Town of Thompson's Station
Municipal Planning Commission
Meeting Agenda
July 24, 2018

Meeting Called To Order

Pledge Of Allegiance

Minutes-

Consideration Of The Minutes Of The June 26, 2018 Meeting

Documents:

06262018 MINUTES.PDF

Election Of Planning Commission Secretary

Public Comments-

Planner Report

Concept Plan for Parsons Valley for the development of 351 residential units consisting of 228 single family lots and 123 townhomes (CP: 2018-004).

Documents:

PLANNER REPORT.PDF
PR - PARSONS VALLEY TRAFFIC ENG MEMO.PDF
PR - PARSONS VALLEY CONCEPT PLAN.PDF
PR - PARSONS VALLEY CONCEPT PLAN 2.PDF
PR - PARSONS VALLEY TRAFFIC STUDY.PDF

Unfinished Business:

1. Preliminary Plat For The Development Of Phases 14 - 17 Within The Fields Of Canterbury (PP 2018-003)

Documents:

ITEM 1 - MEMO CANTERBURY 14 - 17.PDF
ITEM 1 - JUNE PC STAFF REPORT FOR FC 14 - 17.PDF

2. Amendment To The Article III, Subdivision Regulations Section 3.9.23 – Roadway Specifications And The Inclusion Of Section 3.9.24 Related To Traffic Studies (LDO Amend 2018-004)

Documents:

ITEM 2 - MEMO LDO AMENDMENTS.PDF

New Business:

3. Preliminary Plat For The Development Of Avenue Downs In Two Phases For A

Total Of 69 Single-Family Lots, A Pump Station Lot And Five (5) Open Space Lots (PP 2018-004)

Documents:

ITEM 3 STAFF REPORT AVENUE DOWNS.PDF
ITEM 3 AVENUE DOWNS PRELIMINARY PLAT.PDF
ITEM 3 AVENUE DOWNS LANDSCAPE PLAN.PDF
ITEM 3 AVENUE DOWNS TRAFFIC STUDY FEBRUARY 2018.PDF

4. Final Plat For The Creation Of 25 Single-Family Lots Within Section 13A Of The Fields Of Canterbury (FP 2018-011)

Documents:

ITEM 4 STAFF REPORT FINAL PLAT FC13.PDF
ITEM 4 FINAL PLAT FC 13A.PDF

5. Site Plan Approval For The Expansion Of Electric Service To Serve Phases 16 And 17 Of Tollgate Village (SP 2018- 004)

Documents:

ITEM 5 STAFF REPORT.PDF
ITEM 5 SITE PLAN FOR TV ELECTRICITY.PDF

Adjourn

This meeting will be held at 7:00 p.m. at the Thompson's Station Community Center 1555 Thompson's Station Rd West

Minutes of the Meeting
of the Municipal Planning Commission
of the Town of Thompson 's Station, Tennessee
June 26, 2018

Call to Order:
The meeting of the Municipal Planning Commission of the Town of Thompson's Station was called to order at 7:00 p.m. on the 22nd day of May 2018 at the Thompson's Station Community Center with the required quorum. Members and staff in attendance were: Chairman Jack Elder; Vice Chairman Mike Roberts; Commissioner Shawn Alexander; Commissioner Brinton Davis; Alderman Ben Dilks; Commissioner Trent Harris; Commissioner Bob Whitmer; Town Planner Wendy Deats and Town Attorney Todd Moore. Town Clerk Jennifer Jones was unable to attend.

Pledge of Allegiance.

Minutes:

The minutes of the May 22, 2018 meeting were previously submitted.

> **Commissioner Davis made a motion to approve of the May 22, 2018 meeting minutes. The motion was seconded and carried unanimously.**

Public Comment:

> **None**.

Planner Report:

Concept Plan for Tollgate Village to development 25.8 acres with 232 units consisting of townhomes, live/work, condominiums and mixed use and up to 60,000 square feet of commercial (Concept Plan 2018-003).

Mrs. Deats reviewed her report regarding the Concept Plan for Tollgate Village noting concerns that this project increases the trip generation beyond what was identified in the February 2017 traffic study and may require additional improvements to access. Additional information is requested prior to any further approvals. She also stated concerns that Tollgate Village has a total of 943 taps allocated for the development and this project likely exceeds the allocation and prior to future approvals, additional sewer may be necessary.

Troy Gardner with Ragan Smith came forward to speak on behalf of the applicant.
David McGowan with Regent Homes came forward to give more detail on the Concept Plan.

New Business:

1. **Preliminary Plat for the development of phases 14-17 within the Fields of Canterbury (PP 2018-003).**

Mrs. Deats reviewed her report and with the recommended contingencies, the preliminary plat will comply with the Land Development Ordinance, therefore, Staff recommends Planning Commission approval with the contingencies:

1. Prior to the approval of construction plans, the developer shall enter into a development agreement for the project.
2. Prior to the approval of construction plans, revise the traffic study to include the phasing and timing of signal operation and equipment be modified to provide a right turn overlap for the right turn westbound and left turn southbound.
3. Prior to the approval of construction plans, the landscaping plan shall be revised to incorporate all tree replacement as required by the ordinance.
4. Buffer type 3 (semi-opaque) shall be installed in between the project and the adjacent properties within the D1 zoning district.
5. Prior to the approval of construction plans, all applicable codes and regulations shall be addressed to the satisfaction of the Town Engineer. A drainage study shall be submitted to verify that drainage is managed adequately on site.
6. Street lights shall be incorporated into these phases to match the existing neighborhood and shall be documented on the construction drawings.
7. All construction traffic into these phases shall be required to use Lioncrest Lane. The construction of Lioncrest shall be coordinated with the Town's improvements to Critz Lane.
8. During construction, the developer shall comply with all recommendations of the geotechnical report dated June 2, 2017.

Jay Easter with Ragan Smith and Ryan Manners with Encompass came forward to give a presentation on behalf of the applicant.

Alderman Dilks then reviewed his presentation citing concerns with traffic on Critz Lane.

After discussion, Commissioner Roberts made a motion to defer Item 1, the Preliminary Plat for development of phases 14-17 within the Fields of Canterbury (PP 2018-003) until the July meeting and plan a work session with Barge and possibly BOMA to discuss the development on Critz Lane and the impact that has by adding additional residential units. The motion was seconded and carried by a vote of 6 to 1 with Commissioner Davis casting the dissenting vote.

2. Amendment to the Article III, Subdivision Regulation section 3.9.23 – Roadway Specifications and the inclusion of section 3.9.24 related to traffic studies (LDO Amend 2018-004).

Mrs. Deats reviewed her Staff report and Staff is requesting the Planning Commission adopt these standards in Article 3 of the Land Development Ordinance.

After discussion, Commissioner Roberts made a motion to defer Item 2, an amendment to Article III, Subdivision Regulation section 3.9.23 – Roadway specifications and the inclusion of section 3.9.24 related to traffic studies (LDO Amend 2018-004) until July meeting and discuss during work session.

3. Request from Alderman Shepard to amend Article 1, Sections 1.2.5, 1.3 and Article 4, Section 4.5 of the Land Development Ordinance (Zone Amend 2018-005).

Mrs. Deats reviewed her Staff report.

Alderman Graham Shepard came forward to speak on behalf of his proposal agreeing with the Staff recommendations.

After discussion, Commissioner Harris made a motion to send Item 3, a request from Alderman Shepard to amend Article 1, Sections 1.2.5, 1.3 and Article 4, Section 4.5 of the Land Development Ordinance with Staff recommendations and the modification to add garage space to the Board of Mayor and Alderman. The motion was seconded and carried by vote of 5 to 2 with Commissioners Davis and Whitmer casting the dissenting votes.

There being no further business, Alderman Dilks made a motion to adjourn. The motion was seconded and the meeting was adjourned at 8:18 p.m.

_____
Jack Elder, Chairman

Attest:

_____
, Secretary

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

DATE: July 17, 2018

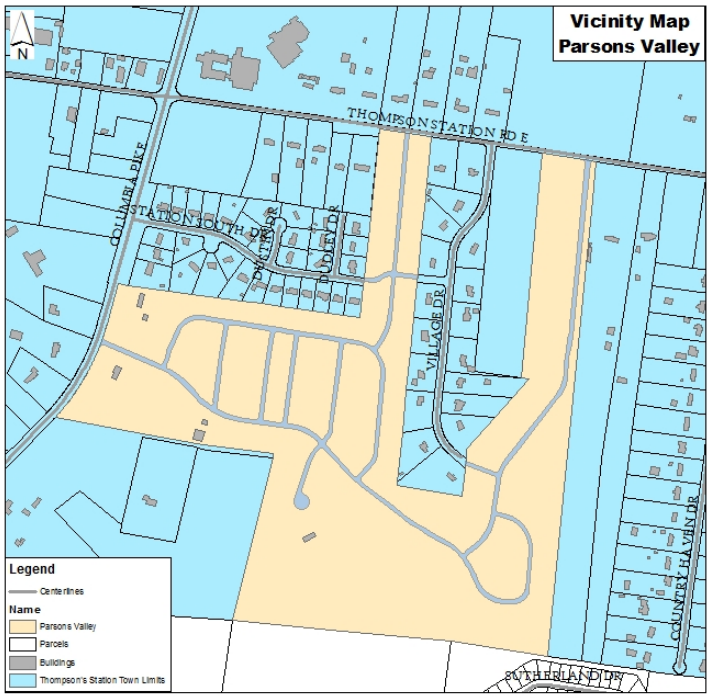
TO: Planning Commission

FROM: Wendy Deats, Town Planner

SUBJECT: Planner Report 7/24/2018

Parsons Valley Concept Plan (CP 2018-004)

Ragan Smith has submitted a concept plan for review of a development consisting of 351 units including single-family and townhomes on 118.83 acres located along the east side of Columbia Pike, south of Thompson's Station Road East within the D3 zone.



Zoning/Concept Plan

The land, consisting of 118.83 acres is located within the D3 zone. The site is located on Columbia Pike with access on Thompson's Station Road East. The subject site is zoned D3 which is intended for "higher density residential development where urban services and facilities, including public sewer, are provided or where the extension of such services and facilities will be available prior to development" (Section 1.2.7) and permits a density of three units per acre.

The project proposes 351 residential units which will consist of 228 single-family and 123 townhomes, for a density of 2.95 units an acre. Lot widths vary on the concept plan from 22 feet for townhome lot to 50 feet for village lots and 57 feet for garden and cottage lots. Setbacks are identified as 10 feet for the front yard and secondary frontages, 15 feet for the side yard aggregate with a minimum of five feet and 20 feet for the rear yard.

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

The site requires a buffer 3 (semi opaque screen) between the adjacent properties and the project site to a height of at least 20 feet. A landscaping plan was not submitted but will be required during plat review.

Block Lengths

The project proposes a roadway network, which in some areas will exceed the maximum permitted block length to which the developer is seeking administrative relief. The site, zoned D3 is permitted to have a maximum block length of 800 feet. Section 3.8.3 designates the block length and provides a provision for the Town Planner to "adjust the length of a block face by up to 10% by administrative deviation to accommodate site specific conditions" or exempt blocks "adjacent to undeveloped land, areas unsuitable for development, or pre-existing incomplete blocks from a limitation on block length buy administrative deviation."

Road A has a block length of 1,108 feet. The road, located in the southeast corner of the property is adjacent to open space, in proximity to an area within the RHPA which is also set aside in permanent open space and the land to the east is undeveloped land and can therefore be exempted.

Road B has a block length of 816 feet. This length exceeds 10% and the road does not meet the criteria to be exempt. Staff believes a modification to the plan can be done to achieve compliance with block length requirement. After discussions with Staff, the developer intends to reduce the block length to 800 feet.

Road G has a block length of 819 feet. The block length is determined by a pre-existing road (Station South Drive) which dictates the location of the intersection, therefore, can be exempted.

Road H has a block length of 2,035 feet. The road is located adjacent to the site perimeter, which is undeveloped land and can be exempted. The location of this road, given the adjacency to the neighboring parcel can provide a future connection should the neighboring property be developed.

Open Space/ Amenities

Development of the site includes 53.47 acres set aside for open space, which will comply with the 45% open space requirement. Several civic spaces are proposed as part of the open space, including a recreation lot which will contain a pool amenity. The project requires two amenities, which the pool and other civic spaces will meet.

Natural Resources

Ridgeline Hilltop Preservation/Slopes

The site does contain land within the Ridgeline Hilltop Preservation Area (RHPA). Development within this area is prohibited unless a permit is obtained from the Board of Zoning Appeals. However, no development is proposed within the RHPA and all of this area will be designated and platted as part of the open space for the project. The site contains slopes between 15% and 25% that will be developed. Eleven lots are located within these slope areas and will be designated as critical lots. These lots will be subject to the requirements set forth for critical lots.

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

Woodlands/Trees
The site has several wooded areas. A tree inventory has not been submitted for review and the natural resource map does not show any tree impacts. However, any trees over 18 inches in diameter proposed for removal will be required to have a replacement ratio of one and a half inches for every inch removed.

Geotechnical
A geotechnical report was submitted for the project and is currently under review. The report noted the presence of a sinkhole on the subject site. Currently, the sinkhole is located within a single-family lot which is not permitted. The Land Development Ordinance Section 3.3.6 states "the disturbance, alteration or mitigation of such features shall be discouraged. All closed depressions shall be included in required or common open space along with a 50-foot buffer circling the highest contour of the closed depression. All sinkholes shall be incorporated into the overall storm water management plan." Therefore, a revision to the plan will be required to incorporate this sinkhole into the open space and provide the required buffer. All other recommendations for site work and development should be adhered to during the development process.

Storm water Considerations
Storm water detention is proposed on site and will be reviewed further during the platting process.

Traffic
A traffic study was submitted for the project. The Town's traffic consultant has submitted comments to the developer's traffic engineer. All comments should be addressed to the satisfaction of the town traffic engineer prior to any plat approvals.

Utilities
HB&TS and MTEMC have provided water and electricity availability letters. The applicant shall be responsible for any improvements to water and electric infrastructure to meet the demands of the project. The site does not have approval for wastewater, therefore, prior to the submittal of any further applications, the applicant should obtain approvals from the Board of Mayor and Aldermen. Sewer availability should be approved prior to any plat approvals.

<u>Attachments</u>
Concept Plan Packet
Traffic Study
Barge Design Traffic Memo

615 Third Avenue South, Suite 700
Nashville, TN 37210
Phone: 615-252-4373 |
www.bargedesign.com

MEMORANDUM

To: Wendy Deats — Town of Thompson's Station

From: Jonathan Smith, P.E. — Barge Design Solutions

Date: July 2, 2018

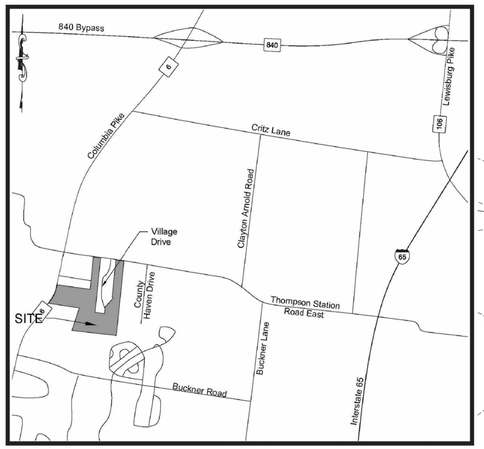
Project ID: 36727-06

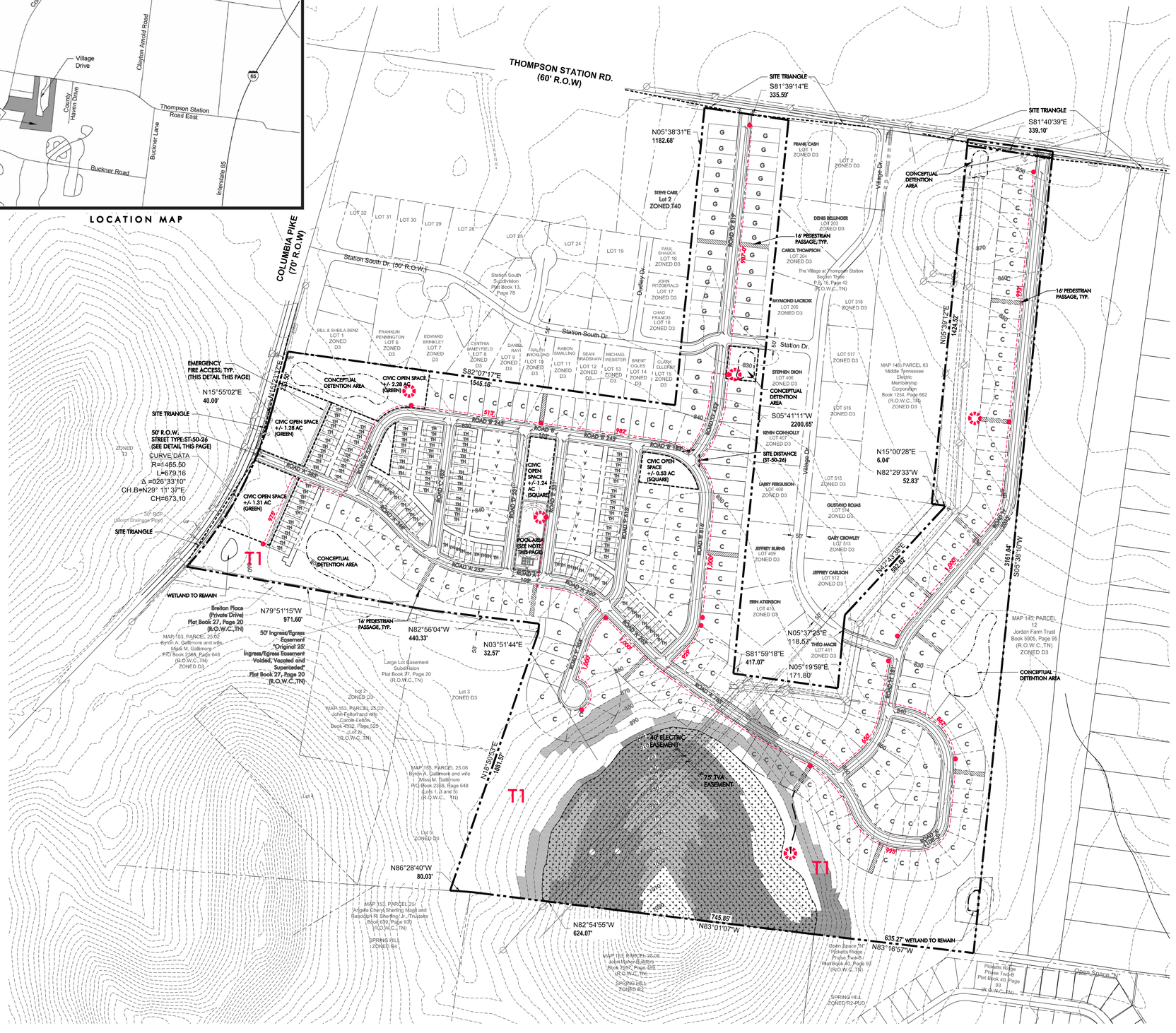
Re: **Pearl Street Partners TIS Comments**

This memorandum presents the preliminary review comments for the Traffic Impact Study (TIS) provide for the proposed Pearl Street Partners development. The following comments are preliminary in nature and it is recommended that the study be revised and resubmitted following a review of these comments.

1. The intersection turning movement counts were collected when school was out of session with no explanation or adjustment provided. When the collected counts are compared to the nearby TDOT count station data, there are appears to be significant discrepancy between the data sets.
2. The TIS did not provide any existing or recommended signal timing information for the signalized intersection of Thompson's Station Road and US 31 – Columbia Pike.
3. There are locations identified (in table 12) with failing levels of service where mitigation measures are not provided.
4. The TIS did not provide collision rates for the data presented.
5. The TIS did not provide any collision information along the roadways, it only presents intersection related collisions.
6. The TIS did not provide any sight triangle information for the site access driveways. Site triangle information should be provided with the updated TIS.

If you have any questions about the above comments, please do not hesitate to contact our office.





VARIANCE REQUEST:
THE APPLICANT RESPECTFULLY REQUESTS A VARIANCE TO ARTICLE 3.8.3 "BLOCK STANDARDS" OF THE ZONING CODE TO EXEMPT THE REQUIRED 800' BLOCK LENGTH FROM PROPOSED BLOCKS THAT ARE LOCATED ALONG THE PERIMETER OF THE PROPERTY PER ARTICLE 3.8.3 (D). THE APPLICANT REQUESTS THAT ROADS 'A', 'B', 'G', AND 'H' ARE WAIVED FROM THIS REQUIREMENT DUE TO BEING LOCATED ADJACENT TO "UNDEVELOPED LAND, AREAS UNSUITABLE FOR DEVELOPMENT, OR PRE-EXISTING INCOMPLETE BLOCKS".

SITE DATA

PROJECT NAME:	PARSONS VALLEY
SITE AREA:	+/- 118.83 ACRES
SITE ID:	PARCEL 23, TAX MAP 153
ZONING:	D-3
SECTOR:	G1 & G2
PROPOSED COMMUNITY TYPE:	RESIDENTIAL SUBDIVISION

RESIDENTIAL SUBDIVISION DEVELOPMENT STANDARDS
ZONING DISTRICTS - REQUIREMENTS

T1 OR T2 (OPEN SPACE)	45% (53.47 AC)
T1 - AREA PROPOSED	45% (53.57 AC)
CIVIC SPACE *ALSO COUNTED TOWARDS T1/T2 REQUIREMENT	5% - 10% (5.94 - 11.88 AC)
CIVIC SPACE - AREA PROPOSED	5.6% (+/- 6.64 AC)
MAX. DENSITY	3 UNITS/ACRE (356 UNITS)
PROPOSED DENSITY	2.97 UNITS/ACRE (353 UNITS)

LOT STANDARDS

PRIMARY FRONTAGE	10' MIN.
SECONDARY FRONTAGE	10' MIN.
SIDE LOT LINE AGGREGATE	15' TOTAL, 5 FT. MIN.
REAR LOT LINE	20'
LOT WIDTH	50' MIN.
TOWNHOME LOT WIDTH	20' MIN.

LOT BREAKDOWN

(V) VILLAGE LOTS	50' X 140'	16 UNITS
(TH) TOWNHOMES	22' X 85'	123 UNITS
(G) GARDEN LOTS	57' X 116'	35 LOTS
(C) COTTAGE LOTS	57' X 125'	177 LOTS
TOTAL LOTS		351

POOL AREA

+/- 20,000 SQ. FT.
OUTDOOR RECREATION AREA

34 PARKING SPACES REQUIRED
40 PARKING SPACES PROVIDED (ON-STREET)

Street: ST-50-26	
ROW Width	50 ft.
Design Speed	20 mph
Design ADT	1,000 VPD
Curb-to-Curb Width	26 feet
Maximum Grade	10%
Minimum Curve Radius	100 feet
Curb Return Radius	15 feet
Clear Sight Distance	20' along local street from end of curb radius
Zoning Districts	T3, T4
Functional Classification	Local
Green Street Provisions	Pervious pavers and/or bioswales and/or inverted crown French drain

PROPOSED STREET SECTION

THE PROPOSED STREET SECTION "ST-50-26" IS PROPOSED TO CONNECT TO THE EXISTING STUB-OUTS LOCATED ON THE ADJACENT "STATION SOUTH" AND "VILLAGE AT THOMPSON'S STATION" DEVELOPMENTS. (THESE DEVELOPMENTS DO NOT CONTAIN WALKS AND/OR TRAILS HOWEVER).
IN ADDITION, 16' PEDESTRIAN PASSAGES ARE LOCATED THROUGHOUT THE DEVELOPMENT TO ALLOW ACCESS TO OPEN SPACES.

PROPOSED FIRE ACCESS DETAIL AND SECTION

LEGEND

✺	PLAYGROUND	- - XXX' - -	DISTANCE TO PLAYGROUND
░	15% - 25% SLOPES	├ XXX' ┤	BLOCK LENGTH
▓	25% & GREATER SLOPES		
⁺	HILLTOP PROTECTION AREA		

0' 100' 200' 400'

NORTH

EDGE
PLANNING LANDSCAPE ARCHITECTURE GRAPHIC DESIGN
210 Twelfth Avenue South
Suite 202
Nashville, Tennessee 37203
P 615-250-8154
F 615-250-8155

ENERGY LAND & INFRASTRUCTURE
1420 DONELSON PIKE, SUITE A12 • NASHVILLE, TN 3721
OFFICE 615-383-6300 • WWW.ELI-LLC.COM
ENGINEERS • SURVEYORS • INFRASTRUCTURE • ENVIRONMENTA

© 2014 ENERGY LAND & INFRASTRUCTURE, LLC, ALL RIGHTS RESERV

JOHN DAVID HAAS, JR.
TENNESSEE NO. 574
06/15/18

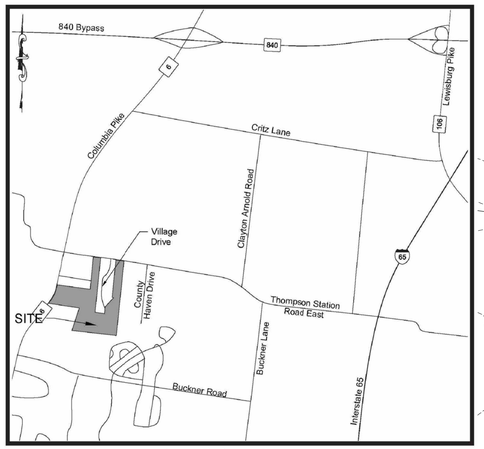
PARSONS VALLEY
CONCEPT PLAN SUBMITTAL
4738 COLUMBIA PIKE
THOMPSON'S STATION, TN

PEARL STREET PARTNERS LLC.
BRENTWOOD, TN.

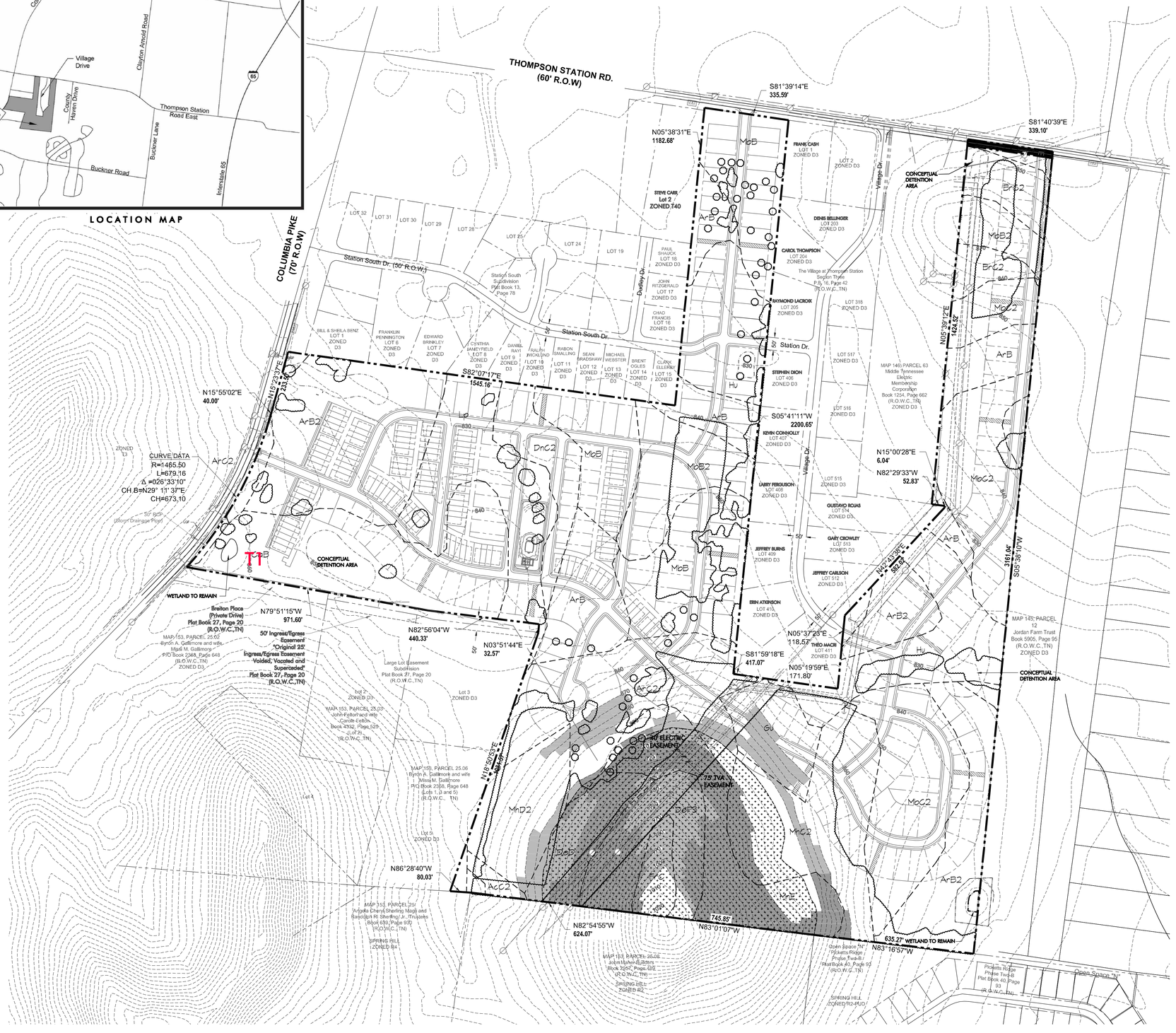
PROJECT NO.	XXXXX
Date	06/15/18
Revisions	

Sheet Title
CONCEPT PLAN

Sheet Number
C-1.0



LOCATION MAP



SITE DATA

PROJECT NAME:	PARSONS VALLEY
SITE AREA:	+/- 118.83 ACRES
SITE ID:	PARCEL 23, TAX MAP 153
ZONING:	D-3
SECTOR:	G1 & G2
PROPOSED COMMUNITY TYPE:	RESIDENTIAL SUBDIVISION

RESIDENTIAL SUBDIVISION DEVELOPMENT STANDARDS
ZONING DISTRICTS - REQUIREMENTS

T1 OR T2 (OPEN SPACE)	45% (53.47 AC)
T1 - AREA PROPOSED	45% (53.57 AC)
CIVIC SPACE	5% - 10% (5.94 - 11.88 AC)
*ALSO COUNTED TOWARDS T1/T2 REQUIREMENT	
CIVIC SPACE - AREA PROPOSED	5.6% (+/- 6.64 AC)
MAX. DENSITY	3 UNITS/ACRE (356 UNITS)
PROPOSED DENSITY	2.97 UNITS/ACRE (353 UNITS)

LOT STANDARDS

PRIMARY FRONTAGE	10' MIN.
SECONDARY FRONTAGE	10' MIN.
SIDE LOT LINE AGGREGATE	15' TOTAL, 5 FT. MIN.
REAR LOT LINE	20'
LOT WIDTH	50' MIN.
TOWNHOME LOT WIDTH	20' MIN.

