"	30,700
401	MH:W5-G12-1	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	12/7/2011	RAIN	2.1"	3,400

**TABLE A-1 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**HISTORICAL OVERFLOWS FOR FIVE-YEAR PERIOD 2007 THROUGH 2011**

<b>Item</b>	<b>Location</b>	<b>Sewershed</b>	<b>Address</b>	<b>Start Date</b>	<b>Cause</b>	<b>Comments</b>	<b>Volume (gal)</b>
402	MH:W5-G12-2	CENTRAL CITY	1403 OAK RIDGE TURNPIKE	12/7/2011	RAIN	2.1"	8,400
403	MH:W18A-J11-16	Y12	216 S. ILLINOIS AVE.	12/7/2011	RAIN	2.1"	5,100
404	MH:W19-H11-4	Y12	191 TUSCULUM DR.	12/7/2011	RAIN	2.1"	1,560
405	MH:W14-D5-58	TURTLE PARK	107 SALEM ROAD	12/19/2011	ROOTS		50

**TABLE A-2**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DEPARTURES FROM ORIGINAL ASSESSMENT PLAN**

1. The SSOAP software was used to analyze and manage all rainfall gauge data. However, the software was not used to analyze and manage the flow meter data. Flow data were analyzed using the proprietary software packages that accompanied the Flo-Tote and ISCO meters: Flo-Ware and Flowlink, respectively. In addition, SSOAP was not used to perform the RDII parameter analysis or to generate RDII input hydrographs for the SewerGEMS Sanitary model. Instead the EPA SWMM model was used as described in this report.
2. Abstraction parameters were not used in the RDII unit hydrograph analysis. The R, T and K parameters for each of the three unit hydrographs for each location provide sufficient definition of the response of the system to rainfall.
3. Sewage flows were based on observed flow data. The observed flows were also used for the design condition model instead of criteria-based values due to the relatively low per capita use of water in the sewer basin. Observed water use data for a recent year was used to verify the magnitude of sewage flows to be expected, but were not used directly to calibrate the model, or to develop the design condition model.
4. Due to the magnitude of pipe and manhole surcharging and manhole flooding under design conditions, the capacity assessment approach was modified. Capacity assessment consisted of comparing simulated flows for the design condition with full-flow gravity pipe capacities, identifying the pipes flowing full (gravity and surcharged), identifying manholes with overflows, and reviewing depths of water in manholes.



**TABLE A-4  
CITY OF OAK RIDGE, TENNESSEE  
SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT  
SOUTH GATE RAIN GAUGE ANALYSIS (SSOAP)  
DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
1	5/23/2011 15:00	0.01	0.17	0.01	0
2	5/26/2011 12:00	0.05	0.5	0.05	2.9
3	5/26/2011 19:40	0.11	2.83	0.06	0.3
4	6/1/2011 15:10	0	0.17	0	5.7
5	6/5/2011 18:30	0.01	0.17	0.01	4.1
6	6/14/2011 15:00	0	0.17	0	8.9
7	6/15/2011 13:50	2.42	5.33	1.15	1
8	6/18/2011 12:30	1.5	4.5	0.87	2.7
9	6/19/2011 6:00	0.54	6.67	0.52	0.5
10	6/21/2011 20:30	0.13	1.33	0.11	2.3
11	6/22/2011 7:40	1.36	14.5	1.03	0.4
12	6/23/2011 5:30	0.03	0.33	0.03	0.3
13	6/24/2011 1:00	1.11	3.83	0.61	0.8
14	6/24/2011 11:10	0.01	0.17	0.01	0.3
15	6/26/2011 9:10	0.41	4.5	0.36	1.9
16	6/27/2011 17:20	0.18	0.67	0.18	1.2
17	6/28/2011 6:40	0.01	0.17	0.01	0.5
18	6/28/2011 14:50	0	0.17	0	0.3
19	7/4/2011 14:00	0.19	1	0.19	6
20	7/5/2011 20:40	0.01	0.17	0.01	1.2

**TABLE A-4 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**SOUTH GATE RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

Event	Start Date/Time	Volume (Ins)	Duration (Hrs)	Peak Intensity (Ins/Hr)	Antecedent Dry Period (Days)
21	7/6/2011 13:20	0	0.17	0	0.7
22	7/8/2011 8:20	0.01	0.17	0.01	1.8
23	7/12/2011 6:40	0.13	6.83	0.12	3.9
24	7/13/2011 14:00	0.01	0.5	0.01	1
25	7/14/2011 18:10	2.42	12.33	1.15	1.2
26	7/15/2011 13:50	0.83	7.67	0.29	0.3
27	7/19/2011 13:00	0	0.17	0	3.7
28	7/21/2011 12:10	0.23	2.17	0.17	2
29	7/25/2011 14:30	0.11	2	0.07	4
30	7/26/2011 15:20	0	0.17	0	1
31	7/30/2011 16:00	0.02	5	0.01	4
32	8/3/2011 15:10	0	0.17	0	3.8
33	8/3/2011 23:30	0.4	2.17	0.37	0.3
34	8/6/2011 15:40	0.38	0.67	0.38	2.6
35	8/8/2011 13:50	0.28	5.67	0.27	1.9
36	8/9/2011 17:50	0.01	0.17	0.01	0.9
37	8/10/2011 20:30	0.02	0.33	0.02	1.1
38	8/12/2011 11:40	0	0.17	0	1.6
39	8/19/2011 19:50	0.24	0.83	0.24	7.3
40	8/24/2011 14:40	0	0.17	0	4.8
41	9/3/2011 18:30	0.63	2.83	0.59	10.2

**TABLE A-4 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**SOUTH GATE RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
42	9/4/2011 17:30	7.11	26.17	1.14	0.8
43	9/6/2011 13:30	0.29	7	0.14	0.8
44	9/7/2011 10:20	0.01	0.17	0.01	0.6
45	9/8/2011 14:40	0.01	0.17	0.01	1.2
46	9/9/2011 14:10	0	0.17	0	1
47	9/10/2011 10:50	0.01	0.17	0.01	0.9
48	9/15/2011 8:10	0.07	1	0.07	4.9
49	9/21/2011 3:40	0.42	12.33	0.2	5.8
50	9/23/2011 1:10	0.14	0.83	0.14	1.4
51	9/23/2011 11:20	0.02	0.33	0.02	0.4
52	9/26/2011 13:30	0.34	3.83	0.25	3.1
53	9/28/2011 15:30	0	0.17	0	1.9
54	10/13/2011 15:40	0.04	2.33	0.02	15
55	10/14/2011 8:10	0.01	0.33	0.01	0.6
56	10/27/2011 21:00	0.03	0.5	0.03	13.5
57	10/28/2011 8:10	0.88	10.17	0.21	0.5
58	10/29/2011 0:20	0.07	9.33	0.04	0.3
59	11/1/2011 13:40	0	0.17	0	3.2
60	11/3/2011 14:00	0.73	7.33	0.32	2
61	11/4/2011 4:20	0.04	10.83	0.03	0.3
62	11/9/2011 16:10	0.08	2.67	0.05	5

**TABLE A-4 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**SOUTH GATE RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
63	11/10/2011 16:10	0	0.17	0	0.9
64	11/14/2011 18:30	0.95	11.5	0.67	4.1
65	11/15/2011 14:50	2.03	27	0.93	0.4
66	11/17/2011 4:20	0.04	0.67	0.04	0.4
67	11/17/2011 11:10	0.01	0.17	0.01	0.3
68	11/18/2011 14:10	0	0.17	0	1.1
69	11/20/2011 16:10	0.07	6.5	0.04	2.1
70	11/21/2011 9:40	0.89	7	0.42	0.5
71	11/22/2011 8:20	0.01	0.17	0.01	0.7
72	11/22/2011 14:40	1.11	9.67	0.53	0.3
73	11/23/2011 15:40	0	0.17	0	0.6
74	11/27/2011 10:00	4.67	34.67	0.31	3.8
75	11/29/2011 11:50	0.02	6.5	0.01	0.6
76	12/1/2011 11:10	0.01	0.17	0.01	1.7
77	12/5/2011 19:20	0.75	15.83	0.2	4.3
78	12/6/2011 20:30	1.24	19.83	0.14	0.4
79	12/8/2011 9:50	0.01	5.17	0.01	0.7
80	12/12/2011 18:10	0.02	0.17	0.02	4.1
81	12/13/2011 6:00	0.01	0.17	0.01	0.5
82	12/14/2011 14:20	0	0.17	0	1.3
83	12/15/2011 21:00	0.15	3.17	0.14	1.3

**TABLE A-4 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**SOUTH GATE RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
84	12/16/2011 6:30	0.37	14.5	0.11	0.3
85	12/19/2011 16:10	0	0.17	0	2.8
86	12/21/2011 7:00	0.21	6.33	0.09	1.6
87	12/22/2011 14:30	0.87	6.67	0.41	1.1
88	12/24/2011 13:00	0.01	0.17	0.01	1.7
89	12/27/2011 0:00	0.91	19.17	0.24	2.5
90	12/28/2011 11:30	0.01	0.17	0.01	0.7
91	12/29/2011 11:40	0	0.17	0	1
92	1/1/2012 11:10	0.07	0.33	0.07	3
93	1/7/2012 11:50	0.29	6.67	0.19	6
94	1/8/2012 17:00	0.05	2.17	0.03	0.9
95	1/9/2012 5:20	0.29	3.5	0.27	0.4
96	1/10/2012 12:30	0.01	3	0.01	1.2
97	1/26/2012 8:30	1.21	16.83	0.46	15.7
98	1/27/2012 10:40	0.01	0.17	0.01	0.4

**TABLE A-5  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
EAST PLANT RAIN GAUGE ANALYSIS (SSOAP)  
DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
1	6/9/2011 14:20	0.36	0.83	0.36	0
2	6/14/2011 15:30	0	0.17	0	5
3	6/15/2011 13:50	1.85	5.33	1.11	0.9
4	6/18/2011 12:30	1.03	3	0.65	2.7
5	6/19/2011 5:50	0.93	9.83	0.78	0.6
6	6/19/2011 22:20	0.01	0.17	0.01	0.3
7	6/21/2011 20:30	0.11	4.5	0.09	1.9
8	6/22/2011 11:10	0.94	11.5	0.63	0.4
9	6/23/2011 5:40	0.02	3.17	0.01	0.3
10	6/23/2011 18:20	2.54	10	1.03	0.4
11	6/26/2011 9:10	0.28	6.83	0.22	2.2
12	6/27/2011 17:30	0.1	0.33	0.1	1.1
13	6/28/2011 2:10	0.01	0.17	0.01	0.4
14	6/28/2011 11:20	0.01	4	0.01	0.4
15	7/4/2011 14:00	0.14	1.17	0.14	6
16	7/5/2011 18:10	0.03	5.67	0.01	1.1
17	7/6/2011 17:00	0	0.17	0	0.7
18	7/8/2011 8:30	0.05	0.5	0.05	1.6
19	7/12/2011 6:40	0.24	2.17	0.23	3.9
20	7/13/2011 11:50	0	0.17	0	1.1

**TABLE A-5 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**EAST PLANT RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
21	7/14/2011 23:10	3.38	7.5	2.31	1.5
22	7/15/2011 15:40	0.93	6.33	0.41	0.4
23	7/16/2011 9:40	0.01	0.17	0.01	0.5
24	7/19/2011 14:10	0	0.17	0	3.2
25	7/21/2011 11:50	0.32	2.67	0.28	1.9
26	7/25/2011 5:00	0.06	0.33	0.06	3.6
27	7/25/2011 15:10	0.01	0.17	0.01	0.4
28	7/26/2011 15:50	0	0.17	0	1
29	7/30/2011 15:30	0.64	5.5	0.62	4
30	7/31/2011 8:10	0.01	0.17	0.01	0.5
31	8/3/2011 15:30	0	0.17	0	3.3
32	8/3/2011 23:40	0.14	2.67	0.13	0.3
33	8/6/2011 15:40	0.49	0.67	0.49	2.6
34	8/8/2011 14:10	0.11	5.33	0.06	1.9
35	8/9/2011 3:30	0.01	0.17	0.01	0.3
36	8/10/2011 20:30	0.03	0.83	0.03	1.7
37	8/12/2011 12:40	0	0.17	0	1.6
38	8/13/2011 23:30	0.01	0.17	0.01	1.5
39	8/19/2011 15:00	0.05	5.83	0.03	5.6
40	8/24/2011 15:30	0	0.17	0	4.8
41	9/3/2011 19:00	0.26	3.5	0.25	10.1

**TABLE A-5 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**EAST PLANT RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
42	9/4/2011 17:30	7.49	66.17	0.96	0.8
43	9/9/2011 14:30	0	0.17	0	2.1
44	9/10/2011 11:00	0.01	0.17	0.01	0.9
45	9/12/2011 8:50	0.01	0.17	0.01	1.9
46	9/15/2011 8:10	0.05	1	0.05	3
47	9/17/2011 5:40	0.01	0.17	0.01	1.9
48	9/19/2011 21:00	0.08	5.67	0.04	2.6
49	9/21/2011 3:50	0.49	13	0.27	1.1
50	9/23/2011 1:10	0.17	6.67	0.16	1.4
51	9/26/2011 14:10	0.55	10	0.34	3.3
52	9/28/2011 15:50	0	0.17	0	1.7
53	10/8/2011 8:30	0.01	0.17	0.01	9.7
54	10/11/2011 6:00	0.45	16.33	0.11	2.9
55	10/13/2011 2:20	0.49	16.17	0.29	1.2
56	10/14/2011 8:40	0	0.17	0	0.6
57	10/18/2011 22:30	2.03	12.67	0.42	4.6
58	10/20/2011 13:40	0.01	1.67	0.01	1.1
59	10/23/2011 10:40	0.01	0.17	0.01	2.8
60	10/25/2011 11:30	0	0.17	0	2
61	11/9/2011 16:10	0.03	1.33	0.02	15.2
62	11/10/2011 9:20	0.01	1.83	0.01	0.7

**TABLE A-5 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**EAST PLANT RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

Event	Start Date/Time	Volume (Ins)	Duration (Hrs)	Peak Intensity (Ins/Hr)	Antecedent Dry Period (Days)
63	11/14/2011 18:30	0.01	0.17	0.01	4.3
64	11/15/2011 1:20	0.4	4.17	0.23	0.3
65	11/15/2011 14:20	1.16	27.5	0.49	0.4
66	11/17/2011 4:20	0.03	5.33	0.02	0.4
67	11/18/2011 13:10	0	0.17	0	1.2
68	11/20/2011 16:00	0.5	26.67	0.24	2.1
69	11/22/2011 14:40	0.66	9.67	0.28	0.8
70	11/23/2011 14:30	0.01	1.67	0.01	0.6
71	12/15/2011 20:40	0.11	1.83	0.1	22.2
72	12/16/2011 6:20	0.21	10.67	0.05	0.3
73	12/18/2011 11:00	0.01	0.17	0.01	1.8
74	12/19/2011 16:40	0	0.17	0	1.2
75	12/21/2011 8:00	0.12	5.5	0.04	1.6
76	12/22/2011 15:10	0	0.17	0	1.1
77	1/1/2012 11:10	0.04	0.17	0.04	9.8
78	1/4/2012 16:30	0	0.17	0	3.2
79	1/11/2012 1:20	0.77	20	0.34	6.4
80	1/12/2012 3:50	0.02	5.83	0.01	0.3
81	1/12/2012 16:10	0.06	0.83	0.06	0.3
82	1/17/2012 7:00	0.19	9	0.12	4.6
83	1/26/2012 8:40	0.7	16.83	0.28	8.7

**TABLE A-5 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**EAST PLANT RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
84	1/28/2012 9:30	0.01	0.17	0.01	1.3

**TABLE A-6  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
TURTLE PARK RAIN GAUGE ANALYSIS (SSOAP)  
DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
1	5/26/2011 12:10	0.04	0.5	0.04	0
2	5/26/2011 18:50	0.16	3.5	0.11	0.3
3	6/1/2011 16:20	0	0.17	0	5.8
4	6/5/2011 18:20	0.03	0.33	0.03	4.1
5	6/11/2011 22:30	0.06	0.83	0.06	6.2
6	6/14/2011 13:50	0	0.17	0	2.6
7	6/15/2011 13:40	1.73	5.67	0.96	1
8	6/18/2011 12:20	1.24	3	0.9	2.7
9	6/19/2011 11:40	0.44	0.67	0.44	0.9
10	6/21/2011 20:30	0.09	1.33	0.08	2.3
11	6/22/2011 10:50	1.46	11	0.91	0.5
12	6/23/2011 5:30	0.03	1.17	0.02	0.3
13	6/24/2011 1:10	0.7	4	0.57	0.8
14	6/26/2011 9:20	0.45	4.33	0.37	2.2
15	6/27/2011 17:20	0.24	0.67	0.24	1.2
16	6/28/2011 2:40	0.02	3.17	0.01	0.4
17	6/28/2011 14:50	0	0.17	0	0.4
18	7/4/2011 14:00	0.14	1.17	0.14	6
19	7/6/2011 16:30	0	0.17	0	2.1
20	7/8/2011 8:10	0.05	0.17	0.05	1.7

**TABLE A-6 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**TURTLE PARK RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
21	7/8/2011 14:30	0.01	0.17	0.01	0.3
22	7/12/2011 6:50	0.41	6.67	0.38	3.7
23	7/13/2011 12:30	0	0.17	0	1
24	7/15/2011 0:20	1.64	6	0.61	1.5
25	7/15/2011 15:10	0.84	7.83	0.42	0.4
26	7/19/2011 13:50	0	0.17	0	3.6
27	7/21/2011 12:20	0.31	0.83	0.31	1.9
28	7/25/2011 4:30	0.03	0.33	0.03	3.6
29	7/25/2011 14:20	0.13	1.5	0.09	0.4
30	7/26/2011 14:40	0	0.17	0	1
31	7/30/2011 15:30	0.13	0.67	0.13	4
32	8/3/2011 14:50	0	0.17	0	4
33	8/3/2011 23:10	1.13	2	1.11	0.3
34	8/6/2011 15:30	0.63	0.67	0.63	2.6
35	8/8/2011 13:40	0.31	0.83	0.31	1.9
36	8/9/2011 8:00	0.01	0.17	0.01	0.7
37	8/12/2011 11:50	0	0.17	0	3.2
38	8/19/2011 19:40	0.52	2.67	0.51	7.3
39	8/24/2011 15:00	0	0.17	0	4.7
40	8/26/2011 15:30	0.01	0.17	0.01	2
41	9/3/2011 18:50	0.19	1.83	0.15	8.1

**TABLE A-6 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**TURTLE PARK RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
42	9/4/2011 17:20	9.36	62.5	1.22	0.9
43	9/9/2011 13:00	0	0.17	0	2.2
44	9/12/2011 4:20	0.01	4.17	0.01	2.6
45	9/15/2011 8:00	0.13	5	0.12	3
46	9/19/2011 20:40	0.13	9.33	0.05	4.3
47	9/21/2011 3:20	1.2	13	0.53	0.9
48	9/23/2011 1:10	0.09	0.83	0.09	1.4
49	9/23/2011 11:10	0.04	2.5	0.03	0.4
50	9/26/2011 13:20	0.86	5.33	0.5	3
51	9/27/2011 13:10	0.01	0.17	0.01	0.8
52	9/28/2011 14:40	0	0.17	0	1.1
53	10/11/2011 7:30	0.64	16.17	0.19	12.7
54	10/13/2011 3:10	0.22	18.5	0.1	1.2
55	10/14/2011 8:20	0	0.17	0	0.5
56	10/18/2011 22:20	3.01	25	0.59	4.6
57	10/20/2011 14:30	0	0.17	0	0.6
58	10/25/2011 13:20	0.01	0.17	0.01	5
59	10/27/2011 21:00	0.06	0.67	0.06	2.3
60	10/28/2011 8:10	1.31	20.33	0.29	0.4
61	11/1/2011 11:40	0.01	1.17	0.01	3.3
62	11/3/2011 14:00	0.95	7.17	0.35	2.1

**TABLE A-6 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**TURTLE PARK RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
63	11/4/2011 4:40	0.05	0.83	0.05	0.3
64	11/4/2011 11:40	0.01	3.33	0.01	0.3
65	11/9/2011 16:00	0.07	2.67	0.03	5
66	11/10/2011 11:20	0	0.17	0	0.7
67	11/14/2011 18:20	0.02	0.33	0.02	4.3
68	11/15/2011 1:00	1.14	4.5	0.59	0.3
69	11/15/2011 14:40	2.61	27.67	1.3	0.4
70	11/17/2011 4:10	0.07	1.33	0.06	0.4
71	11/18/2011 13:40	0	0.17	0	1.3
72	11/20/2011 15:50	0.05	7.33	0.03	2.1
73	11/21/2011 9:40	1.13	7	0.52	0.4
74	11/22/2011 13:10	1.39	13.17	0.69	0.9
75	11/23/2011 15:10	0	0.17	0	0.5
76	11/27/2011 6:50	6.14	38.17	0.43	3.7
77	11/29/2011 12:50	0.03	4.67	0.02	0.7
78	11/30/2011 0:30	0.01	0.17	0.01	0.3
79	12/1/2011 10:00	0.01	0.17	0.01	1.4
80	12/5/2011 18:50	1.06	17.33	0.27	4.4
81	12/6/2011 20:40	1.72	20.33	0.19	0.4
82	12/8/2011 15:10	0	0.17	0	0.9
83	12/10/2011 10:40	0.01	0.17	0.01	1.8

**TABLE A-6 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**TURTLE PARK RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
84	12/12/2011 18:10	0.01	0.17	0.01	2.3
85	12/14/2011 13:40	0	0.17	0	1.8
86	12/15/2011 20:50	0.8	21	0.26	1.3
87	12/18/2011 12:00	0.01	0.17	0.01	1.8
88	12/19/2011 16:20	0	0.17	0	1.2
89	12/21/2011 6:50	0.24	6.33	0.1	1.6
90	12/22/2011 10:40	1.03	10.5	0.46	0.9
91	12/26/2011 10:20	0.01	0.17	0.01	3.6
92	12/26/2011 23:50	1.37	22.33	0.34	0.6
93	12/29/2011 10:40	0.01	0.5	0.01	1.5
94	1/1/2012 11:00	0.14	0.5	0.14	3
95	1/4/2012 16:50	0	0.17	0	3.2
96	1/7/2012 11:40	0.46	11.83	0.32	2.8
97	1/8/2012 17:00	0.05	1.33	0.04	0.7
98	1/9/2012 4:50	0.37	1.83	0.34	0.4
99	1/10/2012 3:10	0.01	0.17	0.01	0.9
100	1/10/2012 14:30	0	0.17	0	0.5
101	1/11/2012 0:50	1.86	19.83	0.41	0.4
102	1/12/2012 6:20	0.12	10.5	0.1	0.4
103	1/14/2012 14:10	0.01	0.17	0.01	1.9
104	1/17/2012 7:00	0.84	11.17	0.34	2.7

**TABLE A-6 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**TURTLE PARK RAIN GAUGE ANALYSIS (SSOAP)**  
**DATA THROUGH FEBRUARY 2, 2012**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
105	1/19/2012 10:30	0.01	0.17	0.01	1.7
106	1/20/2012 17:10	1.34	16.17	0.57	1.3
107	1/23/2012 3:20	1.27	5.67	0.5	1.8
108	1/24/2012 13:40	0	0.17	0	1.2
109	1/26/2012 8:30	1.78	17	0.68	1.8

**TABLE A-7  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
Y-12 RAIN GAUGE ANALYSIS (SSOAP)  
DATA THROUGH FEBRUARY 2, 2012 (PARTIAL)**

<b>Event</b>	<b>Start Date/Time</b>	<b>Volume (Ins)</b>	<b>Duration (Hrs)</b>	<b>Peak Intensity (Ins/Hr)</b>	<b>Antecedent Dry Period (Days)</b>
1	10/18/2011 22:30	2.71	25	0.55	0
2	10/24/2011 0:00	0	0.25	0	4
3	12/20/2011 0:15	0	0.25	0	57
4	12/21/2011 7:00	0.2	7	0.1	1.3
5	12/22/2011 15:45	1.06	5.5	0.44	1.1
6	12/27/2011 0:00	1.04	14	0.3	4.1
7	1/1/2012 11:15	0.13	0.75	0.13	4.9
8	1/7/2012 11:45	0.48	6.75	0.34	6
9	1/8/2012 17:00	0.05	1.5	0.04	0.9
10	1/9/2012 5:00	0.35	3.5	0.31	0.4
11	1/9/2012 16:30	0.01	0.25	0.01	0.3
12	1/11/2012 1:00	1.24	19.75	0.3	1.4
13	1/12/2012 3:30	0.01	0.25	0.01	0.3
14	1/12/2012 10:00	0.1	7.5	0.07	0.3
15	1/17/2012 7:15	0.71	11.25	0.25	4.6
16	1/20/2012 17:45	0.02	0.5	0.02	3
17	1/21/2012 0:30	1.27	8.75	0.58	0.3
18	1/23/2012 4:15	1.1	5.25	0.49	1.8
19	1/26/2012 8:30	1.28	17	0.48	3

**TABLE A-8  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
FLOW METER DEPLOYMENT SUMMARY**

Item	Reported Location	Reported Address	Pipe Dia (inches)*	Installed	Moved	Meter Type**	Meter SN	Type Location**	Sewershed**	Meter Location***
1	W18A-N13-8	Scarboro & Bear Creek	18	12-17-2010	Do Not Move	FT	C02050	SP	Y12	
2	E5B-L22-20	Influent to Emory Valley lift station	16	5-10-2011	Do Not Move	FT	46004495	SP	EV	
3	E13B-G22-11	S end of Cario	21	5-10-2011	Do Not Move	FT	A07124	SP	EP	
4	E13B-F22-12	Belgrade @ Cario	10	5-10-2011	Do Not Move	FT	A06838	SP	EP	
5	E25-H15-16	Emory Valley @ Fordham	21	5-10-2011	Do Not Move	FT	A07123	SP	CC	
6	W18D-F10-1	1650 OR Turnpike @ Eagles Lodge	36	5-12-2011	Do Not Move	FT	46004496	SP	TP	
7	W18F-F7-1	2000 OR Turnpike @ LA	36	5-12-2011	Do Not Move	FT	46004503	SP	TP	
8	W18G-E3-5	OR Turnpike @ Shannon Farm	42	5-12-2011	Do Not Move	FT	A06840	SP	TP	
9	E11-E22-12	126 Atlanta	8	5-25-2011	9-6-11	FT	46004497	T	EP	
10	E12-E23-4	130 Athens	10	5-25-2011		FT	46004498	T	EP	
11	E2-E15-1	186 Tennessee	8	6-29-2011	9-1-11	ISCO	211E02224	T	EP	
12	W6-E15-52	101 Ulena	8	6-29-2011	7-8-2011	ISCO	211E02223	T	CC	
13	E10-F20-18	102 California	8	6-22-2011	9-1-11	ISCO	211F00406	T	EP	
14	W6-E14-3	96 E Pasadena	8	6-30-2011	7-8-2011	ISCO	211E001692	T	CC	East
15	W6-E13-2	102 W Pawley	8	6-30-2011	7-8-2011	ISCO	211E02221	T	CC	North-Northeast
16	W6-E14-36	102 Umbria	8	6-30-2011	7-8-2011	ISCO	211E02220 (or 2222?)	T	CC	
17	E4-G17-3	106 Administration	12	7-8-2011	9-1-11 (removed)	ISCO	211E001692	T	EP	
18	E6-F19-47	Florida @ OR Turnpike	12	7-8-2011	9-1-11	ISCO	211E02221	T	EP	

**TABLE A-8 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**FLOW METER DEPLOYMENT SUMMARY**

Item	Reported Location	Reported Address	Pipe Dia (inches)*	Installed	Moved	Meter Type**	Meter SN	Type Location**	Sewershed**	Meter Location***
19	E3-F17-13	Tyler @ Tyrone	10	7-8-2011	9-1-11	ISCO	211E02223	T	EP	Northwest
20	E13A-G19-16	515 OR Turnpike	18	7-8-2011	9-1-11	ISCO	211E02222	T	EP	
21	E9-F20-7	169-175 Tacoma	10	9-20-11	10-25-11	ISCO	211E02223	T	EP	Northwest
22	W18A-H12-3	215 S. Hill @ Garden Plaza	10	9-20-11	10-25-11	ISCO	211E02220	T	Y12	
23	W18A-J11-15	246 S. Illinois @ Big Lots	12	9-16-11	10-25-11	ISCO	211G01267	T	Y12	
24	W18A-K12-9	380 S. Illinois @ Kroger	24	9-16-11	10-25-11	ISCO	211G01269	T	Y12	
25	W19-H11-7	Tusculum Rd @ Tiffin Rd	8	9-20-11	10-26-11	ISCO	211F00406	T	Y12	
26	W3-K13-41	231 Manhattan	12	9-20-11	10-25-11	ISCO	211E02224	T	Y12	
27	W5-G14-15	1281 ORTP @ Wendy's	21	9-20-11	10-26-11	ISCO	211E02222	T	CC	
28	W6-E13-2	102 W Pauley	8	9-20-11	10-25-11	ISCO	211G01268	T	CC	North- Northeast
29	W6-E14-3	96 E Passadena	8	9-20-11	10-25-11	ISCO	211G01261	T	CC	Northeast
30	W6-E14-36	102 Umbria	8	9-20-11	10-25-11	ISCO	211G01263	T	CC	
31	W6-E15-52	101 Ulena	8	9-20-11	10-26-11	ISCO	211G01260	T	CC	
32	W8-F12-12	1450 ORTP @ Soccer Field	12	9-20-11	10-25-11	ISCO	211G01262	T	CC	
33	W8-E12-3	160 Providence Rd @ Ctr Baptist Ch	10	9-20-11	10-25-11	ISCO	2011E02221	T	CC	
34	W5-G12-4	1403 ORTP @ Civic Ctr	24	9-15-11	10-26-11	FT	46004497	T	CC	
35	W17-B2W-13	103 Westwind	8	10-26-11	12-20-11	ISCO	211F00406	T	WE	

**TABLE A-8 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**FLOW METER DEPLOYMENT SUMMARY**

Item	Reported Location	Reported Address	Pipe Dia (inches)*	Installed	Moved	Meter Type**	Meter SN	Type Location**	Sewershed**	Meter Location***
36	W17-D2-29	Katie Hunter Park	12	10-25-11	1-18-12	ISCO	211E02224	T	WE	
37	W17-D1W-2	106 Nebraska	8	10-25-11	1-18-12	ISCO	211G01268	T	WE	
38	W14-E6-29	100 Salem	12	10-25-11	1-18-12	ISCO	211E02220	T	TP	
39	W18D-E9-25	127 Royce Cir	10	10-25-11		ISCO	211E02221	T	TP	
40	W15-D5-52	100 Wiltshire	12	10-25-11		ISCO	211E02223	T	TP	
41	W11-D9-42	136 Iroquois Rd	8	10-26-11		ISCO	211E02222	T	TP	Meter is in pipe between D9-41 and D9-42.
42	W12-D9-5	231 Jefferson	8	10-25-11		ISCO	211G01269	T	TP	
43	W13-E7-6	1998 ORTP	12	10-25-11		ISCO	211G01267	T	TP	Meter is in pipe between E7-6 and E7-5.
44	W18C-F9-2	855 W Vanderbilt	12	10-25-11		ISCO	211G01262	T	TP	
45	W13-C7-31	464 Robertsdale	8	10-25-11		ISCO	211G01263	T	TP	
46	W12-D9-27	234 Jefferson	8	10-25-11		ISCO	211G01261	T	TP	
47	W16-C3-27	118 Montecello	8	10-25-11	1-18-12	ISCO	211G01260	T	TP	
48	W18H-D3-22	106 Macon Rd	16	10-26-11		FT	46004497	T	TP	Meter is in pipe between D3-52 and D3-22.
49	W18A-O14-17	Scarboro Road	12	12-22-11		ISCO	211F00406	T	Y12	
50	E5B-K20-15	117 Cascade Lane	15	1/18/12		ISCO	211E02224	T	EV	
51	E5B-L22-5	116 Baltimore	8	1/18/12		ISCO	211G01260	T	EV	
52	E5A-J19-3	100 Emory Lane	10	1/18/12		ISCO	211G01268	T	EV	

**TABLE A-8 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**FLOW METER DEPLOYMENT SUMMARY**

Item	Reported Location	Reported Address	Pipe Dia (inches)*	Installed	Moved	Meter Type**	Meter SN	Type Location**	Sewershed**	Meter Location***
53	E14-K19-17	112 Cypress Lane	10	1/18/12		ISCO	211E02220	T	EV	
* Diameter from LD&A SewerGEMS model and GIS.										
** FT = Flo Tote, ISCO = ISCO, SP = Semi-Permanent, T = Temporary, EV = Emory Valley, EP = East Plant, TP = Turtle Park, Y12 = Y12, WE = West End, CC = Central City										
*** If more than one pipe enters the manhole, in which pipe is the meter located? North, east, south and west are top, right, bottom and left on GIS plan map.										
**** Semi-Permanent meters left in place throughout flow monitoring program. Temporary meters rotated among sewersheds as directed.										

**TABLE A-9  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	E10-F20-18	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	8	11-16-2011	0	
Sewershed	East Plant	11-21-2011	0	
Street	California Ave	11-23-2011	0	
		11-28-2011	SBU	
		11-29-2011	SBU	
		12-6-2011	24	
		12-6-2011	24	
		12-7-2011	SBU	
		12-20-2011	0	
		12-22-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-9-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-10  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	E13A-G19-16	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	18	11-16-2011	0	
Sewershed	East Plant	11-21-2011	0	
Street	Oak Ridge Turnpike	11-23-2011	0	
		11-28-2011	SBU	
		11-29-11	SBU	
		12-6-2011	0	
		12-6-2011	0	
		12-7-2011	SBU	
		12-20-2011	0	
		12-22-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-11  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	E2-E15-1	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	8	11-16-2011	0	
Sewershed	East Plant	11-21-2011	0	
Street	W Tennessee Ave	11-23-2011	0	
		11-28-2011	SBU	
		11-29-2011	24	
		12-1-2011	8	
		12-6-2011	0	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-21-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-12  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	E15-K19-2	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	10	11-16-2011	0	
Sewershed	Emory Valley	11-21-2011	0	
Street	Briarcliff Ave	11-23-2011	27	
		11-28-2011	12	
		11-29-2011	16	
		12-6-2011	0	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-22-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-13  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	ESB-K23-5	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	8	11-16-2011	0	
Sewershed	Emory Valley	11-21-2011	0	
Street	Balsam Road	11-23-2011	0	
		11-28-2011	0	
		11-29-2011	0	
		12-6-2011	0	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-22-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-14  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.

The horizontal run of the standpipe is approximately 6" above the bench.

The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	W19-H11-7	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	8	11-16-2011	0	
Sewershed	Y-12	11-21-2011	0	
Street	Tusculum Drive	11-23-2011	12	
		11-28-2011	SBU	
		11-29-2011	18	
		12-6-2011	0	
		12-6-2011	0	
		12-7-2011	SBU	
		12-20-2011	0	
		12-21-2011	8	
		12-27-2011	8	
		12-28-2011	0	
		1-9-2012	8	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-15  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	W3-K13-41	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	12	11-16-2011	0	
Sewershed	Y-12	11-21-2011	0	
Street	Manhattan Avenue	11-22-2011	0	
		11-23-2011	0	
		11-28-2011	108	
		11-29-2011	22	
		12-6-2011	0	
		12-6-2011	0	
		12-7-2011	48	
		12-20-2011	0	
		12-21-2011	0	
		12-27-2011	24	
		12-28-2011	0	
		1-9-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-16  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	W18A-K12-9	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	24	11-16-2011	0	
Sewershed	Y-12	11-21-2011	0	
Street	S. Illinois Avenue	11-23-2011	0	
		11-28-2011	SBU	
		11-29-2011	0	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-22-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-17  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

<b>Manhole Location</b>	<b>W8-E12-3</b>	<b>Measurement Date</b>	<b>Measured Depth (ins)</b>	<b>Comments</b>
<b>Pipe Diameter (ins)</b>	10	11-16-2011	SBU	
<b>Sewershed</b>	Central City	11-17-2011	0	
<b>Street</b>	Providence Road	11-21-2011	0	
		11-23-2011	0	
		11-28-2011	SBU	
		11-29-2011	SBU	
		12-1-2011	0	
		12-6-2011	0	
		12-6-2011	0	
		12-7-2011	SBU	
		12-20-2011	0	
		12-21-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-9-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-18  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES**

**Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.

The horizontal run of the standpipe is approximately 6" above the bench.

The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

<b>Manhole Location</b>	<b>W6-E15-52</b>	<b>Measurement Date</b>	<b>Measured Depth (ins)</b>	<b>Comments</b>
<b>Pipe Diameter (ins)</b>	8	11-16-2011	24	
<b>Sewershed</b>	Central City	11-17-2011	0	
<b>Street</b>	Ulena Lane	11-21-2011	0	
		11-22-2011	0	
		11-23-2011	0	
		11-28-2011	SBU	
		11-29-2011	0	
		12-1-2011	0	
		12-6-2011	0	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-21-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-9-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-19  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	W16-C3-27	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	8	11-16-2011	0	
Sewershed	Turtle Park	11-21-2011	0	
Street	Mirmar Circle	11-23-2011	0	
		11-28-2011	0	
		11-29-2011	0	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-21-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-20  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	W14-E6-29	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	10	11-16-2011	Not installed yet	
Sewershed	Turtle Park	11-21-2011	0	
Street	Lindale Lane	11-23-2011	0	
		11-28-2011	18 ½	
		11-29-2011	12	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-21-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-21  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole. The horizontal run of the standpipe is approximately 6" above the bench. The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	W13-C7-31	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	8	11-16-2011	0	
Sewershed	Turtle Park	11-21-2011	0	
Street	Robertsville Road	11-23-2011	14	
		11-28-2011	0	
		11-29-2011	0	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-21-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-22  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

<b>Manhole Location</b>	<b>W18D-E9-25</b>	<b>Measurement Date</b>	<b>Measured Depth (ins)</b>	<b>Comments</b>
<b>Pipe Diameter (ins)</b>	10	11-16-2011	60	
<b>Sewershed</b>	Turtle Park	11-17-2011	66	
<b>Street</b>	Royce Circle	11-21-2011	66	
		11-22-2011	66	
		11-23-2011	60	
		11-28-2011	SBU	
		11-29-2011	SBU	
		12-6-2011	66	
		12-6-2011	66	
		12-7-2011	66	
		12-21-2011	66	
		12-27-2011	66	
		12-28-2011	0	QA note: questionable reading
		1-9-2012	55	
		1-12-2012	66	
		1-17-2012	60	

**TABLE A-23  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

<b>Manhole Location</b>	<b>W17-B2W-13</b>	<b>Measurement Date</b>	<b>Measured Depth (ins)</b>	<b>Comments</b>
<b>Pipe Diameter (ins)</b>	8	11-16-2011	Not installed yet	
<b>Sewershed</b>	West End	11-21-2011	0	
<b>Street</b>	Westwind Drive	11-23-2011	0	
		11-28-2011	0	
		11-29-2011	0	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-21-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-24  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
GROUNDWATER MONITORING REPORT**

**Oak Ridge CA and SSES  
Groundwater Monitoring Analysis**

Measured depth is vertical distance from top of water column in standpipe down to the top of the bench at the bottom of the manhole.  
The horizontal run of the standpipe is approximately 6" above the bench.  
The bench is at approximately the sewer pipe springline, or dia/2 above the sewer pipe invert.

