



City of Franklin

109 3rd Ave S
Franklin, TN 37064
(615)791-3217

Meeting Agenda

Work Session

Tuesday, January 9, 2018

5:00 PM

Board Room

Call to Order

Citizen Comments

WORKSESSION DISCUSSION ITEMS

1. [18-0005](#) Presentation of 2017 4th Quarter and Annual Building Activity Report

Sponsors: Eric Stuckey, Vernon Gerth and Lynn Osland
Attachments: [Quarterly DEVELOPMENT ACTIVITY SUMMARY - 1.1.2017 - 12.31.2017](#)
2. [18-0029](#) Consideration of Ordinance 2017-54, An Ordinance to Create Title 2, Chapter 2 of the City of Franklin Municipal Code Relating to the Creation of a Development Services Advisory Commission; (01/09/18 and 01/23/18 WS; 02/13/18 First BOMA 8-0) SECOND AND FINAL READING

Sponsors: Eric Stuckey and Vernon Gerth
Attachments: [Ordinance 2017-54 - Development Services Commission.Law Approved 4.pdf](#)
3. [17-1040](#) Presentation of Strategic Plan for the Fire Department

Sponsors: Rocky Garzarek
Attachments: [FFD Strategic Plan 2017-22](#)
4. [18-0017](#) Consideration of Resolution 2017-90, A Resolution To Affirm Compliance With Federal Title VI Regulations (01/09/18 WS)

Sponsors: Eric Stuckey
Attachments: [RES 2017-90 Affirm Compliance for 2018 with Title VI.pdf](#)
5. [18-0018](#) *Acknowledgement of Amendment 1 to City of Franklin Contract Number 2016-0098, the Parkland Acquisition Agreement with Crescent Lockwood, LLC

Sponsors: Eric Stuckey, Mark Hilty, Lisa Clayton and Paul Holzen
Attachments: [LW Park Land Agmt Amend 1 12.22.17](#)
[Robinson Lake Dam - Conceptual Engineering Report](#)

6. [17-0971](#) Consideration Of Ordinance 2017-52, To Be Entitled: "An Ordinance To Rezone 188.28 Acres From Estate Residential (ER) District To Civic And Institutional (CI) District For The Property Located East Of I-65 And West Of The Harpeth River, Southeast Municipal Complex." FMPC 6-0, 01/09/18 WS and First BOMA Reading 8-0, 02/13/18 BOMA 2nd Reading 8-0) THIRD AND FINAL READING

Sponsors: Franklin Municipal Planning Commission, Emily Hunter, Amy Diaz-Barriga and Josh King

Attachments: [MAP_SEMunicipalComplex.pdf](#)
[ORD 2017-52 CI Zone SE Municipal Complex_with Map.Law Approved](#)
[SE Municipal Complex REZONING 17 9 29.pdf](#)

Legislative History

11/16/17	Franklin Municipal Planning Commission	referred to the Franklin Municipal Planning Commission
12/14/17	Franklin Municipal Planning Commission	recommended favorably to the Board of Alderman and to the Work Session

7. [17-0979](#) Consideration Of Ordinance 2017-48, To Be Entitled: "An Ordinance To Amend Chapters 3, 5, And 8 Of The Zoning Ordinance Of The City Of Franklin, Tennessee, To Refine Transitional Features Standards For Infill Development."; (12-14-17 FMPC 6-0; 01/09/18 WS and First BOMA Reading 8-0; 02/13/18 Second Reading 7-1) THIRD AND FINAL READING

Sponsors: Emily Hunter and Kelly Dannenfelser

Attachments: [2017-48 ORD AS AMENDED Txt Amend Transitional Features.Law Approved](#) ;
[2017-48 ORD Txt Amend Transitional Features.Law Approved](#)
[Presentation 12 14 17](#)
[Traditional Conventional Standards Map](#)
[Zoning and Overlay Zoning Map](#)

Legislative History

12/14/17	Franklin Municipal Planning Commission	recommended favorably to the Board of Alderman and to the Work Session
----------	--	--

8. [18-0015](#) *Consideration of Grading Permit with Tennessee Department of Transportation (TDOT) (COF Contract No. 2017-0359) for Access from Mack Hatcher Parkway (SR 397) for the Water Reclamation Facility

Sponsors: Mark Hilty and Michelle Hatcher

Attachments: [2017-0359 TDOT to COF RE Grading Permit_Access Road_V1.pdf](#)
[WRF TDOT Driveway Permit Exhibit](#)

9. [18-0012](#) Consideration of Resolution 2017-89, a Resolution Recognizing the Voluntary Financial Contribution and Timing of Said Contribution From Southern Land Company That Helped Fund and Facilitate the Design of the Northwest Quadrant of Mack Hatcher Parkway and Construction of the Multi-use Path. (01/09/18 WS)

Sponsors: Eric Stuckey and Vernon Gerth

Attachments: [Resolution 2017-89 Southern Land Mack Hatcher Contribution.Law Approved.](#)

10. [18-0028](#) Consideration of Resolution 2017-87, "A Resolution to Accept and Recommend Approval of Amendment 1 to the 2016 Comprehensive Transportation Network Plan (Major Thoroughfare Plan) to the Franklin Municipal Planning Commission." (01/09/18 WS)

Sponsors: Paul Holzen

Attachments: [Res 2017-87 MTP-Amendment 1 - BOMA with Exhibit A.Law Approved.pdf](#)

11. [18-0019](#) Consideration Of Establishment For A Term Of Award Of A List Of Qualified, Responsive, And Responsible Service Providers Who Agree To Provide To The City, On A Rotating Basis, Professional Services Pertaining To Title Searches And Reports For The City's Voluntary Purchase Of Real Estate Or Its Acquisition By Eminent Domain For City Public Works Projects And Other Public Purposes (Purchasing Office Procurement Solicitation No. 2018-003; Fees To Be Allocated To The Projects To Which The Services Pertain; Contract Nos. 2017-0362, 2017-0363, 2017-0364, 2017-0365 and 2017-0366) (01/09/18 WS)

Sponsors: Shauna Billingsley

Attachments: [2018-003 Tabulation of submittals 2017.12.23.1017](#)

12. [18-0020](#) Consideration Of Establishment For A Term Of Award Of A List Of Qualified, Responsive, And Responsible Service Providers Who Agree To Provide To The City, On A Rotating Basis, Legal Counsel And Professional Services Pertaining To Real Estate Closings For The City's Voluntary Purchase And Sale Of Real Estate Or Its Acquisition By Eminent Domain For City Public Works Projects And Other Public Purposes (Purchasing Office Procurement Solicitation No. 2018-004; Fees To Be Allocated To The Projects To Which The Services Pertain; Contract Nos. 2017-0367, 2017-0368, 2017-0369 and 2017-0370) (01/09/18 WS)

Sponsors: Shauna Billingsley

Attachments: [2018-004 Tabulation of submittals 2017.12.23.1019](#)

13. [18-0021](#) Consideration Of Procurement Award To Swift Lawn & Land, Inc. Of Franklin, Tennessee In The Estimated Total Amount Of \$26,133 Per Year For A Term Of Award For City Facility Landscaping And Related Contract Services For A Term Of Award For The Facilities Department (Purchasing Office Procurement Solicitation No. 2018-008; \$32,000 Budgeted In 110-82599-41320 For Fiscal Year 2018; Contract No. 2017-0372) (01/09/18 WS)

Sponsors: Brad Wilson

Attachments: [2018-008 Tabulation of bids 2017.12.22.1232](#)

14. [18-0022](#) *Consideration Of Procurement Award To Landscape Services, Inc. Of Nashville, Tennessee In The Estimated Total Amount Of \$247,140 Per Year For A Term Of Award For Mowing And Related Contract Services For Certain City Parks And Certain Other City-Owned Properties For A Term Of Award For The Parks Department (Purchasing Office Procurement Solicitation No. 2018-007; Contract No. 2017-0371) (Deferred from 01/09/18 WS and 01/23/18 BOMA)

Sponsors: Lisa Clayton

Attachments: [2018-007 Tabulation of bids 2017.12.22.1142](#)

Other Business

Adjournment

Anyone requesting accommodations due to disabilities should contact ADA coordinator at 791-3277.

DEVELOPMENT ACTIVITY SUMMARY
PERMITS ISSUED & FEES RECEIVED
Including Construction Valuation

From: 1/1/2017-12/31/2017



PERMIT FEES RECEIVED - Includes Building, Electrical, Mechanical, Plumbing, Demolition, Swimming Pool Permit Fees, & Technology Fees

of PERMITS ISSUED*
*Permits without associated fees are not included.

FEES RECEIVED

January - March 2017

Residential (inc Townhomes/ Duplexes)

1,578

\$573,179

Non-Residential (inc Multi-Family)

374

\$170,406

April - June 2017

Residential (inc Townhomes/ Duplexes)

1,389

\$343,204

Non-Residential (inc Multi-Family)

817

\$202,845

July - September 2017

Residential (inc Townhomes/ Duplexes)

1,444

\$432,008

Non-Residential (inc Multi-Family)

425

\$357,856

October - December 2017

Residential (inc Townhomes/ Duplexes)

1,108

\$317,702

Non-Residential (inc Multi-Family)

397

\$366,265

TOTAL PERMITS ISSUED

7,532

\$2,763,465

ADDITIONAL FEES RECEIVED - Includes Plan Review Fees, Reinspection Fees, Road Impact Fees, Facilities Taxes, & Garbage Container Fees

January - March 2017

Residential (inc Townhomes/ Duplexes)

\$1,898,716

Non-Residential (inc Multi-Family)

\$1,299,704

April - June 2017

Residential (inc Townhomes/ Duplexes)

\$1,060,574

Non-Residential (inc Multi-Family)

\$1,239,104

July - September 2017

Residential (inc Townhomes/ Duplexes)

\$1,349,221

Non-Residential (inc Multi-Family)

\$3,433,748

October - December 2017

Residential (inc Townhomes/ Duplexes)

\$975,646

Non-Residential (inc Multi-Family)

\$4,786,200

TOTAL ADDITIONAL FEES

\$16,042,913

NEW DWELLING UNITS**# of UNITS**

Building Permits Issued - Number of Units by Type

January - March 2017Single Family (Detached) Dwellings
Townhomes190
57April - June 2017Single Family (Detached) Dwellings
Multi-Family (Attached) Dwellings
Townhomes121
30
14July - September 2017Single Family (Detached) Dwellings
Multi-Family (Attached) Dwellings
Townhomes151
429
20October - December 2017Single Family (Detached) Dwellings
Multi-Family (Attached) Dwellings
Townhomes103
461
19TOTAL DWELLING UNITS1,595**WATER & SEWER FEES RECEIVED****FEES
RECEIVED**January - March 2017Residential (inc Townhomes/ Duplexes)
Non-Residential (inc Multi-Family)\$516,562
\$761,462April - June 2017Residential (inc Townhomes/ Duplexes)
Non-Residential (inc Multi-Family)\$267,630
\$215,091July - September 2017Residential (inc Townhomes/ Duplexes)
Non-Residential (inc Multi-Family)\$338,724
\$993,219October - December 2017Residential (inc Townhomes/ Duplexes)
Non-Residential (inc Multi-Family)\$239,317
\$1,174,018TOTAL WATER & SEWER\$4,506,023**STORMWATER, GRADING, & UTILITY
PERMITS ISSUED****# of PERMITS
ISSUED****FEES
RECEIVED**STORMWATER & GRADING PERMITSJanuary - March 201714\$10,200April - June 20179\$6,300July - September 201714\$9,800October - December 201710\$7,000TOTAL STORMWATER &
GRADING PERMITS ISSUED:47\$33,300

GRADING ONLY PERMITS

<u>April - June 2017</u>	<u>2</u>	<u>\$1,400</u>
<u>July - September 2017</u>	<u>2</u>	<u>\$1,400</u>
<u>TOTAL GRADING ONLY PERMITS ISSUED:</u>	<u>4</u>	<u>\$2,800</u>

UTILITY CONSTRUCTION/ INFRASTRUCTURE PERMITS

<u>January - March 2017</u>	<u>11</u>	<u>\$4,600</u>
<u>April - June 2017</u>	<u>6</u>	<u>\$3,000</u>
<u>July - September 2017</u>	<u>7</u>	<u>\$3,300</u>
<u>October - December 2017</u>	<u>4</u>	<u>\$1,800</u>
<u>TOTAL UTILITY CONSTRUCTION/ INFRASTRUCTURE PERMITS ISSUED:</u>	<u>28</u>	<u>\$12,700</u>

ESTIMATED VALUATION OF BUILDING PERMITS***# of BUILDING PERMITS ISSUED****VALUATION**

<u>January - March 2017</u>		
<u>Residential Valuation of Construction</u>	<u>342</u>	<u>\$84,230,781</u>
<u>Non-Residential Valuation of Construction</u>	<u>82</u>	<u>\$82,289,855</u>
<u>April - June 2017</u>		
<u>Residential Valuation of Construction</u>	<u>219</u>	<u>\$49,973,466</u>
<u>Non-Residential Valuation of Construction</u>	<u>96</u>	<u>\$60,499,955</u>
<u>July - September 2017</u>		
<u>Residential Valuation of Construction</u>	<u>260</u>	<u>\$63,263,523</u>
<u>Non-Residential Valuation of Construction</u>	<u>98</u>	<u>\$202,409,229</u>
<u>October - December 2017</u>		
<u>Residential Valuation of Construction</u>	<u>199</u>	<u>\$46,974,924</u>
<u>Non-Residential Valuation of Construction</u>	<u>85</u>	<u>\$229,346,295</u>

TOTAL ESTIMATED VALUATION OF BUILDING PERMITS***\$818,988,028**

*Includes all new residential construction (single family detached dwellings and townhomes), new non-residential construction (including multi-family dwellings), accessory buildings, additions, tenant build-out, renovations, and miscellaneous construction. Estimated Valuations (Construction Costs) are provided by Applicants on **Building** Permit Applications only.

Permit values transacted during the month do not necessarily equal dollars collected because of the timing of the payment and actual issuance of the permits. Permit values are rounded up to the nearest dollar; therefore, totals may not match.

ORDINANCE 2017-54

TO BE ENTITLED: "AN ORDINANCE TO CREATE TITLE 2, CHAPTER 2 OF THE CITY OF FRANKLIN MUNICIPAL CODE RELATING TO THE CREATION OF A DEVELOPMENT SERVICES ADVISORY COMMISSION"

WHEREAS, the City of Franklin Board of Mayor and Aldermen finds that the public welfare will be served by assuring that further development is consistent with the City's goals for land use, transportation, housing, economic development, neighborhood livability, and environment; and

WHEREAS, the Board of Mayor and Aldermen encourages property owners, residents, and businesses to recognize the importance of consistent and fair application and implementation of regulations in the development of plans and standards for this community and in the values expressed in the day-to-day lives of its residents; and

WHEREAS, the City of Franklin desires to continue to be recognized as a diverse, progressive city celebrated as one of the most desirable place to live, learn, work, and play; and

WHEREAS, the Board of Mayor and Aldermen has decided to create a Development Services Advisory Commission for the sole purpose of serving as a policy advisory body to the Board of Mayor and Aldermen and City Administrator to foster timely, predictable, and accountable development review and associated development services that achieve the City's goals.

NOW, THEREFORE,

SECTION 1: BE IT ORDAINED BY THE BOARD OF MAYOR AND ALDERMEN OF THE CITY OF FRANKLIN, Tennessee, that Title 2, Chapter 2 of the Franklin Municipal Code is hereby created and approved to read as follows:

TITLE 2

CHAPTER 2. DEVELOPMENT SERVICES ADVISORY COMMISSION

- Sec. 2-201. Development Services Advisory Commission
- Sec. 2-202. Powers and Duties.
- Sec. 2-203. Membership.
- Sec. 2-204. Appointment and Term of Office.
- Sec. 2-205. Officers, Meetings and Rules of Procedure.
- Sec. 2-206. Compensation.
- Sec. 2-207. Staff Support, Committees, and Technical Assistance.

2-201. Development Services Advisory Commission. The Development Services Advisory Commission is hereby created to act as a policy advisory body to the Board of Mayor and Aldermen and City Administrator representing those with interests in the outcome of policies, budgets, regulations, and procedures that affect development review processes and associated development services. The purpose of the Commission is to foster timely, predictable, and accountable development review processes and associated development services that implement the City's goals for land use, transportation, housing, economic development, neighborhood livability, and the environment. The Commission advocates for

and supports consistent and fair application and implementation of regulations. The Commission provides for public input into development review processes and associated development services.

2-202. Powers and Duties. The Commission shall:

- (1) Provide leadership and expertise on issues affecting development;
- (2) Provide feedback on the impact of potential regulations and administrative rules on development review processes and associated development services, taking into consideration the full range of City goals and objectives;
- (3) Provide recommendations to City Staff, the Planning Commission, and Board of Mayor and Aldermen for regulatory, code, and administrative rule changes affecting development review processes and associated development services;
- (4) Monitor the application and enforcement of regulations for their effectiveness in achieving the City's development goals; and
- (5) Recommend customer service, permitting, development service processes, and compliance improvements to City Staff, the Planning Commission, and the Board of Mayor and Aldermen.

2-203. Membership. The Commission shall consist of a maximum of eleven (11) members and shall be selected to provide representation of those persons actively engaged in real estate, land planning, site design, and development. Members serving on the Commission shall have their primary residence in Williamson County or their business shall have a permanent office located in the City of Franklin.

- One (1) of the members shall be a City of Franklin Alderman who will represent the Board of Mayor and Aldermen.
- One (1) of the members shall be an employee from any one of the public utility companies (cooperatives) that provide essential utility services within Franklin's corporate limits.
- One (1) member shall be an employee of the City of Franklin and shall be appointed by the City Administrator.

The remaining eight (8) members shall include a cross section of members with representation from any of the following entities (or their successors):

- American Institute of Architects (AIA) – Middle Tennessee
- Home Builders Association of Middle Tennessee (NHAB/ HBAT/ HBAMT)
- National Association of the Remodeling Industry (NARI)
- Tennessee Chapter American Society of Landscape Architects (ASLA)
- Tennessee Association of Plumbing Heating Cooling Contractors (TAPHCC)
- National Electrical Contractors Association (NECA)
- Associated Builders and Contractors, Inc. – Greater Tennessee Chapter (ABC)
- Tennessee Society of Professional Engineers (TSPE)
- Urban Land Institute Nashville (ULI)
- American Planning Association (APA)
- Nashville Chapter of NAIOP, Commercial Real Estate Development Association
- Williamson County Board of Realtors
- Williamson, Inc. (Williamson County Chamber of Commerce and Economic Development)

2-204. Appointment and Term of Office. Members of the Commission shall be appointed by the Mayor and confirmed by the Board of Mayor and Aldermen. The term of the Alderman shall be co-terminus with their term on the Board of Mayor and Aldermen. The term of the remaining members shall be three (3) years. All members shall be limited to two consecutive full terms and may be reappointed after a three (3) year absence from serving on the Commission. Except for the term of the Alderman, the initial terms shall be staggered as follows: three (3) members shall serve for one year, three (3) members shall serve for two years, and four (4) members shall serve for three years.

Appointees who fill an unexpired term shall hold office for the remainder of said unexpired term.

2-205. Officers, Meetings, and Rules of Procedure. The officers of the Commission shall be a chair and vice-chair, elected by majority vote of the Commission. The chair shall preside at meetings of the Commission and shall have the right to vote. The vice-chair shall, in case of absence or disability of the chair, perform the duties of the chair. Officers shall serve for terms of one (1) year or until their successors are regularly elected and take office. The Commission shall schedule monthly meetings and have the discretion to meet, with proper notice, upon the call of the chair. The Commission shall meet not less than four (4) times each calendar year. Six (6) members of the Commission shall constitute a quorum. The concurring vote of a majority of members present shall be required for approval or disapproval of any motion or other action of the Commission. All meetings shall be open to the public.

2-206. Compensation. Members of the Development Services Advisory Commission, technical advisors, and citizens at-large shall serve without compensation.

2-207. Staff Support, Committees, and Technical Assistance. The Assistant City Administrator of Community and Economic Development, or their designee, shall serve as staff liaison to the Development Services Advisory Commission.

SECTION II: BE IT FINALLY ORDAINED BY THE BOARD OF MAYOR AND ALDERMEN OF THE CITY OF FRANKLIN, Tennessee, that this Ordinance shall take effect from and after its passage on second and final reading, the public health, safety, and welfare requiring it.

ATTEST:

CITY OF FRANKLIN, TENNESSEE:

BY: _____
ERIC S. STUCKEY
City Recorder/Administrator

BY: _____
DR. KEN MOORE
Mayor

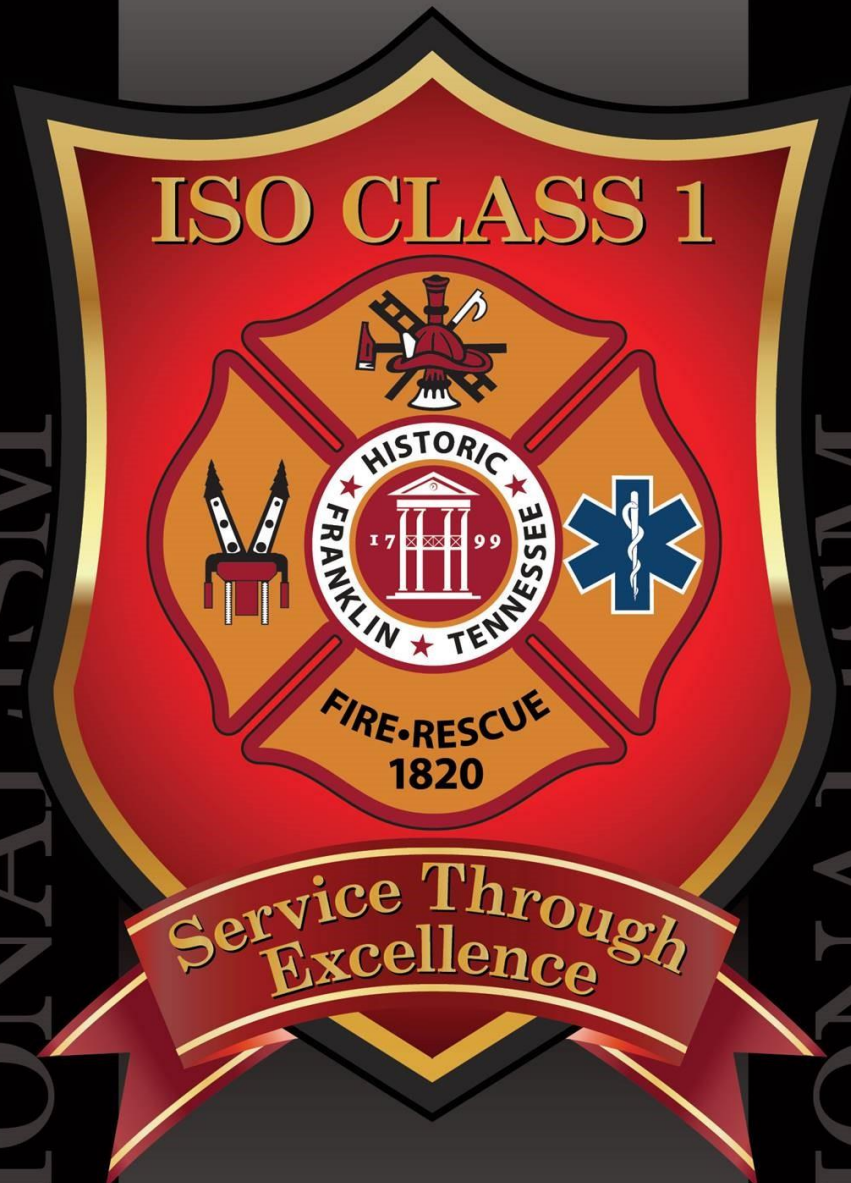
Approved as to Form:

Shauna R. Billingsley, City Attorney

PASSED FIRST READING:

PASSED SECOND READING:

INTEGRITY
COMPASSION
PROFESSIONALISM



FRANKLIN FIRE
DEPARTMENT
**STRATEGIC
PLAN**
2017
THROUGH
2022

PROFESSIONALISM
COMPASSION
INTEGRITY

Contents

A Message from Chief Rocky Garzarek	1
Executive Summary	1
About the Organization.....	2
Background Statement.....	3
Organizational Structure	4
Strategic Planning Process	5
Determining the Need for a Strategic Plan	5
Methodology for Creating the Strategic Plan	6
Committee Formations	6
Self-Assessment	8
Forming the Plan	9
Report of Findings.....	11
Administration.....	11
Assessment & Planning.....	11
Goals and Objectives.....	11
Emergency Management.....	11
Assessment, Planning, and Implementation.....	12
Administrative Support Systems.....	12
Financial Resources.....	12
Governance & Administration	13
Community Risk Reduction	13
Codes Enforcement.....	13
Fire Investigation, Origin & Cause Program.....	14
Public Education.....	15
Water Supply.....	15
Response & Physical Resources	16
Communications Systems	16
EMS	16
Facilities, Equipment, and Apparatus	17



HazMat.....	18
Suppression.....	18
Technical Rescue.....	18
Training & Personnel Resources	19
Personnel Resources.....	19
Professional Standards.....	20
Training and Competencies	20
Strategic Plan.....	21
Meeting the Needs of the City	21
Improving Our Ability to Manage Risks	21
Improving Our Current Services.....	22
Meeting the Needs of our Employees	23
Promoting Workplace Safety	23
Leading by Example	23
Employee Development.....	23
Meeting Future Needs	24
Building a Safer Franklin.....	24
Seeking Innovation.....	24
Continuing Our Long-Range Planning	24
Looking Ahead	26
Appendix A: Acknowledgments	A - 1
Appendix B: Gantt Chart for Plan Implementation	B - 1
Overall View	B - 1
Administration View.....	B - 2
Assessment, Planning, & Implementation View	B - 2
Community Risk Reduction View	B - 3
Response and Physical Resources View.....	B - 4
Training and Personnel Resources View	B - 4
Appendix C: Complete List of Recommendations	C - 1
Assessment and Planning.....	C - 1
Emergency Management	C - 4



Goals and Objectives	C - 6
Administrative Support System	C - 7
Financial Resources	C - 12
Governance and Administration	C - 15
Public Education	C - 18
Fire Investigation, Origin & Cause Program	C - 22
Water Supply	C - 25
Codes Enforcement	C - 28
Suppression	C - 34
EMS.....	C - 37
HazMat	C - 44
Technical Rescue	C - 45
Facilities, Equipment, and Apparatus	C - 48
Personnel Resources	C - 50
Professional Standards.....	C - 54
Training and Competency	C - 57
Appendix D: Recommendation Measurements.....	D - 1
Administration Recommendation Measurements	D - 1
Assessment, Planning, and Implementation Recommendation Measurements	D - 2
Community Risk Reduction Recommendation Measurements.....	D - 3
Response and Physical Resources Recommendation Measurements.....	D - 4
Training and Personnel Recommendation Measurements	D - 5

Executive Summary

The Franklin (TN) Fire Department recognized the need for a long-range planning process. To meet this need, a strategic planning process was initiated to identify departmental goals and establish strategies to achieve them. This process was designed to be dynamic and responsive to the evolving needs of the community. Additionally, all goals and strategies within this document include timeframes for achieving results. Measurements are tracked where possible to ensure their completion in a timely, efficient, and effective manner.

As the Department's first strategic plan, it is intended for use from July 2017 until July 2022. The goals and strategies contained within this document stem from a thorough self-assessment conducted by multiple intra-departmental committees. The committees submitted recommendations targeted at improving various areas of operation; in total, 66 fully substantiated recommendations were received. Several recommendations were echoed by numerous committees and have been consolidated. The most frequently recurring recommendations center on establishing policies, procedures, and guidelines; developing a competitive and equitable pay plan; and producing a standard of coverage document.

These recommendations were then placed along a five-year timeline with several factors taken into consideration, including priority, impact, accountability, and resources required. The dynamic nature of this plan enables the department to add, remove, or alter the strategies contained within this document.



A Message from Chief Rocky Garzarek



In 2016, we set a goal to conduct a straightforward and realistic internal evaluation of our organization. This would provide us with a template we could use to improve our operations and maintain the exceptional standards of service that our residents and visitors have come to expect.

To accomplish this goal, our organization developed the following Strategic Planning document. This report is designed to provide the organization, citizens, and the City of Franklin Policy Makers with a dynamic five-year planning document.

It is a known fact that fire and EMS services change rapidly. The persistent evolution of these fields requires that we assume a proactive stance in planning short, medium, and long term organizational goals. While we acknowledge our department may not fully achieve all of the stated goals within a five-year period, we believe it is important to take the initiative and design a framework that will guide us in our efforts to meet future challenges.

In closing, I would like to thank the members of our department, our community, and our elected officials for providing us with the opportunity to facilitate the development of a document that will guide the future of our fire department. As an organization, we stand committed to accepting the challenge of cultivating these strategic goals into reality, enhancing the services we offer our residents and visitors, and achieving our future vision.



Rocky Garzarek



About the Organization

Background Statement

Located in the heart of Middle Tennessee, the historic City of Franklin serves as the county seat for Williamson County and is one of the fastest growing cities in the Nashville Metropolitan area. In the last 35 years, the population of Franklin has increased by 500 percent and currently ranks as the seventh largest city in Tennessee.

The City of Franklin is governed by a Board of Mayor and Aldermen. There are eight Aldermen on the Board – four elected from the four political divisions of the City called wards; four elected at-large. This governing board is responsible for deciding on the City's policies and procedures by passing Resolutions, Municipal Ordinances, and the Municipal Code, all of which are implemented by the various city departments. Appointed by the Board of Mayor and Aldermen, the City Administrator oversees the City's 14 departments, including the Franklin Fire Department.



The Franklin Fire Department has a rich and lengthy history dating back almost 200 years. In 1818, the City of Franklin purchased its first fire engine. A year later, the City's first fire hall was constructed. Soon after, an ordinance was passed that required all men between the ages of 15 and 55 to serve as volunteer firefighters.

Over the years, Franklin has had its share of historic fires. In 1891, a fire broke out on the public square that burned down 17 buildings including residences, businesses, and even the fire house. Less than a decade later, another fire threatened Franklin's historic Main Street. On the morning of June 13, 1902, a small fire was discovered in Elliott & Mount, a local menswear store. An alarm was sounded, but as volunteers and bystanders began to collect on the scene, the fire had already spread to four connected buildings. Many locals who witnessed the event speculated that an entire city block might have been lost had it not been for the efforts of the Franklin Fire Department.

Countless other fires and emergencies have affected the City of Franklin over the last two centuries, and the Franklin Fire Department has gone through extensive changes and growth in order to better serve the City.

Organizational Structure

The Franklin Fire Department is led by Fire Chief Rocky Garzarek who has served in this position since 2004. The Fire Chief supervises the three main divisions of the Franklin Fire Department: Operations, Administration, and Prevention.



Deputy Chief Glenn Johnson heads the Operations Division of the Franklin Fire Department. This division is responsible for daily emergency response operations, including fire suppression, rescue operations, hazardous materials response, training, and Emergency Medical Services.

Fire Operations is supported by three shifts working on a 24-hour on-duty, 48-hour off-duty schedule. 151 personnel deploy out of eight stations strategically located across the City.



Deputy Chief Todd Horton heads the Administration and Emergency Management Division of the Franklin Fire Department. This division oversees facilities, equipment, budgeting, purchasing, grant writing, technology, radio communications, and emergency management.



Deputy Chief and Fire Marshal Andy King heads the Fire Prevention and Strategic Initiatives Division. This division is responsible for planning based on risks, hazards, and vulnerabilities and overseeing fire plan reviews, fire inspections, code enforcement, fire cause investigations, public education, and water supply. Additional responsibilities include municipal zoning ordinances, streets standards, and fire & life safety codes.

Strategic Planning Process

Determining the Need for a Strategic Plan

As the City of Franklin has grown, members of the Franklin Fire Department have had to identify and implement new methods and processes to ensure they continue to provide excellent service for all citizens and stakeholders.

In 2015, the department initiated a Foundation Development program. During this process, twenty department members met over the course of two days to develop a stronger foundation for the future of the Franklin Fire Department. Members of this group spanned all ranks of the department and were chosen in a joint effort between the Franklin Firefighters Association and the Fire Department Command Staff.

Greg Baltimore • Max Cook • Tyler Crews • David Currie •
Jonathan Dye • David Edge • Rocky Garzarek • Jonathan
Gill • Nathan Goodin • David Hickel • Todd Horton •
Eddie House • James Jennings • Glenn Johnson • Andy
King • Clay Mackey • Jason Morgan • Jose Periut • Joe
Polenzani • Todd Wilson

- Franklin Fire Department Foundation Development Group

The Foundation Development process yielded several immediate benefits for the department. Perhaps most significantly, the members of the core group realized they all shared a common vision for the future of the department – to provide *Service through Excellence*. The Foundation Development group believed this vision statement accurately and succinctly summarized the shared desire amongst all Franklin Fire Department members to consistently rank among the top fire departments in the country across all aspects of operation.

Additionally, the Foundation Development process identified three core values to effectively summarize the character of the department: *Professionalism, Integrity, and Compassion*. *Professionalism* highlights the shared dedication to provide excellent, highly-skilled service. *Integrity* highlights the need to act fairly, ethically, openly, and as an undivided unit to achieve maximum effectiveness. *Compassion* highlights the shared commitment to caring for others with empathy and kindness.



The Franklin Fire Department Foundation Development process also yielded the creation of a *Communication Behavior Agreement* which outlined several critical behaviors to ensure all members of the department function effectively as a team.



Communication Behavior Agreement

- **This is how we will communicate and behave toward one another:**

- Treat one another with dignity, respect, and confidentiality.
- Define roles and responsibilities.
- Do what is ethical regardless of the consequences.
- Be optimistic, open-minded, innovative, and flexible.
- Keep healthy humor alive and maintain a professional environment.
- Deliver excellent customer service, both to one another and to those we serve.
- Treat mistakes as learning experiences and try not to repeat them in the future.
- Use inclusive language (we, our, and us).
- Give full attention to the person with whom you are communicating.
- Inform and stay informed.
- Learn/Teach - if I don't know it, I'll learn; but if I do know it, I'll teach.
- Keep disagreements issue-oriented and not personal.

Undergoing the Foundation Development process helped the Franklin Fire Department unify the department and align its members along a set of shared values. It also highlighted the need to formalize the goal-setting and decision-making processes for the department. To that end, it was determined that a long-range strategic plan would be an invaluable tool for the Franklin Fire Department's use in navigating its growing roles and responsibilities.

Methodology for Creating the Strategic Plan

Once the need for a strategic plan was determined, work was initiated to develop a methodology to help facilitate undertaking a project of this scope. Bob Norton of the Norton Development Group was brought on as a consultant to help guide the process. In addition to his direction, the department also embraced the data-driven approach utilized by the City's "FranklinForward" strategic plan as a valuable reference tool throughout the planning process.

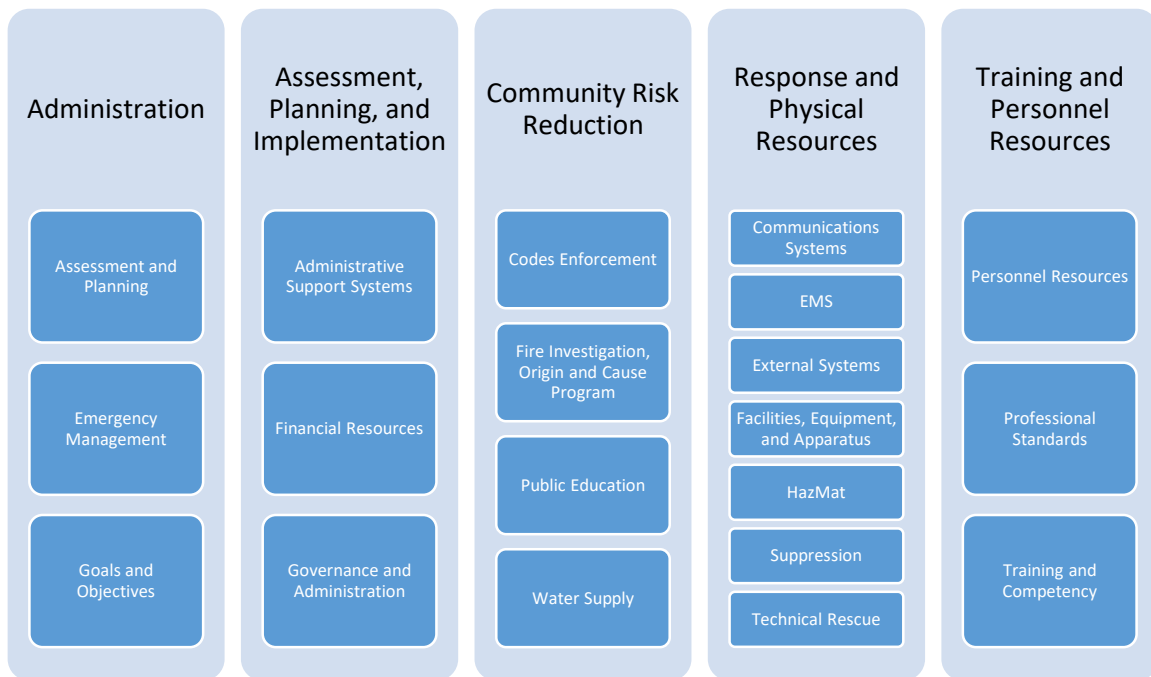
Committee Formations

To ensure that Franklin Fire Department's Strategic Plan is truly a reflection of a collective desire to produce *Service Through Excellence*, a "Steering Committee" was formed to help drive the process. This committee consisted of ten recognized leaders within the department – five chosen by the Firefighter's Association and five chosen by Command Staff. This approach ensured all issues concerning the Franklin Fire Department and the creation of its strategic plan were viewed equitably.

The steering committee was divided into five “Core Committees” focusing on general sections of the department. Members of the core committees were selected based upon their particular subject-matter expertise. These core committees were also responsible for overseeing several subcommittees that would be formed to focus on even more specific functions performed by the Franklin Fire Department.



The subcommittees that branched off from the core committees were charged with examining specific areas of operation within the department. Implementing these subcommittees not only allowed for a more focused examination of departmental functions, but also encouraged the expanded involvement of department members with specialized subject-matter expertise.



Self-Assessment

It was determined that before a comprehensive plan could be developed, a thorough self-assessment of all departmental operations needed to be conducted. The responses and recommendations stemming from this self-assessment would then be used as individual tactics for use within broader, strategic themes targeted at improving departmental functions.

The Commission on Fire Accreditation International's *Fire & Emergency Service Self-Assessment Manual (FESSAM)* was used as a starting point for the departmental self-assessment. While the Franklin Fire Department is not currently accredited, nor is it actively pursuing accreditation, it acknowledged and appreciated the CFAI accreditation model as an excellent reference resource for conducting an internal self-assessment. In loosely following the CFAI model, the Franklin Fire Department core committees were designed to examine *Administration; Assessment, Planning, & Implementation; Community Risk Reduction; Response & Physical Resources; and Training & Personnel Resources*.

To examine the functions within their assigned categories, the core committees oversaw the formation of several more intensely-focused subcommittees. These subcommittees were comprised of department members who expressed an interest in identifying specific strengths and weaknesses within certain departmental functions. Once the subcommittees were formed, they answered corresponding questions from *FESSAM*. Upon completing their assigned questions, the subcommittees used the results to determine areas for growth within their defined areas.



The subcommittees met several times over the course of approximately nine months to discuss their findings and brainstorm solutions to identified deficiencies. These meetings were documented extensively through agendas, meeting minutes, and reports of findings.

After the subcommittees released a report of their findings, the core committees reviewed the information and further collaborated with the subcommittees to produce targeted recommendations aimed at improving the Franklin Fire Department. These recommendations included detailed rationales, estimated timelines for completion, potential budget implications, and a list of key personnel involved.

By the end of the self-assessment process, the subcommittees submitted sixty-six unique recommendations.

Recommendation #4: Improve the process of estimating and reporting actual fire loss amounts.

Rationale: The department cannot accurately report or track its fire losses and saves without accurate data. The members of the department are currently not trained to provide these estimates.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Fire personnel are not trained or experienced in estimating building content losses.	The project could be completed within three months, if personnel are available.	There should be little to no extra costs involved with this project.

Sample Recommendation

Forming the Plan

After the reports of findings were submitted to the steering committee, the group carefully analyzed each report and documented additional notes, corrections, and suggestions. The feedback was distributed to the members of the subcommittees and work began on turning these reports into specifically-targeted recommendations aimed at improving various aspects of departmental function.

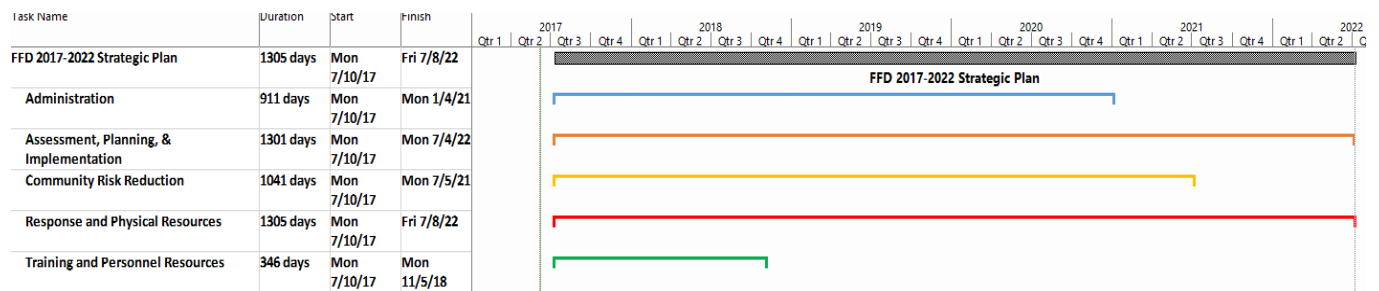
Once each subcommittee submitted its final list of recommendations, a two-day meeting was conducted by the steering committee to review the work. During these arduous but productive meetings, the group of ten worked together to organize all of the recommendations into a timely, measurable, and achievable plan.



In total, over sixty recommendations were submitted by the subcommittees; each one targeted at improving a specific area within the Franklin Fire Department. Over the course of the meeting, it was observed that several subcommittees submitted recommendations that were similarly expressed by other groups. To reduce redundancy within the plan, these recommendations have been combined; however, in the appendix to this document, each recommendation is listed individually.

The steering committee began the meetings by identifying the recommendations they felt were ready for immediate adoption. These recommendations were then assigned a start date and placed at the beginning of a five-year timeline.

In addition to assigning start dates for the recommendations, the steering committee also assigned an estimated project duration to each recommendation. The group then identified current members of the department who would be responsible for ensuring successful implementation of the individual recommendations. Finally, the steering committee created specific methods for measuring the progress and effectiveness of each recommendation.



Report of Findings

Administration

The Administration Core Committee, led by Deputy Chief of Administration Todd Horton and Captain Jose Periut, oversaw committees focused on *Assessment & Planning*, *Goals & Objectives*, and *Emergency Management*. These committees examined the current administrative roles, capabilities, and responsibilities of the Franklin Fire Department.

Assessment and Planning

The *Assessment & Planning* subcommittee reported several significant findings. First, it was noted that the department currently has no documented Standard of Cover. A Standard of Cover document is important because it includes a thorough risk assessment of Franklin, sets performance expectations, and uses a data-driven approach to identify effective response forces and efficiently-distributed staffing and apparatus.

Additionally, *Assessment & Planning* reported that the department currently adopts no standard process for defining dollar losses and dollars saved from fires. It was noted that this lessens the accuracy of the reports submitted to the State and National databases, as well as hampers our local reporting and benchmarking efforts.

Finally, the *Assessment & Planning* subcommittee reported a need for the provision of reports that clearly demonstrate the department's efforts with regard to planning, response, education, and other relevant data. The subcommittee found that virtually no reports are distributed for members of the department to review. These reports could be used to help evaluate efforts toward meeting goals and standards which are needed to help facilitate improvements.

Goals and Objectives

The *Goals and Objectives* subcommittee was assigned to examine the departmental goal-setting process. Organizational goals should be established to implement the agency's mission and short-range plans. Additionally, goals establish targets for performance improvement. Given these criteria, the *Goals and Objectives* subcommittee reported that the department does not currently have a formal goal-setting process.

Emergency Management

The *Emergency Management* subcommittee was formed to examine how the department handles its all-hazards preparedness program. The subcommittee submitted several findings

regarding this subject. The subcommittee reported that the Fire, Hazardous Materials, and Search and Rescue annexes contained within the City's Emergency Operation Plan have not been updated since 2010. The department has undergone many changes in the last several years, and the plan must be updated to reflect these changes.

The subcommittee also determined that the department does not have an all-hazards risk analysis process and lacks SOGs that address the department's role in preparing and responding to these events.

Assessment, Planning, and Implementation

Battalion Chief Joe Polenzani and Lieutenant Matt Stout led the Assessment, Planning, and Implementation Core Committee and oversaw the work produced by the following subcommittees: *Administrative Support Systems*, *Financial Resources*, and *Governance & Administration*. These subcommittees worked together to gauge the effectiveness of departmental planning efforts, financial resource allocation, and the policies and procedures that formalize and support the Franklin Fire Department.

Administrative Support Systems

The *Administrative Support Systems* subcommittee was tasked with identifying strengths and weaknesses regarding the current resources available for handling various administrative tasks throughout the department. Their findings revealed that several departmental functions could be handled more efficiently by instituting various technological fixes. Areas identified for potential improvement included password management, a central hub for all departmental forms and links, and streamlined reports that give quick views of pertinent departmental data.

The subcommittee reviewing *Administrative Support Systems* also reported the department does not currently have a well-established process for the ongoing review of departmental policies and procedures. A policy review process is essential to ensure all departmental policies, procedures, and guidelines are reviewed to maintain accuracy and efficacy.

Finally, the *Administrative Support Systems* group also echoed a finding mentioned by the *Assessment & Planning* subcommittee which highlighted the department's current lack of an officially-adopted process for accurately estimating actual fire loss amounts versus property valuation.

Financial Resources

The *Financial Resources* subcommittee examined the department's stewardship of its finances. Their report highlighted the potential utility of the strategic plan to tie in to the budgeting process. Since the Franklin Fire Department Strategic Plan is being created to formalize departmental goals and strategies, it's a logical tool to use for budgeting concerns.

The subcommittee also reported on the need to establish an equitable and competitive compensation plan. The *Financial Resources* group's report stated that a new plan should be explored to correct the current plan's deficiencies in handling market value, compression, and inversion.

The group also reported on the need to evaluate the current system for apparatus replacement scheduling. The group pointed out that the organization's priorities and strategic direction should influence the apparatus replacement schedule.

Governance and Administration

The *Governance & Administration* subcommittee was assembled to explore the internal and external methods intended to regulate and govern Franklin Fire. Their report highlighted the lack of a centralized collection of guidelines and policies focused expressly on fire department operations. The report cited that while the department does currently have a few officially-adopted policies, they only encompass a small percentage of departmental concerns. Additionally, the report cited difficulty in accessing these policies in a centralized location.

The subcommittee also reported that an excessive amount of effort is being spent on administrative tasks by shift officers. The group cited that scheduling takes up an inordinate amount of the shift officers' day (particularly officers stationed at FFD Station 2). In addition, the G&A subcommittee reported the inability of certain software applications to work together often places an undue level of strain on these administrative processes.

Community Risk Reduction

Community Risk reduction was split into four unique subcommittees which were overseen by Deputy Chief Andy King and Engineer David Edge. These subcommittees focused on *Codes Enforcement*; *Fire Investigation, Origin & Cause Program*; *Public Education*; and *Water Supply*.

Codes Enforcement

The *Codes Enforcement* subcommittee was primarily tasked with assessing Franklin Fire Department's responsibilities in enforcing fire codes; however, the group also looked more broadly into the department's community risk reduction efforts. The scope of their assignment made for an extensive report of findings that highlighted several areas of need for the department.

One such area of need reported by the *Codes Enforcement* group was that of a comprehensive master database of building structures within the City as opposed to the current assorted lists maintained by various departments within the City. The existence of such a list would be extremely helpful in various departmental functions including conducting pre-incident plans, creating a standard of cover, and identifying areas of risk within the City.

The *Codes Enforcement* subcommittee also reported on the need for inspecting existing structures within the City. Currently, Franklin's rate of growth prohibits fire and life safety inspectors from conducting regularly-scheduled inspections of existing buildings. Similarly, the committee also reported on the need to assist the training and operations division in creating a plan for conducting pre-incident plans.

Another area of need reported by *Codes Enforcement* was the potential implementation of a fire protections systems permitting process. The group reported that under the current system, specialized fire alarm systems are installed under Building and Neighborhood Services permits without a thorough review process. Without a review, it often yields inefficient results and may cause builders to incur additional expenses and delays. The committee suggested that in most instances if the fire department had the authority to review and approve plans and issue permits before work started, there would be fewer problems in the field.

The subcommittee's report also suggested that efforts should be initiated toward the eventual adoption of a mandatory residential sprinkler requirement. The group cited that model building codes require residential fire sprinklers. Implementing these codes would ultimately take advantage of the current construction boom and take great strides towards building a safer Franklin one house at a time.

Finally, the group also had several findings that echoed those from other groups. For instance, technical inefficiencies often create undue complications for Fire Inspectors. Specifically, the INFOR data system is required for documenting fire inspections but is extremely inefficient in handling that task. Another finding that echoed other groups was that there are currently no specific SOGs in place to govern the work performed by Fire Inspectors.

Fire Investigation, Origin & Cause Program

The *Fire Investigation, Origin & Cause Program* subcommittee was created to evaluate the manner in which the department conducts its origin and cause investigations and determinations for fires and explosions.

The *FIO&C* subcommittee reported the Franklin Fire Department's Fire Investigation program could benefit from establishing a formal unit structure as well as maximizing communication both within the unit and with the rest of the organization. The group suggested that this would maximize the effectiveness and consistency of fire investigations and also ensure all investigators comply with the same standards.

It was also reported the Fire Investigation program could benefit by expanding its capabilities. Potential program growth could include improving relationships with Franklin Police Department and the District Attorney's office, as well as providing sufficient authority for investigators to perform their duties.



The *FIO&C* group also highlighted the need for the development of a Youth Firesetter Intervention program. These programs are effective tools in providing education and treatment resources for juveniles involved in fire-play incidents.

Finally, the group reported on the need for high quality data in regard to collection and dissemination. This would provide multiple benefits for Franklin Fire, such as ensuring investigations were conducted effectively as well as providing valuable data points to highlight areas in need of increased fire prevention efforts.

Public Education

The *Public Education* subcommittee was tasked with assessing the department's efforts and abilities in reaching out to the public and offering tailored programs designed to reduce risk within the community. With that task in mind, the *Public Education* subcommittee submitted several pertinent findings.

The committee reported that by defining roles and responsibilities related to public information, the department would be able to improve its capability to inform the public of immediate threats and hazards, release official statements more timely, manage public information requests more efficiently, and be more proactive by educating the public.

The *Public Education* subcommittee also reported an opportunity to design, create, and deliver more compelling outreach programs that target and reduce specific risks. By defining and measuring the department's existing educational programs, Franklin Fire could use that information to facilitate targeted learning opportunities for more of the community and its stakeholders.

It was also reported that there are opportunities present to create physical facilities devoted to promoting safety-related training. The subcommittee suggested exploring the possibility of a dedicated facility designed for hosting events. They suggested this endeavor would enable the department to deliver higher quality programs more consistently and meet the increasing public education demands.

Water Supply

The *Water Supply* subcommittee met to assess the capability and reliability of the City's water supply resources.

The committee reported that problems with fire hydrants are not addressed in a timely manner. This causes frustration; despite the issue having been noted, work may not be completed for a substantial amount of time. To fix this issue, the subcommittee suggested that the four water utility districts must be able to immediately see, assign, and correct issues regarding fire hydrants and also be able to keep the fire department informed of the progress of these issues.

It was also reported that a current water model should be established. A water model is a computer model of the individual pressure zones within a defined area. There is no way of knowing how much water is expected to be available on emergency scenes without modeling, testing the model with hydrant flow data, and making corrections.

Finally, the *Water Supply* subcommittee assessed that the department needs to evaluate its current rural response capabilities. The department relies upon mutual aid to provide a rural water supply. Additionally, static sources of water that could be used are not currently mapped or identified for their potential use.

Response & Physical Resources

Deputy Chief of Operations Glenn Johnson and Lieutenant Jonathan Gill were selected to lead the Response & Physical Resources Core Committee. In an effort to assess Franklin Fire's response capabilities and the physical resources at its disposal, this committee split into the following subcommittees: *Communications Systems*; *EMS*; *Facilities, Equipment, & Apparatus*; *HazMat*; *Suppression*; and *Technical Rescue*.

Communications Systems

The *Communications Systems* subcommittee met to evaluate the current processes, technology, and systems that help Franklin Fire communicate. These systems not only enable the department to communicate with itself, but also allow for communication with external agencies and the new joint Williamson County Emergency Communications Center.

The committee's report listed several concerns and observations regarding Franklin Fire's communications systems; however, the Steering Committee recommended that these findings be considered after the Williamson County ECC has had more time to establish itself and its operational capacities.

EMS

The *Emergency Medical Services* subcommittee was tasked with evaluating the current system for delivering quality medical services to the community. Their report of findings ranged in scope; several areas of the program could be improved quickly with the proper focus, but some of the findings suggested the need for more long-term solutions.

The subcommittee reported on several items that could be immediately improved, including improving the inventory control system. The group stated that inventory control is essential to projections necessary for budgeting. Additionally, improving the inventory control system would help ensure the department maintains an efficient level of medical supplies.

Similarly, the group reported that the department's Quality Assurance program for EMS could be improved. The subcommittee suggested that an electronic patient care reporting system

with a pre-installed quality management component could help dramatically improve the current system.

While the previous findings suggest areas for immediate improvement, the *EMS* subcommittee also reported on several areas that would require substantially more effort. For example, the subcommittee reported that the department could potentially benefit from the creation of a dedicated EMS division within the department. Pointing to the growing percentage of EMS calls to which the department responds, the committee reported that creating this new structure would help the department run more smoothly and would also provide a smoother transition into a patient transporting service. Taking that into consideration, the *EMS* subcommittee also recommended that the department study and update a plan for providing patient transport. The group suggested that readying a plan for the adoption of patient transport would be advantageous in the event the City of Franklin determines the need for the department to provide this service. Similar to these findings, the group also reported on the potential need for the department to hire its own medical director. This recommendation was supported in the 2011 EMS Study conducted by Tri-Data in which the report states that the department would benefit from direct communication with its own retained medical director.

Finally, the *EMS* subcommittee also reported several ways to get the community involved in improving Franklin Fire's medical response efforts. It was suggested that the department could seek out ways to involve feedback related to the department's EMS service. Additionally, the subcommittee suggested exploring the viability of a Bystander CPR program. These programs notify qualified individuals of the need for CPR near their area and utilize the public to help increase patient survivability of major medical incidents.

Facilities, Equipment, and Apparatus

The *Facilities, Equipment, and Apparatus* subcommittee was assembled to assess the department's acquisition, use, and stewardship of its physical resources. With those criteria in mind, the subcommittee submitted a report of findings that included several recommendations.

The group reported on the need to develop a plan that adequately addresses the safety of personnel as well as the department's physical resources in response to emergencies by using an all-hazards risk assessment. Such a plan would help ensure the safety and wellbeing of all FFD employees and equipment under a variety of risks.

The *FE&A* subcommittee also suggested benefits from evaluating and improving upon departmental safety and health initiatives. The group cited the department's highest priority is the safety of its employees. With that in mind, it's important for the department to focus on pursuing progressive safety and health initiatives. The subcommittee cited presumptive cancer policies, the implementation of new cleaning strategies, and various other initiatives all aimed toward helping the department stay up to date with the best safety practices.



Finally, the findings revealed there is currently no facilities improvement and maintenance plan in place. Such a plan would help contribute to the longevity of the department's fire stations and ensure the department's physical resources are maintained to operate at a high standard.

HazMat

The *HazMat* subcommittee was created to evaluate the department's hazardous materials program. The group was tasked with determining if the program operates effectively and efficiently in protecting the community from the hazards associated with fires and the uncontrolled release of hazardous and toxic materials.

The report of findings submitted by the *HazMat* committee contained a similar finding to many of the other subcommittees – currently there are no specific SOGs in place to guide HazMat operations. HazMat-specific SOGs would help standardize operations, increase safety, and improve training.

Additionally, the group reported on the need for the development of a true HazMat team. This team would be able to train together on a scheduled basis which would ultimately improve Franklin Fire's ability to respond to HazMat-related emergencies.

Suppression

The *Suppression* subcommittee met to assess the department's ability to operate an adequate, effective, and efficient fire suppression program to control and extinguish fires.

Similar to the reports from most of the other subcommittees, one of the prominent findings listed by the *Suppression* subcommittee was the lack of specific fire suppression-related SOGs. The committee wrote that developing and publishing SOGs for fire suppression operations is imperative in providing guidance for operational standards. Additionally, the subcommittee reported a need to provide targeted training on the implementation of these SOGs.

Finally, the fire suppression subcommittee reported on the need to develop and implement a plan for operations staffing levels. It was suggested that such a plan would help increase productivity and safety. The steering committee determined this recommendation and several others could be addressed with the creation of a Standards of Cover document.

Technical Rescue

The *Technical Rescue* subcommittee was created to assess the department's ability to operate an effective technical rescue program leading to the rescue of trapped or endangered persons from various life-endangering causes.

Within the *Technical Rescue* subcommittee's report of findings, it was noted that there are currently no technical rescue-specific SOGs to guide the program. The group stated SOGs would provide the foundation for the technical rescue program. Having a broad list of guidelines would help Franklin Fire's technical rescue program operate safely, proficiently, and efficiently.



The group also reported on the need to officially establish a defined Technical Rescue Team. Designating a team of dedicated members certified and proficient in technical rescue would improve Franklin Fire's ability to respond to events that necessitate specifically trained responders. Further, the group stated establishing a technical rescue team would help legitimize the department's goal of ranking among the best fire departments in the United States.

Finally, the group found there is currently no defined process in place for technical incident review. The *Technical Rescue* subcommittee reported having a formally-established process for the post-incident review of technical rescue incidents would help streamline future responses, encourage learning, and refine skills.

Training and Personnel Resources

Battalion Chief James Jennings and Captain David Currie helmed the Training and Personnel Resources Core Committee which evaluated various criteria related to Franklin Fire Department's personnel. To more efficiently handle this task, the core committee divided into the following subcommittees: *Personnel Resources*; *Professional Standards*; and *Training & Competencies*.

Personnel Resources

The *Personnel Resources* subcommittee was established to evaluate Franklin Fire's ability to provide its employees with adequate resources which ultimately contribute to the success of both the employee and the department.

Similar to most of the other subcommittees, the *Personnel Resources* group reported on a lack of SOGs related to various personnel resources. The group reported SOGs devoted to personnel-related concerns such as employee development would yield an immediate benefit to performance and productivity.

Additionally, the group reported on the need to create an employee development program. Members of the subcommittee believed the department would benefit greatly from a defined program focused solely on developing its personnel.

The *Personnel Resources* subcommittee also reported on the need to create a fair and equitable compensation plan for the Franklin Fire Department. The group cited several specific issues to be addressed within the compensation plan including: pay compression, pay inversion, specifying a path for advancement within a given pay classification, compensation for performing at a higher rank, and stipends for specialized skillsets. Additionally, recruiting and retaining the best employees is supported by a competitive compensation plan.

Finally, the committee assessed the need for increased involvement from the Human Resources department. The group stated due to the unique nature of fire department employment, members often require additional assistance from human resources staff. The *PR*



subcommittee identified several solutions and suggested implementation of any of them could improve working conditions.

Professional Standards

The *Professional Standards* subcommittee met to assess the standards Franklin Fire requires its employees to meet. The subcommittee reported the department's hiring process would be an excellent place to begin in terms of raising standards. Specifically, the *Professional Standards* subcommittee felt the department would benefit by awarding points for experience to potential new hires. Similarly, the group recommended re-evaluating the physical abilities test; increasing the physical demands of the test would help the department in hiring employees ready to meet the demanding tasks required of the job.

The *Professional Standards* subcommittee also reported on the need to develop training programs specifically targeted towards probationary and recently-promoted employees. The group felt that these employees would benefit from being held accountable to a regimented list of standards within certain timeframes.

Finally, the group also recommended that all personnel have access to departmental policies and SOGs. The group highlighted the importance of a comprehensive collection of performance standard-related SOGs, citing their need for promoting job proficiency and safety.

Training and Competencies

The *Training and Competencies* subcommittee was formed to assess Franklin Fire Department's training program. The group determined a need for the development of training SOGs. These SOGs would provide clear guidance for all department members as to how the training division is expected to carry out its functions.

The *Training and Competencies* subcommittee also reported on the need for two full-time instructors. The group reported having these instructors available would help improve fire department-related training in several ways. Having two dedicated instructors would improve response coverage and company staffing. Currently, the department utilizes members on shift to help with staffing. Dedicated instructors would eliminate the need to remove workers from incident response. Dedicated instructors would also provide consistent, standardized instruction as well as job-specific training. The subcommittee also cited benefits including: station unity, flexibility in scheduling, better utilization of the training center, determination of competencies, and a unification of strategies.

The group also reported a need to develop a credentialing program for the Apparatus Operator and Company Officer positions. Establishing a credentialing process for these ranks would ensure each member who attained credentialing would be qualified to perform within the defined roles and responsibilities of that position.

Strategic Plan

The extensive efforts undertaken throughout this planning process were designed to ensure the Franklin Fire Department Strategic Plan becomes an essential and dynamic tool for assisting the department in continuing to achieve its vision of providing *Service Through Excellence*.

Essentially, it was identified that all of the recommendations submitted by the subcommittees centered around meeting and exceeding the needs of several key stakeholders. This identification made it easier to group the recommendations into broader strategic themes. By utilizing these themes as a starting point, goals were set to help provide accountability for the plan. To achieve those goals, the individual recommendations would then serve as tactics for use in goal achievement. Franklin Fire Department's three major goals over the next five years are centered around meeting the needs of the City, the needs of its employees, and the needs of the future.

Meeting the Needs of the City

The Franklin Fire Department exists to protect the safety, health, and welfare of the public and the history that make the City of Franklin a unique place. With that in mind, it was identified that Franklin Fire must improve in several areas today that challenge the department.

Improving Our Ability to Manage Risks

The department's strategic plan focuses on risk management. As a department, we must recognize the potential risks our community faces and develop strategies to address them. From that review, we then must prepare, mitigate, and be able to recover from the emergency. These recommendations center around risk management:

Developing a Comprehensive Buildings List. Currently building information is incomplete and scattered among multiple data sets. Gathering this building information will allow us to better prioritize hazards.

Conducting Pre-Incident Plans. Having a pre-incident planning process will ensure we monitor changes to the community and that crews are familiar with most buildings, yielding better service and outcomes.

Updating the Emergency Operations Plan. Each City department is responsible for its segment of the City's emergency response plan. Most have not updated it since 2010. It is anticipated to be more detailed and address more preparedness-related issues.

Producing a Standard of Cover Document. By its nature, this planning document defines all hazards and assigns a response. The result is a comprehensive model that ensures we deploy sufficient resources in a way that meets the community's need.

Creating a Community Risk Reduction Plan. After developing the Standard of Cover, a re-evaluation of prevention outreach programs is necessary to close the loop by mitigating newly identified risks.



Improving Our Current Services

Completing the self-assessment identified many areas where continuous improvement efforts should be focused. Below are some recommendations that lead us towards excellence:

Standardizing the Estimate of Damage from Fire. By correctly estimating Franklin's monetary loss due to fires, we can more accurately report our performance over time and demonstrate the value of our service.

Educating the Public. Providing timely, relevant, and continuous training to our community will lead to fewer emergencies and lower risk.

Communicating with the Community. Consistently informing the public through all forms of media will ensure we are meeting their expectations for information about how we serve them.

Improving Our EMS Programs. Emergency medical responses are a key part of our service. Specific areas for improvement include refining inventory management and providing better quality assurance practices.

Inspecting Existing Buildings. We do not have a program for routinely inspecting all existing buildings for changes that negatively impact fire and life safety. Several options should be explored to decide how these inspections could be accomplished.

Creating a HazMat Team. While we respond to hazardous materials incidents, an organized team is not established. Organization will lead to more training and accountability which will lead to safer responses and better outcomes.

Creating a Technical Rescue Team. Organizing into a team will ensure firefighters remain proficient and that they have the resources necessary to respond to a variety of unusual emergencies.

Investigating the Origin and Cause of Fire. Although a team is in place to determine the cause of fire and support the prosecution of any crime, the team needs more routine training, accountability, and processes to conduct more thorough scene exams.

Expanding Child Firesetter Programs. Half of all intentionally-set fires are caused by children. More members need training in evaluating children who start fires. Additional education options are needed for at-risk children.

Repairing Fire Hydrants. With more than 3600 hydrants, managing emergency repairs across four water districts is challenging. Implementing a more efficient work order system will reduce out-of-service times.

Evaluating Water Supply in Areas without Hydrants. Areas without public water and fire hydrants need to be identified. Our ability to transport water with fire apparatus or pump from open bodies of water such as ponds and streams should be evaluated.



Meeting the Needs of our Employees

Our people are our greatest resource. Attracting, retaining, and caring for those who serve is a key to continued excellence. Our strategic plan focuses on goals that provide a rewarding, challenging, and safe environment for our members. By doing so, members are recognized for their contributions and further empowered to provide excellent service.

Promoting Workplace Safety

Creating Safer Fire Stations. By recognizing and minimizing safety and security threats, our fire stations will become more resilient during a disaster. In turn, our members will be able to respond quickly after the event versus potentially becoming a casualty.

Evaluating Departmental Safety and Health Initiatives. Staying up-to-date with progressive health and wellness initiatives is vital to the wellbeing of our members. Potential areas for exploration include presumptive cancer policies and the adoption of new safety equipment.

Leading by Example

Seeking Fair Compensation. Maintaining a fair and competitive pay plan is valued by all members and should be continuously monitored. Improving the way members are recognized and rewarded for their dedicated service to the community is essential for recruiting and retaining the best members and achieving greater levels of job satisfaction.

Supporting Our Members. Establishing a better relationship with Human Resources will provide our members with accurate, timely, and consistent direction and provide a tremendous benefit.

Providing Clear Policy and Rules. Our department does not have current guidelines for responding to emergencies. Providing members with a broad array of operational guides will keep employees safe and set clear expectations.

Adding Staff in Training. Our members need more training staff to meet the department's operational objectives and to ensure our proficiency.

Working Smarter. Providing software or additional staff to reduce the time fire officers spend solving routine staffing issues would greatly assist the operations division.

Surveying Current Staffing Levels. It was identified that a Standard of Cover would help the department identify minimum staffing levels.

Improving Data Dissemination. The department collects a wide range of data on all major elements of our operation; providing clear and timely reports for our members will lead to positive organizational change and individual accountability.

Employee Development

Mentoring & Credentialing Members. Our members seek clear paths for succeeding within their position. Promotions should result from those members who meet certain criteria for serving at a higher rank.



Meeting Future Needs

Franklin Fire must continue forecasting the expectations of our growing community. Future goals reflect our efforts by capitalizing on future growth, expanding new technologies, and becoming more responsive and predictable to our stakeholders.

Building a Safer Franklin

Adopting Home Fire Sprinkler Requirements. Adopting and enforcing a residential sprinkler code for new homes is reasonable, responsible, and proactive.

Modeling Water Available for Fire Protection. As Franklin grows, our water supply systems must evolve. By collaborating with our water utility districts, we can model and test the infrastructure to meet the needed fire flows in critical areas.

Expanding Permits. Creating a permitting system for fire sprinkler and fire alarm plans will identify significant issues earlier in the development cycle. This will allow us to conduct final inspections faster and reduce frustration for contractors who otherwise might need to make field changes.

Seeking Innovation

Adopting a Bystander CPR Program. Bystander CPR programs utilize advanced technology to match critical emergent medical care with certified volunteers in order to help increase patient survivability.

Planning for Potential EMS Division/Transport Service. EMS calls represent the majority of our incident responses. Creating a plan for the adoption of medical transport capabilities is a logical next step for our department, as is creating a dedicated EMS division to manage this operation.

Exploring Opportunities for Fixed Public Education Facility. As the Franklin Fire Department nears its 200th 'birthday,' exploring avenues to showcase its rich history provides an interesting concept. In addition to serving as a museum dedicated to the department's rich history, a fixed facility would provide an excellent opportunity to offer valuable public education and outreach.

Continuing Our Long-Range Planning

Though this may be the first time Franklin Fire Department has undertaken the creation of a strategic plan, those involved in the process quickly recognized its potential utility. With that consideration in mind, several recommendations were submitted to urge the department to continue its strategic planning efforts, including:

Continuing to Plan. Though the current scope of the plan spans five years, it's important to remember that our plan is a dynamic, living document. As the department makes improvements and inevitable new considerations arise, a fundamental aspect is its ability to be revised quickly.

Representing Our Budgeting Goals. As our strategic plan represents the long-term goals of the department, it stands to reason that our budgeting process should correlate closely with the themes and strategies set forth within this plan.





Considering Apparatus and Fixed Facility Needs. When considering the needs of the future, it's important for the department to maintain and replace as necessary our existing capital resources.

Formalizing Our Goal-Setting Processes. While the department has always set goals to spur continuous improvement, it's important to formalize and publicize this goal-setting process. Doing so will help us remain accountable and transparent while delivering first-class services.

Looking Ahead

Franklin Fire Department's Strategic Plan for 2017-2022 is intended to be a dynamic document that can react fluidly to the department's constantly evolving requirements, needs, and goals.

The recommendations contained within this plan were placed upon an aggressive and ambitious timeline. Additionally, these recommendations identified many individuals to aid in their completion. Because this plan spans five years and involves achieving ambitious goals, it's reasonable to assume that timeframes will shift or previously unidentified personnel will be phased in to help complete certain tasks. The dynamic nature of this plan ensures that these changes will be easily adopted into the work already established.



Appendix A: Acknowledgments

Franklin Fire Department's Strategic Plan is the result of a truly collaborative process. Many individuals worked together over the last year to help form our first ever, long-range strategic plan. I would like to take this opportunity to thank those involved.

Bob Norton of the Norton Development Group played an instrumental role in helping to guide the department through this process in facilitating several strategic planning meetings. His diligent work has been extremely valued by our department.

Thanks also to the members of the Steering Committee for their efforts in ensuring this process truly focused on improving the Franklin Fire Department. David Currie, David Edge, Jonathan Gill, Todd Horton, James Jennings, Glenn Johnson, Andy King, Jose Periut, Joe Polenzani, and Matt Stout all deserve recognition for their valuable leadership.

Additional thanks to Firefighter/Paramedic David Hickel for his work throughout this process. His dedication and continued efforts in documenting and drafting this plan are greatly appreciated.

And finally to Jamie Melton, Beth Reeser, and Joanne Finn for documenting, supporting the committees, and copy-editing the final document, we could not do it without you.

To the many members of this department who worked together on the self-assessment which formed the basis for this plan, thank you for the outstanding work you provided:

Alan Fullwood • Alex Enochs • Anthony Sedlak • Bill Almon • Brian Brandon • Brian Daugherty • Clay Mackey • Curt Edelmann • Dan Doss • Daniel Donegan • Dave Metcalf • Doug Bowman • Dustin Anderson • Eddie House • Geoff Manfre • Geoff Woolard • Greg Baltimore • Greg Wild • James Gambill • Jamie Melton • Jason Morgan • Jeff Boggs • Jeff Essig • Jeff Standifer • Jeremiah Rogers • Joanne Finn • John Carolan • Jonathan Dye • Jonathan Jenkins • Josh Meeks • Josh Sanders • Kevin Hunt • Kirk McGee • Kris Bull • Mark Hall • Matt Anderson • Matt Eley • Michael Pardue • Michael Radom • Quaid Ledingham • Richard Hasley • Richey Shatz • Rick Cotton • Ryan Naylor • Sarah Glenn • Sean Smith • Shane Wyatt • Steve Denny • Terry Storey • Todd Wilson • Tom Chaffin • Tyler Crews • Wayne Mobley • Will Farris

In addition to the names listed on this page, I'd like to extend my gratitude to all those who have helped this project become a success.

Thanks to you all,

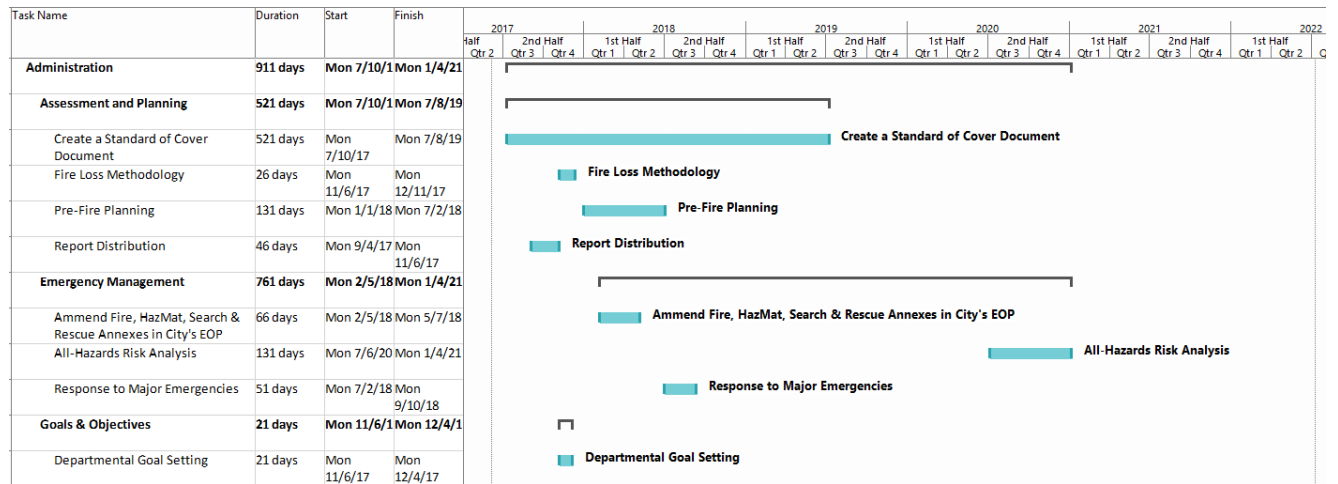


Appendix B: Gantt Chart for Plan Implementation

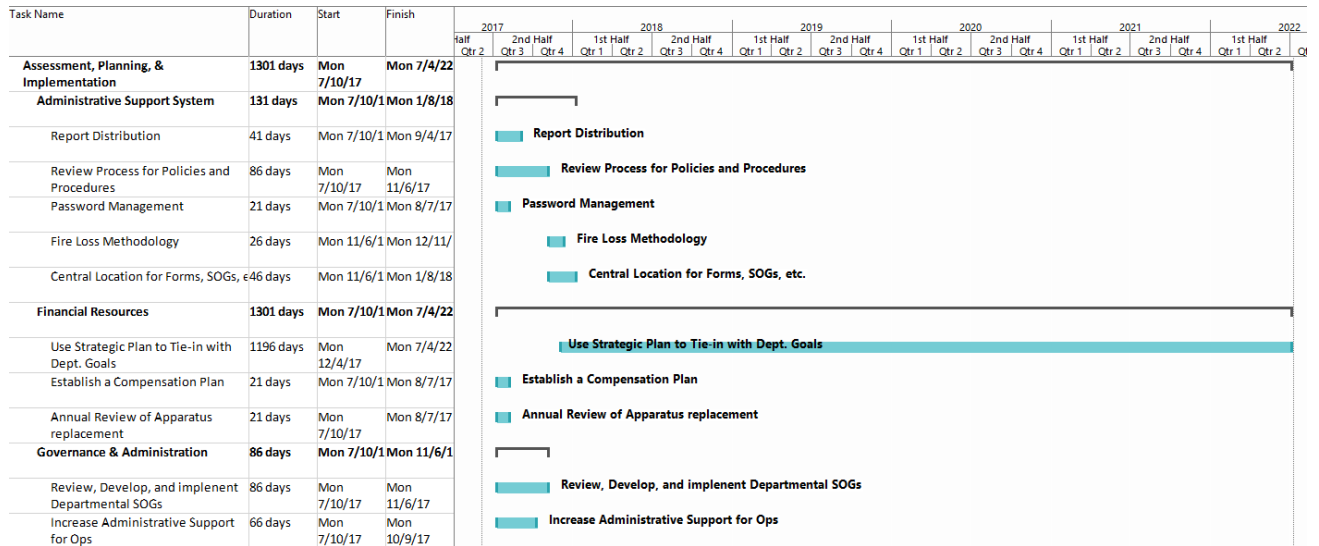
Overall View



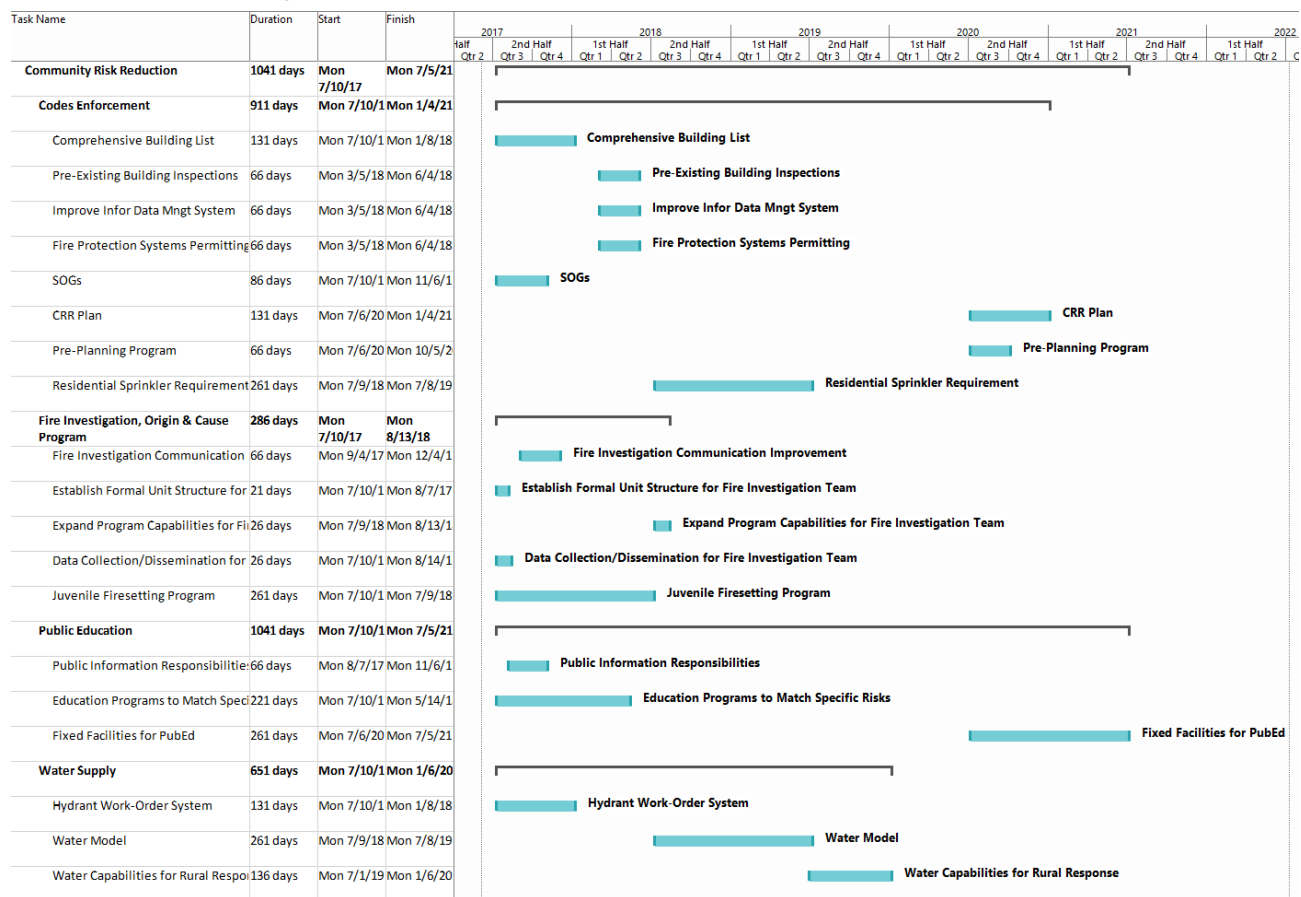
Administration View



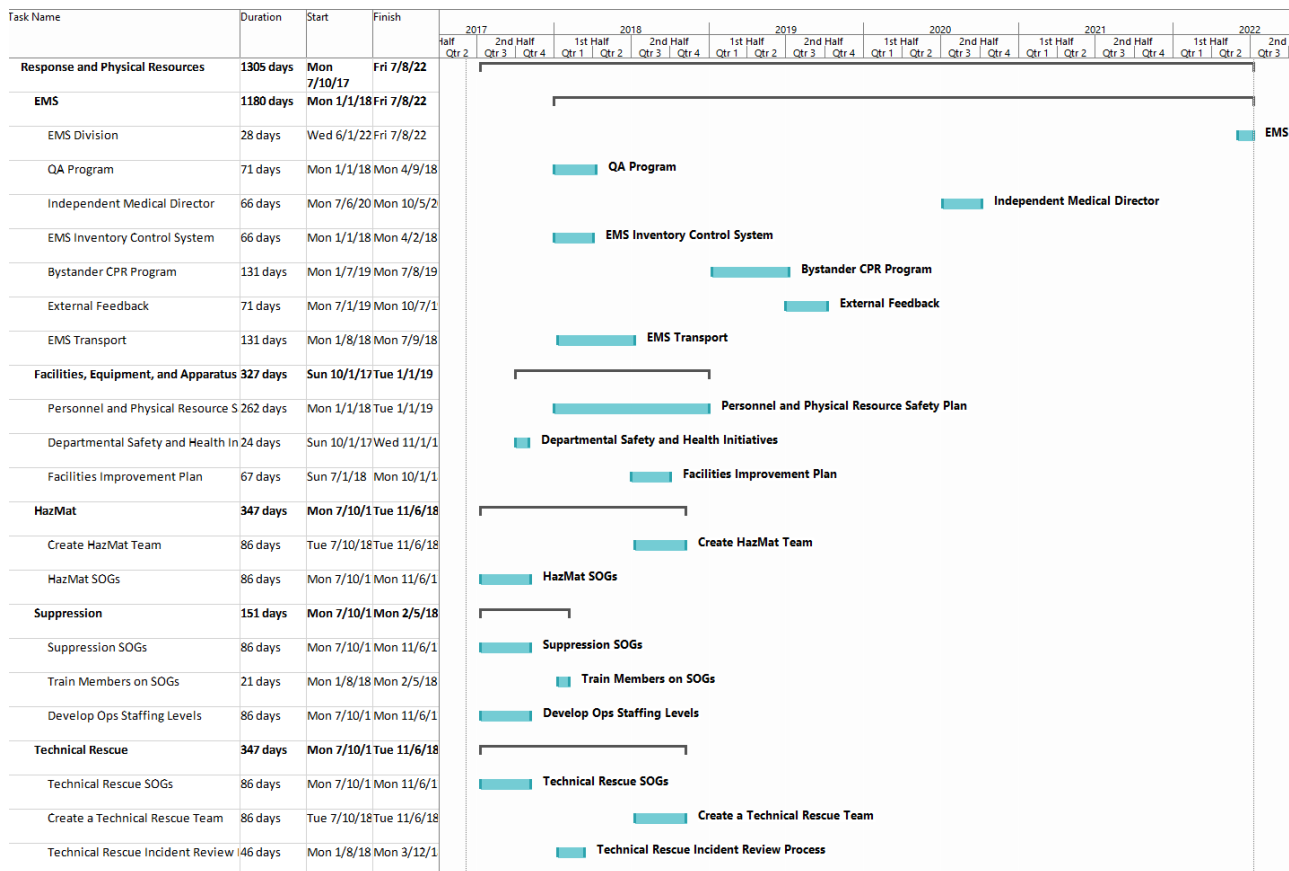
Assessment, Planning, & Implementation View



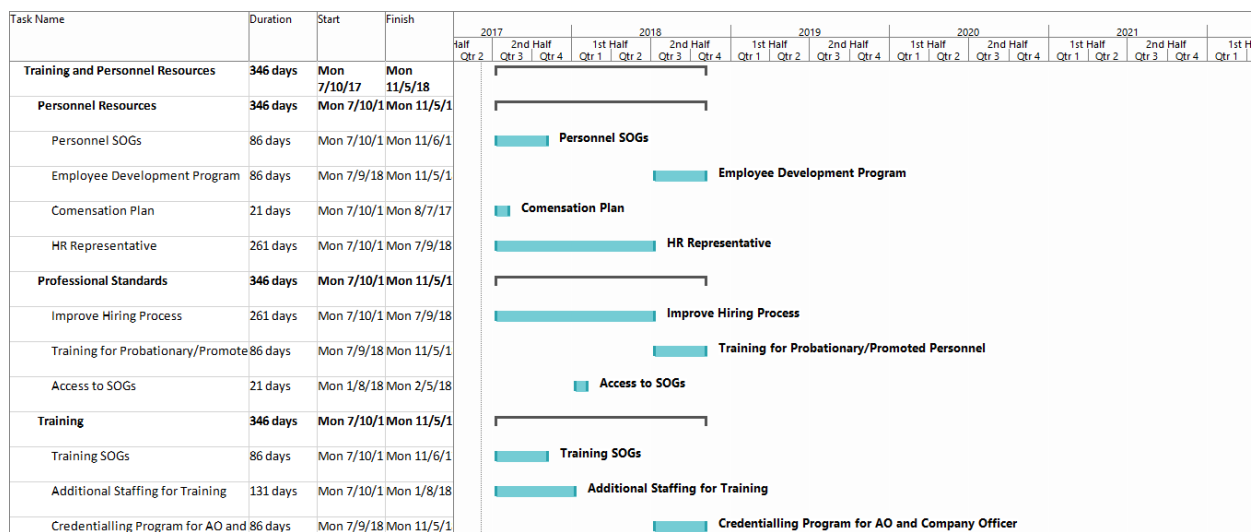
Community Risk Reduction View



Response and Physical Resources View



Training and Personnel Resources View



Appendix C: Complete List of Recommendations

Assessment and Planning

Recommendation # 1: Create a Standards of Cover document that incorporates all available planning elements currently in existence.

