FINAL REPORT

DeKalb County Sanitary Sewer System-Wide Hydraulic Model Application Report: South Fork Peachtree Creek Sewershed

Prepared for

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Contents

Section Page

1 Introduction 1-1
  1.1 Project Background 1-1
  1.2 Dynamic Hydraulic Model Applications 1-2
  1.3 Model Study Area Overview 1-2

2 Data Collection and Review 2-1
  2.1 Physical Attributes Updates 2-1
  2.2 Ancillary Structure Updates 2-1
  2.3 Boundary Condition Updates 2-5
  2.4 2018/2019 Flow Meter and Rain Gauge Data 2-6
    2.4.1 Overview 2-6
    2.4.2 Data Review 2-15
    2.4.3 Storm Events Selection 2-17
  2.5 Other Data Sources 2-20

3 Model Updates 3-1
  3.1 Model Protocol 3-1
  3.2 Model Extent 3-1
  3.3 Model Development Documentation 3-5
  3.4 Model Network 3-6
  3.5 Modeling Subcatchments 3-9
  3.6 Dynamic Hydraulic Model Flow Inputs 3-12
  3.7 Basic Modeling Assumptions 3-17

4 WWF Model Setup for Dynamic Hydraulic Modeling 4-1
  4.1 Combined Model Solution Approach 4-1
    4.1.1 Hydrologic (Surface Runoff) Models 4-1
    4.1.2 Ground Infiltration Model 4-2
  4.2 WWF Model Setup Parameter Groups 4-2
  4.3 Assumptions 4-3

5 Model Results Calibration and Verification 5-1
  5.1 Calibration Criteria 5-1
  5.2 Dry Weather Flow Calibration 5-2
    5.2.1 Calibration Summary 5-2
    5.2.2 Sensitivity Analysis 5-7
  5.3 Wet Weather Flow Calibration 5-8
    5.3.1 Calibration Summary 5-8
    5.3.2 Sensitivity Analysis 5-14
  5.4 Model Verification 5-15

6 System Capacity Assessment 6-1
  6.1 System Performance Criteria 6-1
  6.2 System Capacity Assessment Modeling Results 6-2
  6.3 System Capacity Improvement Projects Evaluation 6-3

7 Capacity Request Evaluation Using Dynamic Model 7-1
  7.1 Background 7-1

Section Page

7.2 Approach.......7-1
7.3 Assumptions.......7-2
7.4 System Performance Criteria.......7-2
7.5 Hydraulic Modeling Results.......7-2

Recommendations.......8-1

References.......9-1

Appendixes

Appendix A Storm Event Selection

Appendix B DWF Calibration

Appendix C WWF Calibration

Appendix D WWF Verification

Appendix E Certification Letter

Tables

Table 2-1. DWM Flow Meter Summary.......2-9

Table 2-2. Preliminary Rain Gauge Assignment.......2-10

Table 2-3. Storm Selection Summary.......2-18

Table 3-1. Updated Model Extent Summary.......3-5

Table 3-2. Updated Model Data Flags.......3-5

Table 3-3. Data Source Flags for Updated Model Manhole Rim Elevation.......3-6

Table 3-4. Data Source Flags for Updated Model Pipe Inverts.......3-7

Table 3-5. Data Source Flags for Updated Model Pipe Diameter.......3-8

Table 3-6. Model WWF Subcatchment Summary.......3-10

Table 3-7. Model DWF Inputs Based on 2018 Flow Monitoring Data.......3-13

Table 3-8. Large Wastewater Dischargers.......3-16

Table 3-9. Top 10 Large Water Users.......3-16

Table 3-10. Manning's N for Various Pipe Material.......3-17

Table 4-1. WWF Parameters Summary.......4-3

Table 5-1. DWF Calibration Summary.......5-3

Table 5-2. RDII Events Summary.......5-8

Table 5-3. WWF Calibration Summary.......5-9

Table 5-4. WWF Parameters Sensitivity Analysis Summary.......5-16

Table 5-5. WWF Parameters Sensitivity Analysis Summary - Fast Response 5-16

Table 5-6. WWF Parameters Sensitivity Analysis Summary - Slow Response 5-16

Figures

Figure 1-1. System Overview Map 1-5

Figure 2-1. Lift Station Location Map 2-3

Figure 2-2. SFPC Sewershed Boundary 2-7

Figure 2-3. Flow Meter Relationship Diagram 2-11

Figure 2-4. South Fork Peachtree Creek Flow Meter and Rain Gauge Locations and Metershed Boundaries (as of May 2019) 2-13