Manhole Location	W17-D1W-2	Measurement Date	Measured Depth (ins)	Comments
Pipe Diameter (ins)	8	11-16-2011	0	
Sewershed	West End	11-21-2011	0	
Street	Nebraska Avenue	11-23-2011	0	
		11-28-2011	0	
		11-29-2011	0	
		12-6-2011	0	
		12-7-2011	0	
		12-20-2011	0	
		12-21-2011	0	
		12-27-2011	0	
		12-28-2011	0	
		1-10-2012	0	
		1-12-2012	0	
		1-17-2012	0	

**TABLE A-25  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
SUMMARY OF DRY WEATHER ANALYSIS USED FOR CALIBRATION**

Item	Manhole	Sewershed	Metered or Flow Point	Base Flow* (gpm)	Mean Daily Sewage Flow** (gpm)	Dry Weather Day
1	E11-E22-12	East Plant	Metered	0	16	7/12/2011
2	E10-F20-18	East Plant	Metered	20	25	7/9/2011
3	E4-G17-3	East Plant	Metered	1	11	7/20/2011
4	E6-F19-47	East Plant	Metered	7	17	7/19/2011
5	E3-F17-13	East Plant	Metered	11	36	7/26/2011
6	E13A-G19-16	East Plant	Metered	123	215	7/19/2011
7	E12-E23-4	East Plant	Metered	0	28	7/11/2011
8	E9-F20-7	East Plant	Metered	2	7	10/15/2011
9	E13B-F22-12	East Plant	Metered	11	43	7/9/2011
10	E13B-G22-11	East Plant	Metered	217	424	7/9/2011
11	E5B-L22-5	Emory Valley	Metered	6	13	1/31/2012
12	E5B-K20-15	Emory Valley	Metered	94	143	1/19/2012
13	E14A-K19-17	Emory Valley	Metered	32	33	1/30/2012
14	E5A-J19-3	Emory Valley	Metered	21	31	1/31/2012
15	W18A-H12-3	Y12	Metered	2	3	10/8/2011
16	W18A-J11-15	Y12	Metered	17	25	10/5/2011
17	W18A-K12-9	Y12	Metered	122	151	10/5/2011
18	W19-H11-7	Y12	Metered	22	25	10/6/2011
19	W3-K13-41	Y12	Metered	11	17	10/15/2011
20	W18A-N13-8	Y12	Metered	69	167	10/5/2011
21	W18A-O14-17	Y12	Metered	17	113	1/31/2012
22	W6-E15-52	Central City	Metered	0.1	2	10/17/2011
23	W6-E14-3	Central City	Metered	4	17	10/6/2011
24	W6-E14-36	Central City	Metered	1	5	10/5/2011
25	W5-G14-15	Central City	Metered	113	511	10/7/2011
26	W6-E13-2	Central City	Metered	0.3	1	10/8/2011
27	W8-F12-12	Central City	Metered	8	72	10/6/2011
28	W8-E12-3	Central City	Metered	5	19	10/17/2011
29	W17-D2-29	West End	Metered	4.7	45	11/8/2011
30	W17-D1W-2	West End	Metered	3.7	40	11/12/2011
31	W14-E6-29	Turtle Park	Metered	0.6	1.5	11/11/2011
32	W18D-E9-25	Turtle Park	Metered	13	34	11/6/2011
33	W15-D5-52	Turtle Park	Metered	12	17	11/10/2011
34	W11-D9-42	Turtle Park	Metered	15	24	11/10/2011
35	W12-D9-5	Turtle Park	Metered	41	71	11/11/2011
36	W13-E7-6	Turtle Park	Metered	5.2	9.7	1/6/2012
37	W13-C7-31	Turtle Park	Metered	0.1	2	11/11/2011
38	W12-D9-27	Turtle Park	Metered	7.4	9.9	1/6/2012
39	W18D-F10-1***	Turtle Park	Metered	654	1187	10/7/2011
40	W18F-F7-1***	Turtle Park	Metered	721	1418	10/7/2011
41	W18G-E3-5***	Turtle Park	Metered	738	1464	10/7/2011

\* "Base Flow" is the minimum (relatively constant) flow, comprised of base infiltration plus possibly some base sewage flow.  
\*\* "Mean Daily Sewage Flow" is the sewage flow that is in excess of "Base Flow" and typically varies during the day.  
\*\*\* These values were estimated based on the average for all three meters; these are last three meters along the Spine.

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**TABLE A-26**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**SUMMARY OF INCREMENTAL DRY WEATHER LOADS INPUT TO MODEL AT LOAD POINTS**  
**(BASED ON DRY WEATHER ANALYSIS)**

Item	Manhole	Sewershed	Metered or Flow Point	Base Flow* (gpm)	Mean Daily Sewage Flow** (gpm)	Dry Weather Day
1	E11-E22-12	East Plant	Metered	0	16	7/12/2011
2	E10-F20-18	East Plant	Metered	20	25	7/9/2011
3	E4-G17-3	East Plant	Metered	1	11	7/20/2011
4	E6-F19-47	East Plant	Metered	7	17	7/19/2011
5	E3-F17-13	East Plant	Metered	11	36	7/26/2011
6	E13A-G19-16	East Plant	Metered	123	215	7/19/2011
7	E12-E23-4	East Plant	Metered	0	28	7/11/2011
8	E9-F20-7	East Plant	Metered	2	7	10/15/2011
9	E7-F17-37	East Plant	Flow Point	1	11	N/A
10	E13A-F20-3	East Plant	Flow Point	20	51	N/A
11	E13B-F22-12	East Plant	Metered	11	43	7/9/2011
12	E13A-G22-7	East Plant	Flow Point	52	113	N/A
13	E13B-G22-11	East Plant	Metered	217	424	7/9/2011
14	E7-G18-21	East Plant	Flow Point	87	101	N/A
15	E13B-G22-20	East Plant	Flow Point	1	18	N/A
16	E5B-L22-5	Emory Valley	Metered	6	13	1/31/2012
17	E5B-K20-15	Emory Valley	Metered	94	143	1/19/2012
18	E14A-K19-17	Emory Valley	Metered	32	33	1/30/2012
19	E5A-J19-3	Emory Valley	Metered	21	31	1/31/2012
20	E5B-L21-3	Emory Valley	Flow Point	5	16	N/A
21	E5B-K20-14	Emory Valley	Flow Point	0	2	N/A
22	E19-L21-18	Emory Valley	Flow Point	0	3	N/A
23	E5A-J17-9	Emory Valley	Flow Point	10	17	N/A
24	E5B-K21-15	Emory Valley	Flow Point	0	1	N/A
25	E14-K17-3	Emory Valley	Flow Point	22	24	N/A
26	W18A-H12-3	Y12	Metered	2	3	10/8/2011
27	W18A-J11-15	Y12	Metered	17	25	10/5/2011
28	W18A-K12-9	Y12	Metered	122	151	10/5/2011
29	W19-H11-7	Y12	Metered	22	25	10/6/2011
30	W3-K13-41	Y12	Metered	11	17	10/15/2011
31	W18A-N13-8	Y12	Metered	69	167	10/5/2011
32	W18A-O14-17	Y12	Metered	17	113	1/31/2012
33	W4-K11-6	Y12	Flow Point	2	3	N/A
34	W4-K10-32	Y12	Flow Point	8	13	N/A

**TABLE A-26 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**SUMMARY OF INCREMENTAL DRY WEATHER LOADS INPUT TO MODEL AT LOAD POINTS**  
**(BASED ON DRY WEATHER ANALYSIS)**

Item	Manhole	Sewershed	Metered or Flow Point	Base Flow* (gpm)	Mean Daily Sewage Flow** (gpm)	Dry Weather Day
35	W18A-N12-1	Y12	Flow Point	--	400	N/A
36	W6-E15-52	Central City	Metered	0.1	2	10/17/2011
37	W6-E14-3	Central City	Metered	4	17	10/6/2011
38	W6-E14-36	Central City	Metered	1	5	10/5/2011
39	W5-G14-15	Central City	Metered	113	511	10/7/2011
40	W6-E13-2	Central City	Metered	0.3	1	10/8/2011
41	W8-F12-12	Central City	Metered	8	72	10/6/2011
42	W8-E12-3	Central City	Metered	5	19	10/17/2011
43	W5-G12-4****	Central City	Flow Point	47	70	N/A
44	W9-F12-4	Central City	Flow Point	3	10	N/A
45	W5-G14-21	Central City	Flow Point	8	28	N/A
46	W17-D2-29	West End	Metered	4.7	45	11/8/2011
47	W17-D1W-2	West End	Metered	3.7	40	11/12/2011
48	W14-E6-29	Turtle Park	Metered	0.6	1.5	11/11/2011
49	W18D-E9-25	Turtle Park	Metered	13	34	11/6/2011
50	W15-D5-52	Turtle Park	Metered	12	17	11/10/2011
51	W11-D9-42	Turtle Park	Metered	15	24	11/10/2011
52	W12-D9-5	Turtle Park	Metered	41	71	11/11/2011
53	W13-E7-6	Turtle Park	Metered	5.2	9.7	1/6/2012
54	W13-C7-31	Turtle Park	Metered	0.1	2	11/11/2011
55	W12-D9-27	Turtle Park	Metered	7.4	9.9	1/6/2012
56	W16-C3-27****	Turtle Park	Flow Point	3	10	N/A
57	W18H-D3-22****	Turtle Park	Flow Point	3	10	N/A
58	W18D-F10-1***	Turtle Park	Metered	654	1187	10/7/2011
59	W18F-F7-1***	Turtle Park	Metered	721	1418	10/7/2011
60	W18G-E3-5***	Turtle Park	Metered	738	1464	10/7/2011
61	W10-E10-21	Turtle Park	Flow Point	0	7	N/A

\* "Base Flow" is the minimum (relatively constant) flow, comprised of base infiltration plus possibly some base sewage flow.

\*\* "Mean Daily Sewage Flow" is the sewage flow that is in excess of "Base Flow" and typically varies during the day.

\*\*\* Calculated base flow and average daily sewage flow; these are last three meters along the Spine.

\*\*\*\* Did not use flow meter data; location used as Flow Point.

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**TABLE A-27**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**GENERAL SUMMARY OF WET WEATHER ANALYSIS USED FOR CALIBRATION**

Item	Manhole	Sewershed	RDII Area (acres)	Rainfall Event	Rainfall Depth (in)	Sum R	Type of Location
1	E11-E22-12	East Plant	89	7/12/11-7/25/11	4.95	0.017	Metered
2	E10-F20-18	East Plant	169	7/12/11-7/25/11	4.95	0.0139	Metered
3	E4-G17-3	East Plant	67	7/12/11-7/25/11	4.95	0.019	Metered
4	E6-F19-47	East Plant	153	7/12/11-7/25/11	4.95	0.0036	Metered
5	E3-F17-13	East Plant	212	7/12/11-7/25/11	3.73	0.0041	Metered
6	E13A-G19-16	East Plant	739	7/12/11-7/25/11	4.95	0.0137	Metered
7	E12-E23-4	East Plant	180	7/12/11-7/25/11	4.95	0.028	Metered
8	E9-F20-7	East Plant	162	10/18/11-10/20/11	2.04	0.025	Metered
9	E13B-F22-12	East Plant	471	7/12/11-7/25/11	4.95	0.0152	Metered
10	E13B-G22-11	East Plant	1573	7/12/11-7/25/11	4.95	0.035	Metered
11	E5B-L22-5	Emory Valley	217	1/20/12-1/22/12	1.29	0.0201	Metered
12	E5B-K20-15	Emory Valley	730	1/20/12-1/22/12	1.29	0.012	Metered
13	E14A-K19-17	Emory Valley	192	1/20/12-1/22/12	1.29	0.0012	Metered
14	E5A-J19-3	Emory Valley	214	1/20/12-1/22/12	1.29	0.0074	Metered
15	W18A-H12-3	Y12	49	10/18/11-10/20/11	2.71	0.021	Metered
16	W18A-J11-15	Y12	305	10/18/11-10/20/11	2.71	0.0251	Metered
17	W18A-K12-9	Y12	2025	10/18/11-10/20/11	2.71	0.013	Metered
18	W19-H11-7	Y12	112	10/18/11-10/20/11	2.71	0.022	Metered
19	W3-K13-41	Y12	136	10/18/11-10/20/11	2.71	0.04	Metered
20	W18A-N13-8	Y12	1709	10/18/11-10/20/11	2.71	0.0184	Metered
21	W18A-O14-17	Y12	810	1/20/12-1/22/12	1.29	0.0042	Metered
22	W6-E15-52	Central City	45	10/18/11-10/20/11	2.71	0.01	Metered
23	W6-E14-3	Central City	153	10/18/11-10/20/11	2.71	0.012	Metered
24	W6-E14-36	Central City	59	10/18/11-10/20/11	2.71	0.009	Metered
25	W5-G14-15	Central City	3686	10/18/11-10/20/11	2.71	0.007	Metered

**TABLE A-27 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**GENERAL SUMMARY OF WET WEATHER ANALYSIS USED FOR CALIBRATION**

Item	Manhole	Sewershed	RDII Area (acres)	Rainfall Event	Rainfall Depth (in)	Sum R	Type of Location
26	W6-E13-2	Central City	39	10/18/11-10/20/11	2.71	0.007	Metered
27	W8-F12-12	Central City	342	10/18/11-10/20/11	2.71	0.0192	Metered
28	W8-E12-3	Central City	204	10/18/11-10/20/11	2.71	0.008	Metered
29	W17-D2-29	West End	1168	11/14/11-11/18/11	3.84	0.0024	Metered
30	W17-D1W-2	West End	614	11/14/11-11/18/11	3.84	0.0021	Metered
31	W14-E6-29	Turtle Park	84	11/14/11-11/18/11	3.84	0.031	Metered
32	W18D-E9-25	Turtle Park	267	11/14/11-11/18/11	3.84	0.026	Metered
33	W15-D5-52	Turtle Park	156	11/14/11-11/18/11	3.84	0.103	Metered
34	W11-D9-42	Turtle Park	160	11/14/11-11/18/11	3.84	0.039	Metered
35	W12-D9-5	Turtle Park	95	11/14/11-11/18/11	3.84	0.019	Metered
36	W13-E7-6	Turtle Park	172	1/7/12-1/14/12	2.88	0.045	Metered
37	W13-C7-31	Turtle Park	32	11/14/11-11/18/11	3.84	0.030	Metered
38	W12-D9-27	Turtle Park	109	1/7/12-1/14/12	2.88	0.025	Metered
39	W18D-F10-1	Turtle Park	7548	11/14/11-11/18/11	3.84	0.0563	Metered
40	W18F-F7-1	Turtle Park	8488	11/14/11-11/18/11	3.84	0.0143	Metered
41	W18G-E3-5	Turtle Park	8922	11/14/11-11/18/11	3.84	0.0335	Metered

**TABLE A-28**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**SUMMARY OF WET WEATHER R, T AND K ANALYSIS FOR CALIBRATION**

Item	Manhole	R1	T1	K1	R2	T2	K2	R3	T3	K3
1	E11-E22-12	0.0019	0.4	8.5	0.0021	0.5	9	0.013	8	30
2	E10-F20-18	0.0018	1	0.5	0.0021	1.5	1.5	0.01	3	15
3	E4-G17-3	0.0055	1	0.5	0.006	5	1	0.0075	10	1.5
4	E6-F19-47	0.0006	0.8	1	0.0013	1.5	1.5	0.0017	1.8	6
5	E3-F17-13	0.0012	1.5	0.5	0.0013	2	0.8	0.0016	2.5	1.2
6	E13A-G19-16	0.0042	0.1	0.3	0.0045	1	2	0.005	2	6
7	E12-E23-4	0.025	1	2	0.002	2	4	0.001	4	7
8	E9-F20-7	0.002	1	1	0.01	3.5	1.5	0.013	6	7
9	E13B-F22-12	0.0002	1	1.5	0.005	1.8	2	0.01	4.5	8
10	E13B-G22-11	0.009	1.5	15	0.011	5.5	4	0.015	7	5
11	E5B-L22-5	0.005	3	0.2	0.0051	3.5	1	0.01	5.5	4
12	E5B-K20-15	0.003	1.6	1	0.004	1.8	4	0.005	2.5	7
13	E14A-K19-17	0.003	3	0.1	0.003	3.5	0.8	0.006	5.5	2
14	E5A-J19-3	0.003	0.9	2	0.0024	1	2.5	0.002	1.1	8
15	W18A-H12-3	0.004	3.6	2	0.007	3.7	4	0.01	4	5
16	W18A-J11-15	0.0082	3.2	1	0.0084	3.5	3	0.0085	4.2	12
17	W18A-K12-9	0.003	3	0.6	0.004	7	0.7	0.006	10	0.8
18	W19-H11-7	0.013	2.1	5	0.007	2.2	13	0.002	2.3	16
19	W3-K13-41	0.015	3	1	0.013	3.2	1.2	0.012	5	8
20	W18A-N13-8	0.0054	1.2	4	0.006	4.5	4.5	0.007	5	11
21	W18A-O14-17	0.002	2.1	0.3	0.0015	2.2	0.4	0.0007	2.3	2
22	W6-E15-52	0.005	3.5	1	0.003	4.8	6	0.002	5.5	12
23	W6-E14-3	0.003	1.5	3	0.004	2.3	5	0.005	3	20
24	W6-E14-36	0.002	2	2.4	0.003	2.3	2.5	0.004	3	5
25	W5-G14-15	0.004	4.5	0.1	0.002	5	0.2	0.001	7	1
26	W6-E13-2	0.0021	4.6	0.4	0.0024	4.7	0.5	0.0025	5	20
27	W8-F12-12	0.0065	2.4	2	0.0064	2.6	2.1	0.0063	2.7	25
28	W8-E12-3	0.005	4.1	0.1	0.002	4.2	0.9	0.001	4.3	5
29	W17-D2-29	0.0016	2.5	0.5	0.0004	2.6	10	0.0004	2.7	12
30	W17-D1W-2	0.0011	1.5	0.1	0.0007	1.6	2.5	0.0003	1.7	20
31	W14-E6-29	0.018	0.6	3	0.007	0.9	8	0.006	2	10
32	W18D-E9-25	0.006	0.3	5	0.008	0.5	12	0.012	2	20
33	W15-D5-52	0.013	1	4	0.02	1.4	15	0.07	8	20
34	W11-D9-42	0.008	0.3	10	0.011	0.5	15	0.02	1	30
35	W12-D9-5	0.012	1.5	0.1	0.005	1.6	1	0.002	1.7	5
36	W13-E7-6	0.016	1	1.5	0.015	3.5	3.7	0.014	7	4
37	W13-C7-31	0.016	0.5	3	0.008	0.9	8	0.006	2.5	9
38	W12-D9-27	0.006	0.7	2	0.007	2.5	6	0.012	3	20
39	W18D-F10-1	0.0153	3.5	3	0.017	6	5	0.024	7	15
40	W18F-F7-1	0.0013	2	3	0.006	5	3.5	0.007	6	3.8
41	W18G-E3-5	0.01	4	0.8	0.0105	6	4	0.013	7	15

**TABLE A-29**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**GENERAL SUMMARY OF INCREMENTAL WET WEATHER LOADS INPUT TO MODEL AT**  
**LOAD POINTS**

Item	Manhole	Sewershed	RDII Area (ac)	Sum R	Metered/Flow Point
1	E11-E22-12	East Plant	89	0.017	Metered
2	E10-F20-18	East Plant	169	0.0139	Metered
3	E4-G17-3	East Plant	67	0.019	Metered
4	E6-F19-47	East Plant	153	0.0036	Metered
5	E3-F17-13	East Plant	212	0.0041	Metered
6	E13A-G19-16	East Plant	79	0.053	Metered
7	E12-E23-4	East Plant	180	0.028	Metered
8	E9-F20-7	East Plant	162	0.025	Metered
9	E7-F17-37	East Plant	22	0.004	Flow
10	E13A-F20-3	East Plant	123	0.03	Flow
11	E13B-F22-12	East Plant	203	0.024	Metered
12	E13A-G22-7	East Plant	273	0.02	Flow
13	E13B-G22-11	East Plant	107	0.053	Metered
14	E7-G18-21	East Plant	206	0.02	Flow
15	E13B-G22-20	East Plant	72	0.02	Flow
16	E5B-L22-5	Emory Valley	217	0.0201	Metered
17	E5B-K20-15	Emory Valley	270	0.012	Metered
18	E14A-K19-17	Emory Valley	106	0.009	Metered
19	E5A-J19-3	Emory Valley	101	0.008	Metered
20	E5B-L21-3	Emory Valley	107	0.012	Flow
21	E5B-K20-14	Emory Valley	31	0.012	Flow
22	E19-L21-18	Emory Valley	33	0.012	Flow
23	E5A-J17-9	Emory Valley	114	0.007	Flow
24	E5B-K21-15	Emory Valley	24	0.012	Flow
25	E14-K17-3	Emory Valley	86	0.011	Flow
26	W18A-H12-3	Y12	49	0.021	Metered
27	W18A-J11-15	Y12	105	0.023	Metered
28	W18A-K12-9	Y12	316	0.02	Metered
29	W19-H11-7	Y12	112	0.022	Metered
30	W3-K13-41	Y12	136	0.04	Metered
31	W18A-N13-8	Y12	50	0.03	Metered
32	W18A-O14-17	Y12	810	0.0042	Metered
33	W4-K11-6	Y12	38	0.022	Flow
34	W4-K10-32	Y12	162	0.022	Flow
35	W18A-N12-1	Y12	900	0.011	Flow
36	W6-E15-52	Central City	45	0.01	Metered
37	W6-E14-3	Central City	49	0.009	Metered
38	W6-E14-36	Central City	59	0.009	Metered
39	W5-G14-15	Central City	131	0.03	Metered
40	W6-E13-2	Central City	39	0.007	Metered
41	W8-F12-12	Central City	150	0.023	Metered
42	W8-E12-3	Central City	204	0.008	Metered
43	W5-G12-4	Central City	144	0.021	Flow
44	W9-F12-4	Central City	63	0.012	Flow
45	W5-G14-21	Central City	95	0.025	Flow
46	W17-D2-29	West End	554	0.002	Metered
47	W17-D1W-2	West End	614	0.0021	Metered
48	W14-E6-29	Turtle Park	84	0.031	Metered
49	W18D-E9-25	Turtle Park	62	0.03	Metered
50	W15-D5-52	Turtle Park	156	0.103	Metered
51	W11-D9-42	Turtle Park	160	0.039	Metered

**TABLE A-29 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**GENERAL SUMMARY OF INCREMENTAL WET WEATHER LOADS INPUT TO MODEL AT**  
**LOAD POINTS**

<b>Item</b>	<b>Manhole</b>	<b>Sewershed</b>	<b>RDII Area (ac)</b>	<b>Sum R</b>	<b>Metered/Flow Point</b>
52	W12-D9-5	Turtle Park	95	0.019	Metered
53	W13-E7-6	Turtle Park	140	0.04	Metered
54	W13-C7-31	Turtle Park	32	0.03	Metered
55	W12-D9-27	Turtle Park	109	0.025	Metered
56	W16-C3-27	Turtle Park	193	0.03	Flow
57	W18H-D3-22	Turtle Park	152	0.03	Flow
58	W18D-F10-1	Turtle Park	387	0.03	Metered
59	W18F-F7-1	Turtle Park	297	0.03	Metered
60	W18G-E3-5	Turtle Park	195	0.02	Metered
61	W10-E10-21	Turtle Park	45	0.03	Flow

**TABLE A-30**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**SUMMARY OF INCREMENTAL WET WEATHER R, T AND K FACTORS**  
**USED AT LOAD POINTS FOR INPUT TO MODEL**

Item	Load Point Manhole No.	R1	T1	K1	R2	T2	K2	R3	T3	K3
1	E11-E22-12	0.0019	0.4	8.5	0.0021	0.5	9	0.013	8	30
2	E10-F20-18	0.0018	1	0.5	0.0021	1.5	1.5	0.01	3	15
3	E4-G17-3	0.0055	1	0.5	0.006	5	1	0.0075	10	1.5
4	E6-F19-47	0.0006	0.8	1	0.0013	1.5	1.5	0.0017	1.8	6
5	E3-F17-13	0.0012	1.5	0.5	0.0013	2	0.8	0.0016	2.5	1.2
6	E13A-G19-16	0.015	1	0.7	0.017	2	1	0.021	10	1.5
7	E12-E23-4	0.025	1	2	0.002	2	4	0.001	4	7
8	E9-F20-7	0.002	1	1	0.01	3.5	1.5	0.013	6	7
9	E7-F17-37	0.0012	1	0.5	0.0013	2	1	0.0016	2.5	1.2
10	E13A-F20-3	0.003	1	1	0.011	2.5	1.5	0.015	3	6
11	E13B-F22-12	0.003	1	2	0.01	1.5	5	0.011	4	7
12	E13A-G22-7	0.0056	1	0.5	0.0066	5	1	0.0078	10	1.5
13	E13B-G22-11	0.015	0.4	8.5	0.017	0.5	9	0.021	8	30
14	E7-G18-21	0.0056	1	0.5	0.0066	5	1	0.0078	10	1.5
15	E13B-G22-20	0.003	1	2	0.008	1.5	5	0.009	4	7
16	E5B-L22-5	0.005	3	0.2	0.0051	3.5	1	0.01	5.5	4
17	E5B-K20-15	0.003	1.2	1	0.0036	1.5	4	0.0054	2	7
18	E14A-K19-17	0.0023	3	0.1	0.0023	3.5	0.8	0.0045	5.5	2
19	E5A-J19-3	0.0033	0.9	1.8	0.0026	1	2	0.0022	1.1	7
20	E5B-L21-3	0.003	2	0.5	0.0036	2.2	2	0.0054	3	5
21	E5B-K20-14	0.003	3	1	0.003	3.5	2	0.006	4.5	5
22	E19-L21-18	0.003	3	0.2	0.003	3.5	1	0.006	5.5	4
23	E5A-J17-9	0.0032	0.9	2	0.0021	1	2.5	0.0018	1.1	8
24	E5B-K21-15	0.003	3	0.2	0.003	3.5	1	0.006	5.5	4
25	E14-K17-3	0.0028	3	0.1	0.0028	3.5	0.8	0.0055	5.5	3
26	W18A-H12-3	0.004	3.6	2	0.007	3.7	4	0.01	4	5
27	W18A-J11-15	0.0074	3.2	1	0.0076	3.5	2	0.0081	4.2	12
28	W18A-K12-9	0.004	3	1	0.007	3.5	3	0.009	4	6
29	W19-H11-7	0.013	2.1	5	0.007	2.2	13	0.002	2.3	16
30	W3-K13-41	0.015	3	1	0.013	3.2	1.2	0.012	5	8
31	W18A-N13-8	0.006	2	4	0.01	3.7	4.5	0.014	4	5
32	W18A-O14-17	0.002	2.1	0.3	0.0015	2.2	0.4	0.0007	2.3	2
33	W4-K11-6	0.0064	2	1	0.0075	2.3	2	0.0081	2.5	15
34	W4-K10-32	0.0064	2	1	0.0075	2.3	2	0.0081	2.5	15
35	W18A-N12-1	0.0057	2	3	0.0035	3.5	5	0.002	4.5	6
36	W6-E15-52	0.005	3.5	1	0.003	4.8	6	0.002	5.5	12
37	W6-E14-3	0.002	2	2.4	0.003	2.3	2.5	0.004	3	5
38	W6-E14-36	0.002	2	2.4	0.003	2.3	2.5	0.004	3	5
39	W5-G14-15	0.0096	3	0.8	0.0099	4	1	0.011	5	7
40	W6-E13-2	0.0021	4.6	0.4	0.0024	4.7	0.5	0.0025	5	20
41	W8-F12-12	0.0078	2	1	0.0076	2.1	1.1	0.0076	2.2	5
42	W8-E12-3	0.005	4.1	0.1	0.002	4.2	0.9	0.001	4.3	5
43	W5-G12-4	0.0053	3.2	2	0.0069	3.5	3	0.0088	3.7	7
44	W9-F12-4	0.0038	2.5	2	0.004	2.6	2.1	0.0042	2.7	25
45	W5-G14-21	0.008	2.5	3	0.0083	2.6	5	0.0088	2.7	20
46	W17-D2-29	0.0012	2.5	0.5	0.0005	2.6	10	0.0003	2.7	12
47	W17-D1W-2	0.0011	1.5	0.1	0.0007	1.6	2.5	0.0003	1.7	20
48	W14-E6-29	0.018	0.6	3	0.007	0.9	8	0.006	2	10

**TABLE A-30 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**SUMMARY OF INCREMENTAL WET WEATHER R, T AND K FACTORS**  
**USED AT LOAD POINTS FOR INPUT TO MODEL**

Item	Load Point Manhole No.	R1	T1	K1	R2	T2	K2	R3	T3	K3
49	W18D-E9-25	0.007	1	4	0.009	1.5	15	0.014	8	20
50	W15-D5-52	0.013	1	4	0.02	1.4	15	0.07	8	20
51	W11-D9-42	0.008	0.3	10	0.011	0.5	15	0.02	1	30
52	W12-D9-5	0.012	1.5	0.1	0.005	1.6	1	0.002	1.7	5
53	W13-E7-6	0.016	1	2	0.013	3	6	0.011	5	7
54	W13-C7-31	0.016	0.5	3	0.008	0.9	8	0.006	2.5	9
55	W12-D9-27	0.006	0.7	2	0.007	2.5	6	0.012	3	20
56	W16-C3-27	0.008	1	2	0.009	1.6	5	0.014	2	10
57	W18H-D3-22	0.006	1.5	4	0.011	1.6	15	0.014	2	20
58	W18D-F10-1	0.009	3	2	0.01	6	3	0.011	7	10
59	W18F-F7-1	0.006	2.2	3	0.01	5	3	0.014	6	4
60	W18G-E3-5	0.005	3	1	0.007	6	3	0.008	7	10
61	W10-E10-21	0.006	0.3	5	0.009	0.5	12	0.015	1	25

**TABLE A-31**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DETAILED MODEL CALIBRATION PROCEDURE**

For each metered location:

1. Using flow meter data and rainfall data, selected a suitable dry period
2. Using Excel spreadsheet, analyzed dry weather hydrograph
  - a. Determined “base flow”
  - b. Determined “average daily sewage flow”
  - c. Determined 24-hour pattern for average daily sewage flow
3. Determined number of addresses
4. Computed ratio of average daily sewage flow to number of addresses

For each sewershed:

5. Using flow meter and rainfall data, selected a suitable rain event
6. For each metered location in the sewershed
  - a. Determined RDII area from maps
  - b. Using Excel spreadsheet, computed total R based on area, rainfall, and volume of RDII
  - c. Constructed a SWMM module
  - d. Input rainfall record into SWMM
  - e. Input observed total hydrograph into SWMM (RDII calibration file)
  - f. Input RDII area, base flow, average daily sewage flow, and average daily flow pattern into SWMM
  - g. Executed SWMM and iteratively determined R, T and K factors for each unit hydrograph
7. Identified flow points to supplement metered points for loading model (metered points + flow points = load points)
8. For each load point
  - a. Determined incremental RDII area
  - b. Determined incremental number of addresses from GIS
  - c. Using Excel spreadsheet containing dry and wet weather analysis results, assigned: R, T, K values, ratio of average daily sewage flow to number of addresses, a pattern for average daily sewage flow, and base flow; these were to be used for computing incremental loads at each load point
  - d. Constructed a SWMM module
  - e. Input rainfall record, incremental RDII area, and the assigned R, T, K values into SWMM
  - f. Executed SWMM and extracted incremental RDII hydrograph

- g. Into SewerGEMS Sanitary, input the incremental RDII hydrograph, incremental base flow, incremental number of addresses, ratio of average daily sewage flow to addresses assigned to that point for incremental flow computation, and the average daily sewage flow pattern assigned to that point
9. Executed SewerGEMS Sanitary and compared computed flows with observed flows
10. For input to Spine model, deleted all except pipes and manholes that are included in hydraulic analysis

Spine:

11. Joined the Spine components of each sewershed model to form the base Spine model.
12. Added the Emory Valley, East Plant and Turtle Park pump stations
13. Selected an observed rain event to apply to the Spine model
14. Using SWMM as described previously, generated incremental RDII hydrographs for each load point in the Spine
15. Imported the incremental RDII hydrographs to the SewerGEMS Sanitary Spine model and retained the previously determined incremental base flow and average daily sewage flow characteristics
16. Executed SewerGEMS Sanitary and adjusted overflow parameters to refine hydraulic grade line profiles
17. Executed refined model and compared the computed flows with observed flows

**TABLE A-32  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
OBSERVED VERSUS COMPUTED PEAK FLOWS  
FOR INITIAL SEWERSHED MODEL CALIBRATIONS**

<b>Sewershed</b>	<b>MH Location</b>	<b>Computed (GPM)</b>	<b>Observed (GPM)</b>	<b>% Difference</b>
Central City	W6-E13-2	31	30	-1
Central City	W6-E14-3	160	167	4
Central City	W6-E14-36	64	67	6
Central City	W6-E15-52	42	43	1
Central City	W8-E12-3	238	247	3
Central City	W8-F12-12	659	725	9
Central City	W5-G14-15	5472	4368	-25
Central City	E25-H15-17	5221	5421	4
Y-12	W3-K13-41	648	659	2
Y-12	W18A-H12-3	91	93	1
Y-12	W18A-J11-15	727	726	0
Y-12	W18A-K12-9	2754	2693	-2
Y-12	W18A-N13-8	2129	2395	11
Y-12	W19-H11-7	289	287	-1
Turtle Park	W11-D9-42	957	974	-2
Turtle Park	W12-D9-5	858	864	-1
Turtle Park	W12-D9-27	311	555	-44
Turtle Park	W13-C7-31	233	259	-10
Turtle Park	W13-E7-6	1225	1693	-28
Turtle Park	W14-E6-29	695	721	-4
Turtle Park	W15-D5-52	896	916	-2
Turtle Park	W18D-E9-25	1160	1225	-5
Turtle Park	W18D-F10-1	26864	24521	10
Turtle Park	W18G-E3-5	23819	28529	-17
East Plant	E11-E22-12	204	199	3
East Plant	E3-F17-13	208	210	-1
East Plant	E4-G17-3	397	402	-1
East Plant	E6-F19-47	197	221	-11
East Plant	E10-F20-18	516	519	-1
East Plant	E13B-F22-12	1619	1186	37
East Plant	E13B-G22-11	5391	8378	-36
East Plant	E13A-G19-16	3439	3552	-3
Emory Valley	E5A-J19-3	245	265	-8
Emory Valley	E14A-K19-17	271	270	1
Emory Valley	E5B-K20-15	991	1046	-5
Emory Valley	E5B-L22-5	318	351	-9
Emory Valley	W17-D2-29	621	684	-9
West End	W17-D1W-2	436	471	-8
West End	W6-E13-2	31	30	-1

*W5-G12-4 and E9-F20-7 were calibrated for dry weather flow characteristics only using supplemental flow data and thus are not included in the table. The W18F-F7-1 flow data plateaus; the actual peak was probably higher than recorded, and is not included here. Data at W5-G12-4 failed quality checks for reliability and was not used. Data for W18H-D3-22 exhibited excessive backwater effects and was not used. The Emory Valley, East Plant and Turtle Park pump stations were not included in the sewershed component models but were added to the Spine model. The computed flows to the pump stations were assumed unrestricted by the pump stations in the sewershed component models.*