Rationale:

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? Using CFAI standards of Cover document for the model, committees as established by the foundation development process, GIS, FH, and other City Data, results from other recommendations, etc., develop the document. Who? All stakeholders	How Long? 3-5 years Priority? High	None





Recommendation #2: Define a methodology for determining fire loss and save.

Rationale: The department currently adopts no standard process for defining dollar losses and dollars saved from fires. This prevents accurate reporting to the State and National databases and hampers our local reporting and benchmarking efforts

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? Locate or define a model. Train all employees. Implement Who? Fire Prevention Division – to develop Training – to teach All employees – learn and implement	How Long? 3-6 months Priority? Low	None

Recommendation #3: Develop and initiate a pre-fire planning initiative focusing first on high life safety and critical infrastructure.

Rationale:

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? Utilizing Various database sources within the City, Occupancy data elements in FH, Collector App for GIS and model pre-planning programs, identify applicable buildings and define a program for data collection. Who? Fire prevention, ASO, Operations Chief, Admin chief to define program. Training to teach. All employees to learn and implement.	How Long? 6-12 months Priority? High	None



Recommendation #4: Create reports that clearly demonstrate the department's efforts with regard to planning, response, education and other relevant data.

Rationale: The department generates virtually no reports for the department as a whole to review and evaluate its efforts toward meeting goals, standards, etc., which are needed to implement changes for improvements.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? Each time the departments sets a goal, standard, benchmark, or other measure it should insure there is a report created to evaluate our compliance with it. Who? Each division working with Admin Chief, ASO, and IT as necessary	How Long? Initially 6-12 months Priority? High	None

Emergency Management

Recommendation # 1: Complete a review and revision of the Fire, Hazardous Materials and Search and Rescue Annexes to the City's Emergency Operations Plan.

Rationale: This plan was last updated in 2010 and needs to be reviewed annually. The department has undergone many changes in the last 7 years which need to be included in the plan.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? Conduct meetings to review and revise the document Who? Chief Horton, a few interested FFD employees, EMA personnel	How Long? Estimated 2 months Priority? High	There will likely be some overtime costs for off-duty personnel

Recommendation # 2: Develop and perform an all-hazards risk analysis process and create SOGs that govern our role in preparing and responding to these events.

Rationale: The department does not have SOGs that address this issue and needs them to help guide department personnel in preparation and response to the incidents.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? Using all-hazards risk analysis models and a critical infrastructure vulnerability assessment model, conduct meetings, site visits, etc. to identify and analyze the various hazards and establish guidelines for them. Who? A committee of interested FFD employees	How Long? 1-2 years Priority? Medium	There will likely be some overtime costs for off duty personnel



Recommendation # 3: Develop programs for preparation and response to major emergencies.

Rationale:

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? Using technology, mapping, training, tools and resources, meetings can occur to define the way the department responds to major emergencies Who? A committee of interested FFD Employees	How Long? Priority?	

Goals and Objectives

Recommendation #1: Develop a departmental goal setting process

Rationale: The department does not currently have a formal goal setting process to illustrate and assess overall annual goal and objective achievement

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How - Formalize a Goal Setting Process - Determine a period for reporting of results - Make sure goals and specific objectives reflect departmental mission and vision - Communicate the goals, objectives, and accomplishments to each employee - Involve the governing board in departmental goal setting Who Widespread stakeholder participation	How Long Creating the process and setting the goals will not take long; monitoring and reporting progress will be an ongoing process Priority	Costs are minimal



Administrative Support System

Recommendation #1: Determine the scope of the monthly FFD division reports

Rationale: Fire officers and other supervisors require accurate and up-to-date data, in order to effectively manage department operations.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Survey operations and administrative officers to determine which types of information would be useful. Examples include: turnout time, average and longest response times, training hours, call volume by apparatus and station, overtime used, sick time used, and completion of TFACA classes or Commission certifications. Most of this information is currently available, but it must be accessed by each individual officer from a variety of different sources. Reports should be compiled into a consistent format and distributed within the first week of each month. Administrative personnel would be needed to handle the work.	All of the necessary information is already being captured, so work could be started immediately. The more serious challenge will be determining the report's format and layout. Given the importance of monitoring our organization's performance, work should be started as soon as possible.	Once the format and process has been established, the ongoing work could probably be done by existing support staff.




Recommendation #2: Establish a Review Process for Policies and SOPs

Rationale: A comprehensive and up-to-date set of guidelines and policies is essential for safe and efficient operations.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Once a current set of SOPs has been developed, a schedule for review should be established, based on the rate of change anticipated within the policy's subject. The policy development company, group, or committee should handle this task as part of the policy development process.	The policy development company, group, or committee should be able to complete this task in a matter of days.	No extra costs anticipated.



Recommendation #3: Utilize a Password Management Software System

Rationale: Requiring employees to utilize multiple user names and passwords decreases productivity, as employees are forced to look up their user name and password every time they log into a program, this practice actually decreases security, as the employee will invariably store their passwords in a relatively unsecure location, such as a personal cell phone or fire station locker door. The hassle associated with these practices also discourages employees from using the programs we have purchased.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Each FD employee must remember multiple user names and passwords for the software programs used by the city. Examples include Everbridge, Green Employee, Kronos, Power DMS, Target Solutions, Trakstar, Windows, and more. Many of these programs also use different user names: john.smith, john.smith@franklinton.gov, jsmith, john smith, etc. Some passwords must also be changed on a regular basis. Commercial password management (“keychain”) programs are available and used by companies worldwide. Given the number of times that our employees utilize computers in their jobs, it is counterproductive and frustrating for them to manage so many passwords and IDs. Password management software would also increase security by eliminating the need for employees to write down their login information or keep it stored on a personal device. MIT would have to be responsible for specifying, purchasing, and managing the software. However, the FD should be involved in the process in order to ensure that the product meets our needs.	The software could be researched, specified, purchased, and installed within six months. The time required to properly field train all personnel in the software’s use must also be factored in. The project should be started as soon as possible.	Cost unknown.



Recommendation #4: Improve the process of estimating and reporting actual fire loss amounts.		
Rationale: The department cannot accurately report or track its fire losses and saves without accurate data. The members of the department are currently not trained to provide these estimates.		
How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Fire personnel are not trained or experienced in estimating building or content losses. The Prevention and/or Training Divisions should work with contractors, realtors, and insurance companies to create a guide for estimating losses. The guide could contain the average home price per square foot, based on geographic location, and the cost of an average room's contents, broken down by room type, such as bedroom, living room, kitchen, etc. The guide could be made available in print or through the FD's network of PCs and MDTs.	The project could be completed within three months, if personnel are available. This is not a high priority project, but the guidance is needed.	There should be little to no extra costs involved with this project.



Recommendation #5: Create a central location for all FFD forms, SOGs, programs, etc.		
Rationale: Placing all of the department's forms in a centralized location will speed access, simplify training, and increase efficiency.		
How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Most forms used by the FD are currently accessible from the Fire page on Inside the City. However, there are still some forms stored on the G: Drive, and many HR forms are only available from their section of the network. All forms used by FD employees (including HR, risk, payroll, insurance, and discipline) should be identified and placed in a central location, such as the Fire page on Inside the City. A survey of each division should be conducted, to identify which forms are still in use. A member of the administrative support staff should be responsible for the maintenance and updating of the archive. Additionally, other city departments must provide the FD with updated versions of relevant forms, any time that changes are made. Training should be provided for all current and future supervisors on the location and completion requirements of each form.	The project could be completed within three months, but should be scheduled for completion before the end of 2017.	No extra costs anticipated.

Financial Resources

Recommendation #1: Use the strategic plan to tie-in the budgeting process with departmental goals and strategies

Rationale: Adequate annual funding of this plan is critical to departmental goals and strategies.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Ask the committees already formed that are attached to the Strategic Planning initiative to formulate a 5 year and 10 year objective list as part of their research. Submit this list to the department leadership to finalize a long range planning initiative. Combine the planning initiative with expected yearly budget connected to the fire department to prioritize initiatives over the next 5-10 years.	Committees should be informed immediately so that proper information can be gathered and work can begin on forming 5-10 year planning.	No cost initially but budget allocation could be effected over the span of 5-10 years depending on agreed initiatives.




Recommendation #2: Establish a new compensation plan

Rationale: The compensation plan is created for a competitive, fair and equal system of salary incremental increases to progress an employee through their career. The compensation plan will address market value, compression and inversion pay issues. The compensation plan identifies each rank within the organization and identifies an initial starting salary for that specific rank. The initial starting salary will be reviewed yearly in review of the Consumer Price Index to ensure a fair market competitive salary is provided. Within each rank the compensation plan will have yearly incremental increases to progress an employee through the position. The yearly incremental increases will be adjusted to reflect any changes to the initial starting salary. The compensation plan has a definitive promotional salary increase as an employee increases their rank within the organization. The compensation plan has dynamics to address employees who temporarily serve out of rank and their compensation for serving in these roles. The compensation plan addresses compensation for employees who serve on specialized teams within the organization.

The compensation plan provides employees with a financial career growth path. This path allows employees to have insight on their financial growth which promotes loyalty, stability and determination.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Perform another pay/benefits assessment which will establish pay ranges separated by pay grade. Break the pay grade into 5-10 year service markers. This will allow for achievement of top out inside of an employees pay grade which currently is not likely given a 25 year service time.	This change should occur immediately to ensure retention of current and future employees. Pay/benefits assessment could be completed in 6 months with implementation occurring at the subsequent budget year.	Scaling costs depending on pay/benefits analysis and commitment from city of franklin.



Recommendation #3: Conduct an annual review of apparatus and vehicle replacement scheduling

Rationale: An apparatus replacement schedule should be established using NFPA 1901 along with organizational priorities to ensure that front line and reserve response apparatus remain safe and well maintained during its useful life. Adequate annual funding of this plan is critical to maintain apparatus reliability.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Consult with fleet management on current apparatus replacement schedule and determine what is in place now. Compare with departments with comparable resources to determine what changes would be appropriate.	Consulting with fleet could be accomplished in 90 days with comparisons being completed in an additional 90 days. Final recommendations could be made within 120 days.	Difficult to determine without completed report. Any potential increase in cost could be included in long-range plan from recommendation #1.

Governance and Administration

Recommendation #1: Review, develop, and implement departmental SOGs and Policies		
Rationale: A comprehensive set of guidelines and policies is essential for safe and efficient operations.		
How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Obtain copies of <u>complete</u> and <u>current</u> city policies from HR. Determine which areas of FD operations are covered by city policies (add fire-specific language to city policies, if necessary). Determine which areas of operations should be covered by FD policies/procedures, and which should be addressed in training manuals or operating guidelines. Example: the FFD policy says that we use triple layer loads with 150' of 1.75" hose in our front crosslays. The manual or guideline tells a recruit how to deploy and reload the crosslay. Find an organization with operations substantially similar to ours and use their SOPs as a basis for our own, with minor modifications, as needed. Establish a timeline for review of each policy/procedure. Policies may be reviewed annually, or every two to five years, depending on the rate of change in the topic covered. There are three options for accomplishing the development and revision of SOPs:	The primary problem with determining the timeframe for this project is that the city does not have a complete and current set of HR policies available to employees. There are also FD policies that are different from those used by other city employees. A set of <u>proposed</u> FD policies could be developed. However, until the city confirms that the FD policies are compatible with city policies, there is no way to implement them. With efficient input from the FD, an outside company could provide a full set of well-designed SOPs within a matter of months. A focused working group, using existing SOPs as a starting point, could probably complete the work within six months, provided they are given timely feedback on questions sent to city administration. A committee could easily take a year or more.	Costs for an outside company are unknown, as this option has not been previously explored. However, compared with the cost of a full-time employee (of any rank) dedicated to policy development, or the overtime costs associated with committees, the fees would certainly be reasonable.



1. Establish a committee representing various ranks and divisions within the department and allow them to develop the policies. 2. Appoint a small working group of two to three people, and empower them to do the majority of the work, with the understanding that the resulting document will reflect currently-accepted FFD procedures and best industry practices. All policies will be subject to review by senior staff. 3. Hire a company, such as Lexipol, which specializes in developing comprehensive, defensible policies and procedures for fire departments. The company will also be responsible for updating all policies to reflect changes in law, technology, or industry practices. Given Franklin’s financial resources and limited administrative staff, I would strongly recommend option #3. Utilizing an outside company would allow our personnel to provide initial guidance for policy development, and then focus their efforts on providing training that reinforces and supports the policies, rather than working on the policies themselves. Failing this, option #2 would be the fastest and most efficient way to proceed.	Proper SOPs are a cornerstone of safe and efficient operations. They also provide employees with guidance, and help a department to manage its risk exposure. Development of up-to-date SOPs should be a high priority for our department.	
---	--	--



Recommendation #2: Review options to increase administrative support for operational division		
Rationale: Shift staffing and scheduling (especially locating overtime personnel) takes up far too much of the shift officers' time, especially since the operating rules in Kronos do not correspond with our department's scheduling policies. Staffing and scheduling tasks for all three shifts should be consolidated into an administrative support position. The Training Division could also use more support staff, for clerical duties, program development, and instruction. Another example is the Administrative Services Officer position. By necessity, Captain Mackey spends much of his time on IT and dispatch issues. We should consider having one administrative officer dedicated to IT support, and another handling the traditional ASO duties, in order to ensure that all areas of operations are supported.		
How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Survey fire officers in the field and staff personnel at Admin. to determine what tasks require specialized training to perform, and which could be handled by non-suppression personnel. Develop job descriptions for support staff, which incorporate these tasks.	Requests for additional personnel would have to be presented as part of next year's budget, unless some sort of emergency addition can be made. However, the need has been growing for a number of years, and the situation should be addressed as soon as possible. Given the relative sizes of our agencies, there is no reason that the FD should not have the same ratio of support personnel as the PD. Education may be an issue, as BOMA, HR, and city administration are most likely unaware of the complexities of FD staffing, training, and operations.	Costs would depend on the pay grade and requirements for each support person.

Public Education

Recommendation #1 (Chapter 4, Criterion 5B: Public Education Program, **reference questions #29 – 42**)

Define roles and responsibilities related to public information in order to more effectively:

- Inform the public in a timely manner of immediate threats and hazards, such as an incident requiring evacuation or shelter in place.
- Release official statements promptly to the media regarding major fires and emergencies.
- Manage increasing requests for information/interviews.
- Achieve a coordinated approach across all media platforms and outreach avenues (including social media – presently these are managed by different individuals throughout the city)
- Achieve a coordinated approach across all divisions of the fire department – operations, community risk reduction and administration/emergency management – both in emergency and non-emergency situations.
- Educate the public, improve community outreach and increase visibility.
- Embrace media and methods of public engagement in both emergency and non-emergency situations.

RATIONALE: We must define the roles and responsibilities related to public information so that we may inform the public in a timely manner on all pertinent information regarding immediate threats and hazards.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How do we accomplish this? Put into place a dedicated, reliable, consistent, publicized and standardized communications process, structure, and hierarchy to manage public information in a coordinated effort for both emergency and non-emergency situations. Possible solutions might include: • Creating a dedicated Public Information Officer position, similar to the Franklin Police Department and Murfreesboro Fire Department. This solution would create consistency, reliability, one voice/one message and a single	How long will this take? 1 year – Within 1 year put a structure into place utilizing existing personnel. Within 5 years consider creating a dedicated PIO position, similar to local agencies Franklin Police and Murfreesboro Fire. Priority - High Priority	Costs attributed to the 1-year solution may involve paying overtime for non-exempt personnel. The 5-year solution if implemented would involve the cost of adding a new staff position.



point of contact for the media, fostering relationship-building and media partnerships. • Assigning existing shift personnel to this task (preferably not the Incident Commander or individual who is actively involved in managing the incident). • Assigning an on-call PIO who would respond to and/or coordinate timely communication of incident information. Who is involved? • Fire Chief • Deputy Chiefs • Battalion Chiefs • Assistant Fire Marshal • Fire and Life Safety Educator • City of Franklin Communications Manager • Franklin Police PIO (who presently handles coverage of major incidents for FFD)		
---	--	--



Recommendation #2 (Chapter 4, Criterion 5B: Public Education Program, **reference questions #1 – 25**)

Design, create and deliver compelling educational programs that target and reduce specific risks, and:

- Are based upon identified high loss and high risk audiences.
- Educate citizens of the most common emergency occurrences and risks.
- Utilize standardized curriculum and materials that follow nationally-recognized best practices.
- Whenever possible incorporate immersive, interactive environments.
- Have adopted and published goals.
- Have defined measurable outcomes.
- A process to routinely evaluate the effectiveness.

RATIONALE: We must define and measure our existing educational programs in order to guarantee the efficient use of our resources as well as facilitate targeted learning opportunities for our community and its stakeholders.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How do we accomplish this? Five key ways: • Adopt and publish public education goals based upon identified high loss and high risk audiences with defined, measurable outcomes. • Evaluate existing programs based upon the following criteria: • Educate citizens of the most common emergency occurrences and risks? • Delivery of messages in accordance with standardized curricula and nationally-recognized best practices for the age group/target audience? • Effective in reducing community risk? • Is program immersive or interactive? • Participant, instructor, support personnel (firefighter), teacher and parent feedback. • Correct deficiencies identified in program evaluation. • Add/expand programs if determined necessary. • Build/incorporate assessment tools into every program. Who is involved? Fire Marshal Assistant Fire Marshal Fire and Life Safety Educator	How long will this take? 1 – 3 years Priority – Medium Priority	If determined additional/expanded programs are needed, there may be associated costs with staffing and the purchasing of program equipment and supplies.



Recommendation #3 (Chapter 4, Criterion 5B: Public Education Program)

Create physical facilities for public education and public information:

1) Safety City campus or public education station

Establish a dedicated location/campus where people of all ages may come to learn CPR, get car seats checked, complete a Family Safety House style program and more. This would enable us to deliver higher quality educational programs with more consistency in a controlled, comfortable and safe environment that is not subjected to weather or incident response. This would also alleviate the need for our personnel to travel to and staff a majority of public education events. This will become increasingly important with our department's rising call volume and demands.

2) Original 1892 fire station/City Offices building on Public Square

Acquire the original fire station on Public Square for the purpose of creating a fire museum. The museum would be dedicated to collecting, conserving and sharing the history of the Franklin Fire Department.

RATIONALE: We should consider creating dedicated facilities designed for hosting public education events and showcasing the historical evolution of our department. This will enable us to deliver higher quality programs more consistently and meet increasing public education demands, as well as celebrate the FFD's 200th Anniversary in 2020.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How do we accomplish this? Community partnerships are key. Potential partners for the safety city include the Franklin Police and Parks Departments, and other Williamson County municipalities. Partner with the Heritage Foundation of Franklin and Williamson County for the 1892 fire station. Who is involved? Mayor and Aldermen City Administrator Fire Chief Fire Deputy Chiefs Assistant Fire Marshal Fire and Life Safety Educator Franklin Firefighters Association COF Communications Manager COF Community Relations Manager Heritage Foundation of Franklin and Williamson County Police Chief Parks Dept. Director	How long will this take? 5-10 years Priority – Medium Priority	Expensive

Fire Investigation, Origin & Cause Program

Recommendation #1: Maximize communication within unit and organization

Rationale: To ensure all investigators comply with the same standards ensure that all fire investigations are consistent and systematic. To keep all investigators apprised of current trends to maximize effectiveness.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Hold regular unit meetings Establish notifications for investigators on all fires Conduct training in evidence preservation and unit goals for suppression personnel	How long will it take? Immediately Priority level?	Overtime for investigators to attend off duty

Recommendation #2: Establish formal unit structure.

Rationale: Maximize effectiveness and consistency of fire investigations conducted by the department regardless of shift

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The team must have official designation within the Department The team will have a defined number of investigators that will meet minimum standards of NFPA 1033 A minimum number of training hours should be established and required of all unit members Establish a team coordinator to ensure compliance with minimum standards and facilitate daily operations	How long will it take? Immediately – 1 month 3 months 3 months Immediately	Personnel costs and OT for training


Recommendation #3: Expand program capabilities.

Rationale: Establish effectiveness in all investigations being conducted to ensure successful cause determination and prosecution.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Increase relationship with FPD, DA's office, and other applicable agencies	12 months	Potential overtime for training personnel
Provide sufficient authority for investigators to be able to perform duties	12 months	No cost
Decrease reliance on the PD to ensure case follow through/resolution	12 months	No cost
Train investigators on legal impacts of criminal investigations	< 6 months	OT for training personnel
Ensure safety of investigators during investigative activities	12-24 months	Additional equipment costs
Model fire investigation program after other effective units, such	12 months	



Recommendation #4: Ensure high quality data collection/dissemination		
Rationale: Ensure effective investigations and provide local data for target fire prevention efforts		
How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Ensure utilization of the Bomb/Arson Tracking System and provide monthly reports to Fire Marshal's Office for targeted prevention efforts	Immediately 1 month	No cost
Implement policies addressing reporting requirements		

Recommendation #5: Develop and implement Juvenile Firesetting Program.		
Rationale: Provide education and treatment resources for juveniles involved in fire play incidents		
How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Model FFD program after other successful programs in the country	Immediate	Training and overtime costs
Ensure appropriate JFS referrals to the unit by suppression company personnel through policy and accountability	Immediate 6 months	Training and overtime costs Training and overtime costs
Ensure that policies are in place to address JFS incidents	12 months	Training and overtime costs
Properly train Fire investigators to maintain the effectiveness of the program		

Water Supply

Recommendation #1: Implement a functional work-order system.

Rationale: Currently hydrant problems are not addressed in a timely basis causing frustration when the issue is noted, but work is not completed. Four utility districts need to be able to immediately see, assign, and correct issues and keep the fire department informed of progress.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How do we accomplish? - Identify potential hardware/software needs - Involve stakeholders (internal / external) - Choose, adopt, and train on the new system Who is involved? - FFD Personnel - Franklin IT 4 water districts - Potentially allow for external stakeholder input	How long will it take? 1 year to 18 months Priority level? This is a high priority due to the fact that it would tremendously expedite the process in reporting, repairing, and improving our water delivery system	- Software implementation - Man hours – however, we have staff that is currently available to work towards this goal - Training employees for use of new system



Recommendation #2: Establish a water model

Rationale: A water model is a computer model of the individual pressure zones. Some of these zones are really large. There is no way of knowing how much water is expected without modelling, testing the model with hydrant flow data, and making corrections. We need to identify key areas and emphasize the importance of the utility districts having viable models and sharing that data with us.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How do we accomplish this? - Approach other stakeholders to encourage involvement - Determine the desired scope of the end result - Bring in a third party consulting/engineering group to evaluate the current system and identify future needs in our water system - Share/review data from the model Who is involved? - FFD - Franklin Water - Mallory Valley - Millcrofton - HB&TS - Engineers - Consultants	Timeframe: 3-5 years Initially, we have to get other departments on board and agree on the need. The next step will be conducting the study. Finally, the data must be shared and reviewed. Priority Level This is a high priority, because it directly affects current and future operations and planning of FFD.	Costs: Explore the costs associated with such a large undertaking. Identify all parties that would have an interest in participating in this process, and look into sharing the cost across all agencies.



Recommendation #3: Evaluate Rural Response Capabilities		
Rationale: The department relies upon mutual aid to provide a rural water supply. Static sources of water that could be used are not mapped and we have not identified what equipment and training might be necessary. We need to determine what the expectation is to use these alternative water sources.		
How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How do we accomplish this? - Identify personnel familiar with current rural response capabilities - Conduct an inventory of available resources - Determine the need for new/additional equipment Who is involved? - FFD personnel - Water districts - External agencies (WCRS, Brentwood, etc.)	Timeframe: 1-2 years It should not take long to conduct a self-assessment of our current capabilities Priority Level This is a medium level priority	Costs:

Codes Enforcement

Recommendation #1: Develop a comprehensive list of all buildings in the city.

Rationale: It's hard to establish goals if the situation isn't clearly defined. There is no one database in the city that shows all of the buildings in the city. Many other city departments could benefit from establishing this database. At this time, we don't know how many buildings are equipped with sprinkler systems, how many buildings have alarms, or even how many buildings need to be inspected.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Survey current data bases to determine what information is available. Determine what information is important to track. Determine format of new data base. Test the data base by conducting field inspections. Compile the final data base.	This is a high priority item as many other department programs can benefit from this information. This task may take up to 6-months or longer depending on the quality of existing data bases and the amount of follow-up in the field is required.	Developing the data base will be a manpower intensive process. One full-time equivalent for six months would be a rough estimate. It may be necessary to provide office space.



Recommendation #2: Develop and implement a plan to inspect existing buildings on a regular basis.

Rationale: Currently, existing buildings are not routinely inspected. Inspectors try to inspect target hazards in their districts, but there is not enough time to inspect every building. Often, building owners and occupants will make changes to a building, which adversely affect fire and life safety. Also, building owners often neglect to do ITM's on their fire protection system.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
This recommendation requires adding personnel to the fire prevention bureau. Personnel must be trained and have required certifications.	This is a high priority item as the current inspectors are unable to perform annual inspections on a consistent basis. Depending on qualifications and experience, personnel may be able to start within a few weeks of being hired.	There are currently about 6700 business licenses issued in the city. Using a guideline of 30-minutes per inspection, a minimum of two full-time equivalents would be required to inspect all properties annually. Additional personnel would also require vehicles, office space and computers.

Recommendation #3: Develop specific recommendations targeted on improving the Infor data management system

Rationale: The current system of recordkeeping, requires inspectors to fill out paper forms, and then enter the information into INFOR. INFOR is not a user-friendly program and requires accessing multiple screens to enter a single inspection report.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The fire department should work with the IT department to see if any improvements can be made to the INFOR software. Converting to a tablet-based system would be a major improvement	Implementing this recommendation depends on IT and their priorities.	Personnel costs would be determined by the IT department. The department would require a minimum of three tablet computers in the short run. Additional equipment would be required if the number of inspectors is increased.


Recommendation #4: Implement a fire protection systems permitting process.

Rationale: Currently, fire systems are installed under building and neighborhood services permits. Once a permit is issued by BNS, contractors can begin work. The fire department requires shop drawings for sprinkler systems and underground fire services to be reviewed and approved before fire inspectors are allowed to do inspections. However, more often than not, especially with underground services, trenches are dug and pipe is laid before the drawings are approved, which puts significant pressure on the inspectors to resolve the issue. Also, fire alarm drawings are approved by BNS, and fire inspectors often find major issues with the installation not meeting code. If the fire department had the authority to review and approve plans and issue permits before any fire protection related work could be started, there would be fewer problems in the field. IN short, if the fire department is required to inspect the work, the work should be reviewed and permitted by the fire department.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The fire prevention bureau as well as fire administration need to determine how extensive a permitting process to adopt. What types of systems will be permitted? How extensive will the review process be? Will reviews be conducted in-house or through a third party?	Drafting the program could be done in a matter of a few weeks. It may be necessary to coordinate with BNS with regard to tracking permits and collecting fees. It might be best to phase the program in over a period of time. At this time, the committee finds that the installation of fire alarm systems is the most pressing issue and should be addressed first.	Depending on the extent of the review process, it may be necessary to add personnel. If the city elects to hire additional personnel, office space would be required. Costs could be offset by charging a permit fee.



Recommendation #5: Develop and implement standard operating procedures / guidelines.

Rationale: The department currently has three full-time fire inspectors and one fire safety officer / inspector. The department needs set guidelines / operating procedures so that the work done by the four inspectors is consistent. The department also has policies, for example locking FDC caps and fire department vehicle access guidelines which are found in different computer files in various locations. There should be one place where all of the operating procedures and guidelines are kept for quick referral.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The fire prevention bureau needs to determine what activities are going to be covered. The department should look at existing checklists and information bulletins to incorporate them into a standard format.	Implementing this recommendation would mostly involve coordinating existing documents and could be accomplished with existing personnel.	This program would not have a major impact on the budget.



Recommendation #6: Develop and implement a Community Risk Reduction Plan.

Rationale: While community risk reduction is not a new concept to the fire service, there is a new emphasis on identifying and prioritizing risks within the community and then focusing fire department resources, both emergency response and prevention, to reduce those risks.

Given Franklin’s growth and the diversity of risks within the community, it would be appropriate to implement a community risk reduction program. Additionally, there is an increasing demand on government resources, and it is important that the fire department uses its resources as affectively as possible.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Form a committee with representatives from operations, administration, and prevention as well as representatives from the city’s planning department and other departments as needed. The committee has to analyze the city’s fire problem and formulate a plan to mitigate the problem as well as address future growth. There are a number of resources available to provide guidance on developing the plan. Implementing this recommendation is beyond the scope of the codes and standard committee.	The department addresses many of the elements involved in community risk reduction. However, there is no comprehensive written plan. This is not an essential item, but it would be a useful tool to address future planning.	Man-hours would be required for meetings and to develop the plan. It should also be considered that the personnel required for this task would be management level positions.



Recommendation #7: Develop and implement a pre-planning program.

Rationale: With the complexity of the occupancies within the city from heavy industrial buildings to high-rise office buildings, firefighters need to know basic information about a building while they're en-route or shortly after arriving on scene. This problem is compounded by the fast growth of the city in that new buildings are being added on almost a monthly basis.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
This program is best addressed by the training and operations divisions of the fire department. FPB staff could provide information.	Priority must be addressed by the operations and training divisions.	Much of the work could be done as part of the regular shift activities. Overall management of the program could be assigned to a shift officer.

Recommendation #8: Develop and implement a mandatory residential sprinkler requirement.

Rationale: The fact that fire sprinklers save lives is undisputed. The greatest danger from fire is in the home. It follows, then, that single-family homes should be sprinklered. The model building codes require home fire sprinklers. Currently, the city has omitted that requirement when adopting the International Residential Code. The city should adopt the code without omitting the requirement for fire sprinklers.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Implementing this recommendation would require working with the board of mayor and alderman to amend Section 12-1002 of the municipal code. The fire department would have to work closely with the department of building and neighborhood services to accomplish this goal.	This recommendation should be implemented as soon as possible to take advantage of the current building boom.	This program may require hiring additional personnel. At the present time, approximately 4-hours per week are devoted to inspections on single family residential fire inspections.

Suppression

Recommendation #1: Develop and implement SOPs for Suppression Ops

Rationale: Developing SOPs for suppression operations is imperative in providing guidance for operational standards.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? A complete out line of all operational SOP's/SOG's need to be identified and prioritize. Once the list is complete have small groups, no more than 2-3 people, work on the SOP's/SOG's. Doing this will cover more SOP's/SOG's faster. Our up to date SOP's/SOG's are important to the successful operations of our department. Without this, we are asking our personnel to operate in high risk situations with very little guidance. There were items that were identified that could result in injuries or death to firefighters and/or citizens. This is a high priority event that needs to be started as soon as possible. The drafting of the SOP's/SOG's will have no cost but, the implementation may result in some cost. So, time is needed to budget for these things. •In the identification process, a group will define what needs to be a SOP or SOG. •Small groups will be assigned one SOP/SOG at a time. This will prevent duplication of work and will keep groups on task to a quick return of work. •Each assignment shouldn't extend over one month, but if more time is needed, due to the complexity of the task, it will be granted. •If an SOP/SOG requires a specific area of interest (Ex. Codes, Prevention, Special Ops.) someone in that field or that has the credentialing may be asked to set in on the process. •The time frame is critical due to this could affect staffing and have some impact on the budget. The areas of staffing may suggest that there is a piece of equipment that may be under staffed or the need to purchase new or replace old equipment. Who? Involve members of FFD Utilize the current employee tasked with Policies/SOPs Utilize contacts from other organizations	How Long? Dependent upon the level of depth we agree upon. Anywhere from 3 months to 1 year + Priority? Based on the amount of questions focused on SOPs from the Self-Assessment Manual, we recommend making this a high priority item	There are no costs attributed to this recommendation.


Recommendation #2: Train Members on New SOPs utilizing Target Solutions platform

Rationale: Training members on new policies and SOPs is necessary to insure that employees maintain compliance and familiarity with the

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? Ensure each person receives the SOP/SOG as soon as it is released. Set up a share point where every firefighter has access always. For all new recruits, they will receive a hard copy on their first day. Each firefighter needs to receive this information as soon as it is released. This will provide the insight to the firefighters in how we operate and issues of safety. There must be a period in with the SOP/SOG is reviewed and up dated. This needs to be set on the effectiveness and risk factor that is identified. This is a high priority based on safety of all firefighters that may be effected. On review of the SOP/SOG one of the original writers should be on the review and at a minimum of one new member, for a fresh look. This has no cost associated with this process.	How Long? This will be an ongoing process, lasting throughout the lifetime of our new SOGs resultant from Rec#1 Priority This is a priority recommendation, in that it involves awareness of departmental Policy/SOGs	There are no costs associated to this rec



Recommendation #3: Develop and Implement Operations Staffing Levels

Rationale: Maintaining an adequate staffing level increases productivity and reduces injury.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How Examine current staffing levels and make sure they align with our needs as a department Who Administration	How Long? This process could potentially take up to 6 months to a year Priority Medium. We believe the department is currently functioning at an adequate level, but could potentially be improved by undertaking a detailed self assessment of our standards of cover.	The only costs from the recommendation would be incurred if it was determined that the department needed to address a current deficiency

EMS

Recommendation #1: Create an EMS Division

Rationale: This recommendation requires an overhaul of the organizational chart to reflect the importance of the EMS division within our department. This department has grown exponentially over the past ten years in number of personnel, number of stations, area covered, call volume, and services provided. We currently operate 11 ALS apparatus with 55 Paramedics, over 160 licensed healthcare providers, and 68% of our call volume is medical, yet nothing has changed with the EMS division since the department started operating above a first responder level. Creating this structure and having these positions in place would allow for a much smoother transition to a transport service should the need arise to increase our level of services in the future Refer to assessment questions #10-11, 46-48, 83-97, 163-165, 185-196 and 2011 Tri- Data Study recommendations

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The EMS Division will contain positions in Administration, training, and shift supervisory positions. New positions must be created and a new promotional process/rank structure must be developed to take into account a different set of qualifications for promotions into EMS related positions. This will allow existing personnel who do not meet the qualifications for fire officer positions to be promoted to EMS officer level positions based on their EMS qualifications and leadership abilities. These officers will serve as on-duty EMS supervision for our department handling daily EMS oversight of personnel and daily oversight of EMS report issues, as well as provide support to the IC on large scale scenes and serve as the rehab officer or safety	This is a priority for the department, but may take some time to implement. Anticipate anywhere from 1-5 years for implementation. A transition can begin immediately with the creation of three new shift positions. Personnel may step into these positions temporarily during the implementation phase to begin taking on the responsibilities that will be carried by these positions once official job descriptions and promotional processes have been developed. This will provide immediate additional staffing to assist with further development and implementation of the recommendations within the EMS division.	Some transitional changes can be made with minimal impact to the budget initially. High priority changes include added positions and would be dependent upon budgetary approval. Cost is dependent upon the decision of rank associated with the positions. Ideally, this includes a re-alignment of current administration position, the addition of an EMS training position, and the addition of three EMS shift supervisory positions (these would also be responsible for the oversight of on-shift QA programs)





officer and provide support where needed.

Policies will be developed to ensure someone promoted through the EMS promotional process does not lateral transfer into a fire officer level position without first completing the promotional process for that position. Existing personnel will be used to staff new positions and new personnel will be hired as recruit firefighters to fill the vacancies created.


Recommendation #2: Improve the QA Program

Rationale: An electronic form was developed in 2016 to provide feedback to personnel and record the review of reports. This form does not have the ability to collect data that can be tied directly back to the report for continuity of review. This was addressed as a concern and need in the 2011 EMS Study that was conducted for the City of Franklin by Tri-Data and is shown in the assessment of the EMS related assessment questions during the strategic planning process.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
1) implement an electronic patient care reporting system that has a quality management component built into the system This involves members of our department reviewing and training on a new software, involvement from our IT department and involvement from EMS. 2) provide training to select shift personnel to assist with continual review of reports This involves additional training for personnel who are currently providing QC reviews of our reports on shift	Improvement of the QA program is a top priority. - Improvements in the current system can be achieved with a review of the system and input from a team of personnel trained on Quality Management immediately - Implementation of an improved EPCR is a top priority (realistic timeframe may be 6-18 months to implement depending on budget and which system is selected)	NFA offers a 6-day on campus course in EMS Quality Management. Sending three shift personnel and the EMS Officer will provide training to a group of personnel who can then act as a peer review team within our department. Total unreimbursed cost is NFA meal ticket x 4. Implementation of an EPCR ranges from free (we have access to a free license for ESO) to the cost of upgrading our current FireHouse software with FireHouse EMS or looking at a total new option such as ImageTrend. Other on-going costs include overtime payment for the peer review team to meet at least quarterly (estimated: 60 hours overtime/year)

Recommendation #3: Hire Independent Medical Director

Rationale: Increased involvement with the medical director was listed as a recommendation in the 2011 EMS Study conducted by Tri-Data as this was identified as a deficiency within our system. With changes in our medical direction since that study was conducted the issue has not improved, but most likely become worse.

Having our own medical director will ensure direct communication with our medical direction and provide the potential to have the medical director directly involved in the QA process and training of personnel.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
To avoid potential conflict with EMS a meeting to discuss concerns and reasons for seeking our own medical direction is recommended. Hiring a new medical director may be accomplished through an RFP process. Ensuring involvement and buy in from our current medical direction is critical. Murfreesboro FD is currently working under this type of system. Seeking input from their department will be helpful.	Hiring our own medical director is a long range goal with a 3-5 year time frame. We can continue to work with our current medical director who provides oversight and protocols, but must develop a plan of action to hire our own at any time in the event our relationship with the current medical director further deteriorates.	A budget of \$50,000 will cover the annual cost of a medical director with the goal of finding the best qualified candidate at a price within that range. (Anticipated expense ranges from \$20,000-\$40,000 depending on candidate pool and expected level of involvement)





Recommendation #4: Research and Implement Solutions to Improve the Inventory Control System		
Rationale: Inventory control is essential to projections necessary for the budgetary process as well as tracking of current inventory, par levels, and expiring or recalled items.		
How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Implement an improved system for supply access by shift personnel with better tracking of inventory par levels and timely ordering of replacement supplies Look for software systems that have this built in or design with help from IT a SharePoint site or database system that will monitor and a location for supplies that allows after-hours access by shift personnel	Ongoing improvements to this system have been taking place over the past several years. Continuous reviews of our processes are important in development of an improved system.	There may be some cost associated if a software purchase is necessary. Explore if there are better capabilities in our current software or in database systems built by IT with no cost associated.

Recommendation #5: Explore the Viability of a Bystander CPR Program

Rationale: Implementation of a public CPR notification would improve access to bystander CPR throughout our response area. This project could be shared or deferred to the County as a county-wide project.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The project involves dispatch, IT, and needs marketing to bolster community involvement (download and use of an app)	Timeframe is dependent upon approval and decision to defer to county or take on the project on our own as well as planning for budget 1-3 years	\$10,000 implementation/1 st year \$8,000 annual subscription thereafter (up to 300,000 population) Plus any marketing expenses *pricing based on the PulsePoint system May be shared with County

Recommendation #6: Implement a Method to Solicit External Stakeholder Feedback on all Departmental Services

Rationale: This can help identify areas of strength and weakness and help to improve our delivery of services

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Train personnel to ask for feedback, provide cards to personnel with information on accessing our online customer satisfaction survey to be handed out after services are rendered.	This can be implemented immediately very easily since we already have the customer survey in place	Minimal cost of cards to be handed out



Recommendation #7: Study and develop a plan for Transport

Rationale: It is no secret that transport has been a consideration of this department for some time. It is imperative that the department continually assess the quality of services that are provided to our citizens and identify who is best to deliver those services to our City. This recommendation allows the department to be prepared to increase capabilities to include transport at any time the City deems this is necessary for our citizens and visitors.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The previous EMS Study was completed in 2011. It is imperative that the data be updated and re-analyzed on an ongoing basis to identify areas of needed improvement and viability of the current level of service and delivery model. This shall be accomplished through a small committee that can continually review the level of service and delivery model and make recommendations to the Chief officers. A multi-tier plan will be developed to address different issues and different options for delivery of services dependent on the needs and desires of the community, department, and City leaders.	A review of the data in the current study will begin as soon as committee is developed to conduct that review. Once the review is complete, each of the existing recommendations will be revisited and updated based on the current data.	The previous study addressed projected costs of different delivery models. This information will be reviewed and updated to reflect current costs. Cost is dependent upon the level of service delivery desired by the department. Cost of an additional study if needed is between \$25,000-\$40,000



HazMat

Recommendation #1: Develop HazMat Specific SOGs

Rationale: To develop proper SOG's, a committee must be formed to complete the task. This committee must meet on a regular basis in order to track progress, make additional assignments, discuss needs and problems, and to make the process as efficient as possible. It must be a priority task, but will need the proper timeframe for completion. To properly complete this task, there will be associated costs. These costs are necessary for this task.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Form a HazMat SOG committee that meets once per month until SOGs are complete SOGs shall be specific, concise, and thorough	Timeframe – 5 months	\$2,500-\$3,000 overtime cost

Recommendation #2: Develop a true HazMat Team with the ability to train together

Rationale: For our department to possess a "True" HazMat Team, there will be a number of goals to meet. The members of this team will need to train together on a regular basis to be labeled a "Team". The training will need to be developed and planned out well in advance, and approved by the Rescue and Hazmat Subcommittee. This will be a budgetary issue to be approved, but is necessary to bring this recommendation to fruition.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Establish a team consisting of HMTOs or higher. Team will meet once per quarter and complete an 8 hour training drill.	Timeframe: Begin 2018 Priority – Undefined	\$26,000-\$35,000

Technical Rescue

Recommendation #1: Develop Technical Rescue-Specific SOPs

Rationale: SOGs will provide the foundation for our technical rescue program. Having a broad but defined list of guidelines will help our program operate safely, proficiently, and efficiently.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The committee will review the Technical Rescue SOPs of departments with similar or slightly larger size and capabilities in order to compare and develop effective, comprehensive SOPs for our department.	This task needs to start as soon as possible in order to assist in the design and equipment purchasing aspects of our new heavy rescue apparatus acquisition. This will take 90 days to review and submit the initial suggestions.	No Cost.





Recommendation #2: Establish a Technical Rescue Team

Rationale: Designating a team of dedicated members certified and proficient in technical rescue will improve our department's ability to respond to events necessitating interventions from specifically trained responders. Further, establishing a technical rescue team helps to legitimize our department's goal of becoming the best fire department in the nation.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
With the implementation of the SOPs the recommendations for members should be adhered to, and the team should be selected. Upon review of the initial team members suggested, the department will enlist a team for each shift similar to the system already being tested by the Training Division every Thursday. The Training Division, Battalion Chiefs, and Operations Chief, will make the final selections and appropriate notifications, once the Technical Rescue Team has been determined. The technical rescue teams will include Collapse Rescue -many buildings in the city are 85+ years old and are occupied on a regular basis * awaiting information specifics-, Rope Rescue (High Angle-Confined Space)-there are 18 buildings in the city that are over 6 stories tall that would be out of the reach of our 100' aerials and permitted confined space areas in the city *awaiting information specifics, Swiftwater Rescue- the city has 16.5 miles of floatable waterway, Trench Rescue- there are numerous permitted trenches in the city limits *awaiting information specifics	The implementation of this team will need to happen as soon as possible as it imperative that the crew begin training together and becoming familiar with the equipment currently in use. The duration will not have an end point as training is an ongoing discipline. This group believes that this recommendation is not gradually phased-in, but established and staffed fully upon its approval.	The team will need be outfitted with some type of equipment that pertains to technical rescue. The recommendation of the committee is a Rescue Helmet suitable for Technical Rescue, Light Extraction/ Flash gear, and other gear that will be worn during training or incidents that will specific to that team member. Another recommendation of the committee is that there be some type of designation of the team members that will let incident commanders or other departments know of the team's capabilities.



Recommendation #3: Establish a Process for Technical Rescue Incident Review

Rationale: Having a formally established process for the post-incident review of technical rescue incidents will provide many benefits, including streamlining future responses, encouraging development through learning, and proficiency of skills by reviewing actions taken during an incident.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The committee will review the Technical Rescue Incident Review processes of departments with similar or slightly larger size and capabilities in order to compare and develop a process that will best suit our department. The individuals involved in the AAR process will include the Deputy Chief of Operations, Risk Manager, Battalion Chief,*Special Operations Chief (if position is created)	This process needs to start immediately as the possibility of a Technical Rescue incident is possible at any moment.	No Cost.

Facilities, Equipment, and Apparatus

Recommendation #1: Develop a plan to address the safety of both personnel and physical resources using an all-hazards risk assessment.

Rationale: This plan will insure the safety and wellbeing of all FFD employees and equipment is accounted for under a variety of risks.

How to Implement the Recommendation	Timeframe and Priority Level	Associated Costs
How do we accomplish this task? Who is Involved?	How long will it take? Does it need to happen immediately?	How do the costs associated with this recommendation affect our budget?
How? - Identify hazards - Identify safety plan to address each hazard Who? Facilities committee	How Long? Dynamic document that will continue to be updated Priority? High priority – this deals directly with personnel safety	Planning – low budgetary impact Implementing recommendations from the plans – potential for capital improvements

Recommendation #2: Evaluate and improve departmental safety and health initiatives

Rationale: Safety of our employees is the FFD's number 1 concern; therefore we need to insure that we are focusing on important health and safety initiatives including presumptive cancer policies, the implementation of new and cutting edge equipment, etc.

How to Implement the Recommendation	Timeframe and Priority Level	Associated Costs
How do we accomplish this task? Who is Involved?	How long will it take? Does it need to happen immediately?	How do the costs associated with this recommendation affect our budget?
How? - Create and enforce departmental policies and SOGs targeted towards improving safety and health - Maintain familiarity with industry best-practices regarding safety and health Who? Committee TBD	How Long? Ongoing Priority? High	Policy/SOG development – no costs Equipment – potential for high costs



Recommendation #3: Develop a facilities improvement and maintenance plan		
Rationale: This plan will help insure the longevity of our fire stations is being properly considered.		
How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
How? Develop a plan that addresses: • Station improvements • Repairs • Technological advances Who? Committee TBD	How Long? Ongoing – dynamic document Priority? Medium	Variable costs

Personnel Resources

Recommendation #1: Develop and implement SOGs that apply to personnel issues.

Rationale: Well-designed SOGs help both individual workers and managers. For individual workers, SOGs clarify job requirements and expectations in a format that can be readily applied on the job. They explain in detail what the department wants them to do in the situations they are most likely to encounter. The result is improved safety, performance, and morale. For department managers, the advantages are equally great. SOGs provide a mechanism to identify needed changes, articulate strategies, document intentions, implement regulatory requirements, enhance training, and evaluate operational performance. The result is improved operational efficiency, greater accountability, and reduced liability.

-Taken from the USFA's "Developing Effective Standard Operating Procedures" FA-197/Dec 1999

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
We, as a committee, don't know if we have SOG's or not. It is our understanding that SOG's are being worked on, but we do not know where we are in this process. There is a Policy & Procedure Manual at each station, but we do not believe they are current. Over the years, there have been memos and emails sent out that would affect individual policies, but these are not easily accessible for reference when needed. It is our recommendation that a complete and comprehensive set of SOG's be written and distributed so that all members of the FD know what they are. We had several questions during our meetings that we did not know how to answer or where to look for the answer. We believe that a complete and comprehensive set of SOG's would have been able to give us the direction we needed. If we are correct, that SOG's need to be written, a committee should be formed and tasked with creating SOG's for our department.	This needs to happen as soon as possible. The time it will take is dependent upon what, if any, SOG's currently exist. If there is a set of SOG's, then making sure that each copy is up to date and each member knows where to find them would not take very long to accomplish. On the other hand, if we are correct that a set of SOG's does not exist, it will take several months at a minimum to accomplish.	Costs to create and distribute SOG's should be minimal. Any costs associated with this task would be paying the employees for this work. If this is done by current employees during their normal work hours, then there would be no additional cost. If employees are asked to work overtime to accomplish this task, then costs would be dependent on how much overtime is needed.



Recommendation #2: Create an Employee Development Program

Rationale: Individuals who enter a new rank, from firefighter to Battalion Chief, have demonstrated at least a minimum competency for the position. Demonstrating a minimum competency does not guarantee that a person will excel at a given position. If we are to be the best fire department in the country, our personnel need to be the best at their individual jobs.

When FFD hires new personnel, a concerted effort is initiated to train these personnel to become effective Firefighters. Afterwards, to ensure that these efforts are not wasted, the personnel undergo continual evaluation during a probationary period. In order to develop personnel to advance within the FFD we need to implement a similar strategy; we need develop personnel to advance to the next position, and when advancement takes place – monitor them within a predefined probationary period.

For new promotions to managerial roles, training should not focus only on departmental policies, but also City/HR policies and procedures.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
This task would be accomplished by a collaboration between the training division, command staff, and current officers, engineers, and firefighters. A committee would need to be formed to design a program that would effectively prepare individuals for promotion and assist them with development when they begin a new position. Development programs should be developed for all ranks from firefighter to Battalion Chief. Additionally, we would recommend offering compensation to employees who work above their current rank. Individuals who ‘step-up,’ even for a single shift or less, are providing a service to the department and community. They are taking on greater responsibility and should be compensated for it.	This should happen as soon as possible. We believe programs could be created and implemented within a year.	Costs should be minimal as the much of the work needed to accomplish this task can be accomplished by current personnel during their normal working hours.


Recommendation #3: Identify problems and create solutions for current compensation plan

Rationale: Compensation continues to be a problem within our department. We have had an increase in turnover and a decrease in applicants over the past several years. Implementing a solution to the current compensation issues would improve both of these areas. Employees would be more likely to stay and the department would become more attractive to top level applicants. Additionally, morale among current employees would improve, which would be a positive step in making Franklin Fire Department the best fire department in the country. Ignoring these issues will lead to continued turnover, continued low applicant turnout, and poor moral within the department.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
The problems associated with the compensation plan have been well documented. The Association leadership has worked diligently to identify issues and propose solutions. Fire Administration and City Administration need to work with the Association leadership to implement a plan that would address the issues that have been identified. Specific issues include: • Pay compression • Pay inversion • No specified plan for advancement within a given paygrade • No ‘step-up’ pay for anything less than 10 consecutive shifts • No stipends for specialty skills such as HazMat, swiftwater, rope, USAR, etc.	This process should begin as soon as possible. It will probably take 1-2 years to implement a plan that addresses the current issues.	This recommendation has the greatest impact on our budget. We do not have exact numbers, but it would undoubtedly take additional money to address the inversion and compression issues that still exist.



Recommendation # 4: Assign a Dedicated CoF HR Representative to FFD

Rationale: Department personnel are often unsure of HR policies and procedures, especially regarding issues that only occur occasionally. Having individuals who understand the workings of both the Fire Departments and HR acting as a liaison would be beneficial. This individual, or individuals, would be able to answer questions from Fire Department personnel and explain how HR policies and procedures impact the Fire Department.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Our idea is to have either one individual for the department, or one individual per shift that fully understands HR policies and practices and acts as a liaison between the FD and HR. The individual(s) assigned to this task would be current employees who have a desire to serve in this role. These individuals would need to undergo training to fully understand HR's policies and practices and develop relationships that would assist them as they bridge the gap between HR and FD personnel.	This process could be implemented within a 6 month time frame. Individuals would need to be selected and trained in that time.	Costs would be minimal, as much of this work would be done by current employees during their normal working hours. Some overtime may need to be paid during the training process.

Professional Standards

Recommendation #1: Develop and implement recommendations targeted on improving the hiring process

Rationale: The current hiring process is currently outdated and in need of a revision. Points for experience are very important to have quality, well trained personal apply to the City of Franklin. Points for experience would also allow already trained new hires to begin working immediately which would save the City of Franklin a significant amount of money in training and time. The polygraph test in the hiring process needs to be eliminated. This process has kept many well trained and knowledgeable new hires from completing the hiring process due to failure of the polygraph. This test does not pertain to any of the duties and responsibilities of a firefighter. We need to reexamine the hiring process so that the City of Franklin can be competitive with other neighboring department and hire quality personal to better serve the citizens of Franklin. The physical agility test needs to be evaluated also. Increase the physical demands of the applicant and also have the applicant do further skills that would apply to a firefighter's daily activities.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
A complete rebuilding of our current hiring process. Work with command staff to better understand what the City of Franklin needs when hiring employees. Include: Human Resources Command Staff Training Staff Fire Chief	Needs to be implemented immediately before the next hiring process. A new hiring process guideline would not take long to implement..	It does not cost anything. Only time to gather information and analysis the city's needs.





Recommendation #2: Develop training programs targeted on probationary / recently promoted employees

Rationale: There needs to be a standard all new hire and promotional personal have to follow during the probation period. Each personal should have a list of skills that they must be proficient in and should be tested on these skills on a regular basis. These skills will allow the personal to be more proficient in their job and will also allow them to continue their training. Newly promoted personal should also be tested on skills pertaining to their new promotion. Company Officers should be held accountable for these personal and should help these personal continue training and learning about their position. At the current time there is no accountability for personal to be held accountable when the personal cannot perform a skill. We must ensure all personal are trained to the highest level and retain those skills to perform their daily functions..

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Hold new and current employees accountable for continued education and training competencies. Include: Training Staff Command Staff	Needs to happen Immediately. Can be implemented in very short time.	Does not cost anything. Only time.


Recommendation #3: Insure all personnel have access to departmental policies/SOGs

Rationale: The City of Franklin must implement SOPS/SOGS immediately. Every major fire department in the country has SOGS that allow personal to refer to when performing their job assignments. Each personal should have access to these files allowing them to perform their job function as the City of Franklin has outlined in the policy. All job functions of each job title should have a detailed policy on what is expected of the personal on a daily basis. Not having SOPS/SOGS is dangerous and could allow personal to get hurt or potentially sued due to no current written policy on how to perform daily functions. All stations should have a copy of these policy's and also an electronic copy available to be viewed at any time by all personal. SOPS/SOGS also allow for a safer environment on the fire ground and eliminate duplication of efforts.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Have a written copy of all departmental SOPS easy to access in the station. Also provide new and current employees a copy of current SOPS. Include: Command Staff Command Staff Human Resources	Timeframe dependent on Policy/SOG development	Cost of paper and ink. Minimal cost for a huge reward.

Training and Competency

Recommendation #1: Develop Training SOGs

Rationale: Training SOGs provide guidance for how the training division will carry out its functions, outline the process for writing and submitting classes for training (lesson plans, ICS forms, etc.), record keeping criteria. A person unfamiliar with how training operations works should be able to pick up the training SOGs and be able to understand how the training division operates.

How to Implement the Recommendation How do we accomplish this task? Who is Involved?	Timeframe and Priority Level How long will it take? Does it need to happen immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
Development of operational SOGs - List all the disciplines in which the department has commitments. (Fire, EMS, HAZMAT, Rope Rescue, Swift Water Rescue, USAR, etc). - Determine key players in each discipline with expertise, knowledge and desire to participate in a committee to develop SOGs. Gather resources - Research what other departments are doing discover what they are using as their SOGs. - Research best practices in the particular discipline. - Compile and Research product manuals of specialty equipment for each discipline. Write the SOGs - Determine format for writing SOGs.	The topic is related to Training SOGs (how we will conduct the training for the specific discipline). This cannot be developed before an operational SOG has been developed and implemented.	Costs associated with this include: Pay for personnel involved in the committee.

Recommendation #2: Provide Additional Staffing for Training Division
(See Following Pages)





Rationale: In June of 2004 the Training facility opened on Century Court including the addition of a 4-story burn tower, and a 2½ story annex burn building. In 2006 a 2nd training officer was added to meet the demand of a growing department. In the last 10 years the department has grown in many areas. We have added 3 new fire stations and have approximately 160 firefighters. We offer additional services such as advanced life support capabilities on 11 apparatus with 55 paramedics and expanded our capabilities in a variety of special operations. The critical need to respond with appropriate resources in a timely manner is evident, through the attention given to moving apparatus “up” to staging areas to cover other response areas, and the scrutiny given to response times. Call volume has grown incrementally each year. Much of our response capability is based on having companies in their districts in order to provide these services. There are days that shifts have struggles to maintain minimum staffing levels. In attempts to meet training needs often stations are split and companies are out of their response areas while attending training at the training center. These things and more define the true operational picture of our department on a given day. Preoccupation with response times and move ups, all the while reducing your response capability by routinely having groups of fire companies throughout the city at the training center is a conflicting message. This imposes unnecessary risk that a significant event would not occur during this period of diminished response capability. Often large-scale departures from the status quo in the fire service are marked by dramatic events. Look no further than the recommendations made to the Charleston Fire Department (ISO class 1) after having the highest number of firefighter fatalities since 911 or any number of NIOSH reports. Jockeying schedules, apparatus, and personnel is a common event every morning to accommodate narrow windows of opportunity to attend training at the training center. Illustrate above; the training division has not had the smooth, moderate adjustments to the changing circumstances presented to our city and department like in other divisions such as fire prevention.

The training division is responsible to ensure that operations staff have the knowledge, skills and abilities to provide the service. Many services the fire department provide are high risk low frequency events. Skills that are not used often, have a shelf life. Perishable skills must be renewed through practice and training. There is a need for 2 additional instructors to meet the needs of the department. The benefits are as follows:

- **Improved coverage and company staffing** - In order to provide training, the division has had to rob operational staff and also pull companies out of their response area to the training center to fulfill the logistical conditions surrounding the training. In the past, this was an acceptable means of accomplishing the training mission. The current size and operational demands create increased risk and vulnerability by staying with current practice. Though some training (18 hours) is required to be conducted at the training center, the remainder can be achieved in leaving fire companies in their response areas. **Table 1** shows the number of days in the month training was conducted and number of shift personnel used to teach the class. This data comes from a 2016 spreadsheet that tracked shift instructor resources over the entire year. In total 161 days of instruction were provided with 448 operational personnel pulled from their daily company assignment. Of the data (not shown) in 31 of the 161 instructional days, only 1 instructor was pulled from their assignment (20% of the time). The other 130 days more than 2 instructors were required (80% of the time). This data shows the

extreme dependence upon the training division to use operational staff to accomplish its mission.

Table 1

Month of	Days of the Month on shift instructors were used.	Number of on shift instructors used.
January	14	38
February	13	24
March	13	68
April	20	51
May	17	32
June	16	32
July	9	22
August	18	57
September	17	56
October	12	39
November	7	11
December	5	18
Totals	161	448

- **Consistent standardized training** - There is an American idiom that says “too many cooks in the kitchen spoil the broth”. As the department attempts to formalize its practices through SOG’s there is a need for a clear consistent message and practice in how we operate. This can be achieved with a dedicated instructor cadre that operates across all three shifts. Standardization promotes unity and consistency. Unity and consistency promotes reliability and trust.
- **Job specific training** – Adding 2 additional instructors to the training division will provide opportunity to provide formal training for officers, engineers, firefighters, paramedics and special operations. As an example the substance of medical training is primarily focused at the EMT/AEMT level. The emphasis on fire ground operations is primarily focused at the firefighter level. Special operations type training has been inconsistent and infrequent. Having the ability to provide specific training for individual roles promotes confidence, better decision making and validation of performance.
- **Promotes station unity and allows for company officers to identify deficiencies** - Current practices in training splits the station and companies into groups. Stations do

not get to train together. Station officers do not get to fully evaluate their stations company's capability as they may not go to the same training on the same day.

- **Flexibility in the schedule** – Daily activities, staffing callouts, weather conditions all affect the shift or a particular station. Additional instructors can help alleviate scheduling issues and time constraints to get training completed in a reasonable window of time. It will also provide training that can occur in parallel on the same day at different stations.
- **Better utilization of the training center**- Additional instructors will allow for opportunities for the training department, and Battalion Chiefs to bring “alarm assignments” down to be evaluated and concert their strategies and tactics.
- **Determine competencies** – A newer component in the strategic plan is developing a credentialing program for promotional eligibility, and determining and validating competencies. The addition of a newer rolls and responsibilities will compete for other responsibilities already imposed on the training division.
- **Unification of strategies** - The conduit for change and operational effectiveness is through the training division. A look at other components of the strategic plan being developed will show that the addition of 2 additional instructors will alleviate some of the issues that have risen out of other strategies. For example: EMS recommendation #1, regarding the creation of an EMS division. A part of the recommendation involves the addition of an EMS training position. EMS recommendation #2 addresses improvements in the QA program. If deficiencies are revealed in the QA process, one of the additional instructors could be tasked with developing training on the topic.

Consequences of the status quo

Regression, increased risk and vulnerability is the future of the department without growing the training division. Under current practice it is impossible to meet the training needs to assure that operations staff are capable of meeting stakeholder expectations. As an example: How many of you are assured that all the paramedics are capable of reading a 12 lead ECG? An AEMT can confidently start an IV? An Engineer or back up driver can provide water or an Officer command a fire ground? These are expectations of the public and other stakeholders. These are the services we boast about providing. What is the true functional state of our capability? What is the risk the leadership is willing to assume of failing to meet these obligations?

Standardization and a consistent message will be difficult to achieve utilizing a variety of operations staff as instructors. Opinion, instructional capability, subject matter knowledge, preparation and interest in the topic can influence the effectiveness of training. This can add to or take away the value of training. Dedicated instructors will not supplant the need for on shift instructors. Dedicated instructors can provide both primary and adjunctive instruction to meet the goals, and objectives of the training topic.





It has been 11 years since the training division has seen any growth. With its small staff its capability has become a barrier to future growth and opportunity for the fire department. Without providing additional instructional staffing the department will be severely restricted to carry out its agenda outlined in the strategic plan.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
• Perform a gap analysis of existing training structure to determine what needs are not being met. • A job description and specification will need to be developed to outline the roles and responsibilities of the position. • Involvement needs to be primarily from the Training Chief, and training Captain as they have a greater knowledge of the needs of the training division.	Timeframe is dependent upon: • the work load of those developing the job description and specification. • the bureaucratic and budget process of getting the position approved.	Determined by pay grade assigned to the position.



Recommendation #3: Develop a Credentialing program for Apparatus Operator and Company Officer

Rationale: Credentialing is a process in which our fire department will assure that each member is properly qualified to perform the KSA's of a particular job. It legitimizes the certifications that operations staff acquire through TFACA, and the fire commission. It is an undertaking to review and verify with confidence the abilities of an individual.

Past practice only requires the collection of certificates as the only means of determining an individual's qualifications to serve a particular roll such as firefighter, Engineer or Fire Officer. This does not provide the total picture of an individual's ability. The Franklin Fire Department has different operational characteristics, methodology and equipment. A formal credentialing program provides a checklist that demonstrates the KSA's unique to us. Those seeking advancement or desire to "ride up" must have the level of certification and credentials to assume that roll.

How to Implement the Recommendation How do we accomplish this task? Who is involved?	Timeframe and Priority Level How long will it take? Does it need to happen Immediately?	Associated Costs How do the costs associated with this recommendation affect our budget?
- Determine key players in each discipline (engineers, officers, HR) with expertise, knowledge and desire to participate in a committee to develop the credentialing program. - Identify KSAs (knowledge, skills and abilities) and essential functions for the role specific to the department. - Research other departments to find examples of their programs. - Develop evaluation process for the KSA and essential functions. - Require completion of the credentialing process for eligibility for promotion.	-6 months to develop the program. - Implementation timeline needs to be a longer period of time to assure opportunities for completion and to provide an adequate pool of candidates to pursue the promotional process.	Costs associated with this include: Pay for personnel involved in the committee.

Appendix D: Recommendation Measurements

Administration Recommendation Measurements

Description	Person(s) Responsible	Measurements	Measurement Date	Measurement Details
Create a Standards of Cover document that incorporates all available planning elements currently in existence.	All BCs, All DCs, combination of 3 individuals from each rank per shift, GIS, Codes Official, Water Department Rep	Process	Every 3 months	Measure against accreditation template that defines processes - More information needed upon completion
Define a methodology for determining fire loss and saves	Jose	Process	Measure based off of each fire loss incident over the first year	Results - Research models and adjust as necessary, provide training, implement, revise standard as necessary. May revise as needed. Dollars lost v. dollars saved. Include insurance agencies for reference
Develop and initiate a pre-fire planning initiative focusing first on high life safety and critical infrastructure.	Fire Prevention (inspectors), 3 DCs, ASO, Training, Admin Cpt,	Process	Quarterly	Define the list, define data elements, define resources to support the initiative, train, implement, evaluate. This will provide us with data that helps produce the standard of cover to insure that the right resources respond to the right calls.
Create reports that clearly demonstrate the department's efforts with regard to planning, response, education and other relevant data	Admin Chiefs, ASO, IT, FH trainers, Input from all suppression personnel. Utilize committee from API	All	Monthly	Define data elements, create the reports, train on the reports, run the reports making adjustments as needed. This will evaluate every aspect of our department for compliance with everything this committee is working on to establish. Standards of cover, Goal setting, public education, response,
Complete a review and revision of the Fire, Hazardous Materials and Search and Rescue Annexes to the City's Emergency Operations Plan	Chief Horton	Process	Monthly, switch to annual review upon completion	Ensure that the plan covers all major disasters affecting our area and how we respond to them effectively. Define the major emergencies, perform risk analysis, implement response packages
Develop and perform an all-hazards risk analysis process and create SOGs that govern our role in preparing and responding to these events	Horton	Process	6 month evaluation	Define the risk analysis process, define the planning zones, develop the SOGs, train on the risk analysis, implement, evaluate
Develop programs for preparation and response to major emergencies	Chief Horton	Process	Quarterly evaluation	Define our major emergencies, research other programs and guidelines, define the program elements, train, implement. This ensures that we utilize our resources and do the most good for the most people during major emergencies
Develop a departmental goal setting process	Fire Chief			



Assessment, Planning, and Implementation

Recommendation Measurements

Description	Person(s) Responsible	Measurements	Measurement Date	Measurement Details
Determine the scope of the monthly FFD division reports	Starter committee - 2 bcs, 2 cpts, 2 Its.			
Establish a Review Process for Policies and SOPs	It, Mackey	Results		
Utilize a Password Management Software System				
Improve the process of estimating and reporting actual fire loss amounts	Jose	All	Annually	Results - Research models and adjust as necessary, provide training, implement, revise standard as necessary. May revise as needed. Dollars lost v. dollars saved. Include insurance agencies for reference
Create a central location for all FFD forms, SOGs, programs, etc.	IT, ASO	Process	Quarterly	All needed data is easily located
Use the strategic plan to tie-in the budgeting process with departmental goals and strategies		Process and Results	Annual	Evaluate budget process and departmental goals against the strategic plan
Establish a compensation plan	6 Person committee - 3 from fire admin, 3 from local	Process and Results	Annually	Retention #s, Recruitment #s - Results based. Process - evaluate where personnel are based on years in grade, and evaluate ranks based on inversion values. Number of people participating in extra activities.
Conduct an annual review of apparatus and vehicle replacement scheduling	Horton	Process and Results	Annual	Determine variables - for instance, amount of time apparatus is out of service, amount of dollars spent on repairs per road mile / operating hour. Ensure we have safe apparatus on the road. Is this vehicle still meeting the purpose for which it was purchased as compared against the standard of cover document.
Review, develop, and implement departmental SOGs and Policies		All	Review after two months initially. After completion of initial process, conduct a 6 month review of all SOGs.	Industry standards, feedback from personnel, review process of SOGs
Review options to increase administrative support for operational division	4 person committee with Cpt. Mackey, Cpt. Pardue, 1 BC, 1 Cpt. (diff. shifts)	Results and Performance	Upon completion of the 3 month review period	Recommendation produced



Community Risk Reduction Recommendation Measurements

Description	Person(s) Responsible	Measurements	Measurment Date	Measurement Details
Develop a comprehensive list of all buildings in the city	GIS, Asst fire marshall, county official, ASO	Process	6 months	Has the list been identified? Are methods in place to keep data current? What data is included? What could be included in the future? Is the data transportable?
Develop and implement a plan to inspect existing buildings on a regular basis	King, Edelman	Process	3 months	What buildings should be inspected? How often? Identify resources needed, how long it would take, and recurrent schedule.
Develop specific recommendations targeted on improving the Infor data management system	Woolard, Edelman, IT			
Implement a fire protection systems permitting process	King, Woolard, BNS, IT			
Develop and implement standard operating procedures / guidelines				
Develop and implement a Community Risk Reduction Plan	King			
Develop and implement a pre-planning program				
Develop and implement a mandatory residential sprinkler requirement	Gerth, Chief, King			
Maximize communication within unit and organization	Edge, Woolard, Sanders, King	Process	3 months	Are regular meetings scheduled?
Establish formal unit structure	Edge, Woolard, Sanders, King	Results	1 month. Evaluate annually after initial review.	Have the team members been selected? Qualified?
Expand program capabilities	Edge Sanders Woolard King			
Ensure high quality data collection/dissemination	Edge, Woolard, Sanders, King	Results	1 month. Evaluate monthly after initial review.	All members are trained in the BATS system and all reports are entered.
Develop and implement Juvenile Firesetting Program	Edge, Woolard, Sanders, King	Process	6 months	Do we have a better relationship with juvenile district attorneys, and CASA
Define roles and responsibilities related to public information	DCs, Melton, Woolard	Process	3 months	Are we missing opportunities to connect with the public? Are we responding effectively to requests for information?
Design, create and deliver compelling educational programs that target and reduce specific risks	Melton, King, Sean Smith, Sanders	Process	Quarterly	Did we identify current risks? Are we reaching target audience? Are we reaching sufficient audience?
Create physical facilities for public education and public information	Melton, DCs, Edge			
Implement a functional work-order system	Lt. Forehand, Wayne Mobley, DC King, One person per shift, Water dept personnel, IT staff	Process and Results	6 month	Are the work orders being entered? Are follow-ups being conducted (internally and externally)? Are work orders being reviewed by external water agencies?
Establish a water model	King			
Evaluate Rural Response Capabilities	Johnson			



Response and Physical Resources

Recommendation Measurements

Description	Person(s) Responsible	Measurements	Measurment Date	Measurement Details
Improve the QA Program	Sarah Glenn, EMS Sub, Wes, Clay, IT	Results and Performance	6 month review of the process. Monthly review of the medical reports	Number of deficient reports identified during the review process
Research and Implement Solutions to Improve the Inventory Control System	Sarah Glenn, EMS Sub, Wes, Clay, IT	Process and Results	6 months	Is the current software solution meeting our needs? Identify necessary data points for tracking
Explore the Viability of a Bystander CPR Program	Glenn	Process and Results	Revie the program within the first 3 months. 6 month recurring review after process	Registered users, active users, documented saves, improved survivability
Implement a Method to Solicit External Stakeholder Feedback on all Departmental Services	Glenn, IT	Results and Performance	6 months	Internal / external customer feedback
Study and develop a plan for Transport / EMS Division / Independent Medical Director	Sarah Glenn, EMS Sub, Wes,	Process and Results	24 month reassessment	Do the results of the study meet the needs of the department? Are we compliant with state regulations and requirements? Are we meeting the needs of the community?
Develop a plan to address the safety of both personnel and physical resources using an all-hazards risk assessment.	Captain Mackey, Brad Wilson, Deputy Chiefs, Jonathan Gill, Andrew Ivey, Rodney Balington	Results and Performance	6 months	Review worker's comp claims and property damage reports
Evaluate and improve departmental safety and health initiatives	Operation staff - battalion chiefs, training division, Potential for outsourcing (Outsourcing)	Results and Performance	6 month, semi annual review	work with incident claims & property damage reports
Develop a facilities improvement and maintenance plan	Subcommittee, Clay, Brad Wilson, Gill	Results and Performance	6 months	Lower cost of maintenance reported throughout our current facilities
Develop HazMat Specific SOGs				
Develop a true HazMat Team with the ability to train together	BCs, Hazmat sub, training	Results and Performance	Quarterly	Response - post incident review. Training - compliance with NFPA/OSHA standards
Develop and implement SOPs for Suppression Ops	Operation staff - battalion chiefs, training division, Potential for outsourcing (Outsourcing)			
Train Members on New SOPs utilizing Target Solutions platform		Results	6 month review	Are we reaching the personnel that we need to? Track through target solutions platform
Develop and Implement Operations Staffing Levels				Are we meeting NFPA 1710
Develop Technical Rescue-Specific SOPs				
Establish a Technical Rescue Team	BCs, Hazmat sub, training	Results and Performance	Quarterly	Response - post incident review. Training - compliance with NFPA/OSHA standards
Establish a Process for Technical Rescue Incident Review	BCs, Tech Rescue Sub, training	All	6 month review of the process, with additional review of each incident	Are we meeting the industry standard? Are we NFPA/OSHA compliant?



Training and Personnel Recommendation Measurements

Description	Person(s) Responsible	Measurements	Measurement Date	Measurement Details
Develop and implement SOGs that apply to personnel issues				
Create an Employee Development Program	Training,	All	Annually	Certifications, training hours, increased education, advancement through the ranks
Identify problems and create solutions for current compensation plan	6 Person committee - 3 from fire admin, 3 from local			
Work with HR to develop and implement a dedicated HR representative for the FD	Chief Jennings works with HR to develop a job description	Process and Results	Annual	Completing job description, obtaining approval from HR, did the process occur?
Develop and implement recommendations targeted on improving the hiring process	Training and HR	Process and Results	Initial review upon completion of the new process, then a subsequent review of each additional process	Evaluate the qualifications/certifications of new hires
Develop training programs targeted on probationary / recently promoted employees	Training	All	Annually	Upon completion of the taskbook (based off NFPA standard)
Insure all personnel have access to departmental policies/SOGs				
Develop Training SOGs				
Provide Additional Staffing for Training Division	Normal promotional process managed by HR	Results	Annual	Total number of training hours presented by training division each year. Compared annually
Develop a Credentialing program for Apparatus Operator and Company Officer	Training	All	Annually	Upon completion of the taskbook (based off NFPA standard)



RESOLUTION 2017-90
A RESOLUTION TO AFFIRM COMPLIANCE WITH
FEDERAL TITLE VI REGULATIONS

WHEREAS, both Title VI of the Civil Rights Act of 1964 and the Civil Rights Restoration Act of 1987 provide that no person in the United States shall, on the ground of race, color or national origin be excluded from participation in, be denied the benefits of or be subjected to discrimination under any program or activity receiving federal financial assistance; and

WHEREAS, the Tennessee Attorney General opined in Opinion No. 92.47 that state and local governments are required to comply with Title VI of the Civil Rights Act in administering federally funded programs; and

WHEREAS, the City of Franklin receives federal funds for various projects through several state agencies such as the Tennessee Department of Transportation (TDOT) the Tennessee Department of Environment and Conservation (TDEC) and others, as well as some federal agencies directly; and

WHEREAS, by virtue receiving the federal funds through the state agencies, the Board of Mayor and Aldermen need to confirm that the City is in compliance with the regulations of Title VI of the Civil Rights Act of 1964 and the Civil Rights Restoration Act of 1987.

NOW THEREFORE, BE IT RESOLVED by the Board of Mayor and Aldermen of the City of Franklin, Tennessee:

SECTION 1. The Board of Mayor and Aldermen of the City of Franklin declares that the City is in compliance with the federal Title VI regulations.

SECTION 2. Any state agency providing pass through federal funds to the City, or any federal agency providing funds directly to the City may from time to time monitor the City's compliance with federal Title VI regulations.

SECTION 3. This Resolution shall take effect upon adoption, the public welfare requiring it.

Adopted this 23rd day of January, 2018.

ATTEST:

CITY OF FRANKLIN, TENNESSEE

By: _____
ERIC S. STUCKEY
City Recorder

By: _____
DR. KEN MOORE
Mayor

PARKLAND ACQUISITION AGREEMENT
COF CONTRACT NO 2016-0098
Amendment No. 1

This amendment ("Amendment") is entered by and between THE CITY OF FRANKLIN, TENNESSEE ("City"), and CRESCENT LOCKWOOD, LLC ("Developer"), on this the 22nd day of DECEMBER, 2017.

WHEREAS, the parties entered into the Parkland Acquisition Agreement (COF Contract No. 2016-0098) on June 22, 2017; and

WHEREAS, the City, with aid from its consultant, CDM Smith, has determined there to be significant costs to rehabilitate the lake located on the Future Park Tract; and

WHEREAS, the parties have negotiated a reduced purchase price and a revision to the dates set forth in the Agreement.

NOW THEREFORE, the City and the Developer, their successors and assigns, do hereby agree as follows:

1. The foregoing recitals are incorporated into this Amendment and made a part thereof.
2. Paragraph 3 is amended as follows:

Developer will pursue the creation of a plan to delineate the portion of the Future Park Tract or on other property as may be approved by the City on which Developer will be entitled to cut and grade soil to accommodate development work within the Lockwood Glen development (the "Grading Plan"). Developer will deliver the Grading Plan to the City for review and approval no later than March 1, 2018, and all approvals and permits related thereto (collectively, the "Grading Approvals") must be approved by the City.

3. The first four sentences of Paragraph 4 are amended as follows:

The City will purchase the Future Park Tract no later than December 31, 2017 (the "Closing Date"). The purchase price for the Future Park Tract is FIVE HUNDRED THOUSAND AND NO/100 DOLLARS (\$500,000.00).

4. Paragraph 7 is amended as follows:

After the Closing Date, the City will undertake all maintenance and management responsibilities for the Future Park Tract, including without limitation the drainage facilities located on the Future Park Tract; provided, however, that Developer will have the obligation to remove siltation resulting from its development and construction activities.

5. All other terms shall remain the same.

Approved by the Franklin Board of Mayor and Aldermen on June 22, 2017.

WITNESS our hands on the dates as indicated.

[SIGNATURES ON FOLLOWING PAGES]

DEVELOPER

CRESCENT LOCKWOOD, LLC, a Delaware limited liability company

By: 
Rob Davenport, Vice-President

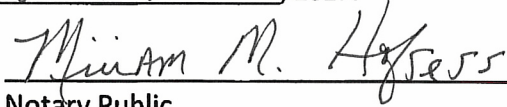
Date: 12/22/17

STATE OF North Carolina)

COUNTY OF Mecklenburg)

Before me, Miriam M. Hofers, a Notary Public of said County and State, personally appeared Rob Davenport, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who, upon oath, acknowledged himself to be Vice President (or other officer authorized to execute the instrument) of Crescent Lockwood, LLC, the within named bargainor, a limited liability company, and that he as Vice President of the limited liability company executed the foregoing instrument for the purposes therein contained.

Witness my hand and seal on this 22 day of December, 2017.


Notary Public
My Commission Expires: _____

Approved as to form by:

My Commission Expires 8-17-2018

Bryan Echols
Counsel for Developer

CITY

CITY OF FRANKLIN, TENNESSEE, a
municipality

By: Eric S. Stuckey
ERIC S. STUCKEY
City Administrator

Date: 12-22-2017

STATE OF TENNESSEE)

)

COUNTY OF WILLIAMSON)

Before me, the undersigned Notary Public of said County and State, personally appeared ERIC S. STUCKEY, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who, upon oath, acknowledged themselves to be the Mayor and City Administrator, respectively, of the City of Franklin, Tennessee, the within named bargainor, a municipality, and that as such Mayor and City Administrator executed the foregoing instrument for the purposes therein contained, by signing the name of the municipality by themselves as Mayor and City Administrator.

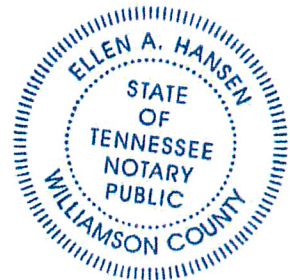
Witness my hand and seal this 22 day of December, 2017.

Ellen A. Hansen
Notary Public

My Commission Expires: October 9, 2018

Approved as to form by:

Shauna R. Billingsley
Shauna R. Billingsley, City Attorney



CONCEPTUAL ENGINEERING REPORT

**Robinson Lake Dam
Franklin, Tennessee**

City of Franklin

December 8, 2017



Robinson Lake Dam

Franklin, Tennessee

Conceptual Engineering Report

December 8, 2017

Prepared By:
CDM Smith

Reviewed By:
CDM Smith

John Briand
Geotechnical Engineer

Stephen Whiteside, P.E.
Vice President

David Mason, P.E.
Associate

Table of Contents

Executive Summary	ES-1
--------------------------------	-------------

Section 1 - Introduction

1.1 Background	1-1
1.2 Purpose and Scope	1-1
1.3 Elevation Datum	1-2
1.4 Report Limitations	1-2

Section 2 - Site Conditions

2.1 Site Description.....	2-1
2.2 Geologic Setting.....	2-1

Section 3 - Conceptual Design Considerations

3.1 General	3-1
3.2 Tennessee Dam Regulations	3-1
3.2.1 Dam Size and Hazard Classification.....	3-1
3.3 Site Constraints.....	3-2
3.4 Design Standards	3-2
3.4.1 General TDEC Design Criteria	3-2
3.4.2 Stability Criteria	3-3
3.4.3 Hydrologic/Hydraulic (H/H) Criteria	3-3
3.4.4 Other Requirements	3-4
3.4.4.1 Dam Crest Width	3-4
3.4.4.2 Project Schedule	3-4
3.4.4.3 Construction Limits and Laydown Areas.....	3-4
3.4.4.4 State Regulatory Requirements.....	3-4

Section 4 - Overview of Design Studies and Analyses

4.1 Studies	4-1
4.1.1 Preliminary Dam Inspection.....	4-1
4.1.2 Site Surveys	4-1
4.1.3 Geotechnical Investigation Program.....	4-1
4.1.3.1 Test Borings	4-1
4.1.3.2 Monitoring Well.....	4-3
4.1.3.3 Geotechnical Laboratory Testing Program.....	4-4
4.1.4 Subsurface Conditions	4-4
4.1.4.1 Embankment Fill	4-4
4.1.4.2 Residual Soils.....	4-8
4.1.4.3 Limestone	4-8
4.1.4.4 Groundwater Levels	4-8
4.1.4.5 Expected Variation in Subsurface Conditions	4-10
4.1.5 Geophysical Investigation Program.....	4-10
4.2 Engineering Evaluation	4-10
4.2.1 Dam Break Analyses.....	4-10

4.2.2 Hydrologic and Hydraulic (H/H) Analyses	4-11
4.2.2.1 Existing Outflow Structures.....	4-11
4.2.2.2 Initial Analyses	4-11
4.2.2.3 Potential Improvements to the Robinson Lake Dam Spillway	4-11
4.2.3 Geotechnical Analyses.....	4-11
4.2.3.1 Seepage Analyses	4-12
4.2.3.1.1 General.....	4-12
4.2.3.1.2 Model Set-Up	4-12
4.2.3.1.3 Analyses and Results	4-12
4.2.3.2 Slope Stability Analyses.....	4-12
4.2.3.2.1 General.....	4-12
4.2.3.2.2 Model Set-Up	4-13
4.2.3.2.3 Analyses and Results	4-13
4.2.3.3 Karst Potential Evaluation.....	4-13

Section 5 - Overview of Conceptual Design

5.1 General.....	5-1
5.2 Description of Proposed Improvements.....	5-1
5.2.1 Earth Embankment Rehabilitation	5-6
5.2.2 Foundation Preparation	5-6
5.2.3 Spillways	5-6
6.1 General.....	6-1
6.2 Meetings with Agencies.....	6-1
6.3 Required Permits, Certifications, and Notifications.....	6-2
6.3.1 TDEC ARAP Permit.....	6-2
6.3.2 TDEC Alteration Permit	6-3
6.3.3 TDEC NPDES Stormwater Construction Permit.....	6-3
6.3.4 FEMA No-Impact Certification	6-4
6.3.5 USACE Pre-Construction Notification.....	6-4
6.3.6 USACE Section 404 Permit.....	6-4

Section 7 – Construction Considerations

7.1 General.....	7-1
7.2 Contract Documents	7-1
7.3 Suggested Construction Sequence.....	7-1

Section 8 – Conceptual-Level Recommendations

8.1 Recommendations	8-1
8.2 Opinion of Probable Construction Cost	8-2

Figures

Figure 2-1 - Locus Map	2-2
Figure 4-1 - Subsurface Investigation Plan	4-2
Figure 5-1 - Proposed Dam Rehabilitation Plan	5-2
Figure 5-2 - Proposed Dam Rehabilitation Primary Spillway Cross-Section	5-3
Figure 5-3 - Proposed Dam Rehabilitation Embankment Cross-Section	5-4
Figure 5-4 - Proposed Dam Rehabilitation Emergency Spillway Cross-Section	5-5

Tables

Table 3-1 - Tennessee Dam Size Classifications.....	3-1
Table 4-1 - Summary of Geotechnical Laboratory Index Test Results.....	4-5
Table 4-2 - Summary of Triaxial Compression Test Results.....	4-6
Table 4-3 - Summary of Subsurface Investigation Program.....	4-7
Table 4-4 - Summary of Monitoring Well Readings	4-9
Table 8-1 - Summary of Conceptual-Level Opinion of Probable Construction Cost.....	8-2

Appendices

Appendix A - Preliminary Inspection Memorandum
Appendix B - Test Boring Logs
Appendix C - Monitoring Well Installation Log
Appendix D - Report of Site Characterization and Geophysical Services
Appendix E - Dam Break Analyses
Appendix F - Hydrologic and Hydraulic (H/H) Analyses
Appendix G - Geotechnical Analyses

Executive Summary

CDM Smith was retained by the City of Franklin, Tennessee (the City) to perform a conceptual design study of Robinson Lake Dam. Robinson Lake is located in Franklin, Tennessee between Interstate 65 (I-65) and Carothers Parkway. The lake is impounded by the Robinson Lake Dam on the south side of the lake. It is our understanding that the City is considering acquiring the property on which the dam and lake are located.