Figure 2-5. Flow Monitoring Dry and Wet Days Summary 2-15

Figure 2-6. Flow Monitoring Data Quality Summary 2-17

Figure 2-7. Storm Event Evaluation 2-20

Figure 3-1. South Fork Peachtree Creek Model and CD Extent Map...3-3

Figure 5-1. WWF Calibration Criteria Graph Example: Volume 5-2

Figure 5-2. Example Dry Weather Flow Calibration Plot at Meter SFORK43 5-7

Figure 5-3. Model Verification: SSOs Check 5-17

Figure 6-1. System Performance Criteria 6-2

Figure 6-2. SCS Type II 2-year, 24-hour Design Storm 6-2

Figure 6-3. South Fork Peachtree Creek Dry Weather Flow Model Capacity Assessment Results........6-5

Figure 6-4. South Fork Peachtree Creek Wet Weather Flow Model Capacity Assessment Results.......6-7

Acronyms and Abbreviations

ADDF	average daily dry weather flow
BSF	base sanitary flow
CAP	Capacity Assurance Program
CCTV	closed-circuit television
CD	Consent Decree
CDPMT	Consent Decree Program Management Team
CIWEM	Chartered Institution of Water and Environmental Management
COA	City of Atlanta
DWF	dry weather flow
DWM	Department of Watershed Management (DeKalb County)
EPA	U.S. Environmental Protection Agency
ft	foot (feet)
GIM	Ground Infiltration Model
GIS	geographic information system
gpm	gallon(s) per minute
GWI	groundwater infiltration
HGL	hydraulic grade line
IDF	intensity-duration-frequency
IGA	Intergovernmental Agreement
IJ	inter-jurisdiction
ITMC	Intrenchment Creek
LS	lift station
MCD	Modified Consent Decree
mgd	million gallon(s) per day
MMADF	maximum month average day flow
MNGWPD	Metropolitan North Georgia Water Planning District
NOAA	National Oceanic and Atmosphere Administration
NPDES	National Pollutant Discharge Elimination System
PASARP	Priority Area Sewer Assessment and Rehabilitation Program
PR	Percentage Runoff
QA/QC	quality assurance/quality control
RDII	rainfall-derived infiltration and inflow
SCS	Soil Conservation Service
SDE	spatial database engine
SFPC	South Fork Peachtree Creek
SOP	Standard Operating Procedures
SSO	sanitary sewer overflow
SSOAP	Sanitary Sewer Overflow Analysis and Planning
TM	technical memorandum
UDG	Urban Drainage Group

WCTS	wastewater collection and transmission system
WEF	Water Environment Federation
WWF	wet weather flow
WWTF	wastewater treatment facility

Glossary

Term	Meaning	Source
Calibrating	The process of accounting for values representative of the County's wastewater collection and transmission system (WCTS) using actual system data (e.g., flow data).	Consent Decree (CD), Paragraph 28(h)
Calibration	The process of adjusting model parameters so that the model output matches the measured sewer flow for the same time period.	DeKalb (2015), Section 1.5.5.3
Capacity	The design maximum flow, or loading, that a wastewater system and its components can handle in a specified period with predictable and consistent performance. Also, the peak flow is equal to the maximum flow only when the time periods are the same.	Water Environment Federation (WEF) (2013) Glossary
Capacity Assessment (System)	Evaluation of system capacity availability and constraints to identify system improvement and upgrade needs.	inferred from Section 1.5.1 of DeKalb County (2015)
Capacity Assurance Program	Definitions and parameters for determining the adequacy of collection, transmission, and treatment facilities to accommodate additional flow from existing connections or future connections. To be coordinated with regulations permitting additional flow.	inferred from Section 1.5.1 of DeKalb County (2015)
Consent Decree or Decree	Shall mean this Consent Decree, and all appendices attached hereto.	CD p. 12
Conveyance System Capacity	The wastewater conveyance system is commonly composed of gravity sewers, inverted siphons, pumping stations and force mains, storage systems, and flow control devices. Each component has an individual capacity. The system is the network of multiple individual reaches of sewers, pumping stations, and other features that work together to convey flow to a downstream point. The conveyance system capacity is determined by initial design criteria, installation techniques, and accuracies, the extent to which the system has been maintained, and how these individual component capacities interrelate.	WEF (2013), Section 1.1.1.3
Critical	Data, sewers, or locations that require field checking/site visits because they 1) are noted as questionable (or are missing) and 2) are integral to hydraulic routing model performance. Refer to Section 3.5 for details.	Consent Decree Program Management Team (CDPMT)
Dynamic Model	One in which the flows, depths and responses vary over time	CDPMT
Hydrologic and Hydraulic (I/I) Model	Refers to a digital combination of site-specific input with software capable of representing the hydrology (flow generation) and hydraulics (piping, pumps, and flow routing) of a sewer system.	CDPMT
Hydraulic Model	A mathematical model of a fluid introduced into a water/ wastewater sewer/storm sewer system at various rates and pressures.	DeKalb (2015), Section 1.5.2
Hydrology	The processes governing the amount of liquid entering a sewer system from rain events and ground water.	CDPMT