**TABLE A-33**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
1	SL:MH:W16-C3-27MH:W16-C3-28	Turtle Park	8	2.42	3.26	No
2	SL:MH:W16-C3-28MH:W16-C3-29	Turtle Park	8	1.87	1.57	Yes
3	SL:MH:W16-C3-32MH:W16-C3-29	Turtle Park	8	1.87	0.89	Yes
4	SL:MH:W16-C3-32MH:W16-C3-33	Turtle Park	8	1.34	0.82	Yes
5	SL:MH:W16-C3-33MH:W16-D3-32	Turtle Park	8	1.34	0.87	Yes
6	SL:MH:W16-D3-32MH:W16-D4-2	Turtle Park	8	1.34	1.72	No
7	SL:MH:W16-D3-42MH:W16-D3-44	Turtle Park	10	1.34	3.2	No
8	SL:MH:W16-D4-9MH:W16-D3-38	Turtle Park	8	1.34	1.14	Yes
9	SL:MH:W16-D3-38MH:W16-D3-41	Turtle Park	10	1.34	2.82	No
10	SL:MH:W16-D3-41MH:W16-D3-42	Turtle Park	10	1.34	3.19	No
11	SL:MH:W16-D4-4MH:W16-D4-9	Turtle Park	8	1.34	1.32	Yes
12	SL:MH:W16-D4-2MH:W16-D4-4	Turtle Park	8	1.34	4.37	No
13	SL:MH:W18H-D3-50MH:W18H-D3-51	Turtle Park	16	1.34	5.54	No
14	SL:MH:W18H-D3-51MH:W18H-D3-52	Turtle Park	16	1.34	2.21	No
15	SL:MH:W18H-D3-52MH:W18H-D3-22	Turtle Park	16	1.34	3.26	No
16	SL:MH:W18H-D3-22MH:W18H-D3-61	Turtle Park	16	2.32	3.05	No
17	SL:MH:W18H-D3-61MH:W18H-D2-21	Turtle Park	16	2.32	3.36	No
18	SL:MH:W18H-D2-21MH:W18H-D2-20	Turtle Park	36	2.32	24.31	No
19	SL:MH:W18H-D2-20MH:W18H-D2-30	Turtle Park	36	2.32	16.18	No
20	SL:MH:W18H-D2-30MH:W18H-D2-6	Turtle Park	12	2.32	4.7	No
21	SL:MH:W18H-D2-6MH:W18H-D2-5	Turtle Park	12	2.32	0.84	Yes
22	SL:MH:W18H-D2-5MH:W18H-D2-4	Turtle Park	12	2.32	2.34	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
23	SL:MH:W18G-E5-1MH:W18G-D5-53	Turtle Park	42	34.03	34.98	No
24	SL:MH:W18G-D5-53MH:W18G-E4-5	Turtle Park	42	34.02	16.75	Yes
25	SL:MH:W18G-E4-4MH:W18G-E4-5	Turtle Park	42	34	34.53	No
26	SL:MH:W18G-E4-4MH:W18G-E4-3	Turtle Park	42	33.97	35.28	No
27	SL:MH:W18G-E4-3MH:W18G-E4-2	Turtle Park	42	33.94	30.52	Yes
28	SL:MH:W18G-E4-2MH:W18G-E4-1	Turtle Park	42	33.96	32.29	Yes
29	SL:MH:W18G-E4-1MH:W18G-E3-5	Turtle Park	42	33.95	78.87	No
30	SL:MH:W18G-E3-5MH:W18G-E3-4	Turtle Park	42	34.67	150.95	No
31	SL:MH:W18G-E3-4MH:W18G-E3-3	Turtle Park	42	34.67	93.64	No
32	SL:MH:W18G-E3-2MH:W18G-E3-1	Turtle Park	42	34.65	88.98	No
33	SL:MH:W18G-E3-3MH:W18G-E3-2	Turtle Park	42	34.66	59.2	No
34	SL:MH:W18G-E3-1MH:W18G-E2-2	Turtle Park	42	34.63	36.48	No
35	SL:MH:W18G-E2-2MH:W18G-E2-1	Turtle Park	42	34.6	36.29	No
36	SL:MH:W18G-E2-1MH:W18G-D2-3	Turtle Park	42	34.59	38.41	No
37	SL:MH:W18G-D2-3MH:W18G-D2-2	Turtle Park	42	34.6	105.83	No
38	SL:MH:W18G-D2-2MH:W18G-D2-1	Turtle Park	42	34.6	91.02	No
39	SL:MH:W14-E6-29MH:W14-E6-29	Turtle Park	12	1.91	8.81	No
40	SL:MH:W18F-F8-3MH:W18F-F8-2	Turtle Park	36	26.67	21.01	Yes
41	SL:MH:W18F-F8-2MH:W18F-F8-1	Turtle Park	36	26.64	21.04	Yes
42	SL:MH:W18F-F8-1MH:W18F-F7-5	Turtle Park	36	26.61	22.93	Yes
43	SL:MH:W18F-F7-5MH:W18F-F7-4	Turtle Park	36	26.58	21.17	Yes
44	SL:MH:W18F-F7-4MH:W18F-F7-3	Turtle Park	36	26.59	21.12	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
45	SL:MH:W18F-F7-3MH:W18F-F7-2	Turtle Park	36	26.59	21.17	Yes
46	SL:MH:W18F-F7-2MH:W18F-F7-1	Turtle Park	36	29.14	23.06	Yes
47	SL:MH:W18F-F7-1MH:W18F-F6-2	Turtle Park	36	30.93	23.13	Yes
48	SL:MH:W18F-F6-2MH:W18F-F6-1	Turtle Park	36	30.91	22.59	Yes
49	SL:MH:W18F-F6-1MH:W18F-E6-4	Turtle Park	36	30.91	23.33	Yes
50	SL:MH:W18F-E6-4MH:W18F-E6-3	Turtle Park	36	30.92	32.95	No
51	SL:MH:W18F-E6-3MH:W18F-E6-2	Turtle Park	36	30.92	22.83	Yes
52	SL:MH:W18F-E6-2MH:W18F-E6-1	Turtle Park	36	30.91	23.3	Yes
53	SL:MH:W18F-E6-1MH:W18F-E5-4	Turtle Park	36	30.9	25.87	Yes
54	SL:MH:W18F-E5-4MH:W18F-E5-3	Turtle Park	36	32.04	52.39	No
55	SL:MH:W18F-E5-3MH:W18F-E5-2	Turtle Park	42	32.04	47.71	No
56	SL:MH:W18F-E5-5MH:W18F-E5-4	Turtle Park	12	1.91	2.12	No
57	SL:MH:W13-C7-31MH:W13-D7-9	Turtle Park	8	0.74	2.31	No
58	SL:MH:W13-D7-9MH:W13-D7-18	Turtle Park	8	0.73	3.72	No
59	SL:MH:W13-D7-18MH:W13-D7-20	Turtle Park	8	0.73	1.37	No
60	SL:MH:W13-D7-20MH:W13-D7-21	Turtle Park	8	0.72	3.55	No
61	SL:MH:W13-D7-21MH:W13-D7-26	Turtle Park	8	0.72	0.78	No
62	SL:MH:W13-D7-26MH:W13-D7-28	Turtle Park	8	0.73	2.04	No
63	SL:MH:W13-D7-28MH:W13-D7-29	Turtle Park	8	0.73	0.42	Yes
64	SL:MH:W13-D7-29MH:W13-D7-30	Turtle Park	8	0.73	1	No
65	SL:MH:W13-D7-30MH:W13-D7-34	Turtle Park	10	0.73	1.82	No
66	SL:MH:W13-D7-34MH:W13-D7-35	Turtle Park	10	0.73	3.75	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
67	SL:MH:W13-D7-35MH:W13-D7-40	Turtle Park	10	0.72	4.18	No
68	SL:MH:W13-D7-40MH:W13-D7-44	Turtle Park	10	0.72	1.77	No
69	SL:MH:W13-D7-44MH:W13-D7-53	Turtle Park	10	0.72	4.72	No
70	SL:MH:W13-D7-53MH:W13-E7-1	Turtle Park	10	0.72	3.26	No
71	SL:MH:W13-E7-1MH:W13-E7-2	Turtle Park	10	0.72	1.51	No
72	SL:MH:W13-E7-2MH:W13-E7-3	Turtle Park	10	0.71	1.56	No
73	SL:MH:W13-E7-3MH:W13-E7-4	Turtle Park	8	0.71	2.21	No
74	SL:MH:W13-E7-4MH:W13-E7-5	Turtle Park	12	0.71	6	No
75	SL:MH:W13-E7-5MH:W13-E7-6	Turtle Park	12	0.71	3.68	No
76	SL:MH:W13-E7-6MH:W13-E7-7	Turtle Park	12	3.08	2.85	Yes
77	SL:MH:W13-E7-7MH:W13-E7-8	Turtle Park	12	3.07	15.13	No
78	SL:MH:W12-D9-27MH:W12-D9-28	Turtle Park	8	0.98	0.76	Yes
79	SL:MH:W12-D9-28MH:W12-D9-29	Turtle Park	8	0.98	0.87	Yes
80	SL:MH:W12-D9-29MH:W12-D9-6	Turtle Park	8	0.97	2.61	No
81	SL:MH:W12-D9-6MH:W12-E9-15	Turtle Park	8	2.57	1.83	Yes
82	SL:MH:W12-D9-5MH:W12-D9-6	Turtle Park	8	2.19	3.33	No
83	SL:MH:W12-E9-15MH:W12-E9-14	Turtle Park	10	2.57	4	No
84	SL:MH:W11-D9-42MH:W11-D9-43	Turtle Park	8	2.3	1.74	Yes
85	SL:MH:W11-D9-43MH:W11-D9-44	Turtle Park	12	2.3	2.91	No
86	SL:MH:W10-E10-21MH:W10-E10-20	Turtle Park	8	0.65	1.14	No
87	SL:MH:W18D-E9-8MH:W18D-E9-17	Turtle Park	36	25	19.25	Yes
88	SL:MH:W18D-E9-17MH:W18D-E9-7	Turtle Park	36	25	21.87	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
89	SL:MH:W18D-E9-7MH:W18D-E9-6	Turtle Park	36	25	21.02	Yes
90	SL:MH:W18D-E9-6MH:W18D-E9-5	Turtle Park	36	25	30.05	No
91	SL:MH:W18D-E9-5MH:W18D-E9-4	Turtle Park	36	26.7	29.83	No
92	SL:MH:W18D-E9-4MH:W18D-E9-3	Turtle Park	36	26.71	20.97	Yes
93	SL:MH:W18D-E9-3MH:W18D-E9-2	Turtle Park	36	26.71	21.27	Yes
94	SL:MH:W18D-E9-2MH:W18D-E9-1	Turtle Park	36	26.7	20.71	Yes
95	SL:MH:W18D-E9-1MH:W18D-F9-1	Turtle Park	36	26.7	21.67	Yes
96	SL:MH:W18D-F9-1MH:W18D-F8-5	Turtle Park	36	26.7	21	Yes
97	SL:MH:W18D-F8-5MH:W18D-F8-4	Turtle Park	36	26.69	24.35	Yes
98	SL:MH:W18D-E9-25MH:W18D-E9-24	Turtle Park	10	1.4	2.61	No
99	SL:MH:W18D-E9-24MH:W18D-E9-9.2	Turtle Park	10	1.4	1.12	Yes
100	SL:MH:W18D-E9-9.2MH:W18D-E9-9.1	Turtle Park	10	1.4	3.23	No
101	SL:MH:W18D-E9-9.1MH:W18D-E9-9	Turtle Park	10	1.4	2.46	No
102	SL:MH:W18D-E9-9MH:W18D-E9-8	Turtle Park	36	25	27.37	No
103	SL:MH:W18D-F11-3MH:W18D-F11-2	Turtle Park	36	19.5	18.38	Yes
104	SL:MH:W18D-F11-2MH:W18D-F11-1	Turtle Park	36	19.5	19.14	Yes
105	SL:MH:W18D-F11-1MH:W18D-F10-6	Turtle Park	36	19.5	18.93	Yes
106	SL:MH:W18D-F10-6MH:W18D-F10-5	Turtle Park	36	19.51	18.68	Yes
107	SL:MH:W18D-F10-5MH:W18D-F10-4	Turtle Park	36	19.51	18.96	Yes
108	SL:MH:W18D-F10-4MH:W18D-F10-3	Turtle Park	36	19.51	18.84	Yes
109	SL:MH:W18D-F10-3MH:W18D-F10-2	Turtle Park	36	19.51	19.21	Yes
110	SL:MH:W18D-F10-2MH:W18D-F10-1	Turtle Park	36	19.51	18.42	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
111	SL:MH:W18D-F10-1 MH:W18D-E10-2	Turtle Park	36	23.6	29.22	No
112	SL:MH:W18D-E10-2 MH:W18D-E10-1	Turtle Park	36	23.6	29.7	No
113	SL:MH:W18D-E10-1 MH:W18D-E9-10	Turtle Park	36	23.6	30.25	No
114	SL:MH:W18D-E9-10 MH:W18D-E9-9	Turtle Park	36	23.6	34.92	No
115	SL:MH:W16-D3-44; MH:W18G-D3-50	Turtle Park	12	1.34	12.1	No
116	SL:MH:W18H-D2-4; MH:W18G-D2-1	Turtle Park	12	2.32	13.33	No
117	SL:MH:W15-D5-52; MH:W18G-E5-1	Turtle Park	12	2.06	6.84	No
118	SL:MH:W18F-E5-2; MH:W18G-E5-1	Turtle Park	42	32.04	72.27	No
119	SL:MH:W14-E6-28; MH:W18F-E5-5	Turtle Park	12	1.91	3.42	No
120	SL:MH:W13-E7-8; MH:W18F-F7-2	Turtle Park	12	3.07	1.97	Yes
121	SL:MH:W18D-F8-4; MH:W18F-F8-3	Turtle Park	36	26.69	32.65	No
122	SL:MH:W10-E10-20; MH:W18D-E10-19	Turtle Park	8	0.64	1.56	No
123	SL:MH:W18D-E10-19; MH:W18D-E9-25	Turtle Park	10	2.2	1.41	Yes
124	SL:MH:W11-D9-44; MH:W18D-E10-19	Turtle Park	12	2.3	4.38	No
125	SL:MH:W12-E9-14; MH:W18D-E9-5	Turtle Park	12	2.57	8.22	No
126	SL:MH:W17-D1W-2 MH:W17-D1-1	West End	8	1.26	0.84	Yes
127	SL:MH:W17-D1-1 MH:W17-D1-2	West End	8	1.26	2.56	No
128	SL:MH:W17-D1-2 MH:W17-D1-13	West End	8	1.26	0.09	Yes
129	SL:MH:W17-D1-13 MH:W17-D1-12	West End	8	1.26	0.77	Yes
130	SL:MH:W17-D1-12 MH:W17-D1-11	West End	8	1.25	0.8	Yes
131	SL:MH:W17-D1-11 MH:W17-D1-10	West End	12	1.24	1.6	No
132	SL:MH:W17-D1-10 MH:W17-D1-7	West End	12	1.22	2.53	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
133	SL:MH:W17-D1-7MH:W17-D2-27	West End	12	1.22	0.24	Yes
134	SL:MH:W17-D2-27MH:W17-D2-28	West End	12	1.23	1.65	No
135	SL:MH:W17-D2-28MH:W17-D2-29	West End	12	1.23	2.15	No
136	SL:MH:W17-D2-29MH:W17-D2-8	West End	12	1.68	0.81	Yes
137	SL:MH:W17-D2-8MH:W17-D2-7	West End	12	1.67	3.52	No
138	SL:MH:W17-D2-7MH:W17-D2-1	West End	12	1.66	11.89	No
139	SL:MH:E25-H15-17MH:E25-H15-16	Central City	21	11.59	16.99	No
140	SL:MH:E25-H15-16MH:E25-H15-15	Central City	21	11.59	22.86	No
141	SL:MH:E25-H15-15MH:E25-H15-14	Central City	21	11.59	14.25	No
142	SL:MH:E25-H15-14MH:E25-H15-13	Central City	21	11.59	12.35	No
143	SL:MH:E25-H15-13MH:E25-H15-12	Central City	21	11.59	11.36	Yes
144	SL:MH:E25-H15-12MH:E25-H15-11	Central City	21	11.59	14.5	No
145	SL:MH:E25-H15-11MH:E25-G15-18	Central City	21	11.59	10.6	Yes
146	SL:MH:E25-G15-18MH:E25-G15-17	Central City	21	11.59	21.68	No
147	SL:MH:E25-G15-17MH:E25-G15-16	Central City	21	11.59	10.13	Yes
148	SL:MH:E25-G15-16MH:E25-G15-15	Central City	21	11.59	11.15	Yes
149	SL:MH:E25-G15-15MH:E25-G15-14	Central City	21	11.59	23	No
150	SL:MH:W5A-G15-6MH:W5A-G15-7	Central City	20	11.59	14.3	No
151	SL:MH:W5A-G15-12MH:W5A-G15-6	Central City	21	11.59	15.09	No
152	SL:MH:W5-G14-21MH:W5-G14-20	Central City	10	0.85	2.06	No
153	SL:MH:W5-G14-20MH:W5-G13-27	Central City	10	0.85	2.63	No
154	SL:MH:W5-G15-11MH:W5-G14-17	Central City	20	11.59	10.28	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
155	SL:MH:W5-G14-17MH:W5-G14-16	Central City	20	11.59	11.51	Yes
156	SL:MH:W5-G14-16MH:W5-G14-6	Central City	20	11.59	11.47	Yes
157	SL:MH:W5-G14-6MH:W5-G14-7	Central City	20	11.59	12.68	No
158	SL:MH:W5-G14-7MH:W5-G14-8	Central City	21	11.59	5.67	Yes
159	SL:MH:W5-G14-8MH:W5-G14-9	Central City	21	11.59	15.36	No
160	SL:MH:W5-G14-9MH:W5-G14-10	Central City	21	11.59	18.9	No
161	SL:MH:W5-G14-10MH:W5-G14-11A	Central City	21	11.59	12.08	No
162	SL:MH:W5-G14-11AMH:W5-H14-31	Central City	21	11.59	8.2	Yes
163	SL:MH:W5-H14-31MH:W5-G14-11	Central City	21	11.59	31.1	No
164	SL:MH:W5-G14-11MH:W5-G14-13	Central City	21	11.59	12.94	No
165	SL:MH:W5-G14-13MH:W5-G14-14	Central City	21	11.59	12.75	No
166	SL:MH:W5-G14-14MH:W5-G14-15	Central City	21	11.59	8.33	Yes
167	SL:MH:W5-G14-15MH:W5-G13-12	Central City	21	13.35	13.22	Yes
168	SL:MH:W5-G13-27MH:W5-G13-20	Central City	10	0.84	2.78	No
169	SL:MH:W5-G13-11MH:W5-G13-10	Central City	21	11.5	9.91	Yes
170	SL:MH:W5-G13-10MH:W5-G13-9	Central City	21	11.5	8.28	Yes
171	SL:MH:W5-G13-9MH:W5-G13-8	Central City	21	12.34	9.25	Yes
172	SL:MH:W5-G13-8MH:W5-G13-7	Central City	21	12.34	6.93	Yes
173	SL:MH:W5-G13-20MH:W5-G13-9	Central City	10	0.84	13.14	No
174	SL:MH:W5-G13-7MH:W5-G13-6	Central City	21	12.34	10.87	Yes
175	SL:MH:W5-G13-6MH:W5-G13-5	Central City	21	12.34	10.36	Yes
176	SL:MH:W5-G13-5MH:W5-G13-4	Central City	21	12.34	14.36	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
177	SL:MH:W5-G13-4MH:W5-G13-3	Central City	21	12.34	12.73	No
178	SL:MH:W5-G13-3MH:W5-G13-2	Central City	21	12.34	8.4	Yes
179	SL:MH:W5-G13-2MH:W5-G13-1	Central City	21	12.34	19.98	No
180	SL:MH:W5-G13-31MH:W5-G13-30	Central City	12	*	2.72	*
181	SL:MH:W5-G13-30MH:W5-G13-1	Central City	10	*	7.09	*
182	SL:MH:W5-G13-32MH:W5-G13-31	Central City	10	*	4.01	*
183	SL:MH:W5-G13-33MH:W5-G13-32	Central City	10	*	2.59	*
184	SL:MH:W5-G13-35MH:W5-G13-34	Central City	10	*	1.93	*
185	SL:MH:W5-G13-34MH:W5-G13-33	Central City	10	*	2.3	*
186	SL:MH:W5-G13-36MH:W5-G13-35	Central City	12	*	3.43	*
187	SL:MH:W5-G13-37MH:W5-G13-36	Central City	10	*	1.86	*
188	SL:MH:W5-G13-12MH:W5-G13-11	Central City	21	11.5	11.29	Yes
189	SL:MH:W5-G13-1MH:W5-G12-7	Central City	21	12.34	14.26	No
190	SL:MH:W5-G12-7MH:W5-G12-6	Central City	21	12.34	12.74	No
191	SL:MH:W5-G12-6MH:W5-G12-5	Central City	21	12.34	16.93	No
192	SL:MH:W5-G12-5MH:W5-G12-4	Central City	24	12.34	21.01	No
193	SL:MH:W5-G12-4MH:W5-G12-3	Central City	24	14.05	10.6	Yes
194	SL:MH:W5-G12-3MH:W5-G12-2	Central City	24	14.04	13.38	Yes
195	SL:MH:W5-G12-2MH:W5-G12-1	Central City	24	14.03	13.37	Yes
196	SL:MH:W5-G12-1MH:W5-G11-8	Central City	24	14.03	23.96	No
197	SL:MH:W5-G11-8MH:W5-G11-9	Central City	24	12.2	11.77	Yes
198	SL:MH:W5-G11-9MH:W5-G11-10	Central City	24	12.2	11.96	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
199	SL:MH:W5-G11-10MH:W5-F11-4	Central City	24	15.77	18.52	No
200	SL:MH:W5-F11-4MH:W5-F11-3	Central City	36	22	20.34	Yes
201	SL:MH:W6-E15-52MH:W6-E15-45	Central City	8	0.14	1.45	No
202	SL:MH:W6-E15-45MH:W6-E14-8	Central City	8	0.14	2.02	No
203	SL:MH:W6-E14-8MH:W6-E14-7	Central City	8	0.14	1.92	No
204	SL:MH:W6-E14-7MH:W6-E14-6	Central City	8	0.33	2.12	No
205	SL:MH:W6-E14-6MH:W6-E14-5	Central City	8	0.33	2.83	No
206	SL:MH:W6-E14-5MH:W6-E14-4	Central City	8	0.33	2.33	No
207	SL:MH:W6-E14-4MH:W6-E14-3A	Central City	8	0.33	2.48	No
208	SL:MH:W6-E14-3AMH:W6-E14-3	Central City	8	0.33	1.93	No
209	SL:MH:W6-E13-2MH:W6-E13-1	Central City	8	0.1	3.38	No
210	SL:MH:W6-E13-1MH:W6-F13-10	Central City	8	0.1	2.15	No
211	SL:MH:W6-E14-36MH:W6-E14-35	Central City	8	0.2	4.34	No
212	SL:MH:W6-E14-35MH:W6-E14-7	Central City	8	0.2	0.91	No
213	SL:MH:W6-E14-2MH:W6-E14-1	Central City	8	0.51	2.61	No
214	SL:MH:W6-E14-1MH:W6-F13-31	Central City	8	0.51	1.74	No
215	SL:MH:W6-F13-31MH:W6-F13-30	Central City	8	0.51	1.46	No
216	SL:MH:W6-F13-30MH:W6-F13-29	Central City	8	0.51	1.12	No
217	SL:MH:W6-F13-29MH:W6-F13-10	Central City	8	0.51	1.31	No
218	SL:MH:W6-F13-10MH:W6-F13-9	Central City	10	0.59	2.55	No
219	SL:MH:W6-F13-9MH:W6-F13-8	Central City	10	0.59	1.82	No
220	SL:MH:W6-F13-8MH:W6-F13-7	Central City	10	0.59	1.76	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
221	SL:MH:W6-F13-7MH:W6-F13-6	Central City	10	0.59	1.56	No
222	SL:MH:W6-F13-6MH:W6-F13-5	Central City	10	0.59	2.12	No
223	SL:MH:W6-F13-5MH:W6-F13-4	Central City	10	0.59	1.97	No
224	SL:MH:W6-F13-4MH:W6-F13-3A	Central City	10	0.59	2.3	No
225	SL:MH:W6-F13-3AMH:W6-F13-3	Central City	10	0.59	1.73	No
226	SL:MH:W6-F13-3MH:W6-F13-2	Central City	10	0.59	5.37	No
227	SL:MH:W6-F13-2MH:W6-F13-1	Central City	10	0.59	2.68	No
228	SL:MH:W6-F13-1MH:W6-F12-16	Central City	10	0.59	2.27	No
229	SL:MH:W6-F12-16MH:W6-F12-15	Central City	12	0.59	7.47	No
230	SL:MH:W6-E14-3MH:W6-E14-2	Central City	8	0.51	0.54	No
231	SL:MH:W9-F12-2MH:W9-F12-3	Central City	10	0.28	1.88	No
232	SL:MH:W9-F12-3MH:W9-F12-2	Central City	15	3.57	5.35	No
233	SL:MH:W9-F12-2MH:W9-F12-1	Central City	15	3.57	5.19	No
234	SL:MH:W9-F12-9MH:W9-F12-8	Central City	15	3.32	6.48	No
235	SL:MH:W9-F12-8MH:W9-F12-3	Central City	15	3.31	6.44	No
236	SL:MH:W9-F12-1MH:W9-F11-10	Central City	15	3.57	4.81	No
237	SL:MH:W9-F11-10MH:W9-F11-9	Central City	15	3.57	4.94	No
238	SL:MH:W9-F11-9MH:W9-F11-8	Central City	15	3.57	5.01	No
239	SL:MH:W9-F11-8MH:W9-F11-7	Central City	15	3.57	11.41	No
240	SL:MH:W7-F12-14MH:W7-G12-13	Central City	12	0.59	3.62	No
241	SL:MH:W8-E12-3MH:W8-E12-2	Central City	10	0.95	4.19	No
242	SL:MH:W8-E12-2MH:W8-E12-1	Central City	10	0.95	1.57	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
243	SL:MH:W8-E12-1MH:W8-F12-28	Central City	10	0.95	1.57	No
244	SL:MH:W8-F12-28MH:W8-F12-27	Central City	10	0.94	4.33	No
245	SL:MH:W8-F12-27MH:W8-F12-26	Central City	10	0.94	2.45	No
246	SL:MH:W8-F12-26MH:W8-F12-25	Central City	10	0.94	1.09	No
247	SL:MH:W8-F12-25MH:W8-F12-11	Central City	12	0.95	12.25	No
248	SL:MH:W8-F12-12MH:W8-F12-11	Central City	12	2.68	3.72	No
249	SL:MH:W8-F12-11MH:W8-F12-10	Central City	15	3.32	12.44	No
250	SL:MH:W9-F11-7;MH:W5-G11-10	Central City	15	3.57	7.53	No
251	SL:MH:W8-F12-10;MH:W9-F12-9	Central City	12	3.32	2.77	Yes
252	SL:MH:W7-G12-13;MH:W8-F12-12	Central City	12	0.59	2.61	No
253	SL:MH:W6-F12-15;MH:W7-F12-14	Central City	12	0.59	8.94	No
254	SL:MH:E25-G15-14;MH:W5-G15-13	Central City	21	11.59	17.06	No
255	SL:MH:W5-G15-13;MH:W5A-G15-12	Central City	21	11.59	15.77	No
256	SL:MH:W5A-G15-7;MH:W5-G15-11	Central City	20	11.59	11.09	Yes
257	SL:MH:W19-H11-7MH:W19-H11-6	Y12	8	0.71	0.6	Yes
258	SL:MH:W19-H11-4MH:W19-H11-3	Y12	8	0.71	1.35	No
259	SL:MH:W19-H11-3MH:W19-H11-2	Y12	8	0.71	0.29	Yes
260	SL:MH:W19-H11-2MH:W19-H11-1	Y12	8	0.7	0.27	Yes
261	SL:MH:W19-H11-6MH:W19-H11-5	Y12	8	0.71	2.33	No
262	SL:MH:W19-H11-5MH:W19-H11-4	Y12	8	0.71	1.01	No
263	SL:MH:W4-K11-6MH:W4-K11-7	Y12	10	0.36	6.07	No
264	SL:MH:W4-K11-7MH:W4-J11-7	Y12	12	0.36	7.49	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
265	SL:MH:W4-J11-7MH:W4-J11-8	Y12	12	1.91	3.89	No
266	SL:MH:W4-J11-8MH:W4-J11-1	Y12	12	1.91	3.7	No
267	SL:MH:W4-J11-1MH:W4-J11-10	Y12	12	1.9	2.76	No
268	SL:MH:W4-J11-10MH:W4-J11-11	Y12	12	1.9	2.48	No
269	SL:MH:W4-J11-11MH:W4-J11-12	Y12	12	1.9	2.54	No
270	SL:MH:W4-J11-12MH:W4-J12-2	Y12	12	1.9	6.7	No
271	SL:MH:W4-K11-13MH:W4-J11-6	Y12	12	1.55	4.68	No
272	SL:MH:W4-J11-6MH:W4-J11-7	Y12	12	1.55	2.96	No
273	SL:MH:W4-K10-32MH:W4-K11-13	Y12	12	1.55	2.49	No
274	SL:MH:W18A-O14-17MH:W18A-O13-9	Y12	12	3.24	4.62	No
275	SL:MH:W18A-O13-9MH:W18A-O13-8	Y12	12	3.24	4.74	No
276	SL:MH:W18A-O13-8MH:W18A-O13-7	Y12	12	3.23	4.76	No
277	SL:MH:W18A-O13-7MH:W18A-O13-5	Y12	12	3.22	8.02	No
278	SL:MH:W18A-O13-5MH:W18A-O13-6	Y12	18	3.22	12.12	No
279	SL:MH:W18A-O13-6MH:W18A-N13-5	Y12	18	3.21	10.79	No
280	SL:MH:W18A-N13-5MH:W18A-N13-6	Y12	15	7.1	6.84	Yes
281	SL:MH:W18A-N13-6MH:W18A-N13-7	Y12	18	7.1	8.8	No
282	SL:MH:W18A-N13-7MH:W18A-N13-8	Y12	18	7.1	7.75	No
283	SL:MH:W18A-N13-8MH:W18A-N13-9	Y12	18	7.67	7.95	No
284	SL:MH:W18A-N13-9MH:W18A-M13-1	Y12	18	7.66	10.75	No
285	SL:MH:W18A-N12-1MH:W18A-N13-1	Y12	15	3.92	11.85	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
286	SL:MH:W18A-N13-1MH:W18A-N13-2	Y12	15	3.92	9.78	No
287	SL:MH:W18A-N13-2MH:W18A-N13-3	Y12	15	3.92	14.34	No
288	SL:MH:W18A-N13-3MH:W18A-N13-4	Y12	15	3.92	14.61	No
289	SL:MH:W18A-N13-4MH:W18A-N13-5	Y12	15	3.92	20.42	No
290	SL:MH:W18A-M13-1MH:W18A-M13-2	Y12	18	7.65	7.81	No
291	SL:MH:W18A-M13-2MH:W18A-M13-3	Y12	18	7.65	8.18	No
292	SL:MH:W18A-M13-3MH:W18A-M13-4	Y12	18	7.64	10.79	No
293	SL:MH:W18A-M13-4MH:W18A-M13-5	Y12	18	7.62	11.94	No
294	SL:MH:W18A-M13-5MH:W18A-L13-1	Y12	18	7.61	7.16	Yes
295	SL:MH:W18A-L13-1MH:W18A-L13-2	Y12	18	7.58	3.89	Yes
296	SL:MH:W18A-L13-2MH:W18A-L13-3	Y12	24	7.58	46.41	No
297	SL:MH:W18A-L13-3MH:W18A-L13-4	Y12	21	7.57	25.18	No
298	SL:MH:W18A-L13-4MH:W18A-L13-5	Y12	21	7.57	6.69	Yes
299	SL:MH:W18A-L13-5MH:W18A-K12-18	Y12	21	7.59	11.31	No
300	SL:MH:W18A-K12-18MH:W18A-K12-16	Y12	21	7.59	9.49	No
301	SL:MH:W18A-K12-16MH:W18A-K12-14	Y12	21	7.59	9.87	No
302	SL:MH:W18A-K12-14MH:W18A-K12-13	Y12	21	7.59	10.75	No
303	SL:MH:W18A-K12-13MH:W18A-K12-12	Y12	21	7.58	27.56	No
304	SL:MH:W18A-K12-12MH:W18A-K12-10	Y12	24	7.58	24.51	No
305	SL:MH:W18A-K12-10MH:W18A-K12-9	Y12	24	7.58	19.99	No
306	SL:MH:W18A-K12-9MH:W18A-K12-8	Y12	24	9.56	13.22	No
307	SL:MH:W18A-K12-8MH:W18A-J12-7	Y12	24	11.52	7.91	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
308	SL:MH:W18A-J12-7MH:W18A-J12-8	Y12	24	11.52	14.33	No
309	SL:MH:W18A-J12-8MH:W18A-J12-10	Y12	24	11.52	17.61	No
310	SL:MH:W18A-J12-9MH:W18A-J12-10	Y12	21	11.52	14.49	No
311	SL:MH:W18A-J12-10MH:W18A-J12-11	Y12	20	11.52	13.74	No
312	SL:MH:W18A-J12-11MH:W18A-J12-13	Y12	21	11.52	27.82	No
313	SL:MH:W18A-J12-13MH:W18A-J12-26	Y12	21	11.52	7.8	Yes
314	SL:MH:W18A-H12-20MH:W18A-J12-27	Y12	21	11.5	8.84	Yes
315	SL:MH:W18A-J12-27MH:W18A-J12-26	Y12	21	11.51	20.15	No
316	SL:MH:W18A-J12-5MH:W18A-J11-13	Y12	12	1.9	3.41	No
317	SL:MH:W18A-J11-13MH:W18A-J11-14	Y12	12	1.9	1.22	Yes
318	SL:MH:W18A-J11-14MH:W18A-J11-15	Y12	12	1.9	1.57	Yes
319	SL:MH:W18A-J11-15MH:W18A-J11-16	Y12	12	2.6	2.2	Yes
320	SL:MH:W18A-J11-16MH:W18A-H11-8	Y12	12	1.82	0.45	Yes
321	SL:MH:W18A-H12-3MH:W18A-H11-18	Y12	10	0.27	3.64	No
322	SL:MH:W18A-H12-20MH:W18A-H12-19	Y12	24	11.49	8.57	Yes
323	SL:MH:W18A-H12-19MH:W18A-H12-18	Y12	24	11.47	20.89	No
324	SL:MH:W18A-H12-18MH:W18A-H11-12	Y12	24	11.47	14.55	No
325	SL:MH:W18A-H11-8MH:W18A-H11-9	Y12	15	1.82	3.25	No
326	SL:MH:W18A-H11-9MH:W18A-H11-36	Y12	15	2.52	3.2	No
327	SL:MH:W18A-H11-36MH:W18A-H11-37	Y12	15	2.52	3.2	No
328	SL:MH:W18A-H11-11MH:W18A-H11-15	Y12	24	13.98	11.39	Yes
329	SL:MH:W18A-H11-15MH:W18A-H11-17	Y12	24	13.98	1.85	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
330	SL:MH:W18A-H11-37MH:W18A-H11-10	Y12	15	2.52	3.29	No
331	SL:MH:W18A-H11-10MH:W18A-H11-11	Y12	15	2.52	3.13	No
332	SL:MH:W18A-H11-12MH:W18A-H11-13	Y12	24	11.45	2.71	Yes
333	SL:MH:W18A-H11-13MH:W18A-H11-14	Y12	24	11.45	12.88	No
334	SL:MH:W18A-H11-14MH:W18A-H11-11	Y12	24	11.46	12.33	No
335	SL:MH:W18A-H11-18MH:W18A-H11-19	Y12	10	0.27	2.86	No
336	SL:MH:W18A-H11-21MH:W18A-G11-22	Y12	24	14.2	16.79	No
337	SL:MH:W18A-G11-22MH:W18A-G11-21	Y12	24	14.2	11.46	Yes
338	SL:MH:W18A-G11-21MH:W18A-G11-20	Y12	24	14.19	20.26	No
339	SL:MH:W18A-G11-20MH:W18A-G11-27	Y12	24	14.19	28.89	No
340	SL:MH:W18A-G11-27MH:W18A-G11-18	Y12	24	14.19	19.09	No
341	SL:MH:W18A-H11-19MH:W18A-H11-39	Y12	10	0.27	3.1	No
342	SL:MH:W18A-39MH:W18A-H11-38	Y12	10	0.27	2.58	No
343	SL:MH:W18-H11-38MH:W18A-H11-17	Y12	10	0.27	8.78	No
344	SL:MH:W18A-G11-18MH:W18A-G11-29	Y12	27	14.18	11.27	Yes
345	SL:MH:W18A-G11-29MH:W18A-G11-28	Y12	27	14.16	8.22	Yes
346	SL:MH:W18A-G11-28MH:W18A-F11-4	Y12	27	14.15	53.21	No
347	SL:MH:W3-K13-41MH:W3-K13-42	Y12	12	2.23	3.93	No
348	SL:MH:W3-K13-42MH:W3-K13-43	Y12	12	2.23	2.31	No
349	SL:MH:W3-K13-43MH:W3-K13-44	Y12	12	2.23	7.09	No
350	SL:MH:W3-K13-44MH:W3-K13-45	Y12	12	2.23	3.99	No
351	SL:MH:W3-K13-45MH:W3-J12-6	Y12	12	2.23	3.14	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
352	SL:MH:W3-J12-6;MH:W18A-K12-8	Y12	12	2.23	3.58	No
353	SL:MH:W4-J12-2;MH:W18A-J12-5	Y12	12	1.9	2.65	No
354	SL:MH:W19-H11-1;MH:W18A-H11-9	Y12	8	0.7	0.99	No
355	SL:MH:E3-F17-13MH:E3-F17-18	East Plant	10	0.76	3.98	No
356	SL:MH:E3-F17-18MH:E3-F17-19	East Plant	10	0.76	0.33	Yes
357	SL:MH:E3-F17-19MH:E3-F17-23	East Plant	12	0.76	4.68	No
358	SL:MH:E3-F17-23MH:E3-F17-26	East Plant	10	0.76	1.63	No
359	SL:MH:E3-F17-26MH:E3-F17-26	East Plant	12	0.76	3.51	No
360	SL:MH:E3-F17-27MH:E3-G17-20	East Plant	12	0.75	3.81	No
361	SL:MH:E3-G17-20MH:E3-G17-21	East Plant	18	1.26	3.8	No
362	SL:MH:E4-G17-3MH:E4-G17-4	East Plant	12	0.67	3.75	No
363	SL:MH:E4-G17-4MH:E4-G17-5	East Plant	12	0.67	4.1	No
364	SL:MH:E4-G17-5MH:E4-G17-7	East Plant	12	0.67	4.6	No
365	SL:MH:E4-G17-7MH:E4-G17-19	East Plant	12	0.67	7.12	No
366	SL:MH:E6-F19-47MH:E6-F19-46	East Plant	12	0.35	2.61	No
367	SL:MH:E6-F19-46MH:E6-F19-45	East Plant	12	0.35	2.18	No
368	SL:MH:E6-F19-45MH:E6-G19-8	East Plant	12	0.35	10.71	No
369	SL:MH:E7-G18-1MH:E7-G18-2	East Plant	18	3.94	6.78	No
370	SL:MH:E7-G18-2MH:E7-G18-3	East Plant	18	3.92	13.52	No
371	SL:MH:E7-G18-3MH:E7-G18-3	East Plant	18	3.92	3.86	Yes
372	SL:MH:E7-G18-4MH:E7-G18-5	East Plant	18	3.9	5.39	No
373	SL:MH:E7-G18-5MH:E7-G18-6	East Plant	18	3.88	4.3	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
374	SL:MH:E7-G18-8MH:E7-G18-9	East Plant	18	3.83	3.7	Yes
375	SL:MH:E7-G18-9MH:E7-G18-10	East Plant	18	3.84	7.92	No
376	SL:MH:E7-G18-10MH:E7-G19-10	East Plant	18	3.84	6.8	No
377	SL:MH:E7-G19-10MH:E7-G19-9	East Plant	18	3.85	9.92	No
378	SL:MH:E7-G18-6MH:E7-G18-7	East Plant	18	3.86	3.97	No
379	SL:MH:E7-G18-7MH:E7-G18-8	East Plant	18	3.85	4.41	No
380	SL:MH:E7-F17-37MH:E7-F17-38	East Plant	12	0.13	7.05	No
381	SL:MH:E7-F17-38MH:E7-F17-41	East Plant	12	0.13	5.12	No
382	SL:MH:E7-F17-41MH:E7-F17-44	East Plant	12	0.13	6.59	No
383	SL:MH:E7-F17-44MH:E7-F17-45	East Plant	12	0.13	3.97	No
384	SL:MH:E7-F17-45MH:E7-G17-25	East Plant	12	0.13	7.21	No
385	SL:MH:E7-G17-25MH:E7-G18-21	East Plant	18	1.37	7.62	No
386	SL:MH:E7-G18-21MH:E7-G18-1	East Plant	18	3.94	27.58	No
387	SL:MH:E9-F20-7MH:E9-F20-6	East Plant	10	0.93	2.23	No
388	SL:MH:E10-F20-18MH:E10-F20-17	East Plant	8	0.91	0.68	Yes
389	SL:MH:E10-F20-17MH:E10-F20-16	East Plant	8	0.91	0.48	Yes
390	SL:MH:E10-F20-13MH:E10-F20-12	East Plant	10	0.88	1.09	No
391	SL:MH:E10-F20-16MH:E10-F20-15	East Plant	12	0.9	2.35	No
392	SL:MH:E10-F20-15MH:E10-F20-14	East Plant	12	0.9	1.38	No
393	SL:MH:E10-F20-14MH:E10-F20-13	East Plant	10	0.89	0.99	No
394	SL:MH:E11-E22-30MH:E11-E22-31	East Plant	10	0.29	3.14	No
395	SL:MH:E11-E22-31MH:E11-E22-32	East Plant	10	0.29	1.55	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
396	SL:MH:E11-E22-32MH:E11-E22-36	East Plant	10	0.29	1.97	No
397	SL:MH:E11-E22-36MH:E11-E23-64	East Plant	10	3	1.21	Yes
398	SL:MH:E11-E23-64MH:E11-E22-68	East Plant	10	2	1.4	Yes
399	SL:MH:E11-E22-68MH:E11-F23-12	East Plant	10	1.7	1.33	Yes
400	SL:MH:E11-E22-12MH:E11-E22-19	East Plant	8	0.29	0.96	No
401	SL:MH:E11-E22-19MH:E11-E22-30	East Plant	8	0.29	1.71	No
402	SL:MH:E12-E23-4MH:E12-E23-5	East Plant	10	4	2.39	Yes
403	SL:MH:E12-E23-5MH:E12-E23-27	East Plant	10	4	5.57	No
404	SL:MH:E13B-F22-17MH:E13B-F23-10	East Plant	10	1.7	1.42	Yes
405	SL:MH:E13B-F23-10MH:E13B-F23-6	East Plant	10	1.7	3.33	No
406	SL:MH:E13B-F23-6MH:E13B-F23-9	East Plant	10	1.7	2.8	No
407	SL:MH:E13B-F23-9MH:E13B-F22-12	East Plant	10	1.7	1.66	Yes
408	SL:MH:E13B-F22-12MH:E13B-F22-13	East Plant	10	3.41	3.15	Yes
409	SL:MH:E13B-F22-13MH:E13B-G22-19	East Plant	10	1.86	1.24	Yes
410	SL:MH:E13B-G22-19MH:E13B-G22-18	East Plant	10	2.35	0.68	Yes
411	SL:MH:E13B-G22-20MH:E13B-G22-19	East Plant	8	0.49	0.77	No
412	SL:MH:E13B-G22-8MH:E13B-G22-9	East Plant	21	10.31	7.18	Yes
413	SL:MH:E13B-G22-9MH:E13B-G22-10	East Plant	21	10.27	6.89	Yes
414	SL:MH:E13B-G22-10MH:E13B-G22-11	East Plant	21	10.29	7.1	Yes
415	SL:MH:E13B-G22-12MH:E13B-G22-13	East Plant	21	15.1	47.16	No
416	SL:MH:E13B-G22-11MH:E13B-G22-12	East Plant	21	12.76	8.03	Yes
417	SL:MH:E13B-G22-11MH:E13B-G22-12	East Plant	21	15.1	8.03	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
418	SL:MH:E13B-G22-18T34	East Plant	15	2.35	16.98	No
419	SL:MH:E13A-F21-1MH:E13A-F22-2	East Plant	18	7.4	6.88	Yes
420	SL:MH:E13A-F22-2MH:E13A-F22-1	East Plant	18	7.4	7.45	No
421	SL:MH:E13A-F22-1MH:E13A-G22-7	East Plant	18	7.4	6.94	Yes
422	SL:MH:E13A-G22-7MH:E13A-G22-6	East Plant	21	10.41	10.52	No
423	SL:MH:E13A-F20-1MH:E13A-F21-6	East Plant	18	7.4	7.11	Yes
424	SL:MH:E13A-F21-6MH:E13A-F21-5	East Plant	18	7.4	7.03	Yes
425	SL:MH:E13A-F21-5MH:E13A-F21-4	East Plant	18	7.4	7.6	No
426	SL:MH:E13A-F21-4MH:E13A-F21-3	East Plant	18	7.4	10.05	No
427	SL:MH:E13A-F21-3MH:E13A-F21-2	East Plant	18	7.4	9.48	No
428	SL:MH:E13A-F21-2MH:E13A-F21-1	East Plant	18	7.4	5.78	Yes
429	SL:MH:E13A-F20-4MH:E13A-F20-3	East Plant	18	6.19	6.4	No
430	SL:MH:E13A-F20-3MH:E13A-F20-2	East Plant	18	7.55	6.85	Yes
431	SL:MH:E13A-F20-2MH:E13A-F20-1	East Plant	18	7.4	6.89	Yes
432	SL:MH:E13A-F20-5MH:E13A-F20-36	East Plant	18	5.3	8.22	No
433	SL:MH:E13A-F20-36MH:E13A-F20-4	East Plant	18	5.3	7.25	No
434	SL:MH:E13A-F19-44MH:E13A-F19-43	East Plant	18	4.18	6.89	No
435	SL:MH:E13A-F19-43MH:E13A-G19-14	East Plant	18	4.17	6.84	No
436	SL:MH:E13A-G19-14MH:E13A-G19-15	East Plant	18	4.16	6.91	No
437	SL:MH:E13A-G19-15MH:E13A-G19-16	East Plant	18	4.15	7.08	No
438	SL:MH:E13A-G19-16MH:E13A-G20-27	East Plant	18	6.52	6.29	Yes
439	SL:MH:E13A-G20-27MH:E13A-F20-5	East Plant	18	6.52	9.58	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
440	SL:MH:E13A-G20-27;MH:E13A-F20-5	East Plant	18	6.52	5.79	Yes
441	SL:MH:E13B-G22-13;MH:E13B-G22-14	East Plant	21	15.1	8.13	Yes
442	SL:E14A-K19-16;E14A-K19-17SHARED	Emory Valley	10	0.44	1.93	No
443	SL:MH:E10-F20-12;MH:E13A-F20-4	East Plant	12	0.89	2.6	No
444	SL:MH:E9-F20-6;MH:13A-F20-5	East Plant	12	0.93	3.59	No
445	SL:MH:E6-G19-8;MH:E13A-F19-44	East Plant	18	4.19	6.92	No
446	SL:MH:E7-G19-9;MH:E6-G19-8	East Plant	18	3.85	6.86	No
447	SL:MH:E3-G17-21;MH:E7-G17-25	East Plant	18	1.26	7.99	No
448	SL:MHE4-G17-19;MH:E3-G17-20	East Plant	12	0.67	3.2	No
449	SL:MH:E11-F23-12;MH:E13B-F22-17	East Plant	12	1.7	2.66	No
450	SL:MH:E12-E23-27;MH:E11-E22-36	East Plant	10	3	1.81	Yes
451	SL:MH:E5B-L22-20;EV Wet Well	Emory Valley	16	5.86	29.97	No
452	SL:E13B-G22-14;EP Wet Well	East Plant	24	13.15	10.12	Yes
453	SL:MH:E5A-J17-9;MH:E5A-J17-8	Emory Valley	10	0.71	2.74	No
454	SL:MH:E5A-J17-8;MH:E5A-J18-7	Emory Valley	10	0.71	2.55	No
455	SL:MH:E5A-J18-7;MH:E5A-J18-6	Emory Valley	10	0.7	1.13	No
456	SL:MH:E5A-J18-6;MH:E5A-J18-31	Emory Valley	10	0.71	1.24	No
457	SL:MH:E5A-J18-31;MH:E5A-J18-5	Emory Valley	10	0.71	0.9	No
458	SL:MH:E5A-J18-5;MH:E5A-J18-4	Emory Valley	10	0.71	1.15	No
459	SL:MH:E5A-J18-4;MH:E5A-J18-3	Emory Valley	10	0.7	1.46	No
460	SL:MH:E5A-J18-3;MH:E5A-J19-18	Emory Valley	10	0.7	1.17	No
461	SL:MH:E5A-J19-18;MH:E5A-J19-17	Emory Valley	10	0.7	0.6	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
462	SL:MH:E5A-J19-17MH:E5A-J19-16	Emory Valley	10	0.7	1.34	No
463	SL:MH:E5A-J19-16MH:E5A-J19-15	Emory Valley	10	0.7	2.23	No
464	SL:MH:E5A-J19-15MH:E5A-J19-4	Emory Valley	10	0.7	1.34	No
465	SL:MH:E5A-J19-4MH:E5A-J19-3	Emory Valley	10	0.69	1.67	No
466	SL:MH:E5A-J19-3MH:E5A-J19-1	Emory Valley	10	1.37	1.78	No
467	SL:MH:E14-K17-3MH:E14-K17-2	Emory Valley	10	0.45	1.95	No
468	SL:MH:E14-K17-2MH:E14-K17-1	Emory Valley	10	0.44	2.28	No
469	SL:MH:E14A-K18-2MH:E14A-K18-9	Emory Valley	10	0.45	3.08	No
470	SL:MH:E14A-K18-9MH:E14A-K18-10	Emory Valley	10	0.45	3.13	No
471	SL:MH:E14A-K18-10MH:E14A-K18-3	Emory Valley	10	0.45	0.58	No
472	SL:MH:E14A-K18-3MH:E14A-K18-4	Emory Valley	10	0.45	3.59	No
473	SL:MH:E14A-K18-4MH:E14A-K18-5	Emory Valley	10	0.45	2.42	No
474	SL:MH:E14A-K18-5MH:E14A-K18-6	Emory Valley	10	0.45	1.94	No
475	SL:MH:E14A-K18-6MH:E14A-K18-7	Emory Valley	10	0.44	2.17	No
476	SL:MH:E14A-K18-7MH:E14A-K18-8	Emory Valley	10	0.44	2.26	No
477	SL:MH:E14A-K18-8MH:E14A-K19-10	Emory Valley	10	0.44	2.69	No
478	SL:MH:E14A-K18-1MH:E14A-K18-2	Emory Valley	10	0.45	3.08	No
479	SL:MH:E14A-K19-10MH:E14A-K19-11	Emory Valley	10	0.44	2.51	No
480	SL:MH:E14A-K19-11MH:E14A-K19-12	Emory Valley	10	0.44	2.69	No
481	SL:MH:E14A-K19-12MH:E14A-K19-13	Emory Valley	10	0.44	1.49	No
482	SL:MH:E14A-K19-13MH:E14A-K19-14	Emory Valley	10	0.44	2.08	No
483	SL:MH:E14A-K19-14MH:E14A-K19-15	Emory Valley	10	0.44	2.08	No