LOT BREAKDOWN

(V) VILLAGE LOTS	50' X 140'	16 UNITS
(TH) TOWNHOMES	22' X 85'	123 UNITS
(G) GARDEN LOTS	57' X 116'	35 LOTS
(C) COTTAGE LOTS	57' X 125'	177 LOTS
TOTAL LOTS		351

SOILS LEGEND

ARB	ARMOUR SILT LOAM, 2 TO 5 PERCENT SLOPES
ARB2	ARMOUR SILT LOAM, 2 TO 5 PERCENT SLOPES, ERODED
ARC2	ARMOUR SILT LOAM, 5 TO 12 PERCENT SLOPES, ERODED
BRC2	BRAXTON CHERTY SILT LOAM, 5 TO 12 PERCENT SLOPES, ERODED
CAB	CAPTINA SILT LOAM, PHOSPHATIC, 2 TO 5 PERCENT SLOPES
DED	DELLROSE GRAVELLY SILT LOAM, 12 TO 20 PERCENT SLOPES, ERODED
DEE3	DELLROSE GRAVELLY SILT LOAM, 20 TO 30 PERCENT SLOPES, SEVERELY ERODED
DNC2	DONERAIL SILT LOAM, 5 TO 12 PERCENT SLOPES, ERODED
FRC	FRANKSTOWN CHERTY SILT LOAM, 5 TO 12 PERCENT SLOPES
GU	GULLIED LAND
HU	HUNTINGTON SILT LOAM, PHOSPHATIC
LP	LINDELL SILT LOAM, 0 TO 2 PERCENT SLOPES, OCCASIONALLY FLOODED
MBB	MAURY SILT LOAM, 2 TO 5 PERCENT SLOPES
MBC2	MAURY SILT LOAM, 5 TO 12 PERCENT SLOPES, ERODED
MHC2	MIMOSA GRAVELLY SILT LOAM, 5 TO 12 PERCENT SLOPES, ERODED
MHD2	MIMOSA GRAVELLY SILT LOAM, 12 TO 20 PERCENT SLOPES, ERODED
MNE	MIMOSA-ROCK OUTCROP COMPLEX, 20 TO 40 PERCENT SLOPES

LEGEND

- EXISTING TREE CANOPY
- 15% - 25% SLOPES
- 25% & GREATER SLOPES
- HILLTOP PROTECTION AREA

0' 100' 200' 400'

NORTH

EDGE
PLANNING LANDSCAPE ARCHITECTURE GRAPHIC DESIGN
210 Twelfth Avenue South
Suite 202
Nashville, Tennessee 37203
P 615-250-8154
F 615-250-8155

ENERGY LAND & INFRASTRUCTURE
1420 DONELSON PIKE, SUITE A12 • NASHVILLE, TN 3721
OFFICE 615-383-6300 • WWW.ELI-LLC.COM
ENGINEERS • SURVEYORS • INFRASTRUCTURE • ENVIRONMENTA
© 2006 ENERGY LAND & INFRASTRUCTURE, LLC, ALL RIGHTS RESERV

JOHN DAVID HAAS, JR. REGISTERED LANDSCAPE ARCHITECT TENNESSEE NO. 514
06/15/18

PARSONS VALLEY
CONCEPT PLAN SUBMITTAL
4738 COLUMBIA PIKE
THOMPSON'S STATION, TN

PEARL STREET PARTNERS LLC.
BRENTWOOD, TN.

PROJECT NO.	XXXXX
Date	06/15/18
Revisions	

Sheet Title

NATURAL RESOURCE PLAN

Sheet Number

C-2.0

TRAFFIC IMPACT STUDY

Thompson's Station Road Subdivision
(Map 153 Parcel 23)
Thompson's Station, TN

T-SQUARE ENGINEERING
CIVIL ENGINEERING CONSULTANTS

TRAFFIC IMPACT STUDY

Thompson's Station Road Subdivision
(Map 153 Parcel 23)
Thompson's Station, TN

Prepared for:

PEARL STREET
PARTNERS, LLC

205 Powell Place
Brentwood, TN 37027

Prepared by:

T-SQUARE ENGINEERING

701 West Main Street
Franklin, TN 37064
615.678.8212
www.T2-eng.com

T-SQUARE ENGINEERING
CIVIL-SITE | TRAFFIC | WASTEWATER

701 West Main Street
Franklin, TN 37064
615.678.8212

www.T2-eng.com

Certification

I certify that this Traffic Impact Study has been prepared by me and under my immediate supervision and that I have the experience and training in the field of traffic and transportation engineering.

6/14/18

Blake A. Turner, P.E.
T-Square Engineering, Inc.
Principal – Vice President

TABLE OF CONTENTS

List of Tables

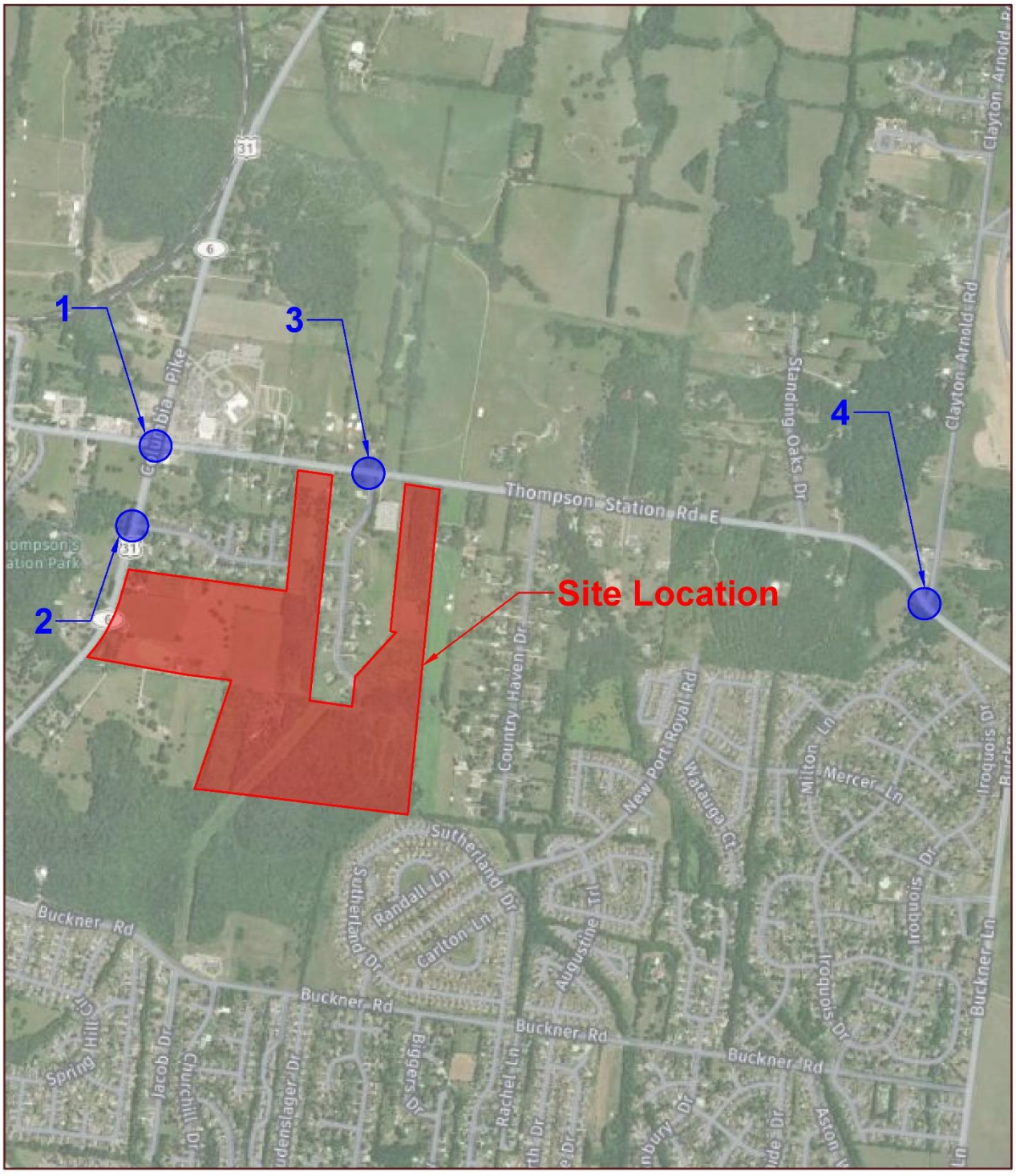
List of Figures

Introduction

The purpose of this study is to analyze the traffic impacts on the surrounding roadway network associated with the proposed Thompson's Station Road Subdivision along Thompson's Station Road and Columbia Pike in Thompson's Station, TN. The development will consist of approximately 230 single-family homes and 123 townhomes.

As shown on the Location Map and Preliminary Site Plan on Figures 1 and 2, respectively, the property is located on Thompson's Station Road and Columbia Pike. The development is proposing three (3) site access points; one (1) to be located on the east side of Columbia Pike approximately 850 feet south of the intersection of Columbia Pike and Station South Drive, one (1) to be located on the south side of Thompson's Station Road approximately 550 feet west of the intersection of Thompson's Station Road and Village Drive, and one (1) to be located on the south side of Thompson's Station Road approximately 650 feet east of the intersection of Thompson's Station Road and Village Drive. The development will also utilize the intersections of Columbia Pike and Station South Drive and Thompson's Station Road and Village Drive to provide access to the site. The surrounding area is predominantly residential.

This study analyzes the existing and projected traffic operations of the roadway networks and intersections surrounding the proposed development. To evaluate the projected traffic operations, existing traffic volumes were grown (background traffic volumes) to a 2020 design year based on average traffic growth rates with estimated trips generated from the proposed development added. Lastly, improvement recommendations were presented to alleviate the expected traffic volume's effect on the existing roadway network.



LEGEND

Analyzed Intersection

N

N.T.S.

Figure 1
Location Map

Figure 2
Site Plan

Existing Study Area

Existing Roadway Network

The existing roadway network surrounding the proposed Thompson's Station Road Subdivision includes Thompson's Station Road, Columbia Pike, Station South Drive, Village Drive, and Clayton Arnold Road. Below is a description of each roadway serving the proposed development:

Thompson's Station Road

Thompson's Station Road is functionally classified by the General Plan for Thompson's Station as a Collector. Near the project site, Thompson's Station Road is oriented in an east-west direction and provides a connection between Lewisburg Pike to the east and Carters Creek Pike to the west. Near the project site, Thompson's Station Road is a two (2) lane roadway with one (1) ten (10) foot travel lane in each direction (eastbound and westbound) and one (1) foot shoulders. The posted speed limit along Thompson's Station Road is 45 MPH.

Looking west along Thompson's Station Road

Columbia Pike

Columbia Pike is functionally classified by the General Plan for Thompson's Station as an Arterial. Near the project site, Columbia Pike is oriented in a north-south direction and provides a connection between the City of Franklin to the north and TN-396 to the south. Near the project site, Columbia Pike is a two (2) lane roadway with one (1) twelve (12) foot travel lane in each direction (northbound and southbound) and one (1) foot shoulders. The posted speed limit along Columbia Pike is 45 MPH.

Looking south along Columbia Pike

Station South Drive

Station South Drive is functionally classified by the General Plan for Thompson's Station as a Local road. Near the project site, Station South Drive is oriented in an east-west direction and provides a connection to Columbia Pike to the east and terminates to the west. Near the project site, Station South Drive is a two (2) lane roadway with one (1) twelve (12) foot travel lane in each direction (eastbound and westbound) and two (2) foot shoulders. The posted speed limit along Station South Drive is 25 MPH.

Looking east along Station South Drive

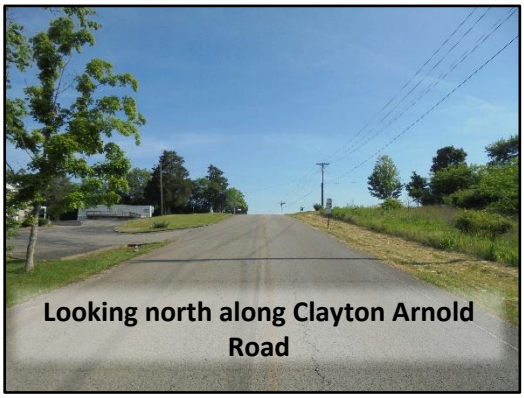
Village Drive

Village Drive is functionally classified by the General Plan for Thompson's Station as a Local road. Near the project site, Village Drive is oriented in a north-south direction and provides a connection from Thompson's Station road to the north and terminates to the south. Village Drive is a two (2) lane roadway with one (1) eleven (11) foot travel lane in each direction (northbound and southbound) and two (2) foot shoulders. The posted speed limit along Village Drive is 25 MPH.

Looking south along Village Drive

Clayton Arnold Road

Sundown Drive Lane is functionally classified by the General Plan for Thompson's Station as a Collector. Near the project site, Clayton Arnold Road is oriented in a north-south direction and provides a connection from Critz Lane to the north and Thompson's Station Road to the south. Clayton Arnold Road is a two (2) lane roadway with one (1) ten (10) foot travel lane in each direction (northbound and southbound) and two (2) foot shoulders. The posted speed limit along Clayton Arnold Road is 45 MPH.

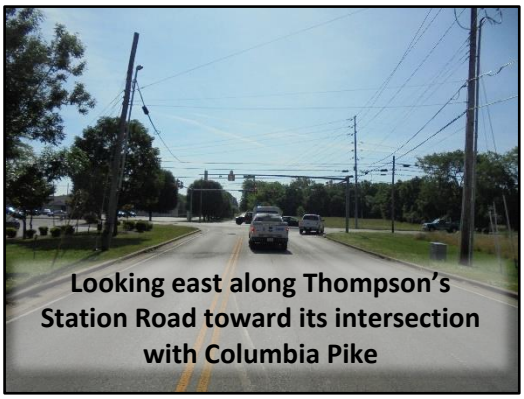


Looking north along Clayton Arnold Road

Existing Intersections

This study analyzed four (4) existing intersections within the vicinity of the project site. The intersections analyzed are listed below with a brief description of each, and Figure 3 shows the existing lane geometry at the intersections.

Thompson's Station Road and Columbia Pike


Looking east along Thompson's Station Road toward its intersection with Columbia Pike

The existing intersection of Thompson's Station Road and Columbia Pike is a signalized intersection with four (4) approaches. The northbound approach of Columbia Pike has one (1) exclusive lane for left-turn movements with approximately 155 feet of storage and one (1) shared lane for through and right-turn movements. The southbound approach of Columbia Pike has one (1) exclusive lane for left-turn movements with approximately 155 feet of storage and one (1) shared lane for through and right-turn movements. The eastbound approach of Thompson's Station Road has one (1) exclusive lane for left-turn movements with approximately 125 feet of storage and one (1) shared lane for through and right-turn movements. The westbound approach of Thompson's Station Road has one (1) exclusive lane for left-turn movements with approximately 100 feet of storage and one (1) shared lane for through and right-turn movements.

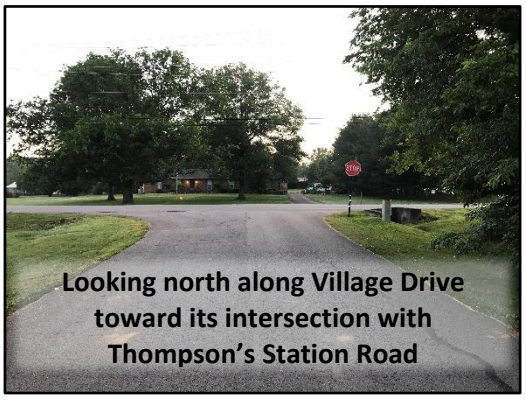
Columbia Pike and Station South Drive

Looking west along Station South Drive toward its intersection with Columbia Pike

The existing intersection of Columbia Pike and Station South Drive is an unsignalized intersection with three (3) approaches. The northbound approach of Columbia Pike has one (1) shared lane for through and right-turn movements operating under a free-flow condition. The southbound approach of Columbia Pike has one (1) shared lane for left-turn and through movements operating under a free-flow condition. The westbound approach of Station South Drive has one (1) shared lane for left-turn and right-turn movements operating under a stop condition.

Thompson's Station Road and Village Drive

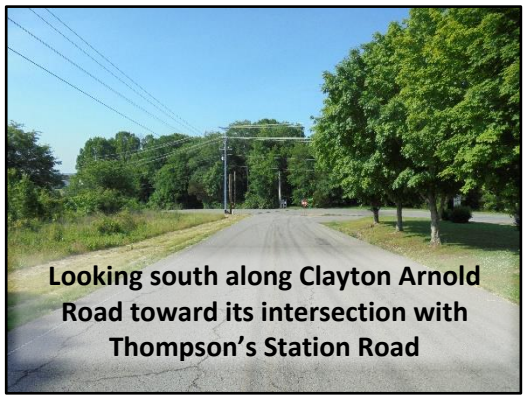
The existing intersection of Thompson's Station Road and Village Drive is an unsignalized intersection with three (3) approaches. The eastbound approach of Thompson's Station Road has one (1) shared lane for through and right-turn movements operating under a free-flow condition. The westbound approach of Thompson's Station Road has one (1) shared lane for left-turn and through movements operating under a free-flow condition. The northbound approach of Village Drive has one (1) shared lane for left-turn and right-turn movements operating under a stop condition.



Looking north along Village Drive toward its intersection with Thompson's Station Road

Thompson's Station Road and Clayton Arnold Road

The existing intersection of Thompson's Station Road and Clayton Arnold Road is an unsignalized intersection with three (3) approaches. The eastbound approach of Thompson's Station Road has one (1) shared lane for left-turn and through movements operating under a free-flow condition. The westbound approach of Thompson's Station Road has one (1) shared lane for through and right-turn movements operating under a free-flow condition. The southbound approach of Clayton Arnold Road has one (1) exclusive lane for left-turn movements and one (1) exclusive channelized lane for right-turn movements with approximately eighty (80) feet of storage operating under a stop condition.



Looking south along Clayton Arnold Road toward its intersection with Thompson's Station Road

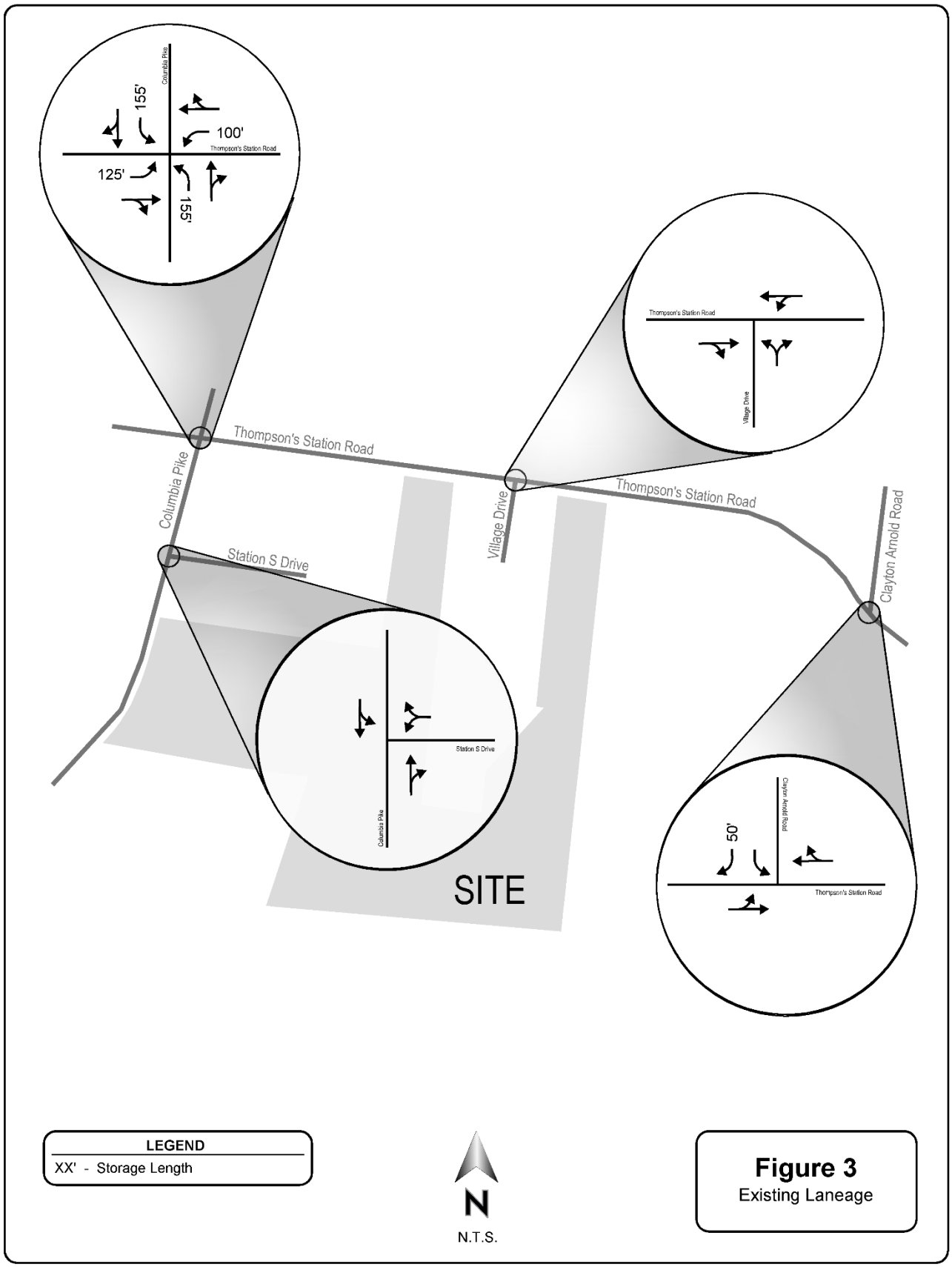


Figure 3
Existing Laneage

Crash Analysis

Crash data was obtained from 2011 to 2018 and was analyzed to determine the type and frequency of crashes at each of the existing study intersections. These crashes include Incapacitating Injury, Non-Incapacitating Injury, Property Damage crashes. The intersection of Thompson's Station Road and Columbia Pike shows a total of ninety-five (95) total crashes in or near the intersection. The intersection of Columbia Pike and Station South Drive shows a total of ten (10) total crashes in or near the intersection. The intersection of Thompson's Station Road and Clayton Arnold Road shows a total of twenty-two (22) total crashes in or near the intersection. The intersection of Thompson's Station Road and Village Drive shows no crashes occurring during 2011-2018. The table below outlines the crash types for each intersection.

Table 1. Crash Data Analysis

Year	Crash Type						
	Angle	Head-On	Rear-End	Sideswipe	Lane Departure	Other	TOTAL
Thompson's Station Road and Columbia Pike							
2011	0	1	8	1	0	0	**10**
2012	3	0	6	0	3	1	**13**
2013	0	0	8	2	0	0	**10**
2014	3	1	7	2	0	0	**13**
2015	0	0	10	0	2	1	**13**
2016	0	0	9	2	0	1	**12**
2017	1	1	13	0	1	1	**17**
2018	1	0	5	0	0	1	**7**
TOTAL	**8**	**3**	**66**	**7**	**6**	**5**	**95**
Columbia Pike and Station South Drive							
2011	0	0	2	0	0	0	2
2013	0	0	1	0	0	0	1
2014	0	0	2	0	0	0	2
2015	0	0	1	0	0	0	1
2017	0	0	4	0	0	0	4
TOTAL	**0**	**0**	**10**	**0**	**0**	**0**	**10**
Thompson's Station Road and Clayton Arnold Road							
2011	3	0	2	0	1	0	6
2012	0	0	1	0	1	0	2
2013	0	0	3	0	1	0	4
2015	2	0	0	1	0	0	3
2016	0	0	2	1	1	0	4
2017	0	0	0	0	1	0	1
2018	1	0	1	0	0	0	2
TOTAL	**6**	**0**	**9**	**2**	**5**	**0**	**22**

Existing Traffic Volumes

Intersection Counts

To establish existing traffic volumes within the study area, T-Square Engineering conducted turning movement counts at the intersections of Thompson's Station Road and Columbia Pike, Columbia Pike and Station South Drive, Thompson's Station Road and Village Drive, and Thompson's Station Road and Clayton Arnold Road on a typical weekday in May 2018. The turning movement counts were conducted over a total of six (6) hours from 6:00 AM – 9:00 AM and 3:00 PM – 6:00 PM. From the turning movement counts, the AM and PM peak hour traffic volumes were established and determined to occur between 7:15 AM – 8:15 AM and 4:30 PM – 5:30 PM, respectively. Existing hourly turning movement counts are shown in Tables 1 through 4. Figure 4 shows the existing peak hour totals at the study intersections for the AM and PM peak hour periods. Appendix A contains the detailed turning movement counts at each intersection.

Table 2. Turning Movement Counts, Thompson's Station Road and Columbia Pike

Time	NORTHBOUND			SOUTHBOUND			WESTBOUND			EASTBOUND		
	Columbia Pike			Columbia Pike			Thompson's Station Road			Thompson's Station Road		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
6:00 – 7:00 AM	35	974	16	8	238	10	19	23	30	29	12	25
7:00 – 8:00	54	897	14	11	395	25	47	48	27	41	13	51
8:00 – 9:00	89	806	26	30	533	37	45	36	21	56	27	57
3:00 – 4:00 PM	89	578	53	27	635	41	52	31	12	31	46	95
4:00 – 5:00	61	574	66	27	813	22	61	31	6	42	52	138
5:00 – 6:00	68	613	71	31	798	22	69	37	1	52	37	116
TOTAL	**396**	**4,442**	**246**	**134**	**3,412**	**157**	**293**	**206**	**97**	**251**	**187**	**482**

Table 3. Turning Movement Counts, Columbia Pike and Station South Drive

Time	NORTHBOUND			SOUTHBOUND			WESTBOUND		
	Columbia Pike			Columbia Pike			Station South Drive		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
6:00 – 7:00 AM	0	1,019	2	0	282	0	1	0	6
7:00 – 8:00	0	957	0	2	491	0	0	0	8
8:00 – 9:00	0	914	0	3	632	0	1	0	7
3:00 – 4:00 PM	0	715	5	7	775	0	1	0	5
4:00 – 5:00	0	699	6	9	1,003	0	3	0	2
5:00 – 6:00	0	747	6	12	971	0	4	0	5
TOTAL	**0**	**5,051**	**19**	**33**	**4,154**	**0**	**10**	**0**	**33**

Table 4. Turning Movement Counts, Thompson's Station Road and Village Drive

Time	NORTHBOUND			WESTBOUND			EASTBOUND		
	Village Drive			Thompson's Station Road			Thompson's Station Road		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
6:00 – 7:00 AM	9	0	1	0	129	0	0	28	2
7:00 – 8:00	0	0	0	0	183	0	0	34	2
8:00 – 9:00	5	0	1	2	145	0	0	63	3
3:00 – 4:00 PM	3	0	0	2	98	0	0	112	5
4:00 – 5:00	3	0	0	3	110	0	0	135	0
5:00 – 6:00	2	0	1	2	124	0	0	131	1
TOTAL	**22**	**0**	**3**	**9**	**789**	**0**	**0**	**503**	**13**

Table 5. Turning Movement Counts, Thompson's Station Road and Clayton Arnold Road

Time	SOUTHBOUND			WESTBOUND			EASTBOUND		
	Clayton Arnold Road			Thompson's Station Road			Thompson's Station Road		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
6:00 – 7:00 AM	13	0	10	0	108	153	12	9	0
7:00 – 8:00	27	0	22	0	147	192	9	18	0
8:00 – 9:00	26	0	46	0	104	101	27	38	0
3:00 – 4:00 PM	141	0	30	0	63	58	21	88	0
4:00 – 5:00	277	0	51	0	79	55	31	104	0
5:00 – 6:00	414	0	48	0	72	77	33	106	0
TOTAL	**898**	**0**	**207**	**0**	**573**	**636**	**133**	**363**	**0**

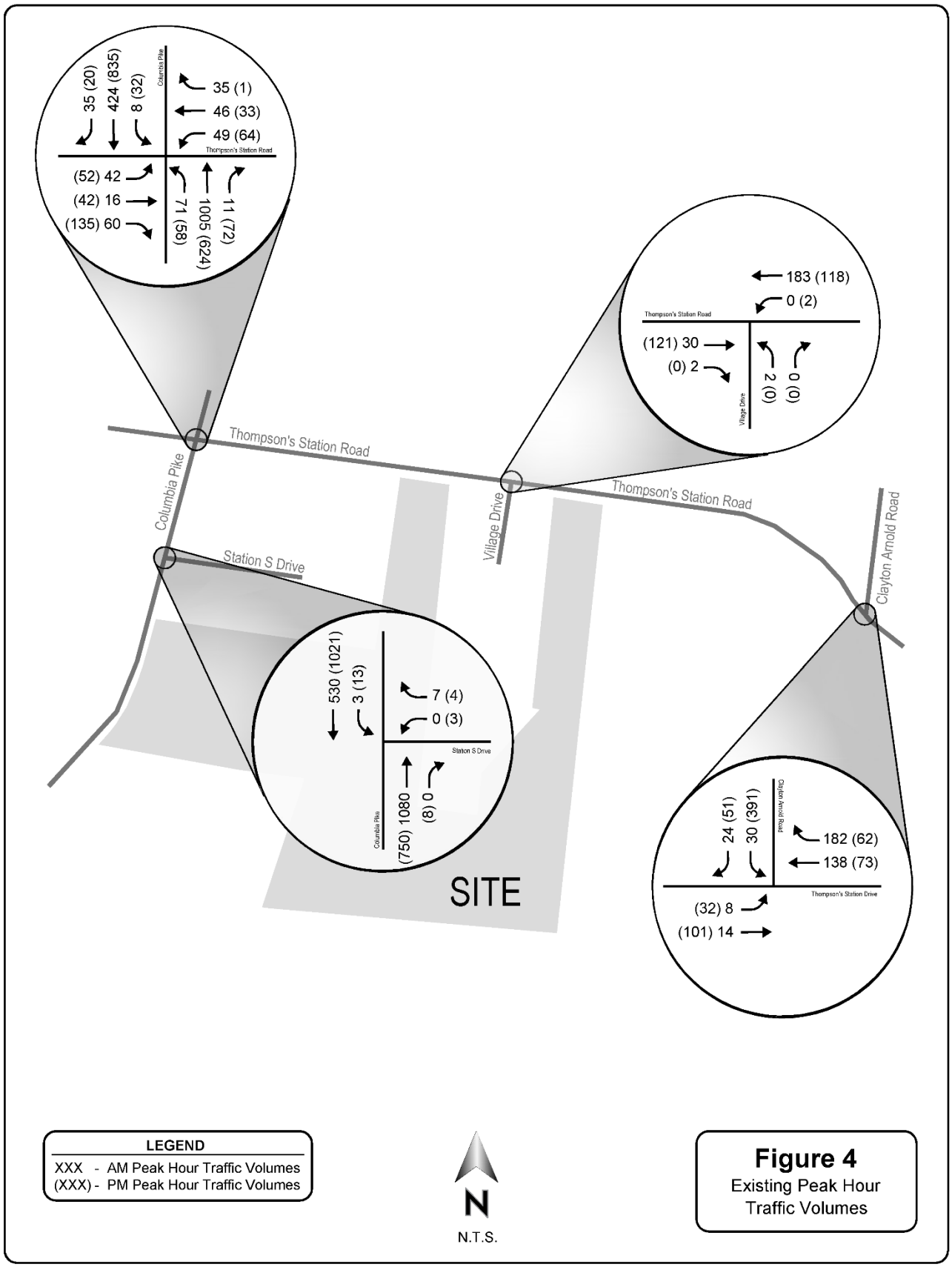


Figure 4
Existing Peak Hour Traffic Volumes

Existing Capacity Analyses

To evaluate the existing traffic operations at the study intersections within the vicinity of the project site, AM and PM peak hour capacity analyses were performed per the calculations outlined in the Highway Capacity Manual[1](HCM). Levels of service (LOS), corresponding average delays, and 95th percentile queues were calculated for each turning movement. An LOS is a qualitative measure or grade used to distinguish how traffic is serviced at an intersection or along a roadway. The range of LOS is A to F, with A being the highest and F the lowest. The 95th percentile queue is the queue length (in vehicles) that has only a five (5) percent probability of being exceeded during the analysis period. The 95th percentile queue is not typical of what an average driver would experience, and driver experiences would be better characterized by the mean queue length. The table below details each LOS for signalized and unsignalized intersections, as specified within the HCM. For this analysis, optimized traffic signal timings were used at the intersection of Thompson's Station Road and Columbia Pike.