The existing dam is an earth embankment dam with a concrete auxiliary spillway in the right abutment area, discharging to the Harpeth River. The dam has a structural height of 22.5 feet and hydraulic height of 19 feet, with a storage capacity of 91 acre-feet at normal pool and 136 acre-feet at maximum pool. The dam site is covered with trees, brush, and tall weeds. The crest is about twelve feet wide with an approximate ground surface at El. 645. The upstream slope is partially covered with riprap and concrete fragments. The upstream and downstream slopes are steep to very steep slopes and are typically 1.5 horizontal to 1 vertical (1.5H:1V) or steeper. In addition, a bare eroded area is present on the crest and downstream slope that may be due to a previous overtopping event. A large seepage flow has been observed through bedrock adjacent to the end of the spillway at the Harpeth River.

The scope of work included a review of available information; a geotechnical investigation including conducting geotechnical test borings, geophysical survey, and geotechnical laboratory testing; simplified inundation mapping; hydrologic/hydraulic (H/H) modeling of the dam; geotechnical analyses including seepage and slope stability analyses; an outline of regulatory requirements; and development of the dam rehabilitation conceptual design and an opinion of probable construction cost (OPCC). This report presents CDM Smith's conclusions and recommendations based upon the data and analyses for this study.

The geotechnical investigation consisted of five geotechnical test borings, installation of one monitoring well, and four geophysical test lines, using Electrical Resistivity Imaging (ERI), along the dam crest and perpendicular to the dam crest for identification of potential karst conditions. Based on the investigation, potential karst conditions were identified. The existing dam embankment fill materials and residual soils appear to be suitable for the proposed rehabilitation of the dam.

The conceptual rehabilitation design includes the following major improvements:

- **Rehabilitation of the Existing Earth Embankment:** The rehabilitation of the existing earth embankment is proposed to include site clearing and grubbing, flattening the upstream and downstream slopes to 3H:1V, armoring the upstream slope from El. 638 to the dam crest with grass-lined articulating concrete block (ACB), and widening the dam crest to 15 feet.
- **Foundation Grouting Program:** To address observed and potential seepage conditions, a foundation grouting program is recommended to address potential seepage paths in the

fractured bedrock zone and potential karst conditions noted during the geophysical program. An internal drainage system will be installed in the embankment to control seepage through the dam.

- **Construction of a New Primary Spillway:** The primary spillway construction is proposed to consist of a 4-foot by 12-foot concrete box riser to El. 640 with a 48-inch-diameter prestressed concrete cylinder pipe (PCCP) outlet pipe discharging to a 20-foot-wide impact stilling basin and riprap-lined discharge channel extending to the Harpeth River. The concrete riser drop-inlet will include a low-level outlet gate to lower the lake levels when necessary. The primary spillway is proposed to pass the 25-year design storm without activating the auxiliary or emergency spillways.
- **Replacement of the Existing Auxiliary Spillway:** The auxiliary spillway rehabilitation is proposed to include replacement of the existing cracked and damaged trapezoidal concrete chute spillway along the entire length of the spillway to the Harpeth River. The auxiliary spillway will include an underdrain system that discharges at the Harpeth River. The auxiliary spillway is proposed to pass the 100-year design storm without activating the emergency spillway.
- **Construction of a New Emergency Spillway.** Construction of a new 355-foot-wide, grass-lined emergency spillway to El. 644. The emergency spillway construction is proposed to include armoring with ACB extending from El. 638 on the upstream slope to the first 100 feet of the grass-lined discharge channel. A small embankment (up to 3 feet high) will be constructed on the eastern edge to direct the flow to the Harpeth River. The emergency spillway is proposed to pass the 1/3 Probable Maximum Precipitation (1/3 PMP) design storm.

The conceptual design OPCC is approximately \$2.5 million. Engineering design, and permitting costs are estimated to be approximately 25% of the construction cost (i.e., about \$625,000). The OPCC breakdown can be found in **Table 8-1**.

Section 1

Introduction

1.1 Background

CDM Smith was previously engaged by the City of Franklin to perform a preliminary assessment of Robinson Lake Dam prior to the City's potentially acquiring the private property on which the dam and lake are located. The purpose of the preliminary assessment was to identify potential dam safety deficiencies and provide recommendations for future actions. The preliminary assessment is summarized in the CDM Smith memorandum titled *Preliminary Assessment of Robinson Lake Dam* dated June 23, 2017.

As a follow-up to that preliminary assessment, the City has requested that CDM Smith perform a conceptual-level design evaluation to identify potential deficiencies, provide a proposed alternative for rehabilitation, and develop an Opinion of Probable Construction Cost (OPCC) for the rehabilitation. Our conceptual design services included field investigations, design analyses, and development of a potential rehabilitation alternative for the dam.

1.2 Purpose and Scope

The purpose of this report is to present the results of our study and provide a recommended alternative and OPCC for the City to aid in proceeding with redevelopment of the dam site property. Specifically, our scope of work included the following:

- Review existing information including available dam records, geologic maps, topographic surveys including field and bathymetric surveys, and LiDAR data of the Robinson Lake drainage basin and surrounding area;
- Conduct five (5) geotechnical test borings (three (3) along the dam crest and two (2) in the downstream area of the existing dam) to investigate subsurface conditions and to obtain soil and rock samples;
- Install one (1) monitoring well along the dam crest to measure groundwater levels;
- Perform geophysical studies consisting of Electrical Resistivity Imaging (ERI) with one (1) ERI survey line along the length of the dam crest and three (3) ERI survey lines perpendicular to the dam crest;
- Perform geotechnical laboratory tests on selected samples to assist with the classification of soils and development of engineering properties;
- Coordinate with the Tennessee Department of Environment and Conservation (TDEC) to determine regulatory requirements;
- Conduct a dam break analysis using DSS WISE (Decision Support System for Water Infrastructure Security) tool to evaluate potential downstream impacts;

- Perform conceptual-level hydrologic/hydraulic (H/H) analyses for the dam drainage area, dam, spillway and downstream areas;
- Perform preliminary seepage and slope stability analyses for the current dam structure and proposed dam rehabilitation alternative;
- Develop the conceptual design drawings for the recommended dam rehabilitation measures;
- Prepare an OPCC for the recommended dam rehabilitation; and
- Prepare this report presenting the data and conclusions of the conceptual design.

1.3 Elevation Datum

Elevations noted herein are in feet and referenced to North American Vertical Datum of 1988 (NAVD 88).

1.4 Report Limitations

This report has been prepared for the Robinson Lake Dam project, located in Franklin, Tennessee and is based upon information available at the time of this report and presented herein. This report has been prepared in accordance with generally accepted engineering practices. No other warranty, express or implied, is made. In the event that changes in the design or location of the structures occur or a variation in the subsurface or hydrologic/hydraulic conditions is encountered, the conclusions and recommendations contained herein should not be considered valid unless verified in writing by CDM Smith.

Section 2

Site Conditions

2.1 Site Description

Robinson Lake is located in the City of Franklin, Tennessee and bordered by Interstate 65 (I-65) to the west, wooded areas and residential structures to the north, Carothers Parkway to the east, and the Harpeth River to the south. The existing dam for Robinson Lake is an earth embankment dam approximately 375 feet long with a crest width of 12 feet at EL. 645. Based upon our observations during the previous site visit, the possible primary spillway drop-inlet is not visible/functioning and the 47-foot-wide trapezoidal concrete auxiliary spillway in the right abutment area is the only means of discharge to the Harpeth River. According to the National Inventory of Dams (NID) database, the dam has a structural height of 22.5 feet, hydraulic height of 19 feet, a storage capacity of 91 acre-feet at normal pool, and a storage capacity of 136 acre-feet at maximum pool. It should be noted that the dam height listed in the NID database is measured from the dam crest to the riverbed of Harpeth River. The appropriate dam height as measured from the dam crest to downstream toe is about 11 feet.

The dam site is covered with trees, brush, and tall weeds. The upstream slope is partially covered with riprap and concrete fragments and is steep, typically ranging from 1.5H:1V to near vertical. The downstream slope is also steep, typically 1.5H:1V with a bare eroded area that may be due to a previous overtopping event.

During the previous site visit, the CDM Smith representatives observed a vertical 36-inch-diameter, 12-foot-long reinforced concrete pipe extending 8 feet below ground surface (ft-bgs) just beyond the downstream slope of the dam. We believe this pipe may be a remnant of the original primary spillway, but the bottom of the pipe had 3 feet of sediment, and no outlet pipes were observed.

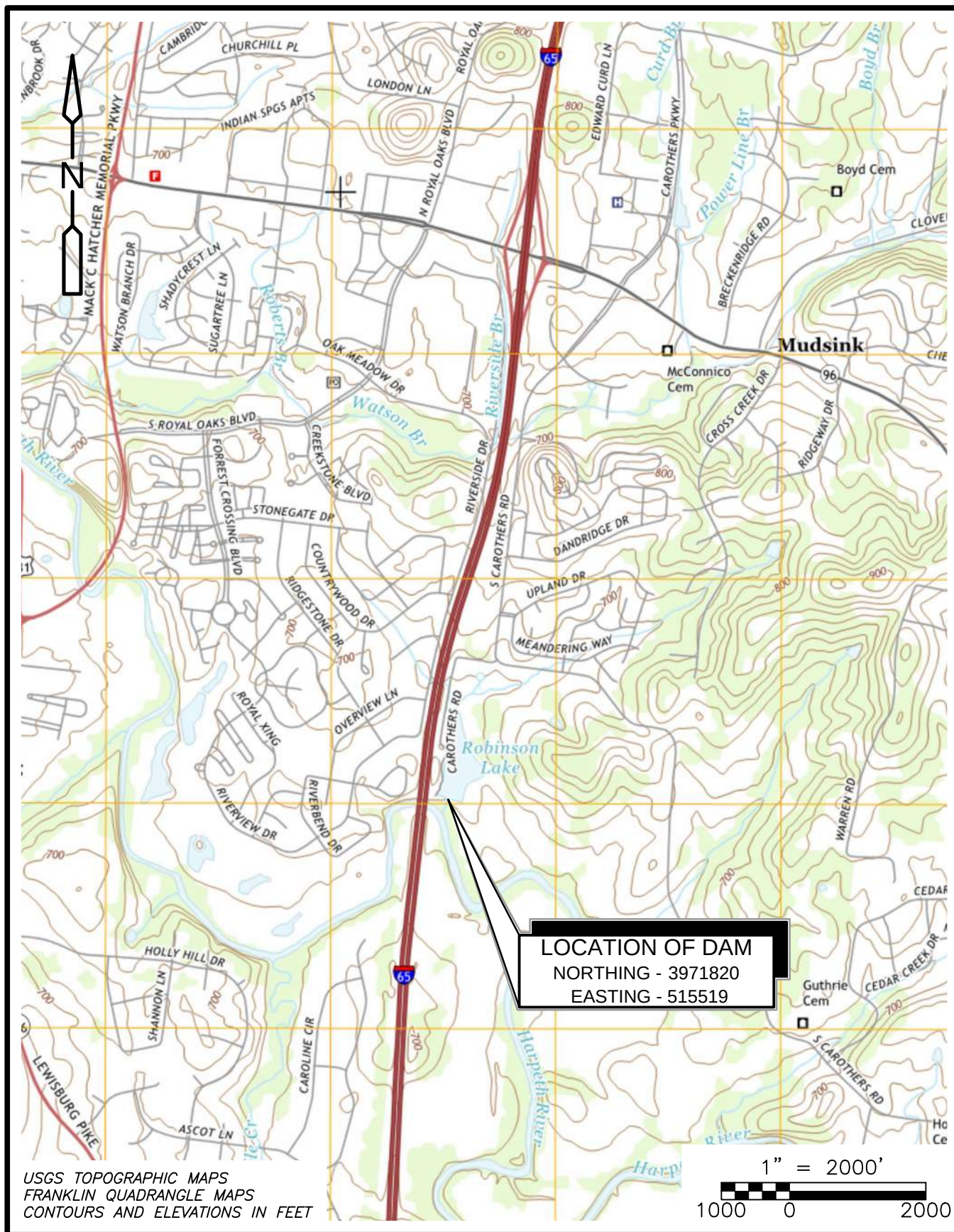
At the end of the auxiliary spillway, it was noted that seepage was flowing through the limestone face at the 15-foot-high drop-off down to the river. In addition, seepage was flowing from the river bank to the left of the limestone face. Total seepage flow was about 100 to 200 gallons per minute. There was erosion in the seepage area, but the seepage flow appeared to be clear.

Note that the terms “right” and “left” used in the report are the directions as viewed looking downstream from the dam crest.

The site locus map is shown on **Figure 2-1**. The State of Tennessee Safe Dams Program information regarding Robinson Lake Dam is included in **Appendix A**.

2.2 Geologic Setting

The site lies within the Carters Limestone formation of the Stones River Group as mapped by the Tennessee Division of Geology on the *West-Central Sheet Geologic Map of Tennessee* dated 1966.



The limestone is typically overlain by a varying thickness of residual soils consisting of clays and silts with low to high plasticity. The Carters Limestone consists of an upper limestone with a typical thickness between 5 and 10 feet and lower limestone with a typical thickness between 60 and 70 feet. The upper limestone is composed of very fine-grained medium light-gray to brownish-gray limestone and yellowish-brown, very fine-grained cryptocrystalline, thin-bedded limestone with thin shale partings. The lower limestone is composed of light-gray to brownish-gray and yellowish brown, cryptocrystalline to very-fine grained limestone with some beds ranging up to coarse-grained, medium- to thick-bedded and thin bands and lenses of Chert locally.

The site is considered susceptible to the typical carbonate hazards of karst topography, including sinkholes based on the results of the geophysical investigation summarized below. Limestone is a carbonate rock and may appear to be very hard and resistant. However, limestone is soluble in slightly acidic water. It is prone to solution and development of karst features that may include a random bedrock surface and irregular weathering, pinnacled bedrock, "floating" boulders, sinkholes, and solution cavities. The occurrence of sinkholes is potentially the most significant of these hazards. Sinkholes occur primarily due to differential weathering of the bedrock and "flushing" or "raveling" of overburden soils into the cavities in the bedrock. The loss of bedrock resulting from solution creates a cavity or "dome" in the overburden. Growth of the dome over time or excavation over the dome can create a condition in which rapid, local subsidence, or collapse of the roof of the dome occurs. Changes in the groundwater flow regime can also accelerate sinkhole development. Solution cavity and sinkhole formation can increase the risk of dam foundation instability and excessive seepage and settlement.

A certain degree of risk with respect to sinkhole formation and subsidence should be considered with any site located within geologic areas underlain by potentially soluble rock units like the Carters Limestone.

Section 3

Conceptual Design Considerations

3.1 General

The conceptual-level rehabilitation design of the existing Robinson Lake Dam in Franklin, Tennessee, must consider the requirements of the Tennessee Dam Regulations, the governing permitting agencies, and general engineering design principles. The following is a discussion of the minimum conceptual design considerations for the existing dam rehabilitation project. The permitting requirements for this project are discussed in **Section 6**.

3.2 Tennessee Dam Regulations

The law pertaining to dam safety in Tennessee is the 1973 Safe Dams Act (TCS, Section 69-12-101 et seq. and 4-5-201 et seq.), amended in March 1996. Regulations are found in the Rules of the Tennessee Department of Environment and Conservation, Division of Water Supply, Chapter 0400-45-07 filed October 16, 2012; effective January 14, 2013. Design criteria presented in this section are in accordance with requirements of these regulations and law. The existing dam was previously designated as a “farm pond” since it was owned by a private citizen and was not regulated by TDEC. When the site is purchased by the City, the dam will be regulated by TDEC and is subject to all dam safety requirements.

3.2.1 Dam Size and Hazard Classification

The existing dam will be classified for size and hazard potential category in accordance with the Tennessee Regulations, Ch. 0400-45-07.05. In accordance with these regulations, dams are classified as small, intermediate, or large as determined by either storage or height, whichever results in the larger size category, as listed below in **Table 3-1**:

Table 3-1. Tennessee Dam Size Classifications

Category	Storage (acre-feet)	Height (feet)
Small	30 to 999	20 to 49
Intermediate	1,000 to 49,999	50 to 99
Large	50,000 or Greater	100 or Greater

Based upon the TDEC Dam Inventory Data, the existing dam has a storage capacity of 136 acre-feet at maximum pool and a structural height of 22.5 feet. Therefore, the existing dam should be classified as a small dam.

The existing dam will be assigned a hazard potential category (HPC) to reflect the potential downstream impacts in the event of a dam failure. The following are the hazard potential categories for Tennessee:

- Category 1 - Dams are located where failure would probably result in any of the following: loss of human life; excessive economic loss due to damage of downstream properties; excessive economic loss, public hazard, or public inconvenience due to loss of impoundment and/or damage to roads or any public or private utilities.
- Category 2 - Dams are located where failure may damage downstream private or public property, but such damage would be relatively minor and within the general financial capabilities of the dam owner. Public hazard or inconvenience due to loss of roads or any public or private utilities would be minor and of short duration. Chances of loss of human life would be possible, but remote.
- Category 3 - Dams are located where failure may damage uninhabitable structures or land but such damage would probably be confined to the dam owner's property. No loss of human life would be expected.

In our discussion with Mr. Lyle Bentley of TDEC, he indicated that TDEC currently classifies the dam as Hazard Potential Category 2. However, Mr. Bentley noted that additional downstream impact analysis may allow for reclassification of the dam. Refer to **Section 6** for additional details regarding these TDEC dam classification discussions.

3.3 Site Constraints

A number of site constraints were identified in this conceptual-level study and taken into consideration during conceptual design. The main site constraints of concern are identified as follows:

- Karst Geology
The site is underlain by a limestone formation that is characterized by karst features. The existing dam has some degree of risk due to the karst features in the area and those noted during the subsurface investigation program. The quality of the foundation bedrock and severity of karst features were evaluated during the site investigations and studies.
- Borrow Source
Rehabilitation of the earth embankment dam will require suitable borrow materials to construct the dam modifications. The on-site overburden soils were evaluated during conceptual design with regard to the quantity and suitability for use as borrow material.

3.4 Design Standards

3.4.1 General TDEC Design Criteria

In accordance with the requirements of Tennessee Regulations, Ch. 0400-45-07-.06, the dam needs to meet the following standards for existing dams:

- Stability
 - The dam shall be stable with no excessive cracks, sloughing, seepage, or other signs of instability or deterioration.
- Slope Protection:

- The earth embankment should be protected from surface erosion by appropriate vegetation or some other type of protective surface such as riprap or paving and should be maintained;
 - All inappropriate vegetation such as honeysuckle, briars, bushes, and trees should be removed from the dam; and
 - The root mass of all trees larger than four inches in diameter as measured two feet above ground level should be grubbed out and the hole backfilled with suitable fill material properly compacted.
- Emergency Spillway:
 - The dam should have an emergency spillway system with capacity to pass a flow resulting from a six-hour design storm.

3.4.2 Stability Criteria

For the rehabilitation of an existing dam, we recommend the use of the USACE Engineer Manual 1110-2-2300 (EM 1110-2-2300) *General Design and Construction Considerations for Earth and Rock-Fill Dams* dated July 30, 2004 and the USBR *Design of Small Dams, Third Edition* dated 1987 as acceptable design references for the rehabilitation of Robinson Lake Dam.

In accordance with these references, the designer is responsible to perform failure mode analyses to determine the most likely modes of failure for the dam, foundation, abutments, and appurtenant structures. The primary cause of failure in the United States is overtopping as a result of inadequate spillway capacity. The next most common cause of embankment dam failure is seepage and piping. These common fatal flaws should be accounted for in design by providing adequate freeboard above the design storm event to reduce the potential for overtopping and provide positive seepage control measures within the dam. Adequate freeboard should be maintained by constructing the crest of the earth dam to a slightly higher elevation than the design to account for the estimated long-term settlement of the dam.

Slope stability should be considered for the existing and proposed conditions. The seepage and slope stability analyses are discussed in detail in **Section 4.2.3**.

3.4.3 Hydrologic/Hydraulic (H/H) Criteria

The existing dam must be able to pass the requirements for existing dams per the Rules and Regulations Applied to the Safe Dams Act of 1973. In accordance with the requirements of the Tennessee Regulations, the emergency spillway shall match the minimum freeboard design storms based on the category and size classification of the dam.

As noted in **Section 3.2**, TDEC has determined that Robinson Lake Dam is a small dam with a Hazard Potential Category 2, therefore requiring safe passage of the 1/3 Probable Maximum Precipitation (PMP), 6-hour duration design storm event. Further documentation of this determination by TDEC is included in **Section 6**. However, based upon our H/H analyses, the current spillway capacity for the dam is not sufficient to pass the required design storm (1/3 PMP for a Category 2 small dam). The current spillway configuration is predicted to pass the 50-year

storm for existing land-use conditions, but not future land-use conditions. Thus, the conceptual design will need to account for an increase in spillway capacity.

3.4.4 Other Requirements

3.4.4.1 Dam Crest Width

The proposed dam crest width of the non-overtopping earth dam section should be 15 feet. The crest width for the earth embankment was selected based on the recommended criteria set forth in the USBR *Design of Small Dams, Third Edition* summarized in the equation below, which is more-stringent than the State of Tennessee regulations.

$$W = (z/5) + 10$$

where W is the crest width and z is the height of the dam, in feet, above the streambed.

3.4.4.2 Project Schedule

Design, permitting, and bidding are anticipated to be at least 12 months, and the project schedule will be determined upon notice to proceed with final design. The construction schedule should consider the order of activities and the seasonal rain events to limit exposed areas and reduce the potential for the occurrence of large overtopping events that could impact work-in-place.

3.4.4.3 Construction Limits and Laydown Areas

Construction limits and laydown areas must be identified during design to facilitate land-use permissions or acquisitions negotiated prior to construction activities.

3.4.4.4 State Regulatory Requirements

All submittals to the State for dam alterations should identify the dam, state reasons why alteration is necessary, give details of the proposed work, and provide an evaluation of the effects of the contemplated action. The plans and specifications should accompany the application for existing dams. This information will be submitted after the final design phase.

Section 4

Overview of Design Studies and Analyses

4.1 Studies

An investigation program, including a preliminary dam inspection, topographic survey, geophysical survey, test borings, and geotechnical laboratory testing, was performed to obtain quantitative and qualitative data on the site conditions and to provide a basis for design analyses. The following sections summarize the results of these studies.

4.1.1 Preliminary Dam Inspection

A preliminary dam inspection (i.e., visual inspection only) was performed by Stephen Whiteside and David Mason of CDM Smith on June 12, 2017. The CDM Smith representatives were accompanied by Doug Noonan of the City and Jason Deal of BWSC.

The preliminary dam inspection report is included in **Appendix A**.

4.1.2 Site Surveys

The City of Franklin engaged BWSC to perform a site survey of the Robinson Lake Dam property on September 7, 2017. In addition, the City of Franklin engaged Mainstream Commercial Divers, Inc. to perform a bathymetric survey within Robinson Lake to determine the depth to the top of the sediment within the footprint of the lake. The data collected from the surveys was used to produce a baseline site plan for the project site. Test boring and geophysical test line locations were located in the field by tape measure prior to drilling and line-of-sight from existing site features. The final locations were surveyed by Civil Infrastructure Associates at the completion of the subsurface investigation program.

4.1.3 Geotechnical Investigation Program

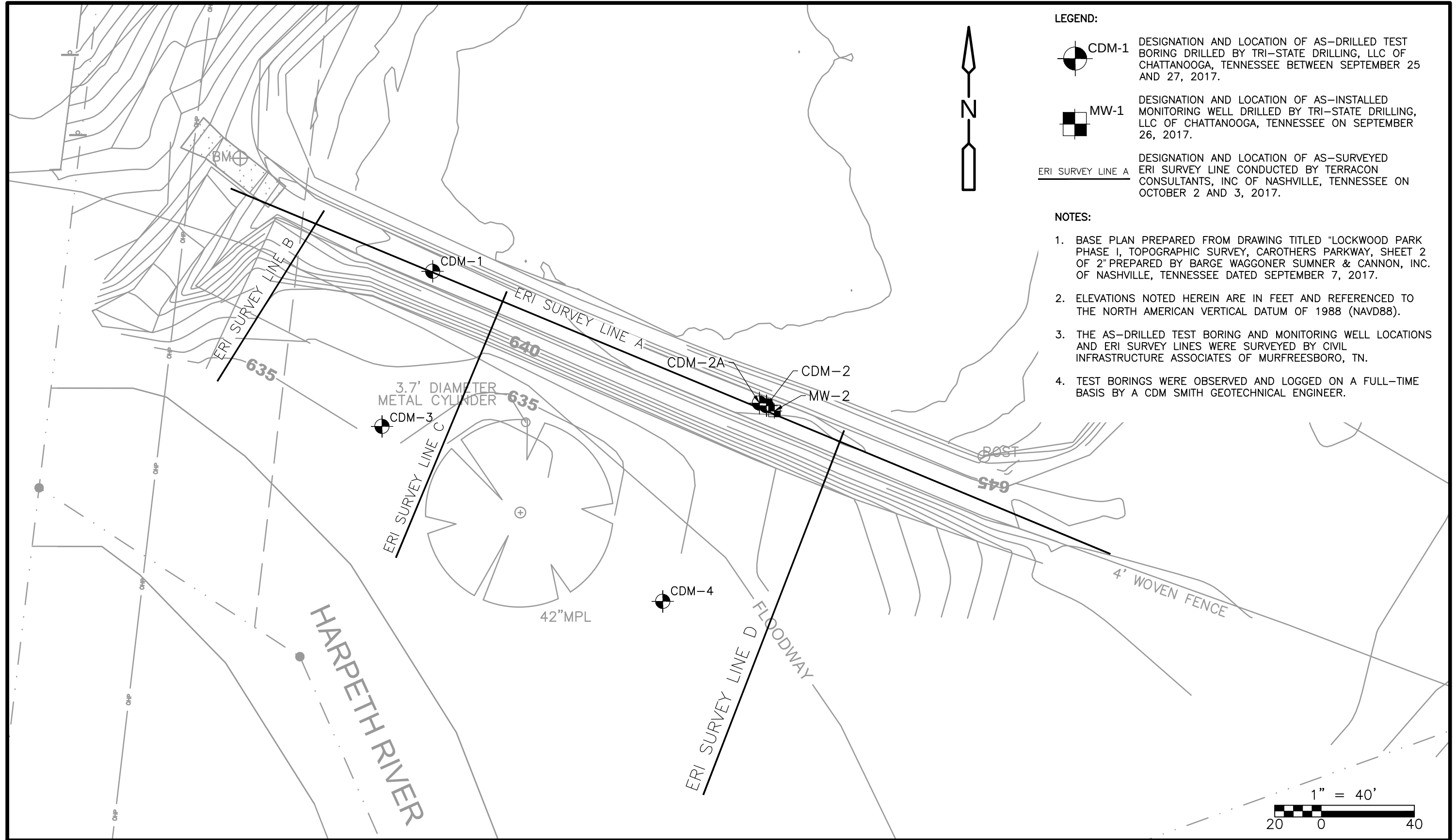
A geotechnical investigation program, including test borings, geotechnical laboratory testing, and geophysical survey, was performed. The following sections summarize the results of these investigations.

4.1.3.1 Test Borings

CDM Smith conducted a subsurface investigation at the Robinson Lake Dam site between September 25 and 27, 2017.

The test boring program consisted of five (5) geotechnical test borings, CDM-1 through CDM-4 and CDM-2A. The locations of the test borings are shown on **Figure 4-1**. The test borings were drilled by Tri-State Drilling, LCC. using an all-terrain vehicle-mounted CME 550X drill rig. Note that CDM-2 was abandoned at 16 ft-bgs due to loss of drilling equipment in the borehole and offset as test boring CDM-2A. For the purpose of this section, it is assumed that CDM-2 and CDM-2A are a singular continuous test boring denoted as CDM-2/CDM-2A.

© 2015 CDM SMITH ALL RIGHTS RESERVED. REUSE OF DOCUMENTS: THESE DOCUMENTS AND DESIGNS PROVIDED BY PROFESSIONAL SERVICE, INCORPORATED HEREIN, ARE THE PROPERTY OF CDM SMITH AND ARE NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.



CITY OF FRANKLIN, TENNESSEE
ROBINSON LAKE DAM
ROBINSON LAKE
FRANKLIN, TENNESSEE

FIGURE 4-1
SUBSURFACE INVESTIGATION PLAN
DECEMBER 2017

Test borings CDM-1 and CDM-2/CDM-2A, located along the existing dam crest, were drilled to depths of 36.3 and 41 ft-bgs, respectively. Test borings CDM-3 and CDM-4, located in the downstream area of the existing dam, were drilled to depths of 23.5 and 21.3 ft-bgs, respectively. The test borings were advanced using 3 ¼" inside diameter (ID) hollow stem auger drilling techniques to auger refusal (i.e., approximate top of bedrock). Auger refusal was encountered between 22 and 22.5 ft-bgs in the crest test borings and between 8.3 and 9.5 ft-bgs in the downstream area test borings.

Split-spoon sampling was conducted continuously in soils from the ground surface until auger refusal was encountered in accordance with ASTM D1586 (using a 2-inch outside-diameter (O.D.) sampler, driven 24 inches by blows from a 140-pound automatic hammer falling freely for 30-inches). The number of blows required to drive the sampler each 6-inch increment was recorded and the Standard Penetration Resistance (SPT) N-value was determined as the sum of the blows over the middle 12 inches of penetration.

Undisturbed (Shelby tube) samples were collected in test borings CDM-1 and CDM-3 in general accordance with ASTM D1587. The Shelby tube samples were trimmed back from both ends of the tube to ensure that only relatively undisturbed material was retained in the tube. Both ends of the tube samples were then sealed with wax, capped with plastic caps, and wrapped in tape. The tubes were labeled and stored upright for transportation. All soil samples were transported to the Terracon Consultants, Inc. (Terracon) Geotechnical Laboratory for storage and geotechnical laboratory testing.

Rock coring was conducted in all test borings in general accordance with ASTM D2113. Rock coring was conducted using an NQ-size rock core barrel, having an outside diameter of approximately 3 inches and an inside diameter of approximately 2 inches. The recovered rock cores were logged in the field by the CDM Smith representative and were stored in cardboard boxes for later review. A Rock Quality Designation (RQD) value was determined for each core run. The RQD is defined as the sum, in inches, of all pieces of sound rock core, four inches in length or longer, divided by the length in inches of the entire core run, expressed as a percentage.

A CDM Smith representative was on-site to observe drilling of the test borings and to visually classify the soil samples recovered in general accordance with the Burmister classification system. Representative soil samples from each split spoon were collected, logged, and stored in bags for later review and geotechnical laboratory testing.

All test borings were backfilled with cement grout to the ground surface upon completion. The test boring logs, prepared by CDM Smith, are included in **Appendix B**.

4.1.3.2 Monitoring Well

A groundwater monitoring well was installed in an offset borehole in the vicinity of test boring CDM-2/CDM-2A. The monitoring well was installed to a depth of 22 ft-bgs to monitor groundwater levels. A 5-foot-long well screen was constructed of 2-inch-diameter, schedule 40 PVC pipe with 0.01-inch machine-slots from 21 to 16 ft-bgs. The well riser was constructed of 2-inch-diameter, threaded, solid PVC.

The annular space around the well screen was backfilled using a sand pack to a level of one foot below and two feet above the screen. The sand pack was allowed to settle while slowly removing the downhole tools. A two-foot-thick bentonite seal was constructed above the sand pack. The remainder of the borehole was backfilled with cement grout around the riser to the ground surface. The monitoring well was completed with an above-grade standpipe embedded in a 6-inch-thick concrete well pad.

The monitoring well installation log is included in **Appendix C**.

4.1.3.3 Geotechnical Laboratory Testing Program

Geotechnical laboratory tests were performed on select split spoon samples obtained from the test borings to assist with soil classification. All geotechnical laboratory tests were performed at the Terracon geotechnical laboratory and consisted of the following:

- Four (4) sieve analysis with hydrometer tests were performed in accordance with ASTM D6913 and ASTM D7928;
- Four (4) sieve analysis with wash of No. 200 sieve tests were performed in accordance with ASTM D6913;
- Eight (8) moisture content tests were performed in accordance with ASTM D2216;
- Eight (8) Atterberg limits tests were performed in accordance with ASTM D4318; and
- One (1) three-point consolidated undrained (CU) triaxial test was performed in accordance with ASTM D4767.

A summary of the geotechnical laboratory index test results is presented in **Table 4-1**. A summary of the triaxial compression test results is presented in **Table 4-2**. The geotechnical laboratory test results are included in **Appendix D**.

4.1.4 Subsurface Conditions

Subsurface conditions encountered during the recent test boring program typically consisted of embankment fill and overburden residual soils overlying bedrock. A summary of soil, bedrock, and groundwater conditions encountered in the test borings is included in **Table 4-3**. Subsurface conditions encountered along the dam crest and perpendicular to the dam crest are described in detail below.

4.1.4.1 Embankment Fill

The embankment fill layer was encountered at test borings CDM-1 and CDM-2/CDM-2A. This layer was overlain by four inches of topsoil and was about 10 feet thick. The embankment fill typically consisted of soft to hard, SILT & CLAY to Silty CLAY, some to trace fine sand and trace to no fine gravel. The SPT-N values for the cohesive layer ranged from 4 to 35 blows per foot (bpf) with an average of about 14 bpf. Pocket penetrometer tests were typically conducted on the split spoon samples, and the measured unconfined compressive strength typically ranged from 3.5 to greater than 4.5 tons per square foot (tsf).

**City of Franklin
Robinson Lake Dam
Franklin, Tennessee**

**Table 4-1
Summary of Geotechnical Laboratory Index Test Results**

Test Boring Number	Sample Number	Sample Depth (ft)	Stratum	USCS Classification ⁽¹⁾	Moisture Content ⁽²⁾ (%)	Atterberg Limits ⁽³⁾			Sieve Analysis ⁽⁴⁾			
						LL	PL	PI	% Gravel	% Sand	% Silt	% Clay
CDM-1	S-3	4.0-6.0	Overburden Soils	CL-ML	15.6	23	16	7	1.9	27.4	70.7	
CDM-1	U-1	12.0-14.0	Overburden Soils	CL	19.1	24	16	8	0.0	23.0	56.5	20.6
CDM-1	S-9	18.0-20.0	Overburden Soils	CL	23.1	22	14	8	0.0	11.0	89.0	
CDM-2	S-2	2.0 - 4.0	Overburden Soils	CL	11.4	42	16	26	0.0	33.9	47.5	18.6
CDM-2	S-5	8.0-10.0	Overburden Soils	CL	18.1	31	17	14	0.2	12.3	59.2	28.3
CDM-2A	S-1	16.0-18.0	Overburden Soils	CL	19.2	40	15	25	4.1	28.6	67.3	
CDM-3	S-2	2.0-4.0	Overburden Soils	CL	20.6	33	17	16	0.0	22.8	51.0	26.2
CDM-4	S-3	4.0-6.0	Overburden Soils	CL	18.7	31	15	16	0.6	20.6	78.7	

Notes:

- 1 USCS classifications were performed in accordance with ASTM D2487.
- 2 Moisture content tests were performed in accordance with ASTM D2216.
- 3 Atterberg Limit tests were performed in accordance with ASTM D4318.
- 4 Sieve analyses performed in accordance with ASTM D6913 and ASTM D7928.

Abbreviations:

LL	Liquid Limit	CL	Lean Clay
PL	Plastic Limit	CL-ML	Silty Clay
PI	Plasticity Index		

**City of Franklin
Robinson Lake Dam
Franklin, Tennessee**

**Table 4-2
Summary of Triaxial Compression Test Results**

Test Boring Number	Sample Number	Sample Depth (ft)	Stratum	USCS Classification ⁽¹⁾	Atterberg Limits ⁽³⁾			Initial Conditions			Effective Confining Stress, σ_c' (psi)	Failure at q_{max} ^(4&5)	
					LL	PL	PI	Initial Water Content	Initial Void Ratio	Initial Dry Unit Weight (pcf)		p' (psi)	q (psi)
CDM-1	U-1	12.0-14.0	Overburden Soils	CL	24	16	8	19.1	0.64	102.9	7	7.0	23.0
											10	9.7	28.1
											16	14.7	37.6

Notes:

- 1 USCS classifications were performed in accordance with ASTM D2487.
- 2 Moisture content tests were performed in accordance with ASTM D2216.
- 3 Atterberg Limit tests were performed in accordance with ASTM D4318.
- 4 Failure criterion: maximum deviator stress or maximum deviator stress at strain equal to 15%, whichever is lower.
- 5 Consolidated Isotropically Undrained (CIU) Triaxial Compression tests were performed in accordance with ASTM D4846.

Abbreviations:

- | | |
|------|------------------------------------|
| CL | Lean Clay |
| LL | Liquid Limit |
| PL | Plastic Limit |
| PI | Plasticity Index |
| USCS | Unified Soil Classification System |

**City of Franklin
Robinson Lake Dam
Franklin, Tennessee**

**Table 4-3
Summary of Subsurface Investigation Program**

Test Boring Number	Ground Surface Elevation (ft) ⁽¹⁾	Exploration Depth (ft) ⁽²⁾	Strata Thickness (ft)		Auger Refusal Depth (ft)	Groundwater Depth (ft) ^(2&3)	Approximate Top of Bedrock Elevation (ft) ⁽¹⁾	Comments
			Overburden Soils	Limestone				
CDM-1	644.4	36.3 ⁽⁴⁾	22.5	>13.8	621.9	8.0	621.9	Rock coring performed from 22.5 to 36.3 ft-bgs.
CDM-2	646.4	16 ⁽⁴⁾	>16 ⁽⁵⁾	NE	NE	5.5	NE	
CDM-2A	646.1	41.0	22 ⁽⁶⁾	>19	624.1	4.5	624.1	Rock coring performed from 22.0 to 41 ft-bgs
CDM-3	634.3	25.5	9.5	>16	624.8	2.0	624.8	Rock coring performed from 9.5 to 25.5 ft-bgs
CDM-4	635.5	21.3	8.3	>13	627.2	NE	627.2	Rock coring performed from 8.3 to 21.3 ft-bgs.

Notes:

- 1 Elevations are in feet and referenced to the National American Vertical Datum of 1988 (NAVD88).
- 2 Indicated depths are depths below ground surface at the time of drilling.
- 3 Groundwater levels were measured at the time of drilling and may not represent the stabilized groundwater level.
- 4 The top 10 ft of Overburden Soils layer assumed to be embankment fill based on the pocket penetrometer data.
- 5 Borehole terminated at 16 ft-bgs due to drilling equipment lost in borehole. See CDM-2A for continuation of test boring.
- 6 Borehole is offset test boring for CDM-2 and was augered directly to 16 ft-bgs prior to commencing sampling.

Abbreviations:

- > Indicates strata not fully penetrated
- NE Not encountered
- ft-bgs Feet below ground surface

The liquid limit of the embankment fill ranged from 23 to 42 with an average of 32; the plastic limit ranged from 16 to 17 with an average of 16; and the plasticity index ranged from 7 to 26 with an average of 16 at the test boring locations. The USCS classification symbols of the soils comprising the majority of the embankment fill were CL (Lean Clay and Sandy Lean Clay) and CL-ML (Silty Clay with Sand).

4.1.4.2 Residual Soils

The residual soils were encountered at all test boring locations. The residual soils layer was encountered below the embankment fill at test borings CDM-1 and CDM-2/CDM-2A and at the ground surface at test borings CDM-3 and CDM-4. This layer was 12.5 and 12 feet thick at the crest borings CDM-1 and CDM-2/CDM-2A, respectively and 9.5 and 8.3 feet thick at the downstream test borings CDM-3 and CDM-4, respectively. The residual soils typically consisted of soft to very stiff, SILT & CLAY to Silty CLAY, some to trace fine sand and trace to no fine gravel. In test boring CDM-3, a loose to medium dense, brown, fine SAND and Silty CLAY layer was encountered from 5 feet to 9.5 ft. The SPT-N values for the cohesive layer ranged from weight of hammer (WOH) to 59 bpf with an average of about 9 bpf. Pocket penetrometer tests were typically conducted on the split spoon samples. In the crest test borings, the pocket penetrometer test results typically ranged from 0.25 to 2 tsf, and in the downstream area test borings, the pocket penetrometer test results typically ranged from 0.5 to 1.5 tsf.

The liquid limit of the residual soils ranged from 22 to 40 with an average of 30; the plastic limit of the ranged from 14 to 17 with an average of 15; and the plasticity index ranged from 16 to 25 with an average of 15 at the test boring locations. The USCS classification symbols of the soils comprising the majority of the residual soils were CL (Lean Clay and Lean Clay with Sand).

4.1.4.3 Limestone

Limestone (bedrock) was encountered below the residual soils at all test boring locations. The bedrock typically consisted of moderately hard, fresh to slightly weathered, fine-grained, gray, LIMESTONE, with extremely thin bedding and horizontal, smooth slickened joints. The bedrock coring depth ranged from 13 to 19 feet in the borings. A 6-inch void was observed in CDM-3 between 11.7 and 12.2 ft-bgs. The rock-core recovery ranged from 65% to 100% with an average of 87%. The RQD ranged from 28% to 73% with an average of 41%.

4.1.4.4 Groundwater Levels

When possible, groundwater levels were observed at the test boring locations at the completion of rock coring and in the installed monitoring well. **Table 4-4** presents the groundwater levels measured in the monitoring well.

The groundwater levels were encountered between 4.5 and 8 feet-bgs (El. 641.6 to El. 636.4) in the crest test borings and between 2 to 4 ft-bgs (El. 632.3 to El. 631.5) in the downstream area test borings. Whereas, the groundwater level readings observed in the monitoring well, MW-2, were between 14 and 14.9 ft-bgs (i.e., El. 632.2 to El. 631.4).

City of Franklin
Robinson Lake Dam
Franklin, Tennessee

Table 4-4
Summary of Monitoring Well Readings

Monitoring Well Number	Ground Surface Elevation (ft) ⁽²⁾	Groundwater Elevation (ft) ⁽²⁾			
		9/26/2017	9/27/2017	10/2/2017	10/3/2017
MW-2	646.2	632.2	632.2	631.5	631.4

Notes:

1. See Figure 4-1 for monitoring well location.
2. Elevations are in feet and referenced to the North American Vertical Datum of 1988 (NAVD88).
3. Monitoring well installed in offset boring in the vicinity of CDM-2 and CDM-2A

4.1.4.5 Expected Variation in Subsurface Conditions

The interpretation of general subsurface soil and bedrock conditions presented herein are based on soil, bedrock and groundwater conditions observed during the recent subsurface investigation program. However, subsurface conditions may vary between test boring and ERI survey line locations. If conditions are found to be different than assumed, recommendations contained in this report should be reevaluated by CDM Smith and confirmed in writing.

Water levels measured in the explorations should not necessarily be considered to represent stabilized groundwater levels. In addition, water levels are expected to fluctuate with time due to river level, season, temperature, climate, and construction in the area, as well as other factors.

Therefore, groundwater conditions at the time of construction may be different from those observed at the time of the explorations.

4.1.5 Geophysical Investigation Program

CDM Smith subcontracted Terracon to perform a geophysical survey consisting of ERI to identify potential karst locations and subsurface anomalies. The geophysical investigation program was performed by Terracon on October 2 and 3, 2017. The geophysical survey was performed along the dam crest and downstream area. The geophysical survey consisted of four (4) ERI survey lines. One (1) ERI survey line, Line A, extended along the entire length of the dam crest, and three (3) ERI survey lines, Lines B through D, extended perpendicular to the dam crest from the dam crest to the downstream area in the vicinity of the Harpeth River.

The results of the geophysical survey are summarized in the memorandum included in **Appendix D**.

4.2 Engineering Evaluation

4.2.1 Dam Break Analyses

CDM Smith performed a planning-level dam break analysis to assist in evaluating potential downstream effects if a dam failure were to occur. DSS WISE (Decision Support System for Water Infrastructure Security) can be used to approximate a dam-break and estimate potential downstream effects. In the simulation, the lake's hydraulic height, dam crest length, and lake elevation and volume at normal pool level and maximum (dam-break) pool level were used. The simulation was run assuming a sunny day breach which assumes a non-storm event failure and that the primary outlet structure is blocked and unable to release any water from the lake. The lake level prior to failure was assumed to be at the dam crest.

The model approximates the inundation flood depth downstream of the lake and indicates the potential downstream effects that a dam break would have including inundation of residences and overtopping of roads. Based on the results of the approximate analysis, no residences downstream would be inundated, and no roads downstream would be overtopped. The approximate analysis indicates that the dam may be classified as Hazard Potential Category 3 (low hazard potential). However, TDEC would require a more-robust dam break analysis using HEC-RAS to challenge their current classification of the dam as Hazard Potential Category 2 (significant hazard potential).

A DSS WISE-generated inundation map indicating the approximate flood depth downstream of the lake is contained in **Appendix E**.

4.2.2 Hydrologic and Hydraulic (H/H) Analyses

4.2.2.1 Existing Outflow Structures

There is an existing 47-foot-wide auxiliary spillway with a weir crest at El. 643. In addition to the spillway, the dam crest is at El. 645. No other outlet structures were identified for this lake.

4.2.2.2 Initial Analyses

HEC-HMS was utilized to perform the H/H analyses on Robinson Lake Dam. The software was used to determine the appropriate size and outlet configuration for the dam that would be required to pass the 25-year, 6-hour duration design storm through a primary spillway (riser-barrel configuration), the 100-year, 6-hour duration design storm through an auxiliary spillway (weir), and the 1/3 PMP, 6-hour duration storm through an emergency spillway without overtopping the dam. The design precipitation for the 25-year and 100-year, 6-hour storms were identified using NOAA Atlas 14. A hyetograph for the contributing drainage area (~1 mi²) was created for the 1/3 PMP design storm using HMR 51 and HMR52 references.

4.2.2.3 Potential Improvements to the Robinson Lake Dam Spillway

For the primary spillway, a 4-foot by 12-foot concrete riser drop-inlet at El. 640 feet (existing normal pool) and a 48-inch-diameter outlet pipe is required to successfully pass the 25-year, 6-hour duration storm without activating the auxiliary spillway. The existing auxiliary spillway (47-foot-wide weir at El. 643) in addition to the primary spillway is sufficient to pass a 100-year, 6-hour duration design storm without activating the proposed emergency spillway. In addition to the outlet structures stated above, a proposed 355-foot-wide, grass-lined emergency spillway at El. 644 feet with an increase in dam height to elevation 645.5 feet is required to pass the 1/3 PMP without overtopping the dam. This design storm would safely pass with zero freeboard. It is recommended that articulated concrete block (ACB) be used to armor the first 100-feet of the grass-lined emergency spillway to reduce the potential for erosion. Because the dam is not predicted to overtop under this scenario, overtopping protection is not recommended for the dam.

A detailed description of the H/H analyses and results are contained in **Appendix F**.

4.2.3 Geotechnical Analyses

Seepage and stability analyses were performed as part of the conceptual design studies. These analyses were performed in general accordance with accepted engineering practices and the applicable codes/references as indicated. The soil properties and subsurface profile for the analyses were developed based upon the geotechnical investigation, existing survey data, and the preliminary dam inspection. The complete geotechnical analyses are contained in **Appendix G**.

4.2.3.1 Seepage Analyses

4.2.3.1.1 General

Seepage analyses were performed using the SEEP/W version 2012 software program, a two-dimensional finite element seepage analysis package distributed by GEO-SLOPE International, Ltd.

SEEP/W was run for two-dimensional flow through both the existing and proposed cross-sections. The existing condition model was used to calibrate the dam and foundation materials permeability and the proposed condition model was used to evaluate the following:

- Phreatic surface location in the proposed embankment design; and
- Flow rate captured by the internal drain pipe.

The geometry of existing condition model was based upon the surveyed contours of the existing dam site. Soil and rock permeabilities in the model were adjusted until the model outputs matched the actual water level readings collected at the monitoring well installed on-site. Then, the calibrated model was imported into the proposed conditions model.

The proposed conditions model is based on a 15-foot-wide dam crest at EL. 645.5 with 3H:1V upstream and downstream slopes. Seepage analyses were run using two water levels inside the lake including the normal pool level of EL. 640 and a higher pool level of EL. 643. The higher pool level was based on the elevation of the existing spillway.

4.2.3.1.2 Model Set-Up

The soil profile in the seepage models was developed based upon the results of the field and laboratory investigations and engineering judgment. The model was calibrated based upon monitoring well readings. **Table 1a** in Appendix G summarized the soil properties used in seepage analyses.

4.2.3.1.3 Analyses and Results

The results of the seepage analyses are presented in Appendix G. The seepage results are presented as figures.

Results of the seepage analyses indicate that the phreatic surface within the proposed dam cross-section does not present a concern, and seepage is not expected to daylight in downstream slope. However, the seepage will daylight at the riverbank of the Harpeth River downstream.

4.2.3.2 Slope Stability Analyses

4.2.3.2.1 General

The USACE design references (EM 1110-2-2300, ER 1110-2-1806, and EM 1110-2-1902) were used for preparation of these calculations. In accordance with these references, four (4) slope stability loading cases were considered and analyzed:

1. End of construction condition,
2. Normal pool conditions under static load,

3. Maximum pool conditions under static load (El. 643 pool was used), and
4. Normal pool under seismic loading.

In the seismic loading condition (case 4), the pseudo-static analysis method is used. A horizontal acceleration equal to the peak ground acceleration (PGA) of the earthquake event happens within 100 years with 10% probability was used in this analysis, based upon ER 1110-2-1806.

4.2.3.2.2 Model Set-Up

Stability analyses were performed using the SLOPE/W 2012 modeling software package from Geo-Slope International. The geometry of the cross-sections, phreatic surface, and the pore water pressure distribution were obtained from the seepage analyses as described in previous sections. The strength properties used in SLOPE/W model were developed from the field and laboratory investigations, and presented in **Table 1b** in Appendix G.

4.2.3.2.3 Analyses and Results

The slope stability analysis results and the minimum slope stability factors of safety required by USACE (EM 1110-2-1902) for each loading condition, are presented in **Table 2** in Appendix G.

Results of the stability analyses indicate that the proposed dam cross-section would have adequate factors of safety under all cases analyzed. Factors of safety selected for all cases are global stability failures and shallow/surficial sloughing type failures were not considered. SLOPE/W run results for all cases performed are included in Appendix G.

4.2.3.3 Karst Potential Evaluation

Terracon noted one anomaly of interest during the geophysical investigation program. This anomaly was found in the ERI Survey Line A cross-section along the dam crest. The anomaly is an area of low resistivity. In general, low resistivity values are indicative of soil overburden or weak, saturated, or fractured bedrock. The anomaly appears to be at and below the contact with bedrock and could indicate a potential karst condition and pathway for potential water seepage. It was noted during the preliminary dam assessment that seepage was observed in the downstream area and at the base of the drop-off, adjacent to the river, and seepage was flowing through the limestone face at the end of the spillway flowing between approximately 100 and 200 gallons per minute.

Refer to **Section 2.2** for the general risks associated with karst topography.

Based on the above information and the proposed modifications to the dam, the risk for sinkhole development at this site is considered to be relatively high and will require grouting of the dam foundation to address seepage issues.

Section 5

Overview of Conceptual Design

5.1 General

Based upon the dam break, H/H, and geotechnical studies and analyses discussed in **Section 4**, the conceptual design summarized in this section provides additional spillway capacity to pass the required design storm. In addition, the following dam deficiencies were noted during the preliminary dam inspection and in the investigation and analyses for the conceptual design:

- The upstream and downstream slopes and downstream area are covered with large trees and heavy vegetation;
- The upstream and downstream slopes are steep to very steep ranging from 1.5H:1V to near vertical;
- The bare, eroded area on the crest and downstream slope may indicate previous overtopping of the dam during a flood event. If that is the case, the spillway capacity may be inadequate;
- No outlet works or low-level outlet for draining the pond were observed;
- Seepage was observed in the area downstream of the reinforced concrete riser pipe;
- Seepage was observed through and adjacent to the limestone at the end of the spillway discharge channel;
- There are trees and brush in the approach area to the spillway that will reduce spillway capacity. In addition, the fence along the upstream side of the weir can collect debris and reduce spillway capacity;
- The concrete in the spillway discharge channel is badly cracked and has brush growing in the bottom and sides of the channel;
- The geophysical investigation program noted an approximately 15 ft wide by 20 ft deep anomaly along the dam crest, which may be a potential karst condition; and
- The H/H analyses indicated that the spillway system was too small to pass the required design storm.

5.2 Description of Proposed Improvements

Based on the results of the investigations and analyses, CDM Smith developed a conceptual design for rehabilitation measures to address the identified dam safety deficiencies. This section discusses the proposed improvements for the rehabilitation of Robinson Lake Dam, which are shown on **Figures 5-1** through **5-4**. Refer to **Sections 5.2.1** through **5.2.3** for a detailed description of the proposed improvements.

© 2015 CDM SMITH ALL RIGHTS RESERVED. REUSE OF DOCUMENTS: THESE DOCUMENTS AND DESIGNS PROVIDED BY PROFESSIONAL SERVICE, INCORPORATED HEREIN, ARE THE PROPERTY OF CDM SMITH AND ARE NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.

NOTES:

1. REFER TO SECTION 7.3 OF THE REPORT FOR THE SUGGESTED CONSTRUCTION SEQUENCE.
2. REFER TO FIGURES 5-2 THROUGH 5-4 FOR PROPOSED DAM REHABILITATION CROSS-SECTION THROUGH PRIMARY SPILLWAY, EARTH EMBANKMENT, AND EMERGENCY SPILLWAY, RESPECTIVELY.

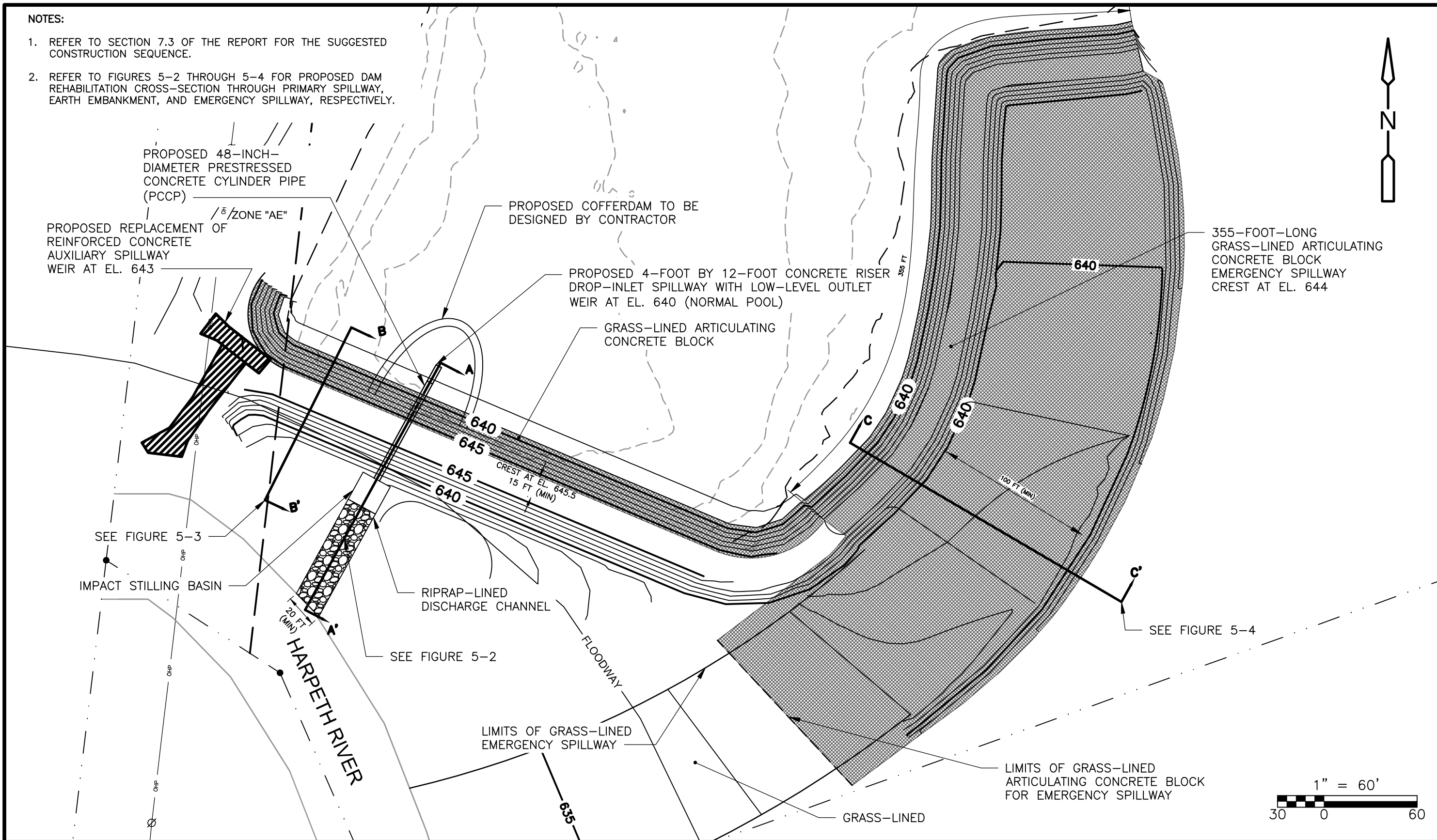
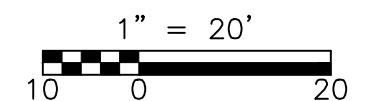


FIGURE 5-2
PROPOSED DAM REHABILITATION PRIMARY SPILLWAY CROSS-SECTION
DECEMBER 2017

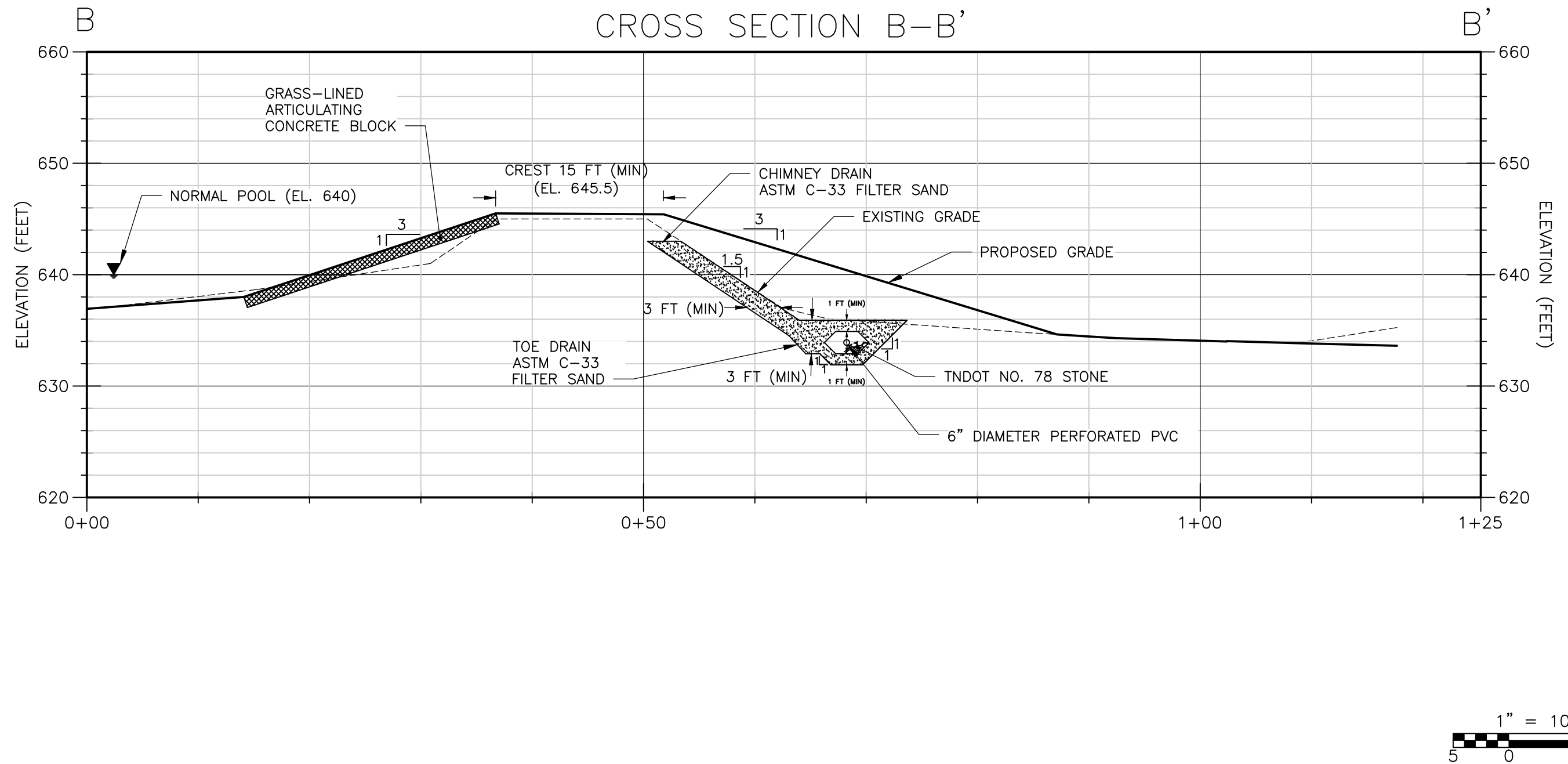


1. REFER TO FIGURE 5-1 FOR PROPOSED DAM REHABILITATION PLAN.
2. REFER TO SECTION 7.3 OF THE REPORT FOR THE SUGGESTED CONSTRUCTION SEQUENCE.

© 2015 CDM SMITH ALL RIGHTS RESERVED. REUSE OF DOCUMENTS: THESE DOCUMENTS AND DESIGNS PROVIDED BY PROFESSIONAL SERVICE, INCORPORATED HEREIN, ARE THE PROPERTY OF CDM SMITH AND ARE NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.

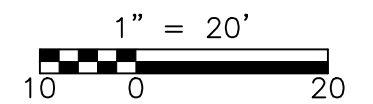
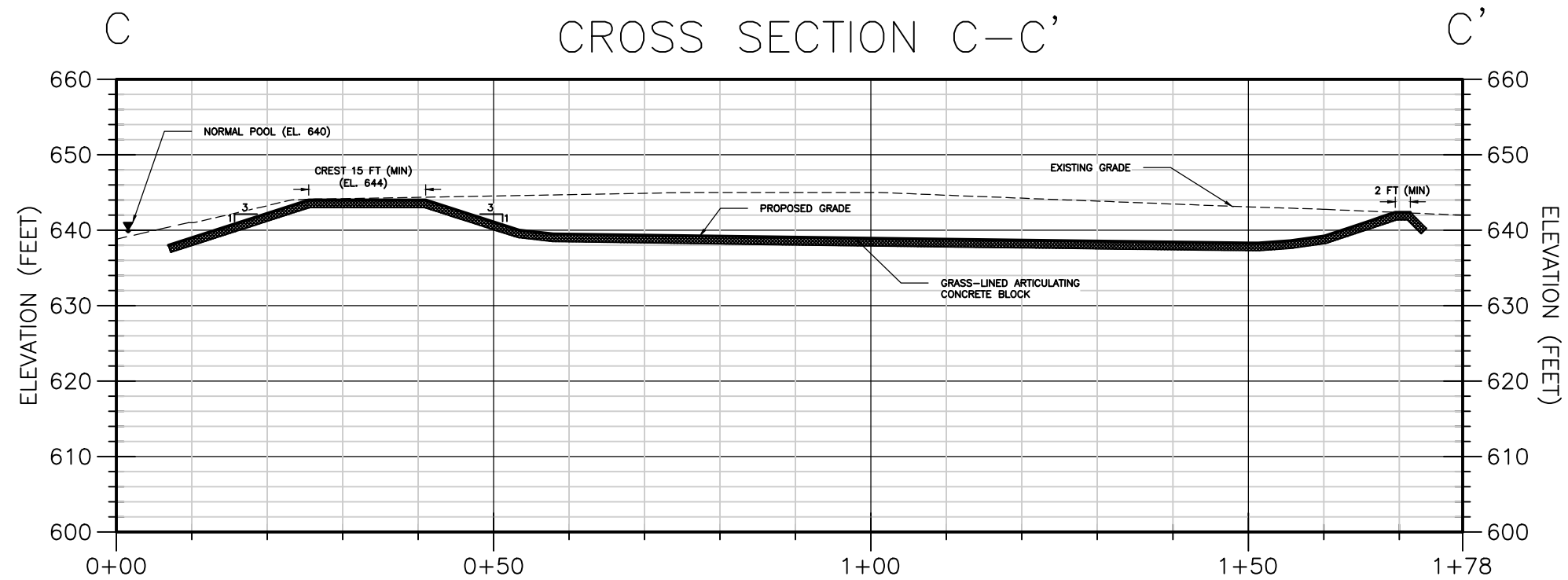
NOTES:

1. REFER TO FIGURE 5-1 FOR PROPOSED DAM REHABILITATION PLAN.
2. REFER TO SECTION 7.3 OF THE REPORT FOR THE SUGGESTED CONSTRUCTION SEQUENCE.



NOTES:

1. REFER TO FIGURE 5-1 FOR PROPOSED DAM REHABILITATION PLAN.
2. REFER TO SECTION 7.3 OF THE REPORT FOR THE SUGGESTED CONSTRUCTION SEQUENCE.



5.2.1 Earth Embankment Rehabilitation

The earth embankment rehabilitation will be constructed using borrow materials available from the off-site borrow sources. The earth embankment dam rehabilitation will consist of increasing the dam height to El. 645.5 from El. 645, flattening the upstream and downstream slopes to 3H:1V, widening the dam crest to 15 feet with compacted embankment fill, and placing ACB on the upstream slope from the crest to El. 638. An interior drainage system consisting of a chimney, blanket, and toe drain will be included to control seepage through the embankment.

5.2.2 Foundation Preparation

The earth embankment is founded on approximately 11 feet of residual soils overlying bedrock. Based on the field inspection observations and subsurface data obtained from the test borings and geophysical survey, seepage was observed in the downstream area and at the end of the spillway discharge channel through and adjacent to the limestone. Potential karst conditions were also observed along the dam crest during the geophysical survey. Therefore, a foundation grouting program will be implemented to address potential seepage flow paths in the bedrock underlying the dam.

5.2.3 Spillways

The proposed improvements consider the use of a new primary spillway to pass the 25-year design storm consisting of a 4-foot by 12-foot concrete riser drop-inlet at El. 640 (existing normal pool) and a 48-inch-diameter outlet pipe discharging in the downstream area through an impact stilling basin and flowing via a riprap-lined discharge channel to the Harpeth River. The riser will have a gate to serve as the low-level outlet. A filter diaphragm is recommended around the new spillway pipe through the earthen dam to capture potential seepage around the pipe and discharge it safely to the downstream area. A filter diaphragm consists of a sand filter around the pipe (within the dam) that is hydraulically connected to a filter sand blanket downstream of the diaphragm.

It is proposed to replace the existing trapezoidal weir structure for use as the auxiliary spillway to pass the 100-year design storm without activating the proposed emergency spillway. The auxiliary spillway will be a 47-foot-wide trapezoidal weir at El. 643 (i.e., the current weir elevation). The concrete chute along the entire length of the existing auxiliary is damaged and should be replaced with new reinforced concrete underlain by a drainage layer with an outlet at the Harpeth River.

Also, an emergency spillway is proposed to be constructed along the southeastern edge of Robinson Lake. The proposed emergency spillway will be a 355-foot-wide, grass-lined spillway at El. 644 to pass the 1/3 PMP design storm without overtopping the dam. The first 100 feet of the grass-lined emergency spillway discharge channel will be lined with ACB to reduce the potential for erosion, and a small embankment (up to 3 feet high) will be constructed on the eastern edge of the emergency spillway to direct flow towards the Harpeth River.

Section 6

Permitting

6.1 General

In the State of Tennessee, dams are regulated by the TDEC's Safe Dams Program, which is responsible for conducting certifications, inspections, and approvals of dam and reservoir projects.

To alter a dam in the State of Tennessee several permits need to be acquired. The following permitting bodies will need to issue the following documents:

- TDEC
 1. Aquatic Resource Alteration Permit (ARAP) from the TDEC Division of Water Resources
 2. Alteration Permit from the TDEC Safe Dams Program
 3. National Pollutant Discharge Elimination System (NPDES) Stormwater Construction Permit from the TDEC Division of Water Pollution Control
- The City of Franklin
 1. "No-Impact" Certification for Proposed Developments in Regulatory Floodways
- USACE
 1. Pre-Construction Notification
 2. Section 404 Permit

The Robinson Lake Dam rehabilitation will require submittals to the necessary permitting agencies. A summary of the meetings with the agencies to determine the required permits, and the permit conditions can be found below in **Sections 6.2** and **6.3**.

6.2 Meetings with Agencies

Mr. Lyle Bentley of TDEC Safe Dams Program previously confirmed with Mr. Stephen Whiteside of CDM Smith that the dam is currently classified as a farm pond dam and is not subject to the dam safety regulations. Farm pond dams are defined as any impoundment used only for providing water for agricultural and domestic purposes such as livestock and poultry watering, irrigation of crops, recreation, and conservation, for the owner or occupant of the farm, his family, and invited guests, but does not include any impoundment for which the water, or privileges or products of the water, are available to the general public. However, Mr. Bentley noted that should the City purchase the property and the dam, the dam will be subject to the dam safety regulations.

Mr. Whiteside and Mr. John Briand of CDM Smith spoke with Mr. Lyle Bentley of TDEC Safe Dams Program via conference call on October 23, 2017. Mr. Bentley indicated that Robinson Lake Dam is classified as an existing dam per TDEC regulations, and the current TDEC classification of the

dam is a Category 2 (significant hazard) dam. Mr. Bentley stated that the rehabilitation should consider the following requirements:

- The dam should have all trees, brush, vegetation, etc. grubbed and cleared from the footprint of the dam;
- Any steep slopes for the dam should be regraded;
- The dam shall be “stable” based on the geotechnical analyses; and
- Any seepage issues should be dealt with by appropriate measures.

Mr. Bentley suggested that CDM Smith consider rehabilitation assuming the design storm for a Category 1 (high hazard) small dam (i.e., 6-hour, ½ PMP event) in order to not require modifications to the dam based on potential future development downstream, and he suggested modeling the H/H analyses using either the Soil Conservation Service (SCS) Type II rainfall distribution or the Hydrometeorological Report No. 52 (HMR 52). Mr. Bentley also stated that the dam break analyses should consider a dam break during a ½ PMP event in addition to the sunny-day dam break previously analyzed as discussed in **Section 4.2.1** should the Engineer consider reclassifying the dam to a Category 3 (low hazard) dam from a Category 2 (significant hazard) dam, which it is currently classified as discussed prior.

Mr. Briand spoke with Mr. Brandon Yates of TDEC of the Division of Water Resources Permitting/Assessment division via phone on November 1, 2017. Mr. Yates is responsible for the TDEC permitting operations in Williamson County. Mr. Yates confirmed that an ARAP permit is required for the proposed construction, and a NPDES stormwater construction permit is required should the area of disturbance for construction be greater than 1 acre.

Mr. Bernard Graves spoke with Shanna McCoy, Flood Plain Administrator, for the City of Franklin, Tennessee via phone on November 8, 2017, and Ms. McCoy stated that a “No-Impact” Certification for Proposed Developments in Regulatory Floodways is required for the proposed construction. In addition, Mr. Graves spoke with Mr. Casey Ehorn, East Branch Chief for the USACE Nashville District, via phone on November 8, 2017, and Mr. Ehorn stated that a pre-construction notification and USACE Section 404 permit would be required. Mr. Ehorn stated that based on the discussion of the conceptual level rehabilitation improvements that he would anticipate the work would likely require a Nationwide Permit 3 (Maintenance) application.

6.3 Required Permits, Certifications, and Notifications

6.3.1 TDEC ARAP Permit

The ARAP permitting process requires public notice to be issued. If there is sufficient public interest, a public hearing may also be required.

To meet the requests of TDEC, the City of Franklin will submit a new ARAP application. A complete ARAP application contains the following information:

- Scope of the current project;
- USGS topographical map indicating the exact location of the project;

- Photographs of site with location description;
- Description of existing stream or wetland characteristics and dimensions such as depth, length, average width, substrate, and riparian vegetation;
- In the case of wetlands, include a wetland delineation with delineation forms and site map denoting location of data points;
- Description of any proposed channel modifications, such as changes in depth, length, average width, substrate, and riparian vegetation;
- A copy of all hydrologic or jurisdictional determination issued for water resources on the project site;
- A project rationale;
- Detailed plans, specifications, blueprints, or legible sketches of present site conditions and the proposed activity;
- Discussion regarding the sequencing of events and construction methods;
- Depiction and narrative on the location and type of erosion and sediment control measures for the proposed alterations; and
- Description of any other alterations to the properties of waters of the state.

6.3.2 TDEC Alteration Permit

A Safe Dams Alteration Certificate will need to be issued for the rehabilitation of the Robinson Lake Dam. The plans, specifications and engineering report for the rehabilitation will need to be submitted to Mr. Bentley for approval prior to the issuing the project for bid. The submittal will include the modeling input from dam break, H/H and geotechnical seepage and slope stability analyses, and other design criteria. When the plans, specifications, and engineering report are acceptable, Safe Dams will issue a construction permit that extends for one year, contingent on receiving the ARAP permit. Rehabilitation of the dam must be started during this year or another review of the plans, specifications, and engineering report will be required.

6.3.3 TDEC NPDES Stormwater Construction Permit

The NPDES Stormwater Construction permit will be one of the later permits secured once the ARAP is issued. The stormwater runoff permit has a two-step permitting process. The components include:

- A completed and signed Notice of Intent (NOI) for Construction Activity - Storm Water Discharges. The NOI must include a map on 8 ½ inch by 11 inch paper with boundaries 1-2 miles outside the site property with the site and construction area outlined and the receiving water or receiving storm sewer highlighted and identified.
- A site-specific SWPPP (Storm Water Pollution Prevention Plan) must be developed and submitted with the NOI.

6.3.4 FEMA No-Impact Certification

The Federal Emergency Management Agency (FEMA) No-Impact Certification for Proposed Developments in Regulatory Floodways should be submitted to the City of Franklin. The certification requires that following components to confirm there is no change in flood levels from existing conditions:

- Hydraulic models in a currently approved FEMA hydraulic model including an effective model, duplicate effective model, corrected effective model, existing conditions model, and proposed conditions model,
- Project narrative,
- Topographic work map,
- Cross-section plots,
- Property survey, and
- No-rise certification.

6.3.5 USACE Pre-Construction Notification

The USACE pre-construction notification should be submitted to the USACE, and the notification includes the following components:

- Name, address and telephone numbers of the permittee,
- Location of the proposed activity,
- Identification of the specific Nationwide Permits,
- Description of the proposed construction activities including purpose, environmental effects, etc., and
- Delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site,

6.3.6 USACE Section 404 Permit

The Robinson Lake Dam rehabilitation will most likely require a Nationwide Permit 3. The Nationwide Permit 3 is reviewed by the USACE, which evaluates applications under a public interest review, as well as the environmental criteria set forth in the CWA Section 404(b)(1) Guidelines, regulations promulgated by EPA.

Section 8

Conceptual-Level Recommendations

8.1 Recommendations

The conceptual-level design for the rehabilitation of Robinson Lake Dam include the following primary recommendations:

- **Rehabilitation of the Existing Earth Embankment:** The rehabilitation of the existing earth embankment is proposed to include site clearing and grubbing, flattening the upstream and downstream slopes to 3H:1V, armoring the upstream slope from El. 638 with grass-lined articulating concrete block, and widening the dam crest to 15 feet.
- **Foundation Grouting Program:** To address observed and potential seepage conditions, a foundation grouting program is recommended to address potential seepage paths in the fractured bedrock zone and potential karst conditions noted during the geophysical program. An internal drainage system will be installed along the downstream slope of the existing embankment to control seepage through the dam.
- **Construction of a New Primary Spillway:** The primary spillway construction is proposed to consist of a 4-foot by 12-foot concrete box riser to El. 640 with a 48-inch diameter prestressed concrete cylinder pipe (PCCP) barrel discharging to a 20-foot wide impact stilling basin and riprap-lined channel flowing to the Harpeth River. The concrete riser drop-inlet will include a low-level outlet to lower the lake levels when necessary. The primary spillway is proposed to pass the 25-year design storm without activating the auxiliary or emergency spillways.
- **Replacement of the Existing Auxiliary Spillway:** The auxiliary spillway replacement is proposed to include removal and replacement of the existing cracked and damaged trapezoidal concrete chute spillway along the entire length of the spillway to the Harpeth River. The new auxiliary spillway slab will have an underdrain system that discharges at the Harpeth River. The auxiliary spillway is proposed to pass the 100-year design storm without activating the emergency spillway.
- **Construction of a New Emergency Spillway.** Construction of a new 355-foot-wide, grass-lined emergency spillway to El. 644. The emergency spillway construction is proposed to include armoring with ACB extending from El. 638 on the upstream slope to the first 100 feet of the grass-lined discharge channel. A small embankment (up to 3 feet in height) will be constructed on the eastern edge to capture flow from the spillway and direct the flow to the Harpeth River. The emergency spillway is proposed to pass the 1/3 probable maximum precipitation (PMP) design storm.

Section 7

Construction Considerations

7.1 General

The Robinson Lake Dam project involves rehabilitation of approximately 375-foot embankment dam section, a 47-foot-wide trapezoidal concrete weir and discharge channel and construction of a 355-foot-wide emergency spillway. Prior to commencing the work, a supplemental subsurface investigation program should be conducted to further investigate potential seepage paths through the bedrock layer encountered during the recent subsurface investigation program and to investigate the subsurface conditions near the emergency spillway and channel. The supplemental subsurface investigation may include but is not limited to additional geophysical exploration, test borings, and test pits. The test borings should include packer testing to assist in the determination of the bedrock permeability.

The rehabilitation work includes, but is not limited to the following:

- Existing conditions survey and site plan,
- Erosion and siltation control,
- Construction of cofferdam(s) and stream diversion/dewatering,
- Site clearing and grubbing,
- Sediment removal,
- Work and laydown areas,
- Foundation grouting,
- Construction of concrete riser drop-inlet structure and low-level outlet,
- Installation of internal drain system,
- Rehabilitation and grading of the earth embankment dam,
- Replacement of auxiliary spillway,
- Construction of emergency spillway and channel, and
- Site restoration

7.2 Contract Documents

Conceptual figures for the selected alternative are contained in **Section 5**. Contract documents will be developed during final design.

7.3 Suggested Construction Sequence

The opinion of probable construction cost (**Section 8.2**) is based on certain assumptions and sequencing of construction. These assumptions are presented in this Section. The Contractor is

not required to perform the work in this sequence, but the work must be coordinated with the City of Franklin and accomplished in a logical order to allow construction to be completed within the time allowed by the final contract documents without exceeding this time limit or causing the need for additional funding. The given sequence outlines a conceptual construction sequence and is provided only as a guide to aid in the bidding process. This sequence outlines only major steps assumed for construction of the project. This sequence is not a detailed procedure, and the Contractor will be held responsible to provide the details, procedures, specifics, and intermediate steps, as required to meet the project requirements and operational restrictions from the owner. The Contractor will determine the actual means and methods employed during construction.

1. **Survey Work:** Prior to beginning any construction, the Contractor will perform a survey to document existing site conditions. As part of the final design, control points established from a land survey will be added to the final contract drawings. The Contractor will be responsible to locate and verify the accuracy of these control points.
2. **Preparation of Site Plan of Existing Conditions:** Results of the survey of existing conditions will be documented on a site plan and included in the project submittals.
3. **Erosion and Siltation Control:** Erosion and siltation control measures will be installed prior to any clearing, earthwork, dewatering and water diversion activities.
4. **Cofferdam Construction and Dewatering:** Prior to any significant construction activities, the lake will be dewatered and a cofferdam such as a Portadam™ will be constructed around the proposed primary spillway structure (i.e., concrete riser drop-inlet with low-level outlet) to protect areas of work and allow construction to be performed in-the-dry. Drawdown of the lake will be in accordance with TDEC guidelines and approved permit(s). Stream diversion will be phased such that flows are initially diverted through the cofferdam via temporary pipes or pumps. Upon completion of this work, the flow will be diverted to the new spillway to allow construction/rehabilitation of the remaining dam components.
5. **Site Clearing and Grubbing:** Clearing and grubbing will be required in the work area and laydown areas. The approximate extents of these areas will be delineated on the contract drawings during final design. All trees, root balls and other vegetation will be removed from the dam embankment, abutments and downstream area prior to commencing excavations.
6. **Sediment Removal:** Sediment will be removed from the lake areas by conventional earth moving equipment and disposed of off-site.
7. **Work and Laydown Areas:** The work and laydown areas will be set-up in the area east of the left abutment as shown on the contract drawings during final design. These areas will be located such that they are accessible and compatible with the stream diversion design.
8. **Foundation Grouting:** Prior to commencing excavation for the primary spillway, primary foundation grouting holes will be drilled to a depth of 20 feet below top of bedrock. Pressure grouting will be conducted in primary grout holes to seal permeable zones in the bedrock (limestone) below the dam foundation. Secondary grout holes will be drilled between primary hole to a depth of 20 feet below top of bedrock and will also be pressure grouted.

Tertiary grout holes will be drilled and grouted as needed and as directed by the Engineer. Note that the foundation grouting plan will be reviewed during final design.