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
484	SL:MH:E14A-K19-15MH:E14A-K19-16	Emory Valley	10	0.44	2.38	No
485	SL:MH:E14-K17-1;MH:E14A-K18-1	Emory Valley	10	0.44	2.03	No
486	SL:MH:E5B-L22-5MH:E5B-L22-6	Emory Valley	8	1.65	1.25	Yes
487	SL:MH:E5B-L22-6MH:E5B-L22-3	Emory Valley	8	1.65	1.6	Yes
488	SL:MH:E5B-L22-3MH:E5B-L22-9	Emory Valley	15	5.87	5.36	Yes
489	SL:MH:E5B-L21-18MH:E5B-L22-3	Emory Valley	15	4.6	5.78	No
490	SL:MH:E5B-K20-11EMH:E5B-K20-21	Emory Valley	12	1.49	6.93	No
491	SL:MH:E5B-K20-21MH:E5B-K20-20	Emory Valley	15	2.06	5.5	No
492	SL:MH:E5B-K20-20MH:E5B-K20-19	Emory Valley	15	2.06	3.13	No
493	SL:MH:E5B-K20-19MH:E5B-K20-18	Emory Valley	15	2.06	4.25	No
494	SL:MH:E5B-K20-18MH:E5B-K20-17	Emory Valley	15	2.06	4.07	No
495	SL:MH:E5B-K20-17MH:E5B-K20-16	Emory Valley	15	2.06	3.67	No
496	SL:MH:E5B-K20-16MH:E5B-K20-15	Emory Valley	15	2.05	5.23	No
497	SL:MH:E5B-K20-15MH:E5B-L21-8	Emory Valley	15	3.9	4.98	No
498	SL:MH:E5B-L21-8MH:E5B-L21-7	Emory Valley	15	3.89	4.44	No
499	SL:MH:E5B-L21-7MH:E5B-L21-6	Emory Valley	15	3.89	5.34	No
500	SL:MH:E5B-L21-6MH:E5B-L21-5A	Emory Valley	15	3.89	3.99	No
501	SL:MH:E5B-L21-5AMH:E5B-L21-5	Emory Valley	15	3.9	5.36	No
502	SL:MH:E5B-L21-5MH:E5B-L21-4	Emory Valley	15	3.9	4.66	No
503	SL:MH:E5B-L21-4MH:E5B-L21-3	Emory Valley	15	3.9	4.37	No
504	SL:MH:E5B-L21-3MH:E5B-L21-2	Emory Valley	15	4.49	4.05	Yes
505	SL:MH:E5B-L21-2MH:E5B-L21-24	Emory Valley	15	4.48	3.83	Yes

**TABLE A-33 (CONTINUED)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM CAPACITY ASSESSMENT REPORT**  
**CAPACITY ANALYSIS FOR SEWER PIPES IN SPINE MODEL**

Item	Sewer Pipe	Sewershed	Diameter (in)	Computed Peak Flow (cfs)	Full Flow Capacity (cfs)	Flow > Capacity?
506	SL:MH:E5B-L21-24MH:E5B-L21-18	Emory Valley	15	4.48	6.07	No
507	SL:MH:E5B-K21-15MH:E5B-K20-9	Emory Valley	10	0.11	4.59	No
508	SL:MH:E5B-K20-9MH:E5B-K20-10	Emory Valley	10	0.11	1.52	No
509	SL:MH:E5B-K20-10MH:E5B-K20-11	Emory Valley	10	0.11	2.21	No
510	SL:MH:E5B-K20-11MH:E5B-K20-12	Emory Valley	10	0.11	1.12	No
511	SL:MH:E5B-K20-12MH:E5B-K20-13	Emory Valley	10	0.11	1.21	No
512	SL:MH:E5B-K20-14MH:E5B-K20-14	Emory Valley	10	0.22	1.02	No
513	SL:MH:E5B-K20-11FMH:E5B-K20-11E	Emory Valley	10	0.22	1.02	No
514	SL:MH:E5B-K20-13MH:E5B-K20-14	Emory Valley	10	0.11	1.09	No
515	SL:MH:E19-L21-18;MH:E5B-L22-4	Emory Valley	8	0.15	2.03	No
516	SL:MHE5B-L22-9MH:E5B-L22-20	Emory Valley	16	5.87	5.24	Yes
517	SL:MH:E14A-K19-17SHARED;MH:E5B-K20-21	Emory Valley	10	0.86	3.15	No
518	SL:MH:E5A-J19-1;MH:E5B-K20-11E	Emory Valley	10	1.37	4.98	No
519	MH:13A-G22-6-MH:13B-G22-8	East Plant	21	10.39	3.73	Yes
520	SL:MH:W18G-D2-1;TP Wet Well	Turtle Park	42	38.27	97.19	No
* Indicated pipes not loaded; dead end run in commercial area.						

**TABLE A-34  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
1	SL:MH:W16-C3-27MH:W16-C3-28	Turtle Park	8	0.04	3.26	0.01
2	SL:MH:W16-C3-28MH:W16-C3-29	Turtle Park	8	0.04	1.57	0.03
3	SL:MH:W16-C3-32MH:W16-C3-29	Turtle Park	8	0.04	0.89	0.04
4	SL:MH:W16-C3-32MH:W16-C3-33	Turtle Park	8	0.04	0.82	0.05
5	SL:MH:W16-C3-33MH:W16-D3-32	Turtle Park	8	0.04	0.87	0.05
6	SL:MH:W16-D3-32MH:W16-D4-2	Turtle Park	8	0.04	1.72	0.02
7	SL:MH:W16-D3-42MH:W16-D3-44	Turtle Park	10	0.04	3.2	0.01
8	SL:MH:W16-D4-9MH:W16-D3-38	Turtle Park	8	0.04	1.14	0.04
9	SL:MH:W16-D3-38MH:W16-D3-41	Turtle Park	10	0.04	2.82	0.01
10	SL:MH:W16-D3-41MH:W16-D3-42	Turtle Park	10	0.04	3.19	0.01
11	SL:MH:W16-D4-4MH:W16-D4-9	Turtle Park	8	0.04	1.32	0.03
12	SL:MH:W16-D4-2MH:W16-D4-4	Turtle Park	8	0.04	4.37	0.01
13	SL:MH:W18H-D3-50MH:W18H-D3-51	Turtle Park	16	0.04	5.54	0.01
14	SL:MH:W18H-D3-51MH:W18H-D3-52	Turtle Park	16	0.04	2.21	0.02
15	SL:MH:W18H-D3-52MH:W18H-D3-22	Turtle Park	16	0.04	3.26	0.01
16	SL:MH:W18H-D3-22MH:W18H-D3-61	Turtle Park	16	0.09	3.05	0.03
17	SL:MH:W18H-D3-61MH:W18H-D2-21	Turtle Park	16	0.09	3.36	0.03
18	SL:MH:W18H-D2-21MH:W18H-D2-20	Turtle Park	36	0.09	24.31	0.00
19	SL:MH:W18H-D2-20MH:W18H-D2-30	Turtle Park	36	0.09	16.18	0.01
20	SL:MH:W18H-D2-30MH:W18H-D2-6	Turtle Park	12	0.09	4.7	0.02
21	SL:MH:W18H-D2-6MH:W18H-D2-5	Turtle Park	12	0.09	0.84	0.11
22	SL:MH:W18H-D2-5MH:W18H-D2-4	Turtle Park	12	0.09	2.34	0.04

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
23	SL:MH:W18G-E5-1MH:W18G-D5-53	Turtle Park	42	11.11	34.98	0.32
24	SL:MH:W18G-D5-53MH:W18G-E4-5	Turtle Park	42	11.1	16.75	0.66
25	SL:MH:W18G-E4-4MH:W18G-E4-5	Turtle Park	42	11.1	34.53	0.32
26	SL:MH:W18G-E4-4MH:W18G-E4-3	Turtle Park	42	11.1	35.28	0.31
27	SL:MH:W18G-E4-3MH:W18G-E4-2	Turtle Park	42	11.1	30.52	0.36
28	SL:MH:W18G-E4-2MH:W18G-E4-1	Turtle Park	42	11.1	32.29	0.34
29	SL:MH:W18G-E4-1MH:W18G-E3-5	Turtle Park	42	11.1	78.87	0.14
30	SL:MH:W18G-E3-5MH:W18G-E3-4	Turtle Park	42	11.2	150.95	0.07
31	SL:MH:W18G-E3-4MH:W18G-E3-3	Turtle Park	42	11.2	93.64	0.12
32	SL:MH:W18G-E3-2MH:W18G-E3-1	Turtle Park	42	11.2	88.98	0.13
33	SL:MH:W18G-E3-3MH:W18G-E3-2	Turtle Park	42	11.2	59.2	0.19
34	SL:MH:W18G-E3-1MH:W18G-E2-2	Turtle Park	42	11.2	36.48	0.31
35	SL:MH:W18G-E2-2MH:W18G-E2-1	Turtle Park	42	11.2	36.29	0.31
36	SL:MH:W18G-E2-1MH:W18G-D2-3	Turtle Park	42	11.2	38.41	0.29
37	SL:MH:W18G-D2-3MH:W18G-D2-2	Turtle Park	42	11.19	105.83	0.11
38	SL:MH:W18G-D2-2MH:W18G-D2-1	Turtle Park	42	11.19	91.02	0.12
39	SL:MH:W14-E6-29MH:W14-E6-29	Turtle Park	12	0.01	8.81	0.00
40	SL:MH:W18F-F8-3MH:W18F-F8-2	Turtle Park	36	10.48	21.01	0.50
41	SL:MH:W18F-F8-2MH:W18F-F8-1	Turtle Park	36	10.48	21.04	0.50
42	SL:MH:W18F-F8-1MH:W18F-F7-5	Turtle Park	36	10.48	22.93	0.46
43	SL:MH:W18F-F7-5MH:W18F-F7-4	Turtle Park	36	10.48	21.17	0.50
44	SL:MH:W18F-F7-4MH:W18F-F7-3	Turtle Park	36	10.47	21.12	0.50
45	SL:MH:W18F-F7-3MH:W18F-F7-2	Turtle Park	36	10.47	21.17	0.49

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
46	SL:MH:W18F-F7-2MH:W18F-F7-1	Turtle Park	36	10.51	23.06	0.46
47	SL:MH:W18F-F7-1MH:W18F-F6-2	Turtle Park	36	11.02	23.13	0.48
48	SL:MH:W18F-F6-2MH:W18F-F6-1	Turtle Park	36	11.02	22.59	0.49
49	SL:MH:W18F-F6-1MH:W18F-E6-4	Turtle Park	36	11.02	23.33	0.47
50	SL:MH:W18F-E6-4MH:W18F-E6-3	Turtle Park	36	11.02	32.95	0.33
51	SL:MH:W18F-E6-3MH:W18F-E6-2	Turtle Park	36	11.02	22.83	0.48
52	SL:MH:W18F-E6-2MH:W18F-E6-1	Turtle Park	36	11.02	23.3	0.47
53	SL:MH:W18F-E6-1MH:W18F-E5-4	Turtle Park	36	11.01	25.87	0.43
54	SL:MH:W18F-E5-4MH:W18F-E5-3	Turtle Park	36	11.02	52.39	0.21
55	SL:MH:W18F-E5-3MH:W18F-E5-2	Turtle Park	42	11.02	47.71	0.23
56	SL:MH:W18F-E5-5MH:W18F-E5-4	Turtle Park	12	0.01	2.12	0.00
57	SL:MH:W13-C7-31MH:W13-D7-9	Turtle Park	8	0.01	2.31	0.00
58	SL:MH:W13-D7-9MH:W13-D7-18	Turtle Park	8	0.01	3.72	0.00
59	SL:MH:W13-D7-18MH:W13-D7-20	Turtle Park	8	0.01	1.37	0.01
60	SL:MH:W13-D7-20MH:W13-D7-21	Turtle Park	8	0.01	3.55	0.00
61	SL:MH:W13-D7-21MH:W13-D7-26	Turtle Park	8	0.01	0.78	0.01
62	SL:MH:W13-D7-26MH:W13-D7-28	Turtle Park	8	0.01	2.04	0.00
63	SL:MH:W13-D7-28MH:W13-D7-29	Turtle Park	8	0.01	0.42	0.02
64	SL:MH:W13-D7-29MH:W13-D7-30	Turtle Park	8	0.01	1	0.01
65	SL:MH:W13-D7-30MH:W13-D7-34	Turtle Park	10	0.01	1.82	0.01
66	SL:MH:W13-D7-34MH:W13-D7-35	Turtle Park	10	0.01	3.75	0.00
67	SL:MH:W13-D7-35MH:W13-D7-40	Turtle Park	10	0.01	4.18	0.00
68	SL:MH:W13-D7-40MH:W13-D7-44	Turtle Park	10	0.01	1.77	0.01

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
69	SL:MH:W13-D7-44MH:W13-D7-53	Turtle Park	10	0.01	4.72	0.00
70	SL:MH:W13-D7-53MH:W13-E7-1	Turtle Park	10	0.01	3.26	0.00
71	SL:MH:W13-E7-1MH:W13-E7-2	Turtle Park	10	0.01	1.51	0.01
72	SL:MH:W13-E7-2MH:W13-E7-3	Turtle Park	10	0.01	1.56	0.01
73	SL:MH:W13-E7-3MH:W13-E7-4	Turtle Park	8	0.01	2.21	0.00
74	SL:MH:W13-E7-4MH:W13-E7-5	Turtle Park	12	0.01	6	0.00
75	SL:MH:W13-E7-5MH:W13-E7-6	Turtle Park	12	0.01	3.68	0.00
76	SL:MH:W13-E7-6MH:W13-E7-7	Turtle Park	12	0.05	2.85	0.02
77	SL:MH:W13-E7-7MH:W13-E7-8	Turtle Park	12	0.05	15.13	0.00
78	SL:MH:W12-D9-27MH:W12-D9-28	Turtle Park	8	0.06	0.76	0.08
79	SL:MH:W12-D9-28MH:W12-D9-29	Turtle Park	8	0.06	0.87	0.07
80	SL:MH:W12-D9-29MH:W12-D9-6	Turtle Park	8	0.06	2.61	0.02
81	SL:MH:W12-D9-6MH:W12-E9-15	Turtle Park	8	0.45	1.83	0.25
82	SL:MH:W12-D9-5MH:W12-D9-6	Turtle Park	8	0.39	3.33	0.12
83	SL:MH:W12-E9-15MH:W12-E9-14	Turtle Park	10	0.45	4	0.11
84	SL:MH:W11-D9-42MH:W11-D9-43	Turtle Park	8	0.11	1.74	0.06
85	SL:MH:W11-D9-43MH:W11-D9-44	Turtle Park	12	0.11	2.91	0.04
86	SL:MH:W10-E10-21MH:W10-E10-20	Turtle Park	8	0.02	1.14	0.02
87	SL:MH:W18D-E9-8MH:W18D-E9-17	Turtle Park	36	10.11	19.25	0.53
88	SL:MH:W18D-E9-17MH:W18D-E9-7	Turtle Park	36	10.11	21.87	0.46
89	SL:MH:W18D-E9-7MH:W18D-E9-6	Turtle Park	36	10.11	21.02	0.48
90	SL:MH:W18D-E9-6MH:W18D-E9-5	Turtle Park	36	10.11	30.05	0.34
91	SL:MH:W18D-E9-5MH:W18D-E9-4	Turtle Park	36	10.49	29.83	0.35

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
92	SL:MH:W18D-E9-4MH:W18D-E9-3	Turtle Park	36	10.49	20.97	0.50
93	SL:MH:W18D-E9-3MH:W18D-E9-2	Turtle Park	36	10.49	21.27	0.49
94	SL:MH:W18D-E9-2MH:W18D-E9-1	Turtle Park	36	10.49	20.71	0.51
95	SL:MH:W18D-E9-1MH:W18D-F9-1	Turtle Park	36	10.49	21.67	0.48
96	SL:MH:W18D-F9-1MH:W18D-F8-5	Turtle Park	36	10.49	21	0.50
97	SL:MH:W18D-F8-5MH:W18D-F8-4	Turtle Park	36	10.49	24.35	0.43
98	SL:MH:W18D-E9-25MH:W18D-E9-24	Turtle Park	10	0.14	2.61	0.05
99	SL:MH:W18D-E9-24MH:W18D-E9-9.2	Turtle Park	10	0.14	1.12	0.13
100	SL:MH:W18D-E9-9.2MH:W18D-E9-9.1	Turtle Park	10	0.14	3.23	0.04
101	SL:MH:W18D-E9-9.1MH:W18D-E9-9	Turtle Park	10	0.14	2.46	0.06
102	SL:MH:W18D-E9-9MH:W18D-E9-8	Turtle Park	36	10.11	27.37	0.37
103	SL:MH:W18D-F11-3MH:W18D-F11-2	Turtle Park	36	8	18.38	0.44
104	SL:MH:W18D-F11-2MH:W18D-F11-1	Turtle Park	36	8	19.14	0.42
105	SL:MH:W18D-F11-1MH:W18D-F10-6	Turtle Park	36	7.99	18.93	0.42
106	SL:MH:W18D-F10-6MH:W18D-F10-5	Turtle Park	36	7.98	18.68	0.43
107	SL:MH:W18D-F10-5MH:W18D-F10-4	Turtle Park	36	7.98	18.96	0.42
108	SL:MH:W18D-F10-4MH:W18D-F10-3	Turtle Park	36	7.98	18.84	0.42
109	SL:MH:W18D-F10-3MH:W18D-F10-2	Turtle Park	36	7.98	19.21	0.42
110	SL:MH:W18D-F10-2MH:W18D-F10-1	Turtle Park	36	7.98	18.42	0.43
111	SL:MH:W18D-F10-1MH:W18D-E10-2	Turtle Park	36	9.99	29.22	0.34
112	SL:MH:W18D-E10-2MH:W18D-E10-1	Turtle Park	36	9.99	29.7	0.34
113	SL:MH:W18D-E10-1MH:W18D-E9-10	Turtle Park	36	9.99	30.25	0.33
114	SL:MH:W18D-E9-10MH:W18D-E9-9	Turtle Park	36	9.98	34.92	0.29

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
115	SL:MH:W16-D3-44;MH:W18G-D3-50	Turtle Park	12	0.04	12.1	0.00
116	SL:MH:W18H-D2-4;MH:W18G-D2-1	Turtle Park	12	0.09	13.33	0.01
117	SL:MH:W15-D5-52;MH:W18G-E5-1	Turtle Park	12	0.1	6.84	0.01
118	SL:MH:W18F-E5-2;MH:W18G-E5-1	Turtle Park	42	11.02	72.27	0.15
119	SL:MH:W14-E6-28;MH:W18F-E5-5	Turtle Park	12	0.01	3.42	0.00
120	SL:MH:W13-E7-8;MH:W18F-F7-2	Turtle Park	12	0.05	1.97	0.03
121	SL:MH:W18D-F8-4;MH:W18F-F8-3	Turtle Park	36	10.49	32.65	0.32
122	SL:MH:W10-E10-20;MH:W18D-E10-19	Turtle Park	8	0.02	1.56	0.01
123	SL:MH:W18D-E10-19;MH:W18D-E9-25	Turtle Park	10	0.13	1.41	0.09
124	SL:MH:W11-D9-44;MH:W18D-E10-19	Turtle Park	12	0.11	4.38	0.03
125	SL:MH:W12-E9-14;MH:W18D-E9-5	Turtle Park	12	0.45	8.22	0.05
126	SL:MH:W17-D1W-2MH:W17-D1-1	West End	8	0.17	0.84	0.20
127	SL:MH:W17-D1-1MH:W17-D1-2	West End	8	0.17	2.56	0.07
128	SL:MH:W17-D1-2MH:W17-D1-13	West End	8	0.17	0.09	1.89
129	SL:MH:W17-D1-13MH:W17-D1-12	West End	8	0.17	0.77	0.22
130	SL:MH:W17-D1-12MH:W17-D1-11	West End	8	0.17	0.8	0.21
131	SL:MH:W17-D1-11MH:W17-D1-10	West End	12	0.17	1.6	0.11
132	SL:MH:W17-D1-10MH:W17-D1-7	West End	12	0.17	2.53	0.07
133	SL:MH:W17-D1-7MH:W17-D2-27	West End	12	0.17	0.24	0.71
134	SL:MH:W17-D2-27MH:W17-D2-28	West End	12	0.17	1.65	0.10
135	SL:MH:W17-D2-28MH:W17-D2-29	West End	12	0.17	2.15	0.08
136	SL:MH:W17-D2-29MH:W17-D2-8	West End	12	0.2	0.81	0.25
137	SL:MH:W17-D2-8MH:W17-D2-7	West End	12	0.2	3.52	0.06

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
138	SL:MH:W17-D2-7MH:W17-D2-1	West End	12	0.2	11.89	0.02
139	SL:MH:E25-H15-17MH:E25-H15-16	Central City	21	7.84	16.99	0.46
140	SL:MH:E25-H15-16MH:E25-H15-15	Central City	21	7.69	22.86	0.34
141	SL:MH:E25-H15-15MH:E25-H15-14	Central City	21	7.39	14.25	0.52
142	SL:MH:E25-H15-14MH:E25-H15-13	Central City	21	7.26	12.35	0.59
143	SL:MH:E25-H15-13MH:E25-H15-12	Central City	21	6.95	11.36	0.61
144	SL:MH:E25-H15-12MH:E25-H15-11	Central City	21	6.71	14.5	0.46
145	SL:MH:E25-H15-11MH:E25-G15-18	Central City	21	6.31	10.6	0.60
146	SL:MH:E25-G15-18MH:E25-G15-17	Central City	21	5.73	21.68	0.26
147	SL:MH:E25-G15-17MH:E25-G15-16	Central City	21	5.56	10.13	0.55
148	SL:MH:E25-G15-16MH:E25-G15-15	Central City	21	5.42	11.15	0.49
149	SL:MH:E25-G15-15MH:E25-G15-14	Central City	21	5.17	23	0.22
150	SL:MH:W5A-G15-6MH:W5A-G15-7	Central City	20	4.78	14.3	0.33
151	SL:MH:W5A-G15-12MH:W5A-G15-6	Central City	21	4.8	15.09	0.32
152	SL:MH:W5-G14-21MH:W5-G14-20	Central City	10	0.3	2.06	0.15
153	SL:MH:W5-G14-20MH:W5-G13-27	Central City	10	0.3	2.63	0.11
154	SL:MH:W5-G15-11MH:W5-G14-17	Central City	20	4.72	10.28	0.46
155	SL:MH:W5-G14-17MH:W5-G14-16	Central City	20	4.67	11.51	0.41
156	SL:MH:W5-G14-16MH:W5-G14-6	Central City	20	4.59	11.47	0.40
157	SL:MH:W5-G14-6MH:W5-G14-7	Central City	20	4.54	12.68	0.36
158	SL:MH:W5-G14-7MH:W5-G14-8	Central City	21	4.51	5.67	0.80
159	SL:MH:W5-G14-8MH:W5-G14-9	Central City	21	4.48	15.36	0.29
160	SL:MH:W5-G14-9MH:W5-G14-10	Central City	21	4.43	18.9	0.23

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
161	SL:MH:W5-G14-10MH:W5-G14-11A	Central City	21	4.35	12.08	0.36
162	SL:MH:W5-G14-11AMH:W5-H14-31	Central City	21	4.3	8.2	0.52
163	SL:MH:W5-H14-31MH:W5-G14-11	Central City	21	4.13	31.1	0.13
164	SL:MH:W5-G14-11MH:W5-G14-13	Central City	21	4.11	12.94	0.32
165	SL:MH:W5-G14-13MH:W5-G14-14	Central City	21	4.09	12.75	0.32
166	SL:MH:W5-G14-14MH:W5-G14-15	Central City	21	4.06	8.33	0.49
167	SL:MH:W5-G14-15MH:W5-G13-12	Central City	21	4.42	13.22	0.33
168	SL:MH:W5-G13-27MH:W5-G13-20	Central City	10	0.3	2.78	0.11
169	SL:MH:W5-G13-11MH:W5-G13-10	Central City	21	4.33	9.91	0.44
170	SL:MH:W5-G13-10MH:W5-G13-9	Central City	21	4.29	8.28	0.52
171	SL:MH:W5-G13-9MH:W5-G13-8	Central City	21	4.59	9.25	0.50
172	SL:MH:W5-G13-8MH:W5-G13-7	Central City	21	4.59	6.93	0.66
173	SL:MH:W5-G13-20MH:W5-G13-9	Central City	10	0.3	13.14	0.02
174	SL:MH:W5-G13-7MH:W5-G13-6	Central City	21	4.59	10.87	0.42
175	SL:MH:W5-G13-6MH:W5-G13-5	Central City	21	4.59	10.36	0.44
176	SL:MH:W5-G13-5MH:W5-G13-4	Central City	21	4.58	14.36	0.32
177	SL:MH:W5-G13-4MH:W5-G13-3	Central City	21	4.57	12.73	0.36
178	SL:MH:W5-G13-3MH:W5-G13-2	Central City	21	4.56	8.4	0.54
179	SL:MH:W5-G13-2MH:W5-G13-1	Central City	21	4.54	19.98	0.23
180	SL:MH:W5-G13-31MH:W5-G13-30	Central City	12	*	2.72	*
181	SL:MH:W5-G13-30MH:W5-G13-1	Central City	10	*	7.09	*
182	SL:MH:W5-G13-32MH:W5-G13-31	Central City	10	*	4.01	*
183	SL:MH:W5-G13-33MH:W5-G13-32	Central City	10	*	2.59	*