Table 6. Level of Service (LOS) Details

Level of Service*	Average Control Delay (seconds per vehicle)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50
Source: HCM 2010, Exhibits 18-4 and 19-1 ** LOS color coding per Capacity Figures.*		

In order to determine the effectiveness of traffic operations within the study area, a minimum LOS or baseline needs to be established. Any LOS below the established baseline will be considered unsatisfactory. LOS C is generally acceptable for typical roadway function while LOS D is typically considered to be the minimum acceptable LOS. The following conditions shall be considered unsatisfactory for the purposes of this study:

1. Overall intersections with an LOS D, E, or F;
2. Individual traffic movements with an LOS E or F;

The existing intersections within the study segment were analyzed with existing traffic volumes under existing roadway conditions/geometries.

[1] Transportation Research Board (TRB). Highway Capacity Manual, 5th Edition (2010). Washington, DC: 2010

Table 7. Existing Capacity Analyses

Study Intersection	Control	Approach	2018 Existing Conditions					
			AM Peak Hour			PM Peak Hour		
			LOS	Delay (s)	Queue (veh)	LOS	Delay (s)	Queue (veh)
1. **Thompson's Station Road and Columbia Pike**	Signal	NB Left	A	6.6	8	B	19.8	3
		NB Thru/Right	C	24.1	17	B	19.9	11
		SB Left	B	17.1	1	B	13.1	7
		SB Thru/Right	A	9.6	7	D	42.5	21
		EB Left	D	36.4	4	C	27.9	4
		EB Thru/Right	D	45.2	4	D	41.5	6
		WB Left	D	36.4	3	C	29.0	3
		WB Thru/Right	D	44.2	4	C	30.3	3
		Overall	**C**	**22.1**	**--**	**C**	**32.2**	**--**
2. **Columbia Pike and Station South Drive**	TWSC	SB Left	B	11.1	0	A	9.5	1
		WB Left/Right	C	20.9	1	E	35.4	1
3. **Thompson's Station Road and Village Drive**	TWSC	NB Left/Right	A	9.8	0	A	0.0	0
		WB Left	A	0.0	0	A	7.5	0
4. **Thompson's Station Road and Clayton Arnold Road**	TWSC	SB Left	B	10.4	1	C	18.6	5
		SB Right	A	9.7	1	A	9.1	1
		EB Left	A	8.0	0	A	7.6	1

As shown in Table 6, the westbound approach to the intersection of Columbia Pike and Station South Drive currently operates at LOS E during the PM peak hour. All other critical movements to the study intersections surrounding the proposed development currently operate at a minimum of LOS D during the AM and PM peak hours with existing traffic volumes. Appendix C contains the detailed capacity analyses results.

Intersection Assessments (Existing Conditions)

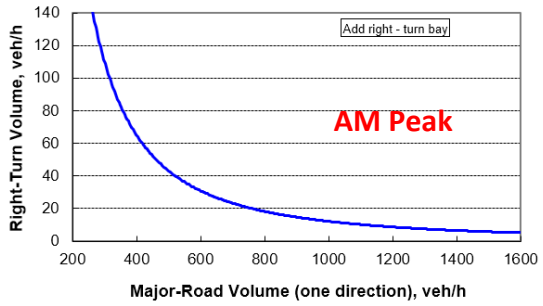
Engineering assessments were performed on the intersections within the study area to identify underlying inefficiencies and solutions to alleviate any concerns associated with the existing geometries and traffic volumes along the roadway network. It should be noted that while all study intersections were analyzed, only intersections or traffic movements with deficiencies are presented within this section of the study.

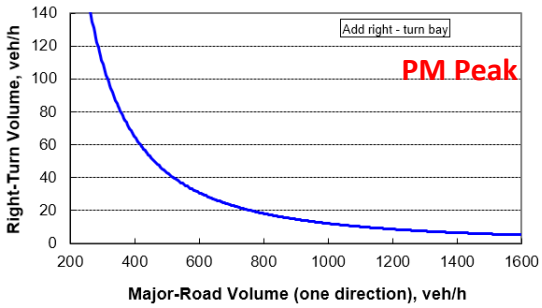
Major Road Approach Geometry Warrants - Projected

Major-road approach geometric warrants were performed based on Figures 2-5 and 2-6, respectively, in the *NCHRP Report 457 – Evaluating Intersection Improvements: An Engineering Study Guide*[2].

Table 8. Major-Road Approach Geometry, WB Thompson's Station Road at Clayton Arnold Road

Variable	AM Peak	PM Peak
Major-road speed, mph:	45	45
Major-road volume (one direction), veh/h:	320	135
Major-road Right-turn volume, veh/h:	182	62
Limiting right-turn volume, veh/h:	98	476
Right-turn bay warranted:	**YES**	**NO**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		



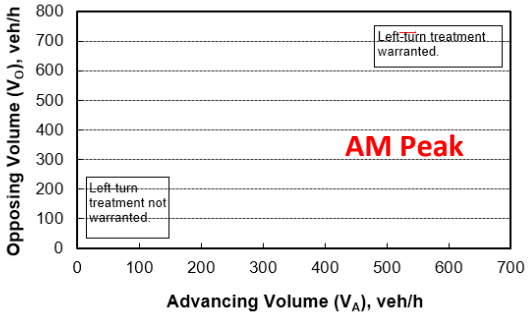


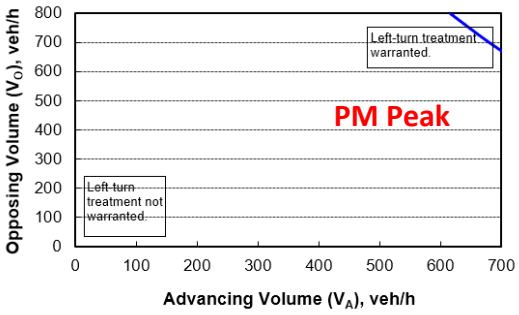
As shown in Table 7 and the corresponding graphs, it was determined that a westbound right-turn lane is presently warranted along Thompson's Station Road at its intersection with Clayton Arnold Road during the AM peak hour with existing traffic volumes.

[2] Transportation Research Board (TRB). Evaluating Intersection Improvements: An Engineering Study Guide. Washington, DC: 2001

Table 9. Major-Road Approach Geometry, SB Columbia Pike at Station South Drive

Variable	AM Peak	PM Peak
85th percentile speed, mph:	45	45
Percent of left-turns in advancing volume (V_A), %:	1%	1%
Advancing volume (V_A), veh/h:	533	1,034
Opposing volume (V_O), veh/h:	1,080	758
Limiting advancing volume (V_A), veh/h:	701	643
Left-turn bay warranted:	**NO**	**YES**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		





As shown in Table 8 and the corresponding graphs, it was determined that a southbound left-turn lane is presently warranted along Columbia Pike at its intersection with Station South Drive during the PM peak hour with existing traffic volumes.

Background Traffic Volumes

To account for traffic growth within the vicinity of the project site prior to the completion of the proposed Thompson's Station Road Subdivision, background traffic volumes were established. Average annual daily traffic (AADT) volumes were obtained from Tennessee Department of Transportation (TDOT) count stations, and an average growth trend per year was established. This growth trend was used as a multiplication factor to grow the existing traffic volumes to the 2020 design year (development completion). Figure 5 displays the locations of the TDOT Count Stations within the surrounding area.

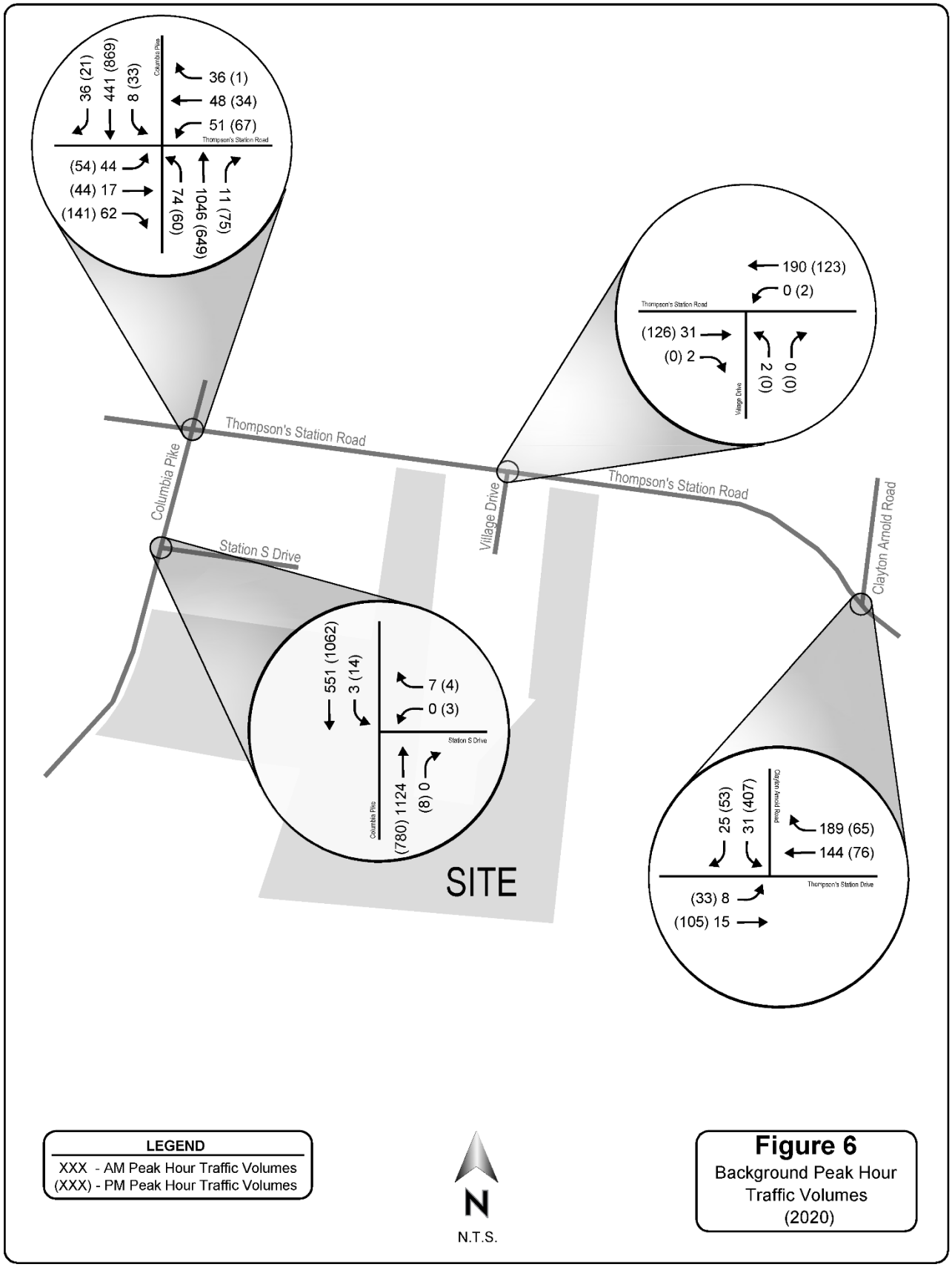
As shown in Figure 5, the average yearly percent change in traffic over a six (6) year period from 2011 - 2016 was 0.88%. Therefore, as a conservative estimate, the existing traffic volumes were grown by +2.00% per year for two (2) years. Figure 6 shows the background peak hour totals at the study intersections for the AM and PM peak hour periods.

TDOT Count Station:	Williamson 000066		Williamson 000067		Williamson 000068		Average % Growth
Year	AADT	% Change	AADT	% Change	AADT	% Change	
2016	2,693	--	19,816	--	2,800	--	--
2015	2,666	1.01%	19,620	1.00%	2,617	6.99%	3.00%
2014	2,659	0.64%	21,013	-2.85%	2,952	-2.57%	-1.59%
2013	2,404	4.01%	19,666	0.25%	2,723	0.94%	1.73%
2012	3,019	-2.70%	18,101	2.37%	2,720	0.74%	0.13%
2011	2,634	0.45%	18,685	1.21%	2,585	1.66%	1.11%
Average % Change	**0.68%**		**0.40%**		**1.55%**		**0.88%**

N

N.T.S.

Figure 5
TDOT Count Locations & Background Traffic Growth Trends


Thompson's Station Road
Columbia Pike
Village Drive
Thompson's Station Road
Clayton Arnold Road
Station S Drive
SITE
36 (21)
441 (869)
8 (33)
36 (1)
48 (34)
51 (67)
(54) 44
(44) 17
(141) 62
74 (60)
1046 (649)
11 (75)
190 (123)
0 (2)
(126) 31
(0) 2
2 (0)
0 (0)
551 (1062)
3 (14)
7 (4)
0 (3)
(780) 1124
(8) 0
25 (53)
31 (407)
189 (65)
144 (76)
(33) 8
(105) 15
LEGEND
XXX - AM Peak Hour Traffic Volumes
(XXX) - PM Peak Hour Traffic Volumes
N
N.T.S.
Figure 6
Background Peak Hour
Traffic Volumes
(2020)

Background Capacity Analyses

To evaluate the background traffic operations at the study intersections within the vicinity of the project site, the AM and PM peak hour capacity analyses were performed based on calculations outlined in the Highway Capacity Manual (HCM). Levels of service (LOS), corresponding average delays, and 95th percentile queues were calculated for each turning movement. The intersections were analyzed based on existing roadway conditions and lane geometries with background traffic volumes. Appendix C contains the detailed capacity analyses results. For this analysis, optimized traffic signal timings were used at the intersection of Thompson's Station Road and Columbia Pike.

Table 10. Background Capacity Analyses

Study Intersection	Control	Approach	2020 Background Conditions					
			AM Peak Hour			PM Peak Hour		
			LOS	Delay (s)	Queue (veh)	LOS	Delay (s)	Queue (veh)
1. **Thompson's Station Road and Columbia Pike**	Signal	NB Left	A	6.4	1	C	20.5	3
		NB Thru/Right	C	24.3	12	C	22.2	11
		SB Left	B	18.9	2	B	14.2	9
		SB Thru/Right	A	9.4	7	F	55.1	24
		EB Left	D	40.6	3	C	27.8	3
		EB Thru/Right	D	50.4	3	D	42.9	7
		WB Left	D	40.7	3	C	29.1	4
		WB Thru/Right	D	49.4	5	C	30.2	3
		Overall	**C**	**22.8**	**--**	**D**	**38.7**	**--**
2. **Columbia Pike and Station South Drive**	TWSC	SB Left	B	11.4	0	A	9.7	1
		WB Left/Right	C	22.0	1	E	39.1	1
3. **Thompson's Station Road and Village Drive**	TWSC	NB Left/Right	A	9.8	0	A	0.0	0
		WB Left	A	0.0	0	A	7.5	0
4. **Thompson's Station Road and Clayton Arnold Road**	TWSC	SB Left	B	10.5	1	C	20.2	5
		SB Right	A	9.8	1	A	9.1	1
		EB Left	A	8.0	0	A	7.6	1

As shown in Table 9, the southbound through/right-turn movements to the intersection of Thompson's Station Road and Columbia Pike will operate at LOS F during the PM peak hour with the addition of the background traffic volumes. Even though these movements will operate at an unacceptable LOS, the overall intersection will operate at LOS D during the PM peak hour, which is acceptable. The westbound approach to the intersection of Columbia Pike and Station South Drive will continue to operate at LOS E during the PM peak hour with the addition of background traffic volumes. All other critical movements to the study intersections surrounding the proposed development will continue to operate at a minimum of LOS D during the AM and PM peak hours with the addition of background traffic volumes. Appendix C contains the detailed capacity analyses results.

Impacts

Traffic Generation

Trips were generated to establish projected traffic volumes for the proposed Thompson's Station Road Subdivision. Daily and peak hour trips were generated by formulas presented in the Trip Generation Manual[3] based on the number of detached single-family homes and townhomes proposed by the development. As previously stated, the proposed Thompson's Station Road Subdivision is expected to consist of approximately 230 detached single-family homes and 123 townhomes. The Single-Family Detached Housing (210) and the Multi-Family Housing (220) ITE Land Uses were used to estimate the generated traffic volumes. Table 10 provides the new trips generated for the proposed development. Appendix B contains detailed trip generation calculations.

Table 11. Thompson's Station Road Subdivision Trip Generation

ITE Land Use (Code)	Units	Generated Traffic Volumes				
		Daily	AM Peak		PM Peak	
			Enter	Exit	Enter	Exit
Single-Family Detached Housing (210)	230 Dwelling Units	2,237	42	126	142	84
Multi-Family Housing (220)	123 Dwelling Units	889	13	45	45	26
TOTAL		**3,126**	**55**	**171**	**187**	**110**

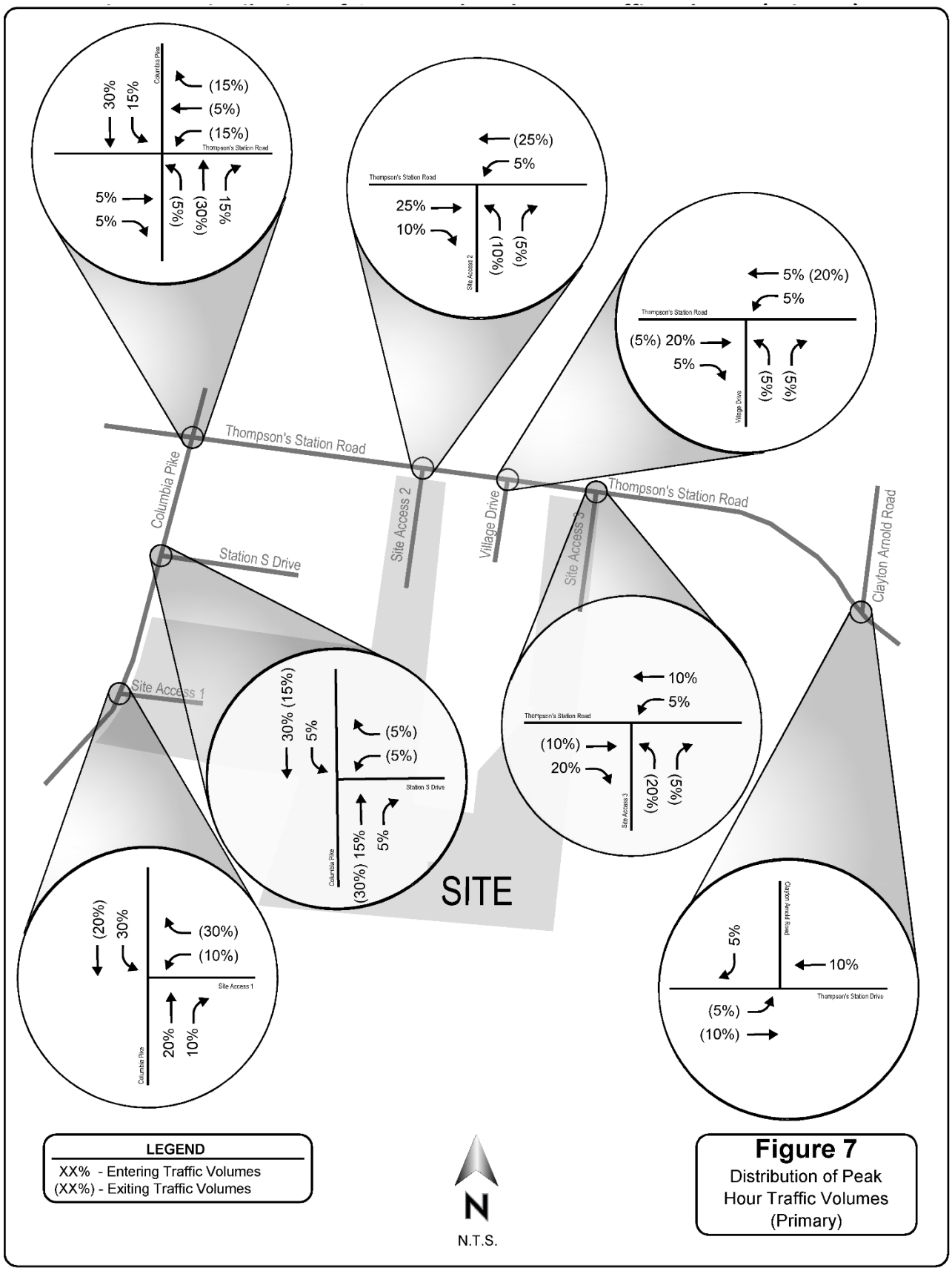
Projected Traffic Distribution and Assignments

For the purposes of this study, estimated directional distributions shown on Figure 7 were made for the proposed development's generated traffic volumes. The development of these directional distributions was established based on the following:

- Conducted hourly turning movement counts;
- Existing land use characteristics;
- Existing roadway network;
- Existing lane geometry of surrounding intersections;
- The development's proposed access locations;
- Locations of populations centers within the surrounding area;

The generated trips were assigned to the existing roadway network per the distributions shown on Figure 7, resulting in the generated peak hour traffic volumes shown on Figure 8. The generated peak hour traffic volumes were added to the background peak hour traffic volumes resulting in the total projected peak hour traffic volumes shown on Figure 9.

[3] Institute of Transportation Engineers (ITE). Trip Generation Manual, 10th Edition. Washington, DC: ITE, 2017


Thompson's Station Road
Columbia Pike
Station S Drive
Site Access 1
Site Access 2
Village Drive
Site Access 3
Clayton Arnold Road
SITE
30% 15%
(15%)
(5%)
(15%)
5%
5%
(5%)
(30%)
15%
(25%)
5%
25%
10%
(10%)
(5%)
5% (20%)
5%
(5%) 20%
5%
(5%)
(5%)
30% (15%)
5%
(5%)
(5%)
(30%) 15%
5%
10%
5%
(10%)
20%
(20%)
(5%)
(20%)
30%
(30%)
(10%)
20%
10%
5%
10%
(5%)
(10%)
LEGEND
XX% - Entering Traffic Volumes
(XX%) - Exiting Traffic Volumes
N
N.T.S.
Figure 7
Distribution of Peak Hour Traffic Volumes (Primary)

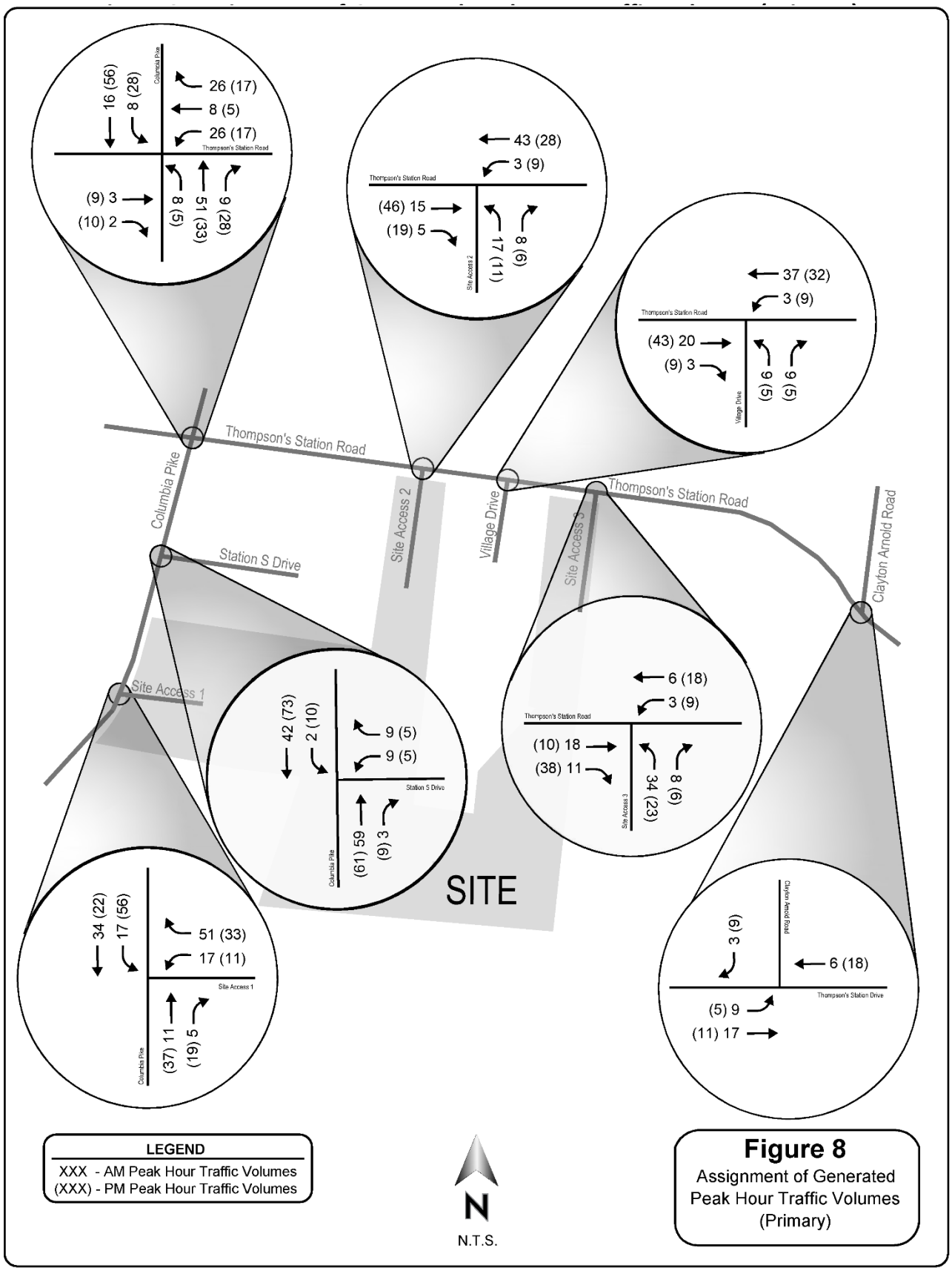


Figure 8
Assignment of Generated Peak Hour Traffic Volumes (Primary)

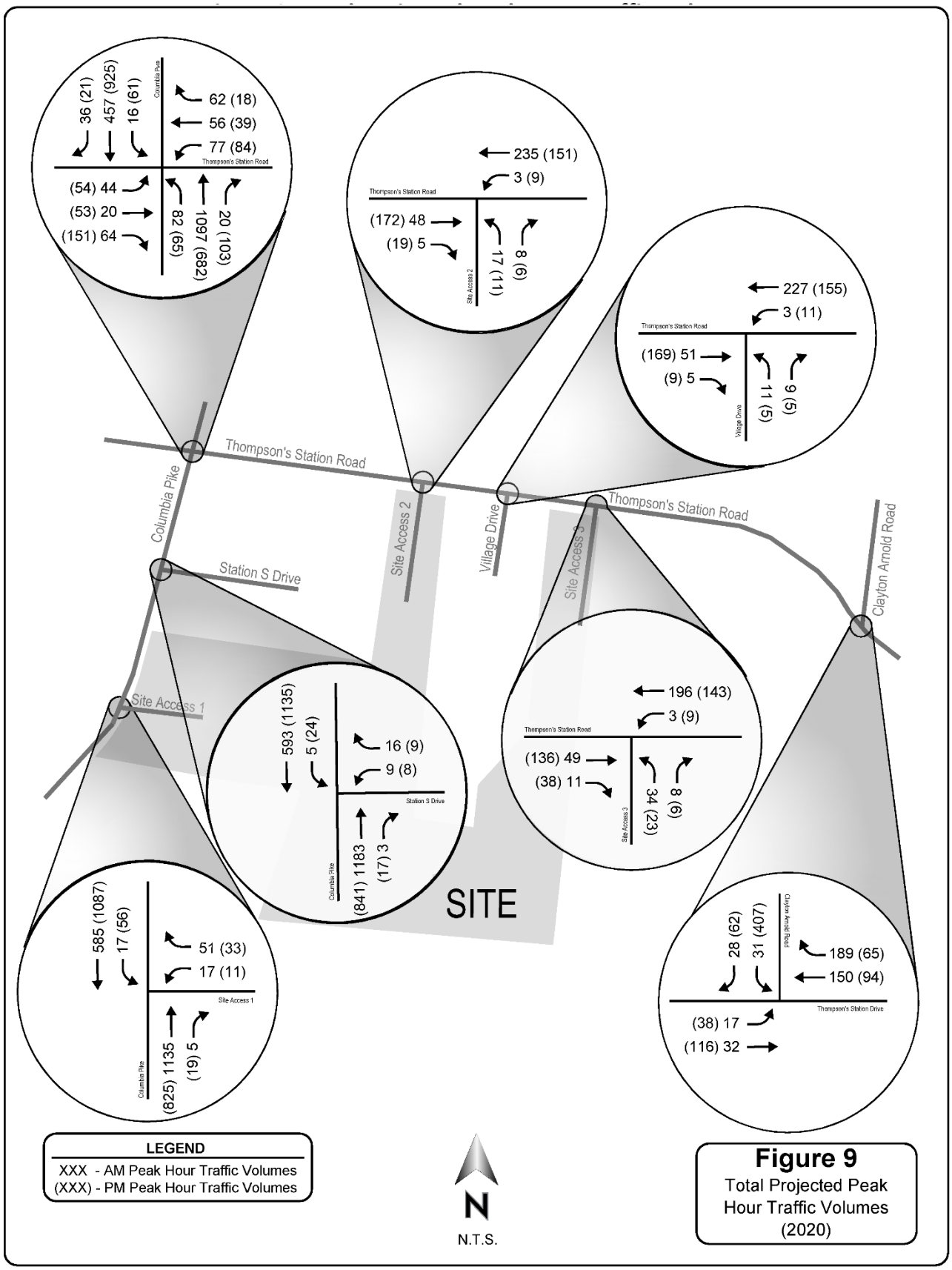


Figure 9
Total Projected Peak Hour Traffic Volumes (2020)

Projected Capacity Analyses

To evaluate the projected traffic operations at the study intersections within the vicinity of the project site, AM and PM peak hour capacity analyses were performed. The capacity analyses include the total projected traffic volumes generated from the proposed development in addition to background traffic volumes. Levels-of-service (LOS), corresponding average delays, and 95th percentile queues were calculated for each turning movement. Appendix C contains the detailed capacity analyses results. For this analysis, optimized traffic signal timings were used at the intersection of Thompson's Station Road and Columbia Pike.