9. **Construction of Primary Spillway and Discharge Channel:** The proposed primary spillway area will be excavated with stable slopes to suitable subgrade. At this time, it is not known whether an abandoned primary spillway is located in the vicinity of the proposed primary spillway. Should an existing abandoned spillway be located at the same location, the Contractor shall remove the existing spillways pipe/structure and construct the new 4-foot by 12-foot concrete riser drop-inlet spillway with low-level outlet in its place. The spillway will consist of a 48-inch-diameter barrel discharging to an impact stilling basin and a riprap-lined channel extending to the Harpeth River. If no existing spillway is present, the Contractor shall construct the primary spillway at the proposed location as shown.
10. **Diversion and Isolation of Proposed Dam Construction Area:** Following completion of proposed primary spillway, flow will be restored to the stream bed through the low-level outlet in the primary spillway.
11. **Rehabilitation of Earth Embankment:** Once the proposed dam area is isolated, excavated and foundation grouting has been completed, construction activities shall commence. The Contractor shall excavate with stable side slopes and install the proposed internal drainage system. The Contractor shall construct the internal drain as shown on the contract drawings during final design. Then, the Contractor shall commence grading for the dam which will include flattening the upstream and downstream slopes to 3H:1V and increasing the dam height to El. 645.5. It is anticipated that the earth dam section will be constructed with on-site borrow materials excavated from the proposed borrow area. Articulating concrete block should be installed to armor the upstream slope to El. 638 and lined with grass (i.e., topsoil and seed or sod).
12. **Replacement of Auxiliary Spillway and Concrete Chute:** The auxiliary spillway replacement will consist of removal of the existing concrete surface along the entire length of the existing spillway and construction of a new 47-foot-wide trapezoidal weir at El. 643. The Contractor should then install a 12-inch-thick reinforced concrete chute over the entire length of the auxiliary spillway to the limestone ledge at the Harpeth River. The spillway and concrete chute will include construction of an underdrain system beneath the slab.
13. **Installation of Emergency Spillway and Discharge Channel:** The proposed emergency spillway will be excavated with stable side slopes for a 15-foot-wide crest at El. 644. The emergency spillway will be grass-lined ACB from El. 638 along the upstream slope and extend along the first approximately 500-feet of the grass-lined emergency spillway discharge channel. The Contractor will re-grade the emergency spillway as shown on the contract drawings including an embankment on the east side of the spillway to contain the 1/3 PMP flood event.
14. **Removal of Stream Diversions:** Following installation of erosion control and overtopping protection measures, all remaining temporary cofferdams and stream diversion measures will be removed to restore the natural flow of the stream.

15. **Site Restoration:** All areas disturbed by construction activities will be restored to pre-construction conditions or better (paved, vegetated, etc.), unless otherwise indicated on the plans.

Section 8

Conceptual-Level Recommendations

8.1 Recommendations

The conceptual-level design for the rehabilitation of Robinson Lake Dam include the following primary recommendations:

- **Rehabilitation of the Existing Earth Embankment:** The rehabilitation of the existing earth embankment is proposed to include site clearing and grubbing, flattening the upstream and downstream slopes to 3H:1V, armoring the upstream slope from El. 638 with grass-lined articulating concrete block, and widening the dam crest to 15 feet.
- **Foundation Grouting Program:** To address observed and potential seepage conditions, a foundation grouting program is recommended to address potential seepage paths in the fractured bedrock zone and potential karst conditions noted during the geophysical program. An internal drainage system will be installed along the downstream slope of the existing embankment to control seepage through the dam.
- **Construction of a New Primary Spillway:** The primary spillway construction is proposed to consist of a 4-foot by 12-foot concrete box riser to El. 640 with a 48-inch diameter prestressed concrete cylinder pipe (PCCP) barrel discharging to a 20-foot wide impact stilling basin and riprap-lined channel flowing to the Harpeth River. The concrete riser drop-inlet will include a low-level outlet to lower the lake levels when necessary. The primary spillway is proposed to pass the 25-year design storm without activating the auxiliary or emergency spillways.
- **Replacement of the Existing Auxiliary Spillway:** The auxiliary spillway replacement is proposed to include removal and replacement of the existing cracked and damaged trapezoidal concrete chute spillway along the entire length of the spillway to the Harpeth River. The new auxiliary spillway slab will have an underdrain system that discharges at the Harpeth River. The auxiliary spillway is proposed to pass the 100-year design storm without activating the emergency spillway.
- **Construction of a New Emergency Spillway.** Construction of a new 355-foot-wide, grass-lined emergency spillway to El. 644. The emergency spillway construction is proposed to include armoring with ACB extending from El. 638 on the upstream slope to the first 100 feet of the grass-lined discharge channel. A small embankment (up to 3 feet in height) will be constructed on the eastern edge to capture flow from the spillway and direct the flow to the Harpeth River. The emergency spillway is proposed to pass the 1/3 probable maximum precipitation (PMP) design storm.

8.2 Opinion of Probable Construction Cost

The following conceptual opinion of probable construction cost (OPCC) has been developed based on the recommendations and rehabilitation measures described above. The costs are based on a limited investigation and are provided for general guidance only. The OPCC should not be considered an engineer's estimate as actual costs may be somewhat more or less than indicated. The actual rehabilitation costs can vary depending on contracting procedures as required by the State of Tennessee as well as other factors. These costs should be considered preliminary and should be confirmed by obtaining estimates from local contractors.

Refer to **Table 8-1** below for the summary of the OPCC.

Table 8-1. Summary of Conceptual-Level Opinion of Probable Construction Cost

Description	OPCC (\$)
Erosion and Siltation Control	\$16,000
Site Clearing	\$38,000
Dewatering and Cofferdam Installation	\$205,000
Primary Spillway and Riprap-Lined Discharge Channel	\$321,000
Embankment Rehabilitation	\$123,000
Emergency Spillway	\$1,592,000
Auxiliary Spillway	\$122,000
Dam Foundation Grouting	\$108,000
Conceptual-Level OPCC Total	\$2,500,000

Notes:

1. The conceptual-level OPCC line items have been rounded to the nearest thousand.
2. The conceptual-level OPCC total is considered accurate to two significant figures.
3. Note that the articulating concrete block (i.e., approximately 50% of the total OPCC) may be replaced during final design with lower-cost armoring methods such as turf reinforcement matting after conducting additional H/H analyses.

Finally, it is estimated that the engineering design and permitting costs associated with the project would be approximate 25 percent of the construction cost (i.e., about \$625,000).

Appendix A

Preliminary Assessment Memorandum



Memorandum

To: Paul Holzen, PE

From: Steve Whiteside, PE
Dave Mason, PE

Date: June 23, 2017

Subject: Preliminary Assessment of Robinson Lake Dam
Franklin, Tennessee

CDM Smith was engaged by the City of Franklin to perform a preliminary assessment of Robinson Lake Dam in Franklin, Tennessee. We understand that the City is considering acquiring the property on which the dam and lake are located. The purpose of the assessment is to identify potential dam safety deficiencies and provide recommendations for future actions.

Background

The existing dam for Robinson Lake is an earth embankment dam with a concrete spillway in the right abutment area discharging to the Harpeth River. The dam has a structural height of 22.5 feet and hydraulic height of 19 feet, with a storage capacity of 91 acre-feet at normal pool and 136 acre-feet at maximum pool. Currently, the dam is privately owned.

Note that the terms “right” and “left” used in this memorandum are the directions as viewed looking downstream from the dam.

Scope of Work

CDM Smith performed the following scope of work for the assessment.

- Contacted the Tennessee Department of Environment and Conservation, Division of Water Resources, Safe Dams Program to obtain information in their files and confirm the current regulatory status of the dam.
- Performed a site visit to observe the current conditions of the dam and appurtenant structures and identified potential dam safety deficiencies. Our scope did not include any geotechnical or structural investigations.
- Prepared this memorandum summarizing the results of the assessment. The memorandum includes a summary of the field observations and representative photos. It includes our opinion concerning potential dam safety deficiencies that may need to be addressed and

planning--level cost estimates investigating and addressing the potential deficiencies. Our scope did not include geotechnical, structural, or hydrologic analyses.

Safe Dams Program Information

CDM Smith contacted Lyle Bentley who is in charge of the Safe Dams Program. Mr. Bentley provided the information included in Appendix A. Mr. Bentley confirmed that the lake is currently classified as a farm pond and is not subject to the dam safety regulations. Per Mr. Bentley, if the City purchases the property and dam, the dam will be subject to the dam safety regulations.

Site Visit Observations

Steve Whiteside and Dave Mason of CDM Smith performed a preliminary visual inspection of Robinson Lake Dam on June 12, 2017. We were accompanied by Doug Noonan of the City and Jason Deal of Barge Waggoner Sumner & Cannon. At the time of the inspection, the reservoir level appeared to be at normal pool. The dam structural height, according to the National Inventory of Dams (NID) database, is 22.5 feet and there was approximately 5.5 feet of freeboard above normal pool.

A dam inspection checklist and representative photographs are included in Appendix B. An overall view of the lake is shown in Photo 1. The following sections summarize the results of the visual inspection.

Crest

The crest is approximately 12 feet wide. The left portion is covered with tall grass and weeds, and the right portion is mostly bare with tall grass and weeds along both sides of the crest (Photos 2 and 3). There is a bare, slightly eroded area on the may be due to a previous overtopping event (Photo 4).

Upstream Slope

The upstream slope is covered with trees, brush, and tall weeds (Photos 5 and 6). The left portion of the slope is partially covered with riprap and concrete fragments (Photo 7). The trees are up to 12 inches in diameter (Photo 8). The slope is very steep, ranging from 1.5 horizontal to 1 vertical (1.5H:1V) to near vertical.

Downstream Slope and Downstream Area

The downstream slope and downstream area are covered with leaves, vines, brush, and trees up to 12 inches in diameter (Photos 9 through 11). The downstream slope is steep, typically about 1.5H:1V. Photo 12 shows the bare, eroded area that may be due to a previous overtopping event.

There is a vertical 36-inch-diameter RCP pipe located downstream of the dam (Photo 13). The pipe is 12 feet long and extends 8 feet below the ground surface. The bottom of the pipe has three feet of muck or sediment. No outlet pipes were observed.

There is significant seepage downstream of the RCP pipe (Photos 14 and 15). The seepage flows downstream and discharges at a drop-off to the Harpeth River. There appeared to be seepage emerging at the base of the drop-off, adjacent to the river.

Outlet Works

No outlet works or low-level outlet for draining the pond was observed.

Spillway

The spillway is located in the right abutment and consists of a trapezoidal concrete weir and discharge channel. The weir is about 46.5 wide with a 25-foot bottom width (Photo16). There is a partially intact fence along the upstream side of the weir that apparently serves as a trash guard (Photo 17). There are small trees and brush in the approach channel upstream of the fence.

The concrete discharge channel is heavily cracked and has brush growing in the channel bottom and sloped walls (Photos 18 and 19). The channel ends at limestone bedrock (Photo 20) where there is a 15-foot-high drop-off down to the river. Seepage was flowing through the limestone face (Photo 21). In addition, seepage was flowing from the river bank to the left of the limestone face (Photos 22 and 23). Total seepage flow was about 100 to 200 gpm. There was erosion in the seepage area, but the seepage flow appeared to be clear.

Summary of Dam Safety Deficiencies

The following are potential dam safety deficiencies CDM Smith identified during the preliminary visual inspection.

1. The slopes and downstream area are covered with large trees and heavy vegetation.
2. The upstream and downstream slopes are very steep.
3. The bare, eroded area on the crest and downstream slope may indicate previous overtopping of the dam during a flood event. If that is the case, the spillway capacity may be inadequate.
4. No outlet works or low-level outlet for draining the pond were observed.
5. Seepage was observed in the area downstream of the RCP riser pipe.
6. Seepage was observed through and adjacent to the limestone at the end of the spillway discharge channel.
7. There are trees and brush in the approach area to the spillway that will reduce spillway capacity. In addition, the fence along the upstream side of the weir can collect debris and reduce spillway capacity.
8. The concrete in the spillway discharge channel is badly cracked and has brush growing in the bottom and sides of the channel.

Recommendations

CDM Smith has the following recommendations to assess and mitigate the identified dam safety deficiencies. The recommended mitigation measures will require a permit from the Safe Dams Program and will need to be designed by a licensed professional engineer experienced in dam safety engineering.

1. Perform hydrologic/hydraulic analyses to evaluate the required spillway capacity for passing the design storm event without overtopping the dam.
2. Perform a geotechnical and geophysical investigation to evaluate the condition of the dam and foundation.
3. Perform geotechnical analyses, including seepage and stability analyses.
4. Based on the results of the analyses and the identified dam safety deficiencies, develop a rehabilitation design. We anticipate that the design may consist of the following:
 - a. Removal of all trees, root balls, and other vegetation.
 - b. Flattening the upstream and downstream slopes to 3H:1V. The downstream slope modification would include the installation of an internal drainage system to control seepage.
 - c. Repairing or replacing the existing spillway. The spillway modification or replacement would include a drainage system to control seepage.
 - d. Grouting bedrock in the spillway area to reduce seepage.
 - e. Constructing a low-level outlet combined with a drop inlet spillway to serve as the principal spillway

Planning-Level Estimate of Rehabilitation Costs

CDM Smith has developed a planning-level cost estimate for rehabilitation measures described above. The planning level construction cost is estimated to be \$1.5-\$2.0 million, which is contingent upon the further exploration and limitations summarized below. On average, the City can also anticipate approximately 25-30% for design and permitting associated with the proposed rehabilitation measures.

Limitations

The conclusions and recommendations provided in this memorandum are based solely on the visual observations of the dam and appurtenant structures by the CDM Smith engineers at the time of the inspection. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team. It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can unsafe conditions be detected.

The planning-level cost estimates provided in this memorandum are based on the visual observations, engineering judgment, and similar projects. No warranty, express or implied, is included.

Appendix A

Tennessee Safe Dams Program Information

94-10

TENNESSEE DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES
2611 West End Avenue
Nashville, Tennessee 37203
Telephone (615) 741-2572

2

INVENTORY DATA ON IMPOUNDMENT

Dam # _____

Quad # 63-NE 8

Name of Dam Robinson Lake
~~Thomas Robinson~~

Name of Owner Dexter Lockwood
~~William J. Wilson & Thomas Wilson~~

Address P.O. Box 588, Franklin, Tenn. 37064 Tel. 794-3216 (H)
794-8465 (B)

County Williamson Stream Trib., Harpeth River (9A)

Dam at Stream, Lat. 35° 53' 32", Long. 86° 49' 41"

Type of Dam Earth Purposes Recreation

Downstream Hazard Category, (D/S HAZ), _____

Type of Spillway Concrete, Rock

Length of Crest 354 Ft., ^{Width} length of Spillway 30 Ft.

Hydraulic Cap. of all Spillways _____ cfs _____ cfs-sm

Spillway Lip Elev. _____ Ft. (MSL), Pool Area 11.5 Ac.

Volume in Dam _____ Cu. Yds., Drainage Area 49052 Ac.

Max. Vol. Pool 136 (1) Ac. Ft., ^{Normal} Min. Vol. Pool 91 (1) Ac. Ft.

Structural Ht. Dam 22.5 Ft. Hydraulic Ht. Dam 19 Ft.

Engineered by None

Construction by McDowell & Company

Year Completed 1950 (2), Plans, _____, At _____

Inspection by _____, Date _____

Certificate # _____, Issued on _____, Expires _____

Comments (1) Estimated by 0.4 factor

(2) Estimated

June 21, 1973

Lyle Bentley

From: Lyle Bentley
Sent: Monday, March 23, 2015 8:08 AM
To: 'Clay Wallace'
Cc: Ernest Ekwugha; Erin O'Brien
Subject: RE: Robinson/Lockwood Lake

#94-7010

Mr. Wallace-

We did discuss what you have said below. If the lake is fenced off and not open to the public, then it would still stay unregulated, assuming it is still privately owned. If Franklin owns it, it will be regulated, fenced or not, because it is publicly owned.

Lyle

Lyle Bentley, P. E.
Natural Resources Unit
Division of Water Resources
Office: (615) 532-0154
Email: Lyle.Bentley@tn.gov



TENNESSEE DEPARTMENT OF
ENVIRONMENT AND CONSERVATION

Sign-up for the [TDEC E-Newsletter](#).

From: Clay Wallace [<mailto:Clay.Wallace@eli-llc.com>]
Sent: Monday, March 23, 2015 7:38 AM
To: Lyle.Bentley@state.tn.us
Subject: Robinson/Lockwood Lake

*** This is an EXTERNAL email. Please exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email. - OIR-Security***

Mr. Bentley,

We spoke earlier this year about the status of Robinson Lake on the Lockwood property (east of I-65 and south of S Carothers Rd). This is part of the property that Khri Pasarella is purchasing for the Lockwood Glen subdivision. It will be separated from all of the houses by Carothers Parkway which is currently under construction. I just wanted to confirm that we discussed that as long as the lake is not open to public access that it will remain unregulated. Per our discussion, it was my understanding that the lake would only fall under regulation at such a time that it became part of a common open space that was accessible and usable by the subdivision or by the general public. Can you please confirm? I did have one question that I don't remember if we covered. If that area was to be converted to usable open space or a park or some sort, and the lake is fenced off, would it still remain unregulated?

Thank you!

Clay Wallace, PE
Senior Project Engineer
Energy Land & Infrastructure, LLC (PLLC in NC)

1420 Donelson Pike, Suite A-12

Nashville, TN 37217
(615) 383-6300 Office
(615) 971-5284 Cell
clay.wallace@eli-llc.com
www.eli-llc.com

PRIVILEGED AND CONFIDENTIAL COMMUNICATION - This electronic transmission, including any attachments, may contain confidential and/or privileged information. This communication is to be used only by the intended recipient. If you received this email in error, please notify the sender and delete the email. Any disclosure, copying, distribution, or use of information received in error is strictly prohibited.

Lyle Bentley

From: Lyle Bentley *LB*
Sent: Thursday, December 11, 2014 11:34 AM
To: Ernest Ekwugha
Cc: Erin O'Brien
Subject: Robertson Dam, I. D. No. 94-7010

Ernest-

I contacted Kaye Lockwood, owner of Robertson Dam in Williamson County. The lake is still a farm pond. The construction taking place nearby is due to Franklin extending Carothers Road southward.

Ms. Lockwood is selling the property incrementally to Pearl Street Partners, who will apparently develop it. She thought the lake was eventually going to be given to Franklin to be part of a greenway or something similar. The next property purchase will occur in January, 2015, and the final in January, 2016. She did not know which sale would include the lake. I also talked to Paul Holzen, the Franklin engineering director, and told him that the dam would become regulated once the property started getting developed. He is now aware that the city would have to bring the dam into compliance if it is not in compliance when transferred to the city.

I left several messages for Kris Pascarella of Pearl Street Partners to call me, but he hasn't, yet. In the last one I told him that the dam would be regulated once the property started getting developed and would have to comply with our regulations.

I am going to flag the dam for follow-up in February, 2015, and February, 2016. Please check on it when it shows up to see if it has been sold and what's going to happen with it. Please print this out for your file.

Kaye Lockwood Cell: (615) 948-7386 Bus: (615) 794-8465

Kris Pascarella

Pearl Street Partners, LLC

205 Powell Place

Brentwood, TN 37027-7525

Bus: (615) 312-8242

Cell: (615) 604-3714

Lyle

Lyle Bentley, P. E.
Natural Resources Unit
Division of Water Resources
Office: (615) 532-0154
Email: Lyle.Bentley@tn.gov



Sign-up for the [TDEC E-Newsletter](#).

LB12/11
VCC: NFO 12/11

```
1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 11DEC14 TIME 11:54:44 *
*****
```

```
*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****
```

```

X X XXXXXX XXXXX X
X X X X XX
X X X X X
XXXXXXX XXXX X XXXXX X
X X X X X X
X X X X X
X X XXXXXXX XXXXX XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID ROBERTSON DAM, WILLIAMSON COUNTY, I.D. NO. 94-7010
2 ID DATA FROM GIS AND CURRENT FILE DATA.
3 IT 5 11DEC14 0 109
4 IO 3 0 0
5 JR PREC 0.18 0.33

6 KK INFLOW
7 BA .814 0
8 PB 29.4
9 IN 15 11DEC14 0
10 PC 0.0 0.02 0.04 0.06 0.08 0.11 0.14 0.18 0.23 0.4
11 PC 0.58 0.65 0.7 0.74 0.77 0.8 0.83 0.86 0.88 0.9
12 PC 0.92 0.94 0.96 0.98 1.0
13 LS 0 85 0
14 UD .46

15 KK OUTFLOW
16 RS 1 ELEV 650 0
17 SV 87 133
18 SE 650 653.5
19 SQ 0 90 254 468 589
20 SE 650 651 652 653 653.5
21 ST 653.5 354 2.8 1.5
22 ZZ
```

```
1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 11DEC14 TIME 11:54:44 *
*****
```

```
*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****
```

ROBERTSON DAM, WILLIAMSON COUNTY, I.D. NO. 94-7010
DATA FROM GIS AND CURRENT FILE DATA.

```
4 IO OUTPUT CONTROL VARIABLES
      IPRNT 3 PRINT CONTROL
      IPLOT 0 PLOT CONTROL
      QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
      NMIN 5 MINUTES IN COMPUTATION INTERVAL
      IDATE 11DEC14 STARTING DATE
      ITIME 0000 STARTING TIME
      NQ 109 NUMBER OF HYDROGRAPH ORDINATES
      NDDATE 11DEC14 ENDING DATE
      NDTIME 0900 ENDING TIME
      ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
```

TOTAL TIME BASE 9.00 HOURS

ENGLISH UNITS

DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-Feet
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.18 .33

*** **

* *
6 KK * INFLOW *
* *

9 IN TIME DATA FOR INPUT TIME SERIES
JXMIN 15 TIME INTERVAL IN MINUTES
JXDATE 11DEC14 STARTING DATE
JXTIME 0 STARTING TIME

SUBBASIN RUNOFF DATA

7 BA SUBBASIN CHARACTERISTICS
TAREA .81 SUBBASIN AREA

PRECIPITATION DATA

8 PB STORM 29.40 BASIN TOTAL PRECIPITATION

10 PI INCREMENTAL PRECIPITATION PATTERN
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .02 .02 .02 .06 .06 .06 .06 .06 .06
.02 .02 .02 .02 .02 .02 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01

13 LS SCS LOSS RATE
STRTL .35 INITIAL ABSTRACTION
CRVNR 85.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

14 UD SCS DIMENSIONLESS UNITGRAPH
TLAG .46 LAG

UNIT HYDROGRAPH
30 END-OF-PERIOD ORDINATES

60.	179.	367.	599.	744.	784.	747.	656.	537.	391.
293.	222.	174.	133.	101.	77.	58.	44.	34.	26.
20.	15.	11.	9.	7.	6.	4.	3.	1.	0.

TOTAL RAINFALL = 29.40, TOTAL LOSS = 2.02, TOTAL EXCESS = 27.38

PEAK FLOW	TIME	6-HR	24-HR	72-HR	9.00-HR
+	(CFS)				
+	7897.	2.75	2374.	1598.	1598.
		(CFS)	27.120	27.383	27.383
		(INCHES)	1177.	1189.	1189.
		(AC-FT)			

CUMULATIVE AREA = .81 SQ MI

*** **

HYDROGRAPH AT STATION INFLOW
FOR PLAN 1, RATIO = .18

TOTAL RAINFALL = 5.29, TOTAL LOSS = 1.65, TOTAL EXCESS = 3.64

PEAK FLOW	TIME	6-HR	24-HR	72-HR	9.00-HR
+	(CFS)				
+	1068.	2.83	318.	212.	212.
		(CFS)			

(INCHES)	3.632	3.639	3.639	3.639
(AC-FT)	158.	158.	158.	158.

CUMULATIVE AREA = .81 SQ MI

*** **

HYDROGRAPH AT STATION INFLOW
FOR PLAN 1, RATIO = .33

TOTAL RAINFALL = 9.70, TOTAL LOSS = 1.84, TOTAL EXCESS = 7.86

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW	
(CFS)	(HR)		24-HR	9.00-HR
+	2322.	2.83	686.	459.
		(CFS)	459.	459.
		(INCHES)	7.865	7.865
		(AC-FT)	341.	341.

CUMULATIVE AREA = .81 SQ MI

*** **

*
15 KK * OUTFLO * W
*

HYDROGRAPH ROUTING DATA

16 RS	STORAGE ROUTING		
	NSTPS	1	NUMBER OF SUBREACHES
	ITYP	ELEV	TYPE OF INITIAL CONDITION
	RSVRIC	650.00	INITIAL CONDITION
	X	.00	WORKING R AND D COEFFICIENT
17 SV	STORAGE	87.0	133.0
18 SE	ELEVATION	650.00	653.50
19 SQ	DISCHARGE	0.	90. 254. 468. 589.
20 SE	ELEVATION	650.00	651.00 652.00 653.00 653.50
21 ST	TOP OF DAM		
	TOPEL	653.50	ELEVATION AT TOP OF DAM
	DAMWID	354.00	DAM WIDTH
	COQD	2.80	WEIR COEFFICIENT
	EXPD	1.50	EXPONENT OF HEAD

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	87.00	100.14	113.29	126.43	133.00
OUTFLOW	.00	90.00	254.00	468.00	589.00
ELEVATION	650.00	651.00	652.00	653.00	653.50

*** **

HYDROGRAPH AT STATION OUTFLO
FOR PLAN 1, RATIO = .18

PEAK OUTFLOW IS 666. AT TIME 3.33 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW	
(CFS)	(HR)		24-HR	9.00-HR
+	666.	3.33	299.	205.
		(CFS)	205.	205.
		(INCHES)	3.505	3.505
		(AC-FT)	152.	152.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE	
(AC-FT)	(HR)		24-HR	9.00-HR
+	135.	3.33	115.	106.
			106.	106.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE	
(FEET)	(HR)		24-HR	9.00-HR
+	653.63	3.33	652.10	651.46
			651.46	651.46

CUMULATIVE AREA = .81 SQ MI

HYDROGRAPH AT STATION OUTFLO
FOR PLAN 1, RATIO = .33

PEAK OUTFLOW IS 2229. AT TIME 2.92 HOURS

PEAK FLOW	TIME		6-HR	24-HR	72-HR	9.00-HR
+	(CFS)	(HR)				
+	2229.	2.92	(CFS)			
			656.	449.	449.	449.
		(INCHES)	7.492	7.686	7.686	7.686
		(AC-FT)	325.	334.	334.	334.

PEAK STORAGE	TIME		6-HR	24-HR	72-HR	9.00-HR
+	(AC-FT)	(HR)				
+	149.	2.92				
			126.	115.	115.	115.

PEAK STAGE	TIME		6-HR	24-HR	72-HR	9.00-HR
+	(FEET)	(HR)				
+	654.72	2.92				
			652.97	652.11	652.11	652.11

CUMULATIVE AREA = .81 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	RATIO 2
				.18	.33
+	HYDROGRAPH AT INFLOW	.81	1	FLOW	1068.
				TIME	2.83
+	ROUTED TO OUTFLO	.81	1	FLOW	666.
				TIME	3.33

** PEAK STAGES IN FEET **

1	STAGE	653.63	654.72
	TIME	3.33	2.92

1

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION OUTFLO
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1	ELEVATION	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	650.00	653.50	653.50	
	87.	133.	133.	
	OUTFLOW	0.	589.	589.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.18	653.63	.13	135.	666.	.50	3.33	.00
.33	654.72	1.22	149.	2229.	2.25	2.92	.00

*** NORMAL END OF HEC-1 ***

$\sim \frac{1}{3}$ C soils

$\sim \frac{2}{3}$ B soils

Assume $\frac{1}{8}$ ac. lots after devel. is thru

$$\frac{2}{3}(85) + \frac{1}{3}(90) = 87 \quad \text{~~87~~}$$

Not all is developed - use 85

Watershed area: 521 ac.

NPA: 11.5 ac.

Ass. TOD area = 14.5 ac.

NP Vol: $19(11.5)(.4) = 87$ ac.

TOD " : $87 + 3.5(13) = 133$ ac.

5.4, 5.5, 4.5, 2.6, 4.8, 7.3, 8.4, 10.9 ave: 6.2

$$L = 6160$$

$$L = \frac{(6160)^{.8} \left(\frac{1000}{85} - 9 \right)^{.7}}{1900 (6.2)^{.5}} = .46 \text{ hr.}$$

Est. ~~NP~~ NP @ 650, PS: BW=30, Z=0

Elev.	H	C	Q
650	0	3	0
651	1	3	90
652	2	3	254
653	3	3	468
653.5	3.5	3	589

Lyle Bentley



TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
OFFICE CORRESPONDENCE

LB 7/31
MS 8/01

TRIP REPORT

MEMO TO FILE

DAM NAME: Robinson Lake Dam I.D. No. 94-7010
COUNTY: Williamson INSPECTION DATE: July 13, 2012
PURPOSE OF VISIT: FARM POND REVIEW
INSPECTOR'S NAME: Ernest Ekwugha
OTHERS PRESENT: _____
WEATHER CONDITIONS: Sunny. 90
PHOTOS TAKEN: Yes NO X

CHANGE IN HAZARD CATEGORY: NO _____

FINDINGS: On July 13, 2012, I visited the above referenced dam to determine whether it still qualifies as a farm pond. I noticed that the dam is secured and the public had no access to the lake. There were no changes to the downstream of the dam.

I called Mrs. Dexter Lockwood, the owner of the property to confirm the ownership and usage. A family member answered the phone. She indicated that the farm pond verification will be handled by the owner's daughter.

Based on this trip report, I recommend that the dam remain classified as a significant hazard farm pond. Mrs. Lockwood's address and telephone number had not changed. The next scheduled farm pond review for the above dam will be conducted in July 2017.

Please de-list from upcoming activities report.

Mrs. Dexter Lockwood
4351 South Carothers Road
Franklin, TN 37064

Home Tel. (615) 794-3216

Inspector's signature / Date :

Ernest Ekwugha

July 30, 2012

cc: Central Office

20170715



TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

OFFICE CORRESPONDENCE

TN DEPT OF ENVIRONMENT
AND CONSERVATION2007 OCT 12 P 3:46
TRIP REPORTDIVISION
OF WATER SUPPLYS/S 7/26
EJW - 7/27
LB 10/12
MS 10/12

MEMO TO FILE

DAM NAME: Robinson Lake Dam I.D. No. 94 - 7010

COUNTY: Williamson INSPECTION DATE: July 2, 2007

PURPOSE OF VISIT: FARM POND REVIEW

INSPECTOR'S NAME: Ernest Ekwugha

OTHERS PRESENT: _____

WEATHER CONDITIONS: Sunny, 86°

PHOTOS TAKEN: Yes ☐ NO ☒

CHANGE IN HAZARD CATEGORY: NO _____

FINDINGS: On July 2, 2007, the above referenced dam was visited to determine whether or not it still qualifies as a farm pond. I observed that the impoundment is on private property and there were no developments downstream.

On July 3, 2007, I called Mrs. Dexter Lockwood, the owner of the property to confirm the ownership and usage. She said the impoundment is located on her property, that it is secured and not open to the general public.

Based on this trip report, I recommend that the dam remain classified as a significant hazard farm pond. Mrs. Lockwood's address and telephone number had not changed. The next scheduled farm pond review for the above dam will be conducted in July 2012.

Please de-list from upcoming activities report.

Mrs. Dexter Lockwood
4351 South Carothers Road
Franklin, TN 37064

Home Tel. (615) 794 - 3216

Inspector's signature / Date :

July 26, 2007

cc: Central Office

20120715

DIVISION OF WATER SUPPLY
SAFE DAMS SECTION

TN DEPT OF ENVIRONMENT
AND CONSERVATION

LB 5/28
MS 5/29
EE 5/30

TRIP REPORT

DAM NAME Robinson Lake Dam I.D. NO. 94-7010
COUNTY Williamson INSPECTION DATE 5/6/02
PURPOSE OF VISIT Farm Pond Review
INSPECTOR'S NAME Ghufran Barzani
OTHERS PRESENT None.
WEATHER CONDITIONS Cloudy, 65°
PHOTOS TAKEN YES NO X
CHANGE IN HAZARD CATEGORY No

FINDINGS: On May 6, 2002, the above referenced dam was visited for the purpose of evaluating its "farm pond" status. I found nothing changed either on the property or in the downstream area. The property was still fenced and posted with "No-Trespassing" and "No-Fishing" signs. The access road was closed off by a gate.

On the same date, I contacted the owner, Ms. Dexter Lockwood. Her secretary told me that she still owns the property that surrounds Robinson Lake and the lake was used only for livestock purpose and that she did not allow anyone to use it otherwise.

The next scheduled "farm pond" review for the above referenced dam will be conducted in July 2007.

I recommend that the lake be classified as a farm pond and the hazard category remain as high. A "farm pond" letter should be sent to this mailing address:

Ms. Dexter Lockwood
P.O. Box 588
Franklin, TN 37064
(615) 794-3216 (home)
(615) 794-8465 (work)

Ghufran Barzani 5/8/2002
INSPECTOR'S SIGNATURE/DATE

DIVISION OF WATER SUPPLY
SAFE DAMS SECTION

TRIP REPORT

DAM NAME Robinson Lake I.D. NO. 94-7010
COUNTY Williamson INSPECTION DATE 9/6/96
PURPOSE OF VISIT Farm Pond Review
INSPECTOR'S NAME Ghufran Barzani
OTHERS PRESENT Gary Horne
WEATHER CONDITIONS Sunny, 71°
PHOTOS TAKEN YES NO X
CHANGE IN HAZARD CATEGORY No

FINDINGS: On September 6, 1996, Gary Horne and I visited the above referenced dam in order to perform a "farm pond" review.

When we arrived at the property, the entrance access road was unlocked. The property was posted with "No Trespassing and Private Property signs.

I spoke with Mr. Dexter Lockwood's daughter, who stated that her father was deceased, but her Mother still owns the property. According to her, the lake is not open to the general public.

Based upon this inspection, the dam should remain classified as a low hazard "farm pond".

I recommend that the dam be flagged again in September, 2001. A "farm pond" letter should be sent to:

Mrs. Dexter Lockwood
P.O. Box 588
Franklin, TN 37064
(615) 794-3216 home
(615) 8465 work

INSPECTOR'S SIGNATURE/DATE

Ghufran Barzani 9/9/96

'KB 9/12

LB 9/13

JSM 9/13

EE 9/17

OFFICE OF THE
STATE ENGINEER

SEP 13 9 40 AM '96

IN DEPT OF TRANSPORTATION
AND CONSTRUCTION



LB 9/17
SM 9/20
EE 9/23

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER SUPPLY
6th FLOOR, L & C TOWER
401 CHURCH STREET
NASHVILLE, TN 37243-1549

September 13, 1996

Mrs. Dexter Lockwood
P.O. Box 588
Franklin, TN 37064

RE: Robinson Lake Dam; Williamson County
I.D. No. 94-7010

Dear Mrs. Lockwood:

Your dam has been classified as a "farm pond" as defined in the Rules and Regulations. This office does not intend to regulate your dam based on this definition. A "farm pond" means any impoundment used only for providing water for agricultural and domestic purposes such as livestock and poultry watering, irrigation of crops, recreation, and conservation, for the owner or occupant of the farm, his family, and invited guests, but does not include any impoundment for which the water, or privileges or products of the water, are available to the general public.

General public as used above includes patrons, members, and customers of institutions and/or clubs such as but not limited to summer camps, schools, retirement facilities, churches, private clubs, communes, hunting clubs, and health care facilities. The following are examples of impoundments that are not "farm ponds":

State owned recreational lakes, residential subdivision lakes, industrial waste impoundments, industrial water supply impoundments, hunting clubs, public water supply impoundments, commercial land developments, state owned or operated conservation impoundments, and watershed district impoundments.

Farm as used above means a tract of land that is or may be used for cultivation of crops and or raising livestock. A farm pond is not subject to the requirements of the Safe Dams Act; however, at any time in the future that your

TO	DATE
PLB	9/10
CC: NFO	9/19
FILE	

TELEPHONE/MEETING RECORD

DATE: 9-9-91

TO: FILE

FROM: JOHN MCCLURKAN

SUBJECT: ROBINSON LK Dam 94-7010
Williamson County

On 9-6-91, the above site was visited, and it appeared to still be a farmpond.

On 9-9-91, a call was made to Mr. Dexter Lockwood. His secretary told me that he still owns the property that surrounds Robinson Lake.

I recommend that this dam remain as classified.



TENNESSEE DEPARTMENT OF HEALTH AND ENVIRONMENT

Bureau of Environment
T.E.R.R.A. BUILDING
150 NINTH AVENUE NORTH
NASHVILLE, TENNESSEE 37219-5404

September 22, 1986

Dexter Lockwood
P.O. Box 588
Franklin, TN 37064

Re: Robinson Lake, Williamson Co.
I.D. No. 94-7010

Dear Mr. Lockwood:

Your dam has been classified as a "farm pond" as defined in the Proposed Rules and Regulations. Although these Rules and Regulations have not yet been promulgated, this office does not intend to regulate your dam based on this definition. A "farm pond" means any impoundment used only for providing water for agricultural and domestic purposes for the owner or occupant of the farm, his family, and invited guest, such as livestock and poultry watering, irrigation of crops, recreation, and conservation, but does not include any impoundment for which the water, or privileges or products of the water, are available to the general public.

General public as used above includes patrons, members, and customers of institutions and/or clubs such as but not limited to summer camps, schools, retirement facilities, churches, private clubs, communes, hunting clubs, and health care facilities. The following are examples of impoundments which are not "farm ponds".

State owned recreational lakes, residential subdivision lakes, industrial waste impoundments, industrial water supply impoundments, hunting clubs, public water supply impoundments, commercial land developments, state owned or operated conservation impoundments, and watershed district impoundments.

Farm as used above means a tract of land which is or may be used for cultivation of crops and/or raising livestock.

A farm pond is not subject to the requirements of the Safe Dams Act; however, at any time in the future that your facility becomes used by the general public or is developed into one of the other regulated types of impoundments, you must comply with the Act. At this time you are required to notify this office.

As the owner of a dam you are legally liable for any damages resulting from the failure of this dam. Enclosed is a manual you should read that will help you evaluate your dam for any potential problems. We recommend that any problems encountered be investigated by a professional engineer.

I.D. NO. 94-7010

JDR 9-19
JCG 9/19
CC NBO

Date 9/18/86

Basin NBO

INSPECTION REPORT

Name of Dam: Robinson Lake County: Williamson

Owner's Name: ~~William + Tommy Wilson~~ Quad: 63-NE

Type Project: Dexter Lockwood

Existing ☒
New Construction ☐
Repair/Alteration ☐
Removal ☐

Type Inspection: Cursory

Damage Potential Category: One ☐ Two ☒ Three ☐ Undetermined ☐

Inspection by: L. Bentley

Inspection Results:

I went to this lake on 9/17/86.
It was fenced + posted + was ~~used~~
surrounded by pasture. I recommend
that it be classified as a farm
pond.

POOL 1
R153

conc.

9% grade

rock

S P I L L W A Y

ROBINSON'S LAKE, WILLIAMSON CO., TENN.
Aug. 1, 1973 LDS WDT

POOL 2
R153
8.72

23:1

0.72

POOL 3
R153
9.9

19:1

POOL 4
R153
10.75
9.1
4.7

2:1

12" metal pipe w. valve

POOL 5
R153
10.75

POOL 6
R153

R153
R153

END
R200

END
R134
R2185

RIVER

POOL

POOL

SPILL

CREST: LENGTH - 354'

WIDTH - 9'

SPI L LWAY: WIDTH - 31'

CONC., ROCK

HEIGHT: STRUCTURAL - 22.5'

HYDRAULIC - 19'

ROBINSON'S LAKE, WILLIAMSON CO., TENN.
Aug. 1, 1973 LDS, WOT

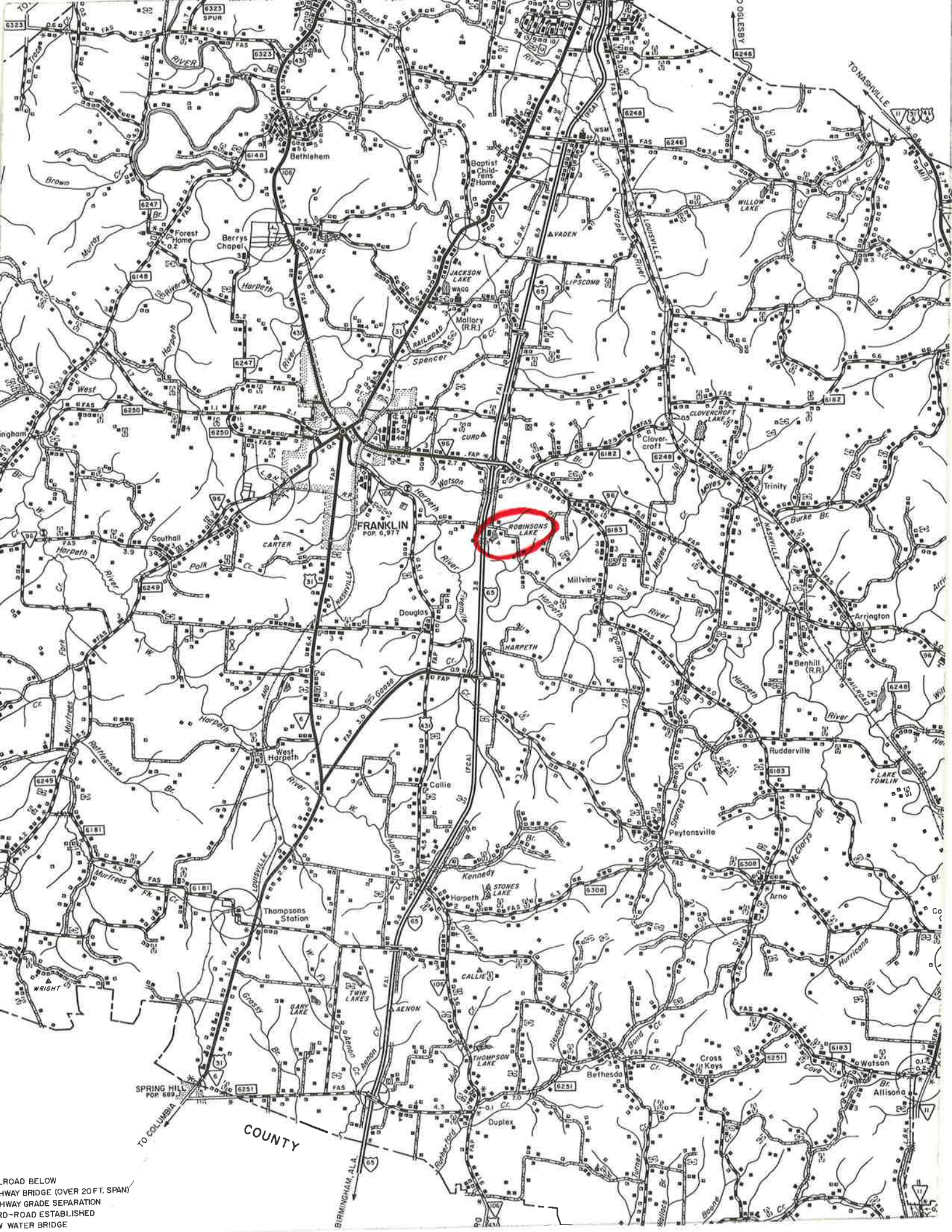
4200

4100

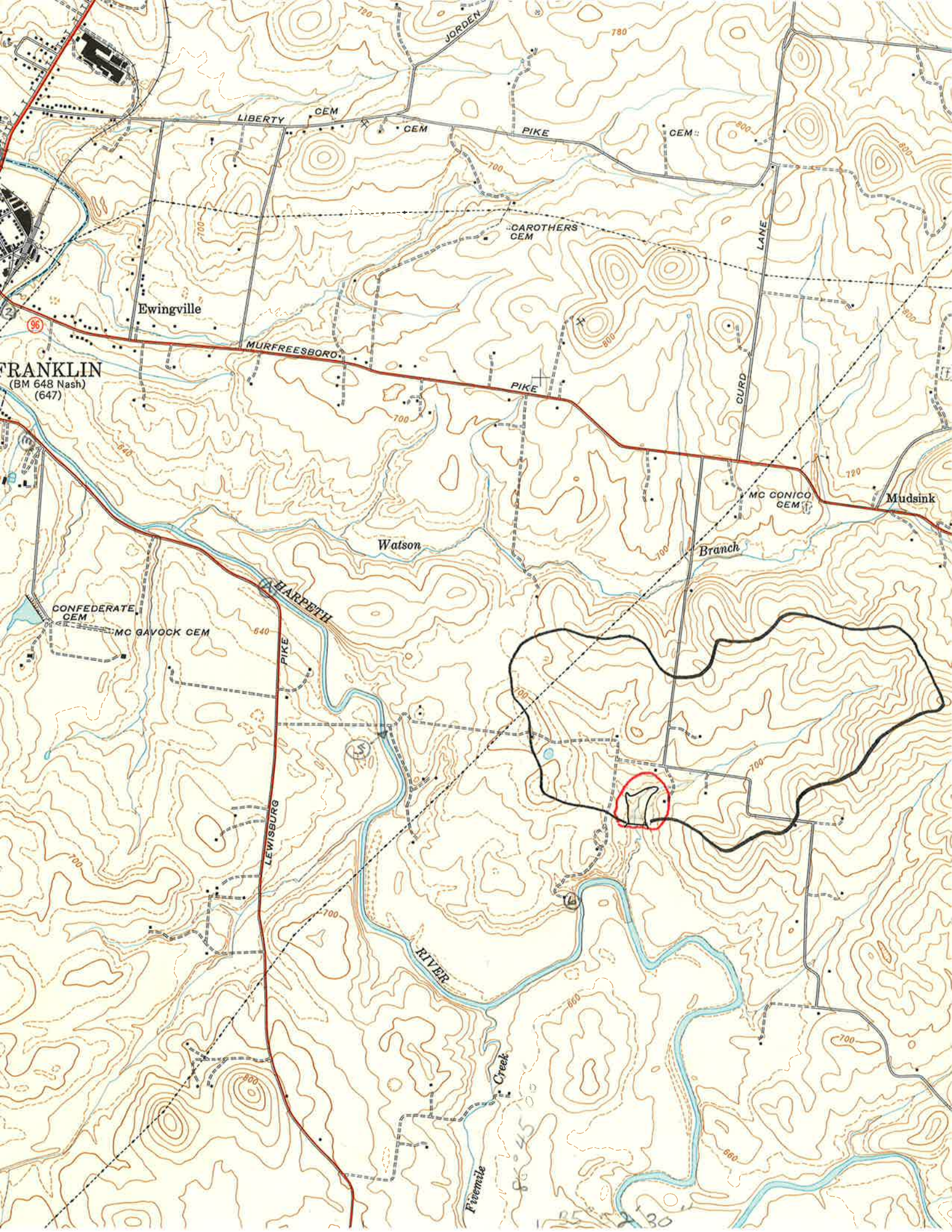
4000

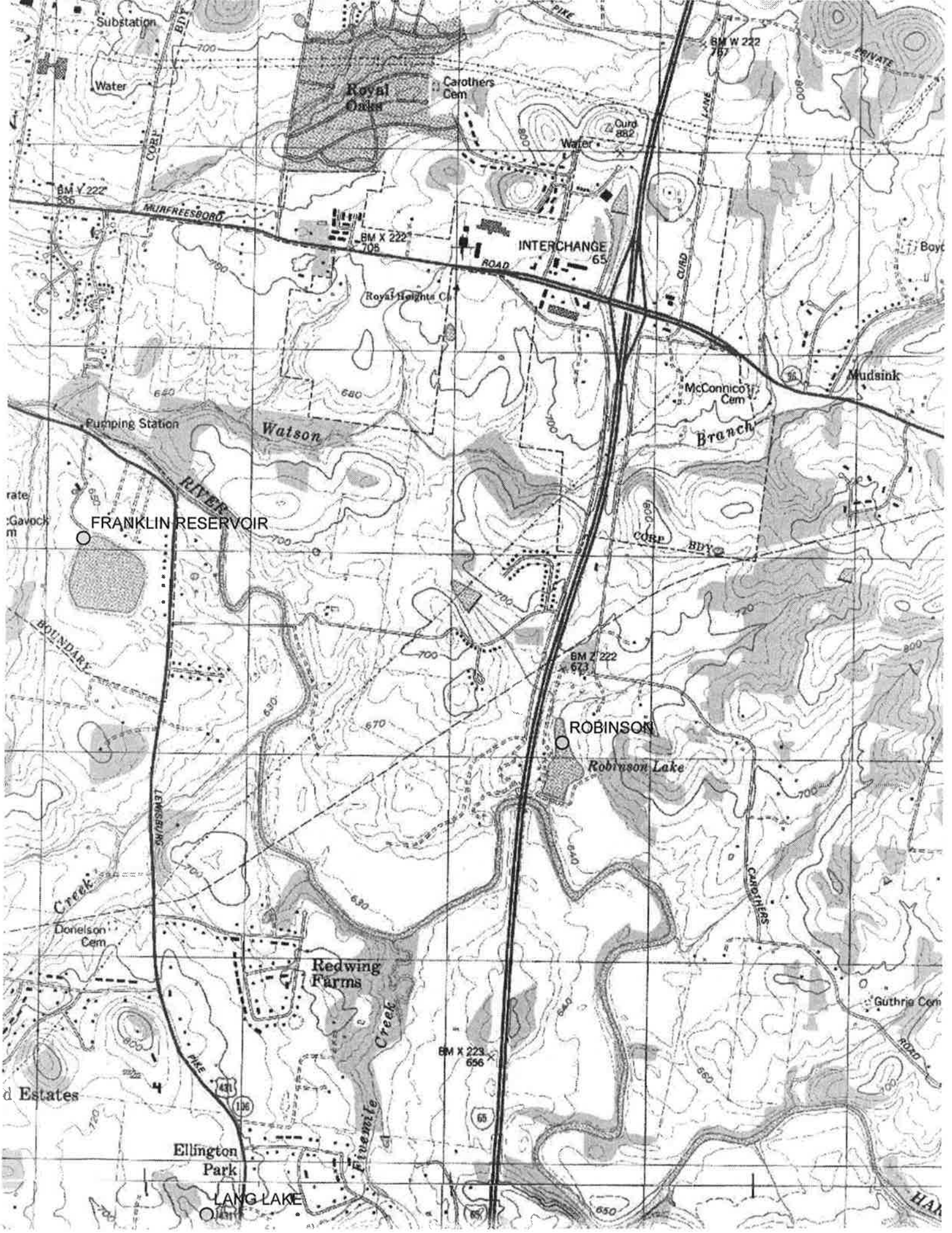
3900

3800



ROAD BELOW
HIGHWAY BRIDGE (OVER 20 FT. SPAN)
HIGHWAY GRADE SEPARATION
ROAD-ROAD ESTABLISHED
WATER BRIDGE





Appendix B

Field Checklist and Photographs

DAM INSPECTION CHECKLIST

NAME OF DAM: Robinson Lake Dam

DAM NO.: 94-7010

LOCATION: Municipality: Franklin, TN

County: Williamson

CLASSIFICATION DATA: Size: Small

Hazard: Significant

PHYSICAL DATA:

Type of Dam: Embankment

Height of Dam: 22.5 ft

Normal Pool Storage Capacity: 91 ac-ft

ELEVATIONS:

Normal Pool:

Pool at Inspection: Normal

Tailwater at Inspection:

DAM OWNER: Kaye Lockwood

OPERATOR: _____

ADDRESS: P. O. Box 588

Franklin, TN 37064

PHONE: (615) 948-7386

FAX NO.: (____)-____-____

E-MAIL ADDRESS: _____

PERSONS PRESENT AT INSPECTION:

Name

Title/Position

Representing

Steve Whiteside

Vice President

CDM Smith

David Mason

Associate

CDM Smith

Doug Noonan

Water Quality Specialist

City of Franklin

Jason Deal

Technical Manager

Barge Waggoner Sumner &
Cannon

DATE OF INSPECTION: 6/12/17

WEATHER: Sunny

TEMPERATURE: 85-90 degrees

NAME OF DAM: Robinson Lake Dam	DAM NO.: 94-7010	DATE: 6/12/17
--------------------------------	------------------	---------------

ITEM	CONDITION	COMMENTS	MONITOR	INVESTIGATE	REPAIR
EMBANKMENT: CREST					
1	Surface Cracking	None observed.	☐	☐	☐
2	Sinkhole, Animal Burrow	None observed.	☐	☐	☐
3	Low Area(s)	Low area near middle of crest. Possible overtopping location.	☐	☒	☐
4	Horizontal Alignment	Satisfactory.	☐	☐	☐
5	Ruts and/or Puddles	None observed	☐	☐	☐
6	Vegetation Condition	Tall grass and weeds on both sides of crest.	☐	☐	☐
7	Warning Signs	Possible overtopping location observed.	☐	☒	☐
8			☐	☐	☐
9			☐	☐	☐
Additional Comments (Refer to item number if applicable): Crest length = 375 feet Crest width = 12 feet Freeboard = 5.5 feet					
EMBANKMENT: UPSTREAM SLOPE					
10	Slide, Slough, Scarp	View obscured by heavy vegetation.	☐	☐	☐
11	Slope Protection	Riprap on portions of the slope.	☐	☐	☐
12	Sinkhole, Animal Burrow	View obscured by heavy vegetation.	☐	☐	☐
13	Emb.-Abut. Contact	Satisfactory.	☐	☐	☐
14	Erosion	Eroded areas around tree roots.	☐	☐	☒
15	Vegetation Condition	Trees up to 12-inch diameter. Tall weeds, brush, and grass.	☐	☐	☒
16			☐	☐	☐
17			☐	☐	☐
Additional Comments (Refer to item number if applicable): Slope ranges from 1.5H:1V to near vertical.					

NAME OF DAM: Robinson Lake Dam	DAM NO.: 94-7010	DATE: 6/12/17
--------------------------------	------------------	---------------

ITEM	CONDITION	COMMENTS	MONITOR	INVESTIGATE	REPAIR
EMBANKMENT: DOWNSTREAM SLOPE					
18	Wet Area(s) (No Flow)	None observed.	☐	☐	☐
19	Seepage	None observed.	☐	☐	☐
20	Slide, Slough, Scarp	None observed.	☐	☐	☐
21	Emb. - Abut. Contact	Satisfactory.	☐	☐	☐
22	Sinkhole, Animal Burrow	None observed.	☐	☐	☐
23	Erosion	Some bare areas. Possible overtopping area.	☐	☒	☐
24	Unusual Movement	None observed.	☐	☐	☐
25	Vegetation Control	Trees up to 12-inch diameter, mostly 2-6 inch diameter.	☐	☐	☐
26		Leaves, vines, and brush.	☐	☐	☐
27			☐	☐	☐
Additional Comments (Refer to item number if applicable):					
Slope is typically 1.5H:1V.					
EMBANKMENT: INSTRUMENTATION					
28	Piezometers/Observ. Wells		☐	☐	☐
29	Staff Gauge and Recorder		☐	☐	☐
30	Weirs		☐	☐	☐
31	Survey Monuments		☐	☐	☐
32	Drains		☐	☐	☐
33	Low Flow Release		☐	☐	☐
34	Frequency of Readings		☐	☐	☐
35	Location of Records		☐	☐	☐
36			☐	☐	☐
37			☐	☐	☐
Additional Comments (Refer to item number if applicable):					
No instrumentation observed.					

NAME OF DAM: Robinson Lake Dam	DAM NO.: 94-7010	DATE: 6/12/17
--------------------------------	------------------	---------------

ITEM	CONDITION	COMMENTS	MONITOR	INVESTIGATE	REPAIR
DOWNSTREAM AREA					
38	Abutment Leakage	Seepage to left of spillway at Harpeth River.	☐	☒	☐
39	Foundation Seepage	Seepage downstream of RCP standpipe.	☐	☒	☐
40	Slide, Slough, Scarp	Erosion at river in seepage areas.	☐	☒	☐
41	Drainage System	None observed.	☐	☐	☐
42	Boils	None observed.	☐	☐	☐
43	Wet Areas	Wet areas adjacent to seepage areas.	☐	☒	☐
44	Reservoir Slopes	Covered with vegetation.	☐	☐	☐
45	Access Roads	Unpaved access road.	☐	☐	☐
46	Security Devices	Locked gate.	☐	☐	☐
47			☐	☐	☐
48			☐	☐	☐
49			☐	☐	☐
Additional Comments (Refer to item number if applicable):					
SPILLWAYS: ERODIBLE CHANNEL					
50	Slide, Slough, Scarp		☐	☐	☐
51	Erosion		☐	☐	☐
52	Vegetation Condition		☐	☐	☐
53	Debris		☐	☐	☐
54			☐	☐	☐
55			☐	☐	☐
Additional Comments (Refer to item number if applicable):					
Not Applicable.					

NAME OF DAM: Robinson Lake Dam	DAM NO.: 94-7010	DATE: 6/12/17
--------------------------------	------------------	---------------

ITEM	CONDITION	COMMENTS	MONITOR	INVESTIGATE	REPAIR
SPILLWAYS: NON-ERODIBLE CHANNEL					
56	Sidewalls	Sloped concrete side walls are cracked and have brush on them.	☐	☒	☐
57	Channel Floor	Concrete floor is heavily cracked.	☐	☒	☐
58	Unusual Movement	Cracked concrete floor and walls have displaced in some areas.	☐	☒	☐
59	Approach Area	Small trees and heavy brush. 2-foot-high fence at weir.	☐	☐	☒
60	Weir or Control	Trapezoidal concrete weir with 2-foot-high fence trash guard.	☒	☐	☐
61	Discharge Channel	Concrete channel is heavily cracked.	☐	☒	☐
62	Boils	None observed.	☐	☐	☐
63			☐	☐	☐
64			☐	☐	☐
Additional Comments (Refer to item number if applicable): 60. Trapezoidal weir is 46.5 feet wide with 25-foot bottom width. 61. Spillway channel is about 80 feet long. Spillway downstream channel ends at limestone bedrock. There is a 15-foot-high drop-off down to the river. Water was flowing through the limestone face and to the left of it. Portions of the rock have broken off.					
SPILLWAYS: DROP INLET					
65	Intake Structure		☐	☐	☐
66	Trash rack		☐	☐	☐
67	Stilling Basin		☐	☐	☐
68			☐	☐	☐
69			☐	☐	☐
Additional Comments (Refer to item number if applicable): None observed.					

NAME OF DAM: Robinson Lake Dam	DAM NO.: 94-7010	DATE: 6/12/17
--------------------------------	------------------	---------------

ITEM	CONDITION	COMMENTS	MONITOR	INVESTIGATE	REPAIR
OUTLET WORKS					
70	Intake Structure	None observed.	☐	☒	☐
71	Trash rack	None observed.	☐	☐	☐
72	Stilling Basin	None observed.	☐	☐	☐
73	Primary Closure	None observed.	☐	☐	☐
74	Secondary Closure	None observed.	☐	☐	☐
75	Control Mechanism	None observed.	☐	☐	☐
76	Outlet Pipe	None observed.	☐	☐	☐
77	Outlet Tower	None observed.	☐	☐	☐
78	Outlet Structure	Vertical 36-inch-diameter RCP pipe downstream of dam.	☐	☒	☐
79	Seepage	Seepage flowing downstream of RCP pipe.	☐	☒	☐
80	Unusual Movement	None observed.	☐	☐	☐
81			☐	☐	☐
82			☐	☐	☐
Additional Comments (Refer to item number if applicable): 78. RCP pipe is 12 feet long and extends 8 feet below ground surface. The bottom has about 3 feet of muck. No outlet pipes were observed.					
CONCRETE/MASONRY DAMS: UPSTREAM FACE					
83	Surface Conditions		☐	☐	☐
84	Condition of Joints		☐	☐	☐
85	Unusual Movement		☐	☐	☐
86	Abutment-Dam Contacts		☐	☐	☐
87			☐	☐	☐
88			☐	☐	☐
Additional Comments (Refer to item number if applicable): Not Applicable.					

NAME OF DAM: Robinson Lake Dam	DAM NO.: 94-7010	DATE: 6/12/17
--------------------------------	------------------	---------------

ITEM	CONDITION	COMMENTS	MONITOR	INVESTIGATE	REPAIR
------	-----------	----------	---------	-------------	--------

CONCRETE/MASONRY DAMS: DOWNSTREAM FACE

89	Surface Conditions		☐	☐	☐
90	Condition of Joints		☐	☐	☐
91	Unusual Movement		☐	☐	☐
92	Abutment-Dam Contacts		☐	☐	☐
93	Drains		☐	☐	☐
94	Leakage		☐	☐	☐
95			☐	☐	☐
96			☐	☐	☐

Additional Comments (Refer to item number if applicable):

Not Applicable.

CONCRETE/MASONRY DAMS: CREST

97	Surface Conditions		☐	☐	☐
98	Horizontal Alignment		☐	☐	☐
99	Vertical Alignment		☐	☐	☐
100	Condition of Joints		☐	☐	☐
101	Unusual Movements		☐	☐	☐
102			☐	☐	☐
103			☐	☐	☐

Additional Comments (Refer to item number if applicable):

Not Applicable.

NAME OF DAM: Robinson Lake Dam	DAM NO.: 94-7010	DATE: 6/12/17
--------------------------------	------------------	---------------

ITEM	CONDITION	COMMENTS	MONITOR	INVESTIGATE	REPAIR
RESERVOIR AREA					
104	Sedimentation		☐	☐	☐
105	Slope Stability		☐	☐	☐
106	Sinkholes		☐	☐	☐
107	Fractures		☐	☐	☐
108	Unwanted Growth		☐	☐	☐
109	Storage Gage		☐	☐	☐
110			☐	☐	☐
111			☐	☐	☐
Additional Comments (Refer to item number if applicable): Did not inspect the reservoir area.					
Final Comments:					

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 1: Robinson Lake viewed from dam crest.



Photo No. 2: Crest viewed from left abutment.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 3: Crest viewed from right abutment.



Photo No. 4: Erosion on crest due to possible overtopping.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 5: Upstream slope viewed from left abutment.



Photo No. 6: Upstream slope viewed from right abutment.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 7: Riprap present on portions of upstream slope.



Photo No. 8: Trees on upstream slope.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 9: Downstream slope viewed from right abutment.



Photo No. 10: Downstream slope and downstream area viewed from left abutment.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 11: Downstream slope and downstream area viewed from right abutment.



Photo No. 12: Erosion on downstream slope due to possible overtopping.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 13: 36-inch-diameter RCP pipe downstream of dam.



Photo No. 14: Seepage downstream of RCP pipe.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 15: Seepage downstream of RCP pipe.



Photo No. 16: Spillway weir viewed from right abutment.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 17: Fence (trash guard) on upstream side of spillway weir.



Photo No. 18: Spillway discharge channel viewed looking downstream.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 19: Spillway discharge channel viewed looking upstream.



Photo No. 20: Bedrock drop-off at downstream end of spillway discharge channel.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 21: Seepage through bedrock at downstream end of spillway discharge channel.



Photo No. 22: Seepage to left of spillway.

Robinson Lake Dam Inspection – June 12, 2017



Photo No. 23: Seepage to left of spillway.

Appendix B

Test Boring Logs



BOREHOLE LOG

CDM-1

Client: City of Franklin
Project Location: Franklin, Tennessee

Project Name: Robinson Lake Dam
Project Number: 14915-222189

Drilling Contractor: Tri-State Drilling
Drilling Method/Rig: 3 1/4" HSA/CME-550
Drillers: Kurt Roberts
Drilling Date: Start: 9-26-17 **End:** 9-26-17
Borehole Coordinates:
N: 568538 E: 1723319

Surface Elevation (ft.): 644.4
Total Depth (ft.): 36.3
Depth to Initial Water Level (ft-bgs): 8, after coring
Abandonment Method: Grout
Field Screening Instrument: Pocket Penetrometer
Logged By: BJG

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in	Graphic Log	USCS Designation	Material Description
			644.4					
SS	S-1	24/4	0	7	2 4 3 3		Topsoil	4" Topsoil. Dry, medium stiff, brown, CLAY & SILT, little coarse gravel, trace fine sand, contains IOS. (PP=4.5+ TSF) EMBANKMENT FILL
SS	S-2	24/19		24	7 12 12 13		CL	Dry, very stiff, brown, CLAY & SILT, little coarse gravel, trace fine sand, contains IOS. (PP=4.5+ TSF)
SS	S-3	24/22	639.4 5	35	9 18 17 13		CL-ML	Dry, hard, dark brown, SILT & CLAY, some fine to medium sand, trace fine gravel.
SS	S-4	24/24		10	4 4 6 6		CL	Moist, stiff, olive gray, CLAY & SILT, trace fine gravel, trace fine sand, contains IOS. 1" seam of brown, silty clay at 10.3 ft-bgs. (PP=4.5+ TSF)
SS	S-5	24/24		10	2 4 6 6		CL	Moist, stiff, olive gray, CLAY & SILT, trace fine gravel, trace fine sand contains IOS. (PP=3.5 TSF)
SS	S-6	24/16	634.4 10	5	2 2 3 6		CL	Moist, medium stiff, olive gray, CLAY & SILT, trace fine gravel, trace fine sand, contains IOS. (PP=1.0 TSF) RESIDUAL SOILS
ST	U-1	24/18		TUBE	PUSH		CL	Moist, olive gray, SILT & CLAY, some fine sand.
			629.4		WOH WOH			Moist, very soft, olive gray, CLAY & SILT, trace fine gravel, trace fine sand, contains IOS.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Hammer Weight: 140 lb
Hammer Drop Height: 30 inches
Spoon Size: 2 inch O.D., 24 inches long
ft-bgs = feet below ground surface
TSF = tons per square foot, PP= pocket penetrometer
+ = greater than
RQD= rock quality designation, REC= recovery
WOH= weight of hammer, IOS=iron oxide staining

Reviewed by: J. Briand

Date: 10-26-17

BOREHOLE ROBINSON LAKE GPJ CDM CORP.GDT 11/29/17



BOREHOLE LOG

CDM-1

Client: City of Franklin

Project Name: Robinson Lake Dam

Project Location: Franklin, Tennessee

Project Number: 14915-222189

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in	Graphic Log	USCS Designation	Material Description
SS	S-7	24/22	629.4 15	WOH	WOH 2		CL	(PP=0.5 TSF)
SS	S-8	24/24		4	WOH 2 2 3			Moist, soft to medium stiff, gray, CLAY & SILT, trace fine sand. (PP=1.0 to 1.25 TSF)
SS	S-9	24/24		5	2 2 3 3			Moist, medium stiff, olive gray, SILT & CLAY, little fine sand, minor IOS. (PP=1.25 TSF)
SS	S-10	24/18	624.4 20	2	WOH WOH 2 3			Moist, very soft to soft, olive gray, CLAY & SILT, trace fine sand, trace fine gravel. (PP=0.25 to 1.0 TSF) Auger refusal encountered at 22.5 ft-bgs.
NX	R-1	46/39	619.4 25				LS	Moderately hard, fresh to slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=85% RQD=39% LIMESTONE
NX	R-2	60/60	614.4 30					Moderately hard, fresh to slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=100% RQD=40%
NX	R-3	60/59	609.4 35					Moderately hard, fresh to slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=98% RQD=73%
								Test boring terminated at 36.3 ft-bgs

BOREHOLE ROBINSON LAKE.GPJ CDM CORP.GDT 11/29/17



BOREHOLE LOG

CDM-2

Client: City of Franklin
Project Location: Franklin, Tennessee

Project Name: Robinson Lake Dam
Project Number: 14915-222189

Drilling Contractor: Tri-State Drilling
Drilling Method/Rig: 3 1/4" HSA/CME-550
Drillers: Kurt Roberts
Drilling Date: Start: 9-25-17 **End:** 9-25-17
Borehole Coordinates:
 N: 568481 E: 1723462

Surface Elevation (ft.): 646.4
Total Depth (ft.): 16
Depth to Initial Water Level (ft-bgs): 5.5, after drilling
Abandonment Method: Grout
Field Screening Instrument: Pocket Penetrometer
Logged By: BJG

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in	Graphic Log	USCS Designation	Material Description
			646.4					
SS	S-1	24/2	0	4	2	TOPSOIL	CL	4" Topsoil Dry, soft to medium stiff, brown, Silty CLAY, trace fine to coarse sand, trace fine gravel, contains IOS. (PP=3.5 TSF) EMBANKMENT FILL
SS	S-2	24/22		18	7			Dry, very stiff, brown, Silty CLAY, some fine to medium sand, contains IOS. (PP=3.5 TSF)
SS	S-3	24/24	641.4	15	6		CL	Dry, stiff to very stiff, olive brown, CLAY & SILT, trace fine sand. (PP=4.5+)
SS	S-4	24/23	5	11	4			Moist, stiff, olive, Silty CLAY, trace fine to medium sand, contains IOS. (PP=4.5+ TSF)
SS	S-5	24/24		10	4			Moist, stiff, olive, CLAY & SILT, little fine to medium sand, trace fine gravel, contains IOS. (PP=3.5 TSF)
SS	S-6	24/16	636.4	10	2			Moist, stiff, olive, CLAY & SILT, trace fine to medium sand, trace fine gravel. (PP=2 TSF) RESIDUAL SOILS
SS	S-7	24/23		3	1		CL	Moist, soft, gray, CLAY & SILT, little fine to coarse, sand, trace fine gravel. (PP=0.25 TSF)
					2			
					5			Moist, stiff, gray, CLAY & SILT, little fine to coarse sand, trace fine gravel.
			631.4		7			

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
 HSA - Hollow Stem Auger
 SSA - Solid Stem Auger
 HA - Hand Auger
 AR - Air Rotary
 DTR - Dual Tube Rotary
 FR - Foam Rotary
 MR - Mud Rotary
 RC - Reverse Circulation
 CT - Cable Tool
 JET - Jetting
 D - Driving
 DTC - Drill Through Casing

SAMPLING TYPES:
 AS - Auger/Grab Sample
 CS - California Sampler
 BX - 1.5" Rock Core
 NX - 2.1" Rock Core
 GP - Geoprobe
 HP - Hydro Punch
 SS - Split Spoon
 ST - Shelby Tube
 WS - Wash Sample
OTHER:
 AGS - Above Ground Surface

REMARKS

Hammer Weight: 140 lb
 Hammer Drop Height: 30 inches
 Spoon Size: 2 inch O.D., 24 inches long
 ft-bgs = feet below ground surface
 += greater than, IOS=iron oxide staining
 TSF= tons per square foot, PP=pocket penetrometer
 Borehole collapsed at 12 ft-bgs.
 Shelby tube lost in hole at 14 ft-bgs. Borehole abandoned.

Reviewed by: J. Briand

Date: 10-26-17

BOREHOLE ROBINSON LAKE GPJ CDM CORP.GDT 11/29/17



BOREHOLE LOG

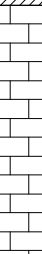
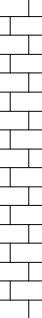
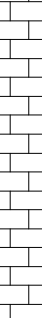
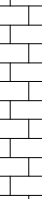
CDM-2A

Client: City of Franklin

Project Name: Robinson Lake Dam

Project Location: Franklin, Tennessee

Project Number: 14915-222189

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in	Graphic Log	USCS Designation	Material Description
			631.1					
			15				Auger	
SS	S-1	24/24		10	3 4 6 6			Moist, stiff, olive gray, Silty CLAY, some fine to course sand, trace fine gravel. (PP=1.75 to 2.0 TSF) RESIDUAL SOILS
SS	S-2	24/23		10	3 4 6 7		CL	Moist, stiff, olive gray and olive brown, Silty CLAY, trace fine sand, trace fine gravel. (PP=2.0 to 2.5 TSF)
SS	S-3	24/23	626.1 20	6	1 2 4 4			Moist, medium stiff, olive brown, Silty CLAY, little fine to course sand, little fine gravel. (PP=3.0 to 3.75 TSF) Auger refusal encountered at 22 ft-bgs.
BX	R-1	48/31						Moderately hard, slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=65% RQD=54% LIMESTONE
			621.1 25					
BX	R-2	60/58						Moderately hard, slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=97% RQD=32%
			616.1 30				LS	
NX	R-3	60/60						Moderately hard, slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=100% RQD=53%
			611.1 35					
BX	R-4	60/58						Moderately hard, slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=97% RQD=28%



BOREHOLE LOG

CDM-3

Client: City of Franklin
Project Location: Franklin, Tennessee

Project Name: Robinson Lake Dam
Project Number: 14915-222189

Drilling Contractor: Tri-State Drilling
Drilling Method/Rig: 3 1/4" HSA/CME-550
Drillers: Kurt Roberts
Drilling Date: Start: 9-27-17 **End:** 9-27-17
Borehole Coordinates:
N: 568472 E: 1723298

Surface Elevation (ft.): 634.3
Total Depth (ft.): 23.5
Depth to Initial Water Level (ft-bgs): 2, after coring
Abandonment Method: Grout
Field Screening Instrument: Pocket Penetrometer
Logged By: BJG

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in	Graphic Log	USCS Designation	Material Description
			634.3					
SS	S-1	24/20	0	4	2 2 2 3		CL	Moist, soft to medium stiff, brown, CLAY & SILT, trace fine sand, trace fine gravel, trace roots. (PP=0.5 to 1.5 TSF) RESIDUAL SOILS
SS	S-2	24/12		5	1 2 3 3		CL	Moist, medium stiff, dark brown, CLAY & SILT, some fine sand, trace roots. (PP=1.5 TSF)
ST	U-1	24/24	629.3 5	TUBE	PUSH			Moist, brown, fine SAND and CLAY & SILT.
SS	S-3	24/24		9	3 4 5 6		SC	Moist, loose, brown, fine SAND and CLAY & SILT.
SS	S-4	18/18		11	3 5 6		SC	Wet, medium dense, brown, fine SAND and CLAY & SILT. Auger refusal encountered at 9.5 ft-bgs.
NX	R-1	12/9	624.3 10		50/3"		LS	Moderately hard, slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=75% RQD=42% LIMESTONE
NX	R-2	60/52					VOID	Moderately hard, slightly weathered, fine grained, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=87% RQD=43% 6" void at 11.7 ft-bgs, staining in the joints at 14 ft-bgs
			619.3				LS	

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Hammer Weight: 140 lb
Hammer Drop Height: 30 inches
Spoon Size: 2 inch O.D., 24 inches long
ft-bgs = feet below ground surface
WOH = weight of hammer
PP = pocket penetrometer
RQD = rock quality designation; REC = recovery
TSF=Tons per square feet

Reviewed by: J. Briand

Date: 10-26-17



BOREHOLE LOG

CDM-3

Client: City of Franklin**Project Name:** Robinson Lake Dam**Project Location:** Franklin, Tennessee**Project Number:** 14915-222189

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in	Graphic Log	USCS Designation	Material Description
			619.3					
			15					
NX	R-3	60/60					LS	Moderately hard, slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=100% RQD=32%
			614.3					
			20					
NX	R-4	60/50						Moderately hard, slightly weathered, fine-grained, gray, LIMESTONE, extremely thin bedding, horizontal, smooth slickened undulating. REC=83% RQD=32%
			609.3					
			25					
								Test boring terminated at 25.5 ft-bgs.
			604.3					
			30					
			599.3					
			35					



BOREHOLE LOG

CDM-4

Client: City of Franklin
Project Location: Franklin, Tennessee

Project Name: Robinson Lake Dam
Project Number: 14915-222189

Drilling Contractor: Tri-State Drilling
Drilling Method/Rig: 3 1/4" HSA/CME-550
Drillers: Kurt Roberts
Drilling Date: Start: 9-27-17 **End:** 9-27-17
Borehole Coordinates:
N: 568397 E: 1723418

Surface Elevation (ft.): 635.5
Total Depth (ft.): 21.3
Depth to Initial Water Level (ft-bgs): 4, after coring
Abandonment Method: Grout
Field Screening Instrument: Pocket Penetrometer
Logged By: BJG

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in	Graphic Log	USCS Designation	Material Description
			635.5					
SS	S-1	24/24	0	5	3		CL	Moist, medium stiff to stiff, brown, CLAY & SILT, trace fine sand. (PP=1.0 TSF) RESIDUAL SOILS
					3			
					2			
					3			
SS	S-2	24/20		5	1			Moist, medium stiff, brown, CLAY & SILT, trace fine sand, trace fine gravel. (PP=1.0 TSF)
					2			
					3			
					3			
SS	S-3	24/22	630.5	7	1			Moist, medium stiff, grayish brown, CLAY & SILT, some fine to course sand, trace fine gravel, contains IOS. (PP=1.0 TSF)
			5		3			
					4			
					7			
SS	S-4	15/15		59+	5			Moist, hard, grayish brown, CLAY & SILT, trace fine sand, trace fine to course gravel, contains IOS. (PP=4.5+ TSF)
					9			Auger refusal encountered at 8.3 ft-bgs.
					50/3"			
NX	R-1	36/24	625.5				LS	Moderately hard, slightly to moderately weathered, fine-grained, gray, LIMESTONE, very thin bedding, horizontal, smooth slickened undulating. Slight joint staining at 9.1 ft-bgs. REC=67% RQD=28% LIMESTONE
			10					
NX	R-2	60/50						Moderately hard, slightly to moderately weathered, fine-grained, gray, LIMESTONE, very thin bedding, horizontal, smooth slickened undulating. Slight joint staining at 12 ft-bgs. REC=83% RQD=38%
			620.5					

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Hammer Weight: 140 lb
Hammer Drop Height: 30 inches
Spoon Size: 2 inch O.D., 24 inches long
ft-bgs = feet below ground surface
NR = not recorded; TSF=tons per square feet
+=greater than
PP = pocket penetrometer
RQD = rock quality designation; REC = recovery

Reviewed by: J. Briand

Date: 10-26-17

BOREHOLE ROBINSON LAKE.GPJ CDM CORP.GDT 11/29/17



BOREHOLE LOG

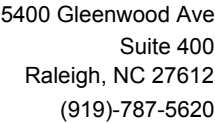
CDM-4

Client: City of Franklin**Project Name:** Robinson Lake Dam**Project Location:** Franklin, Tennessee**Project Number:** 14915-222189

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in	Graphic Log	USCS Designation	Material Description
			620.5 15					
NX	R-3	60/51	615.5 20				LS	Moderately hard, slightly to moderately weathered, fine-grained, gray, LIMESTONE, very thin bedding, horizontal, smooth slickened undulating. REC=85% RQD=43%
			610.5 25					Test boring terminated at 21.3 ft-bgs.
			605.5 30					
			600.5 35					

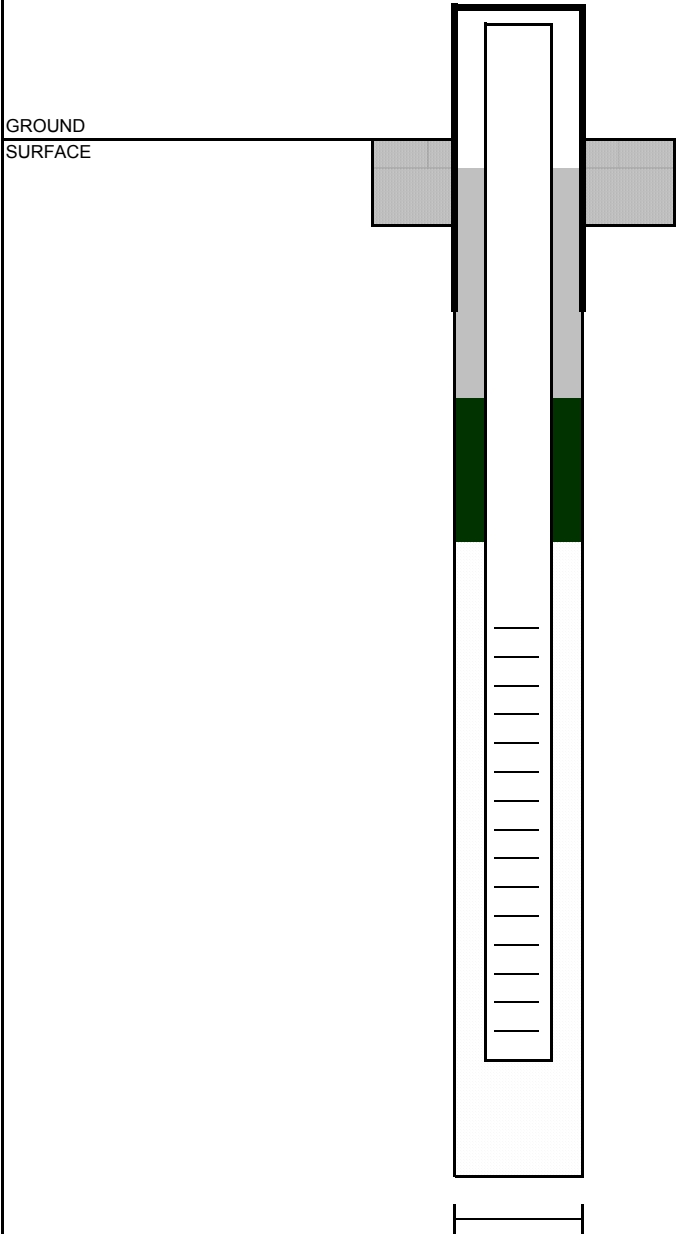
Appendix C

Monitoring Well Installation Log



Monitoring Well Installation Log

Client:	City of Franklin	Contractor:	Tri-State Drilling, LLC	Boring/Well No.:	MW-2
Project Name:	Robinson Lake Dam	Driller:	Kurt Roberts	Date Installed:	9/26/2017
Project Location:	Franklin, TN	Ground EL:	646.2	Logged By:	BJG
Project Number:	14915-222189	Riser EL:	650.1	Page:	1 of 1



SURFACE SEAL: 6-inch thick concrete well pad
(Thickness & Type)

BACKFILL MATERIAL: Cement Grout
(Type)

TOP OF SEAL: 12 feet

SEAL CONSTRUCTION: 2 feet of bentonite chips
(Thickness & Type)

TOP OF SANDPACK: 14 feet

RISER CONSTRUCTION: SCH 40, 2-inch-diameter PVC
(Type, Diameter & Material)

TOP OF SCREEN: 16 feet

SANDPACK TYPE: Well sand pack

SCREEN MATERIAL: SCH 40, 2-inch-diameter slotted PVC
(Type, Slot, Diameter & Material)

BOTTOM OF SCREEN: 21 feet

BOTTOM OF BOREHOLE: 22 feet

BOREHOLE DIAMETER: 12 Inches

NOTE: All depths are in feet below ground surface, unless noted otherwise.

Remarks:

Appendix D

Report of Site Characterization and Geophysical Services

November 3, 2017

CDM Smith
5400 Glenwood Avenue, Suite 400
Raleigh, NC 27612

Attn: Mr. John Briand, P.E.
E: briandjp@cdmsmith.com
P: 919-325-3562

Re: Report of Site Characterization and Geophysical Services
Robinson Lake Dam
Franklin, Williamson County, TN
Terracon Project No. 18175159

Dear Mr. Briand:

Terracon has completed our site characterization and geophysical services for the above-referenced project. The purpose of this study was to characterize the site subsurface conditions using geotechnical drilling and sampling and conduct a geophysical survey at locations prescribed by CDM Smith. Our efforts have been completed in general accordance with our proposal dated September 5, 2017.

1.0 PROJECT INFORMATION

Site Location

Item	Description
Location	Earthen Dam at South end of Robinson Lake Franklin, Williamson County, TN Latitude/Longitude: 35.8921152 / -86.8281411
Existing improvements	None
Current ground cover	Grasses and forested areas.
Existing topography	The dam crest is approximately 15-feet wide and descends on both sides. Based on the survey data provided by CMD Smith, the top of the dam is at approximate elevation 645 feet and the base is at approximate elevation 636 feet.

2.0 GEOPHYSICAL EXPLORATION

Terracon Consultants, Inc. (Terracon) performed geophysical exploration services consisting of Electrical Resistivity Imaging (ERI) on October 2 & 3, 2017. The purpose of the geophysical exploration was to locate geologic features below the dam which may be causing seepage. Terracon utilized an Electrical Resistivity system consisting of an Advanced Geosciences Inc. (AGI) SuperSting R8 control unit.

This method utilizes potential and current electrodes that function independently of one another to measure the potential field. A transmitting current dipole is followed by a series of potential dipoles which measure the resulting voltage gradient at each station. As the transmitting dipole is advanced along the electrodes, the resulting gradient measurements were collected as a 2D section below the survey array. After field collection, the resistivity data was processed using EarthImager 2D (engineered by AGI), an inversion and modeling software package. Changes in the earth resistivity can indicate changes in lithology, saturation, and amount of fracturing. The method can accurately image the interface from soil overburden to bedrock.

Survey Design

Four (4) ERI survey lines were conducted at the southern end of Robinson Lake (Exhibit 1).