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
184	SL:MH:W5-G13-35MH:W5-G13-34	Central City	10	*	1.93	*
185	SL:MH:W5-G13-34MH:W5-G13-33	Central City	10	*	2.3	*
186	SL:MH:W5-G13-36MH:W5-G13-35	Central City	12	*	3.43	*
187	SL:MH:W5-G13-37MH:W5-G13-36	Central City	10	*	1.86	*
188	SL:MH:W5-G13-12MH:W5-G13-11	Central City	21	4.37	11.29	0.39
189	SL:MH:W5-G13-1MH:W5-G12-7	Central City	21	4.54	14.26	0.32
190	SL:MH:W5-G12-7MH:W5-G12-6	Central City	21	4.54	12.74	0.36
191	SL:MH:W5-G12-6MH:W5-G12-5	Central City	21	4.52	16.93	0.27
192	SL:MH:W5-G12-5MH:W5-G12-4	Central City	24	4.52	21.01	0.22
193	SL:MH:W5-G12-4MH:W5-G12-3	Central City	24	5.42	10.6	0.51
194	SL:MH:W5-G12-3MH:W5-G12-2	Central City	24	5.38	13.38	0.40
195	SL:MH:W5-G12-2MH:W5-G12-1	Central City	24	5.36	13.37	0.40
196	SL:MH:W5-G12-1MH:W5-G11-8	Central City	24	5.35	23.96	0.22
197	SL:MH:W5-G11-8MH:W5-G11-9	Central City	24	5.35	11.77	0.45
198	SL:MH:W5-G11-9MH:W5-G11-10	Central City	24	5.36	11.96	0.45
199	SL:MH:W5-G11-10MH:W5-F11-4	Central City	24	5.67	18.52	0.31
200	SL:MH:W5-F11-4MH:W5-F11-3	Central City	36	8.01	20.34	0.39
201	SL:MH:W6-E15-52MH:W6-E15-45	Central City	8	0.01	1.45	0.01
202	SL:MH:W6-E15-45MH:W6-E14-8	Central City	8	0.01	2.02	0.00
203	SL:MH:W6-E14-8MH:W6-E14-7	Central City	8	0.01	1.92	0.01
204	SL:MH:W6-E14-7MH:W6-E14-6	Central City	8	0.03	2.12	0.01
205	SL:MH:W6-E14-6MH:W6-E14-5	Central City	8	0.03	2.83	0.01
206	SL:MH:W6-E14-5MH:W6-E14-4	Central City	8	0.03	2.33	0.01

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
207	SL:MH:W6-E14-4MH:W6-E14-3A	Central City	8	0.03	2.48	0.01
208	SL:MH:W6-E14-3AMH:W6-E14-3	Central City	8	0.03	1.93	0.02
209	SL:MH:W6-E13-2MH:W6-E13-1	Central City	8	0.01	3.38	0.00
210	SL:MH:W6-E13-1MH:W6-F13-10	Central City	8	0.01	2.15	0.00
211	SL:MH:W6-E14-36MH:W6-E14-35	Central City	8	0.02	4.34	0.00
212	SL:MH:W6-E14-35MH:W6-E14-7	Central City	8	0.02	0.91	0.02
213	SL:MH:W6-E14-2MH:W6-E14-1	Central City	8	0.08	2.61	0.03
214	SL:MH:W6-E14-1MH:W6-F13-31	Central City	8	0.08	1.74	0.05
215	SL:MH:W6-F13-31MH:W6-F13-30	Central City	8	0.08	1.46	0.05
216	SL:MH:W6-F13-30MH:W6-F13-29	Central City	8	0.08	1.12	0.07
217	SL:MH:W6-F13-29MH:W6-F13-10	Central City	8	0.08	1.31	0.06
218	SL:MH:W6-F13-10MH:W6-F13-9	Central City	10	0.08	2.55	0.03
219	SL:MH:W6-F13-9MH:W6-F13-8	Central City	10	0.08	1.82	0.04
220	SL:MH:W6-F13-8MH:W6-F13-7	Central City	10	0.08	1.76	0.05
221	SL:MH:W6-F13-7MH:W6-F13-6	Central City	10	0.08	1.56	0.05
222	SL:MH:W6-F13-6MH:W6-F13-5	Central City	10	0.08	2.12	0.04
223	SL:MH:W6-F13-5MH:W6-F13-4	Central City	10	0.08	1.97	0.04
224	SL:MH:W6-F13-4MH:W6-F13-3A	Central City	10	0.08	2.3	0.03
225	SL:MH:W6-F13-3AMH:W6-F13-3	Central City	10	0.08	1.73	0.05
226	SL:MH:W6-F13-3MH:W6-F13-2	Central City	10	0.08	5.37	0.01
227	SL:MH:W6-F13-2MH:W6-F13-1	Central City	10	0.08	2.68	0.03
228	SL:MH:W6-F13-1MH:W6-F12-16	Central City	10	0.08	2.27	0.04
229	SL:MH:W6-F12-16MH:W6-F12-15	Central City	12	0.08	7.47	0.01

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
230	SL:MH:W6-E14-3 MH:W6-E14-2	Central City	8	0.08	0.54	0.15
231	SL:MH:W9-F12-2 MH:W9-F12-3	Central City	10	0.04	1.88	0.02
232	SL:MH:W9-F12-3 MH:W9-F12-2	Central City	15	0.35	5.35	0.07
233	SL:MH:W9-F12-2 MH:W9-F12-1	Central City	15	0.35	5.19	0.07
234	SL:MH:W9-F12-9 MH:W9-F12-8	Central City	15	0.31	6.48	0.05
235	SL:MH:W9-F12-8 MH:W9-F12-3	Central City	15	0.31	6.44	0.05
236	SL:MH:W9-F12-1 MH:W9-F11-10	Central City	15	0.35	4.81	0.07
237	SL:MH:W9-F11-10 MH:W9-F11-9	Central City	15	0.35	4.94	0.07
238	SL:MH:W9-F11-9 MH:W9-F11-8	Central City	15	0.35	5.01	0.07
239	SL:MH:W9-F11-8 MH:W9-F11-7	Central City	15	0.35	11.41	0.03
240	SL:MH:W7-F12-14 MH:W7-G12-13	Central City	12	0.08	3.62	0.02
241	SL:MH:W8-E12-3 MH:W8-E12-2	Central City	10	0.08	4.19	0.02
242	SL:MH:W8-E12-2 MH:W8-E12-1	Central City	10	0.08	1.57	0.05
243	SL:MH:W8-E12-1 MH:W8-F12-28	Central City	10	0.08	1.57	0.05
244	SL:MH:W8-F12-28 MH:W8-F12-27	Central City	10	0.08	4.33	0.02
245	SL:MH:W8-F12-27 MH:W8-F12-26	Central City	10	0.08	2.45	0.03
246	SL:MH:W8-F12-26 MH:W8-F12-25	Central City	10	0.08	1.09	0.07
247	SL:MH:W8-F12-25 MH:W8-F12-11	Central City	12	0.08	12.25	0.01
248	SL:MH:W8-F12-12 MH:W8-F12-11	Central City	12	0.27	3.72	0.07
249	SL:MH:W8-F12-11 MH:W8-F12-10	Central City	15	0.31	12.44	0.02
250	SL:MH:W9-F11-7; MH:W5-G11-10	Central City	15	0.35	7.53	0.05
251	SL:MH:W8-F12-10; MH:W9-F12-9	Central City	12	0.31	2.77	0.11
252	SL:MH:W7-G12-13; MH:W8-F12-12	Central City	12	0.08	2.61	0.03

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
253	SL:MH:W6-F12-15;MH:W7-F12-14	Central City	12	0.08	8.94	0.01
254	SL:MH:E25-G15-14;MH:W5-G15-13	Central City	21	5.02	17.06	0.29
255	SL:MH:W5-G15-13;MH:W5A-G15-12	Central City	21	4.82	15.77	0.31
256	SL:MH:W5A-G15-7;MH:W5-G15-11	Central City	20	4.77	11.09	0.43
257	SL:MH:W19-H11-7MH:W19-H11-6	Y12	8	0.18	0.6	0.30
258	SL:MH:W19-H11-4MH:W19-H11-3	Y12	8	0.18	1.35	0.13
259	SL:MH:W19-H11-3MH:W19-H11-2	Y12	8	0.18	0.29	0.62
260	SL:MH:W19-H11-2MH:W19-H11-1	Y12	8	0.18	0.27	0.67
261	SL:MH:W19-H11-6MH:W19-H11-5	Y12	8	0.18	2.33	0.08
262	SL:MH:W19-H11-5MH:W19-H11-4	Y12	8	0.18	1.01	0.18
263	SL:MH:W4-K11-6MH:W4-K11-7	Y12	10	0.02	6.07	0.00
264	SL:MH:W4-K11-7MH:W4-J11-7	Y12	12	0.02	7.49	0.00
265	SL:MH:W4-J11-7MH:W4-J11-8	Y12	12	0.1	3.89	0.03
266	SL:MH:W4-J11-8MH:W4-J11-1	Y12	12	0.1	3.7	0.03
267	SL:MH:W4-J11-1MH:W4-J11-10	Y12	12	0.1	2.76	0.04
268	SL:MH:W4-J11-10MH:W4-J11-11	Y12	12	0.1	2.48	0.04
269	SL:MH:W4-J11-11MH:W4-J11-12	Y12	12	0.1	2.54	0.04
270	SL:MH:W4-J11-12MH:W4-J12-2	Y12	12	0.1	6.7	0.01
271	SL:MH:W4-K11-13MH:W4-J11-6	Y12	12	0.08	4.68	0.02
272	SL:MH:W4-J11-6MH:W4-J11-7	Y12	12	0.08	2.96	0.03
273	SL:MH:W4-K10-32MH:W4-K11-13	Y12	12	0.08	2.49	0.03
274	SL:MH:W18A-O14-17MH:W18A-O13-9	Y12	12	0.51	4.62	0.11
275	SL:MH:W18A-O13-9MH:W18A-O13-8	Y12	12	0.51	4.74	0.11

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
276	SL:MH:W18A-O13-8MH:W18A-O13-7	Y12	12	0.51	4.76	0.11
277	SL:MH:W18A-O13-7MH:W18A-O13-5	Y12	12	0.51	8.02	0.06
278	SL:MH:W18A-O13-5MH:W18A-O13-6	Y12	18	0.51	12.12	0.04
279	SL:MH:W18A-O13-6MH:W18A-N13-5	Y12	18	0.51	10.79	0.05
280	SL:MH:W18A-N13-5MH:W18A-N13-6	Y12	15	1.4	6.84	0.20
281	SL:MH:W18A-N13-6MH:W18A-N13-7	Y12	18	1.4	8.8	0.16
282	SL:MH:W18A-N13-7MH:W18A-N13-8	Y12	18	1.4	7.75	0.18
283	SL:MH:W18A-N13-8MH:W18A-N13-9	Y12	18	1.76	7.95	0.22
284	SL:MH:W18A-N13-9MH:W18A-M13-1	Y12	18	1.76	10.75	0.16
285	SL:MH:W18A-N12-1MH:W18A-N13-1	Y12	15	0.89	11.85	0.08
286	SL:MH:W18A-N13-1MH:W18A-N13-2	Y12	15	0.89	9.78	0.09
287	SL:MH:W18A-N13-2MH:W18A-N13-3	Y12	15	0.89	14.34	0.06
288	SL:MH:W18A-N13-3MH:W18A-N13-4	Y12	15	0.89	14.61	0.06
289	SL:MH:W18A-N13-4MH:W18A-N13-5	Y12	15	0.89	20.42	0.04
290	SL:MH:W18A-M13-1MH:W18A-M13-2	Y12	18	1.76	7.81	0.23
291	SL:MH:W18A-M13-2MH:W18A-M13-3	Y12	18	1.76	8.18	0.22
292	SL:MH:W18A-M13-3MH:W18A-M13-4	Y12	18	1.76	10.79	0.16
293	SL:MH:W18A-M13-4MH:W18A-M13-5	Y12	18	1.76	11.94	0.15
294	SL:MH:W18A-M13-5MH:W18A-L13-1	Y12	18	1.76	7.16	0.25
295	SL:MH:W18A-L13-1MH:W18A-L13-2	Y12	18	1.76	3.89	0.45
296	SL:MH:W18A-L13-2MH:W18A-L13-3	Y12	24	1.76	46.41	0.04
297	SL:MH:W18A-L13-3MH:W18A-L13-4	Y12	21	1.76	25.18	0.07
298	SL:MH:W18A-L13-4MH:W18A-L13-5	Y12	21	1.76	6.69	0.26

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
299	SL:MH:W18A-L13-5MH:W18A-K12-18	Y12	21	1.76	11.31	0.16
300	SL:MH:W18A-K12-18MH:W18A-K12-16	Y12	21	1.76	9.49	0.19
301	SL:MH:W18A-K12-16MH:W18A-K12-14	Y12	21	1.76	9.87	0.18
302	SL:MH:W18A-K12-14MH:W18A-K12-13	Y12	21	1.76	10.75	0.16
303	SL:MH:W18A-K12-13MH:W18A-K12-12	Y12	21	1.76	27.56	0.06
304	SL:MH:W18A-K12-12MH:W18A-K12-10	Y12	24	1.76	24.51	0.07
305	SL:MH:W18A-K12-10MH:W18A-K12-9	Y12	24	1.76	19.99	0.09
306	SL:MH:W18A-K12-9MH:W18A-K12-8	Y12	24	2.33	13.22	0.18
307	SL:MH:W18A-K12-8MH:W18A-J12-7	Y12	24	2.42	7.91	0.31
308	SL:MH:W18A-J12-7MH:W18A-J12-8	Y12	24	2.41	14.33	0.17
309	SL:MH:W18A-J12-8MH:W18A-J12-10	Y12	24	2.41	17.61	0.14
310	SL:MH:W18A-J12-9MH:W18A-J12-10	Y12	21	2.41	14.49	0.17
311	SL:MH:W18A-J12-10MH:W18A-J12-11	Y12	20	2.41	13.74	0.18
312	SL:MH:W18A-J12-11MH:W18A-J12-13	Y12	21	2.41	27.82	0.09
313	SL:MH:W18A-J12-13MH:W18A-J12-26	Y12	21	2.41	7.8	0.31
314	SL:MH:W18A-H12-20MH:W18A-J12-27	Y12	21	2.4	8.84	0.27
315	SL:MH:W18A-J12-27MH:W18A-J12-26	Y12	21	2.4	20.15	0.12
316	SL:MH:W18A-J12-5MH:W18A-J11-13	Y12	12	0.1	3.41	0.03
317	SL:MH:W18A-J11-13MH:W18A-J11-14	Y12	12	0.1	1.22	0.08
318	SL:MH:W18A-J11-14MH:W18A-J11-15	Y12	12	0.1	1.57	0.06
319	SL:MH:W18A-J11-15MH:W18A-J11-16	Y12	12	0.15	2.2	0.07
320	SL:MH:W18A-J11-16MH:W18A-H11-8	Y12	12	0.15	0.45	0.33
321	SL:MH:W18A-H12-3MH:W18A-H11-18	Y12	10	0.02	3.64	0.01

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
322	SL:MH:W18A-H12-20MH:W18A-H12-19	Y12	24	2.41	8.57	0.28
323	SL:MH:W18A-H12-19MH:W18A-H12-18	Y12	24	2.41	20.89	0.12
324	SL:MH:W18A-H12-18MH:W18A-H11-12	Y12	24	2.41	14.55	0.17
325	SL:MH:W18A-H11-8MH:W18A-H11-9	Y12	15	0.15	3.25	0.05
326	SL:MH:W18A-H11-9MH:W18A-H11-36	Y12	15	0.32	3.2	0.10
327	SL:MH:W18A-H11-36MH:W18A-H11-37	Y12	15	0.32	3.2	0.10
328	SL:MH:W18A-H11-11MH:W18A-H11-15	Y12	24	2.6	11.39	0.23
329	SL:MH:W18A-H11-15MH:W18A-H11-17	Y12	24	2.59	1.85	1.40
330	SL:MH:W18A-H11-37MH:W18A-H11-10	Y12	15	0.32	3.29	0.10
331	SL:MH:W18A-H11-10MH:W18A-H11-11	Y12	15	0.32	3.13	0.10
332	SL:MH:W18A-H11-12MH:W18A-H11-13	Y12	24	2.4	2.71	0.89
333	SL:MH:W18A-H11-13MH:W18A-H11-14	Y12	24	2.4	12.88	0.19
334	SL:MH:W18A-H11-14MH:W18A-H11-11	Y12	24	2.4	12.33	0.19
335	SL:MH:W18A-H11-18MH:W18A-H11-19	Y12	10	0.02	2.86	0.01
336	SL:MH:W18A-H11-21MH:W18A-G11-22	Y12	24	2.61	16.79	0.16
337	SL:MH:W18A-G11-22MH:W18A-G11-21	Y12	24	2.61	11.46	0.23
338	SL:MH:W18A-G11-21MH:W18A-G11-20	Y12	24	2.61	20.26	0.13
339	SL:MH:W18A-G11-20MH:W18A-G11-27	Y12	24	2.61	28.89	0.09
340	SL:MH:W18A-G11-27MH:W18A-G11-18	Y12	24	2.61	19.09	0.14
341	SL:MH:W18A-H11-19MH:W18A-H11-39	Y12	10	0.02	3.1	0.01
342	SL:MH:W18A-39MH:W18A-H11-38	Y12	10	0.02	2.58	0.01
343	SL:MH:W18A-H11-38MH:W18A-H11-17	Y12	10	0.02	8.78	0.00
344	SL:MH:W18A-G11-18MH:W18A-G11-29	Y12	27	2.61	11.27	0.23

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
345	SL;MH:W18A-G11-29MH:W18A-G11-28	Y12	27	2.6	8.22	0.32
346	SL:MH:W18A-G11-28MH:W18A-F11-4	Y12	27	2.6	53.21	0.05
347	SL:MH:W3-K13-41MH:W3-K13-42	Y12	12	0.1	3.93	0.03
348	SL:MH:W3-K13-42MH:W3-K13-43	Y12	12	0.1	2.31	0.04
349	SL:MH:W3-K13-43MH:W3-K13-44	Y12	12	0.1	7.09	0.01
350	SL:MH:W3-K13-44MH:W3-K13-45	Y12	12	0.1	3.99	0.03
351	SL:MH:W3-K13-45MH:W3-J12-6	Y12	12	0.1	3.14	0.03
352	SL:MH:W3-J12-6;MH:W18A-K12-8	Y12	12	0.1	3.58	0.03
353	SL:MH:W4-J12-2;MH:W18A-J12-5	Y12	12	0.1	2.65	0.04
354	SL:MH:W19-H11-1;MH:W18A-H11-9	Y12	8	0.18	0.99	0.18
355	SL:MH:E3-F17-13MH:E3-F17-18	East Plant	10	0.17	3.98	0.04
356	SL:MH:E3-F17-18MH:E3-F17-19	East Plant	10	0.17	0.33	0.52
357	SL:MH:E3-F17-19MH:E3-F17-23	East Plant	12	0.17	4.68	0.04
358	SL:MH:E3-F17-23MH:E3-F17-26	East Plant	10	0.17	1.63	0.10
359	SL:MH:E3-F17-26MH:E3-F17-26	East Plant	12	0.17	3.51	0.05
360	SL:MH:E3-F17-27MH:E3-G17-20	East Plant	12	0.17	3.81	0.04
361	SL:MH:E3-G17-20MH:E3-G17-21	East Plant	18	0.22	3.8	0.06
362	SL:MH:E4-G17-3MH:E4-G17-4	East Plant	12	0.09	3.75	0.02
363	SL:MH:E4-G17-4MH:E4-G17-5	East Plant	12	0.09	4.1	0.02
364	SL:MH:E4-G17-5MH:E4-G17-7	East Plant	12	0.09	4.6	0.02
365	SL:MH:E4-G17-7MH:E4-G17-19	East Plant	12	0.09	7.12	0.01
366	SL:MH:E6-F19-47MH:E6-F19-46	East Plant	12	0.09	2.61	0.03
367	SL:MH:E6-F19-46MH:E6-F19-45	East Plant	12	0.09	2.18	0.04

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
368	SL:MH:E6-F19-45MH:E6-G19-8	East Plant	12	0.09	10.71	0.01
369	SL:MH:E7-G18-1MH:E7-G18-2	East Plant	18	1.01	6.78	0.15
370	SL:MH:E7-G18-2MH:E7-G18-3	East Plant	18	1.01	13.52	0.07
371	SL:MH:E7-G18-3MH:E7-G18-3	East Plant	18	1.01	3.86	0.26
372	SL:MH:E7-G18-4MH:E7-G18-5	East Plant	18	1.01	5.39	0.19
373	SL:MH:E7-G18-5MH:E7-G18-6	East Plant	18	1.01	4.3	0.23
374	SL:MH:E7-G18-8MH:E7-G18-9	East Plant	18	1.01	3.7	0.27
375	SL:MH:E7-G18-9MH:E7-G18-10	East Plant	18	1.01	7.92	0.13
376	SL:MH:E7-G18-10MH:E7-G19-10	East Plant	18	1.01	6.8	0.15
377	SL:MH:E7-G19-10MH:E7-G19-9	East Plant	18	1.01	9.92	0.10
378	SL:MH:E7-G18-6MH:E7-G18-7	East Plant	18	1.01	3.97	0.25
379	SL:MH:E7-G18-7MH:E7-G18-8	East Plant	18	1.01	4.41	0.23
380	SL:MH:E7-F17-37MH:E7-F17-38	East Plant	12	0.09	7.05	0.01
381	SL:MH:E7-F17-38MH:E7-F17-41	East Plant	12	0.09	5.12	0.02
382	SL:MH:E7-F17-41MH:E7-F17-44	East Plant	12	0.09	6.59	0.01
383	SL:MH:E7-F17-44MH:E7-F17-45	East Plant	12	0.09	3.97	0.02
384	SL:MH:E7-F17-45MH:E7-G17-25	East Plant	12	0.09	7.21	0.01
385	SL:MH:E7-G17-25MH:E7-G18-21	East Plant	18	0.31	7.62	0.04
386	SL:MH:E7-G18-21MH:E7-G18-1	East Plant	18	1.01	27.58	0.04
387	SL:MH:E9-F20-7MH:E9-F20-6	East Plant	10	0.04	2.23	0.02
388	SL:MH:E10-F20-18MH:E10-F20-17	East Plant	8	0.17	0.68	0.25
389	SL:MH:E10-F20-17MH:E10-F20-16	East Plant	8	0.17	0.48	0.35
390	SL:MH:E10-F20-13MH:E10-F20-12	East Plant	10	0.17	1.09	0.16

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
391	SL:MH:E10-F20-16MH:E10-F20-15	East Plant	12	0.17	2.35	0.07
392	SL:MH:E10-F20-15MH:E10-F20-14	East Plant	12	0.17	1.38	0.12
393	SL:MH:E10-F20-14MH:E10-F20-13	East Plant	10	0.17	0.99	0.17
394	SL:MH:E11-E22-30MH:E11-E22-31	East Plant	10	0.06	3.14	0.02
395	SL:MH:E11-E22-31MH:E11-E22-32	East Plant	10	0.06	1.55	0.04
396	SL:MH:E11-E22-32MH:E11-E22-36	East Plant	10	0.06	1.97	0.03
397	SL:MH:E11-E22-36MH:E11-E23-64	East Plant	10	0.15	1.21	0.12
398	SL:MH:E11-E23-64MH:E11-E22-68	East Plant	10	0.15	1.4	0.11
399	SL:MH:E11-E22-68MH:E11-F23-12	East Plant	10	0.15	1.33	0.11
400	SL:MH:E11-E22-12MH:E11-E22-19	East Plant	8	0.06	0.96	0.06
401	SL:MH:E11-E22-19MH:E11-E22-30	East Plant	8	0.06	1.71	0.04
402	SL:MH:E12-E23-4MH:E12-E23-5	East Plant	10	0.1	2.39	0.04
403	SL:MH:E12-E23-5MH:E12-E23-27	East Plant	10	0.1	5.57	0.02
404	SL:MH:E13B-F22-17MH:E13B-F23-10	East Plant	10	0.15	1.42	0.11
405	SL:MH:E13B-F23-10MH:E13B-F23-6	East Plant	10	0.15	3.33	0.05
406	SL:MH:E13B-F23-6MH:E13B-F23-9	East Plant	10	0.15	2.8	0.05
407	SL:MH:E13B-F23-9MH:E13B-F22-12	East Plant	10	0.15	1.66	0.09
408	SL:MH:E13B-F22-12MH:E13B-F22-13	East Plant	10	0.33	3.15	0.10
409	SL:MH:E13B-F22-13MH:E13B-G22-19	East Plant	10	0.33	1.24	0.27
410	SL:MH:E13B-G22-19MH:E13B-G22-18	East Plant	10	0.36	0.68	0.53
411	SL:MH:E13B-G22-20MH:E13B-G22-19	East Plant	8	0.05	0.77	0.06
412	SL:MH:E13B-G22-8MH:E13B-G22-9	East Plant	21	2.38	7.18	0.33
413	SL:MH:E13B-G22-9MH:E13B-G22-10	East Plant	21	2.38	6.89	0.35

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
414	SL:MH:E13B-G22-10MH:E13B-G22-11	East Plant	21	2.38	7.1	0.34
415	SL:MH:E13B-G22-12MH:E13B-G22-13	East Plant	21	3	47.16	0.06
416	SL:MH:E13B-G22-11MH:E13B-G22-12	East Plant	21	2.65	8.03	0.33
417	SL:MH:E13B-G22-11MH:E13B-G22-12	East Plant	21	3	8.03	0.37
418	SL:MH:E13B-G22-18T34	East Plant	15	0.36	16.98	0.02
419	SL:MH:E13A-F21-1MH:E13A-F22-2	East Plant	18	1.73	6.88	0.25
420	SL:MH:E13A-F22-2MH:E13A-F22-1	East Plant	18	1.73	7.45	0.23
421	SL:MH:E13A-F22-1MH:E13A-G22-7	East Plant	18	1.73	6.94	0.25
422	SL:MH:E13A-G22-7MH:E13A-G22-6	East Plant	21	2.39	10.52	0.23
423	SL:MH:E13A-F20-1MH:E13A-F21-6	East Plant	18	1.73	7.11	0.24
424	SL:MH:E13A-F21-6MH:E13A-F21-5	East Plant	18	1.73	7.03	0.25
425	SL:MH:E13A-F21-5MH:E13A-F21-4	East Plant	18	1.73	7.6	0.23
426	SL:MH:E13A-F21-4MH:E13A-F21-3	East Plant	18	1.73	10.05	0.17
427	SL:MH:E13A-F21-3MH:E13A-F21-2	East Plant	18	1.73	9.48	0.18
428	SL:MH:E13A-F21-2MH:E13A-F21-1	East Plant	18	1.73	5.78	0.30
429	SL:MH:E13A-F20-4MH:E13A-F20-3	East Plant	18	1.46	6.4	0.23
430	SL:MH:E13A-F20-3MH:E13A-F20-2	East Plant	18	1.73	6.85	0.25
431	SL:MH:E13A-F20-2MH:E13A-F20-1	East Plant	18	1.73	6.89	0.25
432	SL:MH:E13A-F20-5MH:E13A-F20-36	East Plant	18	1.29	8.22	0.16
433	SL:MH:E13A-F20-36MH:E13A-F20-4	East Plant	18	1.29	7.25	0.18
434	SL:MH:E13A-F19-44MH:E13A-F19-43	East Plant	18	1.07	6.89	0.16
435	SL:MH:E13A-F19-43MH:E13A-G19-14	East Plant	18	1.07	6.84	0.16
436	SL:MH:E13A-G19-14MH:E13A-G19-15	East Plant	18	1.07	6.91	0.15

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
437	SL:MH:E13A-G19-15 MH:E13A-G19-16	East Plant	18	1.07	7.08	0.15
438	SL:MH:E13A-G19-16 MH:E13A-G20-27	East Plant	18	1.26	6.29	0.20
439	SL:MH:E13A-G20-27 MH:E13A-F20-5	East Plant	18	1.26	9.58	0.13
440	SL:MH:E13A-G20-27 MH:E13A-F20-5	East Plant	18	1.26	5.79	0.22
441	SL:MH:E13B-G22-13 MH:E13B-G22-14	East Plant	21	3	8.13	0.37
442	SL:E14A-K19-16 ;E14A-K19-17 SHARED	Emory Valley	10	0.24	1.93	0.12
443	SL:MH:E10-F20-12 MH:E13A-F20-4	East Plant	12	0.17	2.6	0.07
444	SL:MH:E9-F20-6 MH:13A-F20-5	East Plant	12	0.04	3.59	0.01
445	SL:MH:E6-G19-8 MH:E13A-F19-44	East Plant	18	1.07	6.92	0.15
446	SL:MH:E7-G19-9 MH:E6-G19-8	East Plant	18	1.01	6.86	0.15
447	SL:MH:E3-G17-21 MH:E7-G17-25	East Plant	18	0.22	7.99	0.03
448	SL:MHE4-G17-19 MH:E3-G17-20	East Plant	12	0.09	3.2	0.03
449	SL:MH:E11-F23-12 MH:E13B-F22-17	East Plant	12	0.15	2.66	0.06
450	SL:MH:E12-E23-27 MH:E11-E22-36	East Plant	10	0.1	1.81	0.06
451	SL:MH:E5B-L22-20 EV Wet Well	Emory Valley	16	0.93	29.97	0.03
452	SL:E13B-G22-14;EP Wet Well	East Plant	24	3	10.12	0.30
453	SL:MH:E5A-J17-9 MH:E5A-J17-8	Emory Valley	10	0.09	2.74	0.03
454	SL:MH:E5A-J17-8 MH:E5A-J18-7	Emory Valley	10	0.09	2.55	0.04
455	SL:MH:E5A-J18-7 MH:E5A-J18-6	Emory Valley	10	0.09	1.13	0.08
456	SL:MH:E5A-J18-6 MH:E5A-J18-31	Emory Valley	10	0.09	1.24	0.07
457	SL:MH:E5A-J18-31 MH:E5A-J18-5	Emory Valley	10	0.09	0.9	0.10
458	SL:MH:E5A-J18-5 MH:E5A-J18-4	Emory Valley	10	0.09	1.15	0.08
459	SL:MH:E5A-J18-4 MH:E5A-J18-3	Emory Valley	10	0.09	1.46	0.06

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
460	SL:MH:E5A-J18-3MH:E5A-J19-18	Emory Valley	10	0.09	1.17	0.08
461	SL:MH:E5A-J19-18MH:E5A-J19-17	Emory Valley	10	0.09	0.6	0.15
462	SL:MH:E5A-J19-17MH:E5A-J19-16	Emory Valley	10	0.09	1.34	0.07
463	SL:MH:E5A-J19-16MH:E5A-J19-15	Emory Valley	10	0.09	2.23	0.04
464	SL:MH:E5A-J19-15MH:E5A-J19-4	Emory Valley	10	0.09	1.34	0.07
465	SL:MH:E5A-J19-4MH:E5A-J19-3	Emory Valley	10	0.09	1.67	0.05
466	SL:MH:E5A-J19-3MH:E5A-J19-1	Emory Valley	10	0.16	1.78	0.09
467	SL:MH:E14-K17-3MH:E14-K17-2	Emory Valley	10	0.24	1.95	0.12
468	SL:MH:E14-K17-2MH:E14-K17-1	Emory Valley	10	0.24	2.28	0.11
469	SL:MH:E14A-K18-2MH:E14A-K18-9	Emory Valley	10	0.24	3.08	0.08
470	SL:MH:E14A-K18-9MH:E14A-K18-10	Emory Valley	10	0.24	3.13	0.08
471	SL:MH:E14A-K18-10MH:E14A-K18-3	Emory Valley	10	0.24	0.58	0.41
472	SL:MH:E14A-K18-3MH:E14A-K18-4	Emory Valley	10	0.24	3.59	0.07
473	SL:MH:E14A-K18-4MH:E14A-K18-5	Emory Valley	10	0.24	2.42	0.10
474	SL:MH:E14A-K18-5MH:E14A-K18-6	Emory Valley	10	0.24	1.94	0.12
475	SL:MH:E14A-K18-6MH:E14A-K18-7	Emory Valley	10	0.24	2.17	0.11
476	SL:MH:E14A-K18-7MH:E14A-K18-8	Emory Valley	10	0.24	2.26	0.11
477	SL:MH:E14A-K18-8MH:E14A-K19-10	Emory Valley	10	0.24	2.69	0.09
478	SL:MH:E14A-K18-1MH:E14A-K18-2	Emory Valley	10	0.24	3.08	0.08
479	SL:MH:E14A-K19-10MH:E14A-K19-11	Emory Valley	10	0.24	2.51	0.10
480	SL:MH:E14A-K19-11MH:E14A-K19-12	Emory Valley	10	0.24	2.69	0.09
481	SL:MH:E14A-K19-12MH:E14A-K19-13	Emory Valley	10	0.24	1.49	0.16
482	SL:MH:E14A-K19-13MH:E14A-K19-14	Emory Valley	10	0.24	2.08	0.12

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
483	SL:MH:E14A-K19-14MH:E14A-K19-15	Emory Valley	10	0.24	2.08	0.12
484	SL:MH:E14A-K19-15MH:E14A-K19-16	Emory Valley	10	0.24	2.38	0.10
485	SL:MH:E14-K17-1;MH:E14A-K18-1	Emory Valley	10	0.24	2.03	0.12
486	SL:MH:E5B-L22-5MH:E5B-L22-6	Emory Valley	8	0.07	1.25	0.06
487	SL:MH:E5B-L22-6MH:E5B-L22-3	Emory Valley	8	0.07	1.6	0.04
488	SL:MH:E5B-L22-3MH:E5B-L22-9	Emory Valley	15	0.93	5.36	0.17
489	SL:MH:E5B-L21-18MH:E5B-L22-3	Emory Valley	15	0.88	5.78	0.15
490	SL:MH:E5B-K20-11EMH:E5B-K20-21	Emory Valley	12	0.17	6.93	0.02
491	SL:MH:E5B-K20-21MH:E5B-K20-20	Emory Valley	15	0.41	5.5	0.07
492	SL:MH:E5B-K20-20MH:E5B-K20-19	Emory Valley	15	0.41	3.13	0.13
493	SL:MH:E5B-K20-19MH:E5B-K20-18	Emory Valley	15	0.41	4.25	0.10
494	SL:MH:E5B-K20-18MH:E5B-K20-17	Emory Valley	15	0.41	4.07	0.10
495	SL:MH:E5B-K20-17MH:E5B-K20-16	Emory Valley	15	0.41	3.67	0.11
496	SL:MH:E5B-K20-16MH:E5B-K20-15	Emory Valley	15	0.41	5.23	0.08
497	SL:MH:E5B-K20-15MH:E5B-L21-8	Emory Valley	15	0.8	4.98	0.16
498	SL:MH:E5B-L21-8MH:E5B-L21-7	Emory Valley	15	0.8	4.44	0.18
499	SL:MH:E5B-L21-7MH:E5B-L21-6	Emory Valley	15	0.8	5.34	0.15
500	SL:MH:E5B-L21-6MH:E5B-L21-5A	Emory Valley	15	0.8	3.99	0.20
501	SL:MH:E5B-L21-5AMH:E5B-L21-5	Emory Valley	15	0.8	5.36	0.15
502	SL:MH:E5B-L21-5MH:E5B-L21-4	Emory Valley	15	0.8	4.66	0.17
503	SL:MH:E5B-L21-4MH:E5B-L21-3	Emory Valley	15	0.8	4.37	0.18
504	SL:MH:E5B-L21-3MH:E5B-L21-2	Emory Valley	15	0.87	4.05	0.21
505	SL:MH:E5B-L21-2MH:E5B-L21-24	Emory Valley	15	0.87	3.83	0.23

**TABLE A-34 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**DRY WEATHER FLOW PIPE CAPACITY ANALYSIS – SPINE MODEL**

Item	Sewer Pipe	Sewershed	Dia (ins)	Flow, Qd (gpm)	Capacity, Qc (gpm)	Qd/Qc
506	SL:MH:E5B-L21-24MH:E5B-L21-18	Emory Valley	15	0.87	6.07	0.14
507	SL:MH:E5B-K21-15MH:E5B-K20-9	Emory Valley	10	0.01	4.59	0.00
508	SL:MH:E5B-K20-9MH:E5B-K20-10	Emory Valley	10	0.01	1.52	0.01
509	SL:MH:E5B-K20-10MH:E5B-K20-11	Emory Valley	10	0.01	2.21	0.00
510	SL:MH:E5B-K20-11MH:E5B-K20-12	Emory Valley	10	0.01	1.12	0.01
511	SL:MH:E5B-K20-12MH:E5B-K20-13	Emory Valley	10	0.01	1.21	0.01
512	SL:MH:E5B-K20-14MH:E5B-K20-14	Emory Valley	10	0.02	1.02	0.02
513	SL:MH:E5B-K20-11FMH:E5B-K20-11E	Emory Valley	10	0.02	1.02	0.02
514	SL:MH:E5B-K20-13MH:E5B-K20-14	Emory Valley	10	0.01	1.09	0.01
515	SL:MH:E19-L21-18;MH:E5B-L22-4	Emory Valley	8	0.01	2.03	0.00
516	SL:MHE5B-L22-9MH:E5B-L22-20	Emory Valley	16	0.93	5.24	0.18
517	SL:MH:E14A-K19-17SHARED;MH:E5B-K20-21	Emory Valley	10	0.34	3.15	0.11
518	SL:MH:E5A-J19-1;MH:E5B-K20-11E	Emory Valley	10	0.16	4.98	0.03
519	MH:13A-G22-6-MH:13B-G22-8	East Plant	21	2.39	3.73	0.64
520	SL:MH:W18G-D2-1;TP Wet Well	Turtle Park	42	11.37	97.19	0.12
* Indicated pipes not loaded; dead end run in commercial area.						