Table 12. Projected (No Improvement) Capacity Analyses

Study Intersection	Control	Approach	2020 Projected Conditions (No Improvement)					
			AM Peak Hour			PM Peak Hour		
			LOS	Delay (s)	Queue (veh)	LOS	Delay (s)	Queue (veh)
1. **Thompson's Station Road and Columbia Pike**	Signal	NB Left	A	7.0	8	C	24.9	5
		NB Thru/Right	C	33.1	17	C	27.4	18
		SB Left	C	27.0	2	B	18.1	11
		SB Thru/Right	A	9.8	9	F	57.6	32
		EB Left	D	48.0	4	C	32.3	4
		EB Thru/Right	E	56.6	4	E	58.1	8
		WB Left	D	48.7	4	C	34.4	4
		WB Thru/Right	E	59.8	5	C	35.0	4
		Overall	**C**	**29.8**	**--**	**D**	**43.1**	**--**
2. **Columbia Pike and Station South Drive**	TWSC	SB Left	B	11.8	0	B	10.1	1
		WB Left/Right	E	43.6	1	F	63.0	1
3. **Thompson's Station Road and Village Drive**	TWSC	NB Left/Right	A	9.6	1	B	10.1	0
		WB Left	A	7.3	0	A	7.6	0
4. **Thompson's Station Road and Clayton Arnold Road**	TWSC	SB Left	B	10.9	1	C	23.1	6
		SB Right	A	9.8	1	A	9.3	1
		EB Left	A	8.1	0	A	7.6	1
5. **Columbia Pike and Site Access 1**	TWSC	SB Left	B	11.6	1	B	10.3	1
		WB Left/Right	F	54.4	3	F	60.0	2
6. **Columbia Pike and Site Access 2**	TWSC	NB Left/Right	A	9.9	1	B	10.4	1
		WB Left	A	7.3	0	A	7.7	0
7. **Columbia Pike and Site Access 3**	TWSC	NB Left/Right	B	10.1	1	B	10.5	1
		WB Left	A	7.3	0	A	7.6	0

As shown in Table 11, the southbound through/right-turn movements at the intersection of Thompson's Station Road and Columbia Pike will operate at LOS F during the PM peak hour with the addition of projected traffic volumes. The eastbound through/right-turn movements at the intersection of Thompson's Station Road and Columbia Pike will operate at LOS E during the AM and PM peak hours with the addition of projected traffic volumes. The westbound through/right-turn movements at the intersection of Thompson's Station Road and Columbia Pike will operate

at LOS E during the AM peak hour with the addition of projected traffic volumes. Even though these movements will operate at an unacceptable LOS, the overall intersection will operate at LOS C and LOS D during the AM and PM peak hours, respectively, which is acceptable. The westbound approach to the intersection of Columbia Pike and Station South Drive will operate at LOS E and LOS F during the AM and PM peak hours, respectively, with the addition of projected traffic volumes. The westbound approach to the intersection of Columbia Pike and Site Access 1 will operate at LOS F during the AM and PM peak hours with the addition of projected traffic volumes. All other critical movements to the study intersections surrounding the proposed development will continue to operate at a minimum of LOS D during the AM and PM peak hours with the addition of projected traffic volumes. Appendix C contains the detailed capacity analyses results.

Intersection Assessments (Projected Conditions)

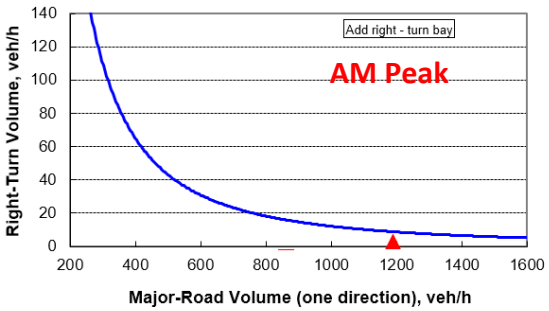
Engineering assessments were performed on the intersections within the study area to identify underlying inefficiencies and solutions to alleviate any concerns associated with existing and proposed geometries and traffic volumes along the roadway network.

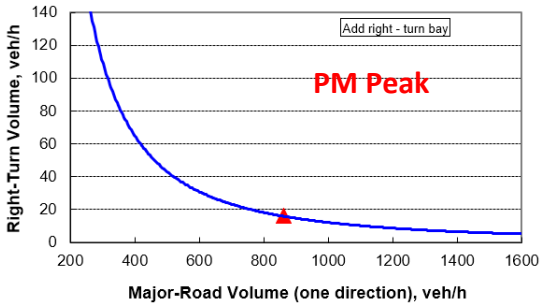
Major Road Approach Geometry Warrants - Projected

Major-road approach geometric warrants were performed based on Figures 2-5 and 2-6, respectively, in the *NCHRP Report 457 – Evaluating Intersection Improvements: An Engineering Study Guide*[4].

Table 13. Major-Road Approach Geometry, NB Columbia Pike at Station South Drive

Variable	AM Peak	PM Peak
Major-road speed, mph:	45	45
Major-road volume (one direction), veh/h:	1,186	858
Major-road right-turn volume, veh/h:	3	17
Limiting right-turn volume, veh/h:	9	16
Right-turn bay warranted:	**NO**	**YES**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		



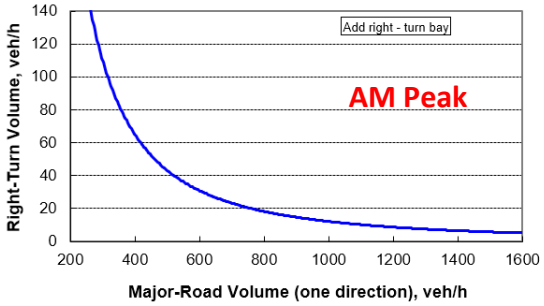


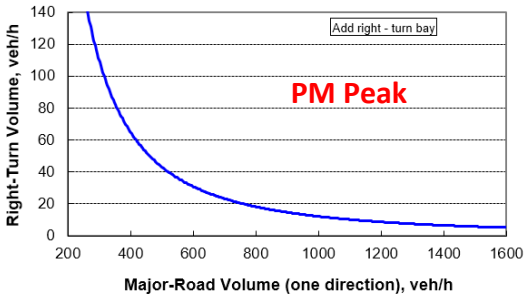
As shown in Table 13 and the corresponding graphs, it was determined that a northbound right-turn lane is warranted along Columbia Pike at its intersection with Station South Drive during the PM peak hour with projected traffic volumes. However, due to the limited turning volumes and projected capacity operating at acceptable levels, a northbound right-turn lane is not recommended as part of this study.

[4] Transportation Research Board (TRB). Evaluating Intersection Improvements: An Engineering Study Guide. Washington, DC: 2001

Table 14. Major-Road Approach Geometry, EB Thompson's Station Road at Village Drive

Variable	AM Peak	PM Peak
Major-road speed, mph:	45	45
Major-road volume (one direction), veh/h:	56	178
Major-road right-turn volume, veh/h:	5	9
Limiting right-turn volume, veh/h:	2,385	287
Right-turn bay warranted:	**NO**	**NO**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

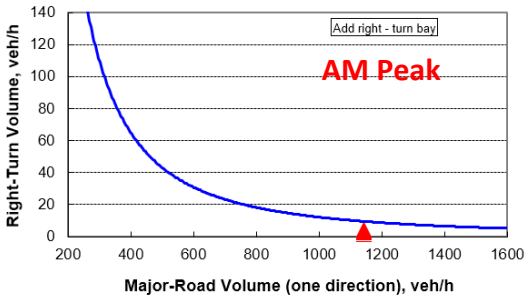


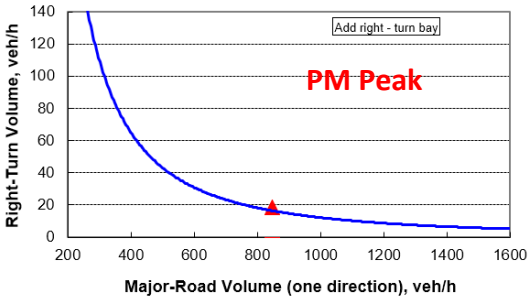


As shown in Table 14 and the corresponding graphs, it was determined that an eastbound right-turn lane is not warranted along Thompson's Station Road at its intersection with Village Drive during either peak hour period with projected traffic volumes.

Table 15. Major-Road Approach Geometry, NB Columbia Pike at Site Access 1

Variable	AM Peak	PM Peak
Major-road speed, mph:	45	45
Major-road volume (one direction), veh/h:	1,140	844
Major-road right-turn volume, veh/h:	5	19
Limiting right-turn volume, veh/h:	10	17
Right-turn bay warranted:	**NO**	**YES**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

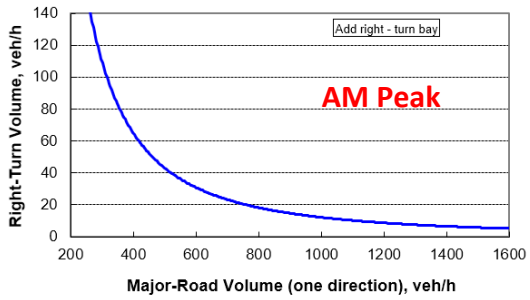


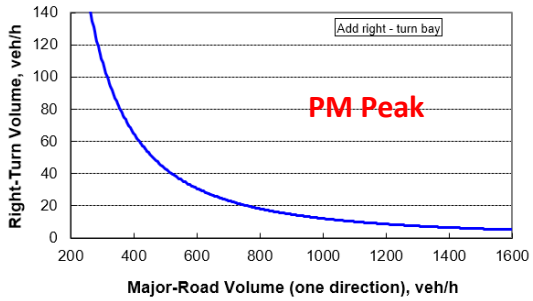


As shown in Table 15 and the corresponding graphs, it was determined that a northbound right-turn lane is warranted along Columbia Pike at its intersection with Site Access 1 during the PM peak hour with projected traffic volumes.

Table 16. Major-Road Approach Geometry, EB Thompson's Station Road at Site Access 2

Variable	AM Peak	PM Peak
Major-road speed, mph:	45	45
Major-road volume (one direction), veh/h:	53	191
Major-road right-turn volume, veh/h:	5	19
Limiting right-turn volume, veh/h:	2,638	252
Right-turn bay warranted:	**NO**	**NO**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

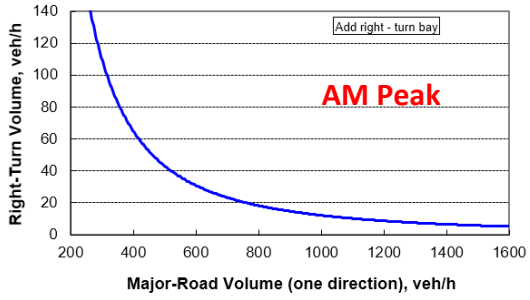


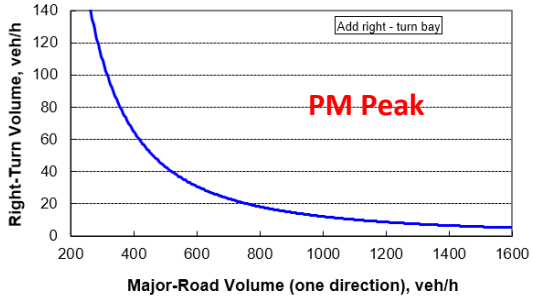


As shown in Table 16 and the corresponding graphs, it was determined that an eastbound right-turn lane is not warranted along Thompson's Station Road at its intersection with Site Access 2 during either peak hour period with projected traffic volumes.

Table 17. Major-Road Approach Geometry, EB Thompson's Station Road at Site Access 3

Variable	AM Peak	PM Peak
Major-road speed, mph:	45	45
Major-road volume (one direction), veh/h:	60	174
Major-road right-turn volume, veh/h:	11	38
Limiting right-turn volume, veh/h:	2,102	299
Right-turn bay warranted:	**NO**	**NO**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

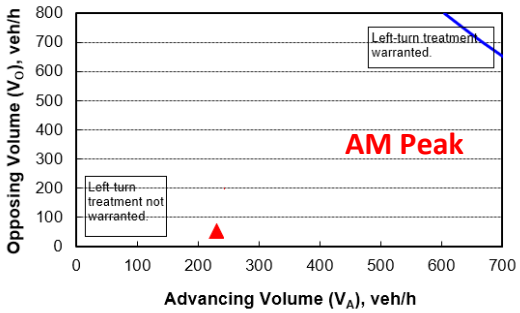


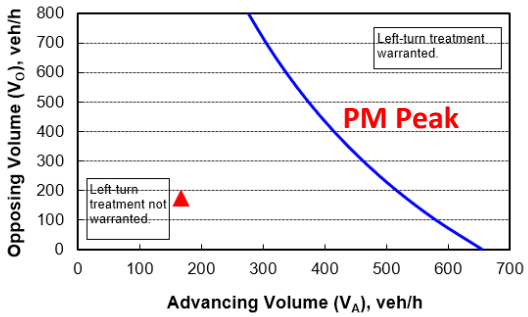


As shown in Table 17 and the corresponding graphs, it was determined that an eastbound right-turn lane is not warranted along Thompson's Station Road at its intersection with Site Access 3 during either peak hour period with projected traffic volumes.

Table 18. Major-Road Approach Geometry, WB Thompson's Station Road at Village Drive

Variable	AM Peak	PM Peak
85th percentile speed, mph:	45	45
Percent of left-turns in advancing volume (V_A), %:	1%	7%
Advancing volume (V_A), veh/h:	230	166
Opposing volume (V_O), veh/h:	56	178
Limiting advancing volume (V_A), veh/h:	1,340	529
Left-turn bay warranted:	**NO**	**NO**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

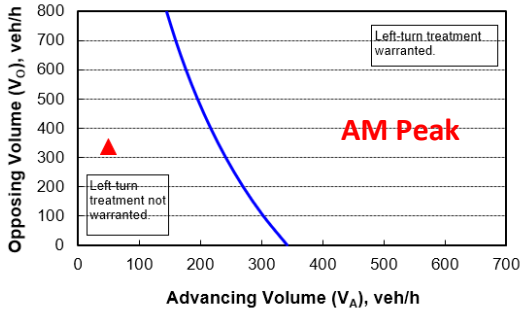


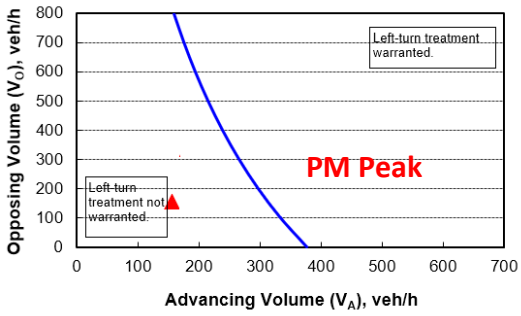


As shown in Table 18 and the corresponding graphs, it was determined that a westbound left-turn lane is not warranted along Thompson's Station Road at its intersection with Village Drive during either peak hour period with projected traffic volumes.

Table 19. Major-Road Approach Geometry, EB Thompson's Station Road at Clayton Arnold Road

Variable	AM Peak	PM Peak
85th percentile speed, mph:	45	45
Percent of left-turns in advancing volume (V_A), %:	35%	25%
Advancing volume (V_A), veh/h:	49	154
Opposing volume (V_O), veh/h:	339	159
Limiting advancing volume (V_A), veh/h:	231	312
Left-turn bay warranted:	**NO**	**NO**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

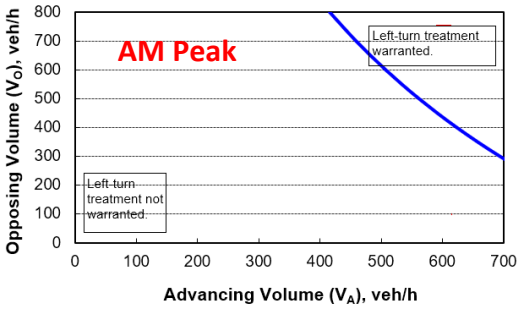


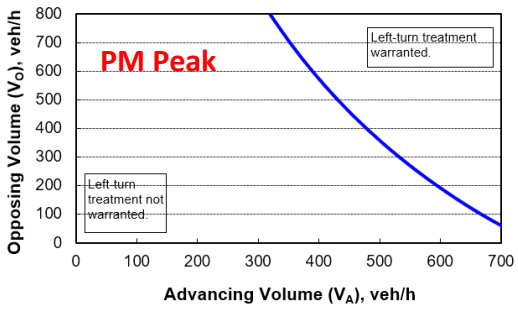


As shown in Table 19 and the corresponding graphs, it was determined that an eastbound left-turn lane is not warranted along Thompson's Station Road at its intersection with Clayton Arnold Road during either peak hour period with projected traffic volumes.

Table 20. Major-Road Approach Geometry, SB Columbia Pike at Site Access 1

Variable	AM Peak	PM Peak
85th percentile speed, mph:	45	45
Percent of left-turns in advancing volume (V_A), %:	3%	5%
Advancing volume (V_A), veh/h:	602	1,143
Opposing volume (V_O), veh/h:	1,140	844
Limiting advancing volume (V_A), veh/h:	299	305
Left-turn bay warranted:	**YES**	**YES**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

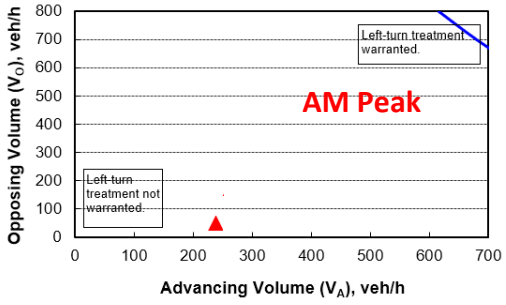


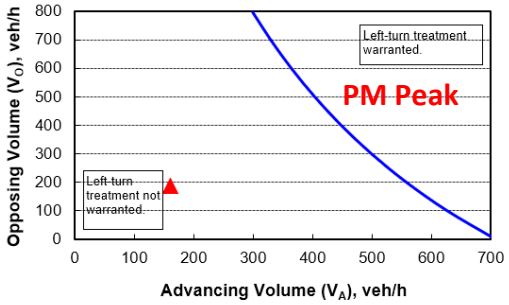


As shown in Table 20 and the corresponding graphs, it was determined that a southbound left-turn lane is warranted along Columbia Pike at its intersection with Site Access 1 during both AM and PM peak hours with projected traffic volumes.

Table 21. Major-Road Approach Geometry, WB Thompson's Station Road at Site Access 2

Variable	AM Peak	PM Peak
85th percentile speed, mph:	45	45
Percent of left-turns in advancing volume (V_A), %:	1%	6%
Advancing volume (V_A), veh/h:	238	160
Opposing volume (V_O), veh/h:	53	191
Limiting advancing volume (V_A), veh/h:	1,367	563
Left-turn bay warranted:	**NO**	**NO**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

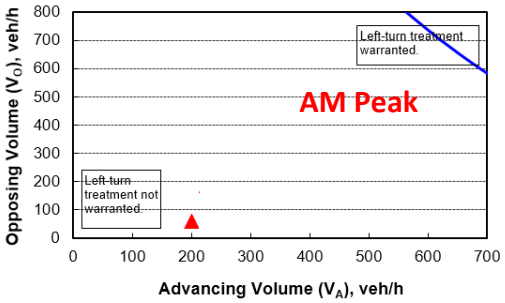


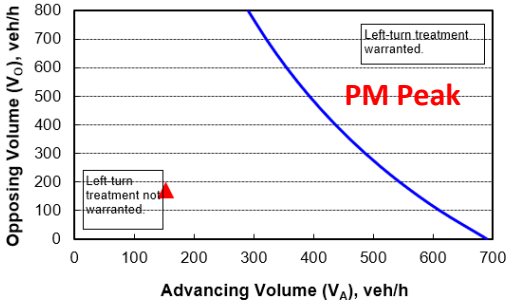


As shown in Table 21 and the corresponding graphs, it was determined that a westbound left-turn lane is not warranted along Thompson's Station Road at its intersection with Site Access 2 during either peak hour period with projected traffic volumes.

Table 22. Major-Road Approach Geometry, WB Thompson's Station Road at Site Access 3

Variable	AM Peak	PM Peak
85th percentile speed, mph:	45	45
Percent of left-turns in advancing volume (V_A), %:	2%	6%
Advancing volume (V_A), veh/h:	199	152
Opposing volume (V_O), veh/h:	60	174
Limiting advancing volume (V_A), veh/h:	1,241	561
Left-turn bay warranted:	**NO**	**NO**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		





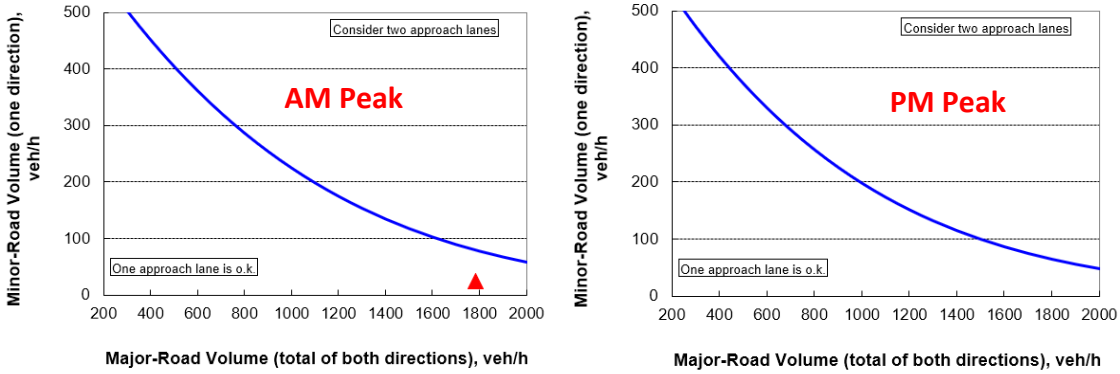
As shown in Table 22 and the corresponding graphs, it was determined that a westbound left-turn lane is not warranted along Thompson's Station Road at its intersection with Site Access 3 during either peak hour period with projected traffic volumes.

Minor Road Approach Geometry Warrants – Projected

Minor-road approach geometric warrants were performed based on Figure 2-4 in the *NCHRP Report 457 – Evaluating Intersection Improvements: An Engineering Study Guide*[5].

Table 23. Minor-Road Approach Geometry, WB Station South Drive at Columbia Pike

Variable	AM Peak	PM Peak
Major-road volume (total both directions), veh/h:	1,784	2,017
Percentage of right-turns on minor road, %:	64%	53%
Minor-road volume (one direction), veh/h:	25	17
Limiting minor-road volume (one direction), veh/h:	79	46
Right-turn bay warranted:	**One (1) approach lane is sufficient**	**One (1) approach lane is sufficient**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

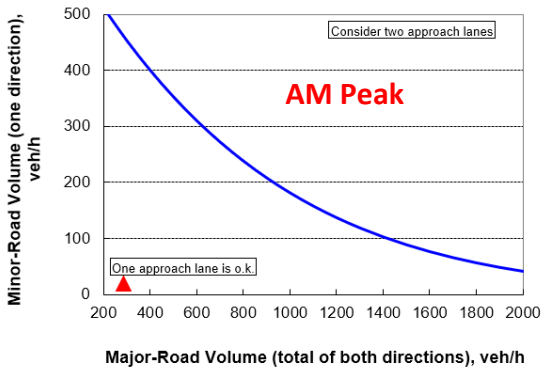


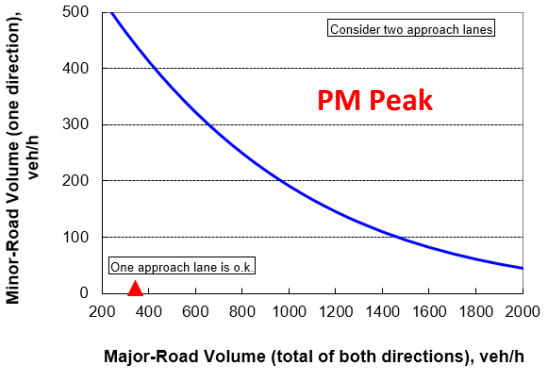
As shown in Table 23 and the corresponding graphs, it was determined that one (1) shared lane for left-turning and right-turning movements is sufficient along the westbound approach of Station South Drive at its intersection with Columbia Pike during the peak hour periods with projected traffic volumes.

[5] Transportation Research Board (TRB). Evaluating Intersection Improvements: An Engineering Study Guide. Washington, DC: 2001

Table 24. Minor-Road Approach Geometry, NB Village Drive at Thompson's Station Road

Variable	AM Peak	PM Peak
Major-road volume (total both directions), veh/h:	286	344
Percentage of right-turns on minor road, %:	45%	50%
Minor-road volume (one direction), veh/h:	20	10
Limiting minor-road volume (one direction), veh/h:	460	441
Right-turn bay warranted:	**One (1) approach lane is sufficient**	**One (1) approach lane is sufficient**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

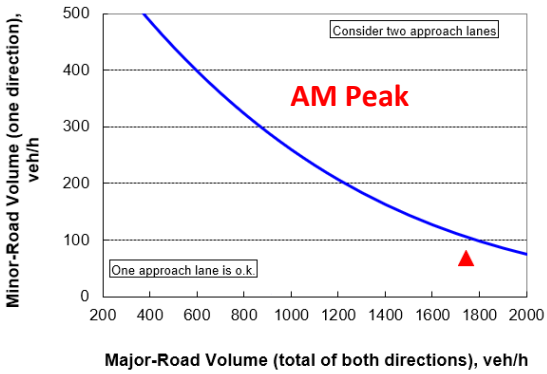


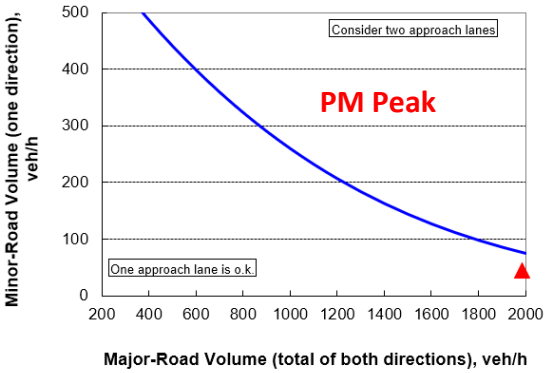


As shown in Table 24 and the corresponding graphs, it was determined that one (1) shared lane for left-turning and right-turning movements is sufficient along Village Drive at its intersection with Thompson's Station Road during the peak hour periods with projected traffic volumes.

Table 25. Minor-Road Approach Geometry, WB Site Access 1 at Columbia Pike

Variable	AM Peak	PM Peak
Major-road volume (total both directions), veh/h:	1,742	1,987
Percentage of right-turns on minor road, %:	75%	75%
Minor-road volume (one direction), veh/h:	68	44
Limiting minor-road volume (one direction), veh/h:	105	76
Right-turn bay warranted:	**One (1) approach lane is sufficient**	**One (1) approach lane is sufficient**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

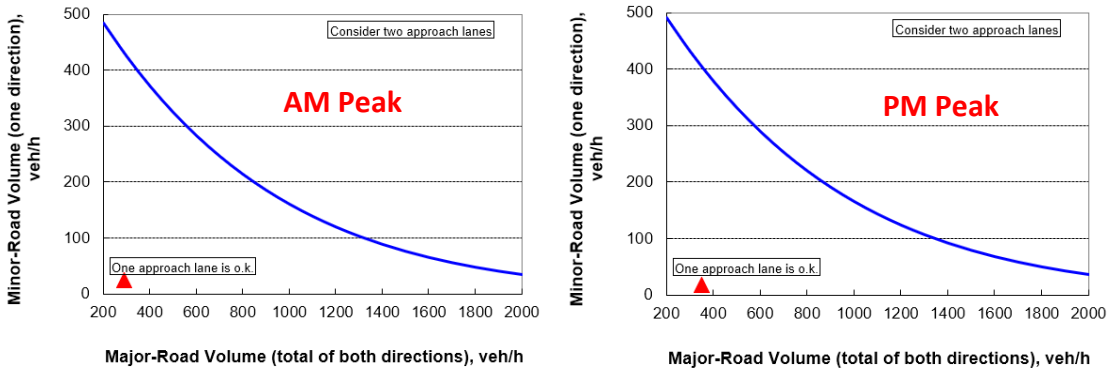




As shown in Table 25 and the corresponding graphs, it was determined that one (1) shared lane for left-turning and right-turning movements is sufficient along Site Access 1 at its intersection with Columbia Pike during the peak hour periods with projected traffic volumes.

Table 26. Minor-Road Approach Geometry, NB Site Access 2 at Thompson's Station Road

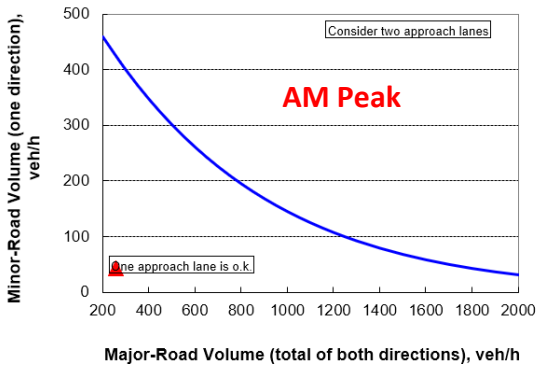
Variable	AM Peak	PM Peak
Major-road volume (total both directions), veh/h:	291	351
Percentage of right-turns on minor road, %:	32%	35%
Minor-road volume (one direction), veh/h:	25	17
Limiting minor-road volume (one direction), veh/h:	429	403
Right-turn bay warranted:	**One (1) approach lane is sufficient**	**One (1) approach lane is sufficient**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		

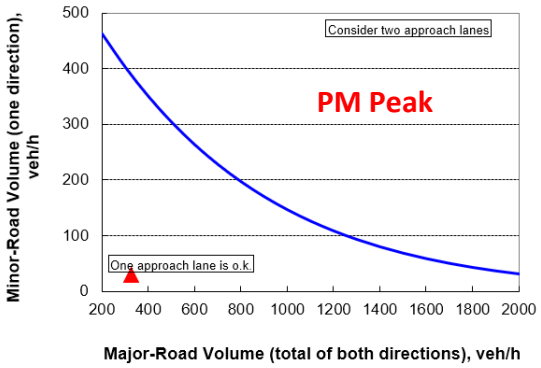


As shown in Table 26 and the corresponding graphs, it was determined that one (1) shared lane for left-turning and right-turning movements is sufficient along Site Access 2 at its intersection with Thompson's Station Road during the peak hour periods with projected traffic volumes.

Table 27. Minor-Road Approach Geometry, NB Site Access 3 at Thompson's Station Road

Variable	AM Peak	PM Peak
Major-road volume (total both directions), veh/h:	259	326
Percentage of right-turns on minor road, %:	19%	21%
Minor-road volume (one direction), veh/h:	42	29
Limiting minor-road volume (one direction), veh/h:	423	388
Right-turn bay warranted:	**One (1) approach lane is sufficient**	**One (1) approach lane is sufficient**
Source: *NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide*		





As shown in Table 27 and the corresponding graphs, it was determined that one (1) shared lane for left-turning and right-turning movements is sufficient along Site Access 3 at its intersection with Thompson's Station Road during the peak hour periods with projected traffic volumes.