- o Line A was conducted across the crest of the dam in an approximate west to east orientation. The line consisted of an approximate 400-foot linear array with 81 electrode stakes that were inserted into the ground, spaced approximately 5 feet apart.
- o Line B was conducted in an approximate north to south orientation, from the crest of the dam near the water's edge. The line consisted of an approximate 90-foot linear array with 19 electrode stakes that were inserted into the ground, spaced approximately 5 feet apart. The line was not extended over the upstream side of the dam due to ground cover and accessibility.
- o Line C was conducted in an approximate north to south orientation, from the crest of the dam near the water's edge. The line consisted of an approximate 130-foot linear array with 27 electrode stakes that were inserted into the ground, spaced approximately 5 feet apart. The line was not extended over the upstream side of the dam due to ground cover and accessibility.
- o Line D was conducted in an approximate north to south orientation, from the crest of the dam near the water's edge. The line consisted of an approximate 170-foot linear array with 35 electrode stakes that were inserted into the ground, spaced approximately 5 feet apart. The line was not extended over the upstream side of the dam due to ground cover and accessibility.

2.1 GEOPHYSICAL FINDINGS

The cross-sectional images generated from the ERI testing are displayed on Exhibit 2. Each image is a representation of the electrical resistivity of the subsurface. In general, high resistivity values (red, orange, and yellow) are indicative of quality bedrock with minimal fractures and voids. Lower resistivity values (green, blue, and purple) are indicative of soil overburden or weak, saturated, or fractured bedrock.

Line A – The cross sectional image shows that the dam is made up of materials which have a moderately low resistivity value. The values are mostly consistent across the length of the dam. Below this layer are resistivity values that indicate bedrock, with the highest values being found next to the spillway, where the bedrock is exposed at the surface. One anomaly is found in the material that makes up the dam. An area of

low resistivity is seen from station 110 to station 125 centered at an elevation of 623. The anomaly is at and below the contact with bedrock and could indicate a pathway for potential water seepage.

Line B – The cross sectional image shows the dam is made of materials consistent with Line A, and no major anomalies are seen.

Line C – This line crosses Line A on the eastern edge of the located anomaly. An area of low resistivity is seen, consistent with Line A in elevation, which extends to station 70.

Line D – The cross sectional image shows the dam is made of materials consistent with Line A, and no major anomalies are seen.

2.2 LIMITATIONS

All geophysical testing methods rely on instrument signals to indicate physical conditions in the field. Signal information can be affected by on-site conditions beyond the control of the operator, such as, but not limited to, cultural features, standing water, high subsurface moisture content, and other buried objects. Interpretation of those signals is based on a combination of known factors combined with the experience of the operator and geophysical scientist evaluating the results. The provided depth measurements are estimations based on an estimation of the electrical properties of the subsurface material.

This report has been prepared for the application discussed and in accordance with generally accepted geophysical practices. No warranties, expressed or implied, are intended or made. The findings presented in this report are based upon the data obtained from the geophysical surveys and from other information discussed in this report. This report does not reflect variations that may occur in areas not tested or inaccessible to the geophysical equipment, across the site, or due to the modifying effects of construction or weather.

2.3 CONCLUSION AND RECOMMENDATIONS

The results of the geophysical testing show the Robinson Lake dam consists of moderately low resistivity materials and are placed on top of competent bedrock. One anomaly was found in the cross section of the dam. This anomaly is an area of low resistivity that is found near the base of the dam and extends into the bedrock below. This may be an area for potential water seepage.

3.0 GEOTECHNICAL DRILLING AND SAMPLING

Terracon's trusted subcontract driller completed four soil test borings and installed two piezometers as proposed and directed by CDM Smith's field engineer on September 25, 26, and 27, 2017. The Borehole location plan and logs are attached. Paths to the bore locations and the geophysical test locations were cleared with a skid steer and a mulching attachment.

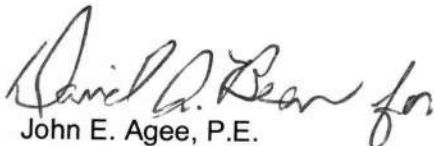
4.0 LABORATORY

As requested, we completed Natural moisture content testing on eight samples, sieve analysis with a No. 200 sieve wash on four samples, sieve analysis with hydrometer testing on four samples, Atterberg limits testing on eight samples, and one 3-point CIU Triaxial test on one sample. The results of these tests are attached.

5.0 CLOSING

We appreciate the opportunity to work with you on this project. If you have any questions or comments regarding this data or require additional services, please give us a call.

Sincerely,
Terracon Consultants, Inc.


John E. Agee, P.E.
Regional Manager


Kyle J. Shalek, Ph.D.
Geophysics Manager

Attachments Exhibits 1-2
Laboratory Results

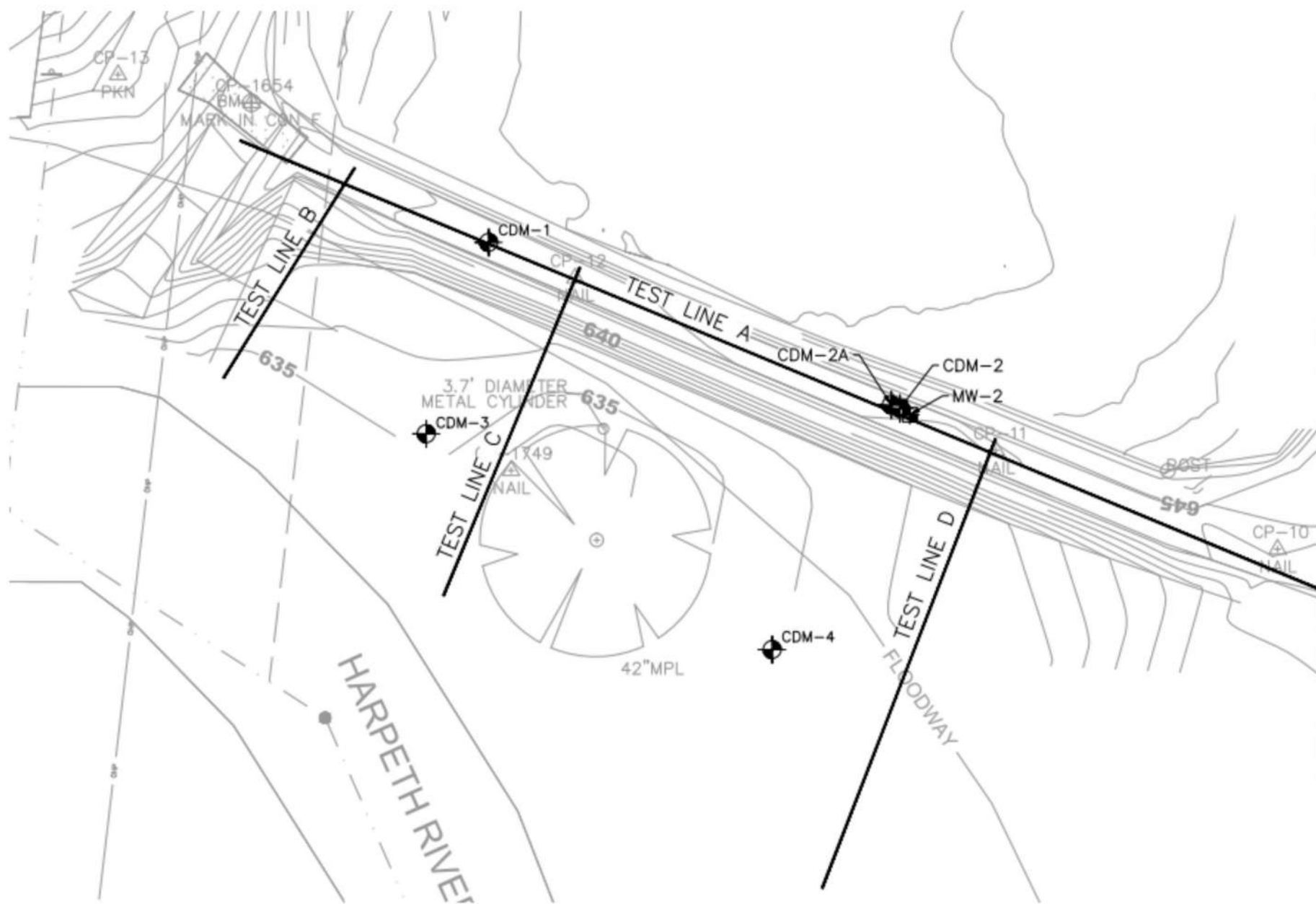
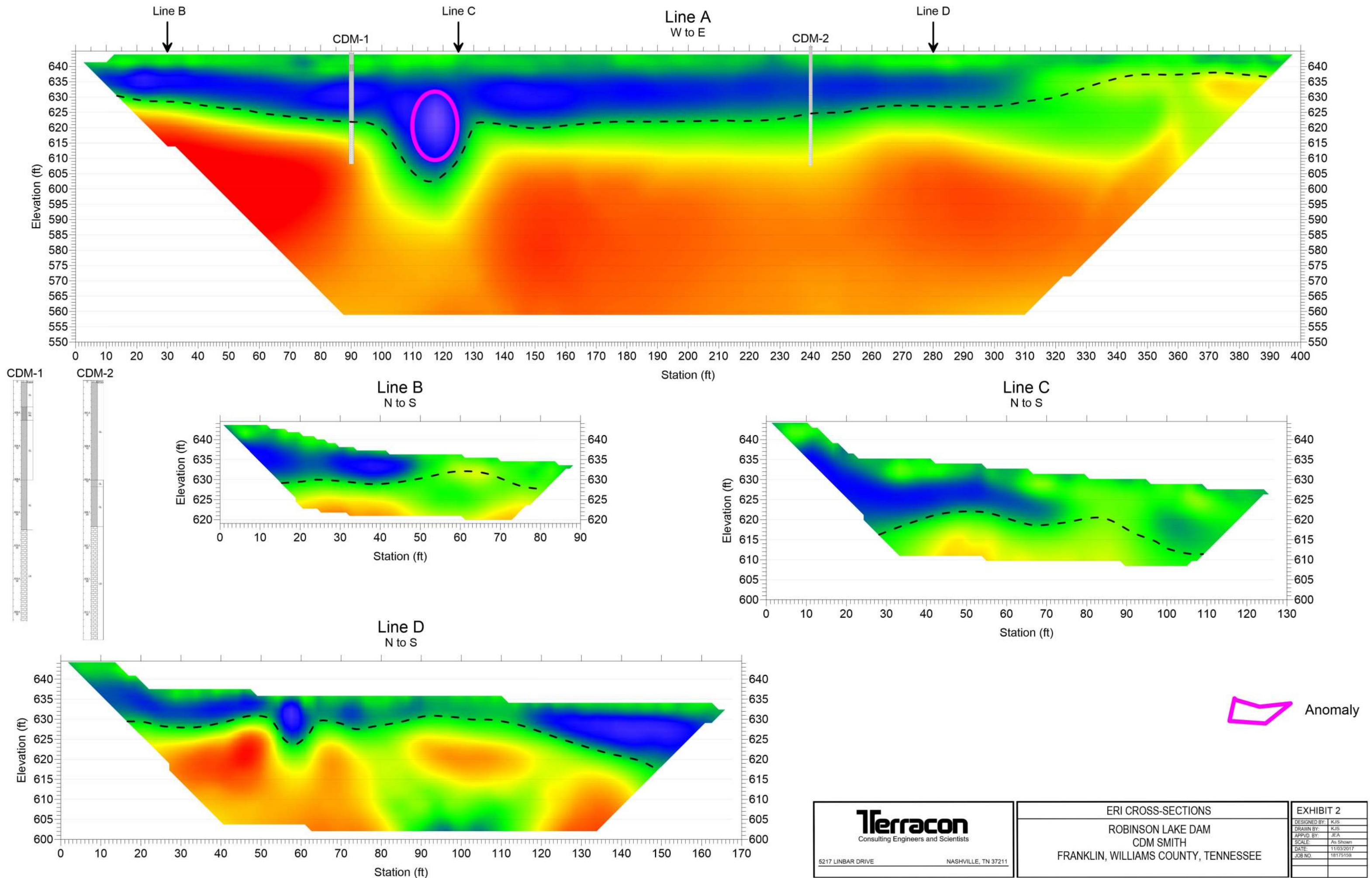


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS
NOT INTENDED FOR CONSTRUCTION PURPOSES



Terracon Consulting Engineers and Scientists 5217 LINBAR DRIVE NASHVILLE, TN 37211	SURVEY LOCATION PLAN ROBINSON LAKE DAM CDM SMITH FRANKLIN, WILLIAMS COUNTY, TENNESSEE		EXHIBIT 1
	DESIGNED BY: KJS DRAWN BY: KJS APP'D BY: JEA SCALE: As Shown DATE: 11/03/2017 JOB NO: 18175159		



Summary of Laboratory Results

BORING ID	Depth	USCS Classification and Soil Description	Specific Gravity	Liquid Limit	Plastic Limit	Plasticity Index	% <#200 Sieve	% Gravel	% Sand	% Silt	% Clay	Water Content (%)	Dry Density (pcf)
CDM-1	4 - 6	SILTY CLAY with SAND(CL-ML)		23	16	7	70.7	1.9	27.4			15.6	
CDM-1	12 - 14	LEAN CLAY with SAND(CL)		24	16	8	77.0	0.0	23.0	56.5	20.6	19.1	
CDM-1	18 - 20	LEAN CLAY(CL)		22	14	8	89.0	0.0	11.0			23.1	
CDM-2	1.5 - 3	SANDY LEAN CLAY(CL)		42	16	26	66.1	0.0	33.9	47.5	18.6	11.4	
CDM-2	8 - 10	LEAN CLAY(CL)		31	17	14	87.5	0.2	12.3	59.2	28.3	18.1	
CDM-2A	16 - 18	SANDY LEAN CLAY(CL)		40	15	25	67.3	4.1	28.6			19.2	
CDM-3	2 - 4	LEAN CLAY with SAND(CL)		33	17	16	77.2	0.0	22.8	51.0	26.2	20.6	
CDM-4	4 - 6	LEAN CLAY with SAND(CL)		31	15	16	78.7	0.6	20.6			18.7	

PROJECT: Robinson Lake Dam

SITE: Franklin, TN



PROJECT NUMBER: 18175159

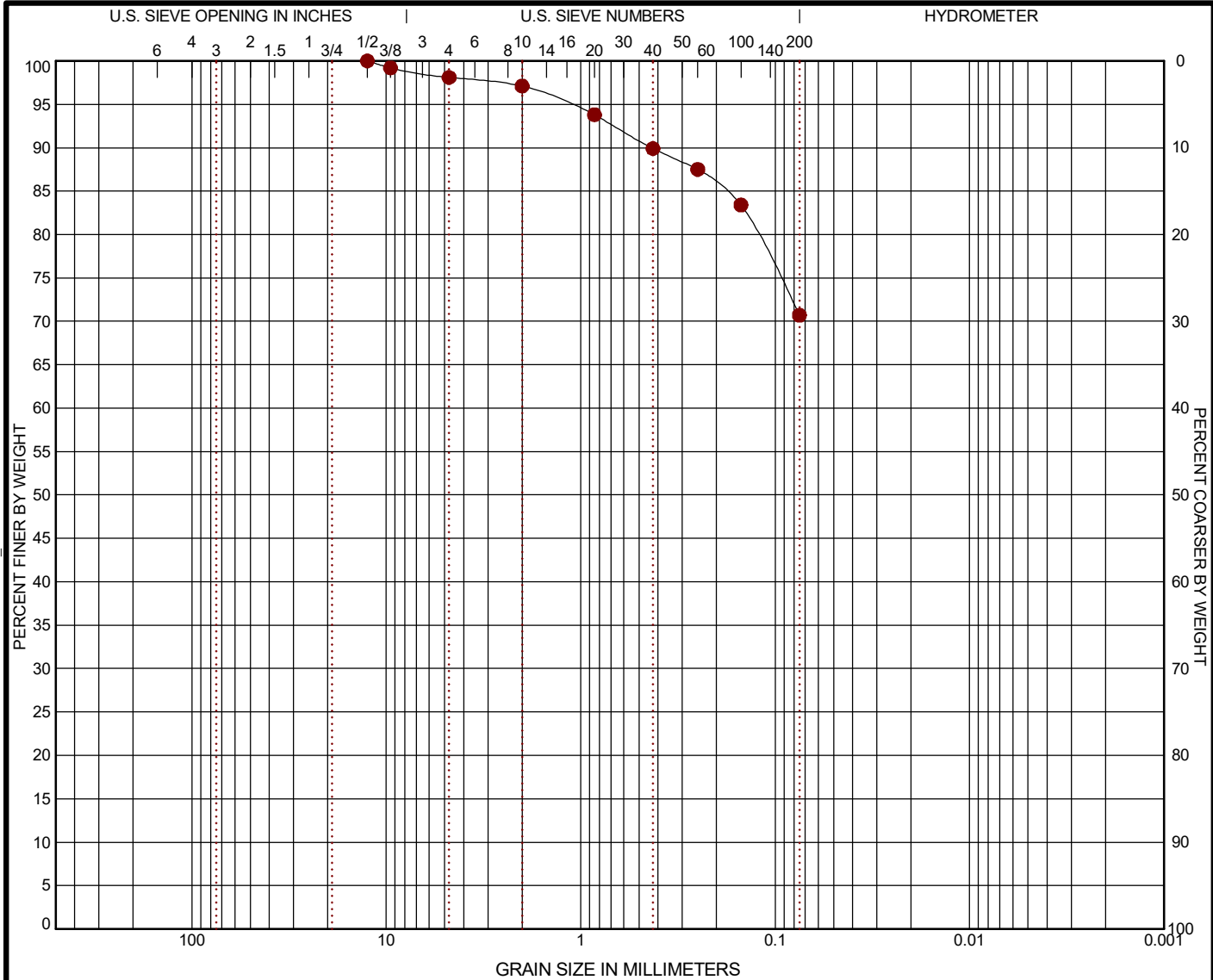
CLIENT: City of Franklin
Franklin, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. E2126320 LAB SUMMARY 18175159-ROBINSON LAKE DAM.GPJ TERRACON_DATATEMPLATE.GDT 10/26/17

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 CORRECTED 18175159-ROBINSON LAKE DAM.GPJ TERRACON_DATATEMPLATE.GDT 10/26/17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
CDM-1	4 - 6	0.0	1.9	27.4		70.7		CL-ML

				SIEVE (size)	PERCENT FINER			SOIL DESCRIPTION
								● SILTY CLAY with SAND (CL-ML)
				1 1/2"				
				1"				
				3/4"				
				1/2"	100.0			
				3/8"	99.2			
				#4	98.1			
				#10	97.1			
				#20	93.8			
				#40	89.9			
				#60	87.5			
				#100	83.4			
				#200	70.7			

PROJECT: Robinson Lake Dam		PROJECT NUMBER: 18175159
SITE: Franklin, TN		CLIENT: City of Franklin Franklin, TN

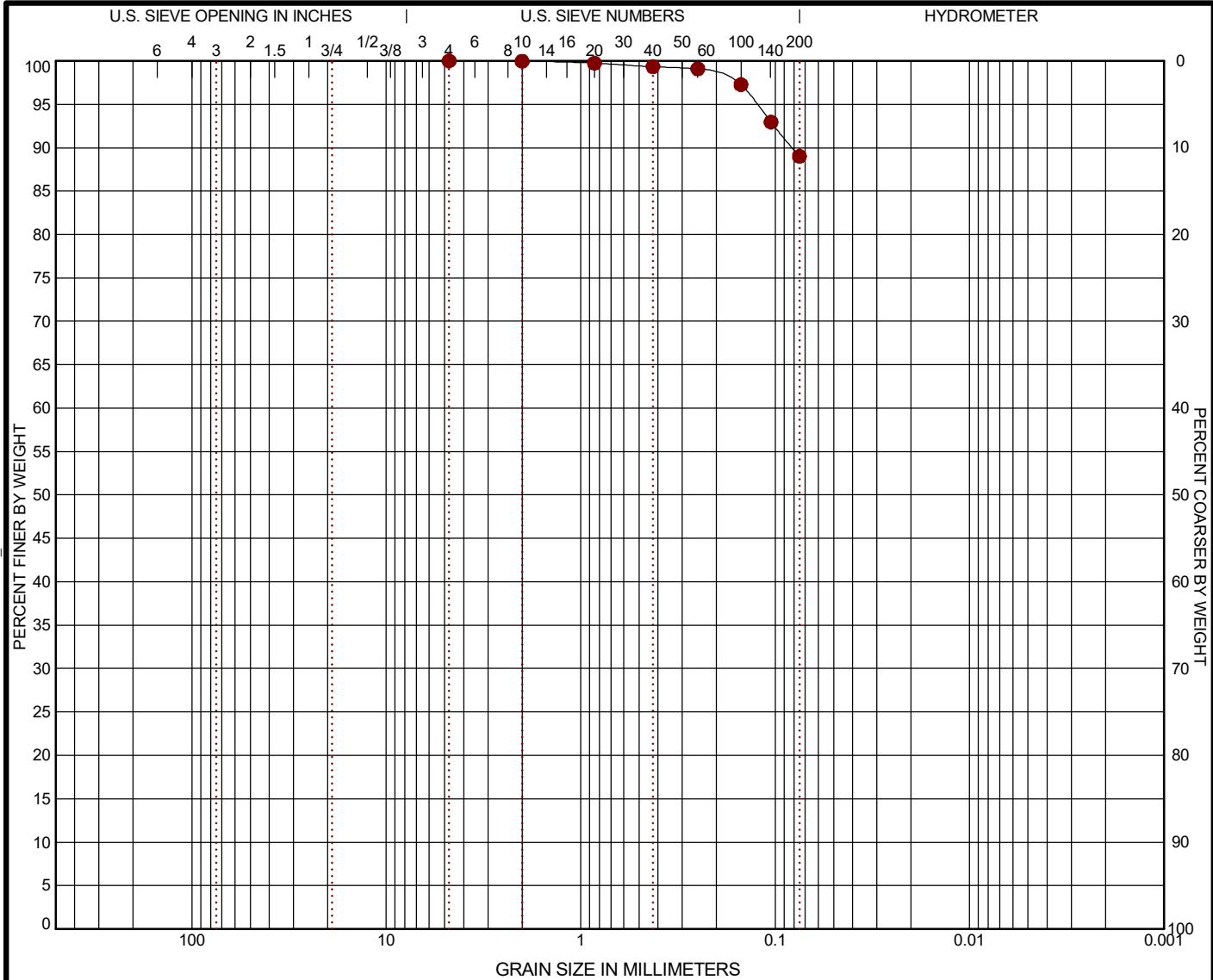
ASTM D422 / ASTM C136



GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 CORRECTED 18175159-ROBINSON LAKE DAM.GPJ TERRACON_DATATEMPLATE.GDT 10/26/17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
CDM-1	18 - 20	0.0	0.0	11.0		89.0		CL

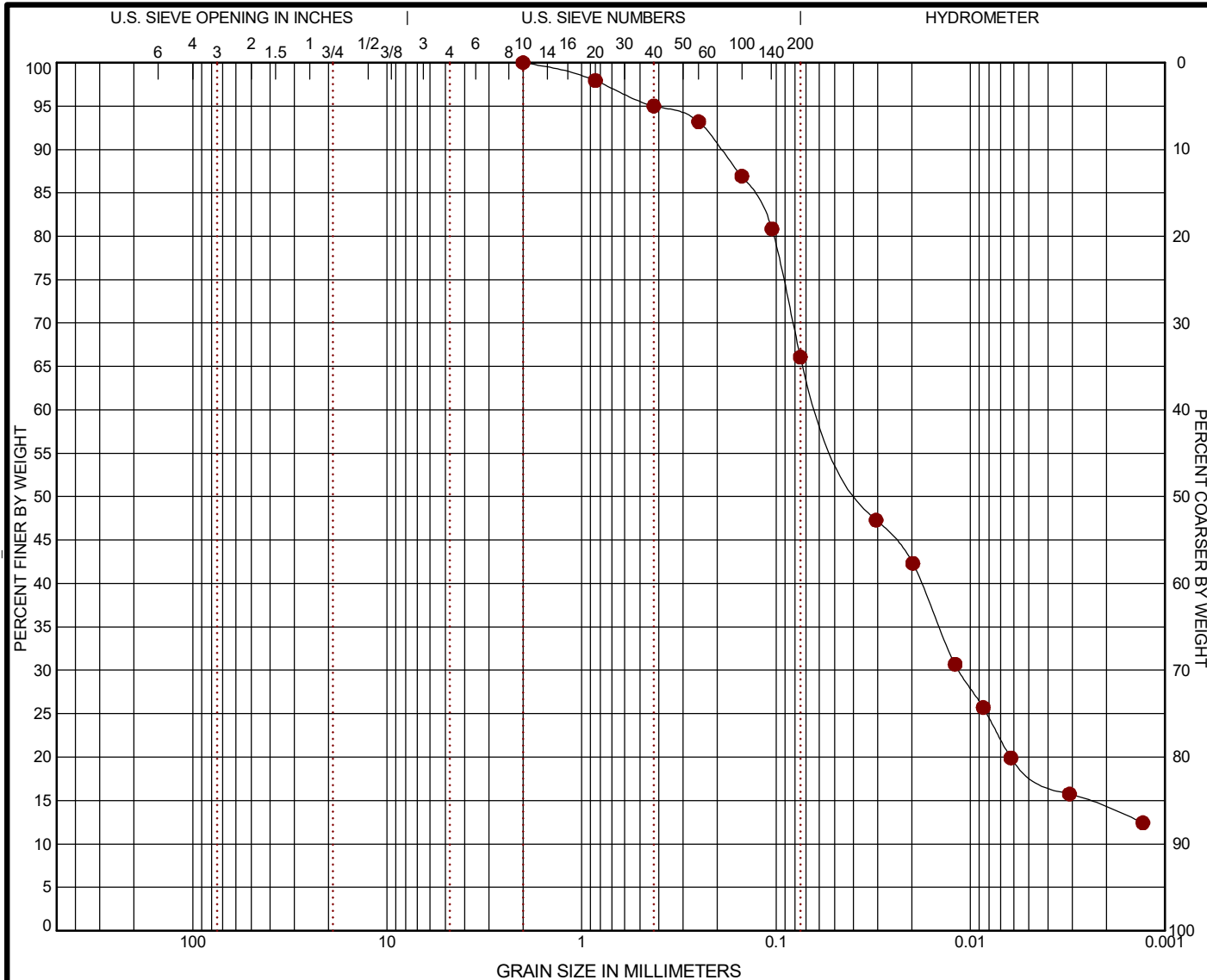
				SIEVE (size)	PERCENT FINER			SOIL DESCRIPTION
								● LEAN CLAY (CL)
	GRAIN SIZE			1 1/2"				
				1"				
				3/4"				
D ₆₀				1/2"				
D ₃₀				3/8"				
D ₁₀				#4				
				#10	100.0			
				#20	99.96			
				#40	99.74			
				#60	99.34			
				#100	99.09			
				#200	97.27			
					89.01			
	</							

PROJECT: Robinson Lake Dam		PROJECT NUMBER: 18175159
SITE: Franklin, TN		CLIENT: City of Franklin Franklin, TN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 CORRECTED 18175159-ROBINSON LAKE DAM.GPJ TERRACON_DATATEMPLATE.GDT 10/26/17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
CDM-2	1.5 - 3	0.0	0.0	33.9	47.5		18.6	CL

GRAIN SIZE		SIEVE (size) 1 1/2" 1" 3/4" 1/2" 3/8" #4 #10 #20 #40 #60 #100 #200	PERCENT FINER 100.0 97.94 95.0 93.19 86.92 66.08	SOIL DESCRIPTION SANDY LEAN CLAY (CL)
COEFFICIENTS C_c C_u		REMARKS		

PROJECT: Robinson Lake Dam

SITE: Franklin, TN

Terracon

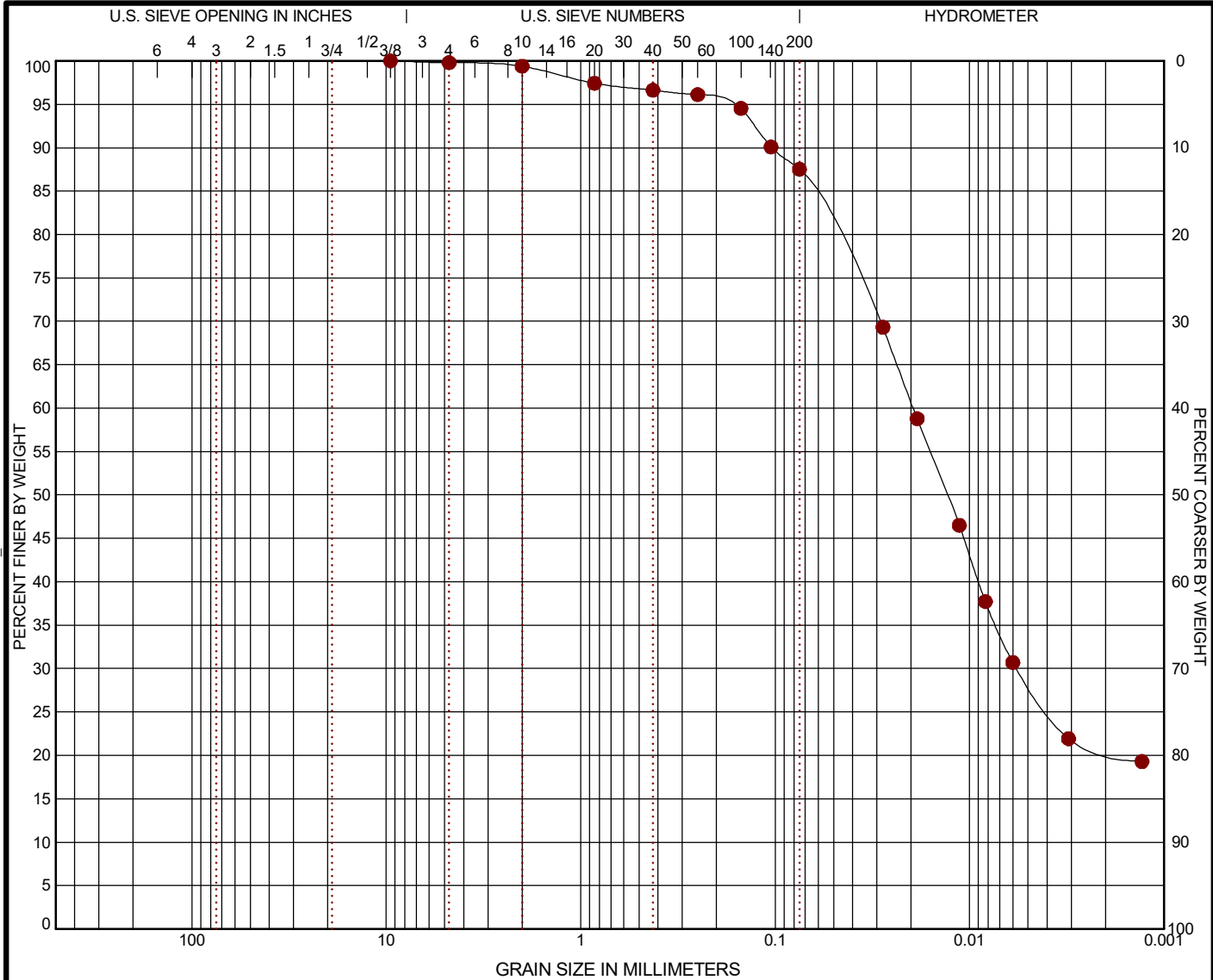
PROJECT NUMBER: 18175159

CLIENT: City of Franklin
Franklin, TN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 CORRECTED 18175159-ROBINSON LAKE DAM.GPJ TERRACON_DATATEMPLATE.GDT 10/26/17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
CDM-2	8 - 10	0.0	0.2	12.3	59.2		28.3	CL

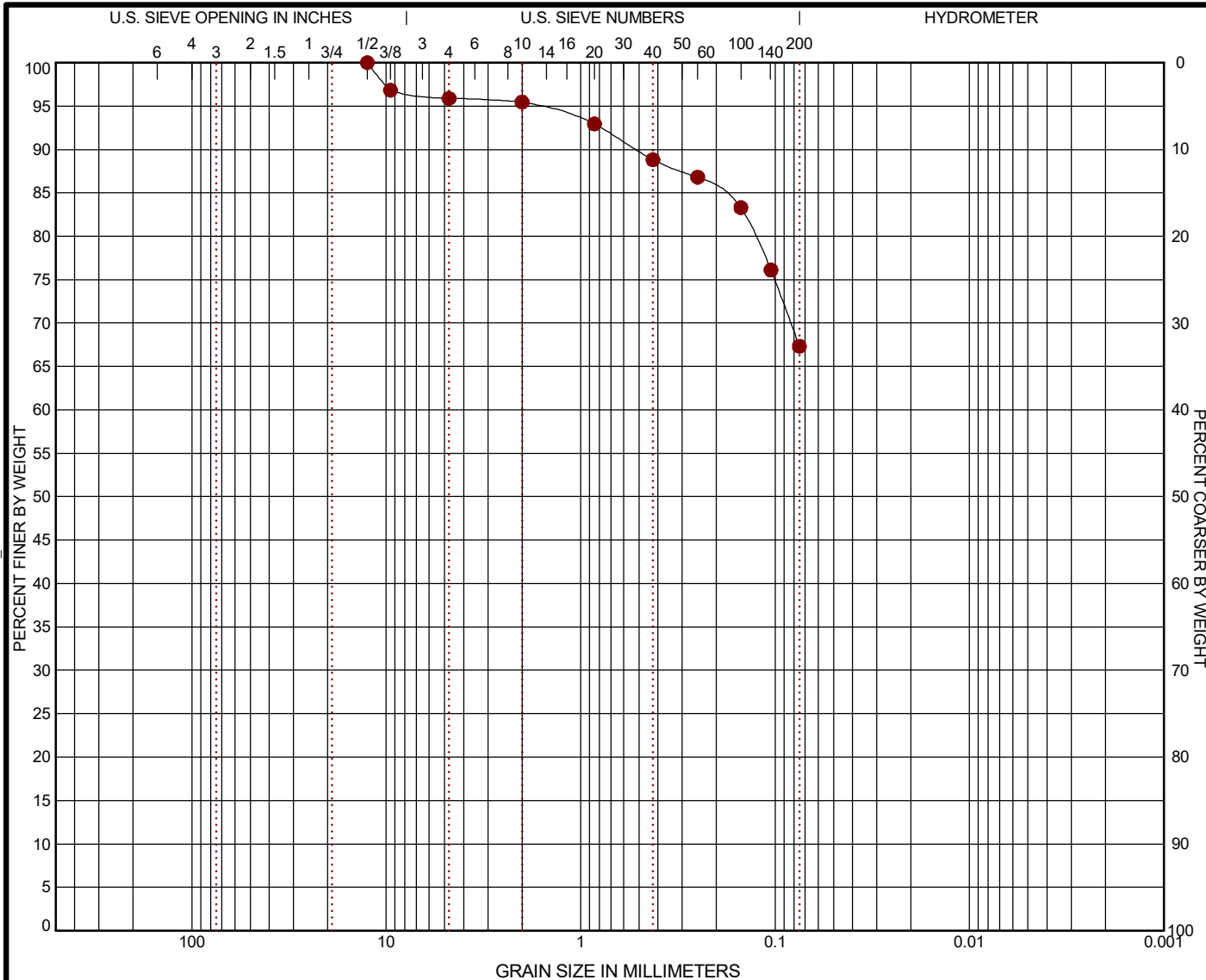
GRAIN SIZE		SIEVE (size) 1 1/2" 1" 3/4" 1/2" 3/8" #4 #10 #20 #40 #60 #100 #200	PERCENT FINER 100.0 99.8 97.42 96.63 96.12 94.53 87.52	SOIL DESCRIPTION LEAN CLAY (CL)
COEFFICIENTS C_c C_u		REMARKS		

PROJECT: Robinson Lake Dam		PROJECT NUMBER: 18175159
SITE: Franklin, TN		CLIENT: City of Franklin Franklin, TN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 CORRECTED 18175159-ROBINSON LAKE DAM.GPJ TERRACON_DATATEMPLATE.GDT 10/26/17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
CDM-2A	16 - 18	0.0	4.1	28.6		67.3		CL

GRAIN SIZE		SIEVE (size) <table border="1"> <tr><td>1 1/2"</td><td></td></tr> <tr><td>1"</td><td></td></tr> <tr><td>3/4"</td><td></td></tr> <tr><td>1/2"</td><td>100.0</td></tr> <tr><td>3/8"</td><td>96.83</td></tr> <tr><td>#4</td><td>95.87</td></tr> <tr><td>#10</td><td>95.45</td></tr> <tr><td>#20</td><td>92.94</td></tr> <tr><td>#40</td><td>88.82</td></tr> <tr><td>#60</td><td>86.8</td></tr> <tr><td>#100</td><td>83.3</td></tr> <tr><td>#200</td><td>67.32</td></tr> </table>	1 1/2"		1"		3/4"		1/2"	100.0	3/8"	96.83	#4	95.87	#10	95.45	#20	92.94	#40	88.82	#60	86.8	#100	83.3	#200	67.32	SOIL DESCRIPTION ● SANDY LEAN CLAY (CL)
1 1/2"																											
1"																											
3/4"																											
1/2"	100.0																										
3/8"	96.83																										
#4	95.87																										
#10	95.45																										
#20	92.94																										
#40	88.82																										
#60	86.8																										
#100	83.3																										
#200	67.32																										
COEFFICIENTS <table border="1"> <tr><td>C_c</td><td></td><td></td></tr> <tr><td>C_u</td><td></td><td></td></tr> </table>		C _c			C _u			REMARKS ●																			
C _c																											
C _u																											

PROJECT: Robinson Lake Dam		PROJECT NUMBER: 18175159
SITE: Franklin, TN		CLIENT: City of Franklin Franklin, TN

ASTM D422 / ASTM C136

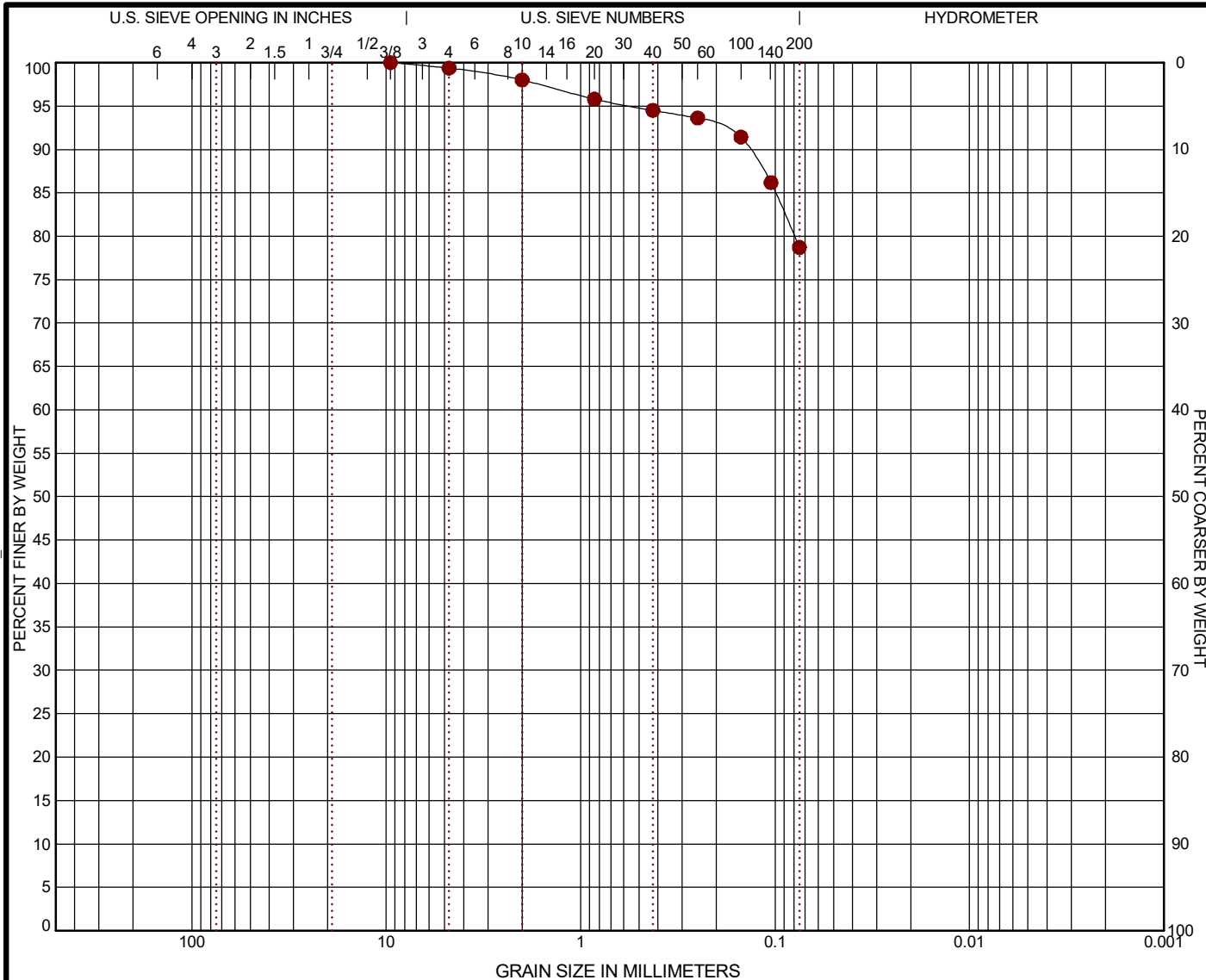


LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 CORRECTED 18175159-ROBINSON LAKE DAM.GPJ TERRACON DATATEMPLATE.GDT 10/26/17

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 CORRECTED 18175159-ROBINSON LAKE DAM.GPJ TERRACON_DATATEMPLATE.GDT 10/26/17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
CDM-4	4 - 6	0.0	0.6	20.6		78.7		CL

GRAIN SIZE		SIEVE (size) 1 1/2" 1" 3/4" 1/2" 3/8" #4 #10 #20 #40 #60 #100 #200	PERCENT FINER	SOIL DESCRIPTION LEAN CLAY with SAND (CL)
COEFFICIENTS		REMARKS		

PROJECT: Robinson Lake Dam

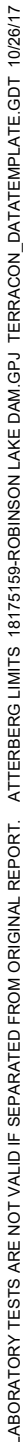
SITE: Franklin, TN

Terracon

PROJECT NUMBER: 18175159

CLIENT: City of Franklin
Franklin, TN

ASTM D4318



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 18175159-ROBINSON LAKE DAM.GPJ TERRACON DATATEMPLATE.GDT 10/26/17

CLIENT: City of Franklin
Franklin, TN

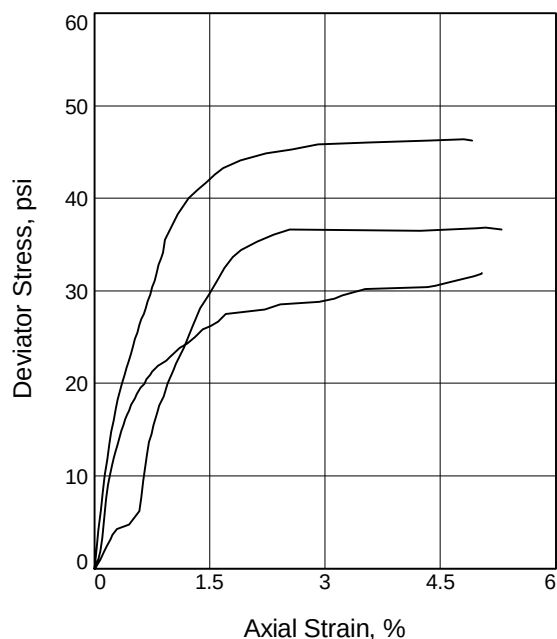
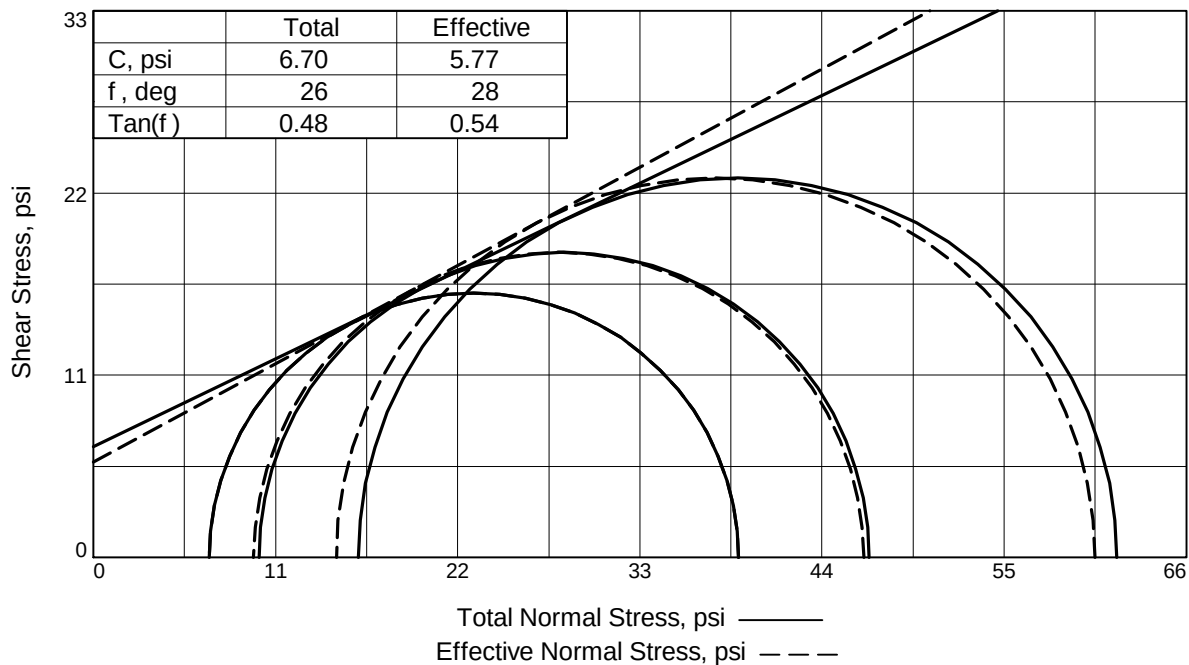
ASTM D4318



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 18175159-ROBINSON LAKE DAM.GPJ TERRACON_DATA\TEMPLATE.GDT 10/26/17

CLIENT: City of Franklin
Franklin, TN

Terracon



Sample No.		1	2	3
Initial	Water Content, %	19.1	19.1	19.1
	Dry Density, pcf	102.9	102.9	102.9
	Saturation, %	80.8	80.8	80.8
	Void Ratio	0.6375	0.6375	0.6375
	Diameter, in.	1.380	1.380	1.380
	Height, in.	2.790	2.790	2.790
At Test	Water Content, %	22.8	22.5	21.9
	Dry Density, pcf	103.9	104.4	105.5
	Saturation, %	99.0	99.0	98.9
	Void Ratio	0.6216	0.6144	0.5977
	Diameter, in.	1.376	1.408	1.438
	Height, in.	2.781	2.644	2.507
Strain rate, in./min.		.0003	.0003	.0003
Eff. Cell Pressure, psi		7.0	10.0	16.0
Fail. Stress, psi		31.9	36.8	45.8
Excess Pore Pr., psi		0.0	0.3	1.3
Strain, %		5.0	5.1	2.9
$\bar{s}_1$ Failure, psi		38.9	46.5	60.5
$\bar{s}_3$ Failure, psi		7.0	9.7	14.7

Type of Test:

CU with Pore Pressures

Sample Type: Tube

Description: Lean Clay with Sand

LL= 24 **PL=** 16 **PI=** 8

Assumed Specific Gravity= 2.7

Remarks: Multistage CU

Client: City of Franklin

Project: Robinson Lake Dam

Source of Sample: CDM-1

Depth: 12.0-14.0 ft

Sample Number: 6U

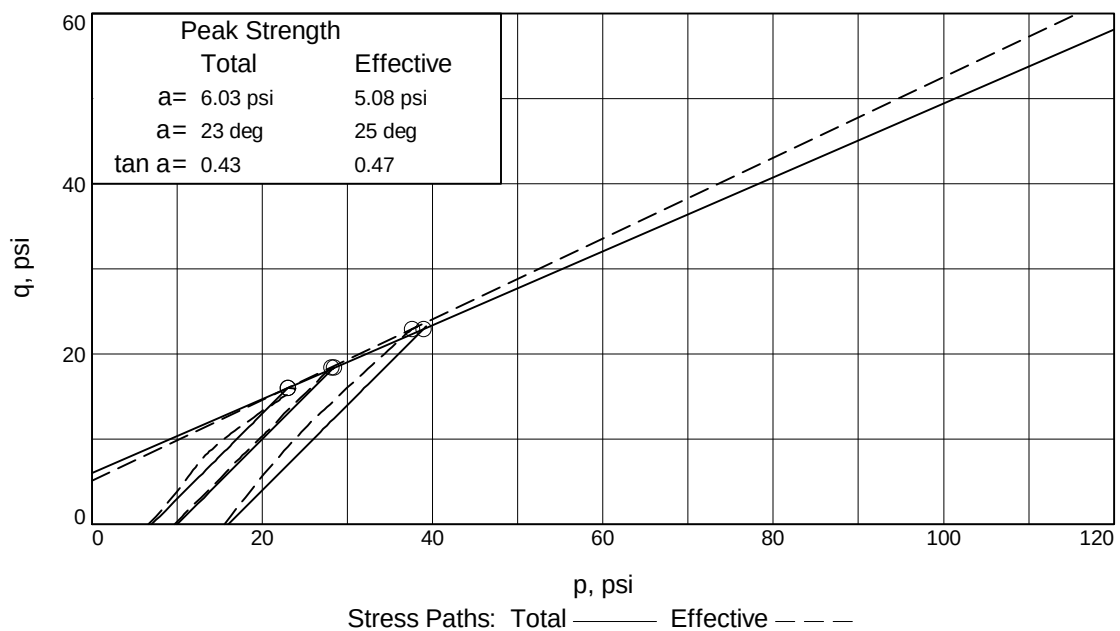
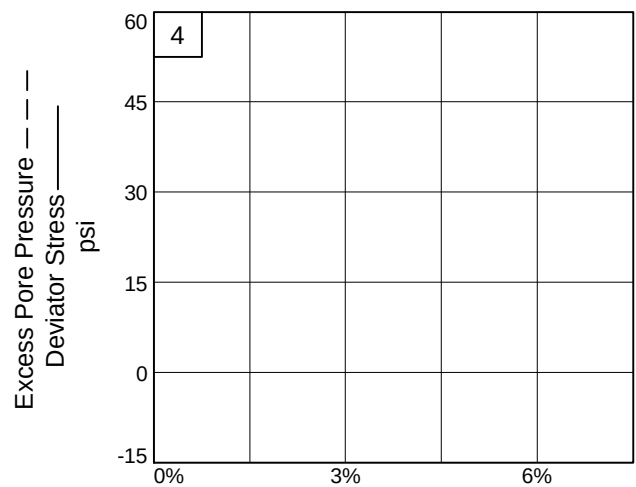
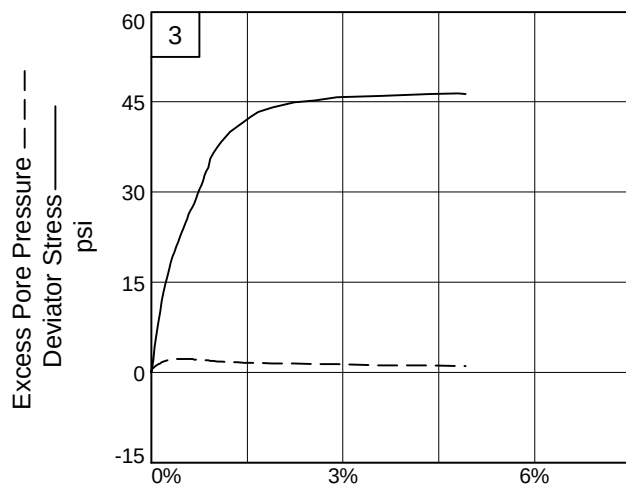
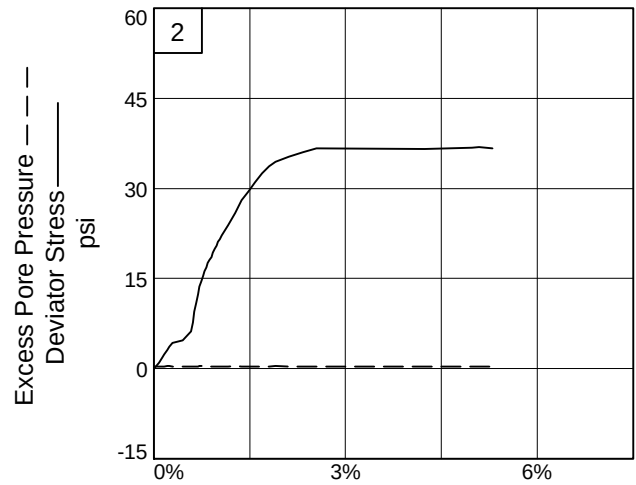
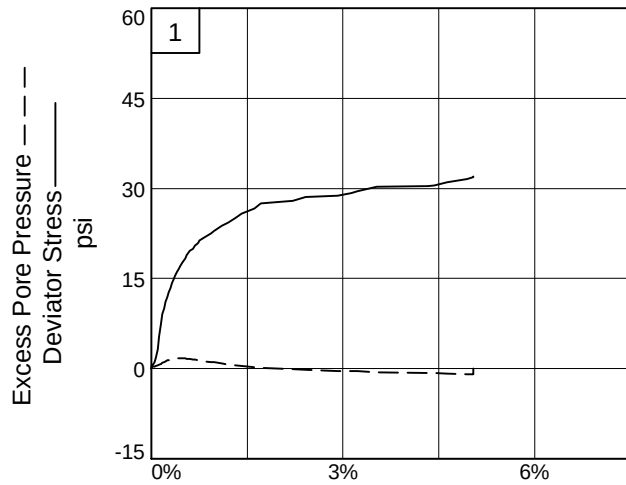
Proj. No.: 18175159

Date Sampled: 9/26/17

TRIAXIAL SHEAR TEST REPORT

Terracon Consultants, Inc.

Chattanooga, TN



Client: City of Franklin

Project: Robinson Lake Dam

Source of Sample: CDM-1

Depth: 12.0-14.0 ft

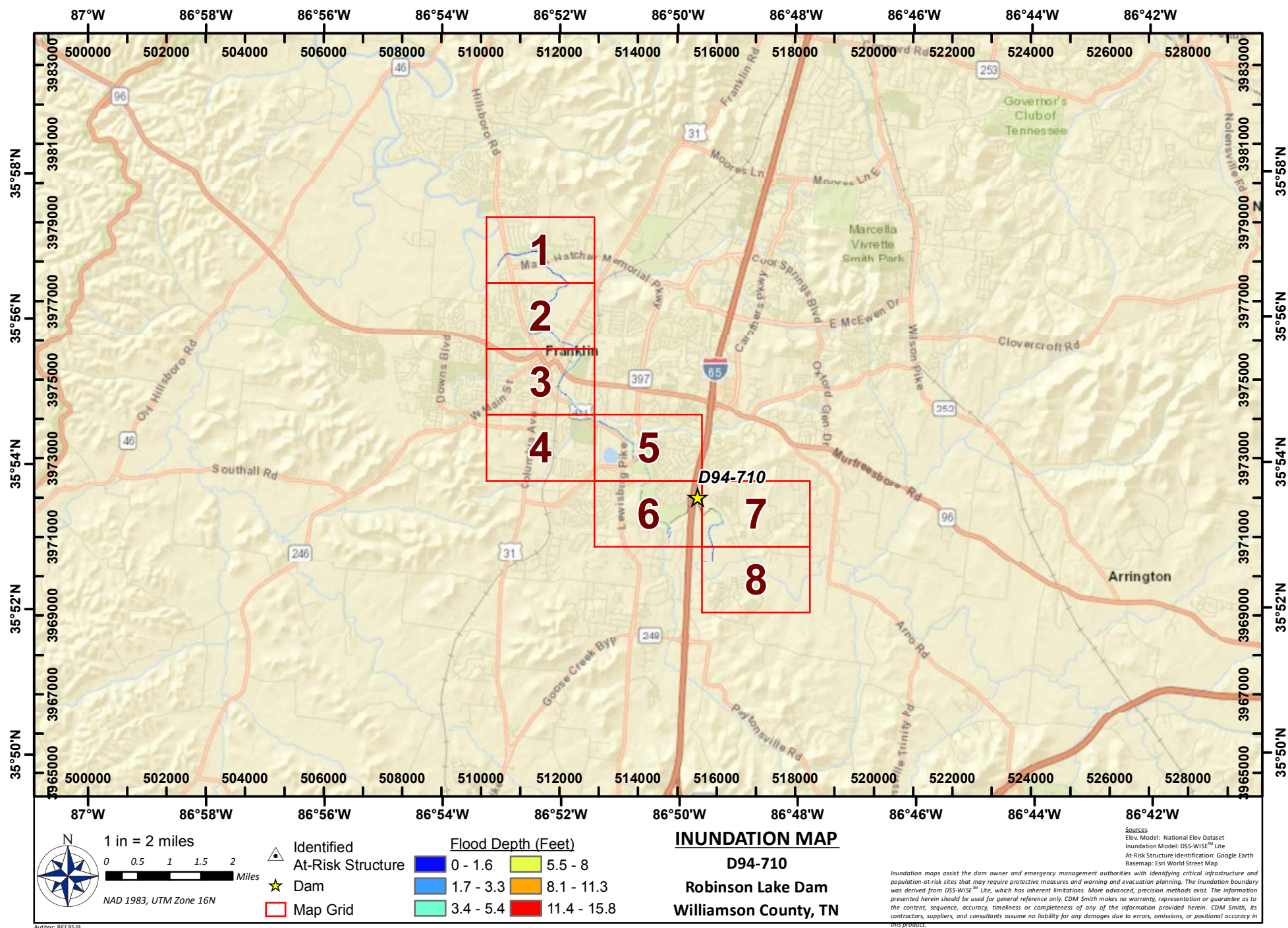
Sample Number: 6U

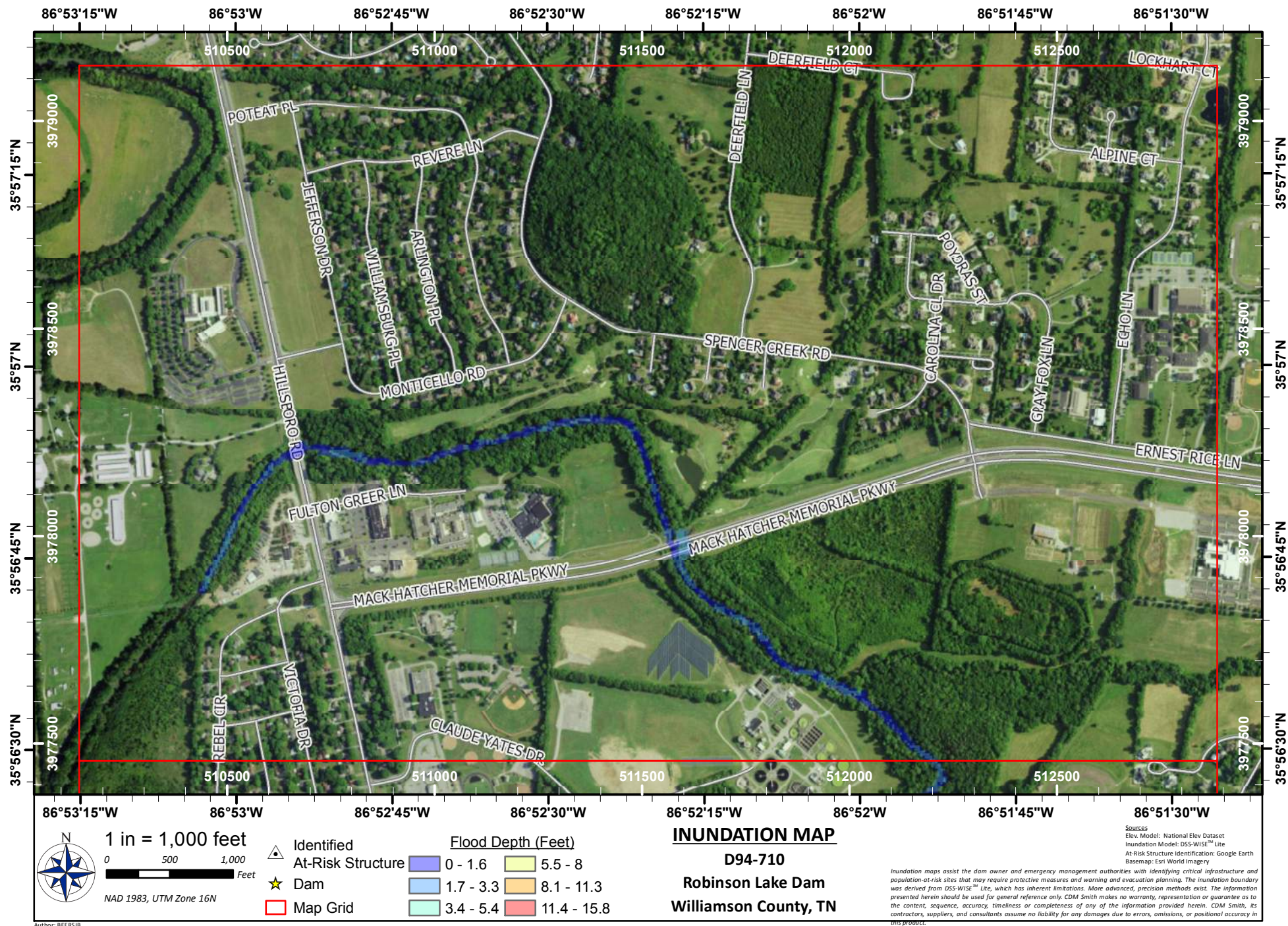
Project No.: 18175159

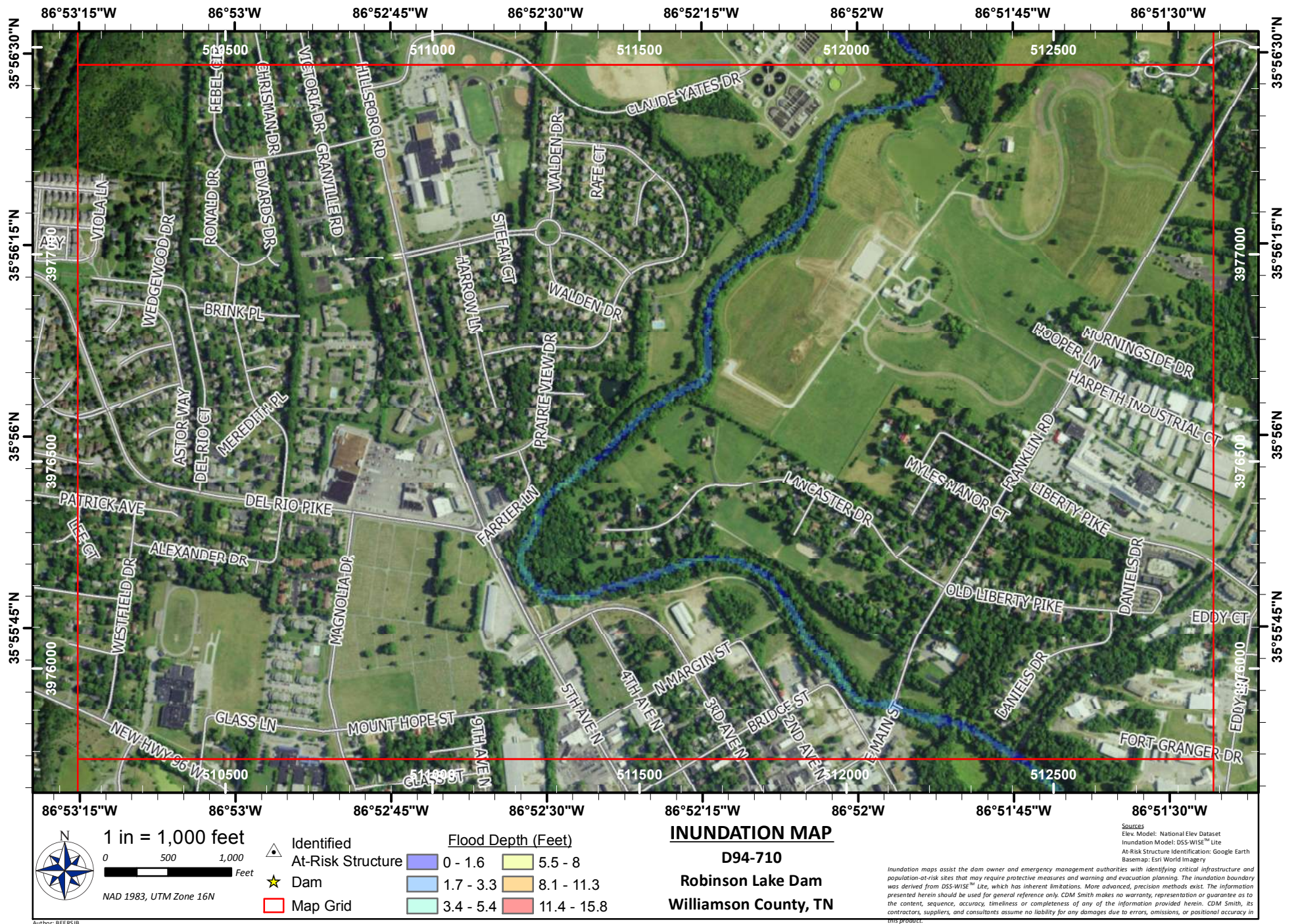
Terracon Consultants, Inc.

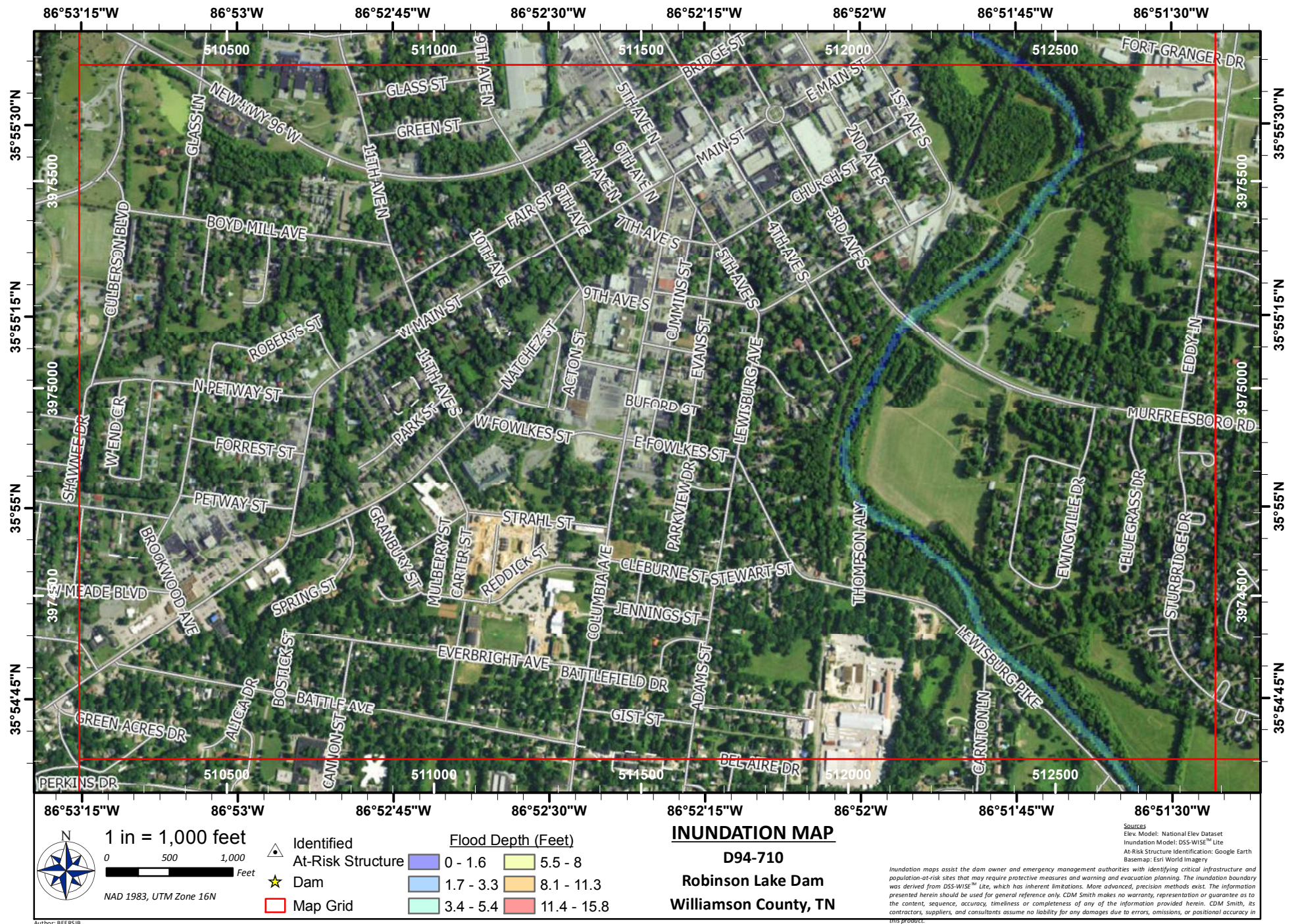
Appendix E

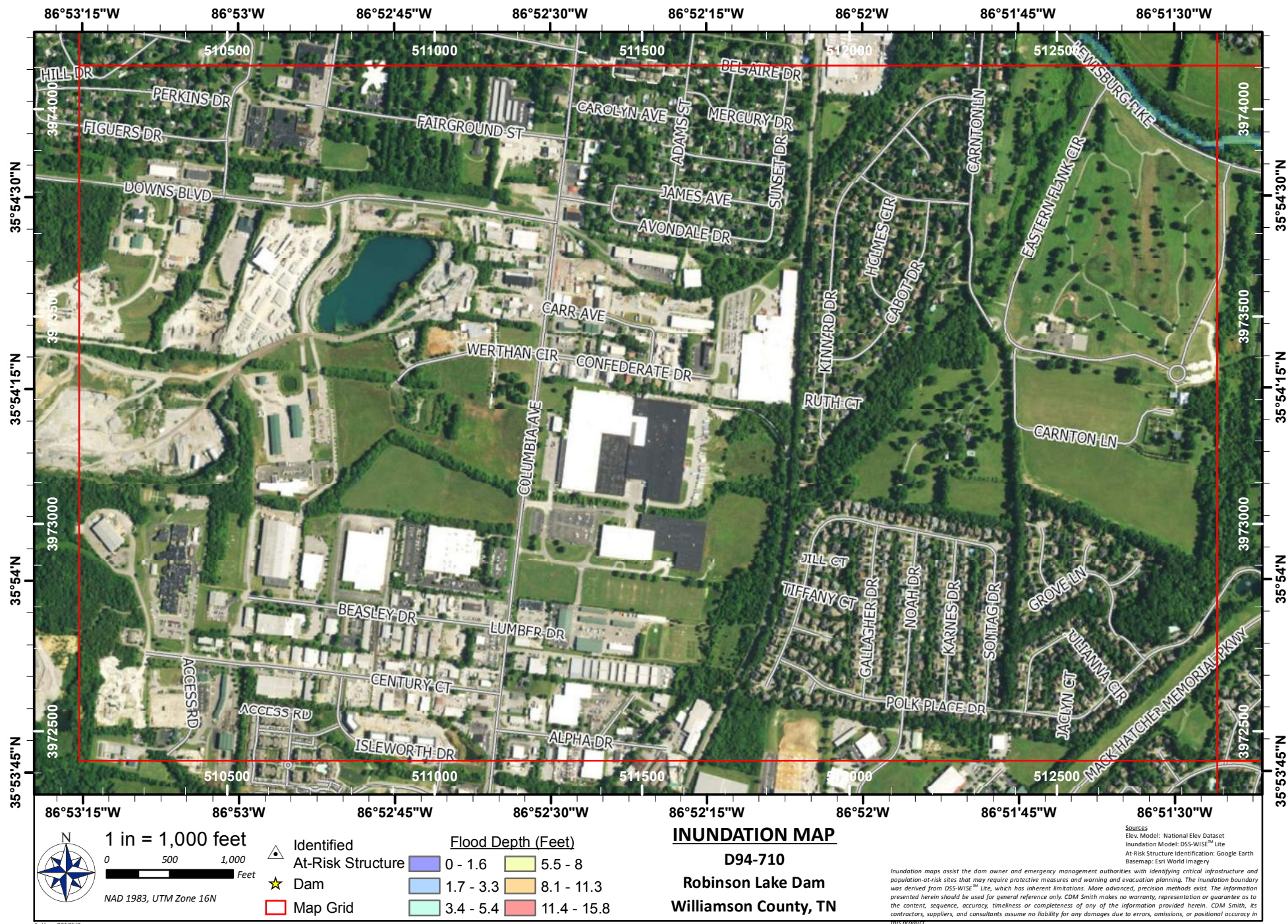
Dam Break Analyses





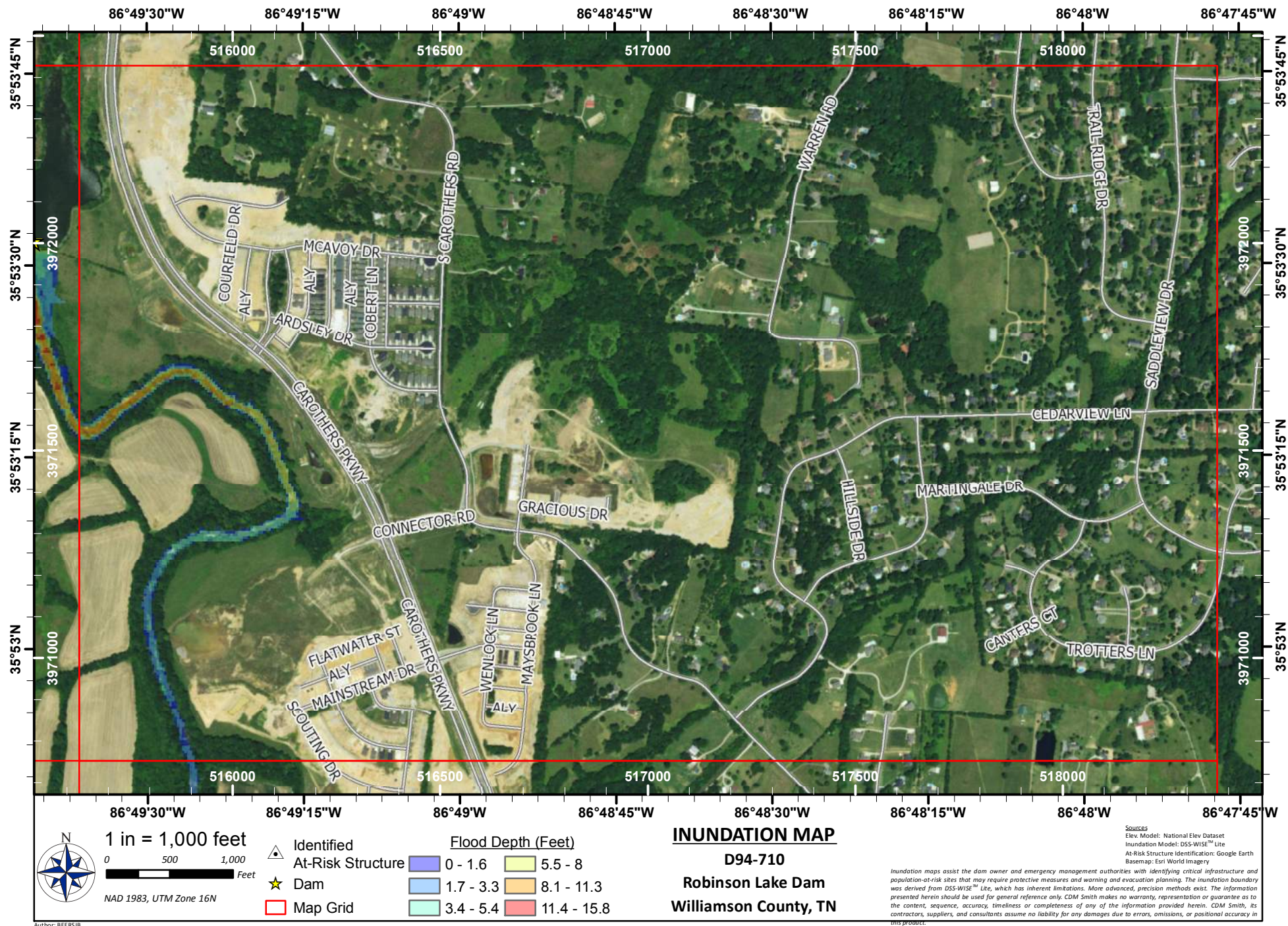














INUNDATION MAP

D94-710

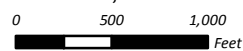
Robinson Lake Dam
Williamson County, TN

Sources
Elev Model: National Elev Dataset
Inundation Model: DSS-WISE™ Lite
At-Risk Structure Identification: Google Earth
Basemap: Esri World Imagery

Inundation maps assist the dam owner and emergency management authorities with identifying critical infrastructure and population-at-risk sites that may require protective measures and warning and evacuation planning. The inundation boundary was derived from DSS-WISE™ Lite, which has inherent limitations. More advanced, precision methods exist. The information presented herein should be used for general reference only. CDM Smith makes no warranty, representation or guarantee as to the content, sequence, accuracy, timeliness or completeness of any of the information provided herein. CDM Smith, its contractors, suppliers, and consultants assume no liability for any damages due to errors, omissions, or positional accuracy in this product.