**TABLE A-35  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
MANHOLE OVERFLOW ANALYSIS  
FOR 2-YEAR, 24-HOUR SPINE MODEL DESIGN EVENT**

Overflow ID	Manhole ID	Sewershed	Overflow Volume (gallons)
19	W18D-E9-24	Turtle Park	0
27	W18G-D2-1	Turtle Park	0
18	W18D-E9-25	Turtle Park	112,778
31A	E13A-F20-4	East Plant	0
3	W5-G11-8	Central City	287,626
24	W18D-E9-3	Turtle Park	0
22	W18D-E9-6	Turtle Park	0
21	W18D-E9-7	Turtle Park	0
20	W18D-E9-8	Turtle Park	0
38A	W18D-F11-3	Turtle Park	487,657
41	E12-E23-27	East Plant	26,064
25	W18D-F8-4	Turtle Park	0
34	T35	0	0
30A	13A-F30-3	East Plant	0
36B	E12-E23-4	East Plant	2,917
23	W18D-E9-5	Turtle Park	0
37B	E11-E22-32	East Plant	0
42	E13A-F21-3	East Plant	0
43	E11-E22-31	East Plant	0
6	W19-H11-4	Y12	0
8	W18A-J12-11	Y12	0
7	W18A-J11-16	Y12	36,194
26A	W18G-D2-2	Turtle Park	0
4	W5-G12-1	Central City	0
14	W12-E9-15	Turtle Park	0
2	W5-G15-13	Central City	0
16	W11-D9-43	Turtle Park	0
15	W11-D9-42	Turtle Park	0
35B	W5-G13-11	Central City	0
13	W12-D9-6	Turtle Park	7,096
17	W18D-E10-19	Turtle Park	22,975
32B	E5B-L22-6	Emory Valley	0
31B	W13-E7-1	Turtle Park	0
30B	W6-F13-10	Central City	0
29B	W6-F13-9	Central City	0
28A	E13B-G22-14	East Plant	34,704
40	E11-E22-36	East Plant	10,629
39B	E11-E22-68	East Plant	19,697
5	W5-G12-2	Central City	0
52	E5B-L22-3	East Plant	0
50	E5B-L21-5A	East Plant	0
51	E5B-L22-4	East Plant	0
37A	W18D-F11-1	Turtle Park	0
10	W16-C3-28	Turtle Park	17,094
36A	W5-G13-12	Central City	240,915

**TABLE A-35 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**MANHOLE OVERFLOW ANALYSIS**  
**FOR 2-YEAR, 24-HOUR SPINE MODEL DESIGN EVENT**

<b>Overflow ID</b>	<b>Manhole ID</b>	<b>Sewershed</b>	<b>Overflow Volume (gallons)</b>
12	W16-D4-9	Turtle Park	0
38B	E11-E23-64	East Plant	52,323
11	W16-C3-32	Turtle Park	35,661
39A	E13B-F22-13	East Plant	116,627
29A	E13A-F20-2	East Plant	1,599
33A	W5-F11-4	Central City	681,107
33B	E13A-F20-5	East Plant	42,357
28B	E13A-F21-1	East Plant	0
32A	E13A-F20-36	East Plant	0
35A	E13A-G20-27	East Plant	0
	Overflows	Subtotal (gallons)	2,236,020
26B	Turtle Park Pump Station to WWTP	Subtotal (gallons)	68,782,343
	Total for Event	Total (gallons)	71,018,363

Note: The step-wise loading of the model should be considered when reviewing the results of the analysis. In some cases the location of a manhole overflow may not coincide with historical information; the simulated overflow location is representative of overflows in that area of the system and not necessarily at that specific manhole.

**TABLE A-36  
CITY OF OAK RIDGE, TENNESSEE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
PUMP STATION CAPACITY SUMMARY**

Name	Mini-System	Address	Rated Capacity (GPM)	Number of Houses	Unrestricted Inflow (GPM)	Pipe-Restricted Inflow (GPM)	Minimum Controlling Inflow > Rated Capacity?	Comments
East Plant	E13B	151 Cairo Road	2800	2390	938	3604	No	Assumed unrestricted by small pump stations
Emory Valley	E5B	Emory Valley Rd/Baylor Dr. Int.	1150	1749	686	2352	No	Assumed unrestricted by small pump stations
Marina	E20	695 Melton Lake Drive	140	133	52	---	No	---
Gregory's	E30	Melton Lake Drive-Parcel 94-D	230	53	21	---	No	---
Castlewood	E28	Turnpike behind Castlewood Apts.	125	96	38	---	No	---
WATO	E12	113 Eastburn Lane	80	13	5	---	No	---
Westview	W29	129 Westview Lane	175	29	11	---	No	---
Williams	W29	Williams Lane	120	50	20	---	No	---
Whippoorwill	W29	104 Whippoorwill Lane	300	133	347	---	Yes	Westview + Williams capacities + local inflow
Palisades #4	E31	40 Palisades Parkway	80	16	121	---	Yes	Palisades #3 capacity + local inflow
Palisades #3	E31	28 Palisades Parkway	115	18	86	---	No	Palisades #2 capacity + local inflow
Palisades #2	E31	18 Palisades Parkway	80	10	84	---	Yes	Palisades #1 capacity + local inflow
Palisades #1	E31	10 Palisades Parkway	80	9	4	---	No	---

**TABLE A-36 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**PUMP STATION CAPACITY SUMMARY**

Name	Mini-System	Address	Rated Capacity (GPM)	Number of Houses	Unrestricted Inflow (GPM)	Pipe-Restricted Inflow (GPM)	Minimum Controlling Inflow > Rated Capacity?	Comments
Scarboro	W26	Scarboro Road	650	12	755	---	Yes	Pump House Road capacity + local inflow
Park Meade	W26A	1402 Edgemoor Road	500	60	24	709	No	---
Rockbridge Green	E29A	117 Rockbridge Greens Blvd	---	67	26	---	---	---
Rolling Links	E29	51 Rolling Links Blvd	---	110	43	---	---	---
Radisson Cove	E29	Radisson Cove near Edgemoor Rd	230	11	4	---	No	---
Rivers Run	E29	100 Rivers Run Blvd	250	76	260	---	Yes	Radisson Cove capacity + local inflow
Warehouse Road	E13A	Warehouse Road	175	2	---	---	---	Commercial complex
Fairbanks	E13A	545 Oak Ridge Turnpike	175	4	2	---	No	---
Emory Heights	E22	Coe Road	180	241	95	---	No	---
Home Depot	E7	Laboratory Drive	---	---	---	---	---	Home Depot
Oak Hills	W17	Oak Ridge Turnpike/SR 58	350	181	496	848	Yes	Southwood capacity + local inflow
Gum Hollow	W20	197 Gum Hollow Road	300	191	275	---	No	Graceland capacity + local inflow
Peach Orchard	W8	105 Wedgewood Road	140	30	12	---	No	---
Summit Ridge	W23	720 S. Illinois Ave.	100	1	---	---	---	DOE facility

**TABLE A-36 (continued)**  
**CITY OF OAK RIDGE, TENNESSEE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**PUMP STATION CAPACITY SUMMARY**

Name	Mini-System	Address	Rated Capacity (GPM)	Number of Houses	Unrestricted Inflow (GPM)	Pipe-Restricted Inflow (GPM)	Minimum Controlling Inflow > Rated Capacity?	Comments
Southwood	W27A	East Southwood	425	64	25	---	No	---
Graceland	W20	113 Graceland Road	200	49	19	---	No	---
Pump House Road	W26	Pump House Road	750	42	541	516	No	Park Meade capacity + local inflow
Centennial Bluff	W26A	300A Centennial Bluff	300	---	---	---	---	---
West Outer	W22	1129 W. Outer Drive	45	46	45	---	No	---
Riversway	E30	120 Marywater Lane	465	33	13	---	No	---

**TABLE A-37  
CITY OF OAK RIDGE  
SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT  
MANHOLE OVERFLOW ANALYSIS – SPINE MODEL  
ELIMINATE CONSTRUCTED OVERFLOWS  
(2-YEAR, 24-HOUR DESIGN EVENT)**

Overflow ID	Manhole ID	Sewershed	Base Condition Overflow Volume (Gallons)	Eliminate Constructed Overflows Overflow Volume (Gallons)
19	W18D-E9-24	Turtle Park	0	0
27	W18G-D2-1	Turtle Park	0	0
18	W18D-E9-25	Turtle Park	112,778	112,778
31A	E13A-F20-4	East Plant	0	0
3	W5-G11-8	Central City	287,626	287,615
24	W18D-E9-3	Turtle Park	0	0
22	W18D-E9-6	Turtle Park	0	0
21	W18D-E9-7	Turtle Park	0	0
20	W18D-E9-8	Turtle Park	0	0
38A	W18D-F11-3	Turtle Park	487,657	487,433
41	E12-E23-27	East Plant	26,064	26,064
25	W18D-F8-4	Turtle Park	0	0
34	T35	0	0	0
30A	13A-F30-3	East Plant	0	0
36B	E12-E23-4	East Plant	2,917	2,917
23	W18D-E9-5	Turtle Park	0	0
37B	E11-E22-32	East Plant	0	0 (CO Removed)
42	E13A-F21-3	East Plant	0	0
43	E11-E22-31	East Plant	0	0
6	W19-H11-4	Y12	0	0
8	W18A-J12-11	Y12	0	0
7	W18A-J11-16	Y12	36,194	36,194
26A	W18G-D2-2	Turtle Park	0	0
4	W5-G12-1	Central City	0	0
14	W12-E9-15	Turtle Park	0	0
2	W5-G15-13	Central City	0	0
16	W11-D9-43	Turtle Park	0	0
15	W11-D9-42	Turtle Park	0	0
35B	W5-G13-11	Central City	0	0
13	W12-D9-6	Turtle Park	7,096	7,096
17	W18D-E10-19	Turtle Park	22,975	22,975
32B	E5B-L22-6	Emory Valley	0	0
31B	W13-E7-1	Turtle Park	0	0 (CO Removed)
30B	W6-F13-10	Central City	0	0 (CO Removed)
29B	W6-F13-9	Central City	0	0 (CO Removed)
28A	E13B-G22-14	East Plant	34,704	27,080
40	E11-E22-36	East Plant	10,629	10,629
39B	E11-E22-68	East Plant	19,697	19,697
5	W5-G12-2	Central City	0	0
52	E5B-L22-3	East Plant	0	0
50	E5B-L21-5A	East Plant	0	0

**TABLE A-37 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM - CAPACITY ASSESSMENT REPORT**  
**MANHOLE OVERFLOW ANALYSIS – SPINE MODEL**  
**ELIMINATE CONSTRUCTED OVERFLOWS**  
**(2-YEAR, 24-HOUR DESIGN EVENT)**

Overflow ID	Manhole ID	Sewershed	Base Condition Overflow Volume (Gallons)	Eliminate Constructed Overflows Overflow Volume (Gallons)
51	E5B-L22-4	East Plant	0	0
37A	W18D-F11-1	Turtle Park	0	0
10	W16-C3-28	Turtle Park	17,094	17,094
36A	W5-G13-12	Central City	240,915	241,818
12	W16-D4-9	Turtle Park	0	0
38B	E11-E23-64	East Plant	52,323	52,323
11	W16-C3-32	Turtle Park	35,661	35,661
39A	E13B-F22-13	East Plant	116,627	116,627
29A	E13A-F20-2	East Plant	1,599	13,508
33A	W5-F11-4	Central City	681,107	681,106
33B	E13A-F20-5	East Plant	42,357	42,357
28B	E13A-F21-1	East Plant	0	0 (CO Removed)
32A	E13A-F20-36	East Plant	0	0 (CO Removed)
35A	E13A-G20-27	East Plant	0	0 (CO Removed)
	Overflows	Subtotal (gallons)	2,236,020	2,240,972
26B	Turtle Park Pump Station to WWTP	Subtotal (gallons)	68,782,343	68,777,945
	Total for Event	Total (gallons)	71,018,363 (2)	71,018,917 (2)

Notes: (1) The step-wise loading of the model should be considered when reviewing the results of the analysis. In some cases the location of a manhole overflow may not coincide with historical information; the simulated overflow location is representative of overflows in that area of the system and not necessarily at that specific manhole. (2) Difference of 0.0008% is due to cumulative computational variance; theoretical difference is zero.

**TABLE A-38**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**MANHOLE OVERFLOW ANALYSIS – SPINE MODEL WORST CASE**  
**(2-YEAR, 24-HOUR DESIGN EVENT)**

Overflow ID	Manhole ID	Sewershed	Base Condition Overflow Volume (Gallons)	Worst Case Overflow Volume (Gallons)
19	W18D-E9-24	Turtle Park	0	0
27	W18G-D2-1	Turtle Park	0	0
18	W18D-E9-25	Turtle Park	112,778	113,208
31A	E13A-F20-4	East Plant	0	0
3	W5-G11-8	Central City	287,626	288,431
24	W18D-E9-3	Turtle Park	0	0
22	W18D-E9-6	Turtle Park	0	0
21	W18D-E9-7	Turtle Park	0	0
20	W18D-E9-8	Turtle Park	0	0
38A	W18D-F11-3	Turtle Park	487,657	492,220
41	E12-E23-27	East Plant	26,064	26,064
25	W18D-F8-4	Turtle Park	0	0
34	T35	0	0	0
30A	13A-F30-3	East Plant	0	0
36B	E12-E23-4	East Plant	2,917	2,917
23	W18D-E9-5	Turtle Park	0	0
37B	E11-E22-32	East Plant	0	0
42	E13A-F21-3	East Plant	0	0
43	E11-E22-31	East Plant	0	0
6	W19-H11-4	Y12	0	0
8	W18A-J12-11	Y12	0	0
7	W18A-J11-16	Y12	36,194	36,194
26A	W18G-D2-2	Turtle Park	0	0
4	W5-G12-1	Central City	0	0
14	W12-E9-15	Turtle Park	0	0
2	W5-G15-13	Central City	0	0
16	W11-D9-43	Turtle Park	0	0
15	W11-D9-42	Turtle Park	0	0
35B	W5-G13-11	Central City	0	0
13	W12-D9-6	Turtle Park	7,096	7,096
17	W18D-E10-19	Turtle Park	22,975	22,975
32B	E5B-L22-6	Emory Valley	0	0
31B	W13-E7-1	Turtle Park	0	0
30B	W6-F13-10	Central City	0	0
29B	W6-F13-9	Central City	0	0
28A	E13B-G22-14	East Plant	34,704	35,255
40	E11-E22-36	East Plant	10,629	10,629
39B	E11-E22-68	East Plant	19,697	19,697
5	W5-G12-2	Central City	0	0
52	E5B-L22-3	East Plant	0	0
50	E5B-L21-5A	East Plant	0	0

**TABLE A-38 (continued)**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**MANHOLE OVERFLOW ANALYSIS – SPINE MODEL WORST CASE**  
**(2-YEAR, 24-HOUR DESIGN EVENT)**

<b>Overflow ID</b>	<b>Manhole ID</b>	<b>Sewershed</b>	<b>Base Condition Overflow Volume (Gallons)</b>	<b>Worst Case Overflow Volume (Gallons)</b>
51	E5B-L22-4	East Plant	0	0
37A	W18D-F11-1	Turtle Park	0	0
10	W16-C3-28	Turtle Park	17,094	17,094
36A	W5-G13-12	Central City	240,915	240,968
12	W16-D4-9	Turtle Park	0	0
38B	E11-E23-64	East Plant	52,323	52,323
11	W16-C3-32	Turtle Park	35,661	35,661
39A	E13B-F22-13	East Plant	116,627	116,627
29A	E13A-F20-2	East Plant	1,599	2,165
33A	W5-F11-4	Central City	681,107	689,623
33B	E13A-F20-5	East Plant	42,357	42,357
28B	E13A-F21-1	East Plant	0	0
32A	E13A-F20-36	East Plant	0	0
35A	E13A-G20-27	East Plant	0	0
	Overflows	Subtotal (gallons)	2,236,020	2,251,504
26B	Turtle Park Pump Station to WWTP	Subtotal (gallons)	68,782,343	71,915,013
	Total for Event	Total (gallons)	71,018,363	74,166,517

Note: The step-wise loading of the model should be considered when reviewing the results of the analysis. In some cases the location of a manhole overflow may not coincide with historical information; the simulated overflow location is representative of overflows in that area of the system and not necessarily at that specific manhole.

City of Oak Ridge Central City Sewer Shed



Map B-1

City of Oak Ridge East Plant Sewer Shed



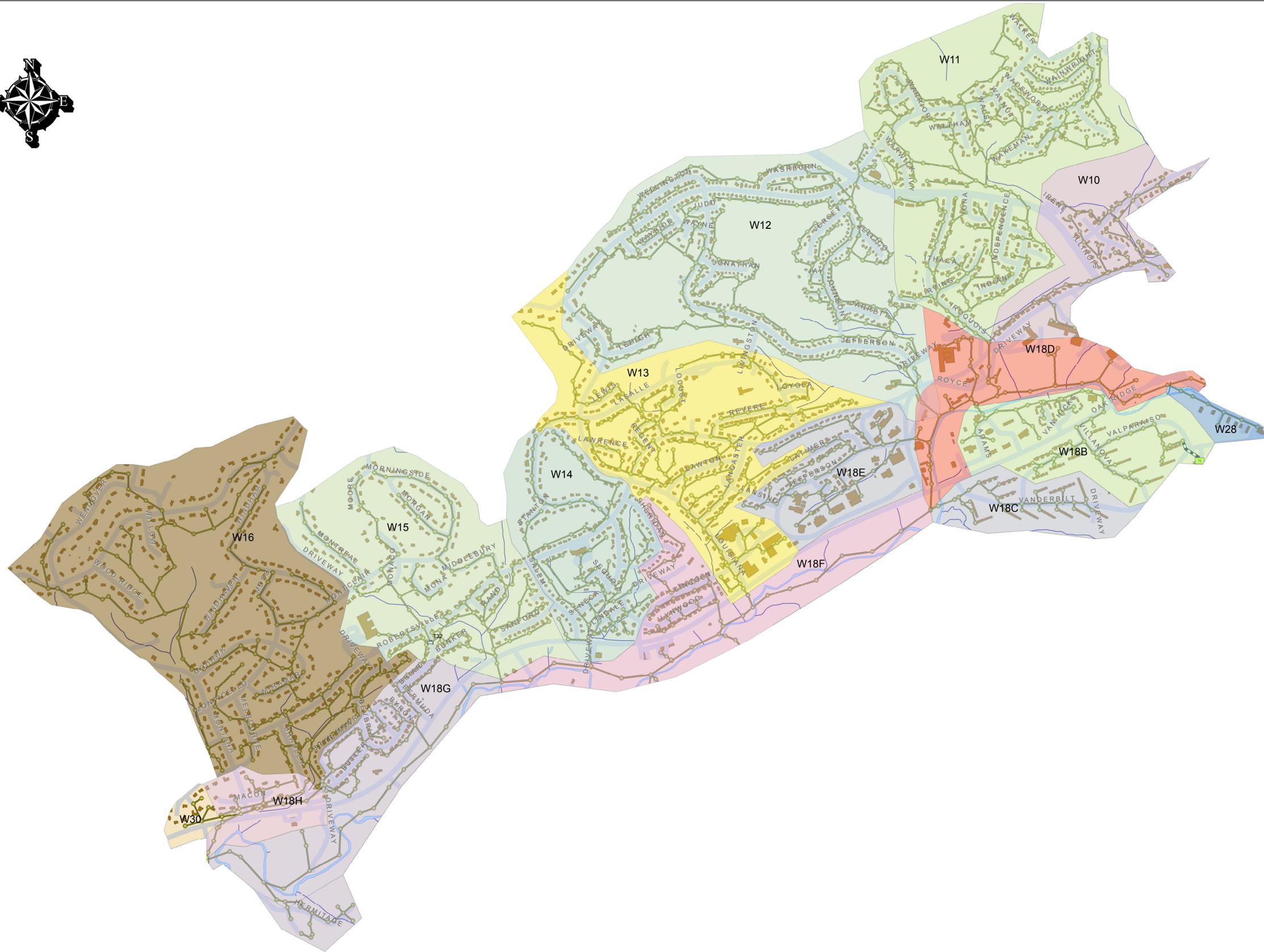
Map B-2

City of Oak Ridge Emory Valley Sewer Shed



Map B-3

City of Oak Ridge Turtle Park Sewer Shed



Map B-4



City of Oak Ridge Y-12 Sewer Shed









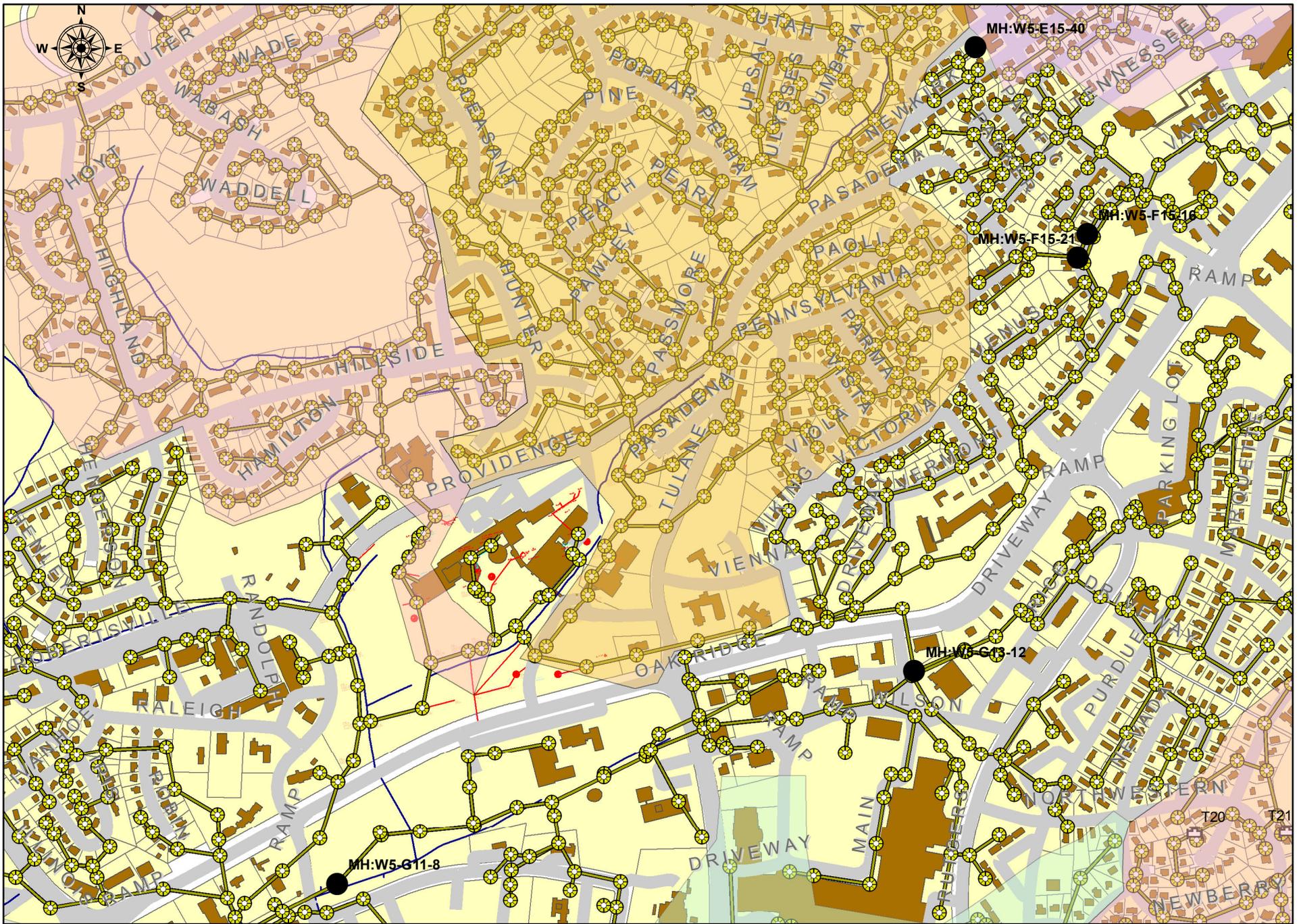










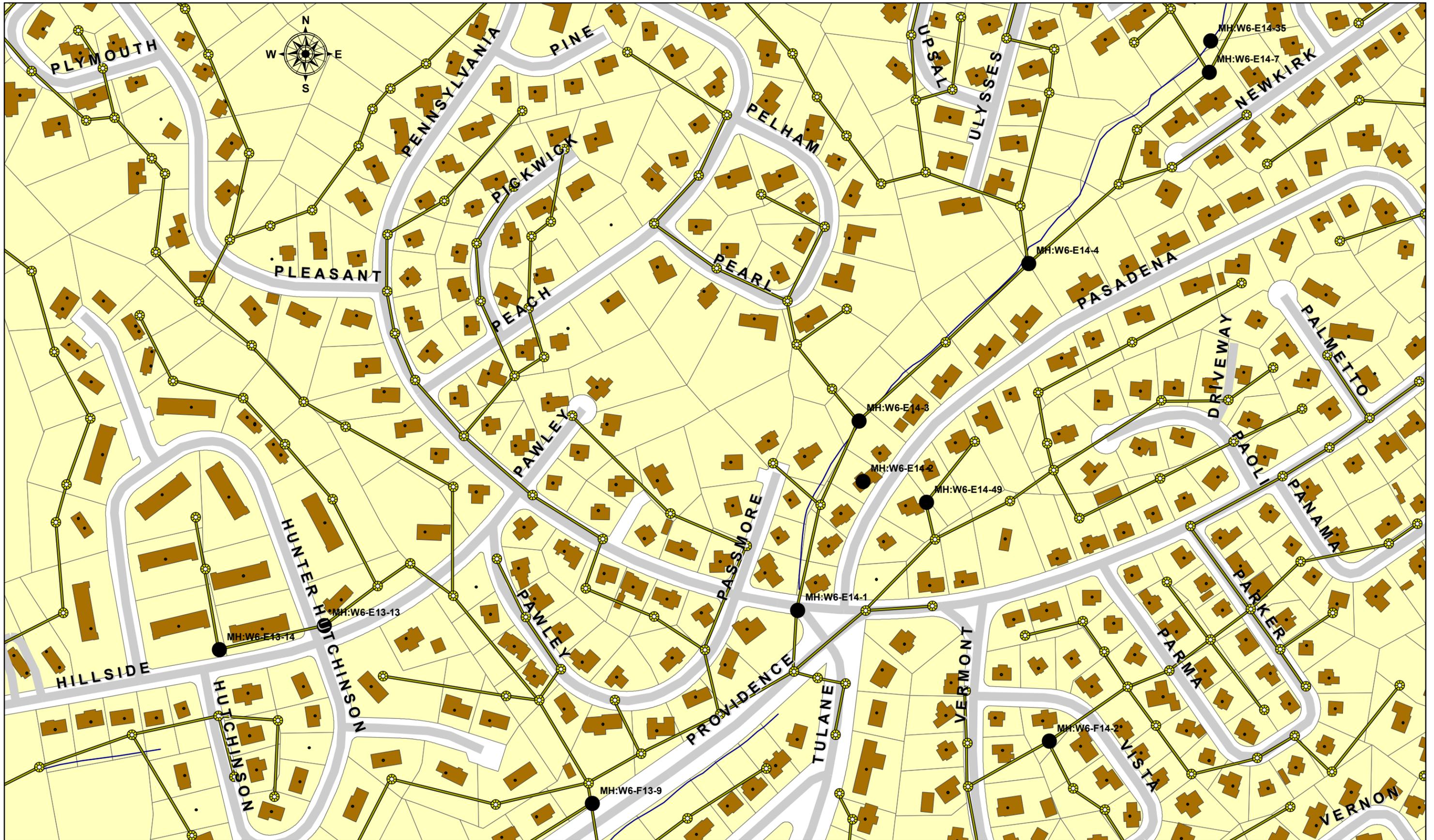


**SS Assets & Overflow Defects**

- Overflow-I&I
- All Sewer Line Network
- Manhole Network

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Map □ - □



SS Assets & Overflow Defects

- Overflow-I&I
- Lift Stations
- Man Holes
- Sewer Lines

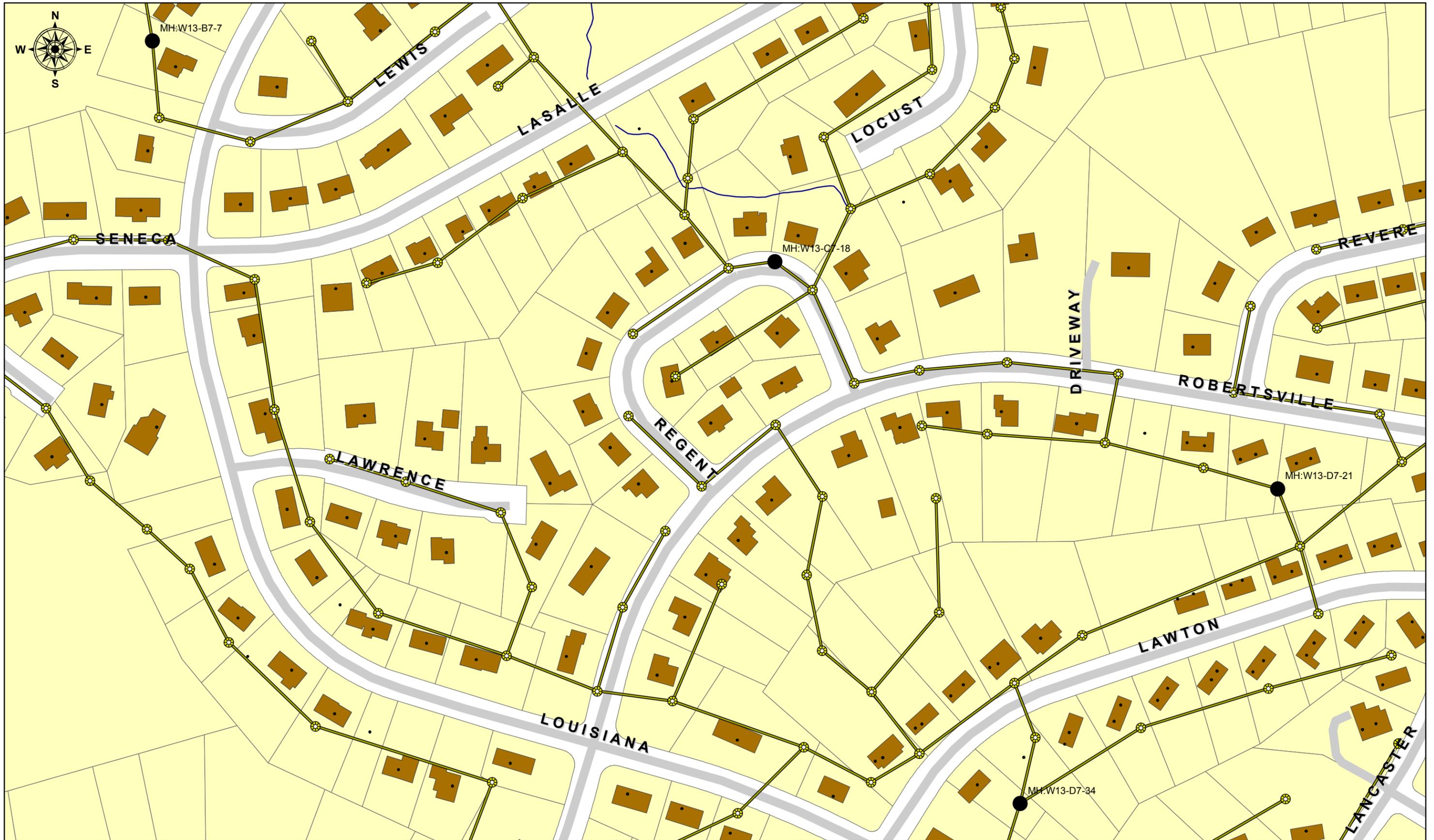
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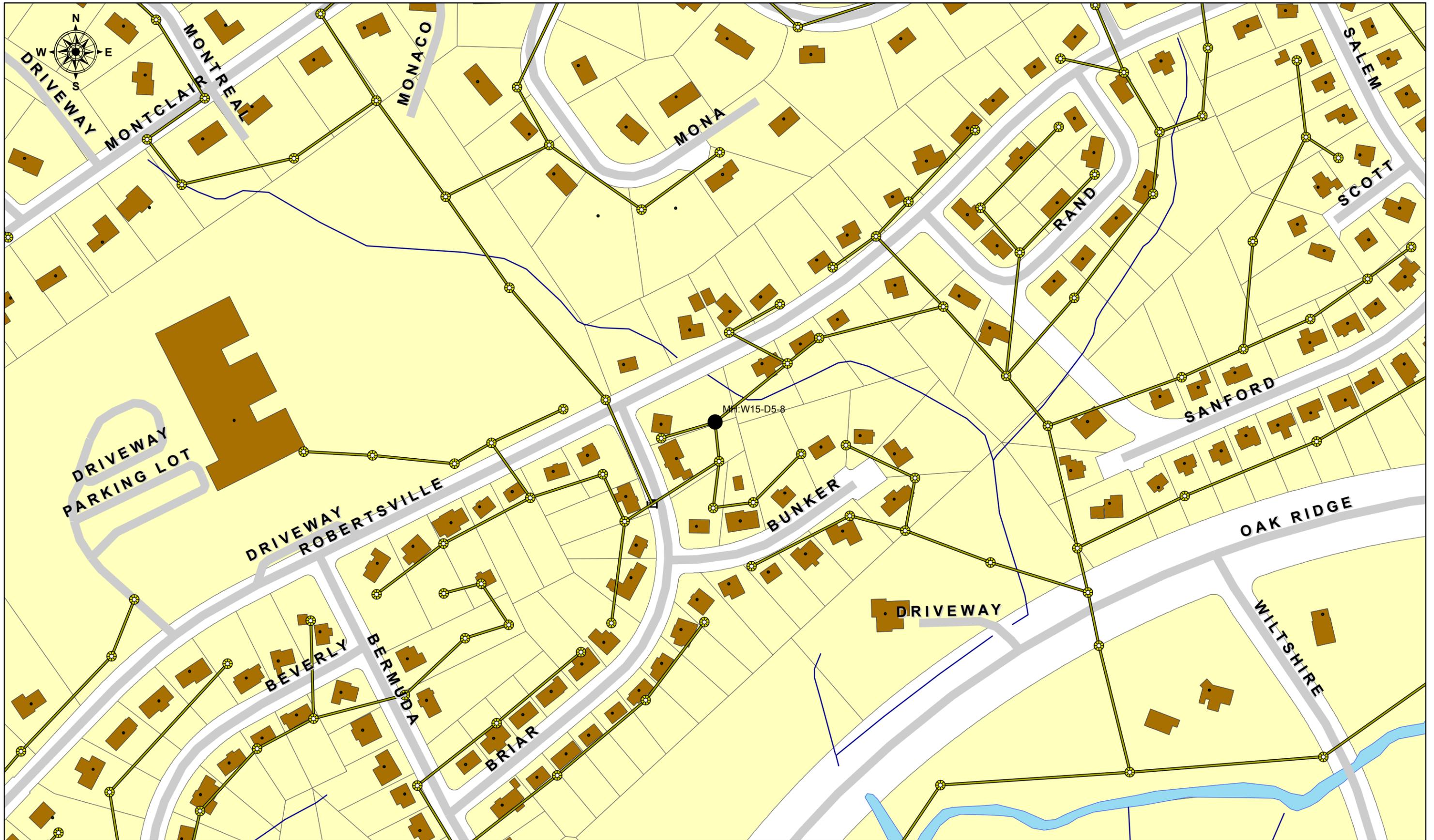
**SS Assets & Overflow Defects**

- Overflow-I&I
- ⊗ Man Holes
- Sewer Lines

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SS Assets & Overflow Defects

- Overflow-I&I
- Man Holes
- Sewer Lines

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**SS Assets & Overflow Defects**

- Overflow-I&I
- All Sewer Line Network
- Manhole Network

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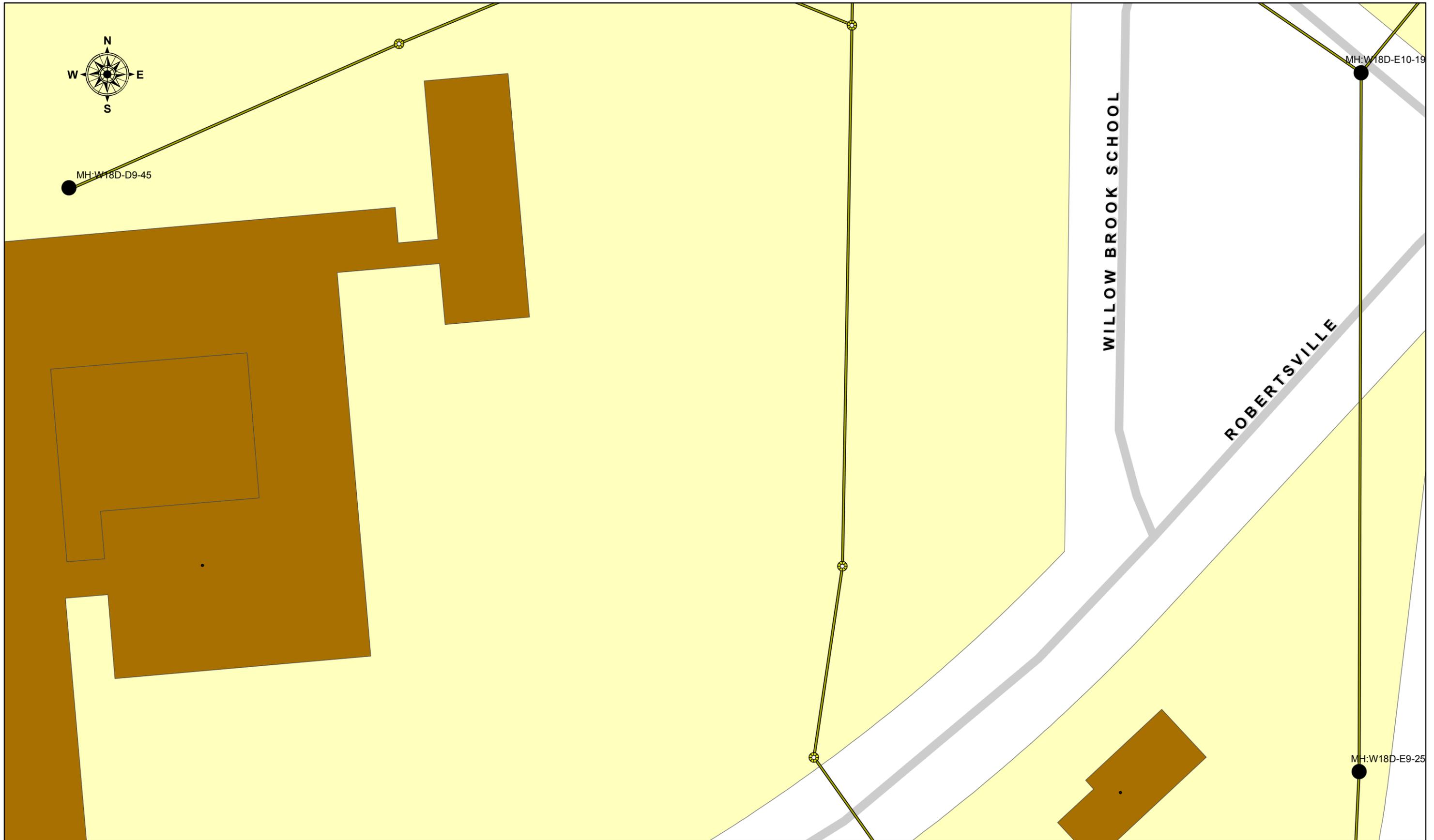