Term	Meaning	Source
Major Gravity Sewer Line	Shall mean Gravity Sewer Lines which are eighteen (18) inches or greater in diameter.	CD, p. 15
Major Lift Station	Shall mean a Lift Station that has at least one (1) pump with greater than ninety-nine (99) horse power and a force main diameter of six (6) inches or greater.	CD, p. 15
Model Application	The process of developing and using a model to support decisions.	CDPMT
Model Development	The process of selecting software, and gathering and inputting data to represent the specific system or application.	CDPMT
Overflow	Shall mean, for purposes of this Consent Decree, a release of wastewater from the WCTS, or from a wastewater treatment facility (WWTF) caused by problems in the WCTS, that does not reach waters of the United States or the State.	CD, p. 15
'R' Value	Shall mean the fraction (sometimes reported as a percentage) of rainfall falling within a given sewershed area that enters a sanitary sewer collection system as rainfall dependent infiltration and inflow (I/I).	CD, p. 16
Sanitary Sewer Overflow or SSO	Shall mean all Spills, Overflows, and Building Backups.	CD, p. 16
Sensitivity Analysis	How the Model responds to changes in input parameters and variables.	CD, Paragraph 28(h)
Sewershed	Shall mean the subdivisions of the County's WCTS containing sewers that are primarily hydraulically linked.	CD, p. 17
Spill	Shall mean, for purposes of this Consent Decree, a discharge of wastewater from the WCTS, or from a WWTF caused by problems in the WCTS, which reaches waters of the United States or the State, including a prohibited Bypass, but not including other discharges from a point source that is specified in the NPDES Permits.	CD, p. 17
Steady-state Model	Flows, depths, and response is steady over time.	CDPMT
Subcatchment	A subcatchment on the InfoWorks ICM model network represents the physical area from which a manhole or other inflow node collects water.	Innovyze InfoWorks ICM Help (2017)
Trunk Line Sewer	Trunk line sewer or trunk sewer is the same as major gravity sewer line. Refer to *Major Gravity Sewer Line*.	CD, p. 15
Update	The process of incorporating system changes, including new building or sewer modification, to better represent the system.	Adapted from CIWEM (2017), Section 3.5
Validation	Involves the process of testing the model against an independent data set.	WEF (2011), p. 208
Verification	A process of comparing model output to measured values and to system operator observations and determining that the model is adequate to be useful.	Adapted from CIWEM (2017), Section 5
Verify	To verify the Model's performance using actual system data (e.g., flow data).	CD, Paragraph 28(h)

SECTION 1

Introduction

1.1 Project Background

The Consent Decree Program Management Team (CDPMT) completed a fully developed steady-state model on December 20, 2017, for each of the seven hydraulic models providing coverage throughout DeKalb County (hereafter, “the County”) using sewer system flows from January 2015 through June 2015. The model reports were developed by CDPMT and submitted to the DeKalb County Department of Watershed Management (DWM); the reports included detailed documentation of the modeling assumptions, findings, and changes to previous documentation or model versions (CDPMT, 2017). The model submitted in December 2017 reflected the following system data changes:

1. Geographic information system (GIS) spatial database engine updates received from the County before August 2017
2. Additional field check results provided by the County before August 2017
3. System-wide lift station updates that would be completed by end of December 2017

Since 2017, CDPMT submitted a Technical Memorandum (TM) to DWM to document the general approach needed to update the steady-state sewer models and to upgrade the steady-state models to fully hydrologic and hydraulic dynamic models (CDPMT, 2018). The approach details were presented to DWM in May 2018. As part of the model update process, CDPMT completed a system-wide model network update based on field survey data provided by DWM prior to February 2018 and submitted the updated steady-state models to DWM in June 2018.