1 in = 1,000 feet



NAD 1983, UTM Zone 16N



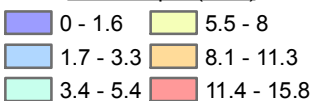
Identified
At-Risk Structure



Dam

Map Grid

Flood Depth (Feet)



Appendix F

Hydrologic and Hydraulic (H/H) Analyses

1/3 PMP Model Run

Project: Robinson Lake Simulation Run: Run1

Reservoir: Reservoir-1

Start of Run:	01Jan2000, 00:00	Basin Model:	RobinsonLake
End of Run:	02Jan2000, 06:00	Meteorologic Model:	g. 1/3 PMP
Compute Time:	21Nov2017, 16:47:54	Control Specifications:	Control 1

Volume Units: ☒ IN ☐ AC-FT

Computed Results

Peak Inflow:	3353.4 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 03:30
Peak Discharge:	3286.0 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 03:35
Inflow Volume:	8.69 (IN)	Peak Storage:	65.1 (AC-FT)
Discharge Volume:	8.69 (IN)	Peak Elevation:	645.5 (FT)

One-Third PMP Design Storm

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
1-Jan-00	0:00	0	0	640	0
1-Jan-00	0:05	0	0	640	0
1-Jan-00	0:10	0	0	640	0
1-Jan-00	0:15	0	0	640	0
1-Jan-00	0:20	0	0	640	0
1-Jan-00	0:25	0	0	640	0
1-Jan-00	0:30	0	0	640	0
1-Jan-00	0:35	0	0	640	0
1-Jan-00	0:40	0	0	640	0
1-Jan-00	0:45	0	0	640	0
1-Jan-00	0:50	0	0	640	0
1-Jan-00	0:55	0	0	640	0
1-Jan-00	1:00	0	0	640	0
1-Jan-00	1:05	0.1	0	640	0
1-Jan-00	1:10	0.7	0	640	0
1-Jan-00	1:15	2.6	0	640	0
1-Jan-00	1:20	6.7	0	640	0
1-Jan-00	1:25	13.4	0.1	640	0.1
1-Jan-00	1:30	22.6	0.2	640	0.3
1-Jan-00	1:35	33.9	0.4	640	0.7
1-Jan-00	1:40	47.3	0.7	640.1	1.4
1-Jan-00	1:45	62.7	1.1	640.1	2.6
1-Jan-00	1:50	80.8	1.5	640.1	4.5
1-Jan-00	1:55	102.2	2.1	640.2	7.3
1-Jan-00	2:00	126.6	2.9	640.3	11.3
1-Jan-00	2:05	153.2	3.7	640.3	16.8
1-Jan-00	2:10	181.3	4.7	640.4	24.1
1-Jan-00	2:15	209.4	5.9	640.5	33.4
1-Jan-00	2:20	235.7	7.1	640.7	44.7
1-Jan-00	2:25	261.5	8.5	640.8	58
1-Jan-00	2:30	290.2	9.9	640.9	73.4
1-Jan-00	2:35	327.7	11.5	641	91.2
1-Jan-00	2:40	387.7	13.3	641.2	112.5
1-Jan-00	2:45	494.8	15.4	641.4	140.6
1-Jan-00	2:50	671.3	18.3	641.7	181.4
1-Jan-00	2:55	929.9	22.4	642	243.7
1-Jan-00	3:00	1273.4	28	642.5	337.1
1-Jan-00	3:05	1683.9	35.4	643.1	480.8
1-Jan-00	3:10	2124	44.2	643.9	756.7
1-Jan-00	3:15	2552.5	52.8	644.6	1482.2
1-Jan-00	3:20	2930.7	58.4	645	2269.8
1-Jan-00	3:25	3209.3	61.9	645.3	2784.8
1-Jan-00	3:30	3353.4	64.1	645.4	3119.5

Outlet Structures	Elevation
Riser and Barrel	640'
Auxiliary Spillway	643'
Emergency Spillway	644'
Dam Crest	645.5'

1-Jan-00	3:35	3347.7	65.1	645.5	3286
1-Jan-00	3:40	3192.5	65	645.5	3274.5
1-Jan-00	3:45	2913.6	64	645.4	3115
1-Jan-00	3:50	2559.4	62.3	645.3	2847.4
1-Jan-00	3:55	2183.1	60.3	645.1	2534.9
1-Jan-00	4:00	1827	57.9	645	2195.7
1-Jan-00	4:05	1516.4	55.7	644.8	1859.7
1-Jan-00	4:10	1264.3	53.5	644.6	1574.3
1-Jan-00	4:15	1071.8	51.6	644.5	1342
1-Jan-00	4:20	931.5	50	644.4	1160.7
1-Jan-00	4:25	832.3	48.6	644.2	1024
1-Jan-00	4:30	760.7	47.4	644.1	922.9
1-Jan-00	4:35	705.5	46.3	644.1	847.9
1-Jan-00	4:40	659.2	45.4	644	798
1-Jan-00	4:45	616.8	44.4	643.9	762.2
1-Jan-00	4:50	578.3	43.4	643.8	726.3
1-Jan-00	4:55	545.6	42.4	643.7	691.2
1-Jan-00	5:00	518.3	41.4	643.7	658.2
1-Jan-00	5:05	495	40.4	643.6	627.6
1-Jan-00	5:10	475.2	39.6	643.5	599.6
1-Jan-00	5:15	458.4	38.7	643.4	574.3
1-Jan-00	5:20	443.3	38	643.4	551.4
1-Jan-00	5:25	430	37.2	643.3	530.8
1-Jan-00	5:30	418.1	36.6	643.2	512.3
1-Jan-00	5:35	406.7	35.9	643.2	495.5
1-Jan-00	5:40	395.6	35.3	643.1	480.2
1-Jan-00	5:45	383.9	34.8	643.1	466.2
1-Jan-00	5:50	372.3	34.2	643.1	453.3
1-Jan-00	5:55	360.7	33.6	643	441.5
1-Jan-00	6:00	346.1	33.1	643	430.6
1-Jan-00	6:05	321.3	32.5	642.9	418.7
1-Jan-00	6:10	283.4	31.7	642.8	404.6
1-Jan-00	6:15	236.1	30.8	642.8	387.2
1-Jan-00	6:20	186.4	29.6	642.7	366.4
1-Jan-00	6:25	140.2	28.3	642.5	342.8
1-Jan-00	6:30	101.1	26.9	642.4	317.6
1-Jan-00	6:35	70.4	25.4	642.3	292
1-Jan-00	6:40	47.5	23.8	642.1	266.9
1-Jan-00	6:45	31.2	22.4	642	243.1
1-Jan-00	6:50	20	20.9	641.9	220.6
1-Jan-00	6:55	12.6	19.6	641.8	200.1
1-Jan-00	7:00	7.7	18.4	641.7	181.6
1-Jan-00	7:05	4.7	17.2	641.6	165
1-Jan-00	7:10	2.8	16.1	641.5	150.2
1-Jan-00	7:15	1.6	15.2	641.4	137.1
1-Jan-00	7:20	0.9	14.3	641.3	125.3
1-Jan-00	7:25	0.5	13.5	641.2	114.8

1-Jan-00	7:30	0.3	12.7	641.2	105.5
1-Jan-00	7:35	0.1	12	641.1	97.1
1-Jan-00	7:40	0.1	11.4	641	89.6
1-Jan-00	7:45	0	10.8	641	82.8
1-Jan-00	7:50	0	10.2	640.9	76.5
1-Jan-00	7:55	0	9.7	640.9	70.9
1-Jan-00	8:00	0	9.2	640.8	65.8
1-Jan-00	8:05	0	8.8	640.8	61.2
1-Jan-00	8:10	0	8.4	640.8	57
1-Jan-00	8:15	0	8	640.7	53.2
1-Jan-00	8:20	0	7.7	640.7	49.7
1-Jan-00	8:25	0	7.3	640.7	46.5
1-Jan-00	8:30	0	7	640.6	43.6
1-Jan-00	8:35	0	6.7	640.6	40.9
1-Jan-00	8:40	0	6.5	640.6	38.5
1-Jan-00	8:45	0	6.2	640.6	36.2
1-Jan-00	8:50	0	6	640.5	34.1
1-Jan-00	8:55	0	5.7	640.5	32.2
1-Jan-00	9:00	0	5.5	640.5	30.4
1-Jan-00	9:05	0	5.3	640.5	28.7
1-Jan-00	9:10	0	5.1	640.5	27.2
1-Jan-00	9:15	0	4.9	640.5	25.7
1-Jan-00	9:20	0	4.8	640.4	24.4
1-Jan-00	9:25	0	4.6	640.4	23.1
1-Jan-00	9:30	0	4.5	640.4	22
1-Jan-00	9:35	0	4.3	640.4	20.9
1-Jan-00	9:40	0	4.2	640.4	19.9
1-Jan-00	9:45	0	4	640.4	18.9
1-Jan-00	9:50	0	3.9	640.4	18
1-Jan-00	9:55	0	3.8	640.3	17.2
1-Jan-00	10:00	0	3.7	640.3	16.4
1-Jan-00	10:05	0	3.6	640.3	15.7
1-Jan-00	10:10	0	3.4	640.3	15
1-Jan-00	10:15	0	3.3	640.3	14.3
1-Jan-00	10:20	0	3.3	640.3	13.7
1-Jan-00	10:25	0	3.2	640.3	13.1
1-Jan-00	10:30	0	3.1	640.3	12.6
1-Jan-00	10:35	0	3	640.3	12.1
1-Jan-00	10:40	0	2.9	640.3	11.6
1-Jan-00	10:45	0	2.8	640.3	11.1
1-Jan-00	10:50	0	2.8	640.3	10.7
1-Jan-00	10:55	0	2.7	640.2	10.3
1-Jan-00	11:00	0	2.6	640.2	9.9
1-Jan-00	11:05	0	2.5	640.2	9.5
1-Jan-00	11:10	0	2.5	640.2	9.1
1-Jan-00	11:15	0	2.4	640.2	8.8
1-Jan-00	11:20	0	2.4	640.2	8.5

1-Jan-00	11:25	0	2.3	640.2	8.2
1-Jan-00	11:30	0	2.2	640.2	7.9
1-Jan-00	11:35	0	2.2	640.2	7.6
1-Jan-00	11:40	0	2.1	640.2	7.3
1-Jan-00	11:45	0	2.1	640.2	7.1
1-Jan-00	11:50	0	2	640.2	6.8
1-Jan-00	11:55	0	2	640.2	6.6
1-Jan-00	12:00	0	2	640.2	6.4
1-Jan-00	12:05	0	1.9	640.2	6.2
1-Jan-00	12:10	0	1.9	640.2	6
1-Jan-00	12:15	0	1.8	640.2	5.8
1-Jan-00	12:20	0	1.8	640.2	5.6
1-Jan-00	12:25	0	1.7	640.2	5.4
1-Jan-00	12:30	0	1.7	640.2	5.2
1-Jan-00	12:35	0	1.7	640.2	5.1
1-Jan-00	12:40	0	1.6	640.2	4.9
1-Jan-00	12:45	0	1.6	640.1	4.8
1-Jan-00	12:50	0	1.6	640.1	4.6
1-Jan-00	12:55	0	1.5	640.1	4.5
1-Jan-00	13:00	0	1.5	640.1	4.4
1-Jan-00	13:05	0	1.5	640.1	4.2
1-Jan-00	13:10	0	1.5	640.1	4.1
1-Jan-00	13:15	0	1.4	640.1	4
1-Jan-00	13:20	0	1.4	640.1	3.9
1-Jan-00	13:25	0	1.4	640.1	3.8
1-Jan-00	13:30	0	1.3	640.1	3.7
1-Jan-00	13:35	0	1.3	640.1	3.6
1-Jan-00	13:40	0	1.3	640.1	3.5
1-Jan-00	13:45	0	1.3	640.1	3.4
1-Jan-00	13:50	0	1.3	640.1	3.3
1-Jan-00	13:55	0	1.2	640.1	3.2
1-Jan-00	14:00	0	1.2	640.1	3.1
1-Jan-00	14:05	0	1.2	640.1	3
1-Jan-00	14:10	0	1.2	640.1	3
1-Jan-00	14:15	0	1.1	640.1	2.9
1-Jan-00	14:20	0	1.1	640.1	2.8
1-Jan-00	14:25	0	1.1	640.1	2.7
1-Jan-00	14:30	0	1.1	640.1	2.7
1-Jan-00	14:35	0	1.1	640.1	2.6
1-Jan-00	14:40	0	1.1	640.1	2.5
1-Jan-00	14:45	0	1	640.1	2.5
1-Jan-00	14:50	0	1	640.1	2.4
1-Jan-00	14:55	0	1	640.1	2.4
1-Jan-00	15:00	0	1	640.1	2.3
1-Jan-00	15:05	0	1	640.1	2.2
1-Jan-00	15:10	0	1	640.1	2.2
1-Jan-00	15:15	0	0.9	640.1	2.1

1-Jan-00	15:20	0	0.9	640.1	2.1
1-Jan-00	15:25	0	0.9	640.1	2
1-Jan-00	15:30	0	0.9	640.1	2
1-Jan-00	15:35	0	0.9	640.1	2
1-Jan-00	15:40	0	0.9	640.1	1.9
1-Jan-00	15:45	0	0.9	640.1	1.9
1-Jan-00	15:50	0	0.8	640.1	1.8
1-Jan-00	15:55	0	0.8	640.1	1.8
1-Jan-00	16:00	0	0.8	640.1	1.7
1-Jan-00	16:05	0	0.8	640.1	1.7
1-Jan-00	16:10	0	0.8	640.1	1.7
1-Jan-00	16:15	0	0.8	640.1	1.6
1-Jan-00	16:20	0	0.8	640.1	1.6
1-Jan-00	16:25	0	0.8	640.1	1.6
1-Jan-00	16:30	0	0.8	640.1	1.5
1-Jan-00	16:35	0	0.7	640.1	1.5
1-Jan-00	16:40	0	0.7	640.1	1.5
1-Jan-00	16:45	0	0.7	640.1	1.4
1-Jan-00	16:50	0	0.7	640.1	1.4
1-Jan-00	16:55	0	0.7	640.1	1.4
1-Jan-00	17:00	0	0.7	640.1	1.4
1-Jan-00	17:05	0	0.7	640.1	1.3
1-Jan-00	17:10	0	0.7	640.1	1.3
1-Jan-00	17:15	0	0.7	640.1	1.3
1-Jan-00	17:20	0	0.7	640.1	1.3
1-Jan-00	17:25	0	0.7	640.1	1.2
1-Jan-00	17:30	0	0.6	640.1	1.2
1-Jan-00	17:35	0	0.6	640.1	1.2
1-Jan-00	17:40	0	0.6	640.1	1.2
1-Jan-00	17:45	0	0.6	640.1	1.1
1-Jan-00	17:50	0	0.6	640.1	1.1
1-Jan-00	17:55	0	0.6	640.1	1.1
1-Jan-00	18:00	0	0.6	640.1	1.1
1-Jan-00	18:05	0	0.6	640.1	1.1
1-Jan-00	18:10	0	0.6	640.1	1
1-Jan-00	18:15	0	0.6	640.1	1
1-Jan-00	18:20	0	0.6	640.1	1
1-Jan-00	18:25	0	0.6	640.1	1
1-Jan-00	18:30	0	0.6	640.1	1
1-Jan-00	18:35	0	0.5	640	0.9
1-Jan-00	18:40	0	0.5	640	0.9
1-Jan-00	18:45	0	0.5	640	0.9
1-Jan-00	18:50	0	0.5	640	0.9
1-Jan-00	18:55	0	0.5	640	0.9
1-Jan-00	19:00	0	0.5	640	0.9
1-Jan-00	19:05	0	0.5	640	0.9
1-Jan-00	19:10	0	0.5	640	0.8

1-Jan-00	19:15	0	0.5	640	0.8
1-Jan-00	19:20	0	0.5	640	0.8
1-Jan-00	19:25	0	0.5	640	0.8
1-Jan-00	19:30	0	0.5	640	0.8
1-Jan-00	19:35	0	0.5	640	0.8
1-Jan-00	19:40	0	0.5	640	0.8
1-Jan-00	19:45	0	0.5	640	0.7
1-Jan-00	19:50	0	0.5	640	0.7
1-Jan-00	19:55	0	0.5	640	0.7
1-Jan-00	20:00	0	0.5	640	0.7
1-Jan-00	20:05	0	0.4	640	0.7
1-Jan-00	20:10	0	0.4	640	0.7
1-Jan-00	20:15	0	0.4	640	0.7
1-Jan-00	20:20	0	0.4	640	0.7
1-Jan-00	20:25	0	0.4	640	0.7
1-Jan-00	20:30	0	0.4	640	0.6
1-Jan-00	20:35	0	0.4	640	0.6
1-Jan-00	20:40	0	0.4	640	0.6
1-Jan-00	20:45	0	0.4	640	0.6
1-Jan-00	20:50	0	0.4	640	0.6
1-Jan-00	20:55	0	0.4	640	0.6
1-Jan-00	21:00	0	0.4	640	0.6
1-Jan-00	21:05	0	0.4	640	0.6
1-Jan-00	21:10	0	0.4	640	0.6
1-Jan-00	21:15	0	0.4	640	0.6
1-Jan-00	21:20	0	0.4	640	0.6
1-Jan-00	21:25	0	0.4	640	0.5
1-Jan-00	21:30	0	0.4	640	0.5
1-Jan-00	21:35	0	0.4	640	0.5
1-Jan-00	21:40	0	0.4	640	0.5
1-Jan-00	21:45	0	0.4	640	0.5
1-Jan-00	21:50	0	0.4	640	0.5
1-Jan-00	21:55	0	0.4	640	0.5
1-Jan-00	22:00	0	0.4	640	0.5
1-Jan-00	22:05	0	0.3	640	0.5
1-Jan-00	22:10	0	0.3	640	0.5
1-Jan-00	22:15	0	0.3	640	0.5
1-Jan-00	22:20	0	0.3	640	0.5
1-Jan-00	22:25	0	0.3	640	0.5
1-Jan-00	22:30	0	0.3	640	0.5
1-Jan-00	22:35	0	0.3	640	0.4
1-Jan-00	22:40	0	0.3	640	0.4
1-Jan-00	22:45	0	0.3	640	0.4
1-Jan-00	22:50	0	0.3	640	0.4
1-Jan-00	22:55	0	0.3	640	0.4
1-Jan-00	23:00	0	0.3	640	0.4
1-Jan-00	23:05	0	0.3	640	0.4

1-Jan-00	23:10	0	0.3	640	0.4
1-Jan-00	23:15	0	0.3	640	0.4
1-Jan-00	23:20	0	0.3	640	0.4
1-Jan-00	23:25	0	0.3	640	0.4
1-Jan-00	23:30	0	0.3	640	0.4
1-Jan-00	23:35	0	0.3	640	0.4
1-Jan-00	23:40	0	0.3	640	0.4
1-Jan-00	23:45	0	0.3	640	0.4
1-Jan-00	23:50	0	0.3	640	0.4
1-Jan-00	23:55	0	0.3	640	0.4
2-Jan-00	0:00	0	0.3	640	0.4
2-Jan-00	0:05	0	0.3	640	0.3
2-Jan-00	0:10	0	0.3	640	0.3
2-Jan-00	0:15	0	0.3	640	0.3
2-Jan-00	0:20	0	0.3	640	0.3
2-Jan-00	0:25	0	0.3	640	0.3
2-Jan-00	0:30	0	0.3	640	0.3
2-Jan-00	0:35	0	0.3	640	0.3
2-Jan-00	0:40	0	0.3	640	0.3
2-Jan-00	0:45	0	0.3	640	0.3
2-Jan-00	0:50	0	0.3	640	0.3
2-Jan-00	0:55	0	0.3	640	0.3
2-Jan-00	1:00	0	0.3	640	0.3
2-Jan-00	1:05	0	0.3	640	0.3
2-Jan-00	1:10	0	0.3	640	0.3
2-Jan-00	1:15	0	0.3	640	0.3
2-Jan-00	1:20	0	0.2	640	0.3
2-Jan-00	1:25	0	0.2	640	0.3
2-Jan-00	1:30	0	0.2	640	0.3
2-Jan-00	1:35	0	0.2	640	0.3
2-Jan-00	1:40	0	0.2	640	0.3
2-Jan-00	1:45	0	0.2	640	0.3
2-Jan-00	1:50	0	0.2	640	0.3
2-Jan-00	1:55	0	0.2	640	0.3
2-Jan-00	2:00	0	0.2	640	0.3
2-Jan-00	2:05	0	0.2	640	0.3
2-Jan-00	2:10	0	0.2	640	0.3
2-Jan-00	2:15	0	0.2	640	0.3
2-Jan-00	2:20	0	0.2	640	0.3
2-Jan-00	2:25	0	0.2	640	0.2
2-Jan-00	2:30	0	0.2	640	0.2
2-Jan-00	2:35	0	0.2	640	0.2
2-Jan-00	2:40	0	0.2	640	0.2
2-Jan-00	2:45	0	0.2	640	0.2
2-Jan-00	2:50	0	0.2	640	0.2
2-Jan-00	2:55	0	0.2	640	0.2
2-Jan-00	3:00	0	0.2	640	0.2

2-Jan-00	3:05	0	0.2	640	0.2
2-Jan-00	3:10	0	0.2	640	0.2
2-Jan-00	3:15	0	0.2	640	0.2
2-Jan-00	3:20	0	0.2	640	0.2
2-Jan-00	3:25	0	0.2	640	0.2
2-Jan-00	3:30	0	0.2	640	0.2
2-Jan-00	3:35	0	0.2	640	0.2
2-Jan-00	3:40	0	0.2	640	0.2
2-Jan-00	3:45	0	0.2	640	0.2
2-Jan-00	3:50	0	0.2	640	0.2
2-Jan-00	3:55	0	0.2	640	0.2
2-Jan-00	4:00	0	0.2	640	0.2
2-Jan-00	4:05	0	0.2	640	0.2
2-Jan-00	4:10	0	0.2	640	0.2
2-Jan-00	4:15	0	0.2	640	0.2
2-Jan-00	4:20	0	0.2	640	0.2
2-Jan-00	4:25	0	0.2	640	0.2
2-Jan-00	4:30	0	0.2	640	0.2
2-Jan-00	4:35	0	0.2	640	0.2
2-Jan-00	4:40	0	0.2	640	0.2
2-Jan-00	4:45	0	0.2	640	0.2
2-Jan-00	4:50	0	0.2	640	0.2
2-Jan-00	4:55	0	0.2	640	0.2
2-Jan-00	5:00	0	0.2	640	0.2
2-Jan-00	5:05	0	0.2	640	0.2
2-Jan-00	5:10	0	0.2	640	0.2
2-Jan-00	5:15	0	0.2	640	0.2
2-Jan-00	5:20	0	0.2	640	0.2
2-Jan-00	5:25	0	0.2	640	0.2
2-Jan-00	5:30	0	0.2	640	0.2
2-Jan-00	5:35	0	0.2	640	0.2
2-Jan-00	5:40	0	0.2	640	0.2
2-Jan-00	5:45	0	0.2	640	0.2
2-Jan-00	5:50	0	0.2	640	0.2
2-Jan-00	5:55	0	0.2	640	0.2
2-Jan-00	6:00	0	0.2	640	0.2

100-year 6 hour Model Run

Project: Robinson Lake Simulation Run: Run1

Reservoir: Reservoir-1

Start of Run:	01Jan2000, 00:00	Basin Model:	RobinsonLake
End of Run:	02Jan2000, 06:00	Meteorologic Model:	c. 100 yr 6 hr
Compute Time:	21Nov2017, 16:49:11	Control Specifications:	Control 1

Volume Units: ☒ IN ☐ AC-FT

Computed Results

Peak Inflow:	1272.0 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 03:30
Peak Discharge:	767.5 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 03:55
Inflow Volume:	2.66 (IN)	Peak Storage:	44.5 (AC-FT)
Discharge Volume:	2.66 (IN)	Peak Elevation:	643.9 (FT)

100-Year 6 Hour Storm

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
1-Jan-00	0:00	0	0	640	0
1-Jan-00	0:05	0	0	640	0
1-Jan-00	0:10	0	0	640	0
1-Jan-00	0:15	0	0	640	0
1-Jan-00	0:20	0	0	640	0
1-Jan-00	0:25	0	0	640	0
1-Jan-00	0:30	0	0	640	0
1-Jan-00	0:35	0	0	640	0
1-Jan-00	0:40	0	0	640	0
1-Jan-00	0:45	0	0	640	0
1-Jan-00	0:50	0	0	640	0
1-Jan-00	0:55	0	0	640	0
1-Jan-00	1:00	0	0	640	0
1-Jan-00	1:05	0	0	640	0
1-Jan-00	1:10	0	0	640	0
1-Jan-00	1:15	0	0	640	0
1-Jan-00	1:20	0	0	640	0
1-Jan-00	1:25	0	0	640	0
1-Jan-00	1:30	0	0	640	0
1-Jan-00	1:35	0	0	640	0
1-Jan-00	1:40	0	0	640	0
1-Jan-00	1:45	0	0	640	0
1-Jan-00	1:50	0	0	640	0
1-Jan-00	1:55	0	0	640	0
1-Jan-00	2:00	0	0	640	0
1-Jan-00	2:05	0	0	640	0
1-Jan-00	2:10	0	0	640	0
1-Jan-00	2:15	0.3	0	640	0
1-Jan-00	2:20	1	0	640	0
1-Jan-00	2:25	2.6	0	640	0
1-Jan-00	2:30	5.5	0	640	0
1-Jan-00	2:35	10.2	0.1	640	0.1
1-Jan-00	2:40	19.4	0.2	640	0.2
1-Jan-00	2:45	36.3	0.4	640	0.6
1-Jan-00	2:50	64.5	0.7	640.1	1.5
1-Jan-00	2:55	111.8	1.3	640.1	3.5
1-Jan-00	3:00	189.7	2.3	640.2	8.3
1-Jan-00	3:05	321.8	4	640.4	18.6
1-Jan-00	3:10	541	6.8	640.6	41.1
1-Jan-00	3:15	809.4	11	641	85.1
1-Jan-00	3:20	1051.9	16.6	641.5	155.9
1-Jan-00	3:25	1211.8	22.9	642.1	252.5
1-Jan-00	3:30	1272	29.4	642.6	362.1

Outlet Structures	Elevation
Riser and Barrel	640'
Auxiliary Spillway	643'
Emergency Spillway	644'
Dam Crest	645.5'

1-Jan-00	3:35	1246.3	35.2	643.1	476.3
1-Jan-00	3:40	1156.1	39.7	643.5	605
1-Jan-00	3:45	1024.9	42.7	643.8	703.8
1-Jan-00	3:50	876.9	44.2	643.9	757.1
1-Jan-00	3:55	731.8	44.5	643.9	767.5
1-Jan-00	4:00	602.3	43.9	643.9	745.4
1-Jan-00	4:05	494	42.7	643.8	702.9
1-Jan-00	4:10	406.9	41.2	643.6	650.6
1-Jan-00	4:15	338.5	39.4	643.5	595.7
1-Jan-00	4:20	285.5	37.7	643.3	543
1-Jan-00	4:25	244.7	35.9	643.2	495.1
1-Jan-00	4:30	213.6	34.2	643.1	454.1
1-Jan-00	4:35	190	32.6	642.9	421.9
1-Jan-00	4:40	173.4	31.1	642.8	392.8
1-Jan-00	4:45	163.4	29.6	642.7	366.2
1-Jan-00	4:50	158.3	28.3	642.5	342.4
1-Jan-00	4:55	155.7	27.1	642.4	321.3
1-Jan-00	5:00	154.8	26	642.3	302.8
1-Jan-00	5:05	154	25	642.3	286.6
1-Jan-00	5:10	152.8	24.2	642.2	272.2
1-Jan-00	5:15	150.9	23.4	642.1	259.5
1-Jan-00	5:20	148.5	22.7	642	248
1-Jan-00	5:25	145.7	22	642	237.6
1-Jan-00	5:30	142.6	21.4	641.9	227.9
1-Jan-00	5:35	139.3	20.8	641.9	219
1-Jan-00	5:40	136.1	20.3	641.8	210.7
1-Jan-00	5:45	132.8	19.8	641.8	203.1
1-Jan-00	5:50	129.7	19.3	641.7	196
1-Jan-00	5:55	126.7	18.9	641.7	189.4
1-Jan-00	6:00	123.8	18.5	641.7	183.2
1-Jan-00	6:05	120.5	18.1	641.6	177.3
1-Jan-00	6:10	114	17.7	641.6	171.6
1-Jan-00	6:15	102.4	17.3	641.6	165.7
1-Jan-00	6:20	86.6	16.8	641.5	159.1
1-Jan-00	6:25	69.2	16.3	641.5	151.7
1-Jan-00	6:30	52.6	15.7	641.4	143.5
1-Jan-00	6:35	38.3	15	641.4	134.9
1-Jan-00	6:40	26.8	14.3	641.3	126.1
1-Jan-00	6:45	18.2	13.7	641.2	117.3
1-Jan-00	6:50	12	13	641.2	108.9
1-Jan-00	6:55	7.7	12.3	641.1	100.9
1-Jan-00	7:00	4.9	11.7	641.1	93.5
1-Jan-00	7:05	3	11.1	641	86.6
1-Jan-00	7:10	1.8	10.6	641	80.2
1-Jan-00	7:15	1.1	10	640.9	74.3
1-Jan-00	7:20	0.6	9.5	640.9	69
1-Jan-00	7:25	0.4	9.1	640.8	64.1

1-Jan-00	7:30	0.2	8.7	640.8	59.7
1-Jan-00	7:35	0.1	8.3	640.8	55.6
1-Jan-00	7:40	0.1	7.9	640.7	51.9
1-Jan-00	7:45	0	7.6	640.7	48.6
1-Jan-00	7:50	0	7.2	640.7	45.5
1-Jan-00	7:55	0	6.9	640.6	42.6
1-Jan-00	8:00	0	6.6	640.6	40
1-Jan-00	8:05	0	6.4	640.6	37.7
1-Jan-00	8:10	0	6.1	640.6	35.4
1-Jan-00	8:15	0	5.9	640.5	33.4
1-Jan-00	8:20	0	5.7	640.5	31.5
1-Jan-00	8:25	0	5.4	640.5	29.8
1-Jan-00	8:30	0	5.3	640.5	28.2
1-Jan-00	8:35	0	5.1	640.5	26.7
1-Jan-00	8:40	0	4.9	640.4	25.3
1-Jan-00	8:45	0	4.7	640.4	23.9
1-Jan-00	8:50	0	4.6	640.4	22.7
1-Jan-00	8:55	0	4.4	640.4	21.6
1-Jan-00	9:00	0	4.3	640.4	20.5
1-Jan-00	9:05	0	4.1	640.4	19.5
1-Jan-00	9:10	0	4	640.4	18.6
1-Jan-00	9:15	0	3.9	640.4	17.8
1-Jan-00	9:20	0	3.7	640.3	16.9
1-Jan-00	9:25	0	3.6	640.3	16.2
1-Jan-00	9:30	0	3.5	640.3	15.4
1-Jan-00	9:35	0	3.4	640.3	14.8
1-Jan-00	9:40	0	3.3	640.3	14.1
1-Jan-00	9:45	0	3.2	640.3	13.5
1-Jan-00	9:50	0	3.1	640.3	12.9
1-Jan-00	9:55	0	3	640.3	12.4
1-Jan-00	10:00	0	3	640.3	11.9
1-Jan-00	10:05	0	2.9	640.3	11.4
1-Jan-00	10:10	0	2.8	640.3	11
1-Jan-00	10:15	0	2.7	640.2	10.5
1-Jan-00	10:20	0	2.7	640.2	10.1
1-Jan-00	10:25	0	2.6	640.2	9.7
1-Jan-00	10:30	0	2.5	640.2	9.4
1-Jan-00	10:35	0	2.5	640.2	9
1-Jan-00	10:40	0	2.4	640.2	8.7
1-Jan-00	10:45	0	2.3	640.2	8.4
1-Jan-00	10:50	0	2.3	640.2	8.1
1-Jan-00	10:55	0	2.2	640.2	7.8
1-Jan-00	11:00	0	2.2	640.2	7.5
1-Jan-00	11:05	0	2.1	640.2	7.2
1-Jan-00	11:10	0	2.1	640.2	7
1-Jan-00	11:15	0	2	640.2	6.8
1-Jan-00	11:20	0	2	640.2	6.5

1-Jan-00	11:25	0	1.9	640.2	6.3
1-Jan-00	11:30	0	1.9	640.2	6.1
1-Jan-00	11:35	0	1.9	640.2	5.9
1-Jan-00	11:40	0	1.8	640.2	5.7
1-Jan-00	11:45	0	1.8	640.2	5.5
1-Jan-00	11:50	0	1.7	640.2	5.4
1-Jan-00	11:55	0	1.7	640.2	5.2
1-Jan-00	12:00	0	1.7	640.2	5
1-Jan-00	12:05	0	1.6	640.1	4.9
1-Jan-00	12:10	0	1.6	640.1	4.7
1-Jan-00	12:15	0	1.6	640.1	4.6
1-Jan-00	12:20	0	1.5	640.1	4.4
1-Jan-00	12:25	0	1.5	640.1	4.3
1-Jan-00	12:30	0	1.5	640.1	4.2
1-Jan-00	12:35	0	1.4	640.1	4.1
1-Jan-00	12:40	0	1.4	640.1	4
1-Jan-00	12:45	0	1.4	640.1	3.8
1-Jan-00	12:50	0	1.4	640.1	3.7
1-Jan-00	12:55	0	1.3	640.1	3.6
1-Jan-00	13:00	0	1.3	640.1	3.5
1-Jan-00	13:05	0	1.3	640.1	3.4
1-Jan-00	13:10	0	1.3	640.1	3.3
1-Jan-00	13:15	0	1.2	640.1	3.3
1-Jan-00	13:20	0	1.2	640.1	3.2
1-Jan-00	13:25	0	1.2	640.1	3.1
1-Jan-00	13:30	0	1.2	640.1	3
1-Jan-00	13:35	0	1.2	640.1	2.9
1-Jan-00	13:40	0	1.1	640.1	2.9
1-Jan-00	13:45	0	1.1	640.1	2.8
1-Jan-00	13:50	0	1.1	640.1	2.7
1-Jan-00	13:55	0	1.1	640.1	2.6
1-Jan-00	14:00	0	1.1	640.1	2.6
1-Jan-00	14:05	0	1	640.1	2.5
1-Jan-00	14:10	0	1	640.1	2.5
1-Jan-00	14:15	0	1	640.1	2.4
1-Jan-00	14:20	0	1	640.1	2.3
1-Jan-00	14:25	0	1	640.1	2.3
1-Jan-00	14:30	0	1	640.1	2.2
1-Jan-00	14:35	0	1	640.1	2.2
1-Jan-00	14:40	0	0.9	640.1	2.1
1-Jan-00	14:45	0	0.9	640.1	2.1
1-Jan-00	14:50	0	0.9	640.1	2
1-Jan-00	14:55	0	0.9	640.1	2
1-Jan-00	15:00	0	0.9	640.1	1.9
1-Jan-00	15:05	0	0.9	640.1	1.9
1-Jan-00	15:10	0	0.9	640.1	1.9
1-Jan-00	15:15	0	0.8	640.1	1.8

1-Jan-00	15:20	0	0.8	640.1	1.8
1-Jan-00	15:25	0	0.8	640.1	1.7
1-Jan-00	15:30	0	0.8	640.1	1.7
1-Jan-00	15:35	0	0.8	640.1	1.7
1-Jan-00	15:40	0	0.8	640.1	1.6
1-Jan-00	15:45	0	0.8	640.1	1.6
1-Jan-00	15:50	0	0.8	640.1	1.6
1-Jan-00	15:55	0	0.8	640.1	1.5
1-Jan-00	16:00	0	0.7	640.1	1.5
1-Jan-00	16:05	0	0.7	640.1	1.5
1-Jan-00	16:10	0	0.7	640.1	1.4
1-Jan-00	16:15	0	0.7	640.1	1.4
1-Jan-00	16:20	0	0.7	640.1	1.4
1-Jan-00	16:25	0	0.7	640.1	1.3
1-Jan-00	16:30	0	0.7	640.1	1.3
1-Jan-00	16:35	0	0.7	640.1	1.3
1-Jan-00	16:40	0	0.7	640.1	1.3
1-Jan-00	16:45	0	0.7	640.1	1.2
1-Jan-00	16:50	0	0.6	640.1	1.2
1-Jan-00	16:55	0	0.6	640.1	1.2
1-Jan-00	17:00	0	0.6	640.1	1.2
1-Jan-00	17:05	0	0.6	640.1	1.2
1-Jan-00	17:10	0	0.6	640.1	1.1
1-Jan-00	17:15	0	0.6	640.1	1.1
1-Jan-00	17:20	0	0.6	640.1	1.1
1-Jan-00	17:25	0	0.6	640.1	1.1
1-Jan-00	17:30	0	0.6	640.1	1
1-Jan-00	17:35	0	0.6	640.1	1
1-Jan-00	17:40	0	0.6	640.1	1
1-Jan-00	17:45	0	0.6	640.1	1
1-Jan-00	17:50	0	0.6	640.1	1
1-Jan-00	17:55	0	0.6	640.1	1
1-Jan-00	18:00	0	0.5	640	0.9
1-Jan-00	18:05	0	0.5	640	0.9
1-Jan-00	18:10	0	0.5	640	0.9
1-Jan-00	18:15	0	0.5	640	0.9
1-Jan-00	18:20	0	0.5	640	0.9
1-Jan-00	18:25	0	0.5	640	0.9
1-Jan-00	18:30	0	0.5	640	0.8
1-Jan-00	18:35	0	0.5	640	0.8
1-Jan-00	18:40	0	0.5	640	0.8
1-Jan-00	18:45	0	0.5	640	0.8
1-Jan-00	18:50	0	0.5	640	0.8
1-Jan-00	18:55	0	0.5	640	0.8
1-Jan-00	19:00	0	0.5	640	0.8
1-Jan-00	19:05	0	0.5	640	0.8
1-Jan-00	19:10	0	0.5	640	0.7

1-Jan-00	19:15	0	0.5	640	0.7
1-Jan-00	19:20	0	0.5	640	0.7
1-Jan-00	19:25	0	0.4	640	0.7
1-Jan-00	19:30	0	0.4	640	0.7
1-Jan-00	19:35	0	0.4	640	0.7
1-Jan-00	19:40	0	0.4	640	0.7
1-Jan-00	19:45	0	0.4	640	0.7
1-Jan-00	19:50	0	0.4	640	0.7
1-Jan-00	19:55	0	0.4	640	0.6
1-Jan-00	20:00	0	0.4	640	0.6
1-Jan-00	20:05	0	0.4	640	0.6
1-Jan-00	20:10	0	0.4	640	0.6
1-Jan-00	20:15	0	0.4	640	0.6
1-Jan-00	20:20	0	0.4	640	0.6
1-Jan-00	20:25	0	0.4	640	0.6
1-Jan-00	20:30	0	0.4	640	0.6
1-Jan-00	20:35	0	0.4	640	0.6
1-Jan-00	20:40	0	0.4	640	0.6
1-Jan-00	20:45	0	0.4	640	0.5
1-Jan-00	20:50	0	0.4	640	0.5
1-Jan-00	20:55	0	0.4	640	0.5
1-Jan-00	21:00	0	0.4	640	0.5
1-Jan-00	21:05	0	0.4	640	0.5
1-Jan-00	21:10	0	0.4	640	0.5
1-Jan-00	21:15	0	0.4	640	0.5
1-Jan-00	21:20	0	0.4	640	0.5
1-Jan-00	21:25	0	0.4	640	0.5
1-Jan-00	21:30	0	0.3	640	0.5
1-Jan-00	21:35	0	0.3	640	0.5
1-Jan-00	21:40	0	0.3	640	0.5
1-Jan-00	21:45	0	0.3	640	0.5
1-Jan-00	21:50	0	0.3	640	0.5
1-Jan-00	21:55	0	0.3	640	0.4
1-Jan-00	22:00	0	0.3	640	0.4
1-Jan-00	22:05	0	0.3	640	0.4
1-Jan-00	22:10	0	0.3	640	0.4
1-Jan-00	22:15	0	0.3	640	0.4
1-Jan-00	22:20	0	0.3	640	0.4
1-Jan-00	22:25	0	0.3	640	0.4
1-Jan-00	22:30	0	0.3	640	0.4
1-Jan-00	22:35	0	0.3	640	0.4
1-Jan-00	22:40	0	0.3	640	0.4
1-Jan-00	22:45	0	0.3	640	0.4
1-Jan-00	22:50	0	0.3	640	0.4
1-Jan-00	22:55	0	0.3	640	0.4
1-Jan-00	23:00	0	0.3	640	0.4
1-Jan-00	23:05	0	0.3	640	0.4

1-Jan-00	23:10	0	0.3	640	0.4
1-Jan-00	23:15	0	0.3	640	0.4
1-Jan-00	23:20	0	0.3	640	0.4
1-Jan-00	23:25	0	0.3	640	0.4
1-Jan-00	23:30	0	0.3	640	0.3
1-Jan-00	23:35	0	0.3	640	0.3
1-Jan-00	23:40	0	0.3	640	0.3
1-Jan-00	23:45	0	0.3	640	0.3
1-Jan-00	23:50	0	0.3	640	0.3
1-Jan-00	23:55	0	0.3	640	0.3
2-Jan-00	0:00	0	0.3	640	0.3
2-Jan-00	0:05	0	0.3	640	0.3
2-Jan-00	0:10	0	0.3	640	0.3
2-Jan-00	0:15	0	0.3	640	0.3
2-Jan-00	0:20	0	0.3	640	0.3
2-Jan-00	0:25	0	0.3	640	0.3
2-Jan-00	0:30	0	0.3	640	0.3
2-Jan-00	0:35	0	0.3	640	0.3
2-Jan-00	0:40	0	0.2	640	0.3
2-Jan-00	0:45	0	0.2	640	0.3
2-Jan-00	0:50	0	0.2	640	0.3
2-Jan-00	0:55	0	0.2	640	0.3
2-Jan-00	1:00	0	0.2	640	0.3
2-Jan-00	1:05	0	0.2	640	0.3
2-Jan-00	1:10	0	0.2	640	0.3
2-Jan-00	1:15	0	0.2	640	0.3
2-Jan-00	1:20	0	0.2	640	0.3
2-Jan-00	1:25	0	0.2	640	0.3
2-Jan-00	1:30	0	0.2	640	0.3
2-Jan-00	1:35	0	0.2	640	0.3
2-Jan-00	1:40	0	0.2	640	0.3
2-Jan-00	1:45	0	0.2	640	0.3
2-Jan-00	1:50	0	0.2	640	0.2
2-Jan-00	1:55	0	0.2	640	0.2
2-Jan-00	2:00	0	0.2	640	0.2
2-Jan-00	2:05	0	0.2	640	0.2
2-Jan-00	2:10	0	0.2	640	0.2
2-Jan-00	2:15	0	0.2	640	0.2
2-Jan-00	2:20	0	0.2	640	0.2
2-Jan-00	2:25	0	0.2	640	0.2
2-Jan-00	2:30	0	0.2	640	0.2
2-Jan-00	2:35	0	0.2	640	0.2
2-Jan-00	2:40	0	0.2	640	0.2
2-Jan-00	2:45	0	0.2	640	0.2
2-Jan-00	2:50	0	0.2	640	0.2
2-Jan-00	2:55	0	0.2	640	0.2
2-Jan-00	3:00	0	0.2	640	0.2

2-Jan-00	3:05	0	0.2	640	0.2
2-Jan-00	3:10	0	0.2	640	0.2
2-Jan-00	3:15	0	0.2	640	0.2
2-Jan-00	3:20	0	0.2	640	0.2
2-Jan-00	3:25	0	0.2	640	0.2
2-Jan-00	3:30	0	0.2	640	0.2
2-Jan-00	3:35	0	0.2	640	0.2
2-Jan-00	3:40	0	0.2	640	0.2
2-Jan-00	3:45	0	0.2	640	0.2
2-Jan-00	3:50	0	0.2	640	0.2
2-Jan-00	3:55	0	0.2	640	0.2
2-Jan-00	4:00	0	0.2	640	0.2
2-Jan-00	4:05	0	0.2	640	0.2
2-Jan-00	4:10	0	0.2	640	0.2
2-Jan-00	4:15	0	0.2	640	0.2
2-Jan-00	4:20	0	0.2	640	0.2
2-Jan-00	4:25	0	0.2	640	0.2
2-Jan-00	4:30	0	0.2	640	0.2
2-Jan-00	4:35	0	0.2	640	0.2
2-Jan-00	4:40	0	0.2	640	0.2
2-Jan-00	4:45	0	0.2	640	0.2
2-Jan-00	4:50	0	0.2	640	0.2
2-Jan-00	4:55	0	0.2	640	0.2
2-Jan-00	5:00	0	0.2	640	0.2
2-Jan-00	5:05	0	0.2	640	0.2
2-Jan-00	5:10	0	0.2	640	0.2
2-Jan-00	5:15	0	0.2	640	0.2
2-Jan-00	5:20	0	0.2	640	0.2
2-Jan-00	5:25	0	0.2	640	0.2
2-Jan-00	5:30	0	0.2	640	0.2
2-Jan-00	5:35	0	0.2	640	0.2
2-Jan-00	5:40	0	0.2	640	0.2
2-Jan-00	5:45	0	0.2	640	0.2
2-Jan-00	5:50	0	0.2	640	0.2
2-Jan-00	5:55	0	0.2	640	0.1
2-Jan-00	6:00	0	0.2	640	0.1

25-year 6 hour Model Run

Project: Robinson Lake Simulation Run: Run1

Reservoir: Reservoir-1

Start of Run:	01Jan2000, 00:00	Basin Model:	RobinsonLake
End of Run:	02Jan2000, 06:00	Meteorologic Model:	a. 25yr 6 hr
Compute Time:	21Nov2017, 16:49:50	Control Specifications:	Control 1

Volume Units: ☒ IN ☐ AC-FT

Computed Results

Peak Inflow:	871.5 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 03:30
Peak Discharge:	428.1 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:00
Inflow Volume:	1.80 (IN)	Peak Storage:	32.9 (AC-FT)
Discharge Volume:	1.79 (IN)	Peak Elevation:	642.9 (FT)

25-Year 6 Hour Storm

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
1-Jan-00	0:00	0	0	640	0
1-Jan-00	0:05	0	0	640	0
1-Jan-00	0:10	0	0	640	0
1-Jan-00	0:15	0	0	640	0
1-Jan-00	0:20	0	0	640	0
1-Jan-00	0:25	0	0	640	0
1-Jan-00	0:30	0	0	640	0
1-Jan-00	0:35	0	0	640	0
1-Jan-00	0:40	0	0	640	0
1-Jan-00	0:45	0	0	640	0
1-Jan-00	0:50	0	0	640	0
1-Jan-00	0:55	0	0	640	0
1-Jan-00	1:00	0	0	640	0
1-Jan-00	1:05	0	0	640	0
1-Jan-00	1:10	0	0	640	0
1-Jan-00	1:15	0	0	640	0
1-Jan-00	1:20	0	0	640	0
1-Jan-00	1:25	0	0	640	0
1-Jan-00	1:30	0	0	640	0
1-Jan-00	1:35	0	0	640	0
1-Jan-00	1:40	0	0	640	0
1-Jan-00	1:45	0	0	640	0
1-Jan-00	1:50	0	0	640	0
1-Jan-00	1:55	0	0	640	0
1-Jan-00	2:00	0	0	640	0
1-Jan-00	2:05	0	0	640	0
1-Jan-00	2:10	0	0	640	0
1-Jan-00	2:15	0	0	640	0
1-Jan-00	2:20	0	0	640	0
1-Jan-00	2:25	0	0	640	0
1-Jan-00	2:30	0	0	640	0
1-Jan-00	2:35	0.4	0	640	0
1-Jan-00	2:40	2.2	0	640	0
1-Jan-00	2:45	7.3	0	640	0
1-Jan-00	2:50	18.2	0.1	640	0.1
1-Jan-00	2:55	40	0.3	640	0.4
1-Jan-00	3:00	81.3	0.7	640.1	1.5
1-Jan-00	3:05	163	1.6	640.1	4.6
1-Jan-00	3:10	314.3	3.1	640.3	13.1
1-Jan-00	3:15	511	5.8	640.5	33
1-Jan-00	3:20	694.9	9.6	640.9	70
1-Jan-00	3:25	820.1	14.2	641.3	124.1
1-Jan-00	3:30	871.5	18.9	641.7	190

Outlet Structures	Elevation
Riser and Barrel	640'
Auxiliary Spillway	643'
Emergency Spillway	644'
Dam Crest	645.5'

1-Jan-00	3:35	858.8	23.3	642.1	258.8
1-Jan-00	3:40	798.5	27.1	642.4	320.8
1-Jan-00	3:45	708.5	29.9	642.7	370.6
1-Jan-00	3:50	606.6	31.7	642.8	404.9
1-Jan-00	3:55	506.7	32.7	642.9	423.4
1-Jan-00	4:00	417.7	32.9	642.9	428.1
1-Jan-00	4:05	343.3	32.6	642.9	422.3
1-Jan-00	4:10	283.7	31.9	642.9	409
1-Jan-00	4:15	236.9	31	642.8	391.1
1-Jan-00	4:20	200.8	29.9	642.7	370.7
1-Jan-00	4:25	173.1	28.7	642.6	349.3
1-Jan-00	4:30	151.9	27.5	642.5	327.9
1-Jan-00	4:35	135.9	26.3	642.4	307.3
1-Jan-00	4:40	124.6	25.1	642.3	287.9
1-Jan-00	4:45	117.7	24	642.2	269.9
1-Jan-00	4:50	114.1	23	642.1	253.7
1-Jan-00	4:55	112.3	22.1	642	239.1
1-Jan-00	5:00	111.5	21.3	641.9	225.9
1-Jan-00	5:05	110.8	20.5	641.9	214.2
1-Jan-00	5:10	109.9	19.8	641.8	203.8
1-Jan-00	5:15	108.5	19.2	641.7	194.5
1-Jan-00	5:20	106.7	18.7	641.7	186
1-Jan-00	5:25	104.7	18.1	641.6	178.3
1-Jan-00	5:30	102.4	17.6	641.6	171.2
1-Jan-00	5:35	100.1	17.2	641.6	164.7
1-Jan-00	5:40	97.8	16.8	641.5	158.6
1-Jan-00	5:45	95.5	16.3	641.5	152.9
1-Jan-00	5:50	93.2	16	641.4	147.6
1-Jan-00	5:55	91.1	15.6	641.4	142.7
1-Jan-00	6:00	89	15.2	641.4	138
1-Jan-00	6:05	86.7	14.9	641.4	133.6
1-Jan-00	6:10	82	14.6	641.3	129.4
1-Jan-00	6:15	73.7	14.3	641.3	124.9
1-Jan-00	6:20	62.3	13.9	641.3	120.1
1-Jan-00	6:25	49.8	13.5	641.2	114.8
1-Jan-00	6:30	37.9	13	641.2	108.9
1-Jan-00	6:35	27.6	12.5	641.1	102.8
1-Jan-00	6:40	19.3	12	641.1	96.5
1-Jan-00	6:45	13.1	11.4	641	90.3
1-Jan-00	6:50	8.6	10.9	641	84.2
1-Jan-00	6:55	5.6	10.4	640.9	78.4
1-Jan-00	7:00	3.5	9.9	640.9	72.9
1-Jan-00	7:05	2.2	9.4	640.9	67.8
1-Jan-00	7:10	1.3	9	640.8	63.2
1-Jan-00	7:15	0.8	8.6	640.8	58.9
1-Jan-00	7:20	0.5	8.2	640.7	54.9
1-Jan-00	7:25	0.3	7.8	640.7	51.3

1-Jan-00	7:30	0.2	7.5	640.7	48
1-Jan-00	7:35	0.1	7.2	640.7	45
1-Jan-00	7:40	0	6.9	640.6	42.2
1-Jan-00	7:45	0	6.6	640.6	39.6
1-Jan-00	7:50	0	6.3	640.6	37.3
1-Jan-00	7:55	0	6.1	640.6	35.1
1-Jan-00	8:00	0	5.8	640.5	33.1
1-Jan-00	8:05	0	5.6	640.5	31.2
1-Jan-00	8:10	0	5.4	640.5	29.5
1-Jan-00	8:15	0	5.2	640.5	27.9
1-Jan-00	8:20	0	5	640.5	26.4
1-Jan-00	8:25	0	4.9	640.4	25
1-Jan-00	8:30	0	4.7	640.4	23.7
1-Jan-00	8:35	0	4.5	640.4	22.5
1-Jan-00	8:40	0	4.4	640.4	21.4
1-Jan-00	8:45	0	4.2	640.4	20.4
1-Jan-00	8:50	0	4.1	640.4	19.4
1-Jan-00	8:55	0	4	640.4	18.5
1-Jan-00	9:00	0	3.8	640.4	17.6
1-Jan-00	9:05	0	3.7	640.3	16.8
1-Jan-00	9:10	0	3.6	640.3	16
1-Jan-00	9:15	0	3.5	640.3	15.3
1-Jan-00	9:20	0	3.4	640.3	14.7
1-Jan-00	9:25	0	3.3	640.3	14
1-Jan-00	9:30	0	3.2	640.3	13.4
1-Jan-00	9:35	0	3.1	640.3	12.9
1-Jan-00	9:40	0	3	640.3	12.3
1-Jan-00	9:45	0	2.9	640.3	11.8
1-Jan-00	9:50	0	2.9	640.3	11.3
1-Jan-00	9:55	0	2.8	640.3	10.9
1-Jan-00	10:00	0	2.7	640.2	10.5
1-Jan-00	10:05	0	2.6	640.2	10.1
1-Jan-00	10:10	0	2.6	640.2	9.7
1-Jan-00	10:15	0	2.5	640.2	9.3
1-Jan-00	10:20	0	2.4	640.2	9
1-Jan-00	10:25	0	2.4	640.2	8.6
1-Jan-00	10:30	0	2.3	640.2	8.3
1-Jan-00	10:35	0	2.3	640.2	8
1-Jan-00	10:40	0	2.2	640.2	7.7
1-Jan-00	10:45	0	2.2	640.2	7.5
1-Jan-00	10:50	0	2.1	640.2	7.2
1-Jan-00	10:55	0	2.1	640.2	6.9
1-Jan-00	11:00	0	2	640.2	6.7
1-Jan-00	11:05	0	2	640.2	6.5
1-Jan-00	11:10	0	1.9	640.2	6.3
1-Jan-00	11:15	0	1.9	640.2	6.1
1-Jan-00	11:20	0	1.8	640.2	5.9

1-Jan-00	11:25	0	1.8	640.2	5.7
1-Jan-00	11:30	0	1.8	640.2	5.5
1-Jan-00	11:35	0	1.7	640.2	5.3
1-Jan-00	11:40	0	1.7	640.2	5.2
1-Jan-00	11:45	0	1.7	640.2	5
1-Jan-00	11:50	0	1.6	640.1	4.8
1-Jan-00	11:55	0	1.6	640.1	4.7
1-Jan-00	12:00	0	1.6	640.1	4.6
1-Jan-00	12:05	0	1.5	640.1	4.4
1-Jan-00	12:10	0	1.5	640.1	4.3
1-Jan-00	12:15	0	1.5	640.1	4.2
1-Jan-00	12:20	0	1.4	640.1	4.1
1-Jan-00	12:25	0	1.4	640.1	3.9
1-Jan-00	12:30	0	1.4	640.1	3.8
1-Jan-00	12:35	0	1.4	640.1	3.7
1-Jan-00	12:40	0	1.3	640.1	3.6
1-Jan-00	12:45	0	1.3	640.1	3.5
1-Jan-00	12:50	0	1.3	640.1	3.4
1-Jan-00	12:55	0	1.3	640.1	3.3
1-Jan-00	13:00	0	1.2	640.1	3.2
1-Jan-00	13:05	0	1.2	640.1	3.2
1-Jan-00	13:10	0	1.2	640.1	3.1
1-Jan-00	13:15	0	1.2	640.1	3
1-Jan-00	13:20	0	1.2	640.1	2.9
1-Jan-00	13:25	0	1.1	640.1	2.8
1-Jan-00	13:30	0	1.1	640.1	2.8
1-Jan-00	13:35	0	1.1	640.1	2.7
1-Jan-00	13:40	0	1.1	640.1	2.6
1-Jan-00	13:45	0	1.1	640.1	2.6
1-Jan-00	13:50	0	1	640.1	2.5
1-Jan-00	13:55	0	1	640.1	2.4
1-Jan-00	14:00	0	1	640.1	2.4
1-Jan-00	14:05	0	1	640.1	2.3
1-Jan-00	14:10	0	1	640.1	2.3
1-Jan-00	14:15	0	1	640.1	2.2
1-Jan-00	14:20	0	0.9	640.1	2.2
1-Jan-00	14:25	0	0.9	640.1	2.1
1-Jan-00	14:30	0	0.9	640.1	2.1
1-Jan-00	14:35	0	0.9	640.1	2
1-Jan-00	14:40	0	0.9	640.1	2
1-Jan-00	14:45	0	0.9	640.1	1.9
1-Jan-00	14:50	0	0.9	640.1	1.9
1-Jan-00	14:55	0	0.9	640.1	1.8
1-Jan-00	15:00	0	0.8	640.1	1.8
1-Jan-00	15:05	0	0.8	640.1	1.8
1-Jan-00	15:10	0	0.8	640.1	1.7
1-Jan-00	15:15	0	0.8	640.1	1.7

1-Jan-00	15:20	0	0.8	640.1	1.7
1-Jan-00	15:25	0	0.8	640.1	1.6
1-Jan-00	15:30	0	0.8	640.1	1.6
1-Jan-00	15:35	0	0.8	640.1	1.6
1-Jan-00	15:40	0	0.7	640.1	1.5
1-Jan-00	15:45	0	0.7	640.1	1.5
1-Jan-00	15:50	0	0.7	640.1	1.5
1-Jan-00	15:55	0	0.7	640.1	1.4
1-Jan-00	16:00	0	0.7	640.1	1.4
1-Jan-00	16:05	0	0.7	640.1	1.4
1-Jan-00	16:10	0	0.7	640.1	1.3
1-Jan-00	16:15	0	0.7	640.1	1.3
1-Jan-00	16:20	0	0.7	640.1	1.3
1-Jan-00	16:25	0	0.7	640.1	1.3
1-Jan-00	16:30	0	0.7	640.1	1.2
1-Jan-00	16:35	0	0.6	640.1	1.2
1-Jan-00	16:40	0	0.6	640.1	1.2
1-Jan-00	16:45	0	0.6	640.1	1.2
1-Jan-00	16:50	0	0.6	640.1	1.1
1-Jan-00	16:55	0	0.6	640.1	1.1
1-Jan-00	17:00	0	0.6	640.1	1.1
1-Jan-00	17:05	0	0.6	640.1	1.1
1-Jan-00	17:10	0	0.6	640.1	1.1
1-Jan-00	17:15	0	0.6	640.1	1
1-Jan-00	17:20	0	0.6	640.1	1
1-Jan-00	17:25	0	0.6	640.1	1
1-Jan-00	17:30	0	0.6	640.1	1
1-Jan-00	17:35	0	0.6	640.1	1
1-Jan-00	17:40	0	0.5	640.1	1
1-Jan-00	17:45	0	0.5	640	0.9
1-Jan-00	17:50	0	0.5	640	0.9
1-Jan-00	17:55	0	0.5	640	0.9
1-Jan-00	18:00	0	0.5	640	0.9
1-Jan-00	18:05	0	0.5	640	0.9
1-Jan-00	18:10	0	0.5	640	0.9
1-Jan-00	18:15	0	0.5	640	0.8
1-Jan-00	18:20	0	0.5	640	0.8
1-Jan-00	18:25	0	0.5	640	0.8
1-Jan-00	18:30	0	0.5	640	0.8
1-Jan-00	18:35	0	0.5	640	0.8
1-Jan-00	18:40	0	0.5	640	0.8
1-Jan-00	18:45	0	0.5	640	0.8
1-Jan-00	18:50	0	0.5	640	0.7
1-Jan-00	18:55	0	0.5	640	0.7
1-Jan-00	19:00	0	0.5	640	0.7
1-Jan-00	19:05	0	0.5	640	0.7
1-Jan-00	19:10	0	0.4	640	0.7

1-Jan-00	19:15	0	0.4	640	0.7
1-Jan-00	19:20	0	0.4	640	0.7
1-Jan-00	19:25	0	0.4	640	0.7
1-Jan-00	19:30	0	0.4	640	0.7
1-Jan-00	19:35	0	0.4	640	0.6
1-Jan-00	19:40	0	0.4	640	0.6
1-Jan-00	19:45	0	0.4	640	0.6
1-Jan-00	19:50	0	0.4	640	0.6
1-Jan-00	19:55	0	0.4	640	0.6
1-Jan-00	20:00	0	0.4	640	0.6
1-Jan-00	20:05	0	0.4	640	0.6
1-Jan-00	20:10	0	0.4	640	0.6
1-Jan-00	20:15	0	0.4	640	0.6
1-Jan-00	20:20	0	0.4	640	0.6
1-Jan-00	20:25	0	0.4	640	0.6
1-Jan-00	20:30	0	0.4	640	0.5
1-Jan-00	20:35	0	0.4	640	0.5
1-Jan-00	20:40	0	0.4	640	0.5
1-Jan-00	20:45	0	0.4	640	0.5
1-Jan-00	20:50	0	0.4	640	0.5
1-Jan-00	20:55	0	0.4	640	0.5
1-Jan-00	21:00	0	0.4	640	0.5
1-Jan-00	21:05	0	0.4	640	0.5
1-Jan-00	21:10	0	0.4	640	0.5
1-Jan-00	21:15	0	0.3	640	0.5
1-Jan-00	21:20	0	0.3	640	0.5
1-Jan-00	21:25	0	0.3	640	0.5
1-Jan-00	21:30	0	0.3	640	0.5
1-Jan-00	21:35	0	0.3	640	0.5
1-Jan-00	21:40	0	0.3	640	0.4
1-Jan-00	21:45	0	0.3	640	0.4
1-Jan-00	21:50	0	0.3	640	0.4
1-Jan-00	21:55	0	0.3	640	0.4
1-Jan-00	22:00	0	0.3	640	0.4
1-Jan-00	22:05	0	0.3	640	0.4
1-Jan-00	22:10	0	0.3	640	0.4
1-Jan-00	22:15	0	0.3	640	0.4
1-Jan-00	22:20	0	0.3	640	0.4
1-Jan-00	22:25	0	0.3	640	0.4
1-Jan-00	22:30	0	0.3	640	0.4
1-Jan-00	22:35	0	0.3	640	0.4
1-Jan-00	22:40	0	0.3	640	0.4
1-Jan-00	22:45	0	0.3	640	0.4
1-Jan-00	22:50	0	0.3	640	0.4
1-Jan-00	22:55	0	0.3	640	0.4
1-Jan-00	23:00	0	0.3	640	0.4
1-Jan-00	23:05	0	0.3	640	0.4

1-Jan-00	23:10	0	0.3	640	0.4
1-Jan-00	23:15	0	0.3	640	0.3
1-Jan-00	23:20	0	0.3	640	0.3
1-Jan-00	23:25	0	0.3	640	0.3
1-Jan-00	23:30	0	0.3	640	0.3
1-Jan-00	23:35	0	0.3	640	0.3
1-Jan-00	23:40	0	0.3	640	0.3
1-Jan-00	23:45	0	0.3	640	0.3
1-Jan-00	23:50	0	0.3	640	0.3
1-Jan-00	23:55	0	0.3	640	0.3
2-Jan-00	0:00	0	0.3	640	0.3
2-Jan-00	0:05	0	0.3	640	0.3
2-Jan-00	0:10	0	0.3	640	0.3
2-Jan-00	0:15	0	0.3	640	0.3
2-Jan-00	0:20	0	0.3	640	0.3
2-Jan-00	0:25	0	0.2	640	0.3
2-Jan-00	0:30	0	0.2	640	0.3
2-Jan-00	0:35	0	0.2	640	0.3
2-Jan-00	0:40	0	0.2	640	0.3
2-Jan-00	0:45	0	0.2	640	0.3
2-Jan-00	0:50	0	0.2	640	0.3
2-Jan-00	0:55	0	0.2	640	0.3
2-Jan-00	1:00	0	0.2	640	0.3
2-Jan-00	1:05	0	0.2	640	0.3
2-Jan-00	1:10	0	0.2	640	0.3
2-Jan-00	1:15	0	0.2	640	0.3
2-Jan-00	1:20	0	0.2	640	0.3
2-Jan-00	1:25	0	0.2	640	0.3
2-Jan-00	1:30	0	0.2	640	0.3
2-Jan-00	1:35	0	0.2	640	0.2
2-Jan-00	1:40	0	0.2	640	0.2
2-Jan-00	1:45	0	0.2	640	0.2
2-Jan-00	1:50	0	0.2	640	0.2
2-Jan-00	1:55	0	0.2	640	0.2
2-Jan-00	2:00	0	0.2	640	0.2
2-Jan-00	2:05	0	0.2	640	0.2
2-Jan-00	2:10	0	0.2	640	0.2
2-Jan-00	2:15	0	0.2	640	0.2
2-Jan-00	2:20	0	0.2	640	0.2
2-Jan-00	2:25	0	0.2	640	0.2
2-Jan-00	2:30	0	0.2	640	0.2
2-Jan-00	2:35	0	0.2	640	0.2
2-Jan-00	2:40	0	0.2	640	0.2
2-Jan-00	2:45	0	0.2	640	0.2
2-Jan-00	2:50	0	0.2	640	0.2
2-Jan-00	2:55	0	0.2	640	0.2
2-Jan-00	3:00	0	0.2	640	0.2

2-Jan-00	3:05	0	0.2	640	0.2
2-Jan-00	3:10	0	0.2	640	0.2
2-Jan-00	3:15	0	0.2	640	0.2
2-Jan-00	3:20	0	0.2	640	0.2
2-Jan-00	3:25	0	0.2	640	0.2
2-Jan-00	3:30	0	0.2	640	0.2
2-Jan-00	3:35	0	0.2	640	0.2
2-Jan-00	3:40	0	0.2	640	0.2
2-Jan-00	3:45	0	0.2	640	0.2
2-Jan-00	3:50	0	0.2	640	0.2
2-Jan-00	3:55	0	0.2	640	0.2
2-Jan-00	4:00	0	0.2	640	0.2
2-Jan-00	4:05	0	0.2	640	0.2
2-Jan-00	4:10	0	0.2	640	0.2
2-Jan-00	4:15	0	0.2	640	0.2
2-Jan-00	4:20	0	0.2	640	0.2
2-Jan-00	4:25	0	0.2	640	0.2
2-Jan-00	4:30	0	0.2	640	0.2
2-Jan-00	4:35	0	0.2	640	0.2
2-Jan-00	4:40	0	0.2	640	0.2
2-Jan-00	4:45	0	0.2	640	0.2
2-Jan-00	4:50	0	0.2	640	0.2
2-Jan-00	4:55	0	0.2	640	0.2
2-Jan-00	5:00	0	0.2	640	0.2
2-Jan-00	5:05	0	0.2	640	0.2
2-Jan-00	5:10	0	0.2	640	0.2
2-Jan-00	5:15	0	0.2	640	0.2
2-Jan-00	5:20	0	0.2	640	0.2
2-Jan-00	5:25	0	0.2	640	0.2
2-Jan-00	5:30	0	0.2	640	0.2
2-Jan-00	5:35	0	0.2	640	0.1
2-Jan-00	5:40	0	0.2	640	0.1
2-Jan-00	5:45	0	0.2	640	0.1
2-Jan-00	5:50	0	0.2	640	0.1
2-Jan-00	5:55	0	0.2	640	0.1
2-Jan-00	6:00	0	0.2	640	0.1

Appendix G

Geotechnical Analyses

Client: <u>City of Franklin, TN</u>	Job No. <u>222189</u>	Calculations By: <u>J.W.</u>
Project: <u>Robinson Lake Dam</u>	Checked By/Date <u>B.B.11/22/2017</u>	Date: <u>11/1/2017</u>
Detail: <u>Seepage&Slope Stability</u>	Reviewed By/Date <u>S.W., 11/26/2017</u>	Calc #: <u>1</u>
		Revision No./Date: <u>Rev 1, 11/30/2017</u>

Calculation Brief Title: Robinson Lake Dam Rehabilitation - Preliminary Seepage and Slope Stability Analyses

1.0 Purpose/Objective:

This calculation package contains seepage and slope stability analyses for the existing and proposed conditions of the Robinson Lake Dam Project at the City of Franklin, Tennessee. The analyses were performed in support of proposed changes to the existing dam cross-section. The objective is to confirm that the calculated factors of safety for the proposed design meet the minimum design requirements.

2.0 Procedure:

The calculations contained herein were performed in general accordance with the requirements outlined in Reference B and Reference C (listed below in Section 3.0).

- A. Based on the soil borings performed by CDM Smith at project site, a generalized design subsurface soil profile was assumed. The dam cross-section was checked for both existing and proposed geometries. Subsurface conditions observed in test borings, field and laboratory testing data, topographic information collected by the survey, and also the information collected during field inspection were used as the basis for the stability analyses.
- B. Prior to beginning the stability analyses, steady-state seepage analyses were performed using the SEEP/W model developed by GEO-SLOPE International. For the seepage analyses, hydraulic conductivity values of the various subsurface layers were assumed based upon experience with similar geologic units. The seepage model was run under steady-state seepage conditions for each of the design cases to provide pore pressure input for SLOPE/W.
- C. For the slope stability analyses, soil strength values of the various subsurface layers were assumed based upon field SPT N-values, pocket penetrometer test results, laboratory test results, and experience with similar geologic units.
- D. The slope stability modeling was performed using the SLOPE/W model developed by GEO-SLOPE International, and Spencer Method was selected. The stability requirements are based on criteria listed in Reference B.
- E. The seismic acceleration coefficient used in seismic condition is assumed equal to PGA (peak ground acceleration) of 0.088g for the return period of 950 years, based on Reference D.

3.0 References/Data Sources:

- A. Subsurface investigations performed by CDM Smith at the Project site.
- B. "Slope Stability", USACE EM 1110-2-1902.

C. USACE (2004), General Design and Construction Considerations for Earth and Rock-Fill Dams, EM 1110-2-2300, July 30, 2004.

D. USACE (2016), Earthquake Design and Evaluation for Civil Works Projects, ER 1110-2-1806, May 31, 2016.

4.0 Assumptions and Limitations:

A. Slope stability cross-sections assume a subsurface profile similar to conditions encountered in the test borings performed by CDM Smith in this area. Refer to modeling results for assumed subsurface layers.

B. Design soil parameters and the basis for selection are summarized in Tables 1a and 1b.

C. Only deep-seated slope failures with depths greater than 5 feet are considered in this analyses.

D. A crest width of 15 feet and upstream/downstream side slopes of 3H:1V were assumed for proposed dam cross-section.

E. The proposed fill used on the dam to constructed the new cross-section will be compacted clay.

F. The proposed dam section also includes an ACB (Articulating Concrete Block) layer at the upstream slope from EL 638 to crest, and an internal drain system which includes chimney, blanket, and toe drains.

G. For short-term loading cases including end of construction and seismic loading, undrained strengths were assumed for the cohesive soil materials.

H. Model boundary conditions used in the seepage models are listed as follows:

1. Water level at upstream lake assumed as: maximum pool level =643 (assumed as the existing spillway's elevation); normal pool level=EL 640 (approximate water level observed during field inspection).
2. Water level at the Harpeth River assumed as EL 621.
3. Downstream area ground surface was assumed as free seepage face;
4. All other boundaries were assumed as non-flow boundaries.

5.0 Calculations: Modeling results for each case are attached and Factors of Safety are summarized in Table 2.

6.0 Conclusions/Results:

A. Under existing condition at normal pool, the seepage analyses show the phreatic surface depth at the dam crest is at about 13 feet, which is close to the field-recorded water depths of 14.7 to 14.85 feet measured during the field exploration on 10/2/2017 and 10/3/2017. This serves as a reasonable calibration for the seepage model.

B. Calculated Factors of Safety under existing and proposed conditions are listed in Tables 2. For existing condition, the downstream slope doesn't meet the required factor of safety under normal pool water level. For proposed dam cross-section, all cases analyzed produced an acceptable factor of safety.

**Robinson Lake Dam Rehabilitation Project
City of Franklin, TN**

Table 1a: Seepage Parameters used in SEEP/W Model

Layer	Material	K_h		k_h / k_v	Basis of Parameter Selection
		ft/day	cm/sec		
1	Embankment Fill	0.0142	5.0E-06	10	From Peck ⁽¹⁾ ; typical value for clay.
2a	Medium Stiff to Stiff Clay	0.0142	5.0E-06	10	From Peck ⁽¹⁾ ; typical value for clay.
2b	Soft/M. Stiff Clay	0.0142	5.0E-06	10	From Peck ⁽¹⁾ ; typical value for clay.
3	Clayey Sand (SC)	0.28	1.0E-04	4	From Peck ⁽¹⁾ ; typical value for mixture of sand and clay.
4	Fractured Limestone	0.028	1.0E-05	4	From Domenico ⁽²⁾ ; typical value for limestone
5	Filter Sand	28.35	1.0E-02	1	From Peck ⁽¹⁾ ; typical value for clean sand.
6	ACB Layer	2835	1.0E-01	1	Assumed.

References:

1. Ralph B. Peck, 'Foundation Engineering', 2nd edition; page 43.
2. Patrick A. Domenico, 'Physical and Chemical Hydrogeology', 2nd edition.

**Robinson Lake Dam Rehabilitation Project
City of Franklin, TN**

Table 1b: Strength Parameters used in SLOPE/W Model

Layer	Material	Unit Weight, pcf	Effective Friction Angle, degrees	Undrained Shear Strength, psf	Basis of Parameter Selection ⁽¹⁾
1	Embankment Fill	120	30	1000 ⁽²⁾	Selected based on N-value and pocket penetrometer readings ⁽¹⁾
2	Filter Sand	120	32	-	Based upon experience in similar projects
3	ACB Layer	125	35	-	Assumed
4a	Medium Stiff to Stiff Clay	110	28	600 ⁽²⁾	Selected based on N-value and pocket penetrometer readings ⁽¹⁾ from borings
4b	Soft/M. Stiff Clay	110	26	200 ⁽²⁾	Selected based on N-values and pocket penetrometer readings ⁽¹⁾ from borings
5	Clayey Sand (SC)	120	28	-	Selected based on N-value
6	Fractured Limestone	130	40	-	Based upon experience in similar geologic conditions

Notes:

1. Pocket penetrometer readings were performed on split spoon samples and Shelby tube sample during drilling.
2. Undrained shear strength used for end-of-construction and seismic conditions.

**Robinson Lake Dam Rehabilitation Project
City of Franklin, TN**

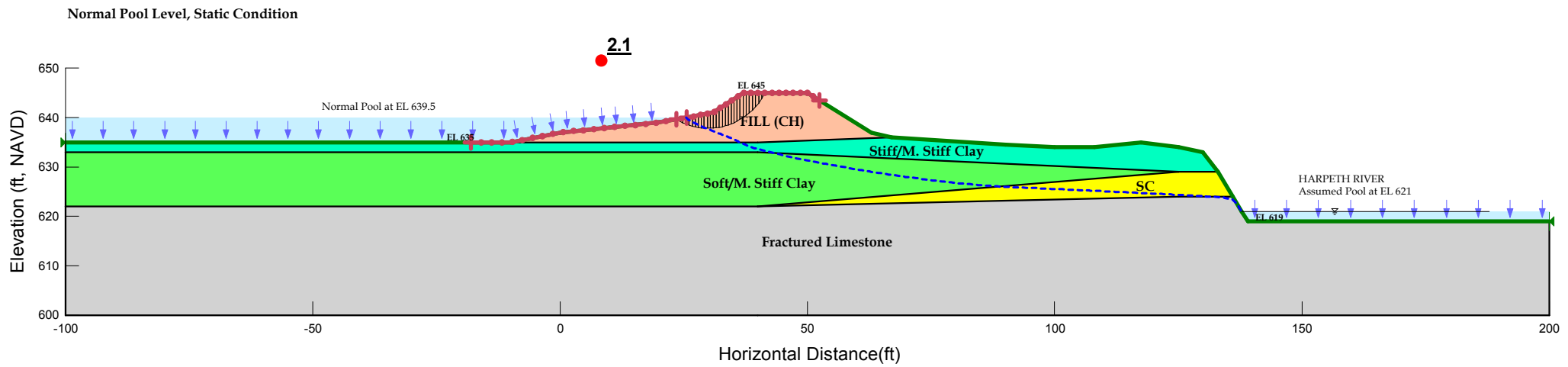
Table 2 - Results of Slope Stability Analyses

Cross-Section	Run #	Modeling Scenario ⁽²⁾	Required Factor of Safety	Calculated Factor of Safety ⁽¹⁾	
				Upstream	Downstream
Existing Dam Section	1a	Normal Pool	1.5	2.1	1.4
	1b	Maximum Pool	1.4	2.4	1.4
	1c	Seismic Condition ⁽³⁾	1.0	1.8	1.4
Proposed Dam Section	2a	End of Construction	1.3	1.6	1.8
	2b	Normal Pool	1.5	2.0	1.9
	2c	Maximum Pool	1.4	2.4	1.9
	2d	Seismic Condition ⁽³⁾	1.0	1.3	1.2

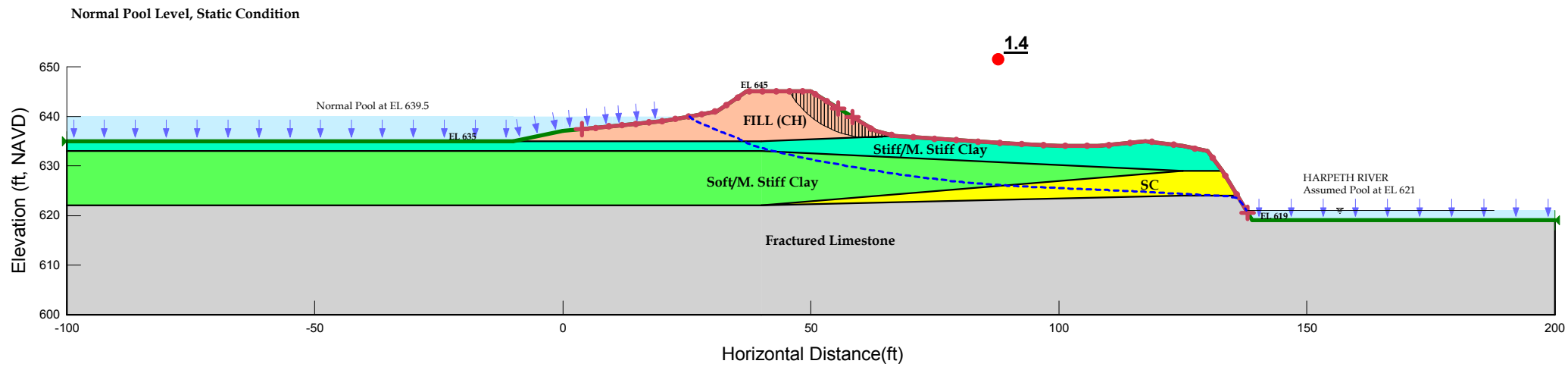
Notes:

1. Factor of Safety was calculated by using Spencer Method. Failure surfaces less than 5 feet deep were not considered deep-seated, and results are not listed here.
2. For run 1c, 2a and 2d, undrained strength was used for clay layers.
3. For seismic condition, a 950-year return period PGA=0.088g was used as peak ground acceleration.

Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Existing Condition

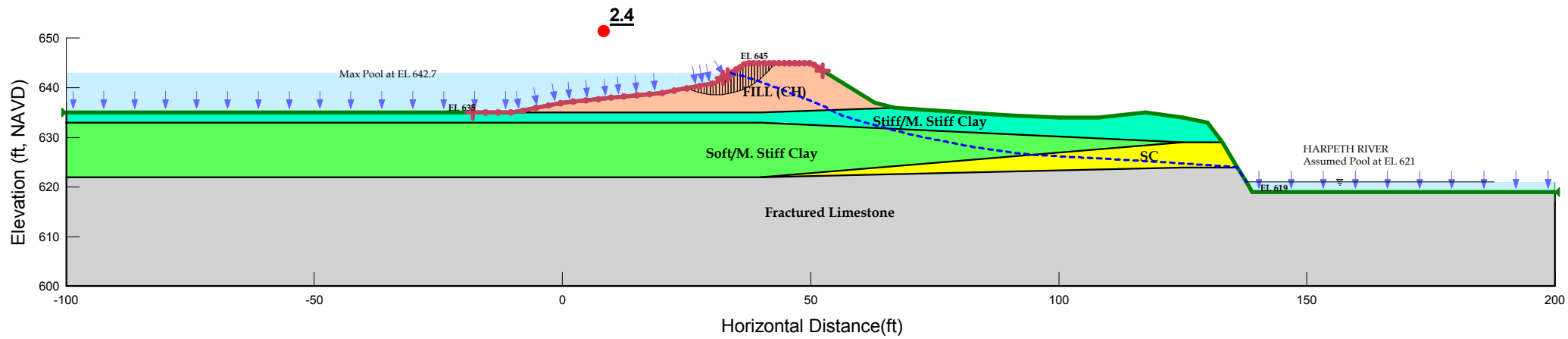


Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Existing Condition



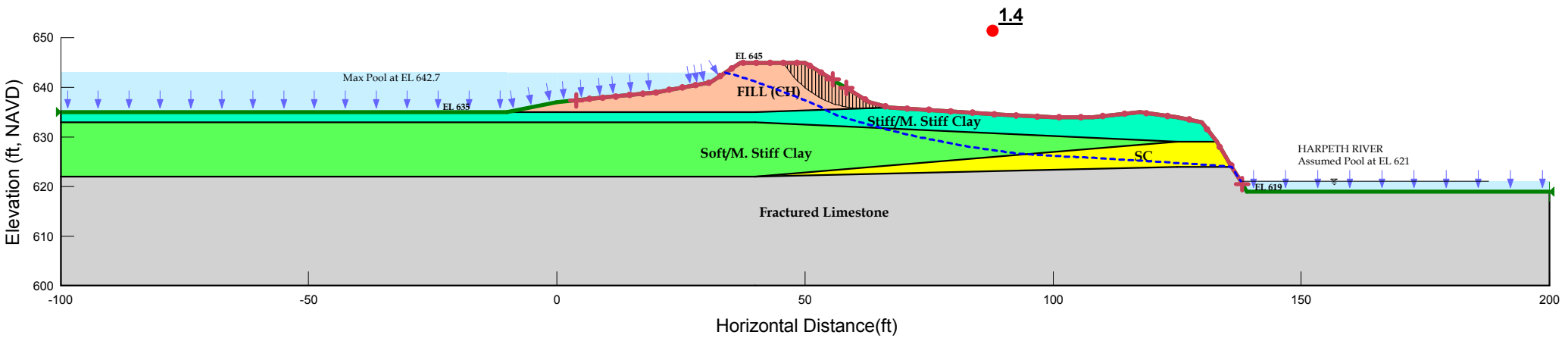
Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Existing Condition

Max Pool Level, Static Condition

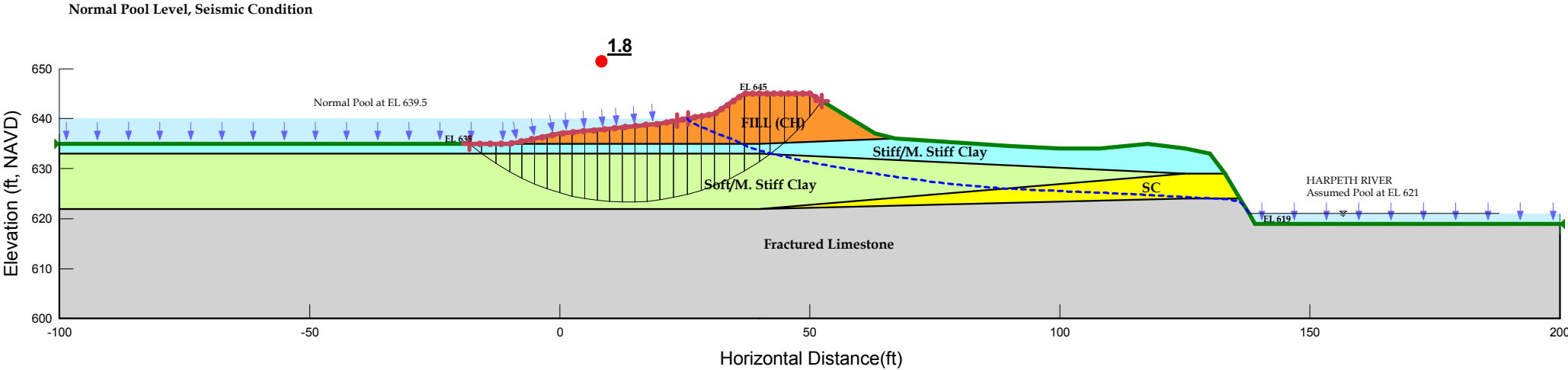


Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Existing Condition

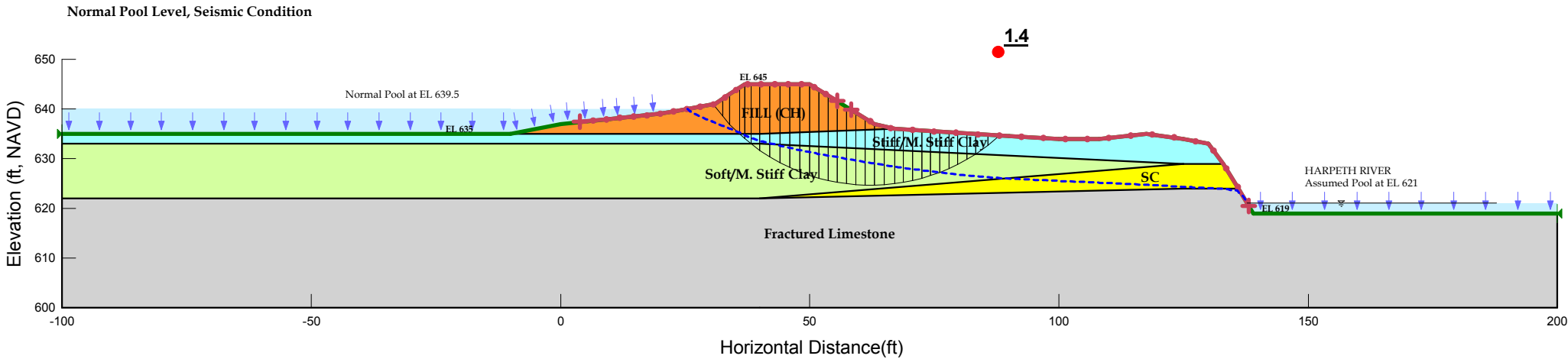
Max Pool Level, Static Condition



Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Existing Condition

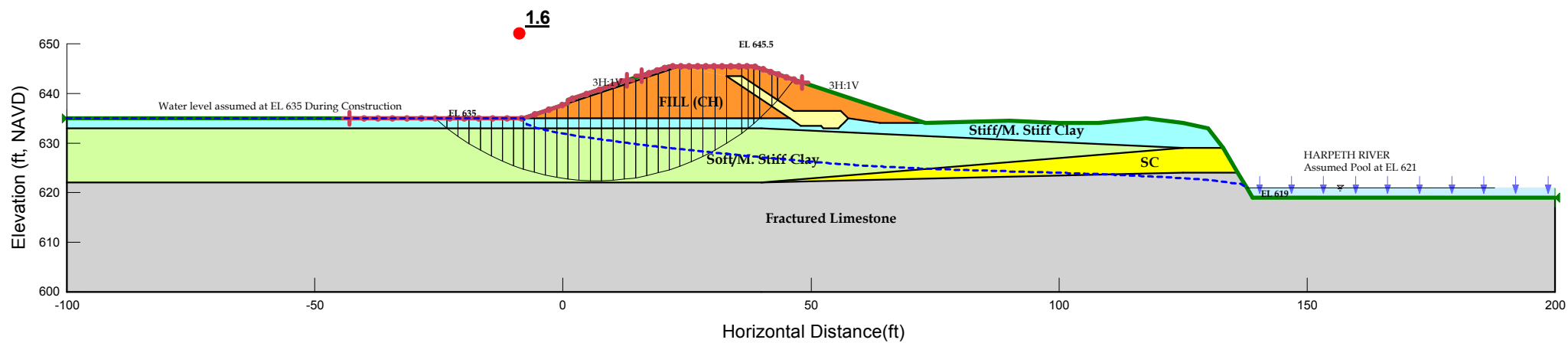


Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Existing Condition



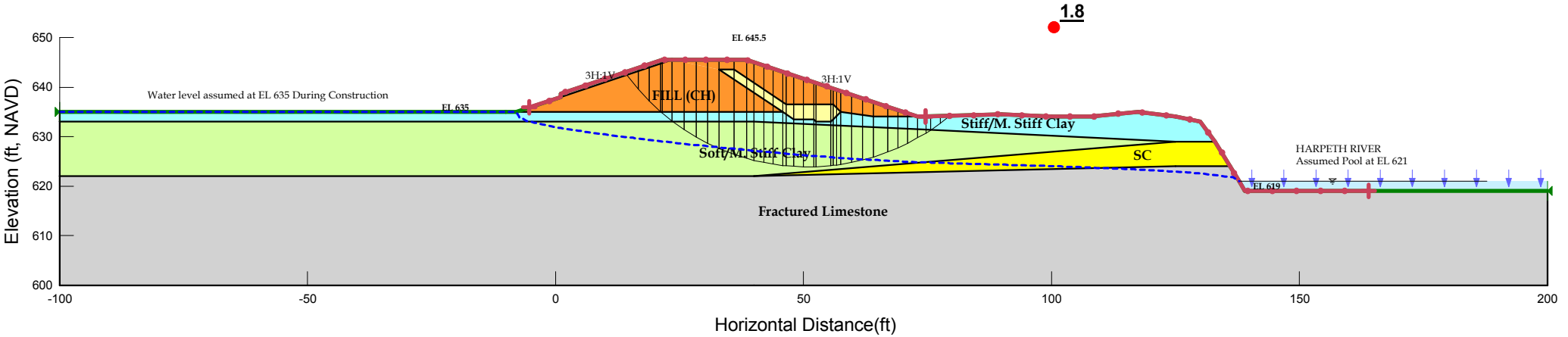
Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Proposed Condition

End of Construction

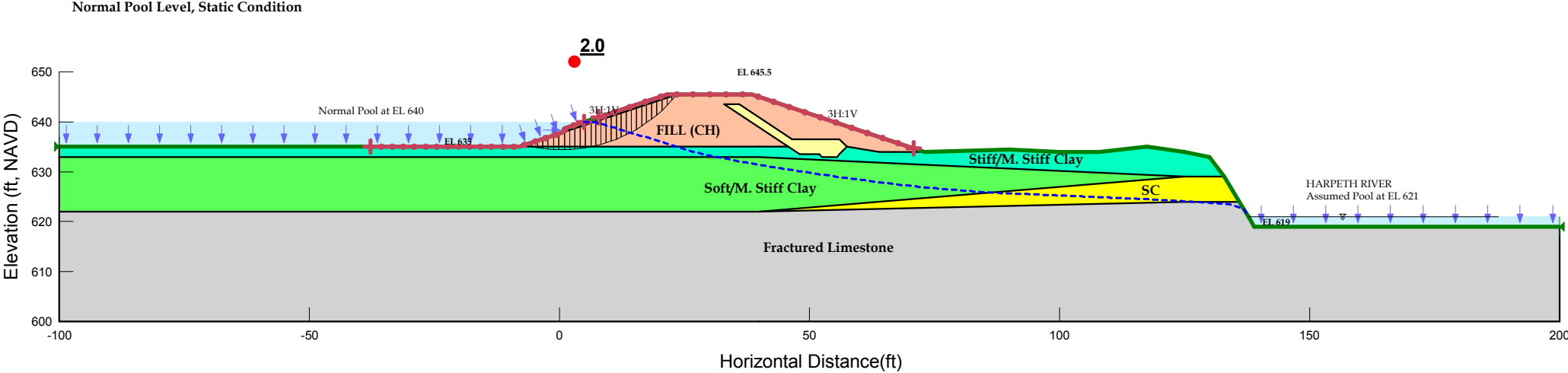


Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Proposed Condition

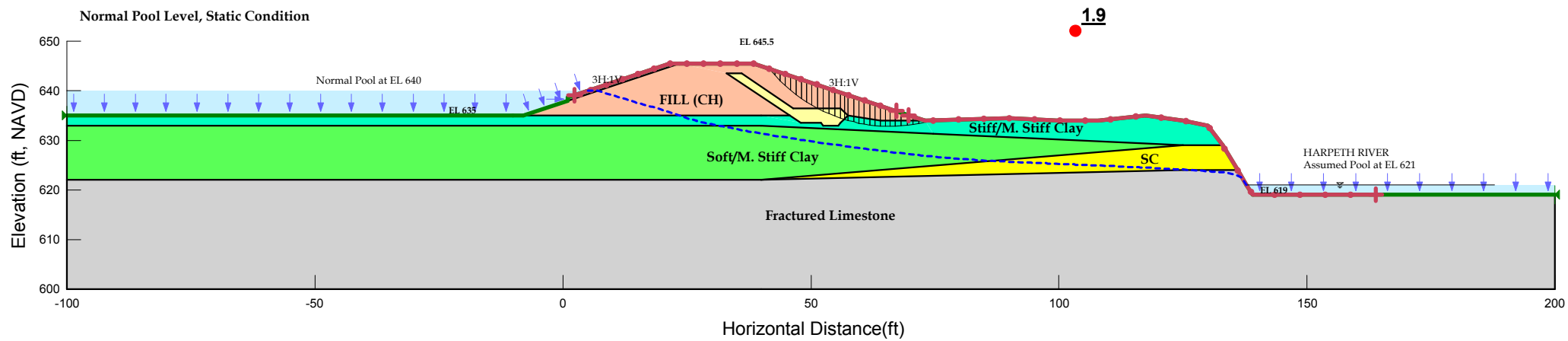
End of Construction



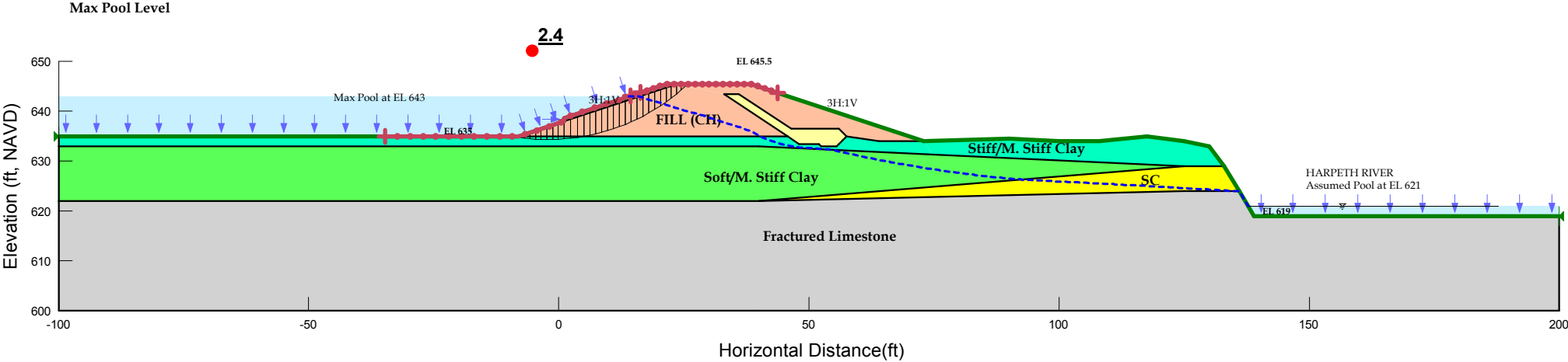
Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Proposed Condition



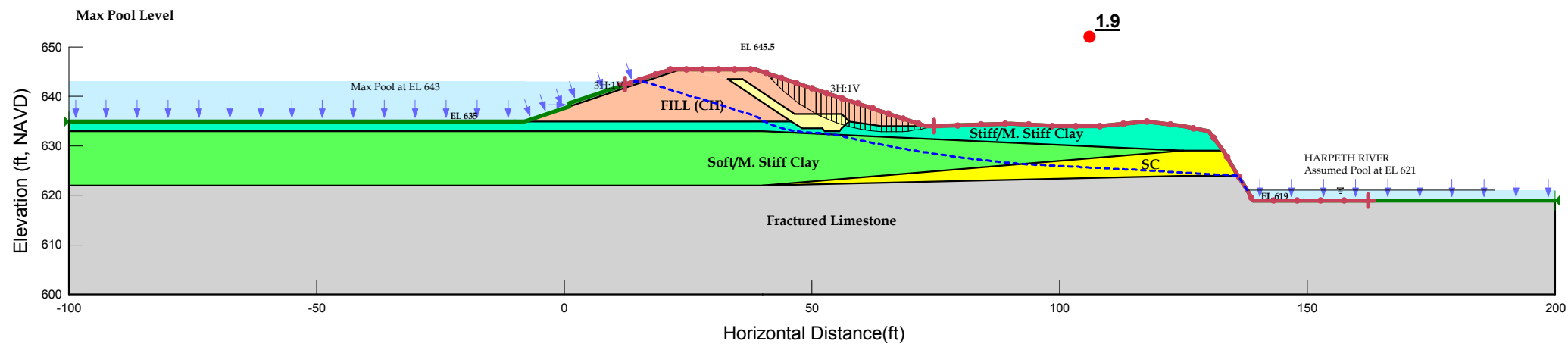
Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Proposed Condition



Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Proposed Condition

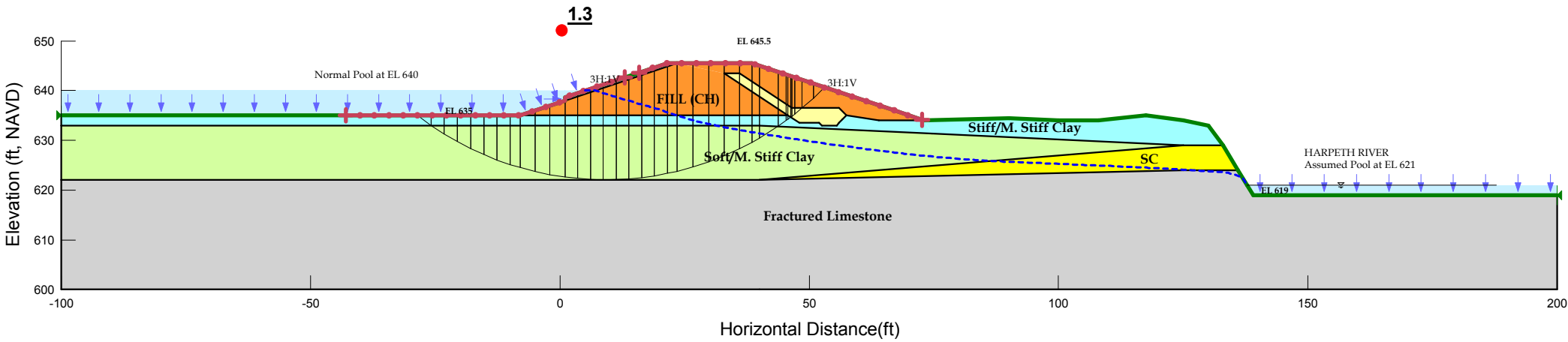


Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Proposed Condition

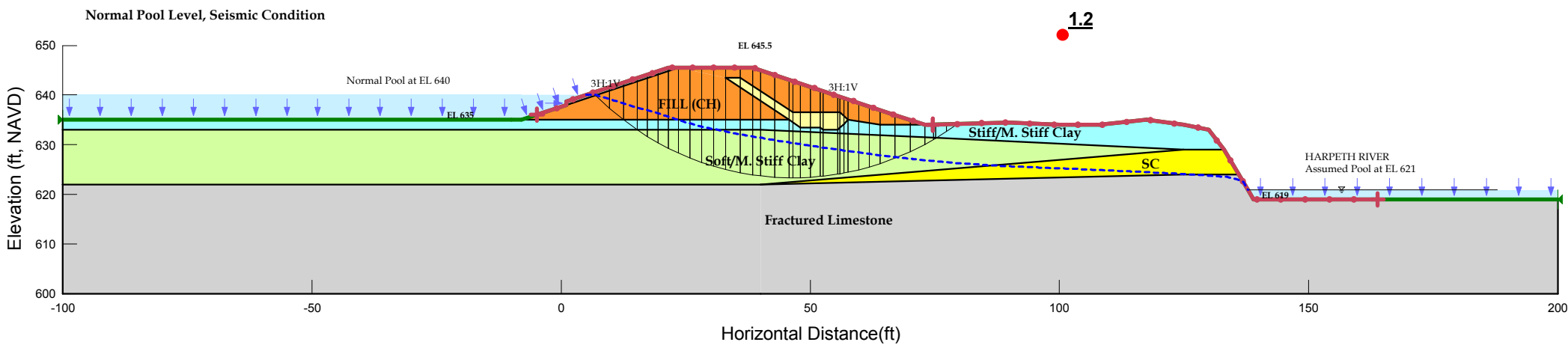


Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Proposed Condition

Normal Pool Level, Seismic Condition

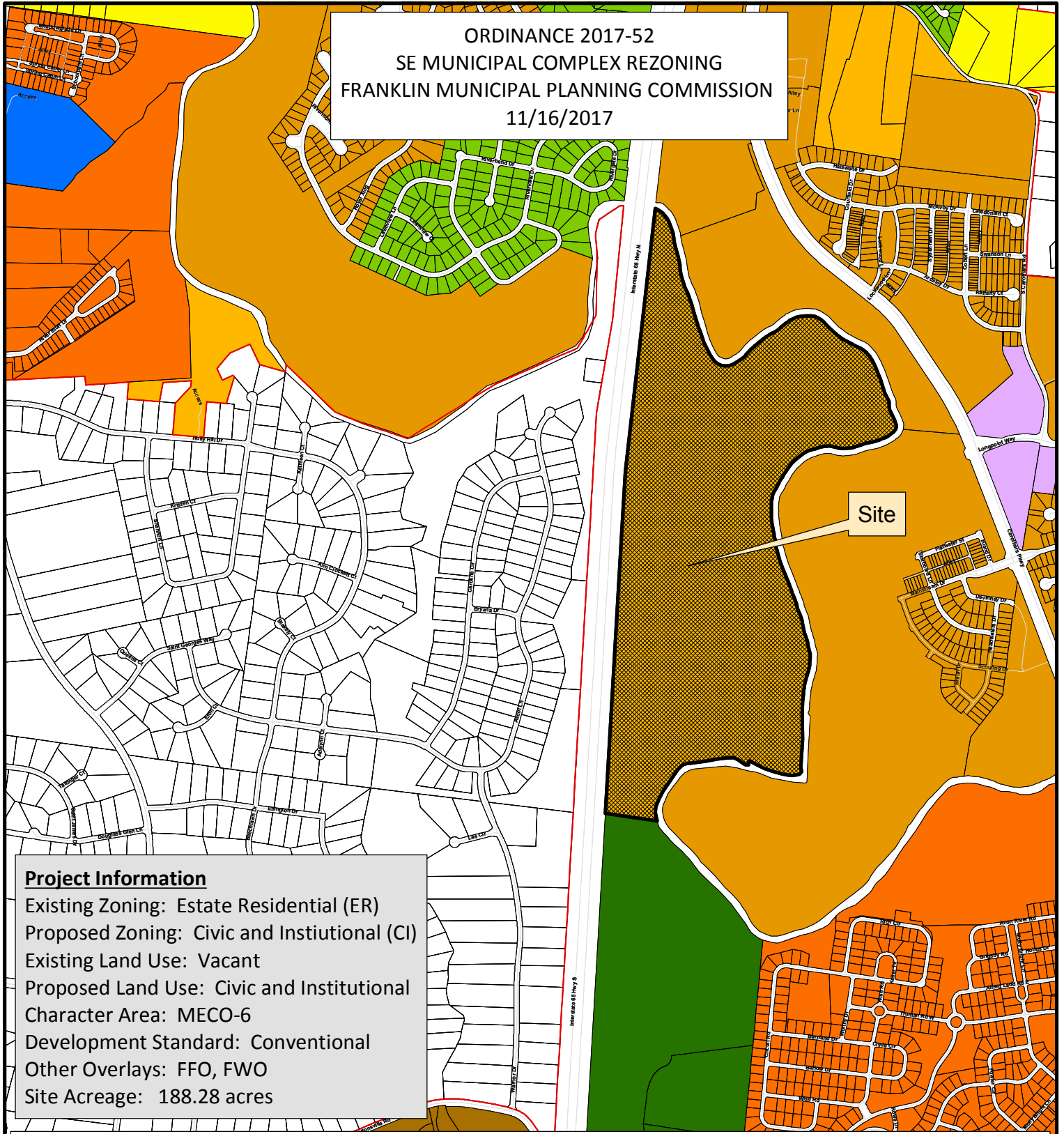


Robinson Lake Dam Rehabilitation
City of Franklin, TN
Seepage and Slope Stability Analyses
Proposed Condition





ORDINANCE 2017-52
SE MUNICIPAL COMPLEX REZONING
FRANKLIN MUNICIPAL PLANNING COMMISSION
11/16/2017



Project Information

Existing Zoning: Estate Residential (ER)
Proposed Zoning: Civic and Institutional (CI)
Existing Land Use: Vacant
Proposed Land Use: Civic and Institutional
Character Area: MECO-6
Development Standard: Conventional
Other Overlays: FFO, FWO
Site Acreage: 188.28 acres

- | | |
|--|---------------------------------------|
| SE Municipal Complex | SD-R Specific Development-Residential |
| AG Agricultural District | SD-X Specific Development-Variety |
| ER Estate Residential | OR Office Residential District |
| R-1 Residential District | GO General Office District |
| R-2 Residential District | CC Central Commercial District |
| R-3 Residential District | NC Neighborhood Commercial District |
| R-6 Residential District | GC General Commercial District |
| RM-10 Attached 10 Residential District | LI Light Industrial District |
| RM-15 Attached 15 Residential District | HI Heavy Industrial District |
| RM-20 Attached 20 Residential District | CI Civic and Institutional District |



0 750 1,500 3,000
Feet

This map was created by the Franklin Planning Department. It was compiled from the most authentic information available. The City is not responsible for any errors or omissions contained hereon. All data and materials (c) copyright 2017. All rights reserved.

ORDINANCE 2017-52

TO BE ENTITLED: "AN ORDINANCE TO REZONE 188.28 ACRES FROM ESTATE RESIDENTIAL (ER) DISTRICT TO CIVIC AND INSTITUTIONAL (CI) DISTRICT FOR THE PROPERTY LOCATED EAST OF I-65 AND WEST OF THE HARPETH RIVER, SOUTHEAST MUNICIPAL COMPLEX"

WHEREAS, the City of Franklin, Tennessee, encourages responsible growth and the sensible transition of land uses and densities; and

WHEREAS, the Civic Institutional district provides zoning for land uses compatible with both the Franklin Land Use Plan and surrounding development; and

WHEREAS, the zoning has been reviewed and approved by BOMA after a public hearing and a recommendation by the Franklin Municipal Planning Commission.

NOW THEREFORE, BE IT ORDAINED BY THE BOARD OF MAYOR AND ALDERMEN OF THE CITY OF FRANKLIN, TENNESSEE, AS FOLLOWS:

SECTION I. That the following described property shall be, and is hereby, rezoned from its present zoning classification of ER District to CI District:

PREMISES CONSIDERED	
Map-Parcel	Acres
106---18600	188.28
Total	188.28

Legal Description - TRACT XI

Beginning at a point, said point being a concrete highway monument in the easterly right-of-way of I-65 and the southwest corner of herein described tract;

Thence, running with the easterly right-of-way of I-65 north $00^{\circ}17'43''$ west, 1329.27 feet, to a point;

Thence, north $89^{\circ}42'17''$ east, 10.00 feet, to a point;

Thence, north $00^{\circ}17'43''$ west, 400.00 feet, to a point;

Thence, south $89^{\circ}42'17''$ west, 10.00 feet, to a point;

Thence, north $00^{\circ}17'43''$ west, 1300.00 feet, to a point;

Thence, 667.81 feet along the arc of a curve to the right, said curve having a central angle of $03^{\circ}23'00''$, a radius of 11309.16 feet, and a chord bearing and distance of North $01^{\circ}23'47''$ east, 667.71 feet, to a point;

Thence, north $03^{\circ}03'09''$ east, 2016.05 feet, to a point in the centerline of the Harpeth River; and on the line of Dexter Lockwood as recorded in Bk 441, Pg 614, R.O.W.C.T.

Thence, leaving said right-of-way and continuing with the centerline of Harpeth River south $60^{\circ}48'30''$ east, 133.54 feet, to a point; said point being north $81^{\circ}07'34''$ east, 46.80 feet, from a witness pin set;

Thence, south $27^{\circ}21'23''$ east, 150.61 feet, to a point;

Thence, south $20^{\circ}08'36''$ east, 101.14 feet, to a point; said point being north $70^{\circ}23'39''$ west, 43.19 feet, from a witness pin set;

Thence, south $17^{\circ}25'11''$ east, 188.71 feet, to a point;

Thence, south $11^{\circ}42'57''$ east, 81.95 feet, to a point;

Thence, south $18^{\circ}06'13''$ east, 168.55 feet, to a point;

Thence, south $24^{\circ}14'09''$ east, 215.41 feet, to a point;

Thence, south $20^{\circ}38'01''$ east, 134.89 feet, to a point;

Thence, south $25^{\circ}20'10''$ east, 322.19 feet, to a point; said point being north $43^{\circ}55'28''$ east, 41.26 feet, from a witness pin set;

Thence, south $61^{\circ}02'29''$ east, 145.06 feet, to a point; said point being north $22^{\circ}23'51''$ west, 55.60 feet, from a witness pin set;

Thence, north $64^{\circ}52'03''$ east, 150.64 feet, to a point;

Thence, north $40^{\circ}43'06''$ east, 132.82 feet, to a point; said point being north $54^{\circ}59'38''$ west, 44.46 feet, from a witness pin set;

Thence, north $47^{\circ}42'13''$ east, 222.92 feet, to a point;

Thence, north $53^{\circ}09'28''$ east, 301.01 feet, to a point;

Thence, north $82^{\circ}31'47''$ east, 58.76 feet, to a point; said point being north $50^{\circ}59'39''$ west, 53.29 feet, from a witness pin set;

Thence, south $82^{\circ}42'59''$ east, 178.83 feet, to a point;

Thence, with the line of Lockwood Construction Co., recorded in Bk 436, Pg 960, R.O.W.C.T., south $56^{\circ}15'36''$ east, 76.98 feet, to a point; said point being north $38^{\circ}55'19''$ west, 60.93 feet, from a witness pin set;

Thence, south $47^{\circ}32'13''$ east, 85.11 feet, to a point;

Thence, south $60^{\circ}56'41''$ east, 364.80 feet, to a point;

Thence, south $43^{\circ}35'28''$ east, 128.68 feet, to a point; said point being north $61^{\circ}46'17''$ east, 47.12 feet, from a witness pin set;

Thence, south $28^{\circ}05'35''$ east, 71.18 feet, to a point;

Thence, south $24^{\circ}36'53''$ east, 263.99 feet, to a point;

Thence, south $21^{\circ}37'22''$ east, 262.02 feet, to a point; said point being north $78^{\circ}26'53''$ east, 36.75 feet, from a witness pin set, and in the line of James Walter Bond, recorded in Bk 95, Pg 579, R.O.W.C.T.

Thence, south $44^{\circ}23'50''$ east, 21.93 feet, to a point;

Thence, south $01^{\circ}54'30''$ west, 73.26 feet, to a point;

Thence, south $37^{\circ}59'30''$ west, 37.73 feet, to a point;

Thence, south $43^{\circ}24'06''$ west, 58.73 feet, to a point; said point being south $45^{\circ}30'20''$ east, 43.85 feet, from a witness pin set;

Thence, south $56^{\circ}08'12''$ west, 110.49 feet, to a point;

Thence, south $71^{\circ}02'44''$ west, 213.12 feet, to a point;

Thence, south $73^{\circ}44'34''$ west, 159.60 feet, to a point;

Thence, north $89^{\circ}04'42''$ west, 166.35 feet, to a point; said point being south $11^{\circ}48'16''$ east, 49.40 feet, from a witness pin set;

Thence, south $79^{\circ}55'55''$ west, 59.70 feet, to a point;

Thence, south $61^{\circ}08'03''$ west, 163.10 feet, to a point;

Thence, south $51^{\circ}25'29''$ west, 82.14 feet, to a point; said point being south $30^{\circ}48'54''$ east, 57.44 feet, from a witness pin set;

Thence, south $45^{\circ}14'23''$ west, 39.61 feet, to a point;

Thence, south $24^{\circ}18'20''$ west, 161.95 feet, to a point;

Thence, south $13^{\circ}20'14''$ west, 298.42 feet, to a point; said point being north $81^{\circ}58'48''$ east, 51.61 feet, from a witness pin set;

Thence, south $09^{\circ}28'12''$ east, 138.54 feet, to a point;

Thence, south $11^{\circ}17'39''$ east, 127.58 feet, to a point;

Thence, south $20^{\circ}19'51''$ east, 234.26 feet, to a point;

Thence, south $24^{\circ}09'02''$ east, 391.59 feet, to a point;

Thence, south $22^{\circ}34'47''$ east, 93.91 feet, to a point;

Thence, south $16^{\circ}57'26''$ east, 190.69 feet, to a point;

Thence, south $19^{\circ}01'49''$ east, 161.37 feet, to a point; said point being north $80^{\circ}30'25''$ east, 48.50 feet, from a witness pin set;

Thence, south $07^{\circ}52'41''$ east, 81.36 feet, to a point;

Thence, south $06^{\circ}20'23''$ west, 307.14 feet, to a point;

Thence, south $00^{\circ}56'23''$ west, 244.98 feet, to a point;

Thence, south $03^{\circ}51'21''$ east, 229.53 feet, to a point;

Thence, south $02^{\circ}30'21''$ east, 204.99 feet, to a point; said point being north $77^{\circ}13'53''$ east, 43.04 feet, from a witness pin set;

Thence, south $07^{\circ}18'04''$ west, 117.83 feet, to a point;

Thence, south $72^{\circ}10'16''$ west, 74.45 feet, to a point; said point being south $19^{\circ}32'40''$ east, 50.46 feet, from a witness pin set;

Thence, south $77^{\circ}56'28''$ west, 59.91 feet, to a point;

Thence, north $77^{\circ}57'49''$ west, 174.24 feet, to a point; said point being south $21^{\circ}14'19''$ east, 48.79 feet, from a witness pin set;

Thence, north $75^{\circ}51'17''$ west, 109.99 feet, to a point;

Thence, north $80^{\circ}53'20''$ west, 118.50 feet, to a point;

Thence, north $79^{\circ}20'34''$ west, 199.38 feet, to a point; said point being south $56^{\circ}27'42''$ east, 73.90 feet, from a witness pin set;

Thence, south $82^{\circ}05'50''$ west, 172.63 feet, to a point;

Thence, south $76^{\circ}50'08''$ west, 189.03 feet, to a point;

Thence, south $48^{\circ}24'12''$ west, 59.06 feet, to a point; said point being south $60^{\circ}15'43''$ east, 53.66 feet, from a witness pin set;

Thence, south $36^{\circ}58'44''$ west, 207.12 feet, to a point;

Thence, south $26^{\circ}17'41''$ west, 122.99 feet, to a point; said point being south $65^{\circ}03'50''$ east, 40.31 feet, from a witness pin set;

Thence, south $06^{\circ}56'23''$ west, 84.74 feet, to a point;

Thence, south $11^{\circ}16'18''$ east, 130.18 feet, to a point;

Thence, leaving centerline of Harpeth River north $85^{\circ}45'34''$ west, 91.84 feet, to an existing iron pin; said pin being in the northerly line of J.W. Cross property, as recorded in Bk 469, Pg 522, R.O.W.C.T.

Thence, with said line, north $85^{\circ}45'34''$ west, 447.57 feet, to the point beginning and containing 188.28 acres more or less, according to a survey by Kevin Tucker & Assoc., on August 25, 1986.

Being the same property conveyed to Douglas S. Hale, Trustee, by deed from Richard D. Speight, Trustee, of record in Book 614, page 07, Register's Office for Williamson County, Tennessee.

SECTION II. That the attached Location Map shall serve the purpose of further delimiting the geographical boundaries as described by this Ordinance.

SECTION III. BE IT FINALLY ORDAINED by the Board of Mayor and Aldermen of the City of Franklin, Tennessee, that this Ordinance shall take effect from and after its passage on third and final reading, the health, safety, and welfare of the citizens requiring it.

ATTEST:

CITY OF FRANKLIN, TENNESSEE:

By: _____
Eric S. Stuckey
City Administrator/Recorder

By: _____
Dr. Ken Moore
Mayor

Approved as to form by:

Shauna R. Billingsley
City Attorney

PLANNING COMMISSION RECOMMENDED:

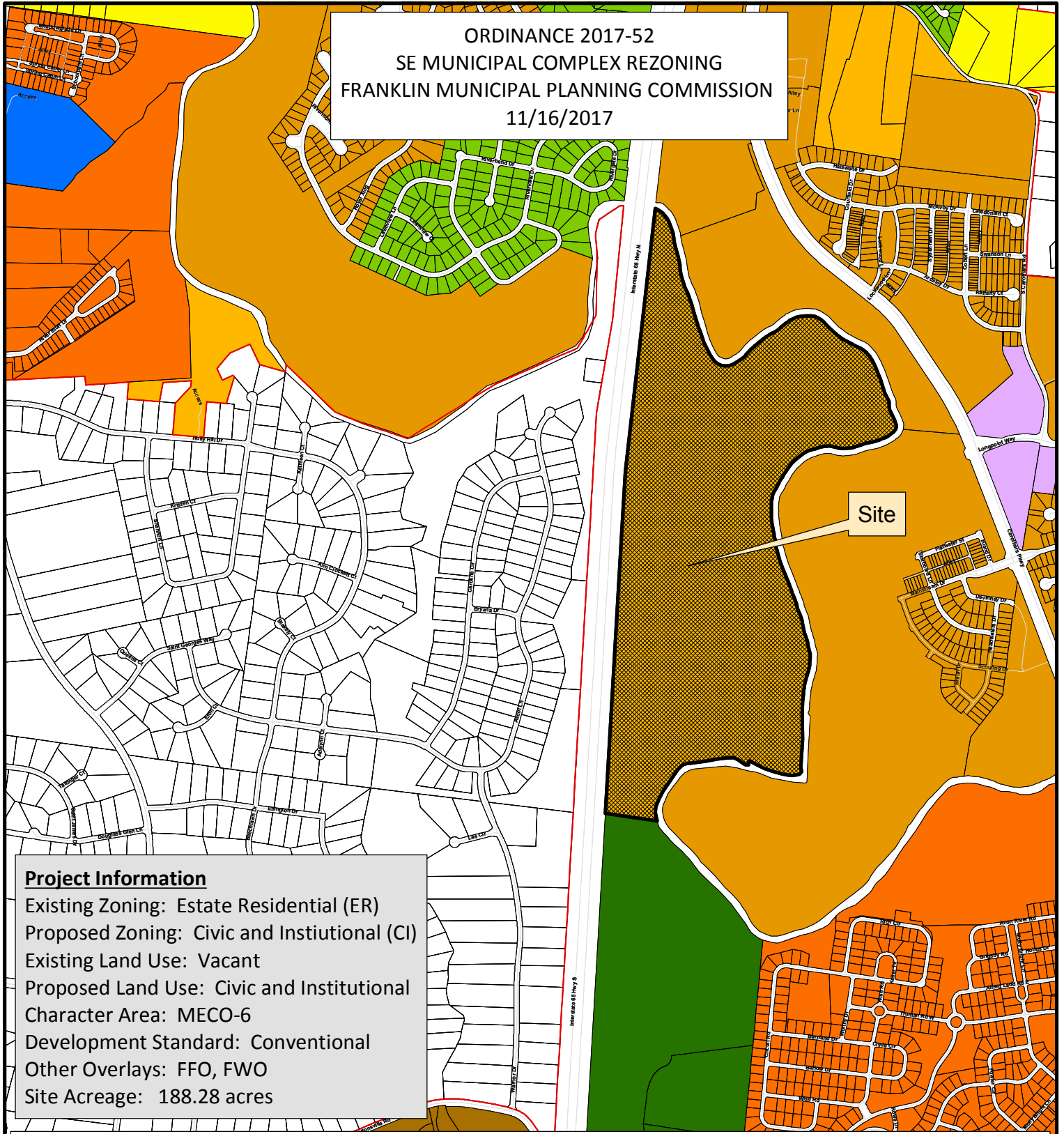
PASSED FIRST READING:

PUBLIC HEARING HELD:

PASSED SECOND READING:

PASSED THIRD READING:

ORDINANCE 2017-52
SE MUNICIPAL COMPLEX REZONING
FRANKLIN MUNICIPAL PLANNING COMMISSION
11/16/2017



Project Information

Existing Zoning: Estate Residential (ER)
Proposed Zoning: Civic and Institutional (CI)
Existing Land Use: Vacant
Proposed Land Use: Civic and Institutional
Character Area: MECO-6
Development Standard: Conventional
Other Overlays: FFO, FWO
Site Acreage: 188.28 acres

- | | |
|--|---------------------------------------|
| SE Municipal Complex | SD-R Specific Development-Residential |
| AG Agricultural District | SD-X Specific Development-Variety |
| ER Estate Residential | OR Office Residential District |
| R-1 Residential District | GO General Office District |
| R-2 Residential District | CC Central Commercial District |
| R-3 Residential District | NC Neighborhood Commercial District |
| R-6 Residential District | GC General Commercial District |
| RM-10 Attached 10 Residential District | LI Light Industrial District |
| RM-15 Attached 15 Residential District | HI Heavy Industrial District |
| RM-20 Attached 20 Residential District | CI Civic and Institutional District |



0 750 1,500 3,000
Feet

This map was created by the Franklin Planning Department. It was compiled from the most authentic information available. The City is not responsible for any errors or omissions contained hereon. All data and materials (c) copyright 2017. All rights reserved.

INDEX OF SHEETS

C100.....COVER SHEET
C101.....NEIGHBORHOOD CONTEXT PLAN
C102.....OVERALL EXISTING CONDITIONS PLAN

OWNER:
CITY OF FRANKLIN, TN
109 3RD AVE SOUTH
FRANKLIN, TN 37064
ATTN: PAUL HOLZEN
615-550-6679

APPLICANT:
CITY OF FRANKLIN, TN
109 3RD AVE SOUTH
FRANKLIN, TN 37064
ATTN: PAUL HOLZEN
615-550-6679

NOTE: AERIAL PHOTO, PARCEL LINES AND TOPOGRAPHIC
INFORMATION PROVIDED BY THE CITY OF FRANKLIN GIS
DEPARTMENT.

SITE DATA:

PROJECT NAME:
PROJECT NUMBER:
SUBDIVISION:
LOT NUMBER:
ADDRESS:
CITY:
COUNTY:
STATE:
CIVIL DISTRICT:
MAP:
GROUP:
PARCEL NUMBERS:
EXISTING ZONING:
PROPOSED ZONING:
CHARACTER AREA OVERLAY:
OTHER APPLICABLE OVERLAYS:
TOTAL ACREAGE:
TREE CANOPY:

SOUTH EAST MUNICIPAL COMPLEX
1234
N/A
N/A
I-65
FRANKLIN
WILLIAMSON
TENNESSEE
10TH
106
N/A
18600
ESTATE RESIDENTIAL
CIVIC AND INSTITUTIONAL
McEWEN
FLOOD WAY AND FLOOD PLAIN OVERLAY
188.28AC (8,201,476.80SF)
65.96AC (35% OF EXISTING SITE)

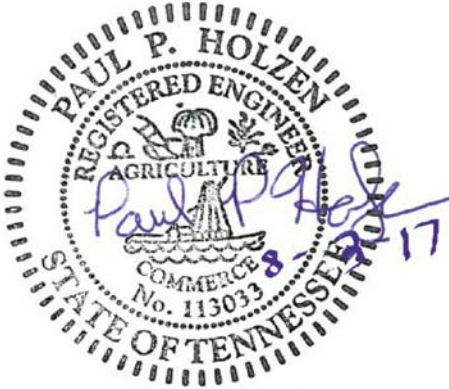
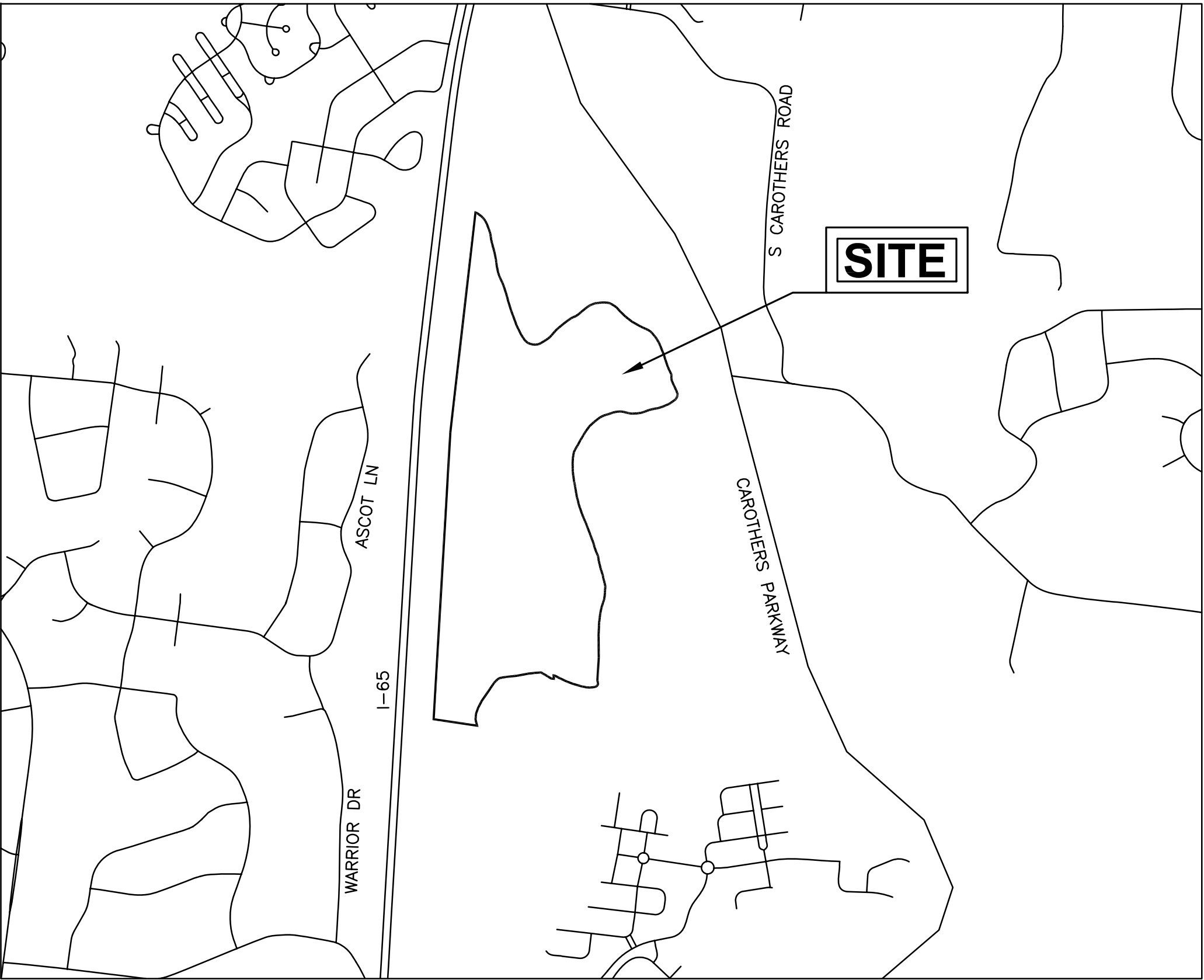
LEGAL DESCRIPTION
LAND LYING IN THE 10 CIVIL DISTRICT OF WILLIAMSON COUNTY, MAP 106, PARCEL 186.00,
REGISTER'S OFFICE OF WILLIAMSON COUNTY, TENNESSEE.

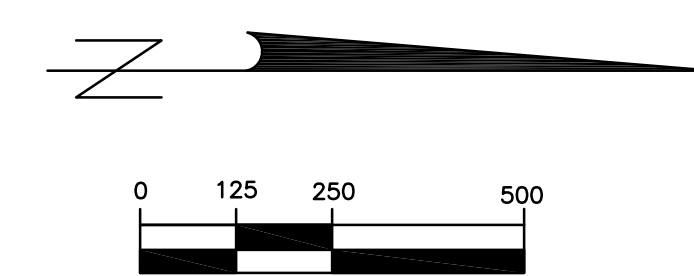
9/28/2017 PRE-APPLICATION SUBMITTAL
X/X/2017 INITIAL SUBMITTAL
X/X/2017 RESUBMITTAL

PROPERTY OWNERS LOCATED WITH 500FT

PARCEL ID	OWNER 1	OWNER2	CITY	OWNER ADDRESS	STATE	ZIP	ZONE	CHARACTER AREA
089 04702 00009089	CRESCENT LOCKWOOD LLC	N/A	CHARLOTTE	227 W TRADE ST STE 1000	NC	28202	SDR	MCEWEN
089 04801 00014089	CRESCENT LOCKWOOD LLC	N/A	CHARLOTTE	227 W TRADE ST STE 1000	NC	28202	SDR	MCEWEN
089 04900 00014089	REAL ESTATE SOLUTIONS GROUP LLC	N/A	THOMPSONS STATION	100 SADDLE SPRINGS BLVD	TN	37179	SDR	MCEWEN
089J C 00700 00009089J	VILLASENOR AGUSTIN GARCIA	GARCIA MARIA S	FRANKLIN	169 RIVERGATE DR	TN	37064	R3	MCEWEN
089J C 00800 00009089J	ARCENEUX GLYNN D	ARCENEUX ROBERTA L	FRANKLIN	165 RIVERGATE DR	TN	37064	R3	MCEWEN
089J C 00900 00009089J	OSTROM TIMOTHY J	N/A	FRANKLIN	161 RIVERGATE DR	TN	37064	R3	MCEWEN
089J C 01000 00009089J	CHEATHAM DENTY	PALERMO ROSE	NASHVILLE	43 MUSIC SQ W	TN	37203	R3	MCEWEN
089J C 01100 00009089J	QUEZADA-MURILLO ISMAEL	N/A	FRANKLIN	153 RIVERGATE DR	TN	37064	R3	MCEWEN
089J C 01200 00009089J	RUCKER MICHAEL S	RUCKER SHAMMY B	SPRING HILL	1709 OBRIEN CT	TN	37174	R3	MCEWEN
089J C 01300 00009089J	DAVIS SCOTT ALLEN	DAVIS EMILY KAY	FRANKLIN	137 RIVERGATE DR	TN	37064	R3	MCEWEN
089J C 01400 00009089J	DAVIS SCOTT ALLEN	DAVIS EMILY KAY	FRANKLIN	137 RIVERGATE DR	TN	37064	R3	MCEWEN
089J C 02300 00009089J	FELNER GEORGIA	N/A	FRANKLIN	160 RIVERGATE DR	TN	37064	R3	MCEWEN
089J C 02400 00009089J	NEARY KATHLEEN M	N/A	FRANKLIN	154 RIVERGATE DR	TN	37064	R3	MCEWEN
089J C 02500 00009089J	SOTO RAMON GONZALEZ	GONZALEZ EUSTOLIA GARCIA	FRANKLIN	140 RIVERGATE DR	TN	37064	R3	MCEWEN
106 15900 00010106	RAINES MINDY W	N/A	FRANKLIN	1138 WARRIOR DR	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106 18500 00010106	BASKIN SADIET	N/A	FRANKLIN	4280 LONG LN	TN	37064	AGRICULTURAL DISTRICT	GOOSE CREEK
106 18600 00010106	CITY OF FRANKLIN	N/A	FRANKLIN	PO BOX 305	TN	37065	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B B 00800 00010106B	MIHALEK DENNIS J	MIHALEK HANNAH B	FRANKLIN	1283 ASCOT LN	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B B 00900 00010106B	SIMPSON PHILLIP D	SIMPSON JELENA R	FRANKLIN	1279 ASCOT LN	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B B 01000 00010106B	WEAVER DOUGLAS PAUL	FALCONE DIANE M	FRANKLIN	1275 ASCOT LN	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B B 01700 00010106B	REDWING MEADOWS HOMEOWNERS ASSOC	N/A	FRANKLIN	PO BOX 1391	TN	37065	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B C 01700 00010106B	PIGNATO JOSEPH	PIGNATO MARJORIE	FRANKLIN	1285 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B C 01800 00010106B	DUNN JERRY E	DUNN LISA D	FRANKLIN	1287 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B C 01900 00010106B	VOYLES CLIFFORD H	VOYLES CYNTHIA A	FRANKLIN	1289 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B C 02000 00010106B	MAGUYLO DONALD J	N/A	FRANKLIN	1291 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B C 02100 00010106B	KITTS CLAYTON D	KITTS EDNA M	FRANKLIN	1293 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B C 02200 00010106B	REDWING MEADOWS HOMEOWNERS ASSOC	N/A	FRANKLIN	PO BOX 1391	TN	37065	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B C 02300 00010106B	HAWKINS CHARLES E	HAWKINS PEGGY J	FRANKLIN	1301 ASCOT LN	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B C 02400 00010106B	LEE KENNETH D	LEE KIMBERLY A	FRANKLIN	1305 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B C 02500 00010106B	HINKLE JEANINE	HINKLE BRIAN	FRANKLIN	1309 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 00100 00010106B	BAILEY KRISTIE	BAILEY BRIAN K	FRANKLIN	1313 ASCOT LN	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 00200 00010106B	GIBBS BOBBY J	GIBBS TRESSA M	FRANKLIN	1317 ASCOT LN	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 00300 00010106B	ULLIG BRIAN V	ULLIG HEATHER N	FRANKLIN	1321 ASCOT LN	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 00400 00010106B	THOMPSON DANIEL	THOMPSON SHERRY	FRANKLIN	1325 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 00500 000100890	WINNARD STAFFORD D	WINNARD LINDA T TANT	FRANKLIN	1329 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 00600 000100890	KRUSAC JOHN P III	BROILES NANCY J	FRANKLIN	1333 ASCOT LN	TN	37067	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 00700 000100890	MILES RONALD	MILES GWENDOLYN MILES	FRANKLIN	1337 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 00800 000100890	SANDERS ROBERT RICHARDSON	SANDERS LANA D	FRANKLIN	1341 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 00900 000100890	SEQUEIRA ANTONIA D	SEQUEIRA DANIELLE M	FRANKLIN	1345 ASCOT LN	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 01000 000100890	PONDER CHARLES SCOTT	N/A	FRANKLIN	1400 AMBLESIDE CT #202	TN	37068	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 01100 000100890	NAPIER EARNEST B	NAPIER CAROLINE E	FRANKLIN	1353 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 01200 000100890	MORTON EDWARD SR	MORTON FRANCES DARLENE	FRANKLIN	1357 ASCOT LANE	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 01300 000100890	GIVENS BOBBY G	GIVENS MARCELLA FAYE	FRANKLIN	1361 ASCOT LN	TN	37064	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 03500 00010106B	REDWING MEADOWS HOMEOWNERS ASSOC	N/A	FRANKLIN	PO BOX 1391	TN	37065	NEIGHBORHOOD CONSERVATION	GOOSE CREEK
106B D 03501 000100890	CITY OF FRANKLIN	N/A	FRANKLIN	PO BOX 305	TN	37065	NEIGHBORHOOD CONSERVATION	GOOSE CREEK

CITY OF FRANKLIN, TN
REZONING REQUEST
SOUTHEAST MUNICIPAL PROPERTY



[illegible]

**ORDINANCE 2017-48
AS AMENDED**

TO BE ENTITLED: "AN ORDINANCE TO AMEND CHAPTERS 3, 5, AND 8 OF THE ZONING ORDINANCE OF THE CITY OF FRANKLIN, TENNESSEE, TO REFINE TRANSITIONAL FEATURES STANDARDS FOR INFILL DEVELOPMENT."

WHEREAS, infill development includes any development or redevelopment of existing structures, parcels, blocks, or neighborhoods within Central Franklin, its surrounding areas, and other highly-developed areas within the city; and

WHEREAS, Franklin's historic core is particularly affected by infill development when it is incompatible with the established character of the surrounding area; and

WHEREAS, the City's long-range plan, *Envision Franklin*, recommends that infill development should demonstrate compatibility with the scale, density, and aesthetics of existing, surrounding development and respect the City's unique historic character; and

WHEREAS, municipalities are statutorily authorized to zone property to regulate the location, height, and size of buildings and other structures, the percentage of a lot that may be occupied, the density of population, and the sizes of yards, courts, and other open spaces; and

WHEREAS, this text amendment enhances the quality of life and economic health of the city by preserving the character and desirable aesthetic features of established neighborhoods; and

WHEREAS, this text amendment ensures these character-defining features, such as building setbacks, building heights, and lot widths are compatible and strengthen the established neighborhood context; and

WHEREAS, this Zoning Ordinance text amendment to amend Transitional Features Standards is in the best interest of the public health, safety, or welfare.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF MAYOR AND ALDERMEN OF FRANKLIN, TENNESSEE, AS FOLLOWS:

SECTION I. That Chapter 5, Subsection 5.3.4, of the Franklin Zoning Ordinance is hereby amended to delete the following text with a ~~strike through~~ and add the following text noted in **bold**, renumber the subsequent Subsections and Figures accordingly, and is approved to read as follows:

5.3.4 Transitional Features

(1) Purpose and Intent

Transitional features are architectural elements or site aspects used to provide a transition between land uses, subdivisions, ~~and sites~~, **and lots throughout the city** in an effort to mitigate conflicts and to provide design compatibility. It is the intent of these standards to:

- (a) Blend new development with existing development form and pattern **where the existing development is established and expected to remain, pursuant to *Envision Franklin***;
- (b) Reduce potential adverse impacts between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture;
- (c) Limit the excessive consumption of available land through the utilization of large vegetated buffers;
- (d) Limit interruptions in vehicular and pedestrian connections created by efforts to segregate uses; ~~and~~
- (e) Establish or maintain vibrant pedestrian-oriented areas where differing uses can operate in proximity to one another; ~~and-~~
- (f) **Regulate infill development to ensure these neighborhood character defining features, such as building height, building setbacks, lot sizes, and lot widths are compatible and strengthen the established context of Central Franklin and the overall City.**

(2) Applicability

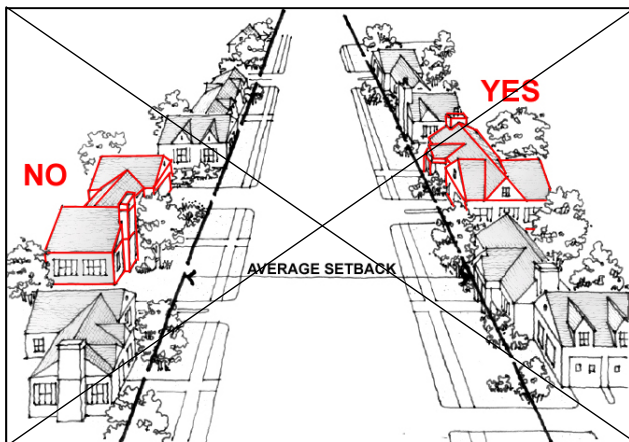
- (a) Transitional features shall be required:
 - (i) ~~When design compatibility cannot be achieved~~ **To achieve design compatibility between new and existing land uses, lots, or structures where the existing development is established and expected to remain, pursuant to *Envision Franklin*; or**
 - (ii) Between lots or uses within a single mixed-use development ~~located in either traditional or conventional areas; or-~~
 - (iii) **For residential development within CFCO Districts, or development within the OR District;**
- (b) **In cases where the standards of this Subsection and other Chapter 5 Sections conflict, the more restrictive standards shall apply. Within the HPO District, where *Historic District Design Guidelines* and this Subsection conflict, the *Historic District Design Guidelines* shall take precedence;**
- (c) **It shall be determined by the Planning and Sustainability Department whether transitional feature requirement(s) shall apply, pursuant to *Envision Franklin* and *Historic District Design Guidelines*, where applicable.**
- ~~(b) In conventional areas, the DRT may require the use of transitional features in addition to the use of a buffer, in accordance with the standards in Subsection 5.4.7, Buffers, where such transitional features are necessary to reduce potential adverse impacts between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture. If the applicant disagrees with the decision of the DRT regarding the use of transitional features, the applicant may appeal the decision to FMPC and/or BOMA, depending on the type of application.~~
- ~~(c) In traditional areas, the DRT may require the use of a buffer in lieu of or in addition to the use of a transitional feature where such buffer is necessary to reduce potential adverse impacts between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture. If the applicant disagrees with the decision of the DRT regarding the use of buffers or transitional features, the applicant may appeal the decision to FMPC and/or BOMA, depending on the type of application.~~

(3) Standards

~~In areas where a transition between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture is needed, the~~ **The** following approaches shall be used, subject to the approval of the ~~DRT, or the~~ Department of Building and Neighborhood Services, **and Department of Planning & Sustainability**, to establish a transition between uses, **lots, and structures**:

(a) **Building Setbacks**

- i. **The minimum front yard setback shall be the average setback of existing principal structures on the same block face. No new structure shall be located closer to the front lot line than the closest adjacent principal structure; Use setbacks that are within 25 percent of the average setbacks for existing uses on the same block face provided no new use is closer to the right of way than the closest existing principal structure**
- ii. **Side and rear yard setbacks in recorded subdivisions shall be no less than the minimum platted setbacks.**
- iii. **The use of a Class C landscape buffer and/or a fence or wall may be required where necessary to reduce potential adverse impacts of new uses or new buildings differing in height, mass, or form. The applicant may appeal the decision to require a buffer to the FMPC, HZC, and/or BOMA, depending on the type of application.**



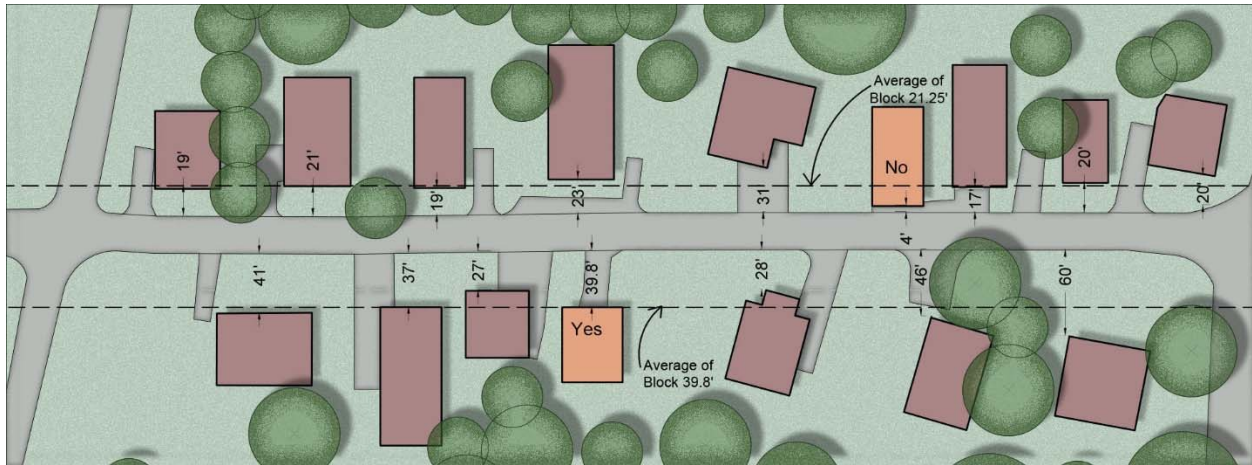


Figure 5-4: The new construction (in tan outlined in red) on the right with a “Yes” demonstrates an appropriate average setback for its block face. The dwelling outlined in red on the left New construction (in tan) with a “No” has a front setback that is too shallow for its block face deep.

(b) **Lot Sizes**

For residential lots within CFCO Districts, or lots zoned OR District, the lot size of a new lot shall be a minimum of 75 percent of the average lot size of existing lots on the same block face.

(c) **Lot Widths**

~~Use lot widths that are 40~~ The lot width for a new residential lot or lot zoned OR shall be a minimum of 75 percent of the average lot width for existing lots on the same block; face, or on the nearest adjacent block face where applicable.

(d) **Building Height**

i. Residential development within CFCO Districts or development within the OR District shall meet the following standards:

A. Building height at the front elevation shall not exceed one half-story above the average height of existing buildings on the same block face and shall not exceed an overall height of one-half story above the height at the front elevation;



Figure 5-5: These examples depict whole and half-stories for the purposes of determining building height.

B. Building height at the front elevation shall not exceed one-half story above the shortest immediately adjacent structure on the same block

face and shall not exceed an overall height of one-half story above the height at the front elevation.



Figure 5-6: These are examples of appropriate design solutions for achieving a one and one-half story appearance at the front elevation.

C. Façade width shall be within 25 percent of the average of immediately adjacent building façade widths;

D. Foundation height shall be a minimum of 12 inches and maximum of 18 inches, unless topographical constraints necessitate additional foundation height;

E. Buildings shall blend with existing buildings along the block face through use of:

- a. Similar roof shapes;**
- b. Dormers set back a minimum of one foot from the exterior wall of a front or side elevation;**
- c. Massing that divides the building into smaller parts;**
- d. Materials that do not accentuate verticality;**
- e. One-story front porch or entry element;**
- f. Attached Residential may also utilize the methods outlined in Subsection 5.3.4(3)(e).**

F. Garages shall have traditional placement and orientation, and be subordinate in height to the rest of the principal structure.



Figure 5-7: These examples show how attached garages are traditionally placed and subordinate to the rest of the principal structure.

ii. Nonresidential and Mixed-Use Standards

A. ~~Ensure the perceived~~ Façade width and height on facades of adjacent structures and structures on opposing sides of a street ~~are~~ **shall be** consistent with each other such that neither façade exceeds the other's dimensions by more than 25 percent. **Topography, viewshed analysis, and methods outlined in Subsection 5.3.4(3)(e) may be included in this assessment;**

B. At major intersections of any combination of arterials and/or collectors in MECO, building height shall be balanced across the intersection, using a viewshed analysis as required in Subsection 3.4.6, HTO, where applicable;

C. At the edge of a zoning district where the adjacent district has a lower maximum building height, buildings shall transition in height using methods outlined in Subsection 5.3.4(3)(e).

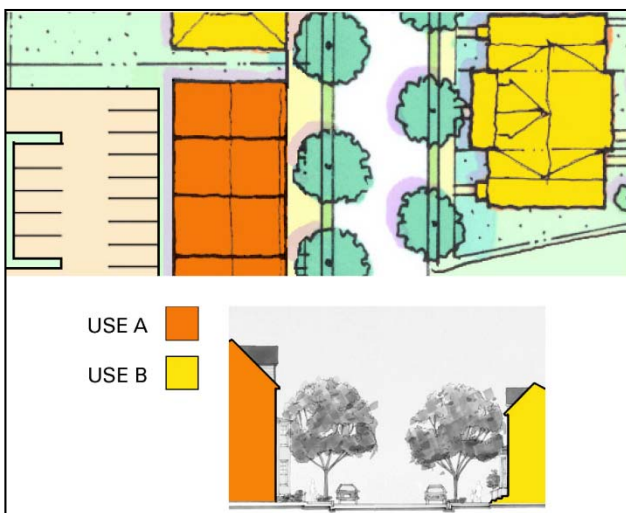


Figure 5-85: Ensuring similar façade height and width dimensions of opposing façades can be an effective means of establishing a transition between uses.

(e) **Transition Methods**

Graduate building height, scale, and mass through utilization of any of the following methods:

- (i) Building step-backs to reduce the bulk of a building's upper floors;
- (ii) Dividing buildings into smaller parts, including detached buildings, to reduce effective visual bulk and to maintain the scale and rhythm of the existing pattern of development;
- (iii) Sight lines or angular planes to gauge the appropriate building height necessary to achieve a steady, incremental transition; or
- (iv) Other techniques to break up the scale of a building to complement existing development patterns, as approved by the ~~DRT, or the~~ Department of **Building and Neighborhood Services and Department of Planning and Sustainability**.

...

SECTION II. That Chapter 5, Subsection 5.3.5, of the Franklin Zoning Ordinance is hereby amended to delete the following text noted with a ~~strike through~~, to add the following text noted in **bold**, and is approved to read as follows:

5.3.5 Residential Development

Attached and detached residential structures shall comply with the following basic residential design standards.

(1) Basic Standards

...

(e) Foundations

(i) The finished floor elevation at the front façade shall be located above grade in accordance with the following standards:

- A.) For setbacks of ten feet or more, the finished floor elevation of the front facade shall be a minimum of 18 inches above grade; and
- B.) For setbacks of less than ten feet, the finished floor elevation of the front facade shall be a minimum of 24 inches above grade;
- C.) Within CFCO Districts, foundation height along the front building facade shall be a minimum of 12 inches, but not exceed 18 inches, unless topographical constraints necessitate additional foundation height.**

...

SECTION III. That Chapter 3, Tables 3.5, 3.6, 3.7 and 3.8, of the Franklin Zoning Ordinance is hereby amended to delete the following text with a ~~strike through~~ and add the following text noted in **bold**, and is approved to read as follows:

TABLE 3-5: BASE DISTRICT DENSITY AND BUILDING HEIGHT [1], [2] [9]

Standard	Base Zoning Districts																		
	AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	RM-10	RM-15	RM-20	OR	CQ	GO	NC	GC	LI	HI	CI
Gross Residential Density (Max.) [3]	1 per 15 AC	0.5	1.0	2.0	3.0	6.0	[6]	[6]	10	15	20	6.0	6.0						
Building Height in Stories (Max.) [4] [9]	3	3	3	3	3	3	3 [4]	3 [4]	3 [4]	3 [4]	3 [4]	3 [4]	3 [4]	3 [4]	3	3 [4]	3	3	3 [4]
Landscape Surface Ratio (LSR) (Min.) [8]	.70	.60	.50	.40	.40	.30	.20 [7]	.20 [7]	.30	.30	.30	.40	.10	.30	.15	.30	.20	.20	[5]

NOTES:

- [1] For lots in recorded subdivisions or approved planned unit developments (PUDs), the maximum densities shown in this table shall not apply, and the requirements shall be recommended by FMPC and set by BOMA.
- [2] Shaded cells indicate that no requirement exists.
- [3] In a TOD, the total quantity of dwelling units and/or square feet of nonresidential buildings is limited. See Subsections 5.3.7 and 5.3.10.
- [4] A maximum height of four (4) stories, not to exceed a total height of 56 feet, is permitted in PUDs if the building and site design comply with Section 5.3.4, Transitional Features. In addition, buildings within the MECO-4, MECO-5, MECO-9, GCCO-3, GCCO-4a, GCCO-4b, GCCO-4c, and GCCO-4d Character Area Overlay Districts may exceed three (3) stories, but shall not exceed six (6) stories (maximum of 84 feet in height). Buildings located within the HTO District are subject to the provisions of Section 3.4.6 of the Height Overlay District.
- [5] Developments using Traditional Area standards shall maintain a minimum LSR of 0.10, and developments using the Conventional Area standards shall maintain a minimum LSR of 0.40.
- [6] Approved entitlements shall be determined during the rezoning process; and listed on the Franklin Zoning Map.
- [7] SD district LSR requirement is .10 for CFCO-2, CFCO-3, CFCO-7, and CFCO-8 Character Areas.
- [8] Development within CFCO-1 and CFCO-9 is exempt from the minimum LSR requirement.
- [9] **Building height shall be in accordance with Subsection 5.3.4, Transitional Features.**

...

TABLE 3-6: SITE DEVELOPMENT STANDARDS FOR RESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2], [3], [4] [109]

Standard			AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	RM-10	RM-15	RM-20
Residential Detached (Street Loaded)	Front Yard and Side Street Setback (feet) [4] [5]	Local	100	75	60	40	25	25	30[98]	30[98]			
		Collector	150	100	90	75	60	35	40[98]	40[98]			
		Arterial / Mack Hatcher	225	150	125	100	80	45	50[98]	50[98]			
	Side Yard Setback (feet) [65] [1110]		50	35	25	[76]	[87]	[87]	[8][98]	[8][98]			
	Rear Yard Setback (feet)[65]		100	65	50	40	30	25	30[98]	30[98]			
	Minimum Lot Size (square feet) [4]		1 per 15 acres	45,000	30,000	15,000	9,000	5,000	5,000[98]	5,000[98]			
	Minimum Lot Width (feet) [4]		200	150	100	75	60	50	50[98]	50[98]			
	Minimum Lot Frontage (feet) [1211]		160	120	80	60	48	40	40[98]	40[98]			
Residential Detached (Alley Loaded)	Front Yard and Side Street Setback (feet) [4] [5]	Local	100	75	60	40	25	25	30[98]	30[98]			
		Collector	150	100	90	75	60	35	40[98]	40[98]			
		Arterial / Mack Hatcher	225	150	125	100	80	45	50[98]	50[98]			
	Side Yard Setback (feet) [65]		50	35	25	[76]	[87]	[87]	[8][98]	[8][98]			
	Rear Yard Setback (feet) [65]		100	65	50	40	30	25	30[98]	30[98]			
	Minimum Lot Size (square feet) [4]		1 per 15	45,000	30,000	15,000	9,000	5,000	4,000[98]	4,000[98]			

TABLE 3-6: SITE DEVELOPMENT STANDARDS FOR RESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2], [3], [4] [109]

Standard		AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	RM-10	RM-15	RM-20
		acres										
	Minimum Lot Width (feet) [4]	200	150	100	75	60	50	40[98]	40[98]			
	Minimum Lot Frontage (feet) [1211]	160	120	80	60	48	40	40[98]	40[98]			
Residential Attached	Front Yard and Side Street Setback (feet) [4] [5]	Local						30[98]	30[98]	30	30	30
		Collector						40[98]	40[98]	40	40	40
		Arterial / Mack Hatcher						50[98]	50[98]	50	50	50
	Side Yard Setback (feet)							15 [98][1110]	15 [98][1110]	15 [1110]	15 [1110]	15 [1110]
	Rear Yard/Alley Setback (feet)							30 [98]	30 [98]	25	25	25

NOTES:

- [1] For lots in recorded subdivisions or approved PUDs, the setbacks, lot sizes, and maximum densities shown in this table shall not apply, and the requirements shown on the Final Plat or approved PUD shall govern.
- [2] Unified developments may establish interior lot lines as necessary, provided that the bulk requirements along the outer boundaries of the development shall be retained as specified in this table.
- [3] Shaded cells indicate that no requirement exists.
- [4] ~~Where the average front yard for existing buildings on the same block face is more than or less than the minimum required front yard, the minimum front yard shall instead be within 25 percent of the average front yard for existing buildings on the same block face.~~
- [54] ~~In cases where a transitional feature is required, the minimum setback shall be in accordance with Subsection 5.3.4, Transitional Features.~~ **The minimum setback, minimum lot width, and minimum lot size shall be in accordance with Subsection 5.3.4, Transitional Features.**
- [65] Where an immediately adjacent existing building is set back less than the minimum required side or rear yard, the minimum side or rear yard requirement shall instead be the same as the immediately adjacent developed building, but not less than five feet. Buildings shall maintain a minimum spacing of ten feet.
- [76] Minimum of eight feet each side, minimum of 20 feet between dwellings.
- [87] Minimum of five feet each side, minimum 12 feet between dwellings.
- [98] Larger or smaller setbacks, lot widths, lot frontages and lot sizes, beyond the range presented in this table, are permitted in cases where topographical or natural constraints exist, or where a particular design approach warrants a different setback subject to Subsection 2.4.2, Planned Unit Developments.

TABLE 3-6: SITE DEVELOPMENT STANDARDS FOR RESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2], [3], [4] [109]

Standard	AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	RM-10	RM-15	RM-20
[109] Appurtenances may encroach into a side-yard provided they maintain a minimum setback of five feet from the property line and ten feet from principal structures on adjacent lots. [1110] For unified developments, internal side setback shall be determined by the applicable Building and Fire Codes as adopted by the City of Franklin. [1211] The minimum lot frontage width shall be required to be maintained to the front yard setback line, at which point the minimum lot width shall apply. However, the minimum lot frontage requirement shall not apply to lots located on the turning radius of a cul-de-sac.											

...

TABLE 3-7: SITE DEVELOPMENT STANDARDS FOR NONRESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2] [3]

Standard				Base Zoning Districts											
		AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	GO	NC	GC	LI	HI	CI
Front Yard and Side Street Setback (feet) [3] [4]	Local	100	75	60	40	25	25	30	30	50	20	30	75	30	20
	Collector	150	100	90	75	60	55	40	40						
	Arterial/ Mack Hatcher	225	150	125	100	80	75	50	50						
Side Yard Setback (feet) [54] [87]		50	35	35	[65]	[76]	[76]	[76]	[76]	25	10	15	25	15	10
Rear Yard Setback (feet) [54]		100	65	50	40	30	30	30	30	40	25	25	25	25	25

NOTES:

- [1] For lots in recorded subdivisions or approved PUDs, the setbacks, lot sizes, and maximum densities shown in this table shall not apply, and the requirements shown on the final plat and/or approved PUD shall govern.
- [2] Unified developments may establish interior lot lines as necessary, provided that the bulk requirements of the outer boundaries along the development shall be retained as specified in this table.
- [3] ~~Where the average front yard for existing buildings on the same block face is more than or less than the minimum required front yards, the minimum front yard shall instead be within 25 percent of the average setbacks for existing buildings on the same block face.~~
- [43] ~~In cases where a transitional feature is required, the minimum setback shall be in accordance with Subsection 5.3.4, Transitional Features.~~ **The minimum setback shall be in accordance with Subsection 5.3.4, Transitional Features.**
- [54] Where an immediately adjacent existing building is set back less than the minimum required side or rear yard, the minimum side or rear yard requirement shall instead be the same as the immediately adjacent developed building.
- [65] Minimum of eight feet each side, minimum of 20 feet between dwellings.
- [76] Minimum of five feet each side, minimum 12 feet between dwellings.

TABLE 3-7: SITE DEVELOPMENT STANDARDS FOR NONRESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2] [3]

Standard	Base Zoning Districts													
	AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	GO	NC	GC	LI	HI	CI
[87]	Appurtenances are permitted to encroach into a required front or rear yard setback up to six feet and within side yards up to five feet from the property line provided a minimum of ten feet between buildings is maintained.													

...

TABLE 3-8 SITE DEVELOPMENT STANDARDS FOR TRADITIONAL AREAS [1], [2], [3] [6]

Standard	Residential Detached (Street Loaded)	Residential Detached (Alley Loaded)	Residential Attached	Mixed-Use	Nonresidential
Front Yard and Side Street Setback [4] [5] [6] [7]	10-30 feet	10-30 feet	0 or 5-25 feet	0–15 feet	0-20 feet
Side Yard Setback [8] [12]	5 feet	5 feet	[9] [13]	0-5 feet	0 feet
Rear Yard Setback [8]	5 feet	5 feet	5 feet	0 feet	0 feet
Main Body/Primary Facade Width (Maximum) [10]	50 feet	50 feet			
Minimum Lot Size [6]	4,000 square feet	2,100 square feet			
Minimum Lot Width [5] [6] [11]	40-85 feet	30-70 feet			
Minimum Lot Frontage [5] [14]	40 feet	30 feet			

NOTES:

- [1] For lots in recorded subdivisions or approved PUDs, the setbacks and lot sizes, maximum densities, and primary façade widths shown in this table shall not apply, and the requirements shown on the final plat, the approved PUD, or conditions on existing lots shall govern.
- [2] Numbers shown as a range indicate a minimum and maximum (Example: 10-30). Shaded cells indicate that no requirement exists.
- [3] Unified developments may establish interior lot lines as necessary, provided that the bulk requirements of the outer boundaries of the development shall be retained as specified in this table.
- [4] For mixed-use and single-use nonresidential building types developed according to the traditional standards, the front building setback shall be measured from the back edge of the sidewalk, not the right-of-way line.
- [5] Larger or smaller setbacks, lot widths, lot frontages and lot sizes, beyond the range presented in this table, are permitted in cases where topographical or natural constraints exist, or where a particular design approach warrants a different setback, subject to Subsection 2.4.2, Planned Unit Developments.

TABLE 3-8 SITE DEVELOPMENT STANDARDS FOR TRADITIONAL AREAS [1], [2], [3] [6]

- [6] ~~In cases where a transitional feature is required, the minimum setback and lot width shall be in accordance with Subsection 5.3.4, Transitional Features.~~ **The minimum setback, minimum lot width, and minimum lot size shall be in accordance with Subsection 5.3.4 Transitional Features.**
- [7] The minimum setback from Mack Hatcher Parkway shall be 80 feet, and the minimum setback from Interstate 65 shall be 100 feet.
- [8] Where an immediately adjacent existing building is set back less than the minimum required side or rear yard, the minimum side or rear yard requirement shall instead be the same as the immediately adjacent developed building, but not less than five feet. Buildings shall maintain a minimum spacing of ten feet.
- [9] Minimum of zero feet each side, minimum ten feet between buildings.
- [10] Side or rear wings designed in accordance with Subsection 5.3.9 are exempt from the maximum width.
- [11] Corner lots may be up to 15 feet wider to accommodate porches or other architectural feature facing the street, and the maximum lot size shall not apply.
- [12] Appurtenances are permitted to encroach into a required front or rear yard setback up to six feet and within side yards up to five feet from the property line provided a minimum of ten feet between buildings is maintained.
- [13] Internal side setbacks shall be determined by the City of Franklin Building Code and or the City of Franklin Fire Code.
- [14] The minimum lot frontage width shall be required to be maintained to the front yard setback line, at which point the minimum lot width shall apply. However, the minimum lot frontage requirement shall not apply to lots located on the turning radius of a cul-de-sac.

...

SECTION IV. That Chapter 3, Subsection 3.3.1 of the Franklin Zoning Ordinance is hereby amended to delete the following text noted with a ~~strikethrough~~; to add the following text noted in **bold**, and is approved to read as follows:

3.3 Site Development Standards

3.3.1 Measurements, Computations, and Exceptions

...

(4) Setbacks, Yards, and Height

...

(h) Height Measurement

(i) Building height shall be measured in the number of complete stories above the finished grade for any building, including habitable attics, half-stories, mezzanines, and at-grade structured parking, but excluding:

A.) Spaces completely below grade, such as basements, cellars, crawl spaces, sub-basements, and underground parking structures; and

B.) Features that are more than one-half story below the finished grade.

(ii) For the purposes of measuring maximum building height for Subsection 5.3.4, Transitional Features:

A.) To calculate the average height, story and half-story heights along the same block face shall be summed, then divided by the total number of principal structures; and.

B.) To calculate one half-story above the average height, one-half (0.5) shall be added to the average height (calculated above), then rounded to the nearest half or whole story.

SECTION V. That Chapter 8, Section 8.3, of the Franklin Zoning Ordinance is hereby amended to delete the following text with a ~~striethrough~~ and add the following text noted in **bold**, and is approved to read as follows:

...

Story

The portion of a building intended for human occupancy included between the upper surface of a floor and the upper surface of the floor next above or the roof.

Story, Half

An uppermost story which usually features dormer windows and in which a sloping roof replaces the upper part of the front wall facing the street. Kneewalls do not exceed five feet in height, measured from the upstairs floor to the wall plate, and the floor space of the upstairs is less than the main floor footprint.

...

SECTION VI. BE IT FINALLY ORDAINED by the Board of Mayor and Aldermen of the City of Franklin, Tennessee that this Ordinance shall take effect from and after its passage on third and final reading, the health, safety, and welfare of the citizens requiring it.

ATTEST:

CITY OF FRANKLIN, TENNESSEE:

BY: _____

Eric S. Stuckey

City Administrator

BY: _____

Dr. Ken Moore

Mayor

Approved as to Form:

Shauna R. Billingsley, City Attorney

PLANNING COMMISSION RECOMMENDED:

PASSED FIRST READING:

PUBLIC HEARING HELD:

PASSED SECOND READING:

PASSED THIRD READING:

ORDINANCE 2017-48

TO BE ENTITLED: "AN ORDINANCE TO AMEND CHAPTERS 3, 5, AND 8 OF THE ZONING ORDINANCE OF THE CITY OF FRANKLIN, TENNESSEE, TO REFINE TRANSITIONAL FEATURES STANDARDS FOR INFILL DEVELOPMENT."

WHEREAS, infill development includes any development or redevelopment of existing structures, parcels, blocks, or neighborhoods within Central Franklin, its surrounding areas, and other highly-developed areas within the city; and

WHEREAS, Franklin's historic core is particularly affected by infill development when it is incompatible with the established character of the surrounding area; and

WHEREAS, the City's long-range plan, *Envision Franklin*, recommends that infill development should demonstrate compatibility with the scale, density, and aesthetics of existing, surrounding development and respect the City's unique historic character; and

WHEREAS, municipalities are statutorily authorized to zone property to regulate the location, height, and size of buildings and other structures, the percentage of a lot that may be occupied, the density of population, and the sizes of yards, courts, and other open spaces; and

WHEREAS, this text amendment enhances the quality of life and economic health of the city by preserving the character and desirable aesthetic features of established neighborhoods; and

WHEREAS, this text amendment ensures these character-defining features, such as building setbacks, building heights, and lot widths are compatible and strengthen the established neighborhood context; and

WHEREAS, this Zoning Ordinance text amendment to amend Transitional Features Standards is in the best interest of the public health, safety, or welfare.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF MAYOR AND ALDERMEN OF FRANKLIN, TENNESSEE, AS FOLLOWS:

SECTION I. That Chapter 5, Subsection 5.3.4, of the Franklin Zoning Ordinance is hereby amended to delete the following text with a ~~strike through~~ and add the following text noted in **bold**, renumber the subsequent Subsections and Figures accordingly, and is approved to read as follows:

5.3.4 Transitional Features

(1) Purpose and Intent

Transitional features are architectural elements or site aspects used to provide a transition between land uses, subdivisions, ~~and sites~~, **and lots throughout the city** in an effort to mitigate conflicts and to provide design compatibility. It is the intent of these standards to:

- (a) Blend new development with existing development form and pattern **where the existing development is established and expected to remain, pursuant to *Envision Franklin***;
- (b) Reduce potential adverse impacts between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture;
- (c) Limit the excessive consumption of available land through the utilization of large vegetated buffers;
- (d) Limit interruptions in vehicular and pedestrian connections created by efforts to segregate uses; ~~and~~
- (e) Establish or maintain vibrant pedestrian-oriented areas where differing uses can operate in proximity to one another; ~~and~~;
- (f) **Regulate infill development to ensure these neighborhood character defining features, such as building height, building setbacks, lot sizes, and lot widths are compatible and strengthen the established context of Central Franklin and the overall City.**

(2) Applicability

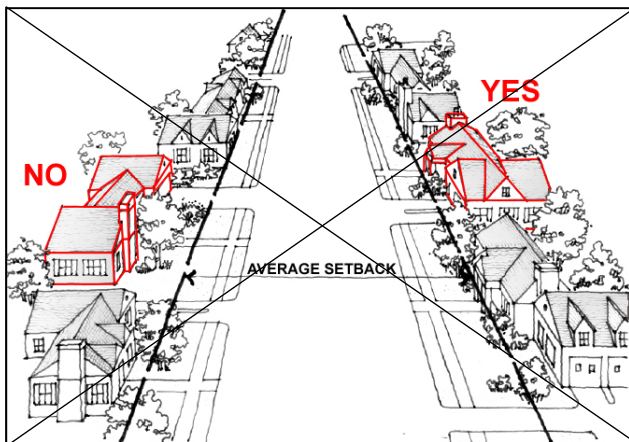
- (a) Transitional features shall be required:
 - (i) ~~When design compatibility cannot be achieved~~ **To achieve design compatibility between new and existing land uses, lots, or structures where the existing development is established and expected to remain, pursuant to *Envision Franklin*; or**
 - (ii) Between lots or uses within a single mixed-use development ~~located in either traditional or conventional areas; or~~
 - (iii) **For residential development within CFCO Districts, or development within the OR District;**
- (b) **In cases where the standards of this Subsection and other Chapter 5 Sections conflict, the more restrictive standards shall apply. Within the HPO District, where *Historic District Design Guidelines* and this Subsection conflict, the *Historic District Design Guidelines* shall take precedence;**
- (c) **It shall be determined by the Planning and Sustainability Department whether transitional feature requirement(s) shall apply, pursuant to *Envision Franklin* and *Historic District Design Guidelines*, where applicable.**
- ~~(b) In conventional areas, the DRT may require the use of transitional features in addition to the use of a buffer, in accordance with the standards in Subsection 5.4.7, Buffers, where such transitional features are necessary to reduce potential adverse impacts between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture. If the applicant disagrees with the decision of the DRT regarding the use of transitional features, the applicant may appeal the decision to FMPC and/or BOMA, depending on the type of application.~~
- ~~(c) In traditional areas, the DRT may require the use of a buffer in lieu of or in addition to the use of a transitional feature where such buffer is necessary to reduce potential adverse impacts between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture. If the applicant disagrees with the decision of the DRT regarding the use of buffers or transitional features, the applicant may appeal the decision to FMPC and/or BOMA, depending on the type of application.~~

(3) Standards

~~In areas where a transition between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture is needed, the~~ **The** following approaches shall be used, subject to the approval of the ~~DRT, or the~~ Department of Building and Neighborhood Services, **and Department of Planning & Sustainability**, to establish a transition between uses, **lots, and structures**:

(a) **Building Setbacks**

- i. **The minimum front yard setback shall be the average setback of existing principal structures on the same block face. No new structure shall be located closer to the front lot line than the closest adjacent principal structure; Use setbacks that are within 25 percent of the average setbacks for existing uses on the same block face provided no new use is closer to the right of way than the closest existing principal structure**
- ii. **Side and rear yard setbacks in recorded subdivisions shall be no less than the minimum platted setbacks.**
- iii. **The use of a Class C landscape buffer and/or a fence or wall may be required where necessary to reduce potential adverse impacts of new uses or new buildings differing in height, mass, or form. The applicant may appeal the decision to require a buffer to the FMPC, HZC, and/or BOMA, depending on the type of application.**



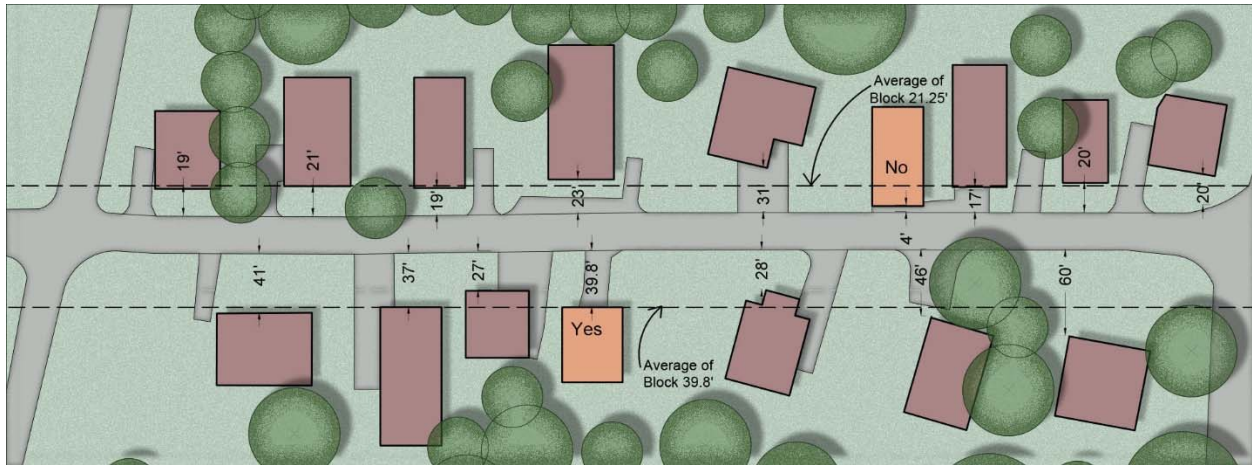


Figure 5-4: The new construction (in tan outlined in red) on the right with a “Yes” demonstrates an appropriate average setback for its block face. The dwelling outlined in red on the left New construction (in tan) with a “No” has a front setback that is too shallow for its block face deep.

(b) **Lot Sizes**

For residential lots within CFCO Districts, or lots zoned OR District, the lot size of a new lot shall be a minimum of 75 percent of the average lot size of existing lots on the same block face.

(c) **Lot Widths**

Use lot widths that are 40 The lot width for a new residential lot or lot zoned OR shall be a minimum of 75 percent of the average lot width for existing lots on the same block; face, or on the nearest adjacent block face where applicable.

(d) **Building Height**

- i. Residential development within CFCO Districts or development within the OR District shall meet the following standards:

- A. Building height at the front elevation shall not exceed one half-story above the average height of existing buildings on the same block face;



Figure 5-5: These examples depict whole and half-stories for the purposes of determining building height.

B. Building height at the front elevation shall not exceed one-half story above the shortest immediately adjacent structure on the same block face.



Figure 5-6: These are examples of appropriate design solutions for achieving a one and one-half story appearance at the front elevation.

C. Façade width shall be within 25 percent of the average of immediately adjacent building façade widths;

D. Foundation height shall be a minimum of 12 inches and maximum of 18 inches, unless topographical constraints necessitate additional foundation height;

E. Buildings shall blend with existing buildings along the block face through use of:

- a. Similar roof shapes;**
- b. Dormers set back a minimum of one foot from the exterior wall of a front or side elevation;**
- c. Massing that divides the building into smaller parts;**
- d. Materials that do not accentuate verticality;**
- e. One-story front porch or entry element;**
- f. Attached Residential may also utilize the methods outlined in Subsection 5.3.4(3)(e).**

F. Garages shall have traditional placement and orientation, and be subordinate in height to the rest of the principal structure.



Figure 5-7: These examples show how attached garages are traditionally placed and subordinate to the rest of the principal structure.

ii. Nonresidential and Mixed-Use Standards

A. ~~Ensure the perceived~~ Façade width and height on facades of adjacent structures and structures on opposing sides of a street ~~are~~ **shall be** consistent with each other such that neither façade exceeds the other's dimensions by more than 25 percent. **Topography, viewshed analysis, and methods outlined in Subsection 5.3.4(3)(e) may be included in this assessment;**

B. At major intersections of any combination of arterials and/or collectors in MECO, building height shall be balanced across the intersection, using a viewshed analysis as required in Subsection 3.4.6, HTO, where applicable;

C. At the edge of a zoning district where the adjacent district has a lower maximum building height, buildings shall transition in height using methods outlined in Subsection 5.3.4(3)(e).