**SS Assets & Overflow Defects**

- Overflow-I&I
- + Man Holes
- Sewer Lines

Map -

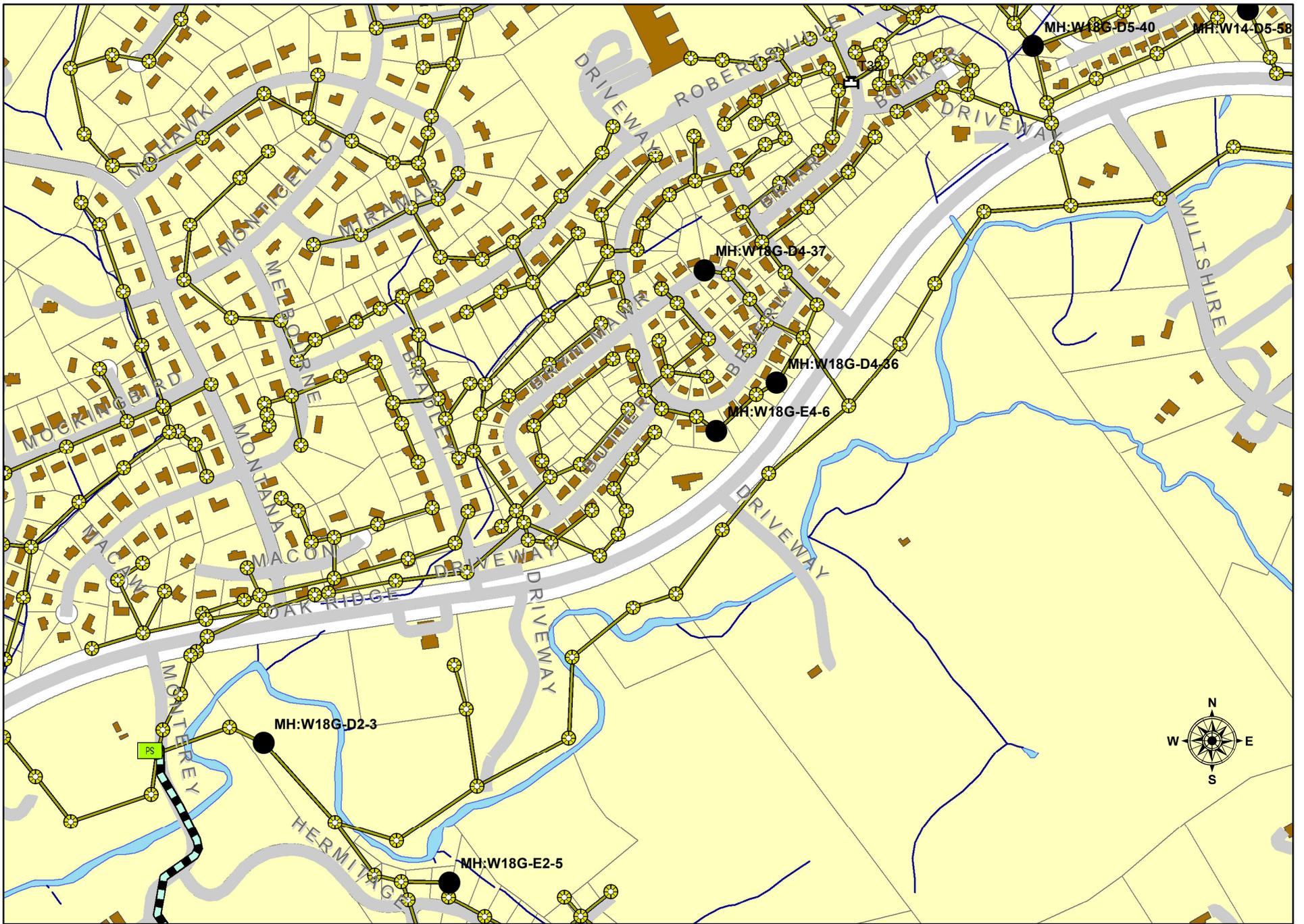


**SS Assets & Overflow Defects**

- Overflow-I&I
- Man Holes
- Sewer Lines

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Map □ - □ □



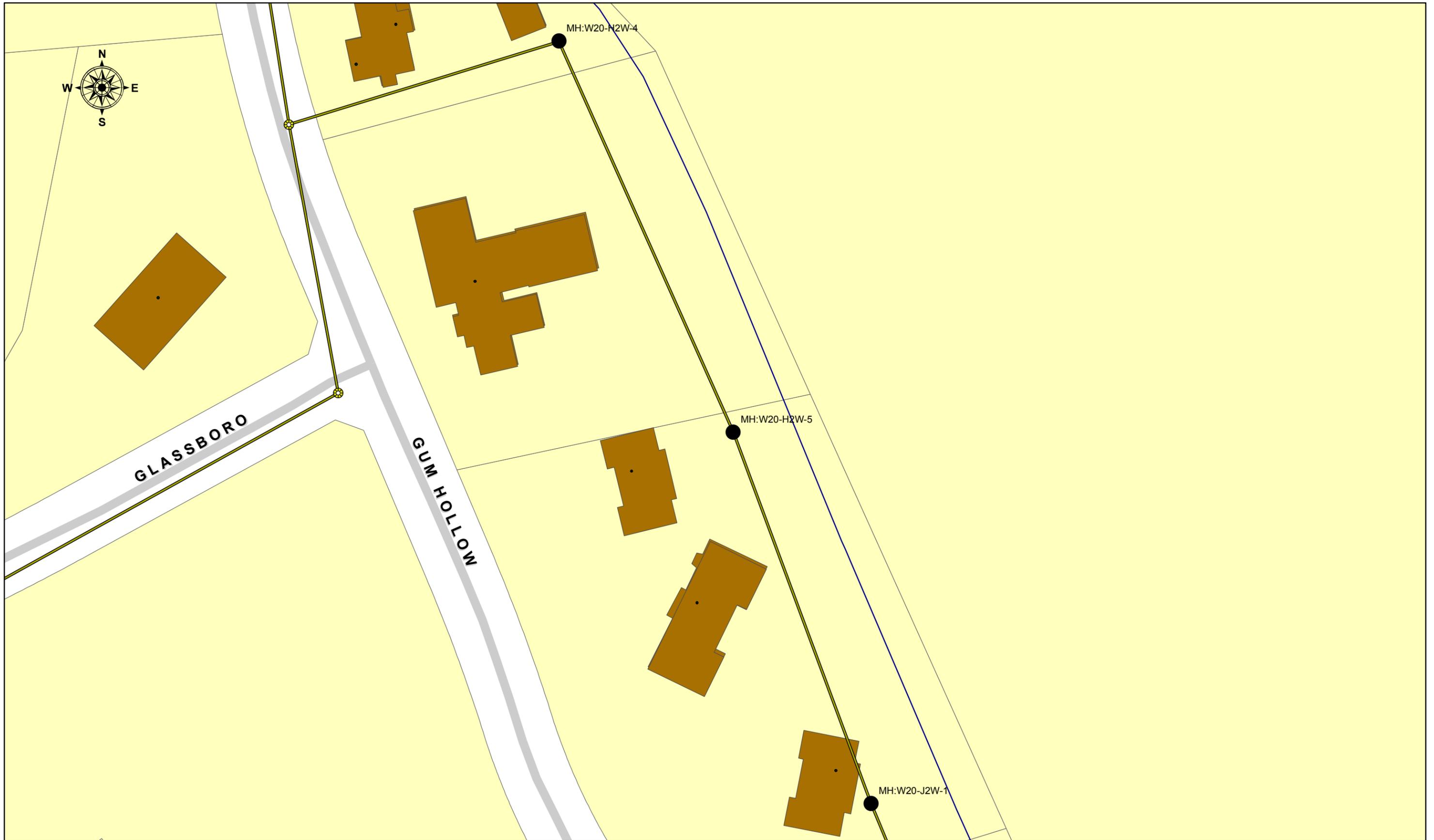
**SS Assets & Overflow Defects**

- Overflow I&I
- All Sewer Line Network
- Manhole Network

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**SS Assets & Overflow Defects**

- Overflow-I&I
- Man Holes
- Sewer Lines

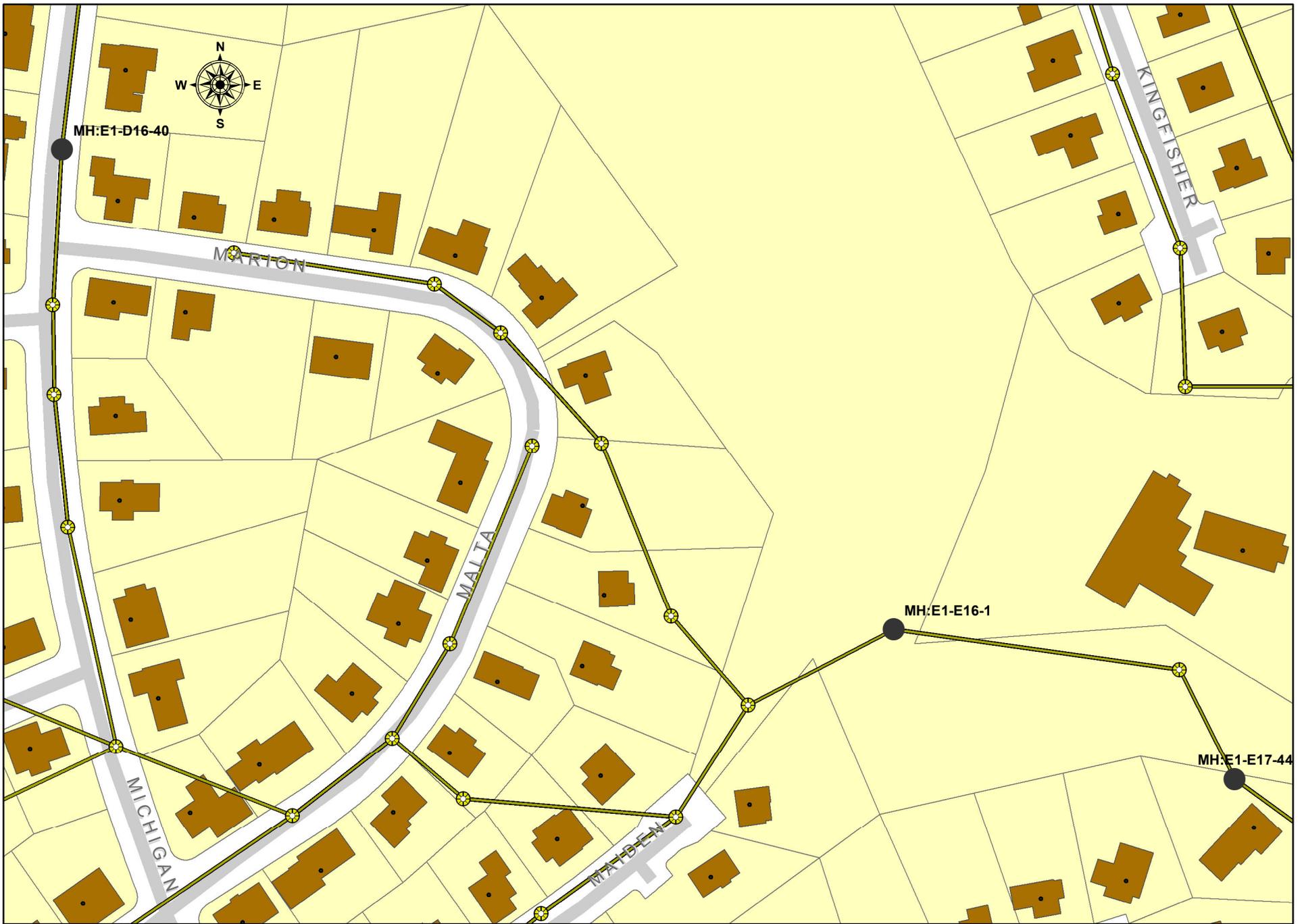
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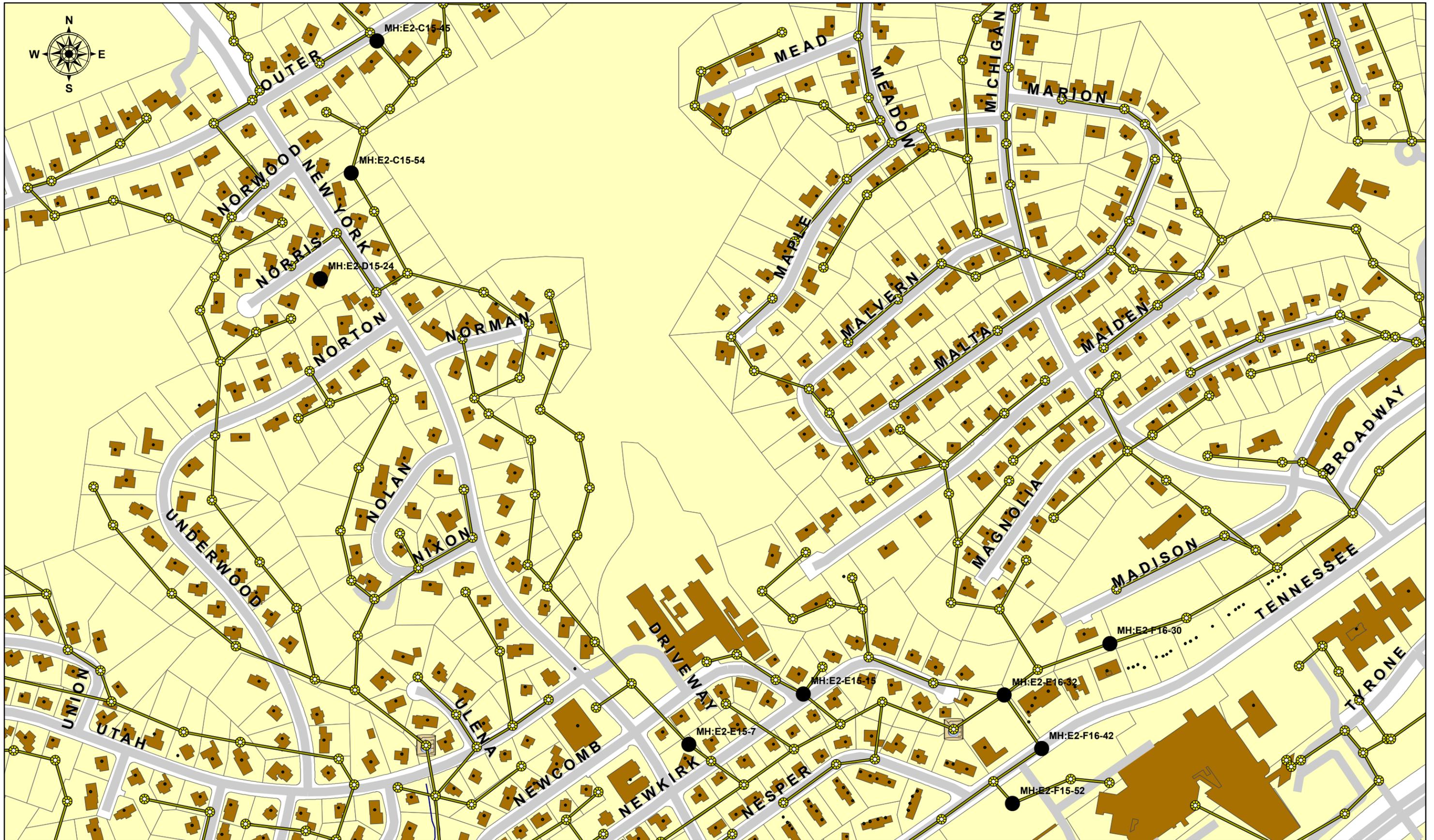


**SS Assets & Overflow Defects**

- Overflow I&I
- All Sewer Line Network
- + Manhole Network

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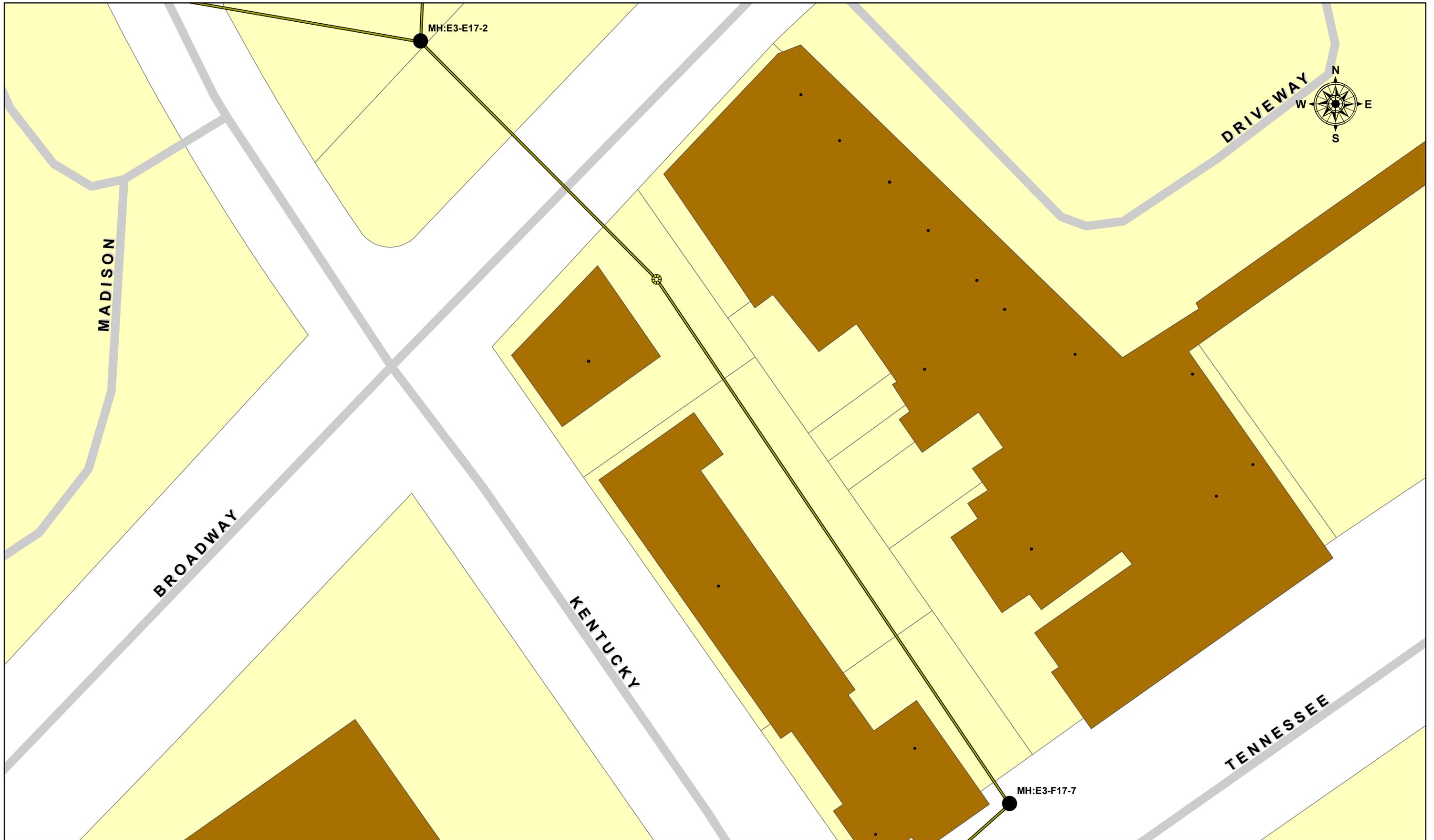


SS Assets & Overflow Defects

- Overflow-I&I
- Man Holes
- Sewer Lines
- PS Lift Stations

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Map □ - □ □



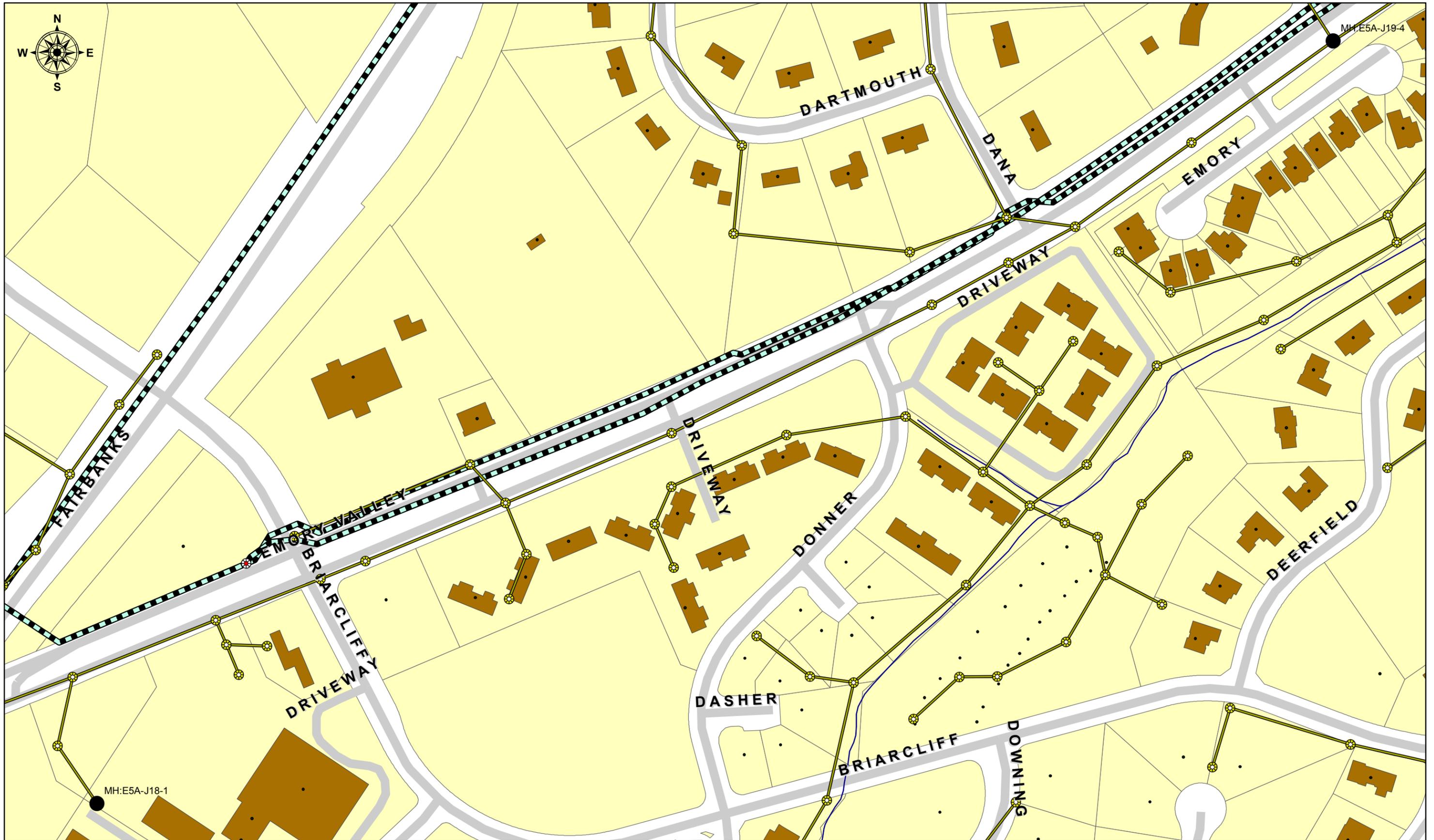
**SS Assets & Overflow Defects**

- Overflow-I&I
- Man Holes
- Lift Stations
- Sewer Force Mains
- Sewer Lines

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**SS Assets & Overflow Defects**

- Overflow-I&I
- Man Holes
- Sewer Lines
- Lift Stations
- Sewer Force Mains

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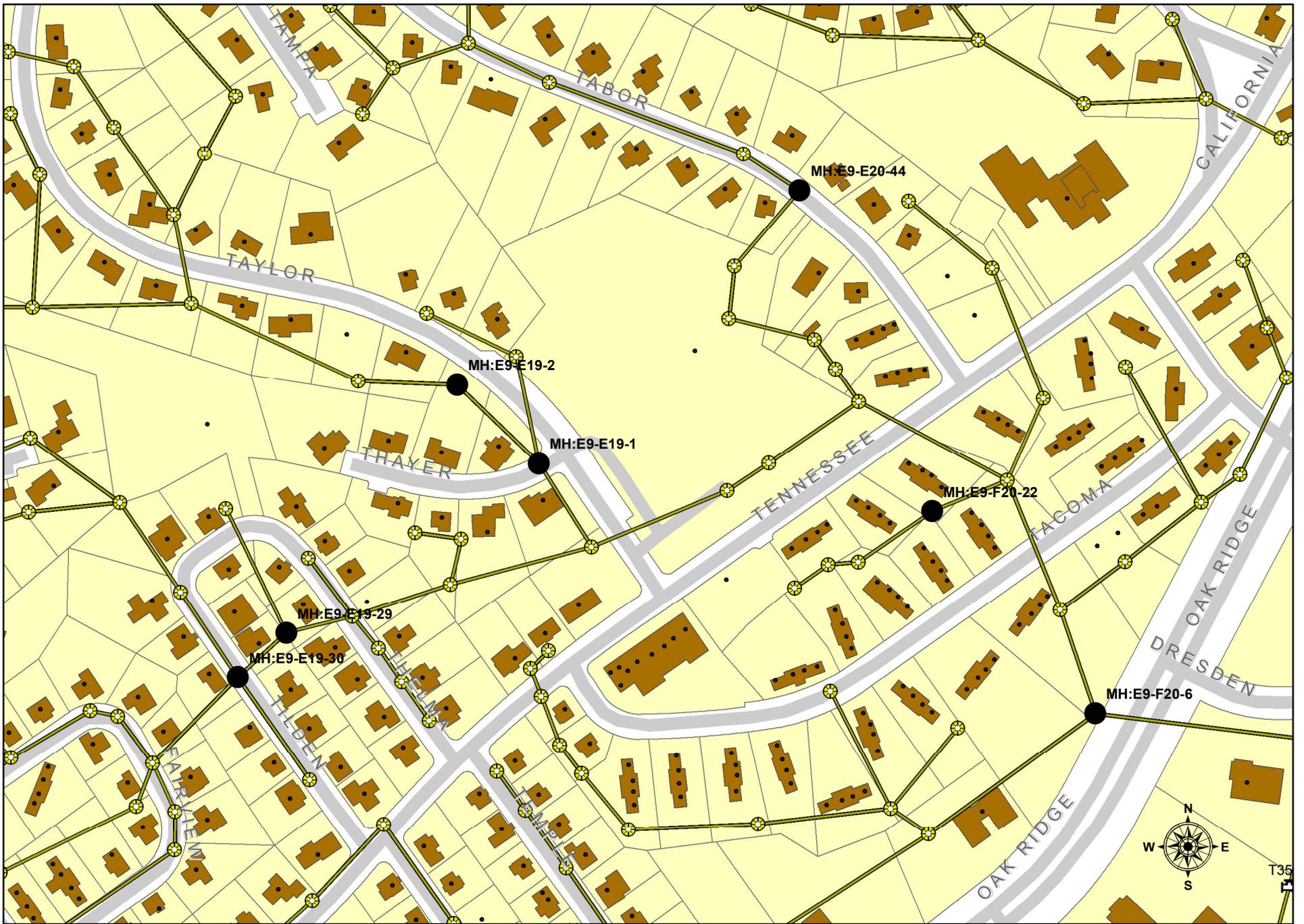
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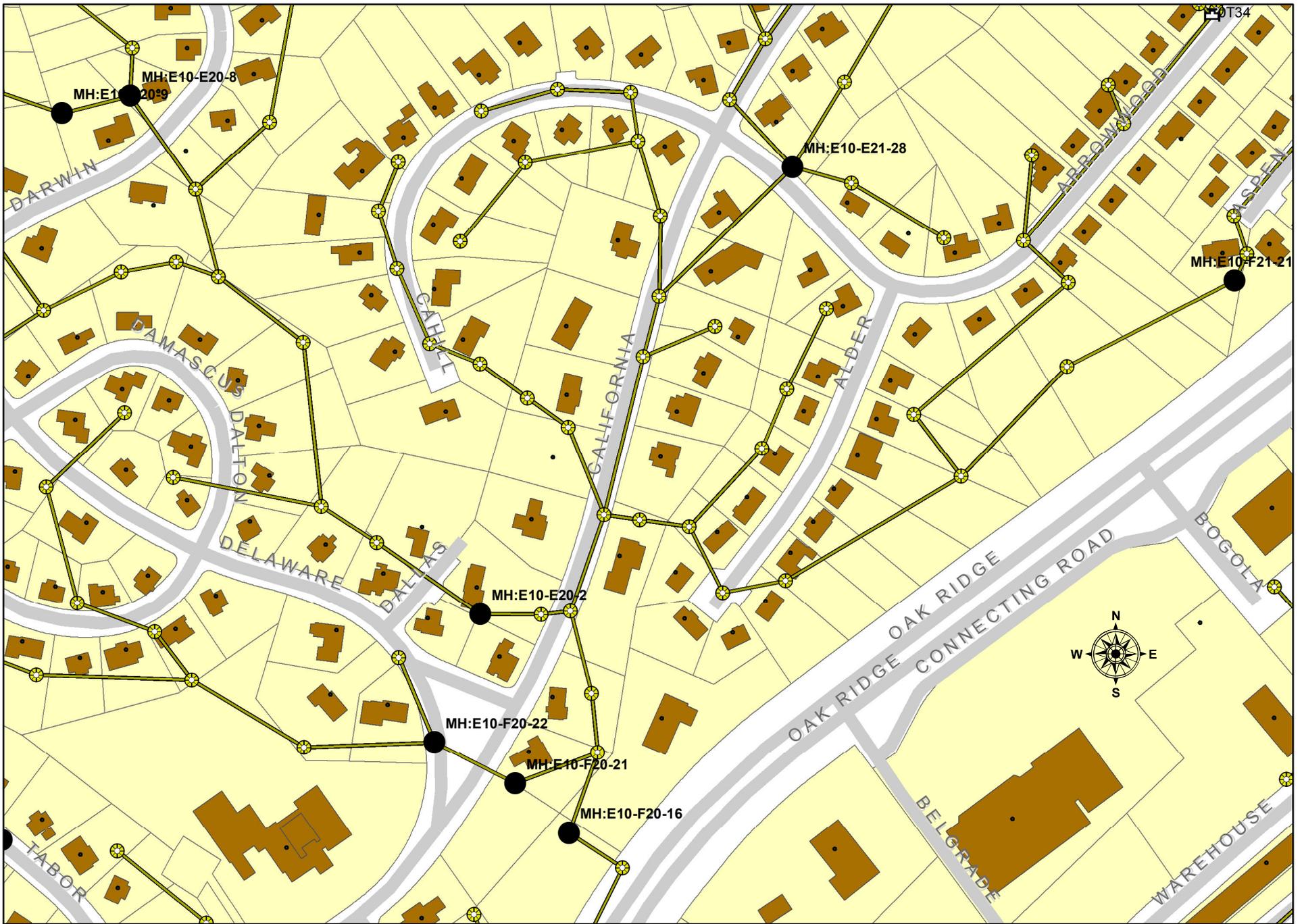
**SS Assets & Overflow Defects**

- Overflow I&I
- All Sewer Line Network
- Manhole Network

Map 1-11

Map 1-11

T35



**SS Assets & Overflow Defects**

- Overflow I&I
- All Sewer Line Network
- Manhole Network

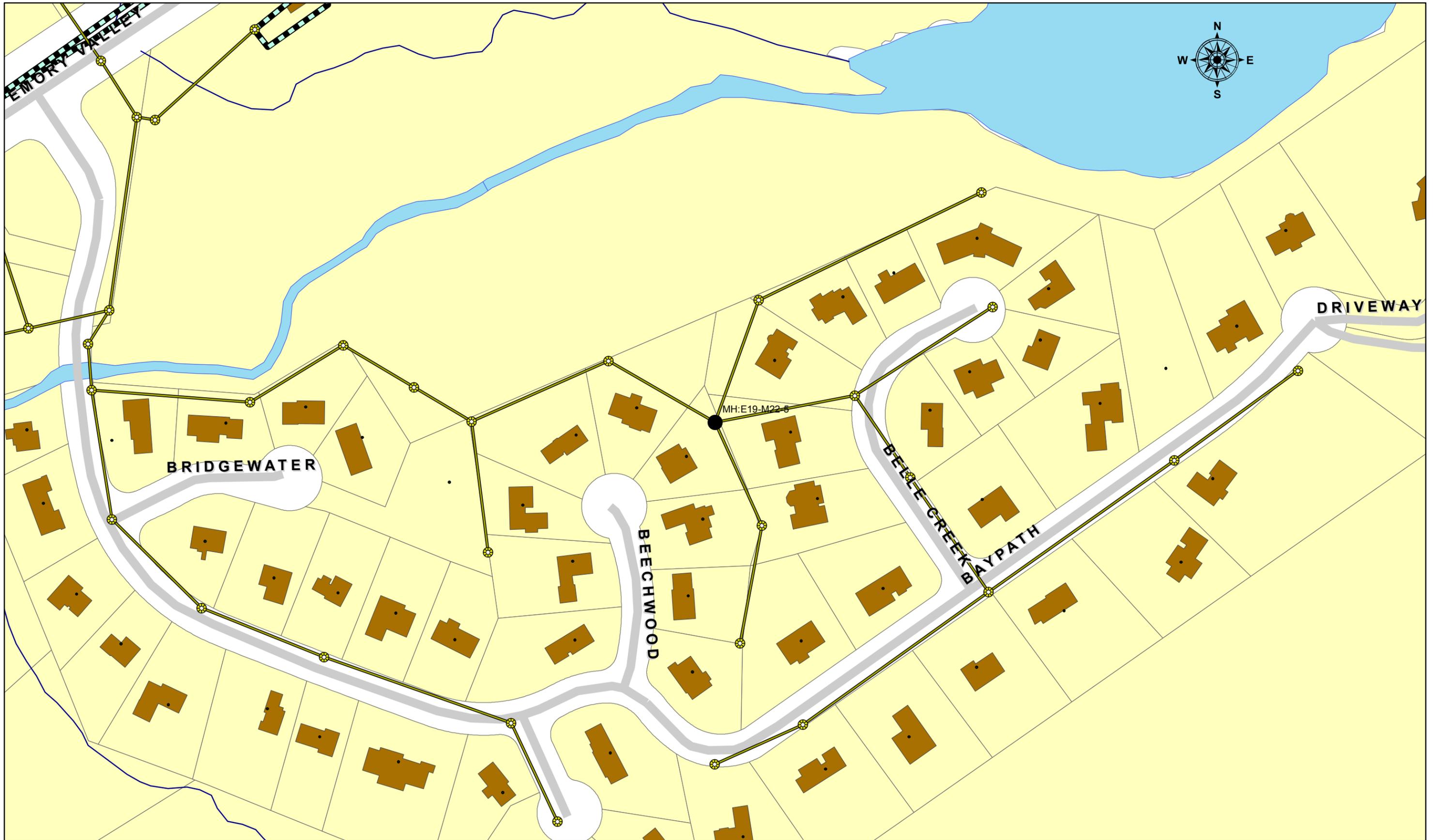
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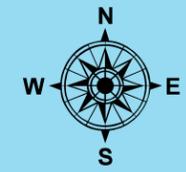


**SS Assets & Overflow Defects**

-  Man Holes
-  Lift Stations
-  Sewer Force Mains
-  Sewer Lines
-  Overflow-I&I

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Map □ - □ □



**SS Assets & Overflow Defects**

-  Man Holes
-  Lift Stations
-  Sewer Force Mains
-  Sewer Lines
-  Overflow-I&I

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Map □ - □ □





**SS Assets & Overflow Defects**

- Overflow-I&I
- Man Holes
- Sewer Lines
- PS Lift Stations

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Map □ - □ 5



**SS Assets & Overflow Defects**

- Man Holes
- Lift Stations
- Sewer Force Mains
- Sewer Lines
- Overflow-I&I

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Map - [unclear]