This report documents primarily the two major activities since December 2017 subsequent to the incorporation of several key sewer system network edits or additions:

1. Steady-state hydraulic models updates and upgrades to dynamic hydraulic models including:
    a. The sewer model inputs update after the delivery of DWM’s December 2017 field survey information including the updated steady-state models submitted to DWM in June 2018. The model updates focus on the model network and flow update as discussed in Section 3.
    b. Steady-state hydraulic model upgrades to fully hydrologic and hydraulic dynamic models as explained in the dynamic model approach TM (CDPMT, 2018) (refer to Section 4).
2. The updated system capacity assessment results based on the dynamic models as discussed in Section 6.
    a. New flow and rainfall data from 2018 and early 2019 were used in the model inputs.
    b. Section 6 evaluation discussion was based on current capacity assurance criteria and may differ from what is used for assessment for capacity requests as well as what is used for long-term planning.

The report herein was developed as the fifth of seven reports as discussed in Section 1.3. Each report will have a similar format and content except where needed to highlight the specific details, analysis, or recommendations for the modeled basin or sewershed.

1.2 Dynamic Hydraulic Model Applications

As provided in the Capacity Assurance Program (CAP) lodged in Federal Court, the dynamic hydraulic model will be used only after EPA/EPD approve this Sub-Model Report and the MCD is entered in Federal Court. (Appendix D to MCD, CAP, Section 1.4.).

As documented in the 2017 model report (CDPMT, 2017), for the first time, the models gave the County the ability to evaluate sewer and lift station capacity-related questions with an understanding of how each sewer or lift station is affected by, or itself affects, other portions of the wastewater collection and transmission system (WCTS).

With a dynamic hydraulic model, the model output provides a more representative understanding of time-based flow impacts, such as rainfall-derived infiltration and inflow (RDII) and its impact on system capacity. However, the model is only as accurate as the data measured, retrieved from existing records, or gathered from field inspections. The CDPMT suggests that DWM consider the recommendations provided in Section 8 to continue improving the quality of DWM data collection and verification.

For capacity request evaluations, the DWM-approved dynamic hydraulic model and results that meet DWM's applicable criteria will replace, upon acceptance, the steady-state model results. The dynamic hydraulic model analysis results for all three basins are based on the latest accepted flow monitor data from April 2018 to February 2019 (per flow monitoring installation schedule, different models have different 6-month periods [refer to Section 2.4 for details]). In contrast, the steady-state model used the maximum month average day flow from the January to June 2015 period.

The dynamic hydraulic model was developed to meet the U.S. Environmental Protection Agency (EPA) Consent Decree (CD) requirement and assist the ongoing Priority Area Sewer Assessment and Rehabilitation Program (PASARP) needs. Any other applications of this model will need to consider the impact from the assumptions applied during the model development and calibration process as explained herein.

As with any model, engineering judgement should be used when interpreting results and should consider ongoing field verification, system improvements, and assumptions indicated in the model.

1.3 Model Study Area Overview

The County's wastewater collection system is comprised of seven separate models developed based on the hydrological characteristics of the service areas. Model update and upgrade priorities were established by following DWM's priority sequence shown below (CDPMT, 2018):

1. Intrenchment Creek (ITMC)
2. Nancy Creek
3. North Fork Peachtree Creek
4. South Fork Peachtree Creek
5. Snapfinger Basin
6. Pole Bridge Basin
7. Miscellaneous (Misc.) sewersheds in Intergovernmental Basin

This report focuses on the South Fork Peachtree Creek (SFPC) model area within the Intergovernmental Basin.

The Intergovernmental Basin diverts flows within each sewershed for the most part into the City of Atlanta (COA), Fulton County, and Gwinnett County. Therefore, in the Intergovernmental Basin the hydraulic models were developed on a sewershed basis. The SFPC model include the following two sewersheds:

- South Fork Peachtree Creek
- Peavine Creek

SFPC sends its flows into COA, and Peavine Creek sends its flows into the SFPC sewershed. Figure 1-1 shows the sewershed location on the system overview map. The above two sewersheds were compiled in one hydraulic model and referred as the SFPC sewershed model in this report.