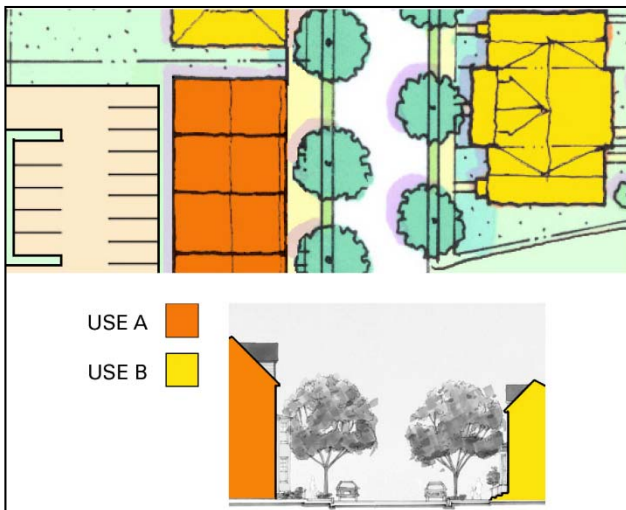


Figure 5-85: Ensuring similar façade height and width dimensions of opposing façades can be an effective means of establishing a transition between uses.

(e) **Transition Methods**

Graduate building height, scale, and mass through utilization of any of the following methods:

- (i) Building step-backs to reduce the bulk of a building's upper floors;
- (ii) Dividing buildings into smaller parts, including detached buildings, to reduce effective visual bulk and to maintain the scale and rhythm of the existing pattern of development;
- (iii) Sight lines or angular planes to gauge the appropriate building height necessary to achieve a steady, incremental transition; or
- (iv) Other techniques to break up the scale of a building to complement existing development patterns, as approved by the ~~DRT, or the~~ Department of **Building and Neighborhood Services and Department of Planning and Sustainability**.

...

SECTION II. That Chapter 5, Subsection 5.3.5, of the Franklin Zoning Ordinance is hereby amended to delete the following text noted with a ~~strike through~~, to add the following text noted in **bold**, and is approved to read as follows:

5.3.5 Residential Development

Attached and detached residential structures shall comply with the following basic residential design standards.

(1) Basic Standards

...

(e) Foundations

(i) The finished floor elevation at the front façade shall be located above grade in accordance with the following standards:

- A.) For setbacks of ten feet or more, the finished floor elevation of the front facade shall be a minimum of 18 inches above grade; and
- B.) For setbacks of less than ten feet, the finished floor elevation of the front facade shall be a minimum of 24 inches above grade;
- C.) Within CFCO Districts, foundation height along the front building facade shall be a minimum of 12 inches, but not exceed 18 inches, unless topographical constraints necessitate additional foundation height.**

...

SECTION III. That Chapter 3, Tables 3.5, 3.6, 3.7 and 3.8, of the Franklin Zoning Ordinance is hereby amended to delete the following text with a ~~strike through~~ and add the following text noted in **bold**, and is approved to read as follows:

TABLE 3-5: BASE DISTRICT DENSITY AND BUILDING HEIGHT [1], [2] [9]

Standard	Base Zoning Districts																		
	AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	RM-10	RM-15	RM-20	OR	CQ	GO	NC	GC	LI	HI	CI
Gross Residential Density (Max.) [3]	1 per 15 AC	0.5	1.0	2.0	3.0	6.0	[6]	[6]	10	15	20	6.0	6.0						
Building Height in Stories (Max.) [4] [9]	3	3	3	3	3	3	3 [4]	3 [4]	3 [4]	3 [4]	3 [4]	3 [4]	3 [4]	3 [4]	3	3 [4]	3	3	3 [4]
Landscape Surface Ratio (LSR) (Min.) [8]	.70	.60	.50	.40	.40	.30	.20 [7]	.20 [7]	.30	.30	.30	.40	.10	.30	.15	.30	.20	.20	[5]

NOTES:

- [1] For lots in recorded subdivisions or approved planned unit developments (PUDs), the maximum densities shown in this table shall not apply, and the requirements shall be recommended by FMPC and set by BOMA.
- [2] Shaded cells indicate that no requirement exists.
- [3] In a TOD, the total quantity of dwelling units and/or square feet of nonresidential buildings is limited. See Subsections 5.3.7 and 5.3.10.
- [4] A maximum height of four (4) stories, not to exceed a total height of 56 feet, is permitted in PUDs if the building and site design comply with Section 5.3.4, Transitional Features. In addition, buildings within the MECO-4, MECO-5, MECO-9, GCCO-3, GCCO-4a, GCCO-4b, GCCO-4c, and GCCO-4d Character Area Overlay Districts may exceed three (3) stories, but shall not exceed six (6) stories (maximum of 84 feet in height). Buildings located within the HTO District are subject to the provisions of Section 3.4.6 of the Height Overlay District.
- [5] Developments using Traditional Area standards shall maintain a minimum LSR of 0.10, and developments using the Conventional Area standards shall maintain a minimum LSR of 0.40.
- [6] Approved entitlements shall be determined during the rezoning process; and listed on the Franklin Zoning Map.
- [7] SD district LSR requirement is .10 for CFCO-2, CFCO-3, CFCO-7, and CFCO-8 Character Areas.
- [8] Development within CFCO-1 and CFCO-9 is exempt from the minimum LSR requirement.
- [9] **Building height shall be in accordance with Subsection 5.3.4, Transitional Features.**

...

TABLE 3-6: SITE DEVELOPMENT STANDARDS FOR RESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2], [3], [4] [109]

Standard			AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	RM-10	RM-15	RM-20
Residential Detached (Street Loaded)	Front Yard and Side Street Setback (feet) [4] [5]	Local	100	75	60	40	25	25	30[98]	30[98]			
		Collector	150	100	90	75	60	35	40[98]	40[98]			
		Arterial / Mack Hatcher	225	150	125	100	80	45	50[98]	50[98]			
	Side Yard Setback (feet) [65] [1110]		50	35	25	[76]	[87]	[87]	[8][98]	[8][98]			
	Rear Yard Setback (feet)[65]		100	65	50	40	30	25	30[98]	30[98]			
	Minimum Lot Size (square feet) [4]		1 per 15 acres	45,000	30,000	15,000	9,000	5,000	5,000[98]	5,000[98]			
	Minimum Lot Width (feet) [4]		200	150	100	75	60	50	50[98]	50[98]			
	Minimum Lot Frontage (feet) [1211]		160	120	80	60	48	40	40[98]	40[98]			
Residential Detached (Alley Loaded)	Front Yard and Side Street Setback (feet) [4] [5]	Local	100	75	60	40	25	25	30[98]	30[98]			
		Collector	150	100	90	75	60	35	40[98]	40[98]			
		Arterial / Mack Hatcher	225	150	125	100	80	45	50[98]	50[98]			
	Side Yard Setback (feet) [65]		50	35	25	[76]	[87]	[87]	[8][98]	[8][98]			
	Rear Yard Setback (feet) [65]		100	65	50	40	30	25	30[98]	30[98]			
	Minimum Lot Size (square feet) [4]		1 per 15	45,000	30,000	15,000	9,000	5,000	4,000[98]	4,000[98]			

TABLE 3-6: SITE DEVELOPMENT STANDARDS FOR RESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2], [3], [4] [109]

Standard		AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	RM-10	RM-15	RM-20
		acres										
	Minimum Lot Width (feet) [4]	200	150	100	75	60	50	40[98]	40[98]			
	Minimum Lot Frontage (feet) [1211]	160	120	80	60	48	40	40[98]	40[98]			
Residential Attached	Front Yard and Side Street Setback (feet) [4] [5]	Local						30[98]	30[98]	30	30	30
		Collector						40[98]	40[98]	40	40	40
		Arterial / Mack Hatcher						50[98]	50[98]	50	50	50
	Side Yard Setback (feet)							15 [98][1110]	15 [98][1110]	15 [1110]	15 [1110]	15 [1110]
	Rear Yard/Alley Setback (feet)							30 [98]	30 [98]	25	25	25

NOTES:

- [1] For lots in recorded subdivisions or approved PUDs, the setbacks, lot sizes, and maximum densities shown in this table shall not apply, and the requirements shown on the Final Plat or approved PUD shall govern.
- [2] Unified developments may establish interior lot lines as necessary, provided that the bulk requirements along the outer boundaries of the development shall be retained as specified in this table.
- [3] Shaded cells indicate that no requirement exists.
- [4] ~~Where the average front yard for existing buildings on the same block face is more than or less than the minimum required front yard, the minimum front yard shall instead be within 25 percent of the average front yard for existing buildings on the same block face.~~
- [54] ~~In cases where a transitional feature is required, the minimum setback shall be in accordance with Subsection 5.3.4, Transitional Features.~~ **The minimum setback, minimum lot width, and minimum lot size shall be in accordance with Subsection 5.3.4, Transitional Features.**
- [65] Where an immediately adjacent existing building is set back less than the minimum required side or rear yard, the minimum side or rear yard requirement shall instead be the same as the immediately adjacent developed building, but not less than five feet. Buildings shall maintain a minimum spacing of ten feet.
- [76] Minimum of eight feet each side, minimum of 20 feet between dwellings.
- [87] Minimum of five feet each side, minimum 12 feet between dwellings.
- [98] Larger or smaller setbacks, lot widths, lot frontages and lot sizes, beyond the range presented in this table, are permitted in cases where topographical or natural constraints exist, or where a particular design approach warrants a different setback subject to Subsection 2.4.2, Planned Unit Developments.

TABLE 3-6: SITE DEVELOPMENT STANDARDS FOR RESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2], [3], [4] [109]

Standard	AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	RM-10	RM-15	RM-20
[109] Appurtenances may encroach into a side-yard provided they maintain a minimum setback of five feet from the property line and ten feet from principal structures on adjacent lots. [1110] For unified developments, internal side setback shall be determined by the applicable Building and Fire Codes as adopted by the City of Franklin. [1211] The minimum lot frontage width shall be required to be maintained to the front yard setback line, at which point the minimum lot width shall apply. However, the minimum lot frontage requirement shall not apply to lots located on the turning radius of a cul-de-sac.											

...

TABLE 3-7: SITE DEVELOPMENT STANDARDS FOR NONRESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2] [3]

Standard				Base Zoning Districts											
		AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	GO	NC	GC	LI	HI	CI
Front Yard and Side Street Setback (feet) [3] [4]	Local	100	75	60	40	25	25	30	30	50	20	30	75	30	20
	Collector	150	100	90	75	60	55	40	40						
	Arterial/ Mack Hatcher	225	150	125	100	80	75	50	50						
Side Yard Setback (feet) [54] [87]		50	35	35	[65]	[76]	[76]	[76]	[76]	25	10	15	25	15	10
Rear Yard Setback (feet) [54]		100	65	50	40	30	30	30	30	40	25	25	25	25	25

NOTES:

- [1] For lots in recorded subdivisions or approved PUDs, the setbacks, lot sizes, and maximum densities shown in this table shall not apply, and the requirements shown on the final plat and/or approved PUD shall govern.
- [2] Unified developments may establish interior lot lines as necessary, provided that the bulk requirements of the outer boundaries along the development shall be retained as specified in this table.
- [3] ~~Where the average front yard for existing buildings on the same block face is more than or less than the minimum required front yards, the minimum front yard shall instead be within 25 percent of the average setbacks for existing buildings on the same block face.~~
- [43] ~~In cases where a transitional feature is required, the minimum setback shall be in accordance with Subsection 5.3.4, Transitional Features. The minimum setback shall be in accordance with Subsection 5.3.4, Transitional Features.~~
- [54] Where an immediately adjacent existing building is set back less than the minimum required side or rear yard, the minimum side or rear yard requirement shall instead be the same as the immediately adjacent developed building.
- [65] Minimum of eight feet each side, minimum of 20 feet between dwellings.
- [76] Minimum of five feet each side, minimum 12 feet between dwellings.

TABLE 3-7: SITE DEVELOPMENT STANDARDS FOR NONRESIDENTIAL BUILDING TYPES IN CONVENTIONAL AREAS [1], [2] [3]

Standard	Base Zoning Districts													
	AG	ER	R-1	R-2	R-3	R-6	SD-R	SD-X	GO	NC	GC	LI	HI	CI
[87]	Appurtenances are permitted to encroach into a required front or rear yard setback up to six feet and within side yards up to five feet from the property line provided a minimum of ten feet between buildings is maintained.													

...

TABLE 3-8 SITE DEVELOPMENT STANDARDS FOR TRADITIONAL AREAS [1], [2], [3] [6]

Standard	Residential Detached (Street Loaded)	Residential Detached (Alley Loaded)	Residential Attached	Mixed-Use	Nonresidential
Front Yard and Side Street Setback [4] [5] [6] [7]	10-30 feet	10-30 feet	0 or 5-25 feet	0–15 feet	0-20 feet
Side Yard Setback [8] [12]	5 feet	5 feet	[9] [13]	0-5 feet	0 feet
Rear Yard Setback [8]	5 feet	5 feet	5 feet	0 feet	0 feet
Main Body/Primary Facade Width (Maximum) [10]	50 feet	50 feet			
Minimum Lot Size [6]	4,000 square feet	2,100 square feet			
Minimum Lot Width [5] [6] [11]	40-85 feet	30-70 feet			
Minimum Lot Frontage [5] [14]	40 feet	30 feet			

NOTES:

- [1] For lots in recorded subdivisions or approved PUDs, the setbacks and lot sizes, maximum densities, and primary façade widths shown in this table shall not apply, and the requirements shown on the final plat, the approved PUD, or conditions on existing lots shall govern.
- [2] Numbers shown as a range indicate a minimum and maximum (Example: 10-30). Shaded cells indicate that no requirement exists.
- [3] Unified developments may establish interior lot lines as necessary, provided that the bulk requirements of the outer boundaries of the development shall be retained as specified in this table.
- [4] For mixed-use and single-use nonresidential building types developed according to the traditional standards, the front building setback shall be measured from the back edge of the sidewalk, not the right-of-way line.
- [5] Larger or smaller setbacks, lot widths, lot frontages and lot sizes, beyond the range presented in this table, are permitted in cases where topographical or natural constraints exist, or where a particular design approach warrants a different setback, subject to Subsection 2.4.2, Planned Unit Developments.

TABLE 3-8 SITE DEVELOPMENT STANDARDS FOR TRADITIONAL AREAS [1], [2], [3] [6]

- [6] ~~In cases where a transitional feature is required, the minimum setback and lot width shall be in accordance with Subsection 5.3.4, Transitional Features.~~ **The minimum setback, minimum lot width, and minimum lot size shall be in accordance with Subsection 5.3.4 Transitional Features.**
- [7] The minimum setback from Mack Hatcher Parkway shall be 80 feet, and the minimum setback from Interstate 65 shall be 100 feet.
- [8] Where an immediately adjacent existing building is set back less than the minimum required side or rear yard, the minimum side or rear yard requirement shall instead be the same as the immediately adjacent developed building, but not less than five feet. Buildings shall maintain a minimum spacing of ten feet.
- [9] Minimum of zero feet each side, minimum ten feet between buildings.
- [10] Side or rear wings designed in accordance with Subsection 5.3.9 are exempt from the maximum width.
- [11] Corner lots may be up to 15 feet wider to accommodate porches or other architectural feature facing the street, and the maximum lot size shall not apply.
- [12] Appurtenances are permitted to encroach into a required front or rear yard setback up to six feet and within side yards up to five feet from the property line provided a minimum of ten feet between buildings is maintained.
- [13] Internal side setbacks shall be determined by the City of Franklin Building Code and or the City of Franklin Fire Code.
- [14] The minimum lot frontage width shall be required to be maintained to the front yard setback line, at which point the minimum lot width shall apply. However, the minimum lot frontage requirement shall not apply to lots located on the turning radius of a cul-de-sac.

...

SECTION IV. That Chapter 3, Subsection 3.3.1 of the Franklin Zoning Ordinance is hereby amended to delete the following text noted with a ~~strikethrough~~; to add the following text noted in **bold**, and is approved to read as follows:

3.3 Site Development Standards

3.3.1 Measurements, Computations, and Exceptions

...

(4) Setbacks, Yards, and Height

...

(h) Height Measurement

(i) Building height shall be measured in the number of complete stories above the finished grade for any building, including habitable attics, half-stories, mezzanines, and at-grade structured parking, but excluding:

A.) Spaces completely below grade, such as basements, cellars, crawl spaces, sub-basements, and underground parking structures; and

B.) Features that are more than one-half story below the finished grade.

(ii) For the purposes of measuring maximum building height for Subsection 5.3.4, Transitional Features:

A.) To calculate the average height, story and half-story heights along the same block face shall be summed, then divided by the total number of principal structures; and.

B.) To calculate one half-story above the average height, one-half (0.5) shall be added to the average height (calculated above), then rounded to the nearest half or whole story.

SECTION V. That Chapter 8, Section 8.3, of the Franklin Zoning Ordinance is hereby amended to delete the following text with a ~~striethrough~~ and add the following text noted in **bold**, and is approved to read as follows:

...

Story

The portion of a building intended for human occupancy included between the upper surface of a floor and the upper surface of the floor next above or the roof.

Story, Half

An uppermost story which usually features dormer windows and in which a sloping roof replaces the upper part of the front wall facing the street. Kneewalls do not exceed five feet in height, measured from the upstairs floor to the wall plate, and the floor space of the upstairs is less than the main floor footprint.

...

SECTION VI. BE IT FINALLY ORDAINED by the Board of Mayor and Aldermen of the City of Franklin, Tennessee that this Ordinance shall take effect from and after its passage on third and final reading, the health, safety, and welfare of the citizens requiring it.

ATTEST:

CITY OF FRANKLIN, TENNESSEE:

BY: _____

Eric S. Stuckey

City Administrator

BY: _____

Dr. Ken Moore

Mayor

Approved as to Form:

Shauna R. Billingsley, City Attorney

PLANNING COMMISSION RECOMMENDED:

PASSED FIRST READING:

PUBLIC HEARING HELD:

PASSED SECOND READING:

PASSED THIRD READING:

ORDINANCE 2017-48

TO BE ENTITLED: "AN ORDINANCE TO AMEND CHAPTERS 3, 5, AND 8 OF THE ZONING ORDINANCE OF THE CITY OF FRANKLIN, TENNESSEE, TO REFINE TRANSITIONAL FEATURES STANDARDS FOR INFILL DEVELOPMENT."

WHEREAS, infill development includes any development or redevelopment of existing structures, parcels, blocks, or neighborhoods within Central Franklin, its surrounding areas, and other highly-developed areas within the city; and

WHEREAS, Franklin's historic core is particularly affected by infill development when it is incompatible with the established character of the surrounding area; and

WHEREAS, the City's long-range plan, *Envision Franklin*, recommends that infill development should demonstrate compatibility with the scale, density, and aesthetics of existing, surrounding development and respect the City's unique historic character; and

WHEREAS, municipalities are statutorily authorized to zone property to regulate the location, height, and size of buildings and other structures, the percentage of a lot that may be occupied, the density of population, and the sizes of yards, courts, and other open spaces; and

WHEREAS, this text amendment enhances the quality of life and economic health of the city by preserving the character and desirable aesthetic features of established neighborhoods; and

WHEREAS, this text amendment ensures these character-defining features, such as building setbacks, building heights, and lot widths are compatible and strengthen the established neighborhood context; and

WHEREAS, this Zoning Ordinance text amendment to amend Transitional Features Standards is in the best interest of the public health, safety, or welfare.

(2) Applicability

(a) Transitional features shall be required:

- (i) ~~When design compatibility cannot be achieved~~ **To achieve design compatibility** between new and existing land uses, lots, or structures where the existing development is established and expected to remain, pursuant to *Envision Franklin*; or
- (ii) Between lots or uses within a single mixed-use development located in either traditional or conventional areas; ~~or~~
- (iii) **For residential development within CFCO Districts, or development within the OR District;**

(b) In cases where the standards of this Subsection and other Chapter 5 Sections conflict, the more restrictive standards shall apply. Within the HPO District, where *Historic District Design Guidelines* and this Subsection conflict, the *Historic District Design Guidelines* shall take precedence;

(c) It shall be determined by the Planning and Sustainability Department whether transitional feature requirement(s) shall apply, pursuant to *Envision Franklin* and *Historic District Design Guidelines*, where applicable.

~~(b) In conventional areas, the DRT may require the use of transitional features in addition to the use of a buffer, in accordance with the standards in Subsection 5.4.7, Buffers, where such transitional features are necessary to reduce potential adverse impacts between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture. If the applicant disagrees with the decision of the DRT regarding the use of transitional features, the applicant may appeal the decision to FMPC and/or BOMA, depending on the type of application.~~

~~(c) In traditional areas, the DRT may require the use of a buffer in lieu of or in addition to the use of a transitional feature where such buffer is necessary to reduce potential adverse impacts between different land uses or buildings differing in scale, mass, height, proportion, form, or architecture. If the applicant disagrees with the decision of the DRT regarding the use of buffers or transitional features, the applicant may appeal the decision to FMPC and/or BOMA, depending on the type of application.~~

as where a transition between different land uses or buildings differing in scale, height, proportion, form, or architecture is needed, the following approaches may be used, subject to the approval of the DRT, or the Department of Building and Neighborhood Services, and Department of Planning & Sustainability, to establish a transition between uses, lots, and structures:

Building Setbacks

- i. The minimum front yard setback shall be the average setback of existing principal structures on the same block face. No new structure shall be located closer to the front lot line than the closest adjacent principal structure; Use setbacks that are within 25 percent of the average setbacks for existing uses on the same block face provided no new use is closer to the right-of-way than the closest existing principal structure
- i. Side and rear yard setbacks in recorded subdivisions shall be no less than the minimum platted setbacks.
- i. The use of a Class C landscape buffer and/or a fence or wall may be required where necessary to reduce potential adverse impacts of new uses or new buildings differing in height, mass, or form. The applicant may appeal the decision to require a buffer to the FMPC, HZC, and/or BOMA, depending on the type of application.



Figure 5-4: The new construction (in tan outlined in red) on the right with a “No” does not meet an appropriate average setback for its block face. The dwelling outlined in red on the left with a “Yes” is an appropriate average setback for its block face.

(b) Lot Sizes

For residential lots within CFCO Districts, or lots zoned OR District, the lot size of a new lot shall be a minimum of 75 percent of the average lot size of existing lots on the same block face.

(c) Lot Widths

~~Use lot widths that are 40~~ The lot width for a new residential lot or lot zoned OR shall be a minimum of 75 percent of the average lot width for existing lots on the same block~~;~~ face, or on the nearest adjacent block face where applicable.

(d) Building Height

- i. Residential development within CFCO Districts or development within the OR District shall meet the following standards:

A. Building height at the front elevation shall not exceed one half-story above the average height of existing buildings on the same block face;



Figure 5-5: These examples depict whole and half-stories for the purposes of determining building height.

B. Building height at the front elevation shall not exceed one-half story above the shortest immediately adjacent structure on the same block face.



Figure 5-6: These are examples of appropriate design solutions for achieving a one and one-half story appearance at the front elevation.

C. Façade width shall be within 25 percent of the average of immediately adjacent building façade widths;

D. Foundation height shall be a minimum of 12 inches and maximum of 18 inches, unless topographical constraints necessitate additional foundation height;

E. Buildings shall blend with existing buildings along the block face through use of:

- a. Similar roof shapes;
- b. Dormers set back a minimum of one foot from the exterior wall of a front or side elevation;
- c. Massing that divides the building into smaller parts;
- d. Materials that do not accentuate verticality;
- e. One-story front porch or entry element;
- f. Attached Residential may also utilize the methods outlined in Subsection 5.3.4(3)(e).

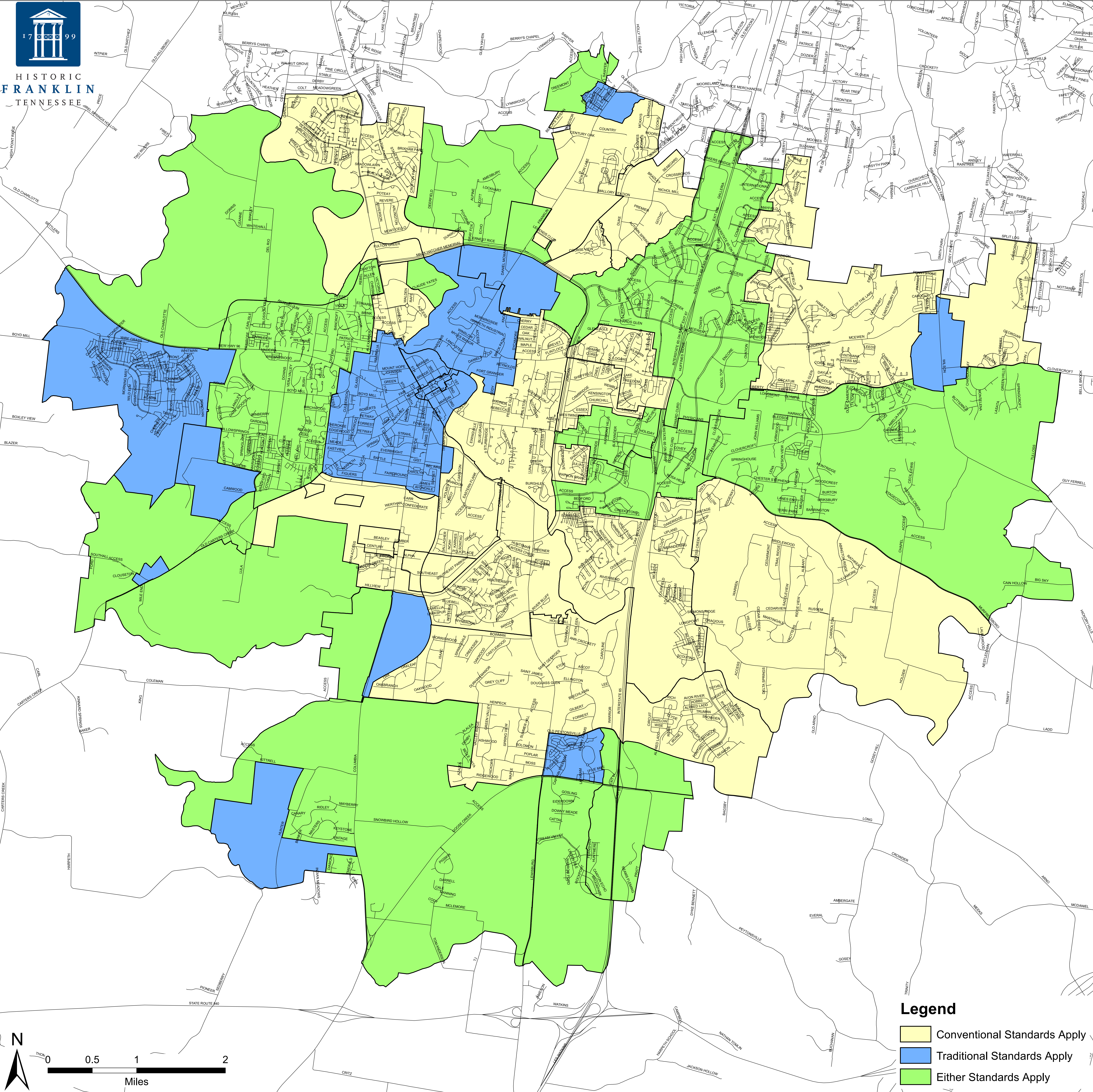
F. Garages shall have traditional placement and orientation, and be subordinate in height to the rest of the principal structure.

ii. Nonresidential and Mixed-Use Standards

- A. ~~Ensure the perceived~~ Façade width and height on facades of adjacent structures and structures on opposing sides of a street ~~are shall be~~ consistent with each other such that neither façade exceeds the other's dimensions by more than 25 percent. Topography, viewshed analysis, and methods outlined in Subsection 5.3.4(3)(e) may be included in this assessment;**
- B. At major intersections of any combination of arterials and/or collectors in MECO, building height shall be balanced across the intersection, using a viewshed analysis as required in Subsection 3.4.6, HTO, where applicable;**
- C. At the edge of a zoning district where the adjacent district has a lower maximum building height, buildings shall transition in height using methods outlined in Subsection 5.3.4(3)(e).**

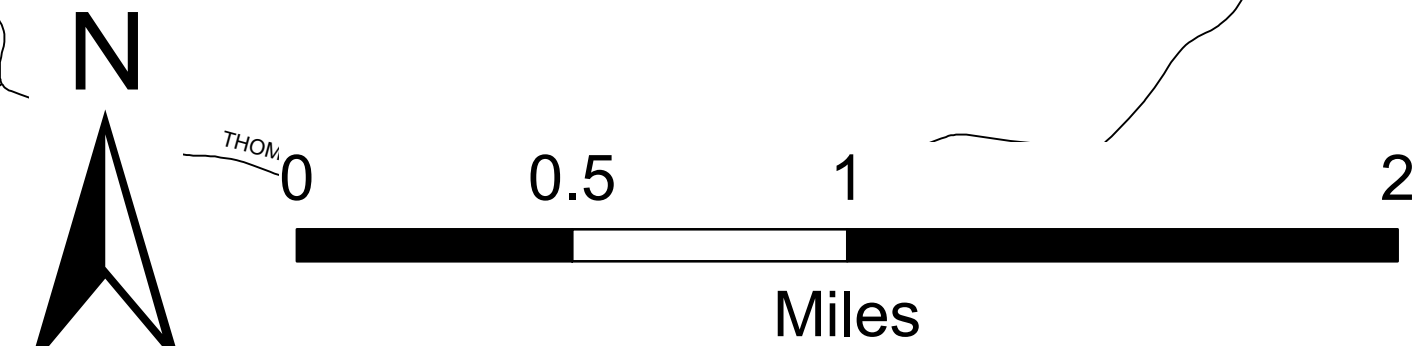


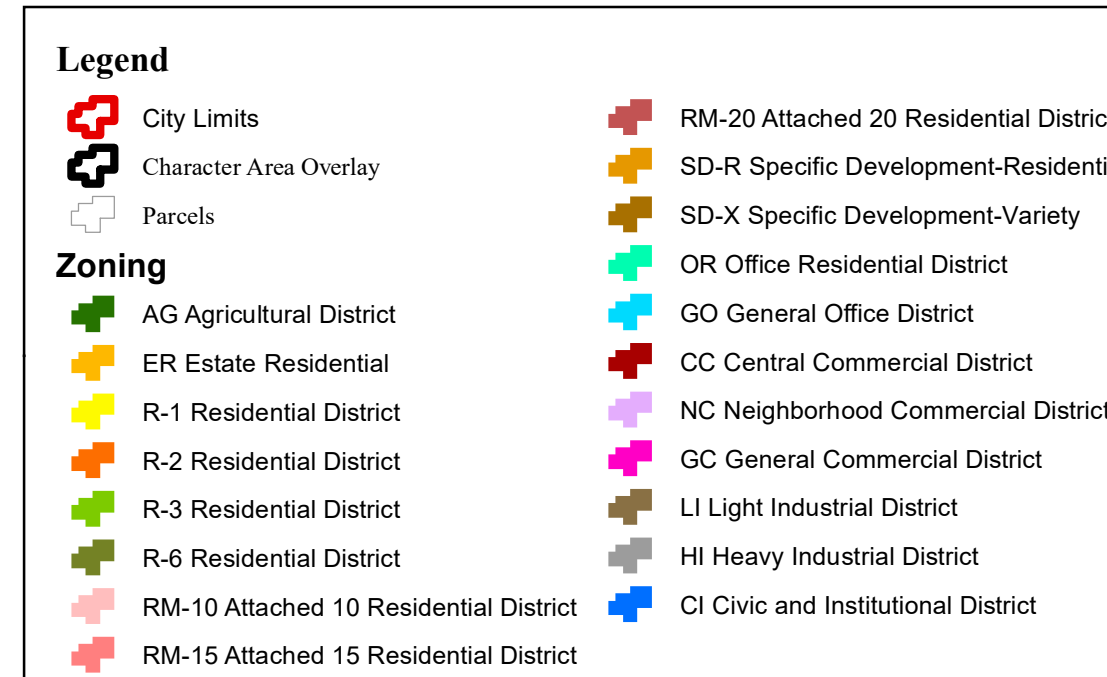
HISTORIC
FRANKLIN
TENNESSEE



Legend

- Conventional Standards Apply
- Traditional Standards Apply
- Either Standards Apply



[illegible]

Date: 12/14/2017

FRANKLIN DISCLAIMER
This map was created by the City of Franklin's IT Department and was compiled from the most authentic information available. The City is not responsible for any errors or omissions contained hereon. All data and materials Copyright © 2017.
All Rights Reserved.



**STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION**

REGION 3 TRAFFIC OFFICE
6603 CENTENNIAL BOULEVARD
NASHVILLE, TENNESSEE 37243-0360
(615) 350-4189

JOHN C. SCHROER
COMMISSIONER

BILL HASLAM
GOVERNOR

October 27, 2015

City of Franklin
P.O. Box 305
Franklin, TN 37065

Re: Grading Permit
SR 397 [LM 7.0]
Franklin, Williamson Co.

Dear Mr. or Mrs.:

As requested enclosed are the necessary permit forms, a surety bond form, and a copy of the regulations which must be followed in order to work on state right of way in conformance with Departmental standards.

Please have both copies signed by the property owner and forward them, the bond and a certificate of liability insurance, to this office within thirty (30) days. If you do not respond within thirty days we will assume that you do not wish to proceed, and your application will be discarded. Any future attempt to obtain a permit for this location would then require a new application.

Your application is still in the processing stage. Once we receive the documentation listed above, we will mail you a copy of the fully executed permit signed by Department representatives. Construction may not begin until you receive this fully executed permit.

If I can be of further assistance please let me know.

Sincerely,

A handwritten signature in cursive script, reading "Phillip R. Trammel".

Phillip R. Trammel, P.E.
Regional Traffic Engineer

Tennessee
Department of Transportation
Region III Traffic Office
Transportation Management Center
6603 Centennial Blvd., 2nd Floor
Nashville, TN 37243-0360
(615) 350-4330 or (615) 350-4332

GRADING PERMIT

In order to assure that construction on State right of-way is to be performed properly and that the State will be protected from liability the following requirements must be met:

1. Permit forms:

Both copies of the permit must be signed by the property owner or a legal representative of the corporation which owns the property. Do not fill in any other blanks on permit form.

2. Insurance:

Either the property owner or the contractor shall carry general liability insurance with an insurer and in a form acceptable to the State. Proof of said insurance shall be furnished to the State in the form of an insurance certificate indicating coverage which shall match the exposure of the State to claims for negligence as set forth in Tenn. Code Ann. Section 9-8-307 as it may be from time to time amended and construed. Said limits are currently three hundred thousand dollars (\$300,000.00) per person and one million dollars (\$1,000,000.00) for each occurrence. Certificate holder must be: State of Tennessee, Department of Transportation. Such insurance shall remain in full force and effect from the beginning of construction on the right of way until such construction has been completed and approved, in writing, by the Tennessee Department of Transportation. Please specify permittee's name (property owner), and identify the location (State Route, and county) covered by this certificate of insurance. If this information is not provided the permit process may be delayed.

3. Bond: NA

Please direct correspondence concerning this permit to the above address.

**TENNESSEE DEPARTMENT OF TRANSPORTATION
PERMIT TO STATE AGENCY OR LOCAL GOVERNMENT
FOR PROJECT WITHIN HIGHWAY RIGHT-OF-WAY**

The State of Tennessee, Tennessee Department of Transportation ("TDOT"), hereby grants this special permit for the use of State property under the following terms and conditions:

PERMITTEE:

City of Franklin
P.O. Box 305
Franklin, TN 37065

AUTHORIZED USE:

Remove 50' of control access fence. Install 43' of 18" RCP with D-SEW 1A end walls. Construct entrance 24' wide to TDOT standards and specifications per drawing received October 12, 2015. At completion of water treatment facility, scarify and obliterate entrance. Replace control access fence in kind. Reseed or sod area.

LOCATION OF PREMISES:

SR 397 LM 7.0
Williamson Co.

EFFECTIVE DATES OF PERMIT:

STANDARD TERMS AND CONDITIONS

1. PERMITTEE shall assume all liability for third party claims for damages arising from its use of the Premises. *to the extent permitted by law.*
2. Prior to commencing the work authorized herein, PERMITTEE shall obtain any other permits or approvals required by federal, state or local laws, and shall notify any utility company affected by this project. PERMITTEE shall be financially responsible for any relocation or replacement of such utilities.

3. Prior to commencing the work authorized herein, PERMITTEE shall notify Tennessee One Call regarding any excavation(s) and shall ensure that the provisions of TCA 65-31-101 et seq. are met.
4. Access to the Premises shall only be at those points that have been previously approved by TDOT. Equipment and vehicles shall be confined to unpaved portions of the Premises.
5. A. PERMITTEE shall not cut any tree or similar vegetation that has a trunk over four inches in diameter.

B. PERMITTEE shall not cut any flowering trees regardless of size.
6. All work on the premises shall be performed in compliance with current TDOT Standard Specifications for Road and Bridge Construction and TDOT Standard Drawings, in addition to applicable federal, state and local law and regulations.
7. PERMITTEE must obtain prior, written approval from TDOT before deviating from the scope of the project or the manner of its construction as described in this permit, including Attachment A.
8. At no time will work authorized by this permit interfere with the normal flow of traffic on roadways adjoining the Premises. PERMITTEE is responsible for providing traffic control for this work zone in accordance with the requirements of the current *Manual on Uniform Traffic Control Devices*. If proper traffic control is not in place, TDOT may order PERMITTEE to stop work until proper traffic control is put in place.
9. While the project is underway, TDOT may conduct inspections to insure compliance with this Permit. Upon completion of the project, PERMITTEE

shall notify TDOT so that the project may be inspected and approved by TDOT.

10. PERMITTEE shall be liable for any damage to state property resulting from the subject work, including but not limited to, the roadway, shoulders, guardrail, drainage, landscaping, signs and controlled-access fences. All repair or replacement of such damage shall be made in accordance with the current TDOT Standard Specifications for Road and Bridge Construction, TDOT Standard Drawings and any other applicable design and/or construction standards or guidelines.
11. PERMITTEE shall keep all debris, soil, refuse or waste of any kind associated with the project from accumulating within the highway right-of-way.
12. PERMITTEE does hereby covenant and agree that in the event the Permit is for the construction or use of or access to space on, over, or under real property acquired, or improved under the Federal-Aid Highway Program, the PERMITTEE shall comply with all requirements imposed pursuant to Title 49, Code of Federal Regulations, Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the Department of Transportation – Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations may be amended.
13. Nothing in this Permit shall be construed to limit TDOT's right to enter the Premises at any time.
14. If the PERMITTEE fails to comply with any of the foregoing conditions, TDOT shall have the right to revoke this permit, and require the immediate vacation of the Premises by the PERMITTEE. In the event of revocation, PERMITTEE must restore the Premises to its original condition. If PERMITTEE fails to do

so within a reasonable time after revocation, TDOT may restore the Premises at the expense of the PERMITTEE.

15. This permit is non-transferable.

16. This permit shall not be construed as a conveyance of any interest in real property.

17. All notices required to be given to TDOT under this Permit shall be sent to:

Johnny Englett
6603 Centennial Blvd.
Nashville, TN 37243
615-350-4338

IN WITNESS WHEREOF, the parties, through their authorized representatives, have executed this agreement.

**STATE OF TENNESSEE
TENNESSEE DEPARTMENT OF TRANSPORTATION**

BY: _____
REGIONAL ENGINEERING DIRECTOR DATE _____

APPROVED AS TO FORM:

REGIONAL ATTORNEY DATE _____

PERMITTEE:
City of Franklin

BY: _____ DATE _____

TITLE: _____

CONTRACTOR:

BY: _____ DATE _____
(to be signed only when bond and/or certificate
of general liability insurance is furnished by
Contractor) By signing this Permit, Contractor
agrees to be bound by the terms and conditions
herein.

TITLE: _____

Approved as to form:

Tiffany M. Pope, Staff Attorney

ACORD_{TM} CERTIFICATE OF LIABILITY INSURANCE				DATE (MM/DD/YYYY)		
PRODUCER Phone: Fax:		THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.				
Insurance Company Address		INSURERS AFFORDING COVERAGE NAIC #				
INSURED Property Owner (Permittee) OR Contractor Mailing Address		INSURER A: _____ INSURER B: _____ INSURER C: _____ INSURER D: _____ INSURER E: _____				
COVERAGES THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS						
INSUR	ADULT	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YYYY)	POLICY EXPIRATION DATE (MM/DD/YYYY)	LIMITS
A		GENERAL LIABILITY ☒ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS MADE ☒ OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☒ PROJECT ☐ LOC			For the duration of the Permit	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ _____ MED EXP (Any one person) \$ _____ PERSONAL & ADV INJURY \$ 300,000 GENERAL AGGREGATE \$ _____ PRODUCTS - COMPTOP AGO \$ _____
A		AUTOMOBILE LIABILITY ☐ ANY AUTO ☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS ☐ HIRED AUTOS ☐ NONOWNED AUTOS				COMBINED SINGLE LIMIT (Ea accident) \$ _____ BODILY INJURY (Per person) \$ _____ BODILY INJURY (Per accident) \$ _____ PROPERTY DAMAGE (Per accident) \$ _____
		GARAGE LIABILITY ☐ ANY AUTO				AUTO ONLY - EA ACCIDENT \$ _____ OTHER THAN AUTO ONLY: EA ACC \$ _____ AGG \$ _____
A		EXCESS UMBRELLA ☐ OCCUR ☐ CLAIMS MADE ☐ DEDUCTIBLE ☐ RETENTION \$ _____				EACH OCCURRENCE \$ _____ AGGREGATE \$ _____ \$ _____ \$ _____ \$ _____
B		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below				☐ WC STATUS ☐ OTHER EL EACH ACCIDENT \$ _____ EL DISEASE - EA EMPLOYEE \$ _____ EL DISEASE - POLICY LIMIT \$ _____
A		OTHER				Limit: _____ Ded: _____
DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS Permittee (Name) _____ Permit Location (State Route, City, County) _____						
CERTIFICATE HOLDER State of Tennessee (Dept of Transportation) Region 3 - Traffic Office 6603 Centennial Boulevard Nashville, TN 37243-0360				CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES. AUTHORIZED REPRESENTATIVE _____ <i>Christie Reese</i>		

ACORD 25 (2001/08)

©ACORD CORPORATION 1988

City of Franklin
Water
Reclamation
Facility
Modifications
& Expansion Project

PROPOSED
CONSTRUCTION
ENTRANCE
TDOT DRIVEWAY
PERMIT EXHIBIT



May 20, 2015



RESOLUTION 2017-89

A RESOLUTION RECOGNIZING THE VOLUNTARY FINANCIAL CONTRIBUTION AND TIMING OF SAID CONTRIBUTION FROM SOUTHERN LAND COMPANY THAT HELPED FUND AND FACILITATE THE DESIGN OF THE NORTHWEST QUADRANT OF MACK HATCHER PARKWAY AND CONSTRUCTION OF THE MULTI-USE PATH.

WHEREAS, January 2007, Southern Land Company initiated conversations with City staff to review development entitlement thresholds placed on the Westhaven Mixed-Use Planned Unit Development in 2001; and

WHEREAS, in 2001, during the review and approval of the Westhaven Mixed-Use Planned Unit Development, the City of Franklin Board of Mayor and Aldermen and Franklin Municipal Planning Commission linked the Westhaven development thresholds to the construction of the northwest quadrant of Mack Hatcher Parkway for which design and construction was anticipated to have been proceeding during the late 2000s; and

WHEREAS, on April 2007, Southern Land Company and its Chief Executive Officer Tim Downey, with limited progress being made by the Tennessee Department of Transportation (TDOT) on the design and construction of the northwest quadrant of Mack Hatcher Parkway, appeared before the City of Franklin Transportation Advisory Committee and Board of Mayor and Aldermen to present an amended development threshold plan for the Westhaven Mixed-Use Planned Unit Development based on an updated traffic analysis which the amended development threshold plan was subsequently approved; and

WHEREAS, on May 8, 2007, Southern Land Company Chief Executive Officer Tim Downey appeared before the City of Franklin Board of Mayor and Aldermen to discuss the cost of the engineering design work associated with the northwest quadrant of Mack Hatcher Parkway and offered to help fund this design work to expedite the Tennessee Department of Transportation's construction schedule for the northwest quadrant of Mack Hatcher Parkway; and

WHEREAS, it was determined the estimated cost to complete the engineering design for the northwest quadrant of Mack Hatcher Parkway was roughly \$1.25 million dollars, and Southern Land Company Chief Executive Officer Tim Downey offered to contribute this amount provided it expedited the Tennessee Department of Transportation construction schedule of the northwest quadrant of Mack Hatcher Parkway; and

WHEREAS, in 2016 as the Tennessee Department of Transportation were finalizing construction drawings for the northwest quadrant of Mack Hatcher Parkway which included a multi-use path and a commitment was made to designate the 1.25 million dollars contribution from Southern Land Company toward the construction of the multi-use path; and

WHEREAS, in the spring of 2017, the Tennessee Department of Transportation announced the construction of the northwest quadrant of Mack Hatcher Parkway was included in its three-year project plan with construction expected to commence in 2018.

NOW THEREFORE, BE IT RESOLVED by the City of Franklin Board of Mayor and Aldermen that:

1. With the recent announcement by the Tennessee Department of Transportation that it has officially included the construction of the northwest quadrant of Mack Hatcher Parkway in its three-year project plan with construction expected to commence in 2018, Southern Land

Company and President Brian Sewell have agreed to honor its \$1.25 million dollar contribution for Mack Hatcher Parkway by submitting 50% of the \$1.25 million dollars (\$625,000 dollars) to the City of Franklin within thirty (30) days following the Tennessee Department of Transportation releasing its Notice to Proceed to the construction firm awarded the contract to build the northwest quadrant of Mack Hatcher Parkway and the final 50% of the \$1.25 million dollars (\$625,000 dollars) to the City of Franklin within twelve (12) months following submittal of the initial installment, but in no case shall the final installment be submitted later than thirteen (13) months following the Tennessee Department of Transportation releasing its Notice to Proceed.

2. Upon the City of Franklin receiving the total \$1.25 million dollar contribution from Southern Land Company, these funds will be deposited with the Tennessee Department of Transportation for the construction of the multi-use path, and with construction commencing on the northwest quadrant of Mack Hatcher Parkway, the previously placed cap on development predicated on the construction of northwest quadrant of Mack Hatcher Parkway shall no longer exist.

IT IS SO RESOLVED AND DONE on this the _____ day of January 2018.

ATTEST:

CITY OF FRANKLIN, TENNESSEE:

By: _____
ERIC S. STUCKEY
City Administrator/Recorder

By: _____
DR. KEN MOORE
Mayor

ATTEST:

By: _____
BRIAN SEWELL
President, Southern Land Company

APPROVED AS TO FORM BY:

Shauna R. Billingsley, City Attorney

RESOLUTION 2017-87

A RESOLUTION TO ACCEPT AND RECOMMEND APPROVAL OF AMENDMENT 1 TO THE 2016 COMPREHENSIVE TRANSPORTATION NETWORK PLAN (MAJOR THOROUGHFARE PLAN) TO THE FRANKLIN MUNICIPAL PLANNING COMMISSION

WHEREAS, pursuant to Tennessee Code Annotated (T.C.A) 13-4-201, it is the function and duty of the Franklin Municipal Planning Commission (FMPC) to adopt an official general plan for the physical development of the City of Franklin; and

WHEREAS, the FMPC may from time to time amend, extend, or add to the plan or carry any part of subject matter into greater detail; and

WHEREAS, the Comprehensive Transportation Network Plan (Major Thoroughfare Plan), which serves as a long-range plan for the transportation network, was last updated on the 25th day of August 2016; and

WHEREAS, the purpose of Amendment 1 is to reclassify South Carothers Road (Longpoint Way to Carothers Parkway South) to a minor collector and adopt a traffic signal masterplan; and

WHEREAS, the Board of Mayor and Aldermen finds that it is in the best interest of the City of Franklin to accept and recommend approval of Amendment 1 to the 2016 Comprehensive Transportation Network Plan (Major Thoroughfare Plan) to the FMPC.

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF MAYOR AND ALDERMEN OF THE CITY OF FRANKLIN, TENNESSEE, AS FOLLOWS: Amendment 1 to the 2016 Comprehensive Transportation Network Plan (Major Thoroughfare Plan) as accepted by the Board of Mayor and Aldermen, be recommended for approval to the Franklin Municipal Planning Commission.

IT IS SO RESOLVED AND DONE on this ____ day of _____, 2018

ATTEST:

CITY OF FRANKLIN, TENNESSEE:

By: _____

Eric S. Stuckey
City Administrator

By: _____

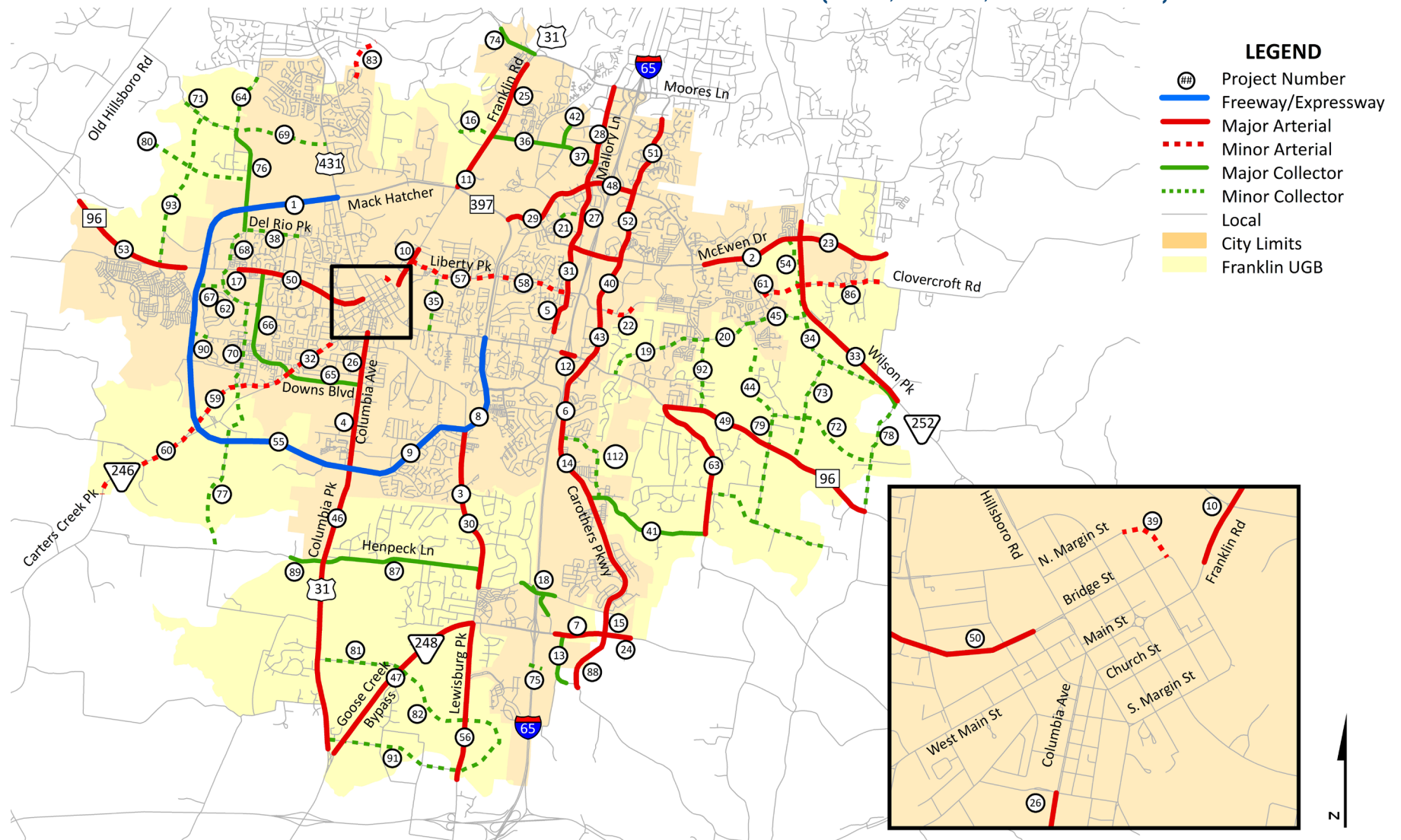
Dr. Ken Moore
Mayor

Approved as to Form:

By: _____

Shauna R. Billingsley
City Attorney

PROPOSED ROADWAY PROJECTS REFERENCE MAP (SHORT, MEDIUM, AND LONG TERM)



2020 (SHORT TERM) PROPOSED PROJECTS

Project Number	Roadway	To	From	Length (Miles)
1	Mack Hatcher Parkway (SR-397)	Highway 96 West (SR-96W)	Hillsboro Road (SR-106/US-431)	2.64
2	East McEwen Drive	Cool Springs Boulevard	Wilson Pike (SR-252)	1.38
3	Lewisburg Pike (SR-106/US-431)	Holly Hill Drive	Mack Hatcher Parkway (SR-397)	0.86
4	Columbia Avenue (SR-6/US-31)	Mack Hatcher Parkway (SR-397)	Downs Boulevard	1.15
5	North Royal Oaks Boulevard	Lakeview Drive	Liberty Pike	0.60
6	Carothers Parkway	South Carothers Road	Murfreesboro Road (SR-96)	1.14
7	Goose Creek Bypass (SR-248) Extension	Existing Peytonsville Road	Carothers Parkway (Future Extension)	0.68
8	Mack Hatcher Parkway (SR-397)	Polk Place Drive	Murfreesboro Road (SR-96)	1.74
9	Mack Hatcher Parkway (SR-397)	Columbia Avenue (SR-6/US-31)	Polk Place Drive	1.46
10	Franklin Road (SR-6/US-31)	Harpeth River Bridge	Harpeth Industrial Court	0.56
11	Franklin Road (SR-6/US-31)	Mack Hatcher Parkway (SR-397)	Mallory Station	0.84
12	Murfreesboro Road (SR-96)	Western I-65 Ramp	Eastern I-65 Ramp	0.25
13	Peytonsville Road	Pratt Lane	Goose Creek Bypass (SR-248) (Future Extension)	0.74
14	Carothers Parkway	Long Lane	South Carothers Road	2.73
15	Carothers Parkway	Long Lane	Goose Creek Bypass (SR-248) (Future Extension)	0.31
16	South Berrys Chapel Road Realignment	South Berrys Chapel Road	Mallory Station Road	0.47
17	Boyd Mill Avenue	Highway 96 West (SR-96W)	Franklin Green Parkway	0.48
18	I-65 Overpass	Old Peytonsville Road	Long Lane	0.70
19	Clovercroft Road	Murfreesboro Road (SR-96)	Oxford Glen Drive	1.40
20	Clovercroft Road	Oxford Glen Drive	Market Street	0.72
21	Jordan Road	Aspen Grove Drive	Mallory Lane	0.32
22	Liberty Pike	Carothers Parkway	Columbia State Community College	0.32
22A	South Carothers Road	Longpoint Way	Carothers Parkway South	1.17

2030 (MEDIUM TERM) PROPOSED PROJECTS

Project Number	Roadway	To	From	Length (Miles)
23	East McEwen Drive	Wilson Pike (SR-252)	Eastern City Limits	1.25
24	Goose Creek Bypass (SR-248) Extension	Carothers Parkway (Future Extension)	Long Lane	0.36
25	Franklin Road (SR-6/US-31)	Mallory Station Road	Davenport Blvd	1.10
26	Columbia Avenue (SR-6/US-31)	Downs Boulevard	Fowlkes Street	0.73
27	Mallory Lane	Mallory Station Road	West McEwen Drive	1.22
28	Mallory Lane	Mallory Station Road	Moore's Lane (SR-441)	1.08
29	Cool Springs Boulevard	Mack Hatcher Parkway (SR-397)	Mallory Lane	1.31
30	Lewisburg Pike (SR-106/US-431)	Old Peytonsville Road	Holly Hill Drive	1.37
31	Mallory Lane	Liberty Pike	West McEwen Drive	0.64
32	West Main Street (SR-246)	Downs Boulevard	Natchez Street	0.72
33	Wilson Pike (SR-252) Realignment	Trinity Road	East McEwen Drive	2.98
34	(Old/Existing) Wilson Pike	Trinity Road	Liberty Pike (Future Extension)	2.29
35	Eddy Lane	Murfreesboro Road (SR-96)	Liberty Pike	0.78
36	Mallory Station Road	Franklin Road (SR-6/US-31)	Seaboard Lane	0.99
37	Mallory Station Road	Seaboard Lane	Mallory Lane	0.52
38	Del Rio Pike	Carlisle Lane	Poplar Grove Elementary School	0.81
39	1st Avenue North	Bridge Street	North Margin Street	0.17
40	Carothers Parkway	Liberty Pike	East McEwen Drive	0.76
41	South Carothers Road	Carothers Parkway	Arno Road	1.79
42	Seaboard Lane	Mallory Station Road	Crossroads Boulevard	0.29
43	Carothers Parkway	Murfreesboro Road (SR-96)	Liberty Pike	0.75
44	Market Street Extension	North Chapel Road (Future Extension)	Amelia Park Subdivision	1.07
45	Clovercroft Road	Market Street	(Old/Existing) Wilson Pike	0.77

2040 (LONG TERM) PROPOSED PROJECTS

Project Number	Roadway	To	From	Length (Miles)
46	Columbia Pike (SR-6/US-31)	Goose Creek Bypass (SR-248)	Mack Hatcher Parkway (SR-397)	3.89
47	Goose Creek Bypass (SR-248)	Columbia Pike (SR-6/US-31)	Lewisburg Pike (SR-106/US-431)	2.66
48	Cool Springs Boulevard	Mallory Lane	Carothers Parkway	0.63
49	Murfreesboro Road (SR-96)	Arno Road	Trinity Road	2.75
50	Highway 96 West (SR-96W)	Carlisle Lane	7th Avenue North	1.80
51	Carothers Parkway	Cool Springs Boulevard	Bakers Bridge Avenue	1.11
52	Carothers Parkway	East McEwen Drive	Cool Springs Boulevard	0.96
53	Highway 96 West (SR-96W)	Old Hillsboro Road (SR-46)	Mack Hatcher Parkway (SR-397)	1.79
54	(Old/Existing) Wilson Pike Extension	Liberty Pike Extension	East McEwen Drive	0.71
55	Mack Hatcher Parkway (SR-397)	Highway 96 West (SR-96W)	Columbia Avenue (SR-6/US-31)	4.17
56	Lewisburg Pike (SR-106/US-431)	McLemore Road	Goose Creek Bypass (SR-248)	2.13
57	Liberty Pike	Franklin Road (SR-6/US-31)	Mack Hatcher Parkway (SR-397)	1.20
58	Liberty Pike	Mack Hatcher Parkway (SR-397)	Mallory Lane	0.97
59	Carters Creek Pike (SR-246)	Mack Hatcher Parkway (SR-397) (Future SW Quadrant)	Downs Boulevard	1.54
60	Carters Creek Pike (SR-246)	Southwest Urban Growth Boundary	Mack Hatcher Parkway (SR-397) (Future SW Quadrant)	1.66
61	Liberty Pike Extension	Terminus of Existing Liberty Pike	Wilson Pike (SR-252)	0.60
62	Boyd Mill Avenue	Franklin Green Parkway	Downs Boulevard	0.38
63	Arno Road	South Carothers Road	Murfreesboro Road (SR-96)	2.04
64	Cotton Lane	Del Rio Pike	Fieldstone Parkway	0.84
65	Downs Boulevard	West Main Street (SR-246)	Columbia Avenue (SR-6/US-31)	1.01
66	Downs Boulevard	Murfreesboro Road (SR-96)	West Main Street (SR-246)	1.70
67	Boyd Mill Avenue Connector	Mack Hatcher Parkway (SR-397)	Boyd Mill Avenue	0.34
68	Carlisle Lane	Stone Mill Lane	Del Rio Pike	0.55
69	New Roadway	Cotton Lane	Hillsboro Road (SR-106/US-431)	1.27
70	Horton Lane	West Main Street (SR-246)	Boyd Mill Avenue	1.18
71	Del Rio Pike	Old Hillsboro Road (SR-46)	Cotton Lane	0.88

TABLE 3.3: 2040 (LONG TERM) PROPOSED PROJECTS, CONTINUED

Project Number	Roadway	To	From	Length (Miles)
72	North Chapel Road	Existing Western 90 degree curve	Wilson Pike (SR-252)	1.58
73	New Road (Existing North Chapel Road)	Murfreesboro Road (SR-96)	Wilson Pike (SR-252)	1.47
74	Lynnwood Way	Northwest Urban Growth Boundary	Franklin Road (SR-6/US-431)	0.61
75	Chadwell/Reams Fleming Overpass	Berry Farms - Chadwell	Berry Farms - Reams-Fleming	0.24
76	Del Rio Pike	Carlisle Lane	Cotton Lane	1.45
77	Horton Lane Extension	Carters Creek Pike (SR-246)	Coleman Road	2.44
78	Trinity Road	Murfreesboro Road (SR-96)	Wilson Pike (SR-252)	1.64
79	North Chapel Road (Future Market Street)	Murfreesboro Road (SR-96)	Existing Western 90 degree curve	0.41
80	New Roadway	Old Hillsboro Road (SR-46)	Del Rio Pike	1.41
81	Snowbird Hollow Road	Columbia Pike (SR-6/US-31)	Goose Creek Bypass (SR-248)	1.14
82	Snowbird Hollow Road	Goose Creek Bypass (SR-248)	Lewisburg Pike (SR-106/US-431)	1.26
83	Fieldstone Parkway Extension	Bexley Park Drive	South Berrys Chapel Road	0.71
84	Ralston Lane	Murfreesboro Road (SR-96)	Lewisburg Pike (SR-106/US-431)	0.72
85	McLemore Road Extension	Lewisburg Pike (SR-106/US-431)	Lewisburg Pike (SR-106/US-431)	1.35
86	Clovercroft Road	Wilson Pike (SR-252)	Eastern City Limits	1.11
87	Henpeck Lane	Columbia Pike (SR-6/US-431)	Lewisburg Pike (SR-106/US-431)	2.16
88	Carothers Parkway (South Extension)	Goose Creek Bypass (SR-248) (Future Extension)	Peytonsville Road	0.90
89	Coleman Road	Columbia Pike (SR-6/US-31)	Western Urban Growth Boundary	0.47
90	Willowsprings Boulevard Extension	Mack Hatcher Parkway (SR-397)	Existing Willowsprings Boulevard	0.74
91	McLemore Road	Goose Creek Bypass (SR-248)	Lewisburg Pike (SR-106/US-431)	1.67
92	Oxford Glen Drive	Murfreesboro Road	Clovercroft Road	0.93
93	New Roadway	Old Charlotte Pike	Del Rio Pike	1.69

FIGURE 3.14: PROPOSED ROADWAY CLASSIFICATION

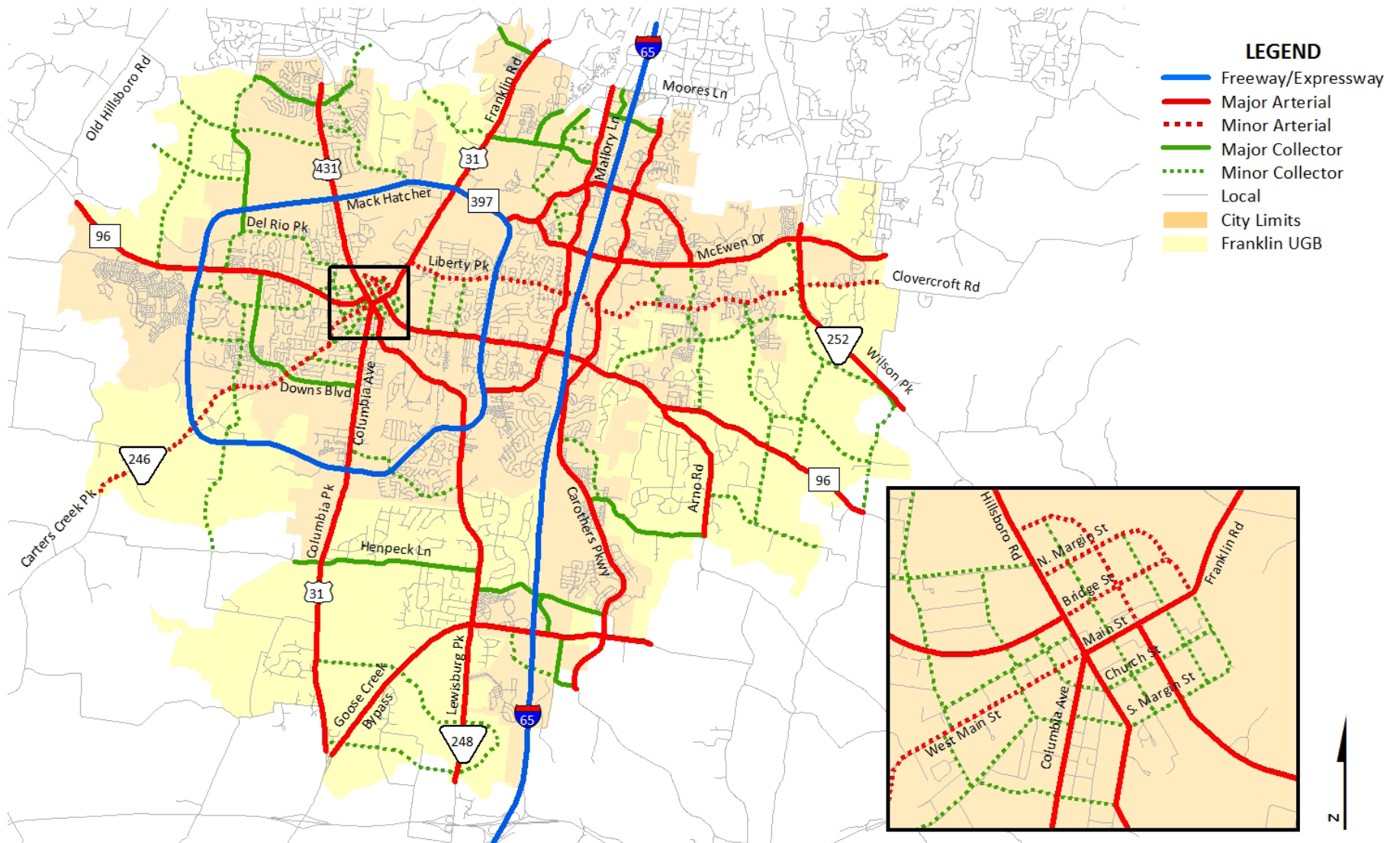
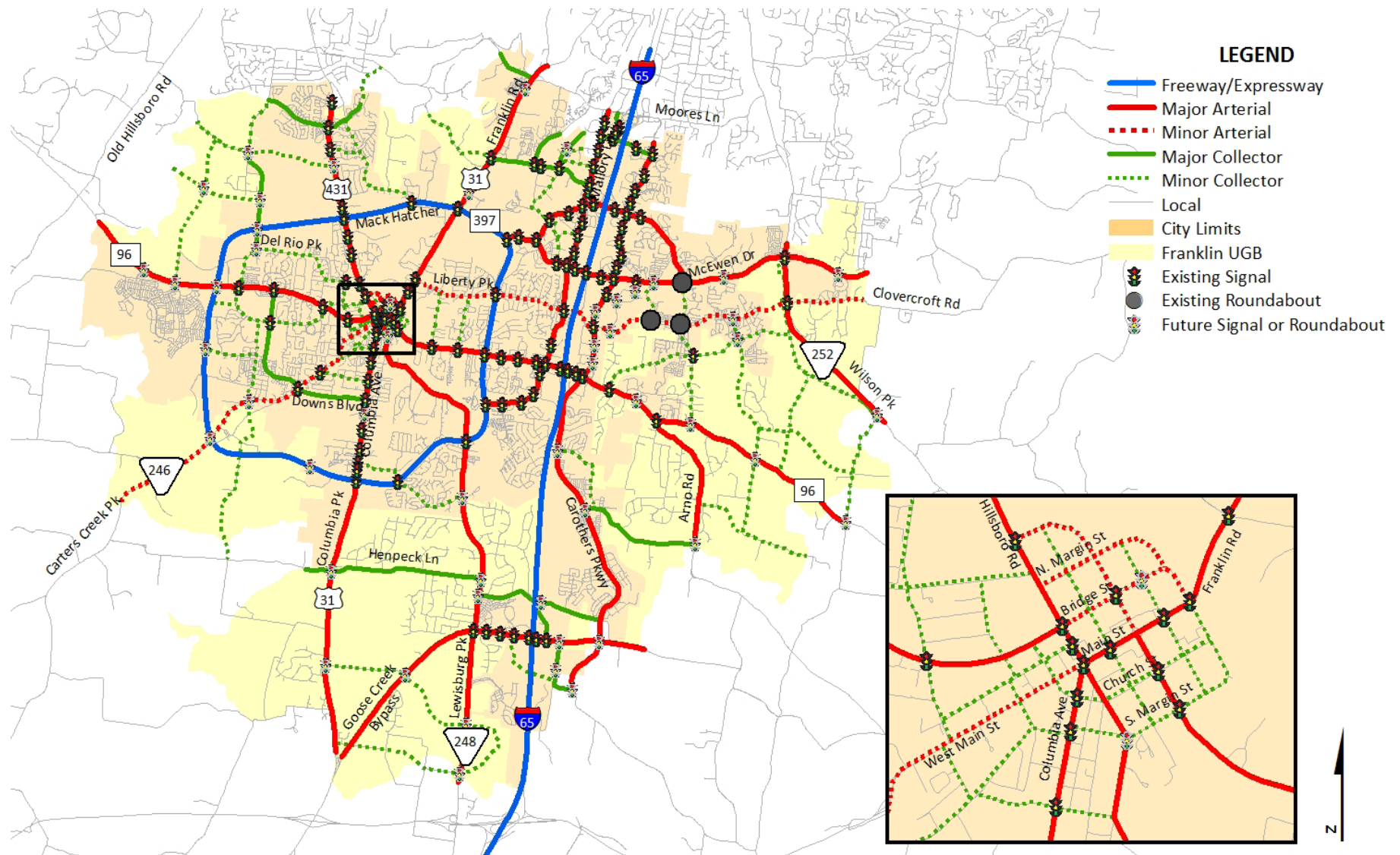


FIGURE 3.14A: PROPOSED TRAFFIC SIGNAL MASTERPLAN



City of Franklin, Tennessee
Tabulation of Submittals

Purchasing Office Solicitation No.:		2018-003 (title search and related services)			
Notice to service providers published in the <i>Williamson Herald</i> on:		11/16/17			
Number of potential submitters that were notified of / that submitted in response to this request for qualifications:		16 / 5			
Date and time submittals due and publicly opened:		12/19/17 2:00 PM			
Present at opening of submittals:		Natalie Keene, Suzanne Ward and Brian Wilcox of the City of Franklin Purchasing Office			
Target meeting of BOMA at which recommendation is scheduled to be considered:		1/23/18			
Submittals received from:	Does the submittal include all required documents?	Does the submittal take any exceptions to the City's procurement solicitation? / If so, how many?	Total quoted fee for services per title search and report or opinion (as per the City's RFQ):	Payment terms:	Submittal is valid and may be accepted through:
Dougall Law Offices, PLLC 101 Southeast Parkway Court, Suite 220 Franklin, TN 37064 R. Mark Dougall, Sole Member 615-369-8180	Yes	Yes / 2 (Indemnification Agreement and Procurement Agreement)	\$450.00	net 30 days	4/15/2018
Thomas N. Jones and Associates 339 Main St. Franklin, TN 37064 Thomas N. Jones, Senior Attorney 615-794-0807 tjones@tnjones.com	Yes	Respondent takes no exceptions	\$450.00	net 30 days	2/28/2018
Amy Cross Nance Attorney at Law 103 Forrest Crossing Blvd, Suite 205 Franklin, TN 37064 Amy Cross Nance, Attorney amy@amycrossnance.com 615-794-5644	Yes	Respondent takes no exceptions	\$450.00	net 30 days	2/28/2018
Puryear, Newman & Morton, PLLC 130 Fourth Ave. South Franklin, TN 37064 Charles E. Morton, IV, Member 615-790-2444 cmorton@pnmlaw.com	Yes	Respondent takes no exceptions	\$450.00	net 30 days	3/31/2018
Rochford Law & Real Estate Title, PLLC 2200 Abbott Martin Rd., Suite 201 Nashville, TN 37215 John Cobb Rochford, Owner 615-269-7676 jcr@etc1949.com	Yes	Respondent takes no exceptions	\$450.00	net 30 days	2/28/2018

City of Franklin, Tennessee
Tabulation of Submittals

Purchasing Office Solicitation No.:		2018-004 (legal counsel for real estate closings)			
Notice to service providers published in the Williamson Herald on:		11/16/17			
Number of potential submitters that were notified of / that submitted in response to this request for qualifications:		16 / 4			
Date and time submittals due and publicly opened:		12/19/17 2:00 PM			
Present at opening of submittals:		Natalie Keene, Suzanne Ward and Brian Wilcox of the City of Franklin Purchasing Office			
Target meeting of BOMA at which recommendation is scheduled to be considered:		1/23/18			
Submittals received from:	Does the submittal include all required documents?	Does the submittal take any exceptions to the City's procurement solicitation? / If so, how many?	Total quoted rates for services, per unit:	Payment terms:	Submittal is valid and may be accepted through:
DLO Title, LLC 101 Southeast Parkway Court, Suite 220 Franklin, TN 37064 R. Mark Dougall, CEO 615-369-8180 Title@DLO.CC	Yes	Yes / 2 (Indemnification Agreement and Procurement Agreement)	Copying costs: \$0.15 per page <u>Purchase/Refinance:</u> Closing Fee per closing: \$250 for buyer / \$250 for seller; Title Search Fee per closing (only charged when no title insurance purchased): \$450 for buyer / \$450 for seller; Processing Fee per closing: \$300 for buyer / \$325 for seller; Title Insurance Premium: based on rates filed with Tennessee Department of Commerce and Insurance; Attorney: \$325 per hour; Paralegal: \$65 per hour <u>Second Loan for same transaction:</u> Closing Fee per closing: \$125; Processing Fee per closing: \$200; Cost of Additional Title Insurance: per filed rates	net 30 days	4/15/2018
Amy Cross Nance Attorney at Law 103 Forrest Crossing Blvd, Suite 205 Franklin, TN 37064 Amy Cross Nance, Attorney amy@amycrossnance.com 615-794-5644	Yes	Respondent takes no exceptions	Attorney: \$200 per hour; Associates: \$175 per hour; Paralegals: \$65 per hour	net 30 days	2/28/2018
Puryear, Newman & Morton, PLLC 130 Fourth Ave. South Franklin, TN 37064 Charles E. Morton, IV, Member 615-790-2444 cmorton@pnmlaw.com	Yes	Respondent takes no exceptions	\$450 per closing	net 30 days	3/31/2018
Rochford Law & Real Estate Title, PLLC 2200 Abbott Martin Rd., Suite 201 Nashville, TN 37215 John Cobb Rochford, Owner 615-269-7676 jcr@ctc1949.com	Yes	Respondent takes no exceptions	Partner attorney: \$300 per hour; Associate attorney: \$200 per hour; Paralegal: \$100 per hour; Closing fee to City per closing: \$425 for residential property / \$650 for commercial property; Document Preparation: \$0	net 30 days	2/28/2018

Tabulation of Bids*

Purchasing Office Solicitation No.:	2018-008 (City facility landscaping and related contract services for a term of award)					
Notice to Bidders published in the Williamson Herald on:	11/9/17					
Number of vendors that were notified of / that responded to this solicitation for bids:	21 / 5					
Date and time bids due and publicly opened:	12/12/17 2:00 PM					
Present at opening of bids:	Steve Garrett of Brentwood Landscapes Inc.; Janet Harlan and Kenneth Harlan of Brentwood Lawn Care of Tennessee; Nate Thompson of LSI; Joseph Raines of Raines Landscaping; David Swift of Swift Lawn and Land; James Bilbo and Brian Walker of the City of Franklin Parks Department; and Natalie Keene, Suzanne Ward and Brian Wilcox of the City of Franklin Purchasing Office					
Target meeting of BOMA at which recommendation is scheduled to be considered:	1/23/18					
Bids received from:	Bid No.:	Does the bid include all required documents?	Does the bid MOES¹? / If not, how many exceptions do not MOES¹?	Total delivered bid price, per unit:	Payment terms:	Bid and bid pricing is valid through:
Brentwood Landscapes, Inc. 104 Glenrose Avenue Nashville, TN 37210 Steve Garrett, President 615/566-0777 steve@brentwood-landscapes.com	1 of 1	Yes	Bidder takes no exceptions	\$27,900.00	net 30 days	04/01/18
Brentwood Lawn Care of Tennessee, LLC 927 Deer Run Rd. Murfreesboro, TN 37128 Janet Harlan, Co-Owner 615/772-3987 janet@brentwoodlawncare.com	1 of 1	Yes	Bidder takes no exceptions	\$27,075.00	net 30 days	03/01/18
Landscape Services, Inc. (LSI) 204 River Hills Drive Nashville, TN 37210 Nate Thompson, Business Development 615/761-4360 natethompson@lsipros.net	1 of 1	Yes	Bidder takes no exceptions	\$27,300.00	net 30 days	02/28/18
Joseph Raines / Raines Landscaping 3008 Tyler Court Columbia, TN 38401 Joseph Raines 615/803-1475 josephrainesrl@gmail.com	1 of 1	No	Bidder takes no exceptions	\$26,350.00	net 30 days	12/31/20
Swift Lawn & Land, Inc. 221 5th Ave. S. Franklin, TN 37064 David Swift, Owner 615/838-8422 david@swiftlawn.biz	1 of 1	Yes	Bidder takes no exceptions	\$26,133.00	net 30 days	02/28/18

¹MOES indicates "meet(s) or exceed(s) specifications"

*Shaded bid is apparent lowest best bid

City of Franklin, Tennessee
Tabulation of Bids*

Jobsite No.	Jobsite Description	Description of Service	Specified estimated quantity of service dates per year	Brentwood Landscapes, Inc.		Brentwood Lawn Care of Tennessee, LLC		Landscape Services, Inc. (LSI)		Raines Landscaping		Swift Lawn & Land, Inc.	
				Total bid fee per service date by service	Estimated total bid fee per year by service	Total bid fee per service date by service	Estimated total bid fee per year by service	Total bid fee per service date by service	Estimated total bid fee per year by service	Total bid fee per service date by service	Estimated total bid fee per year by service	Total bid fee per service date by service	Estimated total bid fee per year by service
1	Police headquarters at 900 Columbia Ave.	Mowing and related	35	\$300.00	\$10,500.00	\$200.00	\$7,000.00	\$360.00	\$12,600.00	\$225.00	\$7,875.00	\$195.00	\$6,825.00
		Mulching and related	1	\$9,000.00	\$9,000.00	\$7,500.00	\$7,500.00	\$6,000.00	\$6,000.00	\$7,500.00	\$7,500.00	\$6,988.00	\$6,988.00
		Shrubbery trimming	2	\$1,500.00	\$3,000.00	\$2,000.00	\$4,000.00	\$500.00	\$1,000.00	\$2,000.00	\$4,000.00	\$2,100.00	\$4,200.00
		Trimming dead flower tops / sprigs	2	\$750.00	\$1,500.00	\$100.00	\$200.00	\$250.00	\$500.00	\$250.00	\$500.00	\$675.00	\$1,350.00
2	property at 405 Hillsboro Rd.	Mowing and related	20	\$50.00	\$1,000.00	\$150.00	\$3,000.00	\$120.00	\$2,400.00	\$100.00	\$2,000.00	\$110.00	\$2,200.00
		Shrubbery trimming	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3	property at 108 Southeast Parkway	Mowing and related	20	\$100.00	\$2,000.00	\$175.00	\$3,500.00	\$180.00	\$3,600.00	\$125.00	\$2,500.00	\$130.00	\$2,600.00
		Mulching and related	1	\$500.00	\$500.00	\$675.00	\$675.00	\$600.00	\$600.00	\$1,025.00	\$1,025.00	\$890.00	\$890.00
		Shrubbery trimming	2	\$200.00	\$400.00	\$600.00	\$1,200.00	\$300.00	\$600.00	\$475.00	\$950.00	\$540.00	\$1,080.00
Grand total:					\$27,900.00		\$27,075.00		\$27,300.00		\$26,350.00		\$26,133.00

*Shaded bid is apparent lowest best bid

Tabulation of Bids*

Purchasing Office Solicitation No.:	2018-007 (mowing and related contract services for certain City parks and certain other City-owned properties for a term of award)					
Notice to Bidders published in the Williamson Herald on:	11/9/17					
Number of vendors that were notified of/ that responded to this solicitation for bids:	21 / 3					
Date and time bids due and publicly opened:	12/12/17 2:00 PM					
Present at opening of bids:	Janet Harlan of Brentwood Lawn Care of Tennessee; Kenneth Harlan of Brentwood Lawn Care of Tennessee; Nate Thompson of LSI; David Swift of Swift Lawn and Land; Brian Walker and James Bilbo of the City of Franklin Parks Department; and Natalie Keene, Suzanne Ward and Brian Wilcox of the City of Franklin Purchasing Office					
Target meeting of BOMA at which recommendation is scheduled to be considered:	1/23/18					
Bids received from:	Bid No:	Does the bid include all required documents?	Does the bid MOES¹? / If not, how many exceptions do not MOES¹?	Estimated total bid fee for all specified services per year:	Payment terms:	Bid and bid pricing is valid through:
Brentwood Lawn Care of Tennessee, LLC 927 Deer Run Road Murfreesboro, TN 37128 Janet Harlan, Co-Owner 615/772-3987 janet@brentwoodlawncare.com	1 of 1	Yes	Bidder takes no exceptions	\$320,850.00	net 30 days	03/01/18
Landscape Services, Inc. (LSI) 204 River Hills Drive Nashville, TN 37210 Nate Thompson, Business Development 615/761-4360 natethompson@lsipros.net	1 of 1	Yes	Bidder takes no exceptions	\$247,140.00	net 30 days	02/28/18
Swift Lawn & Land, Inc. 221 5th Ave. S. Franklin, TN 37064 David Swift, Owner 615/838-8422 david@swiftlawn.biz	1 of 1	Yes	Bidder takes no exceptions	\$556,920.00	net 30 days	02/28/18

¹MOES indicates "meet(s) or exceed(s) specifications"

*Shaded bid is apparent lowest best bid

City of Franklin, Tennessee
Tabulation of Bids*

Jobsite No.	Jobsite Description	Specified estimated quantity of service dates per year	Brentwood Lawn Care of Tennessee, LLC		Landscape Services, Inc. (LSI)		Swift Lawn & Land, Inc.	
			Total bid lump-sum fee per cut for all specified services	Estimated total bid lump-sum fee per year for all specified services	Total bid lump-sum fee per cut for all specified services	Estimated total bid lump-sum fee per year for all specified services	Total bid lump-sum fee per cut for all specified services	Estimated total bid lump-sum fee per year for all specified services
1	The Park at Harlinsdale Farm – 239 Franklin Rd.	36	\$3,500.00	\$126,000.00	\$4,000.00	\$144,000.00	\$8,041.00	\$289,476.00
2	Liberty Park – 2080 Turning Wheel Lane	36	\$2,600.00	\$93,600.00	\$750.00	\$27,000.00	\$2,900.00	\$104,400.00
3	Jim Warren Park – 705 Boyd Mill Ave.	36	\$2,600.00	\$93,600.00	\$1,700.00	\$61,200.00	\$4,159.00	\$149,724.00
4	Old Liberty Pike Neighborhood Park – 204 Old Liberty Pike	36	\$35.00	\$1,260.00	\$75.00	\$2,700.00	\$50.00	\$1,800.00
5	117 Ewingville Drive	18	\$45.00	\$810.00	\$50.00	\$900.00	\$50.00	\$900.00
6	119 Ewingville Drive	18	\$45.00	\$810.00	\$75.00	\$1,350.00	\$50.00	\$900.00
7	124 Ewingville Drive	18	\$45.00	\$810.00	\$50.00	\$900.00	\$50.00	\$900.00
8	127 Ewingville Drive	18	\$45.00	\$810.00	\$50.00	\$900.00	\$50.00	\$900.00
9	1140 Thompson Alley	18	\$35.00	\$630.00	\$30.00	\$540.00	\$50.00	\$900.00
10	Ladd Park Canoe Launch – 5007 Ryecroft Lane	18	\$45.00	\$810.00	\$75.00	\$1,350.00	\$75.00	\$1,350.00
11	131 Daniels Drive	18	\$25.00	\$450.00	\$50.00	\$900.00	\$50.00	\$900.00
12	Open Space near Daniels Drive	18	\$25.00	\$450.00	\$50.00	\$900.00	\$50.00	\$900.00
13	Nissan Walking Trail	18	\$45.00	\$810.00	\$250.00	\$4,500.00	\$215.00	\$3,870.00
Grand Totals:				\$320,850.00		\$247,140.00		\$556,920.00

*Shaded bid is apparent lowest best bid