Traffic Signal Warrants - Projected

The *TDOT Traffic Design Manual* subsection 3.2.4A – Application of Signal Warrants states "In investigation of warrants toward signal justification, Warrant 1 (Eight Hour Vehicular Volume) or Warrant 7 (Crash Experience) will be the primary warrants considered for signal approval." Therefore, this study assumed that a traffic signal would not be warranted unless one (1) of the three (3) Eight Hour Vehicular Volume Warrants was met (Warrants 1A, 1B, and 1C).

Traffic volume related signal warrants were performed based on projected traffic volumes and 70 percent minimum vehicular volumes provided in Section 4C of the Manual on Uniform Traffic Control Device (MUTCD) and as shown in Appendix D. As directed within the MUTCD, traffic volumes within the 70 percent columns were used due to the statutory speed limit exceeding 40 MPH. The results of the signal analyses are provided in the table below. It should be noted that the midday hours between 9:00 AM – 2:00 PM were interpolated and are considered to be a conservative estimate.

Table 28. Signal Warrant Analysis, Columbia Pike and Station South Drive

Hour	Traffic Volumes		Warrants[5] Fulfilled				
	Major	Minor	1A	1B	1C	2	3
	Both Directions	Highest Approach					
6:00-7:00 AM	1481	22	--	--	--	--	--
7:00-8:00	1611	19	--	--	--	--	--
8:00-9:00	1701	16	--	--	--	--	--
9:00-10:00*	1688	16	--	--	--	--	--
10:00-11:00*	1682	13	--	--	--	--	--
11:00 AM-12:00 PM*	1666	12	--	--	--	--	--
12:00-1:00*	1666	13	--	--	--	--	--
1:00-2:00*	1683	15	--	--	--	--	--
2:00-3:00*	1678	14	--	--	--	--	--
3:00-4:00*	1680	14	--	--	--	--	--
4:00-5:00	1928	13	--	--	--	--	--
5:00-6:00	1931	17	--	--	--	--	--
Total Hours Warranted			**0**	**0**	**0**	**0**	**0**
***Existing traffic volumes were interpolated and are considered to be a conservative estimate.**							

As shown in Table 28, none of the five (5) traffic volume related signal warrants were fulfilled for the required number of hours at the intersection of Columbia Pike and Station South Drive with projected traffic volumes.

Table 29. Signal Warrant Analysis, Thompson's Station Road and Village Drive

Hour	Traffic Volumes		Warrants[5] Fulfilled				
	Major	Minor	1A	1B	1C	2	3
	Both Directions	Highest Approach					
6:00-7:00 AM	237	30	--	--	--	--	--
7:00-8:00	285	14	--	--	--	--	--
8:00-9:00	273	16	--	--	--	--	--
9:00-10:00	269	16	--	--	--	--	--
10:00-11:00	272	13	--	--	--	--	--
11:00 AM-12:00 PM	267	11	--	--	--	--	--
12:00-1:00	272	12	--	--	--	--	--
1:00-2:00	284	14	--	--	--	--	--
2:00-3:00	287	13	--	--	--	--	--
3:00-4:00	295	13	--	--	--	--	--
4:00-5:00	340	13	--	--	--	--	--
5:00-6:00	341	13	--	--	--	--	--
Total Hours Warranted			**0**	**0**	**0**	**0**	**0**

As shown in Table 29, none of the five (5) traffic volume related signal warrants were fulfilled for the required number of hours at the intersection of Thompson's Station Road and Village Drive with projected traffic volumes.

Table 30. Signal Warrant Analysis, Thompson's Station Road and Clayton Arnold Road

Hour	Traffic Volumes		Warrants[5] Fulfilled				
	Major	Minor	1A	1B	1C	2	3
	Both Directions	Highest Approach					
6:00-7:00 AM	328	28	--	--	--	--	--
7:00-8:00	409	55	--	--	--	--	--
8:00-9:00	305	79	--	--	--	--	--
9:00-10:00*	296	94	--	--	--	--	--
10:00-11:00*	290	108	--	--	--	--	--
11:00 AM-12:00 PM*	279	123	--	--	--	--	--
12:00-1:00*	279	138	--	--	--	--	--
1:00-2:00*	278	154	--	--	--	--	--
2:00-3:00*	272	169	--	--	--	--	--
3:00-4:00*	268	185	--	--	--	--	--
4:00-5:00	311	350	--	--	--	--	--
5:00-6:00	328	489	--	--	--	--	Yes
Total Hours Warranted			**0**	**0**	**0**	**0**	**1**
***Existing traffic volumes were interpolated and are considered to be a conservative estimate.**							

As shown in Table 30, one of the five (5) traffic volume related signal warrants was fulfilled for the required number of hours at the intersection of Thompson's Station Road and Clayton Arnold Road with projected traffic volumes. Specifically, Warrant 3 (Peak Hour) was fulfilled. However, since Warrant 1 (Eight-Hour Vehicular Volume) was not fulfilled as required by TDOT, this intersection does not warrant a traffic signal.

Table 31. Signal Warrant Analysis, Columbia Pike and Site Access 1

Hour	Traffic Volumes		Warrants[5] Fulfilled				
	Major	Minor	1A	1B	1C	2	3
	Both Directions	Highest Approach					
6:00-7:00 AM	1437	48	--	--	--	--	--
7:00-8:00	1576	35	--	--	--	--	--
8:00-9:00	1677	27	--	--	--	--	--
9:00-10:00*	1665	23	--	--	--	--	--
10:00-11:00*	1661	22	--	--	--	--	--
11:00 AM-12:00 PM*	1650	17	--	--	--	--	--
12:00-1:00*	1647	20	--	--	--	--	--
1:00-2:00*	1658	25	--	--	--	--	--
2:00-3:00*	1656	23	--	--	--	--	--
3:00-4:00*	1658	23	--	--	--	--	--
4:00-5:00	1909	23	--	--	--	--	--
5:00-6:00	1906	23	--	--	--	--	--
Total Hours Warranted			**0**	**0**	**0**	**0**	**0**
***Existing traffic volumes were interpolated and are considered to be a conservative estimate.**							

As shown in Table 31, none of the five (5) traffic volume related signal warrants were fulfilled for the required number of hours at the intersection of Columbia Pike and Site Access 1 with projected traffic volumes.

Table 32. Signal Warrant Analysis, Thompson's Station Road and Site Access 2

Hour	Traffic Volumes		Warrants[5] Fulfilled				
	Major	Minor	1A	1B	1C	2	3
	Both Directions	Highest Approach					
6:00-7:00 AM	249	29	--	--	--	--	--
7:00-8:00	287	21	--	--	--	--	--
8:00-9:00	279	16	--	--	--	--	--
9:00-10:00*	275	14	--	--	--	--	--
10:00-11:00*	276	13	--	--	--	--	--
11:00 AM-12:00 PM*	272	10	--	--	--	--	--
12:00-1:00*	277	12	--	--	--	--	--
1:00-2:00*	291	15	--	--	--	--	--
2:00-3:00*	292	14	--	--	--	--	--
3:00-4:00*	299	14	--	--	--	--	--
4:00-5:00	345	14	--	--	--	--	--
5:00-6:00	345	14	--	--	--	--	--
Total Hours Warranted			**0**	**0**	**0**	**0**	**0**
***Existing traffic volumes were interpolated and are considered to be a conservative estimate.**							

As shown in Table 32, none of the five (5) traffic volume related signal warrants were fulfilled for the required number of hours at the intersection of Thompson's Station Road and Site Access 2 with projected traffic volumes.

Table 33. Signal Warrant Analysis, Thompson's Station Road and Site Access 3

Hour	Traffic Volumes		Warrants[5] Fulfilled				
	Major	Minor	1A	1B	1C	2	3
	Both Directions	Highest Approach					
6:00-7:00 AM	201	49	--	--	--	--	--
7:00-8:00	257	34	--	--	--	--	--
8:00-9:00	250	26	--	--	--	--	--
9:00-10:00*	249	24	--	--	--	--	--
10:00-11:00*	250	21	--	--	--	--	--
11:00 AM-12:00 PM*	248	16	--	--	--	--	--
12:00-1:00*	250	20	--	--	--	--	--
1:00-2:00*	258	25	--	--	--	--	--
2:00-3:00*	261	23	--	--	--	--	--
3:00-4:00*	265	23	--	--	--	--	--
4:00-5:00	314	24	--	--	--	--	--
5:00-6:00	315	24	--	--	--	--	--
Total Hours Warranted			**0**	**0**	**0**	**0**	**0**
***Existing traffic volumes were interpolated and are considered to be a conservative estimate.**							

As shown in Table 33, none of the five (5) traffic volume related signal warrants were fulfilled for the required number of hours at the intersection of Thompson's Station Road and Site Access 3 with projected traffic volumes.

Conclusions and Recommendations

Existing Conditions

The westbound approach to the intersection of Columbia Pike and Station South Drive currently operates at LOS E during the PM peak hour. All other critical movements to the study intersections surrounding the proposed development currently operate at a minimum of LOS D during the AM and PM peak hours with existing traffic volumes.

It was determined that the southbound approach of Columbia Pike at its intersection with Station South Drive presently warrants one (1) exclusive lane for left-turning movements with existing traffic volumes. It is important to note that this improvement is necessary regardless of the proposed Thompson's Station Road Subdivision Development and should not be the responsibility of the development.

It was determined that the westbound approach of Thompson's Station Road at its intersection with Clayton Arnold Road presently warrants one (1) exclusive lane for right-turning movements with existing traffic volumes. It is important to note that this improvement is necessary regardless of the proposed Thompson's Station Road Subdivision Development and should not be the responsibility of the development.

The installation of the southbound left-turn lane along Columbia Pike at its intersection with Station South Drive will reflect a positive impact on the frequency and number of rear-end related crashes for vehicles traveling southbound on Columbia Pike. With vehicles utilizing the southbound left-turn lane at this intersection, vehicles traveling in the though lane can progress through the intersection without being impeded by left-turning vehicles. Thus, improving the safety and overall operation of the intersection. The installation of a westbound right-turn lane along Thompson's Station Road at its intersection with Clayton Arnold Road will reflect a positive impact on the frequency of angle and rear-end related crashes for vehicles traveling westbound on Thompson's Station Road. This right-turn lane will allow vehicles traveling westbound in the through lane to progress through the intersection without being impeded by right-turning vehicles. It is important to note that this improvement is necessary regardless of the proposed Thompson's Station Road Subdivision Development and should not be the responsibility of the development as they are warranted based on existing deficiencies.

Background Conditions

The southbound through/right-turn movements to the intersection of Thompson's Station Road and Columbia Pike will operate at LOS F during the PM peak hour with the addition of the background traffic volumes. Even though these movements will operate at an unacceptable LOS, the overall intersection will operate at LOS D during the PM peak hour, which is acceptable. The westbound approach to the intersection of Columbia Pike and Station South Drive will continue to operate at LOS E during the PM peak hour with the addition of background traffic volumes. All other critical movements to the study intersections surrounding the proposed development will continue to operate at a minimum of LOS D during the AM and PM peak hours with the addition of background traffic volumes.

Projected Conditions

The southbound through/right-turn movements at the intersection of Thompson's Station Road and Columbia Pike will operate at LOS F during the PM peak hour with the addition of projected traffic volumes. The eastbound through/right-turn movements at the intersection of Thompson's Station Road and Columbia Pike will operate at LOS E during the AM and PM peak hours with the addition of projected traffic volumes. The westbound through/right-turn movements at the intersection of Thompson's Station Road and Columbia Pike will operate at LOS E during the AM peak hour with the addition of projected traffic volumes. Even though these movements will operate at an unacceptable LOS, the overall intersection will operate at LOS C and LOS D during the AM and PM peak hours, respectively, which is acceptable. The westbound approach to the intersection of Columbia Pike and Station South Drive will operate at LOS E and LOS F during the AM and PM peak hours, respectively, with the addition of projected traffic volumes. The westbound approach to the intersection of Columbia Pike and Site Access 1 will operate at LOS F during the AM and PM peak hours with the addition of projected traffic volumes. All other critical movements to the study intersections surrounding the proposed development will continue to operate at a minimum of LOS D during the AM and PM peak hours with the addition of projected traffic volumes.

It was determined that the northbound approach of Columbia Pike at its intersection with Station South Drive will warrant one (1) exclusive lane for right-turning movements with projected traffic volumes. However, due to the limited turning volumes and projected capacity operating at acceptable levels, a northbound right-turn lane is not recommended as part of this study.

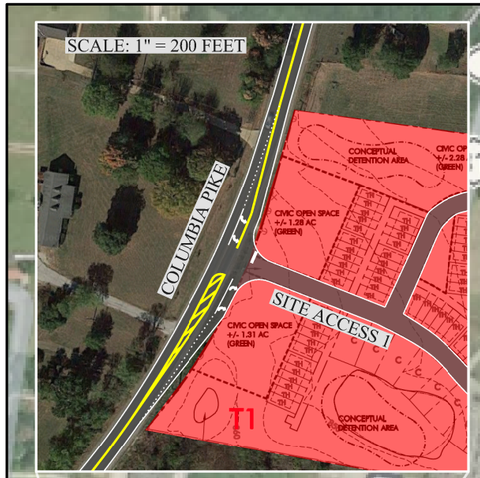
It was determined that the southbound approach of Columbia Pike at its intersection with the proposed Site Access 1 will warrant one (1) exclusive lane for left-turning movements with projected traffic volumes. Furthermore, it was determined that the northbound approach of Columbia Pike at its intersection with the proposed Site Access 1 will warrant one (1) exclusive lane for right-turning movements with projected traffic volumes.

It was determined that one (1) shared lane for left-turning and right-turning movements is sufficient along the westbound approach of the proposed Site Access 1 at its intersection with Columbia Pike with projected traffic volumes. Furthermore, it was determined that one (1) shared lane for left-turning and right-turning movements is sufficient along the northbound approach of the proposed Site Access 2 at its intersection with Columbia Pike with projected traffic volumes.

Based on the analyses within this study, and a review of the proposed development's access plan, the recommendations below (and on Figure 10) are presented to be implemented as part of the proposed Thompson's Station Road Subdivision in Thompson's Station, TN:

Improvement Recommendations for the Thompson's Station Road Subdivision

- Construct the proposed Site Access 1 with one (1) inbound lane and one (1) outbound lane operating under a stop condition according to MUTCD, AASHTO, and TDOT standards; The outbound lane will be a shared lane for left-turning and right-turning movements;
- Construct the proposed Site Access 2 with one (1) inbound lane and one (1) outbound lane operating under a stop condition according to MUTCD, AASHTO, and TDOT standards; The outbound lane will be a shared lane for left-turning and right-turning movements;
- Construct the proposed Site Access 3 with one (1) inbound lane and one (1) outbound lane operating under a stop condition according to MUTCD, AASHTO, and TDOT standards; The outbound lane will be a shared lane for left-turning and right-turning movements;
- Construct one (1) exclusive left-turn lane on the southbound approach of Columbia Pike at its intersection with the proposed Site Access 1. The left-turn lane shall provide 50 feet of storage and taper lengths according to MUTCD, AASHTO, and TDOT standards;
- Construct one (1) exclusive right-turn lane on the northbound approach of Columbia Pike at its intersection with the proposed Site Access 1. The right-turn lane shall provide 50 feet of storage and taper lengths according to MUTCD, AASHTO, and TDOT standards;
- A signal timing study should be performed at the intersection of Columbia Pike and Thompson's Station Road and all timings should be optimized to accommodate projected traffic volumes.
- All radii for the proposed access shall be designed to accommodate the largest turning requirements of either an SU-30 truck (garbage) or an emergency vehicle (fire apparatus) that will service the development according to MUTCD, AASHTO, and TDOT standards;
- Ensure the departure sight distance triangles for all driveways, internal intersections, and site access intersections are designed to be clear of all sight obstructions (including grade) as specified by AASHTO. The design of proposed internal roadway system should be completed according to the MUTCD, AASHTO, and TDOT standards;



Construct the proposed Site Access 1 with one (1) inbound lane and one (1) outbound lane operating under a stop condition according to MUTCD, AASHTO, and TDOT standards; The outbound lane will be a shared lane for left-turning and right-turning movements;

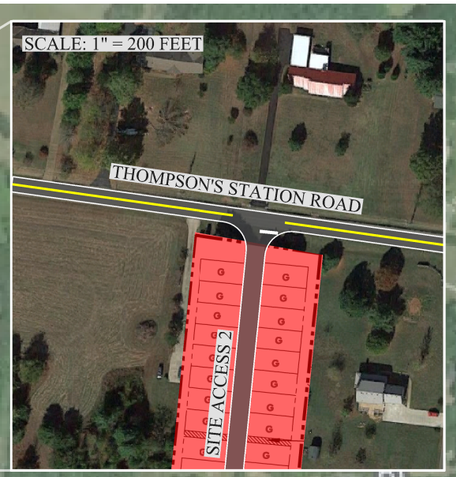
Construct one (1) exclusive left-turn lane on the southbound approach of Columbia Pike at its intersection with the proposed Site Access 1. The left-turn lane shall provide 50 feet of storage and taper lengths according to MUTCD, AASHTO, and TDOT standards;

Construct one (1) exclusive right-turn lane on the northbound approach of Columbia Pike at its intersection with the proposed Site Access 1. The right-turn lane shall provide 50 feet of storage and taper lengths according to MUTCD, AASHTO, and TDOT standards;

All radii for the proposed access shall be designed to accommodate the largest turning requirements of either an SU-30 truck (garbage) or an emergency vehicle (fire apparatus) that will service the development according to MUTCD, AASHTO, and TDOT standards;

Ensure the departure sight distance triangles for all driveways, internal intersections, and site access intersections are designed to be clear of all sight obstructions (including grade) as specified by AASHTO. The design of proposed internal roadway system should be completed according to the MUTCD, AASHTO, and TDOT standards;

Construct the proposed Site Access 2 with one (1) inbound lane and one (1) outbound lane operating under a stop condition according to MUTCD, AASHTO, and TDOT standards; The outbound lane will be a shared lane for left-turning and right-turning movements;



Construct the proposed Site Access 3 with one (1) inbound lane and one (1) outbound lane operating under a stop condition according to MUTCD, AASHTO, and TDOT standards; The outbound lane will be a shared lane for left-turning and right-turning movements;

PROJECT SITE

Columbia

Thompson Station Rd E

Clayton Arnold Rd

Country Haven Dr

31

T-SQUARE ENGINEERING
CIVIL-SITE | TRAFFIC | WASTEWATER

Figure 10 - Recommended Improvements

Thompson's Station Road Subdivision ● Thompson's Station, TN ● Approximate Scale: 1" = 300'

Prepared by T-Square Engineering, Inc. (June 2018)

701 West Main Street ● Franklin, TN 37064 ● www.T2-Eng.com

300' 150' 0' 300'

1 inch = 300 feet

N

Projected Capacity Analyses with Improvements

To evaluate impact of the proposed improvements on the projected traffic operations at the study intersections within the vicinity of the project site, AM and PM peak hour capacity analyses were performed with projected traffic volumes. Levels-of-service (LOS), corresponding average delays, and 95th percentile queues were calculated for each turning movement. The study intersections were analyzed under projected conditions with the proposed recommendations outlined in the Conclusions and Recommendations portion of this study. Appendix C contains the detailed capacity analyses results. For this analysis, optimized traffic signal timings were used at the intersection of Thompson's Station Road and Columbia Pike.

Table 34. Projected (With Improvements) Capacity Analyses

Study Intersection	Control	Approach	2020 Projected Conditions (With Improvements)					
			AM Peak Hour			PM Peak Hour		
			LOS	Delay (s)	Queue (veh)	LOS	Delay (s)	Queue (veh)
1. **Thompson's Station Road and Columbia Pike**	Signal	NB Left	A	7.0	9	C	24.9	6
		NB Thru/Right	C	33.1	22	C	27.4	19
		SB Left	C	27.0	2	B	18.1	10
		SB Thru/Right	A	9.8	8	F	57.6	31
		EB Left	D	48.0	4	C	32.3	3
		EB Thru/Right	E	56.6	5	E	58.1	7
		WB Left	D	48.7	4	C	34.4	4
		WB Thru/Right	E	59.8	6	C	35.0	5
		Overall	**C**	**29.8**	**--**	**D**	**43.1**	**--**
2. **Columbia Pike and Station South Drive**	TWSC	SB Left	B	11.8	0	B	10.1	1
		WB Left/Right	E	43.6	1	F	63.0	1
3. **Thompson's Station Road and Village Drive**	TWSC	NB Left/Right	A	9.6	1	B	10.1	0
		WB Left	A	7.3	0	A	7.6	0
4. **Thompson's Station Road and Clayton Arnold Road**	TWSC	SB Left	B	10.9	1	C	23.1	6
		SB Right	A	9.8	1	A	9.3	1
		EB Left	A	8.1	0	A	7.6	1
5. **Columbia Pike and Site Access 1**	TWSC	SB Left	B	11.6	1	B	10.2	1
		WB Left/Right	F	53.2	3	E	48.5	2
6. **Columbia Pike and Site Access 2**	TWSC	NB Left/Right	A	9.9	1	B	10.4	1
		WB Left	A	7.3	0	A	7.7	0
6. **Columbia Pike and Site Access 3**	TWSC	NB Left/Right	B	10.1	1	B	10.5	1
		WB Left	A	7.3	0	A	7.6	0

As shown in Table 34, the southbound through/right-turn movements at the intersection of Thompson's Station Road and Columbia Pike will operate at LOS F during the PM peak hour with the addition of projected traffic volumes. The eastbound through/right-turn movements at the intersection of Thompson's Station Road and Columbia Pike will operate at LOS E during the AM and PM peak hours with the addition of projected traffic volumes. The westbound through/right-

turn movements at the intersection of Thompson's Station Road and Columbia Pike will operate at LOS E during the AM peak hour with the addition of projected traffic volumes. Even though these movements will operate at an unacceptable LOS, the overall intersection will operate at LOS C and LOS D during the AM and PM peak hours, respectively, which is acceptable. The westbound approach to the intersection of Columbia Pike and Station South Drive will operate at LOS E and LOS F during the AM and PM peak hours, respectively, with the addition of projected traffic volumes. The westbound approach to the intersection of Columbia Pike and Site Access 1 will operate at LOS F and LOS E during the AM and PM peak hours, respectively, with the addition of projected traffic volumes. All other critical movements to the study intersections surrounding the proposed development will continue to operate at a minimum of LOS D during the AM and PM peak hours with the addition of projected traffic volumes and the implementation of the proposed improvements. Appendix C contains the detailed capacity analyses results.

APPENDIX

APPENDIX A – DETAILED TURNING MOVEMENT COUNTS

HOURLY TURNING MOVEMENT COUNTS

Date	May 24, 2018
Counter	T-Square Engineering, Inc.
North-South Road	Columbia Pike
East-West Road	Thompson Station Road E

Time	NORTHBOUND Columbia Pike			SOUTHBOUND Columbia Pike			WESTBOUND Thompson Station Road E			EASTBOUND Thompson Station Road E		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
6:00 - 6:15 AM	9	267	2	0	26	0	4	3	15	9	2	5
6:15 - 6:30	12	260	3	4	64	3	4	3	3	7	1	4
6:30 - 6:45	4	207	5	2	65	2	5	9	9	7	3	9
6:45-7:00	10	240	6	2	83	5	6	8	3	6	6	7
7:00-7:15	17	212	7	5	93	0	9	16	5	12	2	16
7:15-7:30	11	260	4	0	91	8	10	9	3	10	2	5
7:30-7:45	11	225	2	3	107	6	11	15	10	7	2	14
7:45-8:00	15	200	1	3	104	11	17	8	9	12	7	16
8:00-8:15	34	320	4	2	122	10	11	14	13	13	5	25
8:15-8:30	13	141	4	5	51	9	9	8	1	14	7	11
8:30-8:45	24	204	6	4	88	9	6	3	4	19	10	15
8:45-9:00	18	141	12	19	272	9	19	11	3	10	5	6
3:00-3:15	30	174	12	14	166	15	16	9	3	7	13	32
3:15-3:30	24	179	19	1	234	15	14	10	4	6	13	24
3:30-3:45	19	111	8	7	117	5	13	10	3	10	7	19
3:45-4:00	16	114	14	5	118	6	9	2	2	8	13	20
4:00-4:15	23	139	21	5	203	7	17	8	4	12	16	29
4:15-4:30	12	157	15	5	192	7	17	7	1	5	13	32
4:30-4:45	15	148	15	9	219	5	12	8	0	10	6	39
4:45-5:00	11	130	15	8	199	3	15	8	1	15	17	38
5:00-5:15	19	171	23	9	200	3	18	8	0	14	11	33
5:15-5:30	13	175	19	6	217	9	19	9	0	13	8	25
5:30-5:45	19	125	24	11	188	5	8	12	1	14	10	29
5:45-6:00	17	142	5	5	193	5	24	8	0	11	8	29
Total	**396**	**4442**	**246**	**134**	**3412**	**157**	**293**	**206**	**97**	**251**	**187**	**482**
AM PEAK (7:15 AM - 8:15 AM)	71	1005	11	8	424	35	49	46	35	42	16	60
PM PEAK (4:30 PM - 5:30 PM)	58	624	72	32	835	20	64	33	1	52	42	135

HOURLY TURNING MOVEMENT COUNTS

Date	May 24, 2018
Counter	T-Square Engineering, Inc.
North-South Road	Columbia Pike
East-West Road	Station S Drive

Time	NORTHBOUND Columbia Pike			SOUTHBOUND Columbia Pike			WESTBOUND Station S Drive		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
6:00 - 6:15 AM	0	278	0	0	35	0	0	0	0
6:15 - 6:30	0	274	0	0	72	0	0	0	1
6:30 - 6:45	0	214	2	0	79	0	0	0	2
6:45-7:00	0	253	0	0	96	0	1	0	3
7:00-7:15	0	233	0	0	118	0	0	0	3
7:15-7:30	0	275	0	1	105	0	0	0	0
7:30-7:45	0	235	0	0	132	0	0	0	3
7:45-8:00	0	214	0	1	136	0	0	0	2
8:00-8:15	0	356	0	1	157	0	0	0	2
8:15-8:30	0	157	0	2	69	0	0	0	1
8:30-8:45	0	232	0	0	109	0	1	0	2
8:45-9:00	0	169	0	0	297	0	0	0	2
3:00-3:15	0	215	0	2	212	0	0	0	1
3:15-3:30	0	219	1	3	269	0	0	0	3
3:30-3:45	0	137	3	1	148	0	1	0	1
3:45-4:00	0	144	1	1	146	0	0	0	0
4:00-4:15	0	182	1	1	248	0	0	0	1
4:15-4:30	0	183	1	0	241	0	1	0	1
4:30-4:45	0	178	1	6	264	0	1	0	0
4:45-5:00	0	156	3	2	250	0	1	0	0
5:00-5:15	0	212	4	1	250	0	1	0	1
5:15-5:30	0	204	0	4	257	0	0	0	3
5:30-5:45	0	167	1	4	221	0	3	0	1
5:45-6:00	0	164	1	3	243	0	0	0	0
Total	**0**	**5051**	**19**	**33**	**4154**	**0**	**10**	**0**	**33**
AM PEAK (7:15 AM - 8:15 AM)	0	1080	0	3	530	0	0	0	7
PM PEAK (4:30 PM - 5:30 PM)	0	750	8	13	1021	0	3	0	4

HOURLY TURNING MOVEMENT COUNTS

Date	May 24, 2018
Counter	T-Square Engineering, Inc.
North-South Road	Village Drive
East-West Road	Thompson Station Road E

Time	NORTHBOUND Village Drive			WESTBOUND Thompson Station Road E			EASTBOUND Thompson Station Road E		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
6:00 - 6:15 AM	1	0	1	0	24	0	0	2	0
6:15 - 6:30	3	0	0	0	29	0	0	6	1
6:30 - 6:45	1	0	0	0	49	0	0	8	1
6:45-7:00	4	0	0	0	27	0	0	12	0
7:00-7:15	0	0	0	0	40	0	0	13	0
7:15-7:30	0	0	0	0	46	0	0	4	0
7:30-7:45	0	0	0	0	54	0	0	7	1
7:45-8:00	0	0	0	0	43	0	0	10	1
8:00-8:15	2	0	0	0	40	0	0	9	0
8:15-8:30	2	0	1	0	34	0	0	17	2
8:30-8:45	1	0	0	2	32	0	0	21	0
8:45-9:00	0	0	0	0	39	0	0	16	1
3:00-3:15	0	0	0	0	26	0	0	35	0
3:15-3:30	1	0	0	0	26	0	0	22	2
3:30-3:45	0	0	0	0	25	0	0	25	3
3:45-4:00	2	0	0	2	21	0	0	30	0
4:00-4:15	1	0	0	1	33	0	0	48	0
4:15-4:30	2	0	0	1	24	0	0	34	0
4:30-4:45	0	0	0	1	26	0	0	21	0
4:45-5:00	0	0	0	0	27	0	0	32	0
5:00-5:15	0	0	0	0	30	0	0	40	0
5:15-5:30	0	0	0	1	35	0	0	28	0
5:30-5:45	0	0	0	0	26	0	0	37	0
5:45-6:00	2	0	1	1	33	0	0	26	1
Total	**22**	**0**	**3**	**9**	**789**	**0**	**0**	**503**	**13**
AM PEAK (7:15 AM - 8:15 AM)	2	0	0	0	183	0	0	30	2
PM PEAK (4:30 PM - 5:30 PM)	0	0	0	2	118	0	0	121	0

HOURLY TURNING MOVEMENT COUNTS

May 24, 2018

T-Square Engineering, Inc.