The SFPC sewershed hydraulic model, as of November 2019, was updated based on the data resources detailed in Section 2.

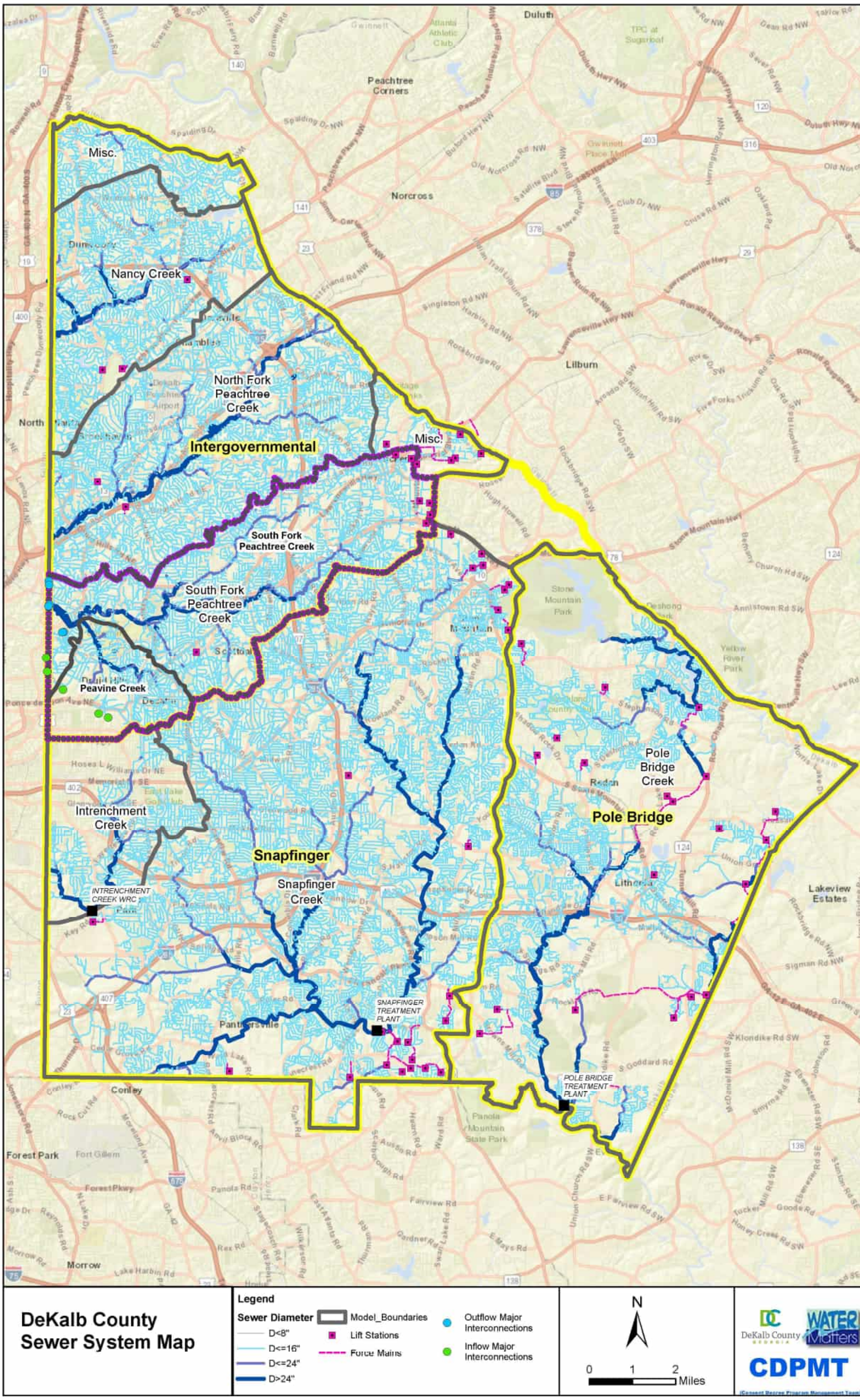

Figure 1-1. System Overview Map

For full report, please visit the Document Repository located at

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