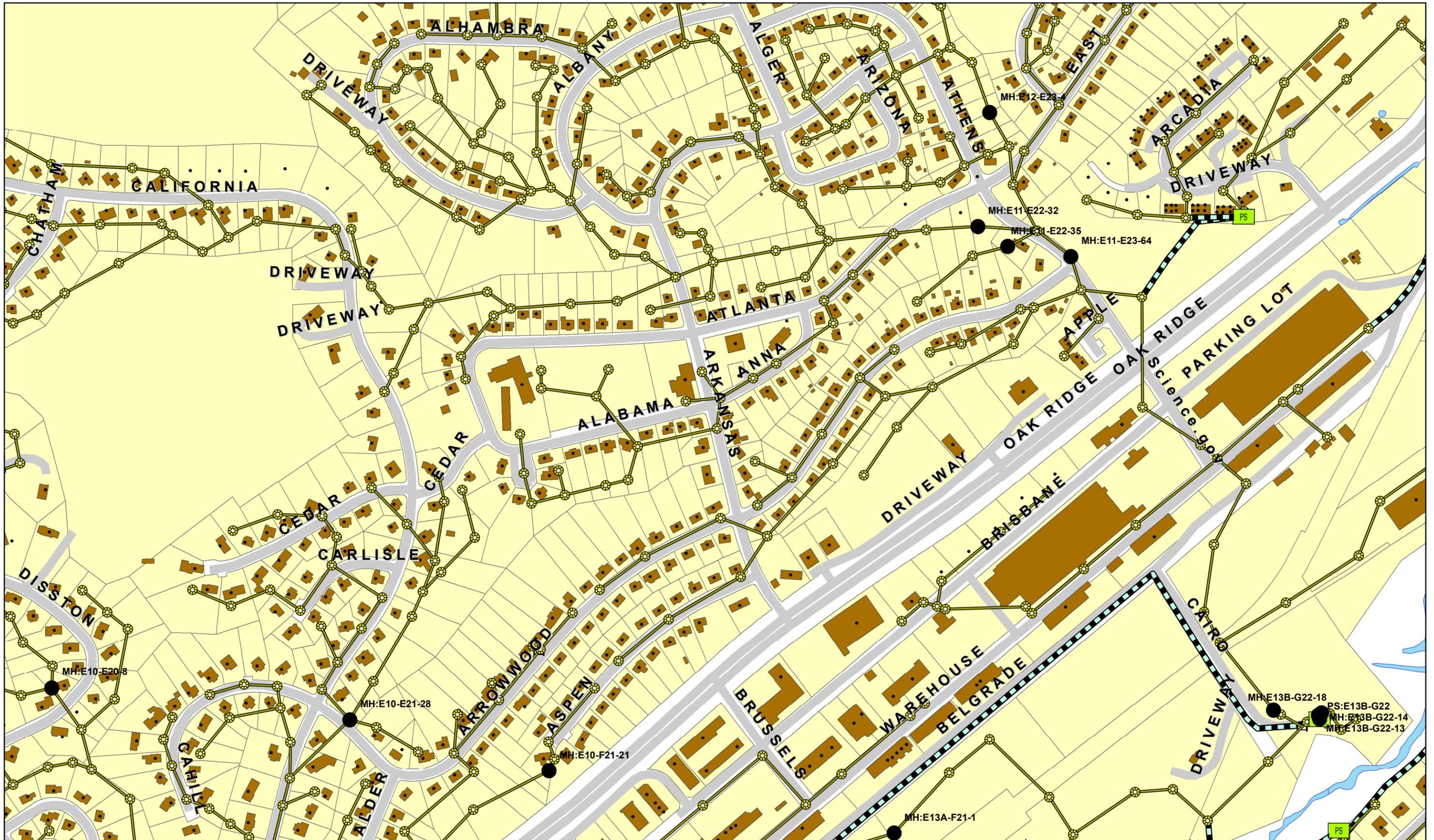


**SS Assets & Overflow Defects**

- Overflow-I&I
- PS Lift Stations
- Man Holes
- Sewer Force Mains
- Sewer Lines

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Map □ - □ □



**Legend**

- Overflow-I&I
- Manholes
- SewerLines
- PS LiftStations

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Map □ - □ □

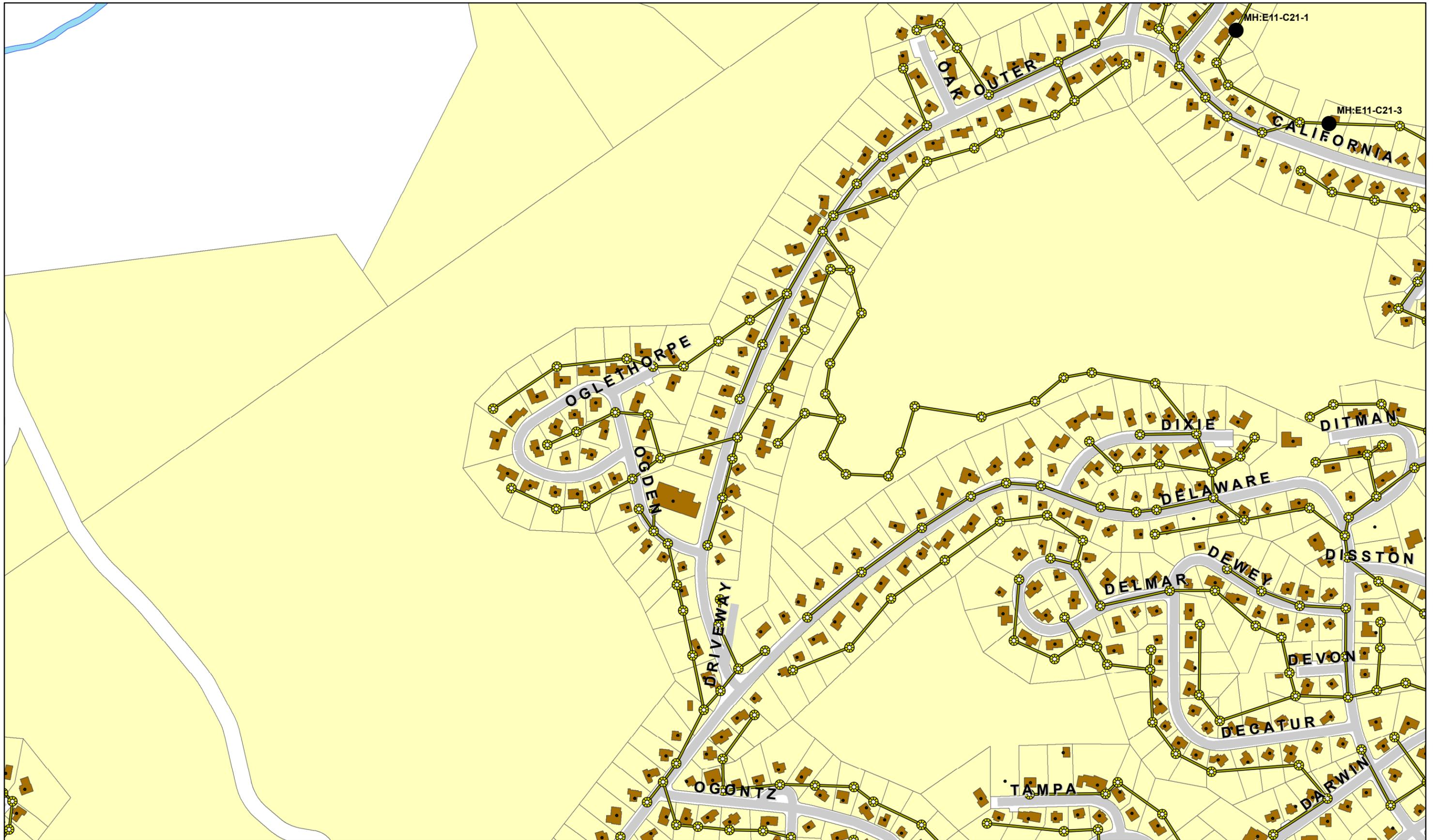


**Legend**

- Overflow-I&I
- Manholes
- SewerLines
- PS LiftStations

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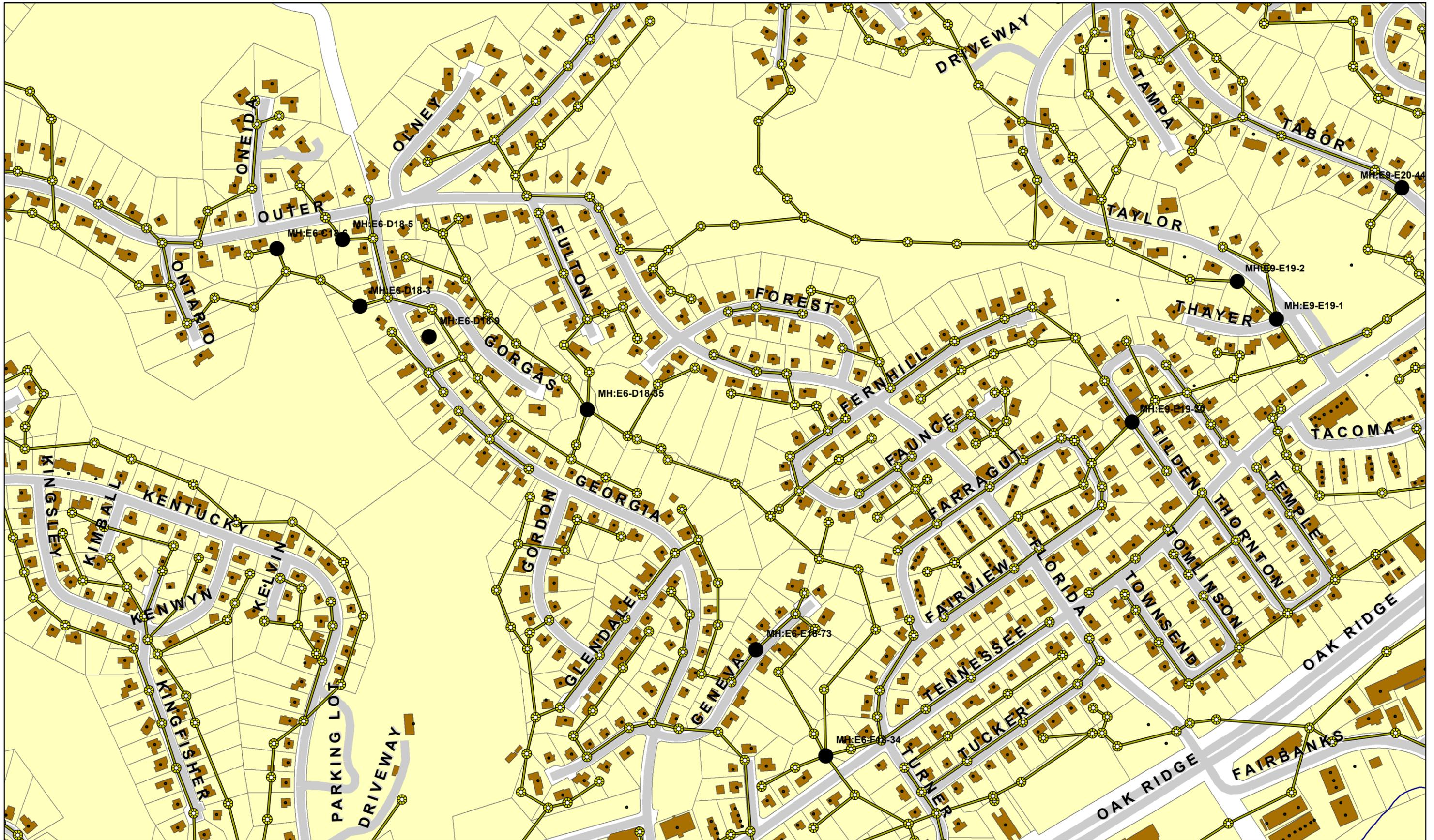


**Legend**

- Overflow-I&I
- Manholes
- SewerLines
- PS LiftStations

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Map □-5□



**Legend**

- Overflow-I&I
- Manholes
- SewerLines
- PS LiftStations

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Map 0-50





MH:E4-G16-17

MH:E5A-J18-1

**Legend**

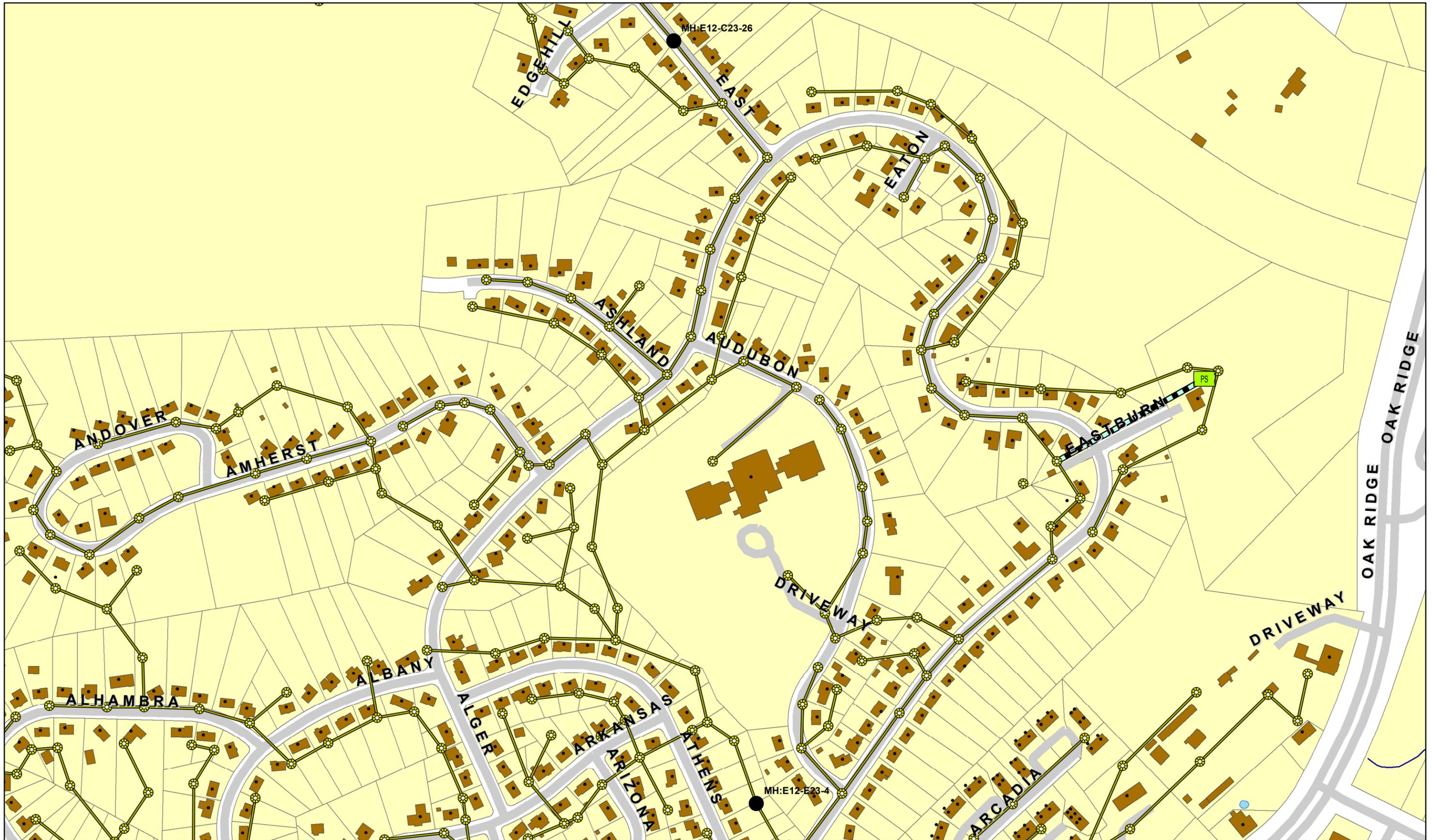
- Overflow-I&I
- Manholes
- SewerLines
- PS LiftStations

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Map □ -5 □







SS Assets & Overflow Defects

- Overflow-I&I
- Manholes
- SewerLines

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Map 0-50



**Legend**

- Manholes
- SewerLines
- PS LiftStations

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Map □ -5 □

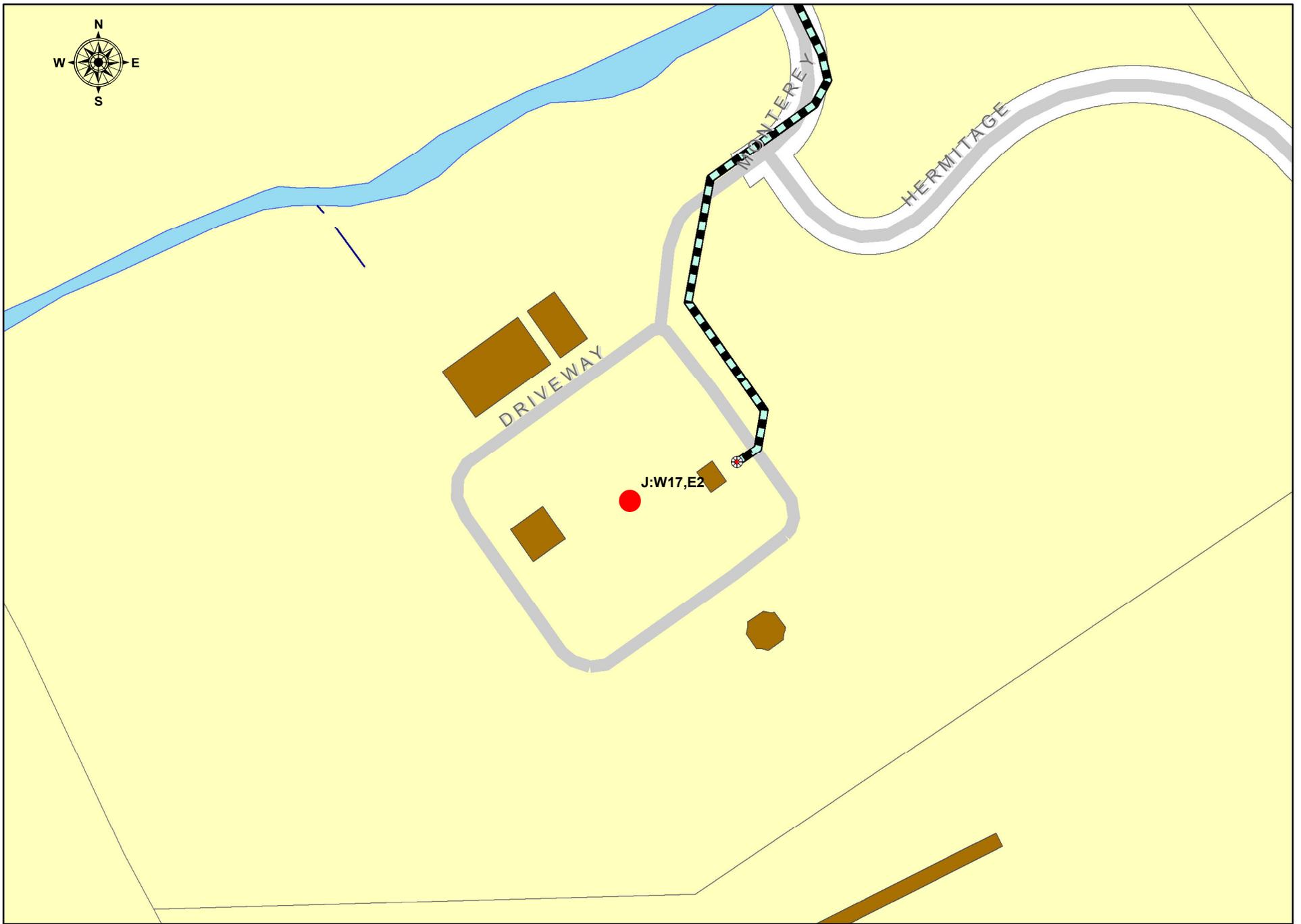


**Legend**

- ⊗ Manholes
  SewerLines
- PS LiftStations

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Map □ -5□



**SS Assets & Overflow Defects**

-  Overflow-I&I
-  All Sewer Line Network
-  Manhole Network

Map -5

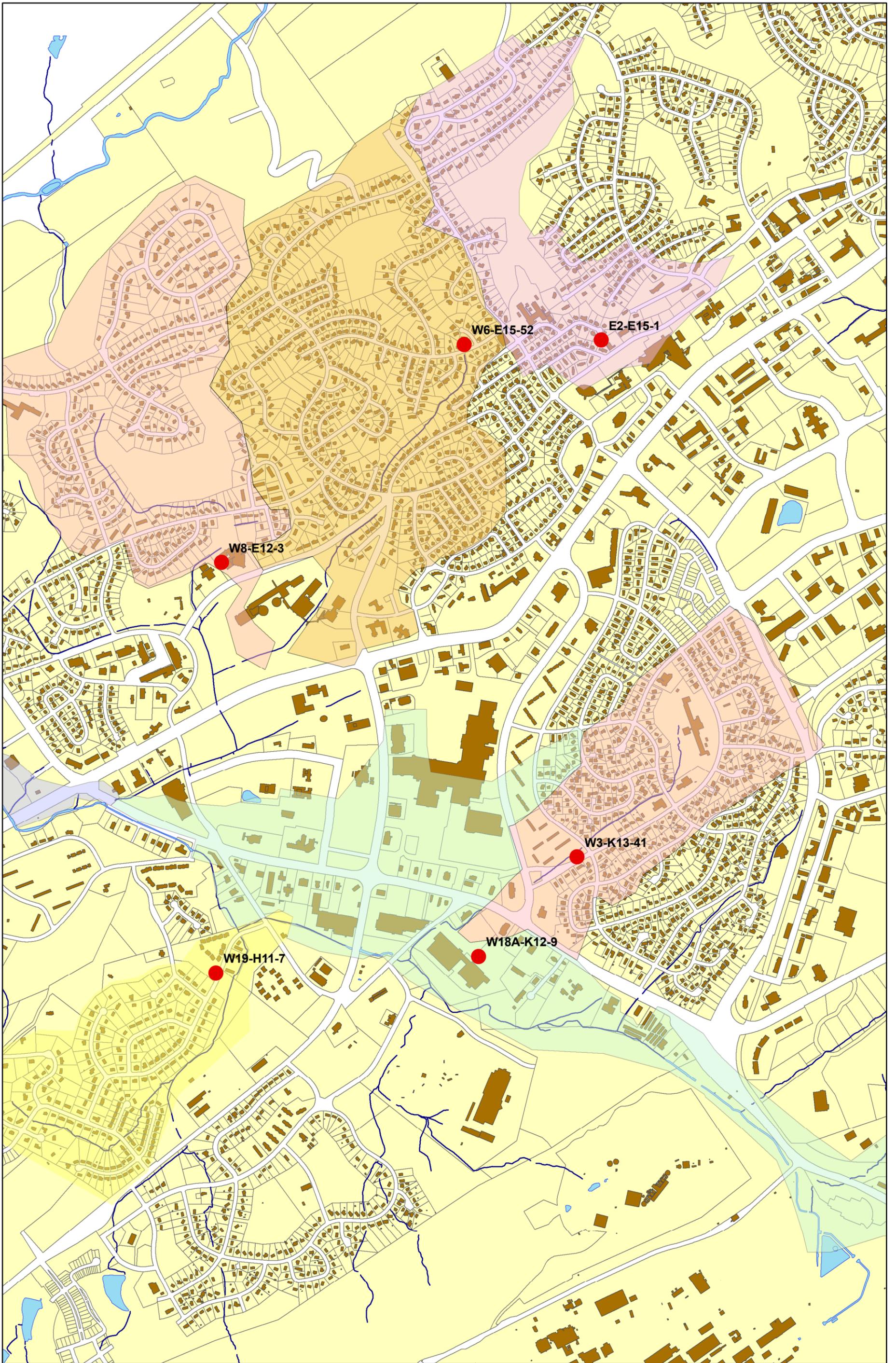
Map -5



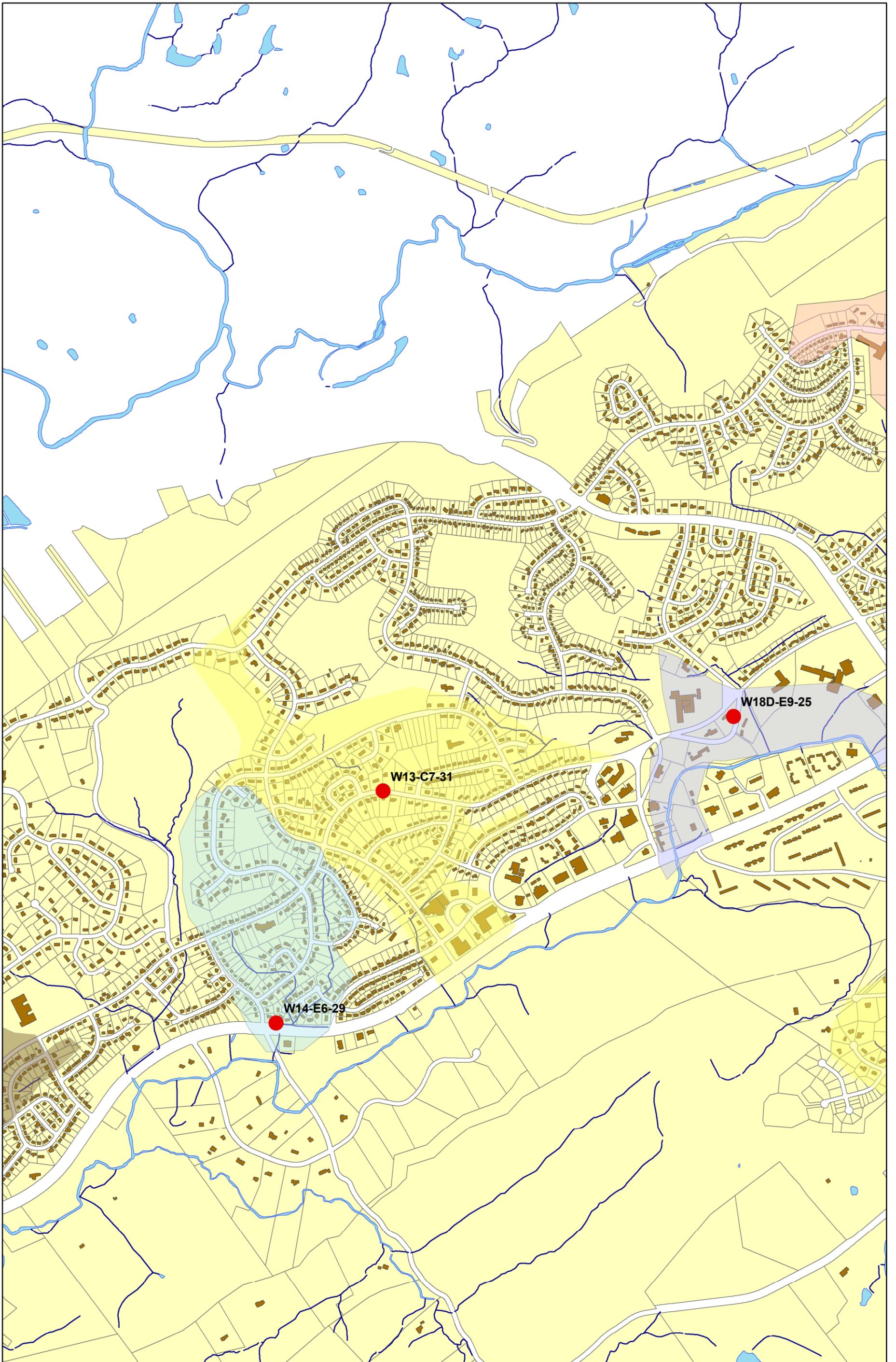
City Of Oak Ridge - Groundwater Monitoring Locations  
Map D-□



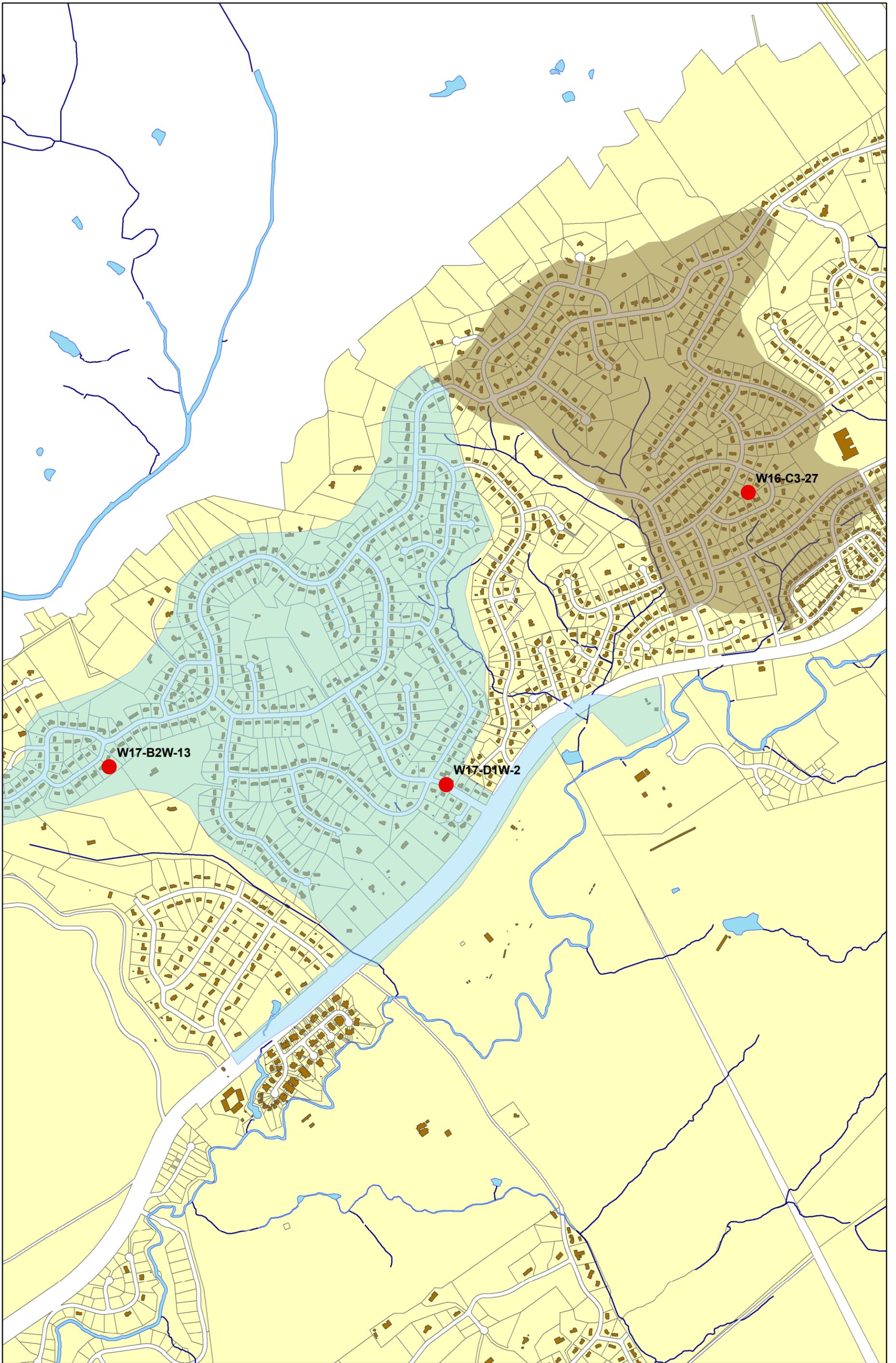
City Of Oak Ridge - Groundwater Monitoring Locations  
Map D-□



City Of Oak Ridge - Groundwater Monitoring Locations  
Map D-□



City Of Oak Ridge - Groundwater Monitoring Locations  
Map D-□

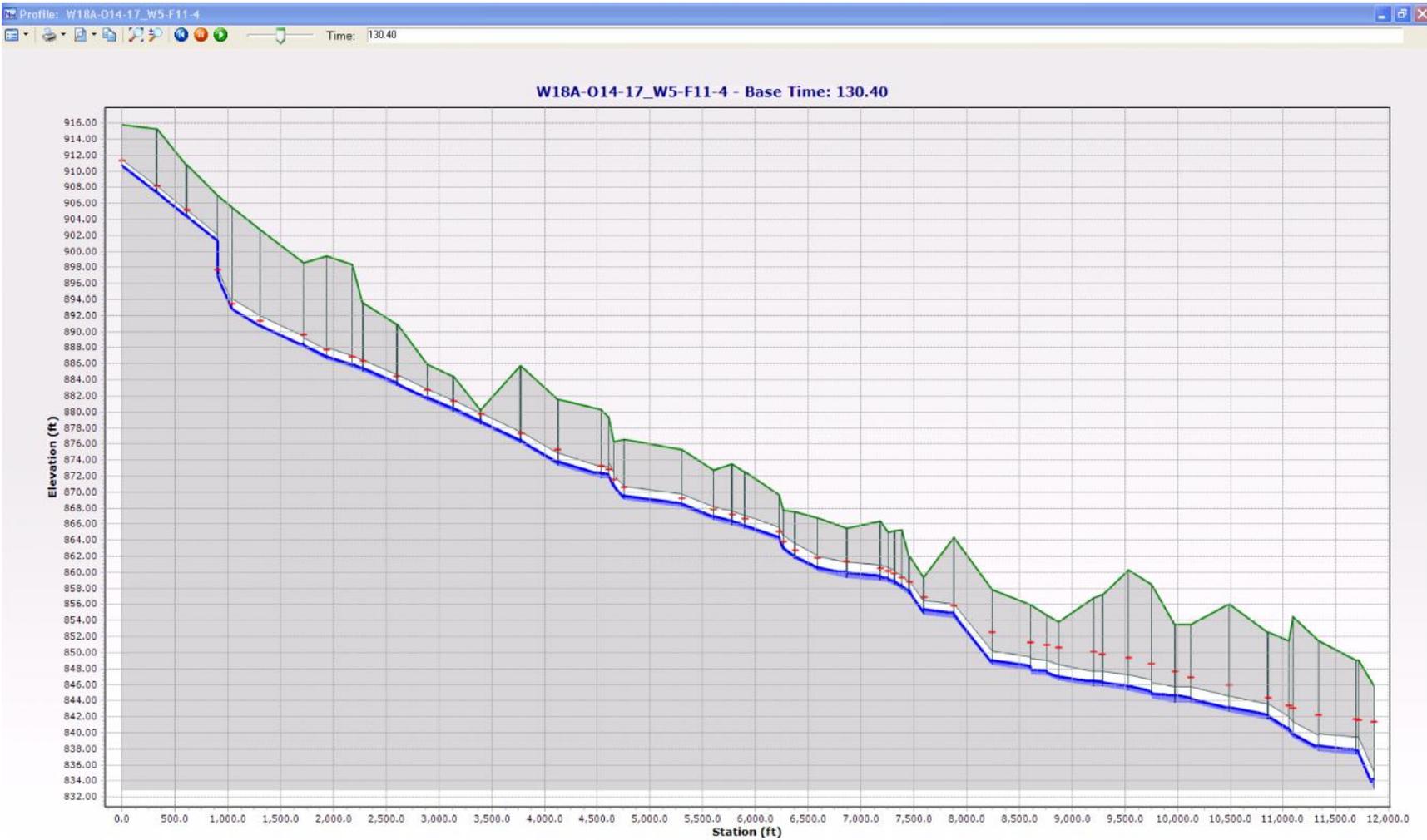


City Of Oak Ridge - Groundwater Monitoring Locations  
Map D-5

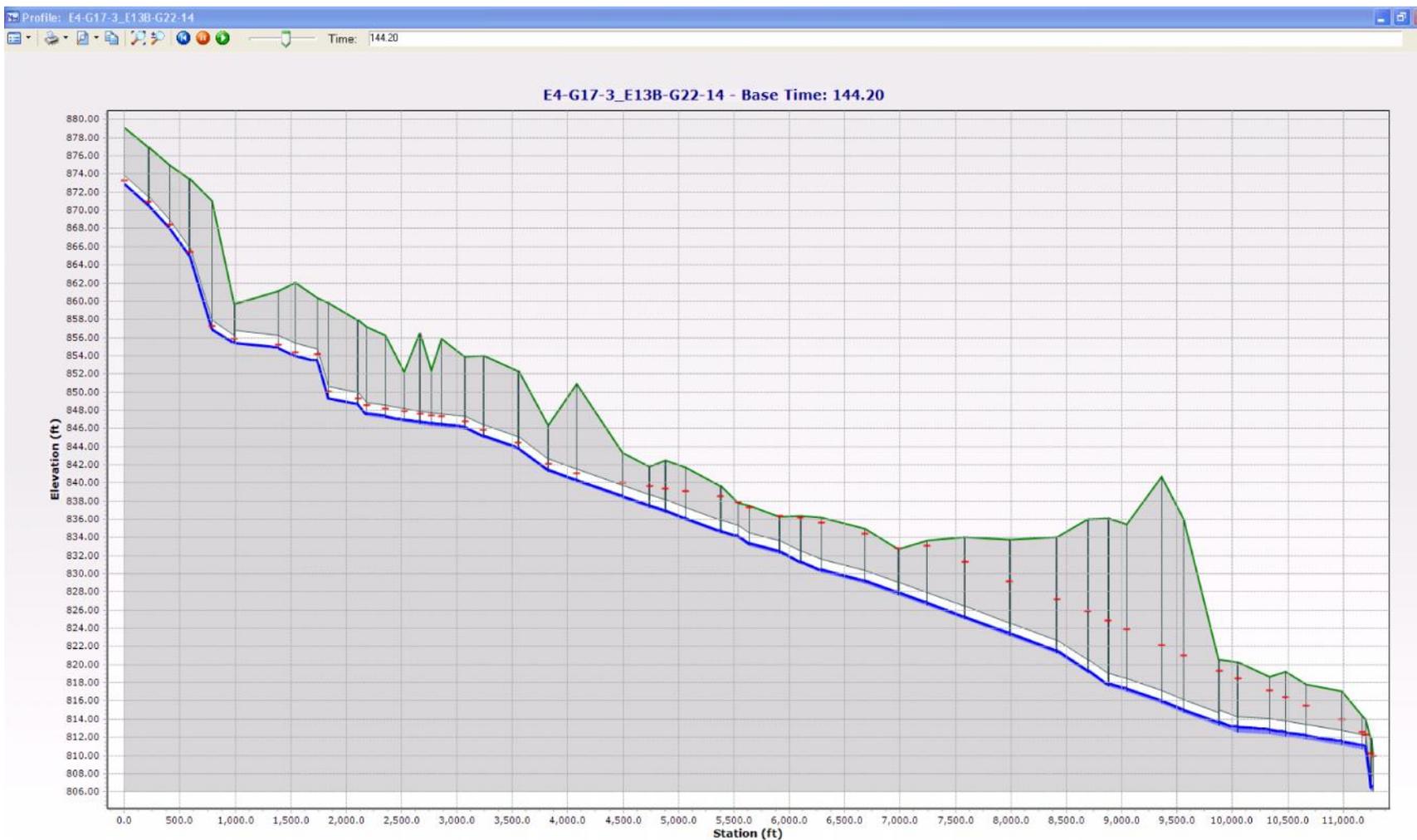
**FIGURE E-1**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**HGL PROFILE #1**



**FIGURE E-2**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**HGL PROFILE #2**



**FIGURE E-3**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**HGL PROFILE #3**



**FIGURE E-4**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**HGL PROFILE #4**



**FIGURE E-5**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**HGL PROFILE #5**



**FIGURE E-6**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**HGL PROFILE #6**



**FIGURE E-7**  
**CITY OF OAK RIDGE**  
**SANITARY SEWER SYSTEM – CAPACITY ASSESSMENT REPORT**  
**HGL PROFILE #7**