Clayton Arnold Road

Thompson Station Road E

Time	SOUTHBOUND Clayton Arnold Road			WESTBOUND Thompson Station Road E			EASTBOUND Thompson Station Road E		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
6:00 - 6:15 AM	1	0	2	0	26	21	2	0	0
6:15 - 6:30	4	0	1	0	24	31	1	2	0
6:30 - 6:45	3	0	4	0	36	53	3	4	0
6:45-7:00	5	0	3	0	22	48	6	3	0
7:00-7:15	6	0	4	0	32	33	4	8	0
7:15-7:30	4	0	3	0	40	52	0	1	0
7:30-7:45	10	0	4	0	44	63	0	5	0
7:45-8:00	7	0	11	0	31	44	5	4	0
8:00-8:15	9	0	6	0	23	23	3	4	0
8:15-8:30	9	0	13	0	26	25	6	13	0
8:30-8:45	3	0	5	0	30	30	9	13	0
8:45-9:00	5	0	22	0	25	23	9	8	0
3:00-3:15	29	0	7	0	12	12	3	27	0
3:15-3:30	40	0	10	0	17	16	7	19	0
3:30-3:45	29	0	8	0	19	18	4	18	0
3:45-4:00	43	0	5	0	15	12	7	24	0
4:00-4:15	41	0	11	0	27	13	9	30	0
4:15-4:30	53	0	10	0	17	17	6	28	0
4:30-4:45	79	0	14	0	16	12	5	17	0
4:45-5:00	104	0	16	0	19	13	11	29	0
5:00-5:15	101	0	7	0	17	16	8	35	0
5:15-5:30	107	0	14	0	21	21	8	20	0
5:30-5:45	113	0	13	0	19	18	12	30	0
5:45-6:00	93	0	14	0	15	22	5	21	0
Total	**898**	**0**	**207**	**0**	**573**	**636**	**133**	**363**	**0**
AM PEAK (7:15 AM - 8:15 AM)	30	0	24	0	138	182	8	14	0
PM PEAK (4:30 PM - 5:30 PM)	391	0	51	0	73	62	32	101	0

APPENDIX B – DETAILED TRIP GENERATION CALCULATIONS

T-SQUARE ENGINEERING
CIVIL-SITE | TRAFFIC | WASTEWATER

701 West Main Street
Franklin, TN 37064

615.678.8212
tsquare@T2-eng.com
www.T2-eng.com

TRIP GENERATION

Project:	Thompson's Station Road Subdivision
ITE Land Use:	Single-Family Detached Housing
ITE Code:	210
Trip Ends vs:	230 Dwelling Units
Daily Equation:	Weekday – Fitted Curve Equation
AM Equation:	AM Peak Hour of Adjacent Street Traffic One-Hour Between 7 and 9 AM – Fitted Curve Equation
PM Equation:	PM Peak Hour of Adjacent Street Traffic One-Hour Between 4 and 6 PM – Fitted Curve Equation

Time Period	Formula[1]	Calculation[1]	Trips
Daily	$Ln\,(T) = 0.92Ln(X) + 2.71$	$Ln\,(T) = 0.92Ln(230) + 2.71$	2,237
AM Peak (Total)	$T = 0.71(X) + 4.80$	$T = 0.71(230) + 4.80$	168
AM Peak (Entering)	$T = 0.25(Total\ AM\ Trips)$	$T = 0.25(168)$	42
AM Peak (Exiting)	$T = 0.75(Total\ AM\ Trips)$	$T = 0.75(168)$	126
PM Peak (Total)	$Ln\,(T) = 0.96Ln(X) + 0.20$	$Ln\,(T) = 0.96Ln(230) + 0.20$	226
PM Peak (Entering)	$T = 0.63(Total\ PM\ Trips)$	$T = 0.63(226)$	142
PM Peak (Exiting)	$T = 0.37(Total\ PM\ Trips)$	$T = 0.37(226)$	84

[1] Institute of Transportation Engineers (ITE). Trip Generation Manual, 10th Edition. Washington, DC: ITE, 2017

T-SQUARE ENGINEERING
CIVIL-SITE | TRAFFIC | WASTEWATER

701 West Main Street
Franklin, TN 37064

615.678.8212
tsquare@T2-eng.com
www.T2-eng.com

TRIP GENERATION

Project:	Thompson's Station Road Subdivision
ITE Land Use:	Multi-Family Housing
ITE Code:	220
Trip Ends vs:	123 Dwelling Units
Daily Equation:	Weekday – Fitted Curve Equation
AM Equation:	AM Peak Hour of Adjacent Street Traffic One-Hour Between 7 and 9 AM – Fitted Curve Equation
PM Equation:	PM Peak Hour of Adjacent Street Traffic One-Hour Between 4 and 6 PM – Fitted Curve Equation

Time Period	Formula[1]	Calculation[1]	Trips
Daily	$T = 7.56(X) - 40.86$	$T = 7.56(123) - 40.86$	889
AM Peak (Total)	$Ln\,(T) = 0.95Ln(X) - 0.51$	$Ln\,(T) = 0.95Ln(123) - 0.51$	58
AM Peak (Entering)	$T = 0.23(Total\ AM\ Trips)$	$T = 0.23(58)$	13
AM Peak (Exiting)	$T = 0.77(Total\ AM\ Trips)$	$T = 0.77(58)$	45
PM Peak (Total)	$Ln\,(T) = 0.89Ln(X) - 0.02$	$Ln\,(T) = 0.89Ln(123) - 0.02$	71
PM Peak (Entering)	$T = 0.63(Total\ PM\ Trips)$	$T = 0.63(71)$	45
PM Peak (Exiting)	$T = 0.37(Total\ PM\ Trips)$	$T = 0.37(71)$	26

[1] Institute of Transportation Engineers (ITE). Trip Generation Manual, 10th Edition. Washington, DC: ITE, 2017

APPENDIX C – CAPACITY ANALYSES

EXISTING CAPACITY ANALYSES

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	16	60	49	46	35	71	1005	11	8	424	35
Future Volume (veh/h)	42	16	60	49	46	35	71	1005	11	8	424	35
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	46	17	65	53	50	38	77	1092	12	9	461	38
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	190	26	100	192	79	60	580	1186	13	165	1032	85
Arrive On Green	0.04	0.08	0.08	0.04	0.08	0.08	0.05	0.64	0.64	0.01	0.61	0.61
Sat Flow, veh/h	1774	339	1295	1774	983	747	1774	1839	20	1774	1698	140
Grp Volume(v), veh/h	46	0	82	53	0	88	77	0	1104	9	0	499
Grp Sat Flow(s),veh/h/ln	1774	0	1634	1774	0	1731	1774	0	1859	1774	0	1838
Q Serve(g_s), s	2.1	0.0	4.3	2.4	0.0	4.4	1.4	0.0	46.1	0.2	0.0	13.0
Cycle Q Clear(g_c), s	2.1	0.0	4.3	2.4	0.0	4.4	1.4	0.0	46.1	0.2	0.0	13.0
Prop In Lane	1.00		0.79	1.00		0.43	1.00		0.01	1.00		0.08
Lane Grp Cap(c), veh/h	190	0	127	192	0	139	580	0	1199	165	0	1118
V/C Ratio(X)	0.24	0.00	0.65	0.28	0.00	0.63	0.13	0.00	0.92	0.05	0.00	0.45
Avail Cap(c_a), veh/h	222	0	332	219	0	351	595	0	1300	245	0	1285
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	35.7	0.0	39.7	35.6	0.0	39.5	6.5	0.0	13.8	17.0	0.0	9.4
Incr Delay (d2), s/veh	0.7	0.0	5.4	0.8	0.0	4.7	0.1	0.0	10.4	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	2.2	1.2	0.0	2.3	0.7	0.0	26.8	0.1	0.0	6.6
LnGrp Delay(d),s/veh	36.4	0.0	45.2	36.4	0.0	44.2	6.6	0.0	24.1	17.1	0.0	9.6
LnGrp LOS	D		D	D		D	A		C	B		A
Approach Vol, veh/h		128			141			1181			508	
Approach Delay, s/veh		42.0			41.3			23.0			9.8	
Approach LOS		D			D			C			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.0	62.2	8.6	11.9	9.3	58.9	8.4	12.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	62.0	5.0	18.0	5.0	62.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	2.2	48.1	4.4	6.3	3.4	15.0	4.1	6.4
Green Ext Time (p_c), s	0.0	9.1	0.0	0.6	0.0	17.6	0.0	0.6

Intersection Summary	
HCM 2010 Ctrl Delay	22.1
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	7	1080	0	3	530
Future Vol, veh/h	0	7	1080	0	3	530
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	8	1174	0	3	576

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1757	1174	0	0	1174	0
Stage 1	1174	-	-	-	-	-
Stage 2	583	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	93	234	-	-	595	-
Stage 1	294	-	-	-	-	-
Stage 2	558	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	92	234	-	-	595	-
Mov Cap-2 Maneuver	92	-	-	-	-	-
Stage 1	294	-	-	-	-	-
Stage 2	554	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.9	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	234	595	-
HCM Lane V/C Ratio	-	-	0.033	0.005	-
HCM Control Delay (s)	-	-	20.9	11.1	0
HCM Lane LOS	-	-	C	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	30	2	0	183	2	0
Future Vol, veh/h	30	2	0	183	2	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	2	0	199	2	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	35	0	233	34
Stage 1	-	-	-	-	34	-
Stage 2	-	-	-	-	199	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1576	-	755	1039
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	835	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1576	-	755	1039
Mov Cap-2 Maneuver	-	-	-	-	755	-
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	835	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	755	-	-	1576	-
HCM Lane V/C Ratio	0.003	-	-	-	-
HCM Control Delay (s)	9.8	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	30	24	8	14	138	182
Future Vol, veh/h	30	24	8	14	138	182
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	50	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	26	9	15	150	198

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	282	249	348	0	-	0
Stage 1	249	-	-	-	-	-
Stage 2	33	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	708	790	1211	-	-	-
Stage 1	792	-	-	-	-	-
Stage 2	989	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	703	790	1211	-	-	-
Mov Cap-2 Maneuver	703	-	-	-	-	-
Stage 1	792	-	-	-	-	-
Stage 2	982	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	10.1	2.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1	SBLn2
Capacity (veh/h)	-	-	1211	-	703	790
HCM Lane V/C Ratio	-	-	0.007	-	0.046	0.033
HCM Control Delay (s)	-	-	8	0	10.4	9.7
HCM Lane LOS	-	-	A	A	B	A
HCM 95th %tile Q(veh)	-	-	0	-	0.1	0.1

Intersection: 1: Columbia Pike & Thompson's Station Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	113	113	63	97	254	580	28	176
Average Queue (ft)	37	46	31	43	55	192	5	71
95th Queue (ft)	83	85	60	83	187	422	21	155
Link Distance (ft)		1341		1494		744		7279
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	125		85		155		155	
Storage Blk Time (%)	0	0		1		8		1
Queuing Penalty (veh)	0	0		1		6		0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	42	135	64	33	1	58	624	72	32	835	20
Future Volume (veh/h)	52	42	135	64	33	1	58	624	72	32	835	20
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	57	46	147	70	36	1	63	678	78	35	908	22
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	348	57	182	212	270	8	186	865	99	285	931	23
Arrive On Green	0.04	0.15	0.15	0.05	0.15	0.15	0.05	0.53	0.53	0.03	0.51	0.51
Sat Flow, veh/h	1774	391	1251	1774	1804	50	1774	1641	189	1774	1811	44
Grp Volume(v), veh/h	57	0	193	70	0	37	63	0	756	35	0	930
Grp Sat Flow(s),veh/h/ln	1774	0	1642	1774	0	1854	1774	0	1829	1774	0	1855
Q Serve(g_s), s	2.2	0.0	9.3	2.7	0.0	1.4	1.3	0.0	27.2	0.7	0.0	39.9
Cycle Q Clear(g_c), s	2.2	0.0	9.3	2.7	0.0	1.4	1.3	0.0	27.2	0.7	0.0	39.9
Prop In Lane	1.00		0.76	1.00		0.03	1.00		0.10	1.00		0.02
Lane Grp Cap(c), veh/h	348	0	239	212	0	278	186	0	964	285	0	953
V/C Ratio(X)	0.16	0.00	0.81	0.33	0.00	0.13	0.34	0.00	0.78	0.12	0.00	0.98
Avail Cap(c_a), veh/h	378	0	362	235	0	409	212	0	964	334	0	955
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.7	0.0	33.7	28.1	0.0	30.1	18.7	0.0	15.6	12.9	0.0	19.3
Incr Delay (d2), s/veh	0.2	0.0	7.7	0.9	0.0	0.2	1.1	0.0	4.3	0.2	0.0	23.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	4.7	1.4	0.0	0.7	0.8	0.0	14.8	0.4	0.0	26.3
LnGrp Delay(d),s/veh	27.9	0.0	41.5	29.0	0.0	30.3	19.8	0.0	19.9	13.1	0.0	42.5
LnGrp LOS	C		D	C		C	B		B	B		D
Approach Vol, veh/h		250			107			819			965	
Approach Delay, s/veh		38.4			29.5			19.8			41.5	
Approach LOS		D			C			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.7	48.0	9.0	16.9	8.8	46.9	8.6	17.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	42.0	5.0	18.0	5.0	42.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	2.7	29.2	4.7	11.3	3.3	41.9	4.2	3.4
Green Ext Time (p_c), s	0.0	8.6	0.0	0.6	0.0	0.1	0.0	1.0

Intersection Summary	
HCM 2010 Ctrl Delay	32.2
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	4	750	8	13	1021
Future Vol, veh/h	3	4	750	8	13	1021
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	4	815	9	14	1110

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1958	820	0	0	824	0
Stage 1	820	-	-	-	-	-
Stage 2	1138	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	70	375	-	-	806	-
Stage 1	433	-	-	-	-	-
Stage 2	306	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	67	375	-	-	806	-
Mov Cap-2 Maneuver	67	-	-	-	-	-
Stage 1	433	-	-	-	-	-
Stage 2	292	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	35.4	0	0.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	126	806	-
HCM Lane V/C Ratio	-	-	0.06	0.018	-
HCM Control Delay (s)	-	-	35.4	9.5	0
HCM Lane LOS	-	-	E	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	121	0	2	118	0	0
Future Vol, veh/h	121	0	2	118	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	132	0	2	128	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	132	0	265	132
Stage 1	-	-	-	-	132	-
Stage 2	-	-	-	-	133	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1453	-	724	917
Stage 1	-	-	-	-	894	-
Stage 2	-	-	-	-	893	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1453	-	723	917
Mov Cap-2 Maneuver	-	-	-	-	723	-
Stage 1	-	-	-	-	894	-
Stage 2	-	-	-	-	892	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1453	-
HCM Lane V/C Ratio	-	-	-	0.001	-
HCM Control Delay (s)	0	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	11.2

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	391	51	32	101	73	62
Future Vol, veh/h	391	51	32	101	73	62
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	50	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	425	55	35	110	79	67

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	292	113	147	0	-	0
Stage 1	113	-	-	-	-	-
Stage 2	179	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	699	940	1435	-	-	-
Stage 1	912	-	-	-	-	-
Stage 2	852	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	681	940	1435	-	-	-
Mov Cap-2 Maneuver	681	-	-	-	-	-
Stage 1	912	-	-	-	-	-
Stage 2	830	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	17.5	1.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1	SBLn2
Capacity (veh/h)	-	-	1435	-	681	940
HCM Lane V/C Ratio	-	-	0.024	-	0.624	0.059
HCM Control Delay (s)	-	-	7.6	0	18.6	9.1
HCM Lane LOS	-	-	A	A	C	A
HCM 95th %tile Q(veh)	-	-	0.1	-	4.4	0.2

Intersection: 1: Columbia Pike & Thompson's Station Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	92	180	71	74	87	338	254	642
Average Queue (ft)	37	73	30	32	37	129	40	275
95th Queue (ft)	80	134	62	67	73	255	160	501
Link Distance (ft)		1341		1494		744		7279
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	125		85		155		155	
Storage Blk Time (%)		1	0	0		5		18
Queuing Penalty (veh)		1	0	0		3		6

BACKGROUND CAPACITY ANALYSES

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	17	62	51	48	36	74	1046	11	8	441	36
Future Volume (veh/h)	44	17	62	51	48	36	74	1046	11	8	441	36
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	48	18	67	55	52	39	80	1137	12	9	479	39
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	176	27	99	178	78	59	586	1231	13	158	1080	88
Arrive On Green	0.04	0.08	0.08	0.04	0.08	0.08	0.05	0.67	0.67	0.01	0.64	0.64
Sat Flow, veh/h	1774	346	1289	1774	990	742	1774	1840	19	1774	1700	138
Grp Volume(v), veh/h	48	0	85	55	0	91	80	0	1149	9	0	518
Grp Sat Flow(s),veh/h/ln	1774	0	1635	1774	0	1732	1774	0	1859	1774	0	1838
Q Serve(g_s), s	2.4	0.0	5.0	2.8	0.0	5.0	1.5	0.0	52.6	0.2	0.0	14.1
Cycle Q Clear(g_c), s	2.4	0.0	5.0	2.8	0.0	5.0	1.5	0.0	52.6	0.2	0.0	14.1
Prop In Lane	1.00		0.79	1.00		0.43	1.00		0.01	1.00		0.08
Lane Grp Cap(c), veh/h	176	0	126	178	0	137	586	0	1244	158	0	1168
V/C Ratio(X)	0.27	0.00	0.68	0.31	0.00	0.66	0.14	0.00	0.92	0.06	0.00	0.44
Avail Cap(c_a), veh/h	200	0	299	198	0	317	596	0	1361	229	0	1346
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	39.8	0.0	44.2	39.8	0.0	44.0	6.3	0.0	14.1	18.8	0.0	9.1
Incr Delay (d2), s/veh	0.8	0.0	6.2	1.0	0.0	5.4	0.1	0.0	10.2	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	2.5	1.4	0.0	2.6	0.7	0.0	30.0	0.1	0.0	7.1
LnGrp Delay(d),s/veh	40.6	0.0	50.4	40.7	0.0	49.4	6.4	0.0	24.3	18.9	0.0	9.4
LnGrp LOS	D		D	D		D	A		C	B		A
Approach Vol, veh/h		133			146			1229			527	
Approach Delay, s/veh		46.9			46.1			23.1			9.5	
Approach LOS		D			D			C			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.1	70.8	8.9	12.6	9.4	67.5	8.7	12.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	72.0	5.0	18.0	5.0	72.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	2.2	54.6	4.8	7.0	3.5	16.1	4.4	7.0
Green Ext Time (p_c), s	0.0	11.2	0.0	0.6	0.0	20.4	0.0	0.6

Intersection Summary	
HCM 2010 Ctrl Delay	22.8
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	7	1124	0	3	551
Future Vol, veh/h	0	7	1124	0	3	551
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	8	1222	0	3	599

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1827	1222	0	0	1222	0
Stage 1	1222	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	84	219	-	-	570	-
Stage 1	278	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	83	219	-	-	570	-
Mov Cap-2 Maneuver	83	-	-	-	-	-
Stage 1	278	-	-	-	-	-
Stage 2	541	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	219	570	-
HCM Lane V/C Ratio	-	-	0.035	0.006	-
HCM Control Delay (s)	-	-	22	11.4	0
HCM Lane LOS	-	-	C	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	31	2	0	190	2	0
Future Vol, veh/h	31	2	0	190	2	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	2	0	207	2	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	36	0	242	35
Stage 1	-	-	-	-	35	-
Stage 2	-	-	-	-	207	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1575	-	746	1038
Stage 1	-	-	-	-	987	-
Stage 2	-	-	-	-	828	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1575	-	746	1038
Mov Cap-2 Maneuver	-	-	-	-	746	-
Stage 1	-	-	-	-	987	-
Stage 2	-	-	-	-	828	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	746	-	-	1575	-
HCM Lane V/C Ratio	0.003	-	-	-	-
HCM Control Delay (s)	9.8	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	31	25	8	15	144	189
Future Vol, veh/h	31	25	8	15	144	189
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	50	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	27	9	16	157	205

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	293	259	362	0	-	0
Stage 1	259	-	-	-	-	-
Stage 2	34	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	698	780	1197	-	-	-
Stage 1	784	-	-	-	-	-
Stage 2	988	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	692	780	1197	-	-	-
Mov Cap-2 Maneuver	692	-	-	-	-	-
Stage 1	784	-	-	-	-	-
Stage 2	980	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	10.2	2.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1	SBLn2
Capacity (veh/h)	-	-	1197	-	692	780
HCM Lane V/C Ratio	-	-	0.007	-	0.049	0.035
HCM Control Delay (s)	-	-	8	0	10.5	9.8
HCM Lane LOS	-	-	A	A	B	A
HCM 95th %tile Q(veh)	-	-	0	-	0.2	0.1

Intersection: 1: Columbia Pike & Thompson's Station Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	65	75	69	111	52	390	27	240
Average Queue (ft)	28	39	33	58	27	145	8	88
95th Queue (ft)	59	71	60	105	49	283	27	175
Link Distance (ft)		1341		1494		744		7279
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	125		85		155		155	
Storage Blk Time (%)			0	5		4		1
Queuing Penalty (veh)			0	2		3		0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	54	44	141	67	34	1	60	649	75	33	869	21
Future Volume (veh/h)	54	44	141	67	34	1	60	649	75	33	869	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	59	48	153	73	37	1	65	705	82	36	945	23
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	354	59	188	212	279	8	171	858	100	260	924	22
Arrive On Green	0.04	0.15	0.15	0.05	0.15	0.15	0.05	0.52	0.52	0.03	0.51	0.51
Sat Flow, veh/h	1774	392	1250	1774	1805	49	1774	1639	191	1774	1811	44
Grp Volume(v), veh/h	59	0	201	73	0	38	65	0	787	36	0	968
Grp Sat Flow(s),veh/h/ln	1774	0	1642	1774	0	1854	1774	0	1829	1774	0	1855
Q Serve(g_s), s	2.3	0.0	9.8	2.8	0.0	1.5	1.4	0.0	29.6	0.8	0.0	42.0
Cycle Q Clear(g_c), s	2.3	0.0	9.8	2.8	0.0	1.5	1.4	0.0	29.6	0.8	0.0	42.0
Prop In Lane	1.00		0.76	1.00		0.03	1.00		0.10	1.00		0.02
Lane Grp Cap(c), veh/h	354	0	246	212	0	286	171	0	957	260	0	947
V/C Ratio(X)	0.17	0.00	0.82	0.34	0.00	0.13	0.38	0.00	0.82	0.14	0.00	1.02
Avail Cap(c_a), veh/h	382	0	359	232	0	406	195	0	957	307	0	947
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.6	0.0	33.9	28.1	0.0	30.0	19.1	0.0	16.4	13.9	0.0	20.1
Incr Delay (d2), s/veh	0.2	0.0	9.0	1.0	0.0	0.2	1.4	0.0	5.8	0.2	0.0	35.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	5.0	1.4	0.0	0.8	0.8	0.0	16.4	0.4	0.0	30.5
LnGrp Delay(d),s/veh	27.8	0.0	42.9	29.1	0.0	30.2	20.5	0.0	22.2	14.2	0.0	55.1
LnGrp LOS	C		D	C		C	C		C	B		F
Approach Vol, veh/h		260			111			852			1004	
Approach Delay, s/veh		39.4			29.5			22.1			53.7	
Approach LOS		D			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.8	48.1	9.1	17.3	8.9	47.0	8.7	17.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	42.0	5.0	18.0	5.0	42.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	2.8	31.6	4.8	11.8	3.4	44.0	4.3	3.5
Green Ext Time (p_c), s	0.0	7.6	0.0	0.6	0.0	0.0	0.0	1.0

Intersection Summary	
HCM 2010 Ctrl Delay	38.7
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	4	780	8	14	1062
Future Vol, veh/h	3	4	780	8	14	1062
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	4	848	9	15	1154

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2037	852	0	0	857	0
Stage 1	852	-	-	-	-	-
Stage 2	1185	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	62	359	-	-	783	-
Stage 1	418	-	-	-	-	-
Stage 2	290	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	59	359	-	-	783	-
Mov Cap-2 Maneuver	59	-	-	-	-	-
Stage 1	418	-	-	-	-	-
Stage 2	275	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	39.1	0	0.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	113	783	-
HCM Lane V/C Ratio	-	-	0.067	0.019	-
HCM Control Delay (s)	-	-	39.1	9.7	0
HCM Lane LOS	-	-	E	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	126	0	2	123	0	0
Future Vol, veh/h	126	0	2	123	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	137	0	2	134	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	137	0	275	137
Stage 1	-	-	-	-	137	-
Stage 2	-	-	-	-	138	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1447	-	715	911
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	889	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1447	-	714	911
Mov Cap-2 Maneuver	-	-	-	-	714	-
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	888	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1447	-
HCM Lane V/C Ratio	-	-	-	0.002	-
HCM Control Delay (s)	0	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	12.1

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	407	53	33	105	76	65
Future Vol, veh/h	407	53	33	105	76	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	50	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	442	58	36	114	83	71

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	304	118	153	0	-	0
Stage 1	118	-	-	-	-	-
Stage 2	186	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	688	934	1428	-	-	-
Stage 1	907	-	-	-	-	-
Stage 2	846	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	669	934	1428	-	-	-
Mov Cap-2 Maneuver	669	-	-	-	-	-
Stage 1	907	-	-	-	-	-
Stage 2	823	-	-	-	-	-

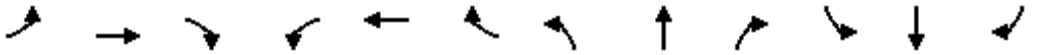
Approach	SB	SE	NW
HCM Control Delay, s	18.9	1.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1	SBLn2
Capacity (veh/h)	-	-	1428	-	669	934
HCM Lane V/C Ratio	-	-	0.025	-	0.661	0.062
HCM Control Delay (s)	-	-	7.6	0	20.2	9.1
HCM Lane LOS	-	-	A	A	C	A
HCM 95th %tile Q(veh)	-	-	0.1	-	5	0.2

Intersection: 1: Columbia Pike & Thompson's Station Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	81	182	78	72	94	350	254	602
Average Queue (ft)	32	99	39	27	37	145	65	326
95th Queue (ft)	71	170	78	57	73	269	221	583
Link Distance (ft)		1341		1494		744		7279
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	125		85		155		155	
Storage Blk Time (%)		5	0	0		6		28
Queuing Penalty (veh)		3	0	0		3		9

PROJECTED CAPACITY ANALYSES (NO IMPROVEMENTS)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	20	64	77	56	62	82	1097	20	16	457	36
Future Volume (veh/h)	44	20	64	77	56	62	82	1097	20	16	457	36
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	48	22	70	84	61	67	89	1192	22	17	497	39
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	149	34	108	179	78	85	582	1243	23	131	1125	88
Arrive On Green	0.03	0.09	0.09	0.04	0.10	0.10	0.04	0.68	0.68	0.02	0.66	0.66
Sat Flow, veh/h	1774	393	1250	1774	813	893	1774	1823	34	1774	1705	134
Grp Volume(v), veh/h	48	0	92	84	0	128	89	0	1214	17	0	536
Grp Sat Flow(s),veh/h/ln	1774	0	1642	1774	0	1705	1774	0	1857	1774	0	1839
Q Serve(g_s), s	2.9	0.0	6.3	5.0	0.0	8.6	1.9	0.0	70.4	0.4	0.0	16.4
Cycle Q Clear(g_c), s	2.9	0.0	6.3	5.0	0.0	8.6	1.9	0.0	70.4	0.4	0.0	16.4
Prop In Lane	1.00		0.76	1.00		0.52	1.00		0.02	1.00		0.07
Lane Grp Cap(c), veh/h	149	0	142	179	0	163	582	0	1266	131	0	1213
V/C Ratio(X)	0.32	0.00	0.65	0.47	0.00	0.78	0.15	0.00	0.96	0.13	0.00	0.44
Avail Cap(c_a), veh/h	165	0	252	179	0	262	587	0	1300	174	0	1288
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.8	0.0	51.7	46.9	0.0	51.8	6.8	0.0	17.1	26.5	0.0	9.6
Incr Delay (d2), s/veh	1.2	0.0	4.8	1.9	0.0	8.0	0.1	0.0	16.0	0.4	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	3.1	0.3	0.0	4.4	0.9	0.0	41.0	0.3	0.0	8.3
LnGrp Delay(d),s/veh	48.0	0.0	56.6	48.7	0.0	59.8	7.0	0.0	33.1	27.0	0.0	9.8
LnGrp LOS	D		E	D		E	A		C	C		A
Approach Vol, veh/h		140			212			1303			553	
Approach Delay, s/veh		53.7			55.4			31.3			10.4	
Approach LOS		D			E			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.1	84.8	10.0	15.2	9.7	82.2	9.0	16.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	82.0	5.0	18.0	5.0	82.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	2.4	72.4	7.0	8.3	3.9	18.4	4.9	10.6
Green Ext Time (p_c), s	0.0	7.4	0.0	0.7	0.0	24.1	0.0	0.6

Intersection Summary	
HCM 2010 Ctrl Delay	29.8
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	16	1183	3	5	593
Future Vol, veh/h	9	16	1183	3	5	593
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	17	1286	3	5	645

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1943	1288	0	0	1289	0
Stage 1	1288	-	-	-	-	-
Stage 2	655	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	71	200	-	-	538	-
Stage 1	259	-	-	-	-	-
Stage 2	517	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	70	200	-	-	538	-
Mov Cap-2 Maneuver	70	-	-	-	-	-
Stage 1	259	-	-	-	-	-
Stage 2	510	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	43.6	0	0.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	120	538	-
HCM Lane V/C Ratio	-	-	0.226	0.01	-
HCM Control Delay (s)	-	-	43.6	11.8	0
HCM Lane LOS	-	-	E	B	A
HCM 95th %tile Q(veh)	-	-	0.8	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	51	5	3	227	11	9
Future Vol, veh/h	51	5	3	227	11	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	55	5	3	247	12	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	61	0	311	58
Stage 1	-	-	-	-	58	-
Stage 2	-	-	-	-	253	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1542	-	681	1008
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	789	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1542	-	680	1008
Mov Cap-2 Maneuver	-	-	-	-	680	-
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	787	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	797	-	-	1542	-
HCM Lane V/C Ratio	0.027	-	-	0.002	-
HCM Control Delay (s)	9.6	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.7

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	31	28	17	32	150	189
Future Vol, veh/h	31	28	17	32	150	189
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	50	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	30	18	35	163	205

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	338	266	368	0	-	0
Stage 1	266	-	-	-	-	-
Stage 2	72	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	658	773	1191	-	-	-
Stage 1	779	-	-	-	-	-
Stage 2	951	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	648	773	1191	-	-	-
Mov Cap-2 Maneuver	648	-	-	-	-	-
Stage 1	779	-	-	-	-	-
Stage 2	937	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	10.4	2.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1	SBLn2
Capacity (veh/h)	-	-	1191	-	648	773
HCM Lane V/C Ratio	-	-	0.016	-	0.052	0.039
HCM Control Delay (s)	-	-	8.1	0	10.9	9.8
HCM Lane LOS	-	-	A	A	B	A
HCM 95th %tile Q(veh)	-	-	0	-	0.2	0.1

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	51	1135	5	17	585
Future Vol, veh/h	17	51	1135	5	17	585
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	55	1234	5	18	636

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1909	1236	0	0	1239	0
Stage 1	1236	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	75	215	-	-	562	-
Stage 1	274	-	-	-	-	-
Stage 2	507	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	71	215	-	-	562	-
Mov Cap-2 Maneuver	71	-	-	-	-	-
Stage 1	274	-	-	-	-	-
Stage 2	482	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	54.4	0	0.3
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	143	562	-
HCM Lane V/C Ratio	-	-	0.517	0.033	-
HCM Control Delay (s)	-	-	54.4	11.6	0
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	2.5	0.1	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	48	5	3	235	17	8
Future Vol, veh/h	48	5	3	235	17	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	52	5	3	255	18	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	58	0	317	55
Stage 1	-	-	-	-	55	-
Stage 2	-	-	-	-	262	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1546	-	676	1012
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	782	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1546	-	675	1012
Mov Cap-2 Maneuver	-	-	-	-	675	-
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	780	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	756	-	-	1546	-
HCM Lane V/C Ratio	0.036	-	-	0.002	-
HCM Control Delay (s)	9.9	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	49	11	3	196	34	8
Future Vol, veh/h	49	11	3	196	34	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	53	12	3	213	37	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	65	0	279	59
Stage 1	-	-	-	-	59	-
Stage 2	-	-	-	-	220	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1537	-	711	1007
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	817	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1537	-	710	1007
Mov Cap-2 Maneuver	-	-	-	-	710	-
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	815	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	752	-	-	1537	-
HCM Lane V/C Ratio	0.061	-	-	0.002	-
HCM Control Delay (s)	10.1	-	-	7.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection: 1: Columbia Pike & Thompson's Station Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	94	96	113	130	255	515	48	327
Average Queue (ft)	32	47	50	69	63	236	11	117
95th Queue (ft)	76	86	90	122	189	407	38	222
Link Distance (ft)		1341		1488		744		7279
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	125		85		155		155	
Storage Blk Time (%)			4	4		12		3
Queuing Penalty (veh)			4	3		10		0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	54	53	151	84	39	18	65	682	103	61	925	21
Future Volume (veh/h)	54	53	151	84	39	18	65	682	103	61	925	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	59	58	164	91	42	20	71	741	112	66	1005	23
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	331	68	191	196	200	95	153	855	129	239	979	22
Arrive On Green	0.04	0.16	0.16	0.05	0.17	0.17	0.04	0.54	0.54	0.04	0.54	0.54
Sat Flow, veh/h	1774	431	1217	1774	1194	569	1774	1582	239	1774	1814	42
Grp Volume(v), veh/h	59	0	222	91	0	62	71	0	853	66	0	1028
Grp Sat Flow(s),veh/h/ln	1774	0	1648	1774	0	1762	1774	0	1821	1774	0	1855
Q Serve(g_s), s	2.7	0.0	12.7	4.1	0.0	2.9	1.7	0.0	39.0	1.6	0.0	52.0
Cycle Q Clear(g_c), s	2.7	0.0	12.7	4.1	0.0	2.9	1.7	0.0	39.0	1.6	0.0	52.0
Prop In Lane	1.00		0.74	1.00		0.32	1.00		0.13	1.00		0.02
Lane Grp Cap(c), veh/h	331	0	258	196	0	295	153	0	984	239	0	1001
V/C Ratio(X)	0.18	0.00	0.86	0.46	0.00	0.21	0.46	0.00	0.87	0.28	0.00	1.03
Avail Cap(c_a), veh/h	350	0	308	196	0	329	167	0	984	254	0	1001
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	32.1	0.0	39.6	32.7	0.0	34.6	22.7	0.0	19.1	17.5	0.0	22.2
Incr Delay (d2), s/veh	0.3	0.0	18.5	1.7	0.0	0.3	2.2	0.0	8.2	0.6	0.0	35.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	7.1	2.1	0.0	1.5	1.1	0.0	21.7	0.8	0.0	36.3
LnGrp Delay(d),s/veh	32.3	0.0	58.1	34.4	0.0	35.0	24.9	0.0	27.4	18.1	0.0	57.6
LnGrp LOS	C		E	C		C	C		C	B		F
Approach Vol, veh/h		281			153			924			1094	
Approach Delay, s/veh		52.7			34.6			27.2			55.3	
Approach LOS		D			C			C			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.1	57.1	10.0	20.1	9.3	57.0	9.0	21.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	52.0	5.0	18.0	5.0	52.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	3.6	41.0	6.1	14.7	3.7	54.0	4.7	4.9
Green Ext Time (p_c), s	0.0	8.4	0.0	0.5	0.0	0.0	0.0	1.2

Intersection Summary	
HCM 2010 Ctrl Delay	43.1
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	9	841	17	24	1135
Future Vol, veh/h	8	9	841	17	24	1135
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	10	914	18	26	1234

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2209	923	0	0	933	0
Stage 1	923	-	-	-	-	-
Stage 2	1286	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	49	327	-	-	734	-
Stage 1	387	-	-	-	-	-
Stage 2	259	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	43	327	-	-	734	-
Mov Cap-2 Maneuver	43	-	-	-	-	-
Stage 1	387	-	-	-	-	-
Stage 2	230	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	63	0	0.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	80	734	-
HCM Lane V/C Ratio	-	-	0.231	0.036	-
HCM Control Delay (s)	-	-	63	10.1	0
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	169	9	11	155	5	5
Future Vol, veh/h	169	9	11	155	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	184	10	12	168	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	193	0	381	189
Stage 1	-	-	-	-	189	-
Stage 2	-	-	-	-	192	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1380	-	621	853
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	841	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1380	-	615	853
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	833	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	715	-	-	1380	-
HCM Lane V/C Ratio	0.015	-	-	0.009	-
HCM Control Delay (s)	10.1	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	13.1

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	407	62	38	116	94	65
Future Vol, veh/h	407	62	38	116	94	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	50	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	442	67	41	126	102	71

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	347	138	173	0	-	0
Stage 1	138	-	-	-	-	-
Stage 2	209	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	650	910	1404	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	826	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	630	910	1404	-	-	-
Mov Cap-2 Maneuver	630	-	-	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	800	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	21.3	1.9	0
HCM LOS	C		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1	SBLn2
Capacity (veh/h)	-	-	1404	-	630	910
HCM Lane V/C Ratio	-	-	0.029	-	0.702	0.074
HCM Control Delay (s)	-	-	7.6	0	23.1	9.3
HCM Lane LOS	-	-	A	A	C	A
HCM 95th %tile Q(veh)	-	-	0.1	-	5.7	0.2

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	33	825	19	56	1087
Future Vol, veh/h	11	33	825	19	56	1087
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	36	897	21	61	1182

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2210	907	0	0	917	0
Stage 1	907	-	-	-	-	-
Stage 2	1303	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	49	334	-	-	744	-
Stage 1	394	-	-	-	-	-
Stage 2	254	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	37	334	-	-	744	-
Mov Cap-2 Maneuver	37	-	-	-	-	-
Stage 1	394	-	-	-	-	-
Stage 2	193	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	60	0	0.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	111	744	-
HCM Lane V/C Ratio	-	-	0.431	0.082	-
HCM Control Delay (s)	-	-	60	10.3	0
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	1.8	0.3	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	172	19	9	151	11	6
Future Vol, veh/h	172	19	9	151	11	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	187	21	10	164	12	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	208	0	381	197
Stage 1	-	-	-	-	197	-
Stage 2	-	-	-	-	184	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1363	-	621	844
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1363	-	616	844
Mov Cap-2 Maneuver	-	-	-	-	616	-
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	841	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	681	-	-	1363	-
HCM Lane V/C Ratio	0.027	-	-	0.007	-
HCM Control Delay (s)	10.4	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	136	38	9	143	23	6
Future Vol, veh/h	136	38	9	143	23	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	148	41	10	155	25	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	189	0	343	168
Stage 1	-	-	-	-	168	-
Stage 2	-	-	-	-	175	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1385	-	653	876
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	855	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1385	-	648	876
Mov Cap-2 Maneuver	-	-	-	-	648	-
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	848	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	685	-	-	1385	-
HCM Lane V/C Ratio	0.046	-	-	0.007	-
HCM Control Delay (s)	10.5	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection: 1: Columbia Pike & Thompson's Station Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	108	244	112	100	254	467	254	865
Average Queue (ft)	39	121	49	35	46	253	88	470
95th Queue (ft)	85	198	90	77	123	426	255	792
Link Distance (ft)		1341		1488		744		7279
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	125		85		155		155	
Storage Blk Time (%)	0	8	2	1		18		32
Queuing Penalty (veh)	0	4	1	1		12		19

PROJECTED CAPACITY ANALYSES (WITH IMPROVEMENTS)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	20	64	77	56	62	82	1097	20	16	457	36
Future Volume (veh/h)	44	20	64	77	56	62	82	1097	20	16	457	36
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	48	22	70	84	61	67	89	1192	22	17	497	39
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	149	34	108	179	78	85	582	1243	23	131	1125	88
Arrive On Green	0.03	0.09	0.09	0.04	0.10	0.10	0.04	0.68	0.68	0.02	0.66	0.66
Sat Flow, veh/h	1774	393	1250	1774	813	893	1774	1823	34	1774	1705	134
Grp Volume(v), veh/h	48	0	92	84	0	128	89	0	1214	17	0	536
Grp Sat Flow(s),veh/h/ln	1774	0	1642	1774	0	1705	1774	0	1857	1774	0	1839
Q Serve(g_s), s	2.9	0.0	6.3	5.0	0.0	8.6	1.9	0.0	70.4	0.4	0.0	16.4
Cycle Q Clear(g_c), s	2.9	0.0	6.3	5.0	0.0	8.6	1.9	0.0	70.4	0.4	0.0	16.4
Prop In Lane	1.00		0.76	1.00		0.52	1.00		0.02	1.00		0.07
Lane Grp Cap(c), veh/h	149	0	142	179	0	163	582	0	1266	131	0	1213
V/C Ratio(X)	0.32	0.00	0.65	0.47	0.00	0.78	0.15	0.00	0.96	0.13	0.00	0.44
Avail Cap(c_a), veh/h	165	0	252	179	0	262	587	0	1300	174	0	1288
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.8	0.0	51.7	46.9	0.0	51.8	6.8	0.0	17.1	26.5	0.0	9.6
Incr Delay (d2), s/veh	1.2	0.0	4.8	1.9	0.0	8.0	0.1	0.0	16.0	0.4	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	3.1	0.3	0.0	4.4	0.9	0.0	41.0	0.3	0.0	8.3
LnGrp Delay(d),s/veh	48.0	0.0	56.6	48.7	0.0	59.8	7.0	0.0	33.1	27.0	0.0	9.8
LnGrp LOS	D		E	D		E	A		C	C		A
Approach Vol, veh/h		140			212			1303			553	
Approach Delay, s/veh		53.7			55.4			31.3			10.4	
Approach LOS		D			E			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.1	84.8	10.0	15.2	9.7	82.2	9.0	16.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	82.0	5.0	18.0	5.0	82.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	2.4	72.4	7.0	8.3	3.9	18.4	4.9	10.6
Green Ext Time (p_c), s	0.0	7.4	0.0	0.7	0.0	24.1	0.0	0.6

Intersection Summary	
HCM 2010 Ctrl Delay	29.8
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	16	1183	3	5	593
Future Vol, veh/h	9	16	1183	3	5	593
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	17	1286	3	5	645

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1943	1288	0	0	1289	0
Stage 1	1288	-	-	-	-	-
Stage 2	655	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	71	200	-	-	538	-
Stage 1	259	-	-	-	-	-
Stage 2	517	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	70	200	-	-	538	-
Mov Cap-2 Maneuver	70	-	-	-	-	-
Stage 1	259	-	-	-	-	-
Stage 2	510	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	43.6	0	0.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	120	538	-
HCM Lane V/C Ratio	-	-	0.226	0.01	-
HCM Control Delay (s)	-	-	43.6	11.8	0
HCM Lane LOS	-	-	E	B	A
HCM 95th %tile Q(veh)	-	-	0.8	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	51	5	3	227	11	9
Future Vol, veh/h	51	5	3	227	11	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	55	5	3	247	12	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	61	0	311	58
Stage 1	-	-	-	-	58	-
Stage 2	-	-	-	-	253	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1542	-	681	1008
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	789	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1542	-	680	1008
Mov Cap-2 Maneuver	-	-	-	-	680	-
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	787	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	797	-	-	1542	-
HCM Lane V/C Ratio	0.027	-	-	0.002	-
HCM Control Delay (s)	9.6	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.7

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	31	28	17	32	150	189
Future Vol, veh/h	31	28	17	32	150	189
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	50	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	30	18	35	163	205

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	338	266	368	0	-	0
Stage 1	266	-	-	-	-	-
Stage 2	72	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	658	773	1191	-	-	-
Stage 1	779	-	-	-	-	-
Stage 2	951	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	648	773	1191	-	-	-
Mov Cap-2 Maneuver	648	-	-	-	-	-
Stage 1	779	-	-	-	-	-
Stage 2	937	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	10.4	2.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1	SBLn2
Capacity (veh/h)	-	-	1191	-	648	773
HCM Lane V/C Ratio	-	-	0.016	-	0.052	0.039
HCM Control Delay (s)	-	-	8.1	0	10.9	9.8
HCM Lane LOS	-	-	A	A	B	A
HCM 95th %tile Q(veh)	-	-	0	-	0.2	0.1

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	51	1135	5	17	585
Future Vol, veh/h	17	51	1135	5	17	585
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	50	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	55	1234	5	18	636

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1907	1234	0	0	1234	0
Stage 1	1234	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	75	215	-	-	565	-
Stage 1	275	-	-	-	-	-
Stage 2	507	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	73	215	-	-	565	-
Mov Cap-2 Maneuver	73	-	-	-	-	-
Stage 1	275	-	-	-	-	-
Stage 2	491	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	53.2	0	0.3
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	145	565	-
HCM Lane V/C Ratio	-	-	0.51	0.033	-
HCM Control Delay (s)	-	-	53.2	11.6	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	2.4	0.1	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	48	5	3	235	17	8
Future Vol, veh/h	48	5	3	235	17	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	52	5	3	255	18	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	58	0	317	55
Stage 1	-	-	-	-	55	-
Stage 2	-	-	-	-	262	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1546	-	676	1012
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	782	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1546	-	675	1012
Mov Cap-2 Maneuver	-	-	-	-	675	-
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	780	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	756	-	-	1546	-
HCM Lane V/C Ratio	0.036	-	-	0.002	-
HCM Control Delay (s)	9.9	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	49	11	3	196	34	8
Future Vol, veh/h	49	11	3	196	34	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	53	12	3	213	37	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	65	0	279	59
Stage 1	-	-	-	-	59	-
Stage 2	-	-	-	-	220	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1537	-	711	1007
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	817	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1537	-	710	1007
Mov Cap-2 Maneuver	-	-	-	-	710	-
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	815	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	752	-	-	1537	-
HCM Lane V/C Ratio	0.061	-	-	0.002	-
HCM Control Delay (s)	10.1	-	-	7.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection: 1: Columbia Pike & Thompson's Station Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	94	157	113	156	255	684	48	210
Average Queue (ft)	34	51	48	69	62	287	12	104
95th Queue (ft)	76	113	91	129	205	544	37	197
Link Distance (ft)		1341		1488		744		7279
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	125		85		155		155	
Storage Blk Time (%)		2	4	6		13		2
Queuing Penalty (veh)		1	4	5		11		0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	54	53	151	84	39	18	65	682	103	61	925	21
Future Volume (veh/h)	54	53	151	84	39	18	65	682	103	61	925	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	59	58	164	91	42	20	71	741	112	66	1005	23
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	331	68	191	196	200	95	153	855	129	239	979	22
Arrive On Green	0.04	0.16	0.16	0.05	0.17	0.17	0.04	0.54	0.54	0.04	0.54	0.54
Sat Flow, veh/h	1774	431	1217	1774	1194	569	1774	1582	239	1774	1814	42
Grp Volume(v), veh/h	59	0	222	91	0	62	71	0	853	66	0	1028
Grp Sat Flow(s),veh/h/ln	1774	0	1648	1774	0	1762	1774	0	1821	1774	0	1855
Q Serve(g_s), s	2.7	0.0	12.7	4.1	0.0	2.9	1.7	0.0	39.0	1.6	0.0	52.0
Cycle Q Clear(g_c), s	2.7	0.0	12.7	4.1	0.0	2.9	1.7	0.0	39.0	1.6	0.0	52.0
Prop In Lane	1.00		0.74	1.00		0.32	1.00		0.13	1.00		0.02
Lane Grp Cap(c), veh/h	331	0	258	196	0	295	153	0	984	239	0	1001
V/C Ratio(X)	0.18	0.00	0.86	0.46	0.00	0.21	0.46	0.00	0.87	0.28	0.00	1.03
Avail Cap(c_a), veh/h	350	0	308	196	0	329	167	0	984	254	0	1001
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	32.1	0.0	39.6	32.7	0.0	34.6	22.7	0.0	19.1	17.5	0.0	22.2
Incr Delay (d2), s/veh	0.3	0.0	18.5	1.7	0.0	0.3	2.2	0.0	8.2	0.6	0.0	35.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	7.1	2.1	0.0	1.5	1.1	0.0	21.7	0.8	0.0	36.3
LnGrp Delay(d),s/veh	32.3	0.0	58.1	34.4	0.0	35.0	24.9	0.0	27.4	18.1	0.0	57.6
LnGrp LOS	C		E	C		C	C		C	B		F
Approach Vol, veh/h		281			153			924			1094	
Approach Delay, s/veh		52.7			34.6			27.2			55.3	
Approach LOS		D			C			C			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.1	57.1	10.0	20.1	9.3	57.0	9.0	21.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	52.0	5.0	18.0	5.0	52.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	3.6	41.0	6.1	14.7	3.7	54.0	4.7	4.9
Green Ext Time (p_c), s	0.0	8.4	0.0	0.5	0.0	0.0	0.0	1.2

Intersection Summary	
HCM 2010 Ctrl Delay	43.1
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	9	841	17	24	1135
Future Vol, veh/h	8	9	841	17	24	1135
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	10	914	18	26	1234

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2209	923	0	0	933	0
Stage 1	923	-	-	-	-	-
Stage 2	1286	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	49	327	-	-	734	-
Stage 1	387	-	-	-	-	-
Stage 2	259	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	43	327	-	-	734	-
Mov Cap-2 Maneuver	43	-	-	-	-	-
Stage 1	387	-	-	-	-	-
Stage 2	230	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	63	0	0.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	80	734	-
HCM Lane V/C Ratio	-	-	0.231	0.036	-
HCM Control Delay (s)	-	-	63	10.1	0
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	169	9	11	155	5	5
Future Vol, veh/h	169	9	11	155	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	184	10	12	168	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	193	0	381	189
Stage 1	-	-	-	-	189	-
Stage 2	-	-	-	-	192	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1380	-	621	853
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	841	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1380	-	615	853
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	833	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	715	-	-	1380	-
HCM Lane V/C Ratio	0.015	-	-	0.009	-
HCM Control Delay (s)	10.1	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	13.1

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	407	62	38	116	94	65
Future Vol, veh/h	407	62	38	116	94	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	50	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	442	67	41	126	102	71

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	347	138	173	0	-	0
Stage 1	138	-	-	-	-	-
Stage 2	209	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	650	910	1404	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	826	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	630	910	1404	-	-	-
Mov Cap-2 Maneuver	630	-	-	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	800	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	21.3	1.9	0
HCM LOS	C		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1	SBLn2
Capacity (veh/h)	-	-	1404	-	630	910
HCM Lane V/C Ratio	-	-	0.029	-	0.702	0.074
HCM Control Delay (s)	-	-	7.6	0	23.1	9.3
HCM Lane LOS	-	-	A	A	C	A
HCM 95th %tile Q(veh)	-	-	0.1	-	5.7	0.2

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	33	825	19	56	1087
Future Vol, veh/h	11	33	825	19	56	1087
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	50	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	36	897	21	61	1182

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2200	897	0	0	897	0
Stage 1	897	-	-	-	-	-
Stage 2	1303	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	49	339	-	-	757	-
Stage 1	398	-	-	-	-	-
Stage 2	254	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	45	339	-	-	757	-
Mov Cap-2 Maneuver	45	-	-	-	-	-
Stage 1	398	-	-	-	-	-
Stage 2	234	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	48.5	0	0.5
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	129	757	-
HCM Lane V/C Ratio	-	-	0.371	0.08	-
HCM Control Delay (s)	-	-	48.5	10.2	-
HCM Lane LOS	-	-	E	B	-
HCM 95th %tile Q(veh)	-	-	1.5	0.3	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	172	19	9	151	11	6
Future Vol, veh/h	172	19	9	151	11	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	187	21	10	164	12	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	208	0	381	197
Stage 1	-	-	-	-	197	-
Stage 2	-	-	-	-	184	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1363	-	621	844
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1363	-	616	844
Mov Cap-2 Maneuver	-	-	-	-	616	-
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	841	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	681	-	-	1363	-
HCM Lane V/C Ratio	0.027	-	-	0.007	-
HCM Control Delay (s)	10.4	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	136	38	9	143	23	6
Future Vol, veh/h	136	38	9	143	23	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	148	41	10	155	25	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	189	0	343	168
Stage 1	-	-	-	-	168	-
Stage 2	-	-	-	-	175	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1385	-	653	876
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	855	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1385	-	648	876
Mov Cap-2 Maneuver	-	-	-	-	648	-
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	848	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	685	-	-	1385	-
HCM Lane V/C Ratio	0.046	-	-	0.007	-
HCM Control Delay (s)	10.5	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection: 1: Columbia Pike & Thompson's Station Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	73	207	118	146	254	631	254	909
Average Queue (ft)	31	102	48	45	48	233	81	368
95th Queue (ft)	62	169	90	101	146	454	228	762
Link Distance (ft)		1341		1488		744		7279
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	125		85		155		155	
Storage Blk Time (%)		4	4	2		15		24
Queuing Penalty (veh)		2	2	2		10		15

APPENDIX D – SIGNAL WARRANTS

Warrants Volume

Information

Analyst		Intersection	Columbia Pike and Station S Dr
Agency/Co	T-Square Engineering	Jurisdiction	Thompson's Station
Date Performed	6/6/2018	Units	U.S. Customary
Project ID	18-0524	Time Period Analyzed	Projected
East/West Street	Station South Drive	North/South Street	Columbia Pike
File Name	2 - Columbia and Station S (Projected).xhy	Major Street	North-South

Project Description *18-0524*

Warrant 1

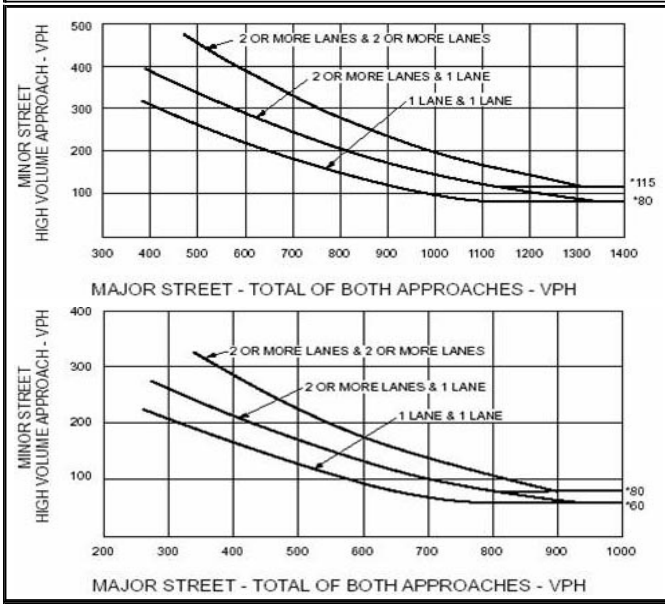
Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

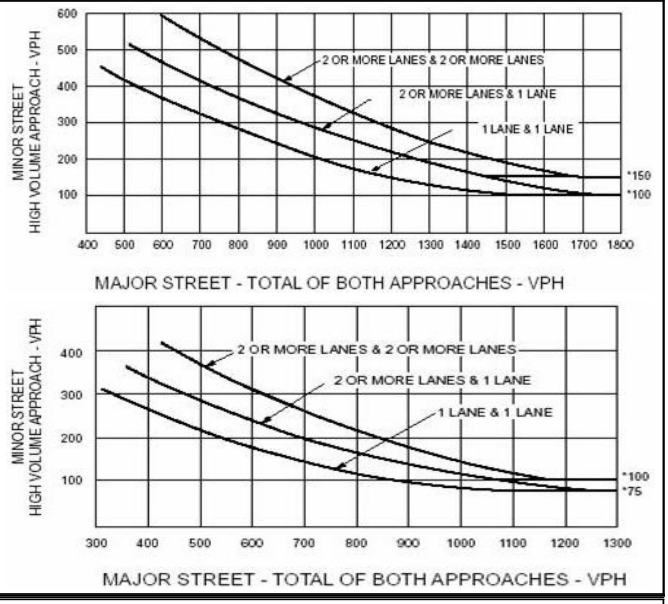
Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 1 **Speed** 45 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
06-07	1481	22	1503	No	No	No	No	No	No	No
07-08	1611	19	1630	No	No	No	No	No	No	No
08-09	1701	16	1717	No	No	No	No	No	No	No
09-10	1688	16	1704	No	No	No	No	No	No	No
10-11	1682	13	1695	No	No	No	No	No	No	No
11-12	1666	12	1678	No	No	No	No	No	No	No
12-13	1666	13	1679	No	No	No	No	No	No	No
13-14	1683	15	1698	No	No	No	No	No	No	No
14-15	1678	14	1692	No	No	No	No	No	No	No
15-16	1680	14	1694	No	No	No	No	No	No	No
16-17	1928	13	1941	No	No	No	No	No	No	No
17-18	1931	17	1948	No	No	No	No	No	No	No
Totals	20395	184	20579	0	0	0	0	0	0	0

Copyright © 2017 University of Florida, All Rights Reserved

Warrants Volume

Information

Analyst		Intersection	Thompson's Sta Rd & Village Dr
Agency/Co	T-Square Engineering	Jurisdiction	Thompson's Station
Date Performed	6/6/2018	Units	U.S. Customary
Project ID	18-0524	Time Period Analyzed	Projected
East/West Street	Thompson's Station Road	North/South Street	Village Drive
File Name	3 - TS and Village (Projected).xhy	Major Street	East-West

Project Description *18-0524*

Warrant 1

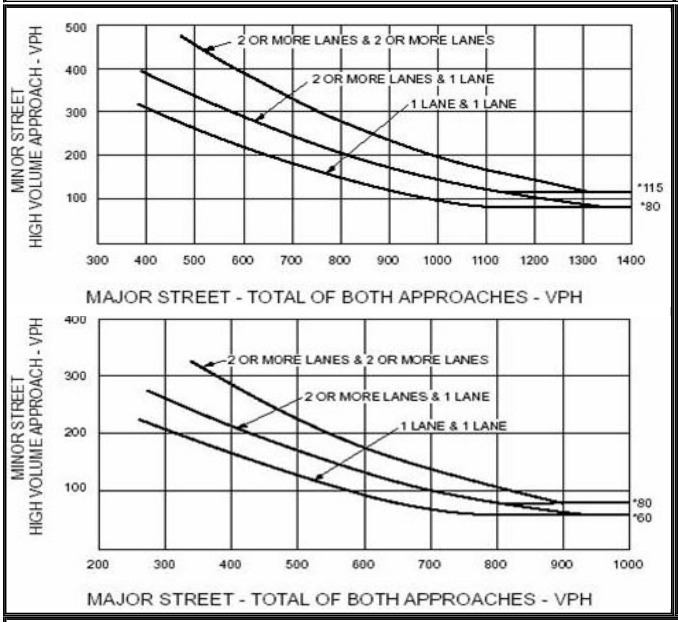
Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

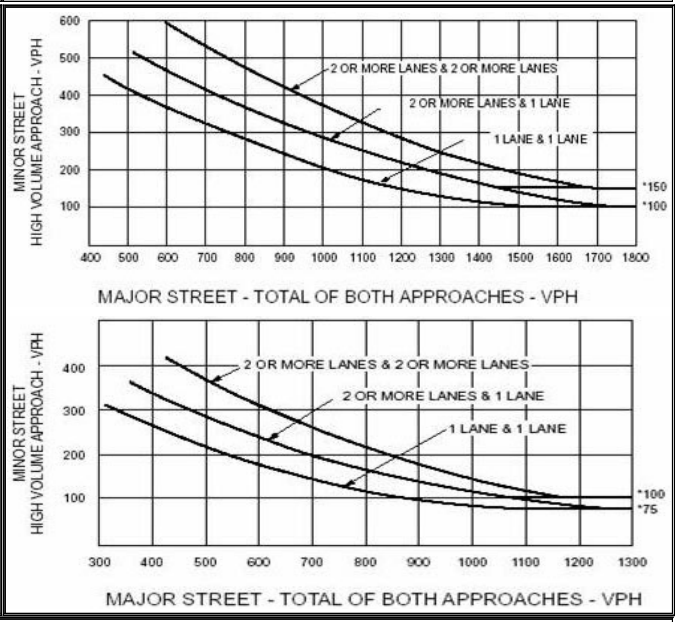
Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 1 **Speed** 45 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
06-07	237	30	267	No	No	No	No	No	No	No
07-08	285	14	299	No	No	No	No	No	No	No
08-09	273	16	289	No	No	No	No	No	No	No
09-10	269	16	285	No	No	No	No	No	No	No
10-11	272	13	285	No	No	No	No	No	No	No
11-12	267	11	278	No	No	No	No	No	No	No
12-13	272	12	284	No	No	No	No	No	No	No
13-14	284	14	298	No	No	No	No	No	No	No
14-15	287	13	300	No	No	No	No	No	No	No
15-16	295	13	308	No	No	No	No	No	No	No
16-17	340	13	353	No	No	No	No	No	No	No
17-18	341	13	354	No	No	No	No	No	No	No
Totals	3422	178	3600	0	0	0	0	0	0	0

Copyright © 2017 University of Florida, All Rights Reserved

HCS7™ Warrants Version 7.3 Generated: 6/13/2018 4:16 PM

Warrants Volume

Information

Analyst		Intersection	Thompson's Sta Rd & Clayton Ar
Agency/Co	T-Square Engineering	Jurisdiction	Thompson's Station
Date Performed	6/6/2018	Units	U.S. Customary
Project ID	18-0524	Time Period Analyzed	Projected
East/West Street	Thompson's Station Road	North/South Street	Clayton Arnold Road
File Name	4 - TS and Clayton Arnold (Projected).xhy	Major Street	East-West

Project Description *18-0524*

Warrant 1

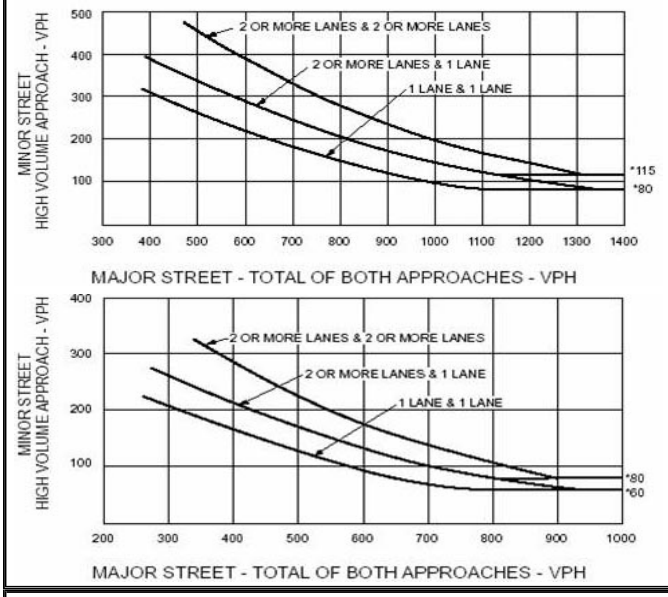
Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

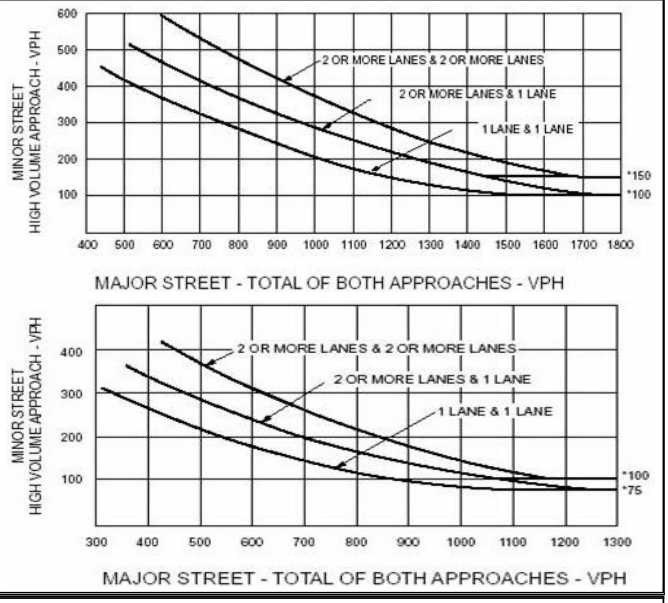
Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 2+ **Speed** 45 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
06-07	328	28	356	No	No	No	No	No	No	No
07-08	409	55	464	No	No	No	No	No	No	No
08-09	305	79	384	No	No	No	No	No	No	No
09-10	296	94	390	No	No	No	No	No	No	No
10-11	290	108	398	No	No	No	No	No	No	No
11-12	279	123	402	No	No	No	No	No	No	No
12-13	279	138	417	No	No	No	No	No	No	No
13-14	278	154	432	No	No	No	No	No	No	No
14-15	272	169	441	No	No	No	No	No	No	No
15-16	268	185	453	No	No	No	No	No	No	No
16-17	311	350	661	No	Yes	No	No	Yes	No	No
17-18	328	489	817	No	Yes	No	No	Yes	No	Yes
Totals	3643	1972	5615	0	2	0	0	2	0	1

Copyright © 2017 University of Florida, All Rights Reserved

HCS7™ Warrants Version 7.3 Generated: 6/6/2018 11:28 AM

Warrants Volume

Information

Analyst			
Agency/Co	T-Square Engineering	Intersection	Columbia Pike and SA 1
Date Performed	6/6/2018	Jurisdiction	Thompson's Station
Project ID	18-0524	Units	U.S. Customary
East/West Street	Site Access 1	Time Period Analyzed	Projected
File Name	5 - Columbia and SA1 (Projected).xhy	North/South Street	Columbia Pike
		Major Street	North-South

Project Description *18-0524*

Warrant 1

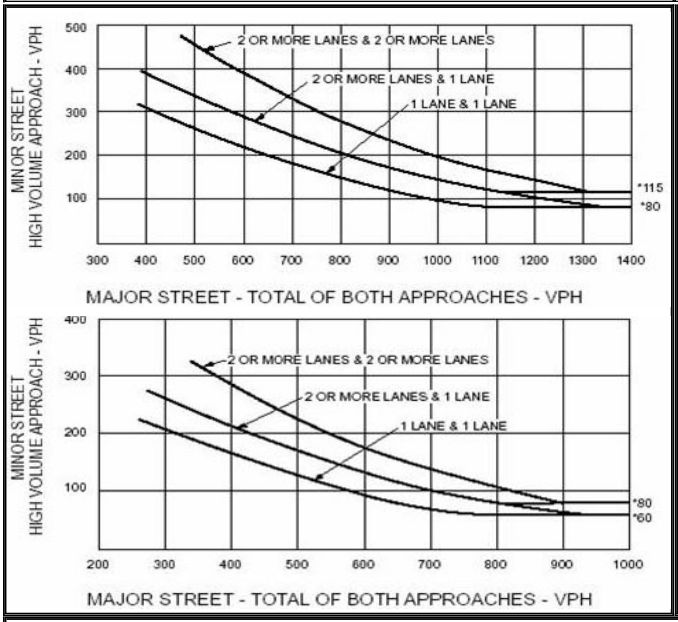
Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

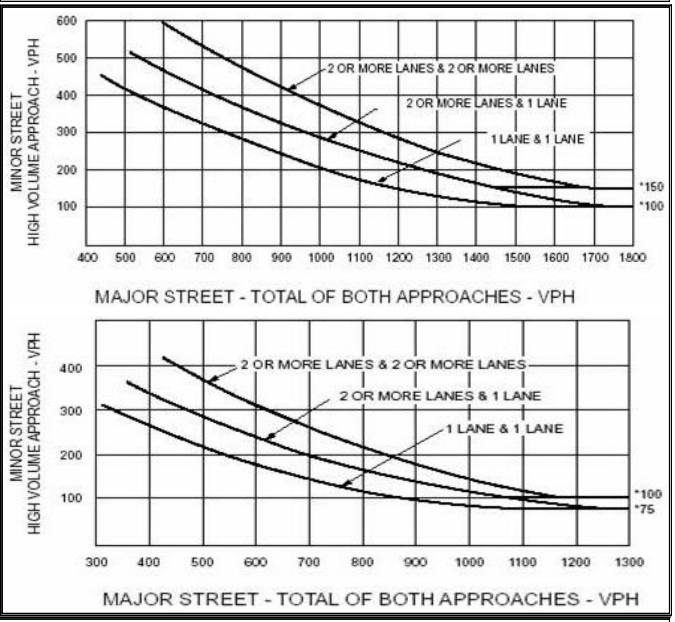
Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 1 **Speed** 45 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
06-07	1437	48	1485	No	No	No	Yes	No	No	No
07-08	1576	35	1611	No	No	No	No	No	No	No
08-09	1677	27	1704	No	No	No	No	No	No	No
09-10	1665	23	1688	No	No	No	No	No	No	No
10-11	1661	22	1683	No	No	No	No	No	No	No
11-12	1650	17	1667	No	No	No	No	No	No	No
12-13	1647	20	1667	No	No	No	No	No	No	No
13-14	1658	25	1683	No	No	No	No	No	No	No
14-15	1656	23	1679	No	No	No	No	No	No	No
15-16	1658	23	1681	No	No	No	No	No	No	No
16-17	1909	23	1932	No	No	No	No	No	No	No
17-18	1906	23	1929	No	No	No	No	No	No	No
Totals	20100	309	20409	0	0	0	1	0	0	0

Copyright © 2017 University of Florida, All Rights Reserved

HCS7™ Warrants Version 7.3 Generated: 6/6/2018 11:32 AM

Warrants Volume

Information

Analyst		Intersection	Thompson's Sta Rd & SA 2
Agency/Co	T-Square Engineering	Jurisdiction	Thompson's Station
Date Performed	6/6/2018	Units	U.S. Customary
Project ID	18-0524	Time Period Analyzed	Projected
East/West Street	Thompson's Station Road	North/South Street	Site Access 2
File Name	6 - TS and SA2 (Projected).xhy	Major Street	East-West

Project Description *18-0524*

Warrant 1

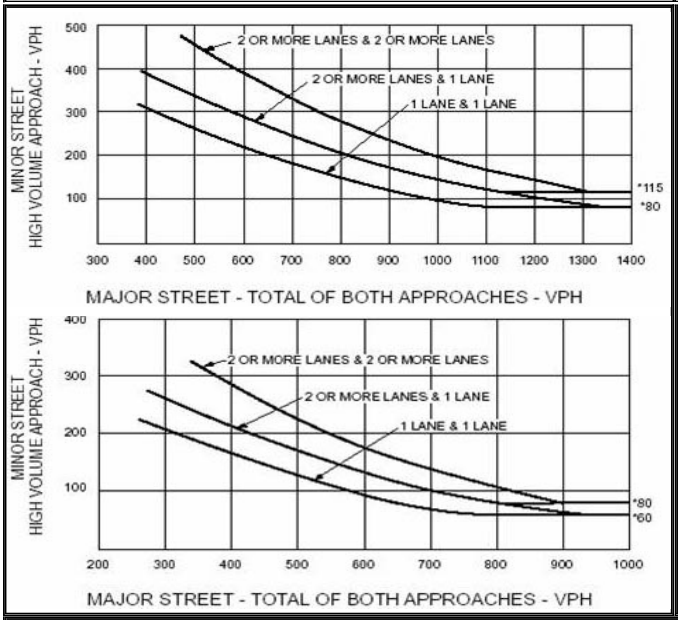
Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

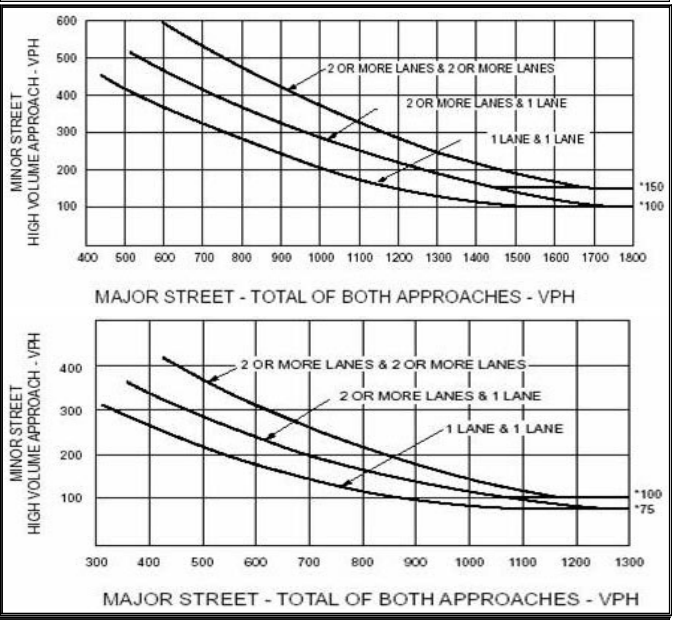
Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 1 **Speed** 45 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
06-07	249	29	278	No	No	No	No	No	No	No
07-08	287	21	308	No	No	No	No	No	No	No
08-09	279	16	295	No	No	No	No	No	No	No
09-10	275	14	289	No	No	No	No	No	No	No
10-11	276	13	289	No	No	No	No	No	No	No
11-12	272	10	282	No	No	No	No	No	No	No
12-13	277	12	289	No	No	No	No	No	No	No
13-14	291	15	306	No	No	No	No	No	No	No
14-15	292	14	306	No	No	No	No	No	No	No
15-16	299	14	313	No	No	No	No	No	No	No
16-17	345	14	359	No	No	No	No	No	No	No
17-18	345	14	359	No	No	No	No	No	No	No
Totals	3487	186	3673	0	0	0	0	0	0	0

Copyright © 2017 University of Florida, All Rights Reserved
HCS7™ Warrants Version 7.3 Generated: 6/13/2018 4:19 PM

Warrants Volume

Information

Analyst		Intersection	Thompson's Sta Rd & SA 3
Agency/Co	T-Square Engineering	Jurisdiction	Thompson's Station
Date Performed	6/6/2018	Units	U.S. Customary
Project ID	18-0524	Time Period Analyzed	Projected
East/West Street	Thompson's Station Road	North/South Street	Site Access 3
File Name	6 - TS and SA3 (Projected).xhy	Major Street	East-West

Project Description *18-0524*

Warrant 1

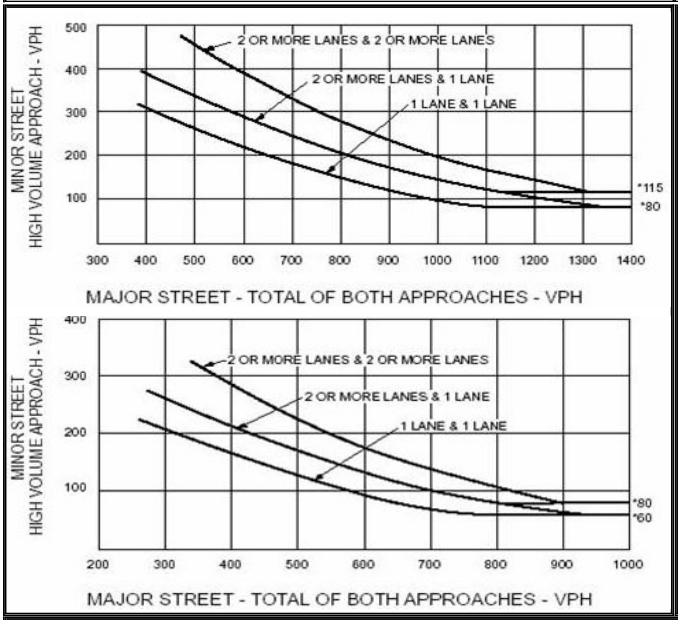
Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

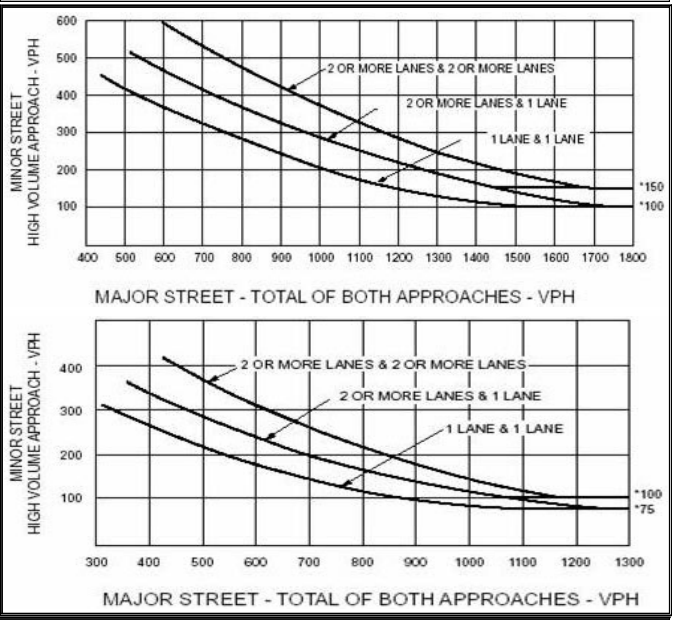
Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 1 **Speed** 45 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
06-07	201	49	250	No	No	No	No	No	No	No
07-08	257	34	291	No	No	No	No	No	No	No
08-09	250	26	276	No	No	No	No	No	No	No
09-10	249	24	273	No	No	No	No	No	No	No
10-11	250	21	271	No	No	No	No	No	No	No
11-12	248	16	264	No	No	No	No	No	No	No
12-13	250	20	270	No	No	No	No	No	No	No
13-14	258	25	283	No	No	No	No	No	No	No
14-15	261	23	284	No	No	No	No	No	No	No
15-16	265	23	288	No	No	No	No	No	No	No
16-17	314	24	338	No	No	No	No	No	No	No
17-18	315	24	339	No	No	No	No	No	No	No
Totals	3118	309	3427	0	0	0	0	0	0	0

Copyright © 2017 University of Florida, All Rights Reserved

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

MEMO

DATE: July 17, 2018

TO: Planning Commission

FROM: Wendy Deats, Town Planner

SUBJECT: The Fields of Canterbury Preliminary Plat – Phases 14 - 17 for the creation of 72 single family lots, 85 townhome lots, a pump station lot and four (4) open space lots and the removal of 96 trees totaling 2,239 inches of trees.

Background

On June 26, 2018, the Planning Commission evaluated the request for a preliminary plat to create phases 14 – 17 within the Fields of Canterbury neighborhood. Due to the concerns regarding the impacts to Critz Lane which is currently in design for improvements, the Commission deferred the request to schedule a work session to discuss the traffic improvements with the Town's traffic engineers.

On July 10, 2018, the Planning Commission held a work session to discuss improvements the project, the traffic study and the improvements in process for Critz Lane. The Town's traffic consultant explained the proposed improvements to Critz will increase capacity at the intersections and improve the safety of the roadway. Concerns over the opening of the new school and the impact to the intersection at Clayton Arnold and Critz will be prior to the construction of the improvements. The developer proposed the idea of working with the town on a public-private partnership for the construction of Critz Lane along the project frontage.

The Planning Commission also expressed concern regarding the request to waive the tree replacement requirements. However, the developer stated that his intentions are to amend his project to eliminate the request for a deviation from the replacement requirements.

Recommendation

With the recommended contingencies, the preliminary plat will comply with the Land Development Ordinance, therefore, Staff recommends Planning Commission approval with the contingencies:

1. Prior to the approval of construction plans, the developer shall enter into a development agreement for the project.
2. Prior to the approval of construction plans, the developer shall obtain approval of an agreement with the Town for the construction of the improvements to Critz Lane along the project frontage, including the intersection of Clayton Arnold and Critz Lane.
3. Prior to the approval of construction plans, revise the traffic study to include the phasing and timing of signal operation and equipment be modified to provide a right turn overlap for the right turn westbound and left turn southbound.

4. Prior to the approval of construction plans, the landscaping plan shall be revised to incorporate all tree replacement as required by the ordinance.
5. Buffer type 3 (semi-opaque) shall be installed in between the project and the adjacent properties within the D1 zoning district.
6. Prior to the approval of construction plans, all applicable codes and regulations shall be addressed to the satisfaction of the Town Engineer. A drainage study shall be submitted to verify that drainage is managed adequately on site.
7. Street lights shall be incorporated into these phases to match the existing neighborhood and shall be documented on the construction drawings.
8. All construction traffic into these phases shall be required to use Lioncrest Lane.
9. During construction, the developer shall comply with all recommendations of the geotechnical report dated June 2, 2017.

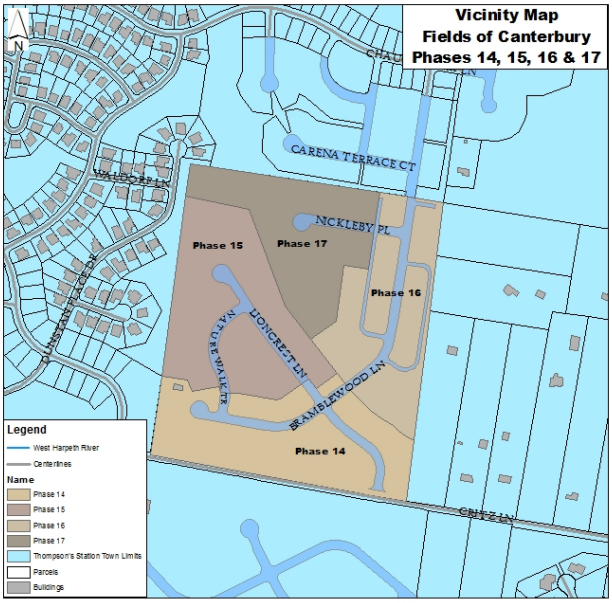
Attachments
June Planning Commission Staff Report

Thompson's Station Planning Commission
Staff Report – Item 1 (PP 2018-003)
June 26, 2018

The Fields of Canterbury Preliminary Plat – Phases 14 - 17 for the creation of 72 single family lots, 85 townhome lots, a pump station lot and four (4) open space lots and the removal of 96 trees totaling 2,239 inches of trees.

PROJECT DESCRIPTION

Ragan Smith & Associates, on behalf of Encompass Land Group submitted a request for a preliminary plat to establish four phases which will include 72 single family lots, 85 townhome lots, a pump station lot, open space lots and the removal of 96 trees.



ANALYSIS

Land Use/Density

The development is located within the D3 – High Intensity zoning district which permits three units an acre and permits housing options that include single-family and townhomes. This plat is a 53.85-acre expansion of The Fields of Canterbury. The original development was 270.5 acres and was approved for 204 townhomes and 612 single-family dwellings for a total of 816 residential units. These phases will add 72 single family and 85 townhomes for a total of 684 single family and 289 townhomes on 324.35 acres for a density of three units an acre.

Lot Width and Setbacks

The single family lots will vary in size from .17 acres to .28 acres with widths greater than 50 feet. The proposed setbacks are 20 feet for the front yard setback, 7.5 feet for the side yard setbacks and 20 feet for the rear yard setback. The townhome lots will have a front yard setback of 15 feet with a minimum of 20 feet for the driveway length and a rear yard setback of 20 feet. In addition, the townhomes will maintain a 15-foot setback in between buildings. Therefore, the preliminary plat conforms to lot widths and setback standards within Land Development Ordinance (LDO).

Roadways

The standard for local roadways is 50 feet. Bramblewood Lane will be extended from phase 13 into these phases. Nickleby Place, Nature Trail Walk and Lioncrest Lane are new roads that will be constructed as part of these phases. All roadways will have a 50 feet right-of-way with a five-foot-

wide landscape strip and a five-foot-wide sidewalk. Street lights are not shown on the plat, however, Staff recommends a contingency that street lights to match the neighborhood lights shall be installed within the landscape strip between the sidewalk and the roadway. Lioncrest, a new roadway will be constructed with a connection to Critz Lane. Critz Lane is currently in design for improvements and Staff is concerned that future road improvements may conflict with the elevation of Lioncrest. Therefore, Staff would recommend that the developer coordinate with the Town during the construction to ensure no conflicts occur between the construction of the proposed road the improvements to Critz Lane.

Critical Lots
No development will occur on slopes exceeding 25%; however, several lots contain slopes between 15 and 25% and are critical lots due to these slopes. Lots 1406-1408, 1414-1415, 1417, 1420, 1423-1425, 1429-1433, 1435, 1501-1502, 1506-1507, 1512, 1516-1523, 1526 and 1531 are designated as critical lots on the plat. A grading plan will be reviewed with the construction plans for the overall phase. Prior to the issuance of building permits, all critical lots require engineered site plans and site-specific grading plans to address any issues.

Open Space
The original development plan was approved with a 25% requirement for open space, however new phases of the neighborhood are subject to the current code open space requirement which is 45%. The total open space within these phases is 25.64 acres or 47% of the project site. Therefore, the project is consistent with the LDO.

Trees
Development of phases 14 - 17 will result in the removal of 96 trees for a total of 2,239 inches. The LDO requires the replacement of trees 18 inches and greater at a ratio of one and a half inches for every inch removed. Therefore, 3,358.5 inches of trees are required to be replaced within the development. This standard is found within Section 3.3.14 Tree Protection in the Subdivision Regulations. The Planning Commission has the authority to grant a deviation is the Commission finds that "extraordinary hardships or practical difficulties may result from strict compliance with the subdivision regulations" and that the deviation from the standard doesn't have a negative impact on the "general intent and purpose of these regulations."

The developer has stated that "the design team exercised sensitivity to the existing trees with the product placement, as well as proposed grading and utilities" and is "incorporating retaining walls and multiple building foundation types (including basement, within specific areas) to minimize the impact on the existing trees" (See attached letter for full justification statement). A landscape plan was submitted and the developer proposes to install/plant 900 trees for a total of 2,000 inches of replacement trees and is requesting relief from the remaining 1,358.5 inches. The proposed trees will include two trees per lot, and the remaining trees within the open space area. This includes a buffer type 3 (semi opaque) between the neighboring properties zoned D1 and the neighborhood zoned D3 as required by the LDO.

The standards for tree replacement were considered and reduced/lessened during the adoption of the LDO. However, due to concerns over the reduced protection of trees, the LDO was amended to increase the requirements to the current standard. Therefore, in keeping with the intent of the LDO, Staff does not recommend the Planning Commission grant a deviation from the tree replacement standards.

Construction Route
The construction route for these phases is proposed to be the new road connection to Critz Lane, Lioncrest Lane. This route will provide direct access to these phases of the project and will reduce the construction traffic on other roads within the subdivision.

Traffic Study
A traffic study was submitted and reviewed by the Town's traffic engineer. All comments are addressed except the Town's traffic engineer does not recommend modifying the lane assignments at Critz Lane/Columbia Pike. The concern is that changing the lane assignments can cause the westbound right turn lane movement to be restricted by not permitting right turn movements during the red phase for westbound traffic. Based on their review of the signal timing and the anticipated peak hour volumes, the recommendation instead of lane assignment is that the phasing and timing of the signal operation and equipment be modified to provide a right turn overlap for the westbound right turn and southbound left turn. Staff recommends that this recommendation be added to the traffic study in place of lane assignments.

RECOMMENDATION
With the recommended contingencies, the preliminary plat will comply with the Land Development Ordinance, therefore, Staff recommends Planning Commission approval with the contingencies:

1. Prior to the approval of construction plans, the developer shall enter into a development agreement for the project.
2. Prior to the approval of construction plans, revise the traffic study to include the phasing and timing of signal operation and equipment be modified to provide a right turn overlap for the right turn westbound and left turn southbound.
3. Prior to the approval of construction plans, the landscaping plan shall be revised to incorporate all tree replacement as required by the ordinance.
4. Buffer type 3 (semi-opaque) shall be installed in between the project and the adjacent properties within the D1 zoning district.
5. Prior to the approval of construction plans, all applicable codes and regulations shall be addressed to the satisfaction of the Town Engineer. A drainage study shall be submitted to verify that drainage is managed adequately on site.
6. Street lights shall be incorporated into these phases to match the existing neighborhood and shall be documented on the construction drawings.
7. All construction traffic into these phases shall be required to use Lioncrest Lane. The construction of Lioncrest shall be coordinated with the Town's improvements to Critz Lane.
8. During construction, the developer shall comply with all recommendations of the geotechnical report dated June 2, 2017.

ATTACHMENT
Preliminary Plat
Landscape Plan
Construction Route Map
Barge Design Traffic Memo
Tree Replacement Variance Request

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

MEMO

DATE: July 17, 2018

TO: Planning Commission

FROM: Wendy Deats, Town Planner

SUBJECT: Item 2 – Land Development Amendments (Zone Amend 2018-004)

On June 26, 2018, the Planning Commission heard a staff initiated request to incorporate additional standards related to road construction specifications, street lights, as built plans and traffic studies. Based on questions pertaining to the appropriate threshold to require a traffic study, the Commission deferred the item to the July meeting for further consideration.

PROPOSED REVISIONS

Section 3.9.23 Road Construction Specifications (page 66).

The road construction specifications in this Article shall be the minimum standards for construction of public or private improvements located within any subdivision within the jurisdictional area. These specifications shall apply to any person, developer, firm, business or other entity constructing public roadways within the Town. All plans shall be submitted for review and approval and shall be scaled drawings with specifications and shall include all aspects of the street, grading and drainage, including all supplemental documentation verifying engineering calculations, erosion control, on street parking, street lighting and any other information related to the construction activities for the project. The construction plans shall be prepared and stamped by a registered engineer in the State of Tennessee. Prior to any approvals, all necessary state approvals, including but not limited to, the Tennessee Department of Transportation, Tennessee Department of Environment and Conservation and the Tennessee Division of Water Pollution shall be submitted to the Town in writing.

Roadway Construction

a. Typical cross sections and dimensions of standard local and collector streets are illustrated in Appendix E.
b. Construction materials and methods including aggregate base stone, asphalt, concrete and roadway subgrades shall be fully tested and constructed in accordance with the designations and requirements within the TDOT Standard Specifications.
c. Drainage facilities including but not limited to ditches, swales, detention/retention ponds, culverts or other structures shall be inspected, tested, and written documentation shall be submitted for approval by the Town prior to the next phase of construction.
d. Subgrade and base stone shall be brought to grade with proper crown prior to compaction test being completed. Proof rolling with a tandem axle loaded dump truck (23 tons) shall be conducted by the contractor and witnessed by Town Staff and testing agency personnel.
e. Proof roll shall be redone if the project is rained on prior to the binder surface installation.
f. Density test shall be conducted by a local testing agency approved by town staff and licensed by the state of Tennessee and shall be at the expense of the developer. A minimum of one density test per lift for each five-hundred (500) feet of roadway shall be required.

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

g. Binder course and surface course shall be inspected and tested per TDOT specifications and written documentation shall be submitted for approval by the Town prior to the next phase of construction.
h. Any materials or workmanship that does not meet the requirements of the approved plans or specifications shall be brought into compliance with all approvals. A stop work order may be given if substandard materials or workmanship is not corrected. No reduction of sureties will be considered if defective materials or workmanship occurs within the development.
i. The developer shall provide the necessary labor and supervision to support field testing by a third party at no cost to the Town. The design engineer or a certified quality control inspector shall be present during construction activities. Weekly test reports shall be submitted in writing and reviewed by the Town throughout the duration of the work. Defects in the workmanship shall be corrected at no cost to the Town. A detailed letter from the testing agency shall be provided attesting that all roadway improvements have been constructed in accordance with the plans and specifications prior to the release of performance surety. The letter shall contain the seal of the Engineer and be in report form, including all weekly project activity and the associated testing results.
j. No asphalt binder shall be installed unless temperature is at least 40 degrees Fahrenheit and rising unless otherwise approved by the Town Engineer.
k. All projects shall be subject to inspection during and upon completion of construction activities by authorized Town staff representatives. A Town inspector on-site does not eliminate the requirement for a third-party inspector and a written report to the Town. Upon completion of the project, the project engineer shall submit in writing to the Town that the construction of all infrastructure was completed in compliance with approved plans and a representative from the Town will make a final inspection to determine the acceptability of the work.

Street Lights

Street lights shall be required for all new subdivisions within the Transect Community, D1, D2 and D3 zoning districts. Street lighting should be pedestrian scaled and shall be decorative in a manner to match the character of the neighborhood. Cobra head and shoebox light heads are not permitted within a residential subdivision. Street lighting should provide adequate lighting to enhance walkway safety. Street lights within neighborhoods shall not exceed 15 feet in height. Street lights shall be installed between the curb and the sidewalk within the grass strip. Streetlights should have a maximum distance of 300 feet apart and shall be approved by Middle Tennessee Electric Membership Corporation. The developer ~~subdivider~~ shall bear the financial responsibility for the original installation costs for the materials and labor for street lighting where it is deemed reasonably necessary by the Town Engineer. ~~Street lighting shall be of such size and specification as deemed appropriate by the Town Engineer to meet the specific requirements of the subdivision. Street lights shall be installed between the curb and the sidewalk within the grass strip.~~

As built plans

As built plans shall be submitted to the Town upon completion of construction activities. As built plans shall be submitted with the completion of each phase of the development. The as built plans shall include all pertinent information related to the phase, including but not limited to, property lines, all cables, utilities, drainage structure, pump stations, etc., detention/retention

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

ponds, any existing structures.

Add the following section to provide additional clarity and guidance in the preparation of traffic studies and analysis.

3.9.24 Traffic Study

a. A traffic study shall be required for any development that will create 750 trips per day or 100 trips or more during a peak hour or any development located on a major arterial within the Town or a project site located in proximity to a road condition that requires further analysis prior to additional volume in the vicinity.
b. Traffic studies shall be prepared by a licensed traffic engineer using the standard format as outlined by the Institute of Transportation Engineers. The applicant shall meet with the Town staff prior to initiating the traffic study to review/determine the scope of study. The completed traffic study shall be submitted to the Town for review. Review shall consist of a third-party review and all cost associated with the Town's third-party review shall be the responsibility of the developer/applicant. Traffic studies older than one year shall be updated.
c. Any project that does not require a traffic study may be required to submit a traffic analysis for access, trip generation, existing conditions and proposed changes to the existing conditions.

RECOMMENDATION

Staff is requesting the Planning Commission adopt these standards in Article 3 of the Land Development Ordinance.

ATTACHMENTS

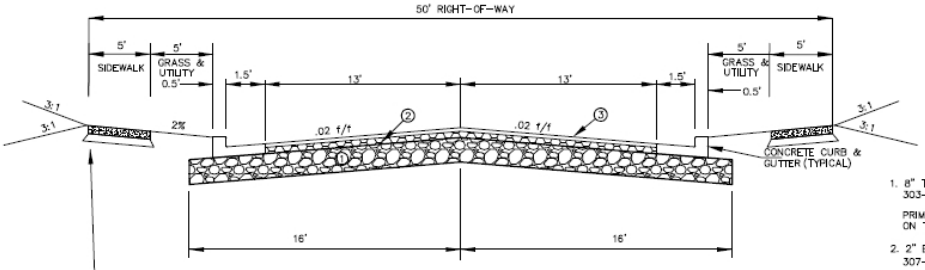
Appendix E – Roadway Cross Sections
Appendix F – Street Lamp Details

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

Appendix E

Roadway Cross Sections

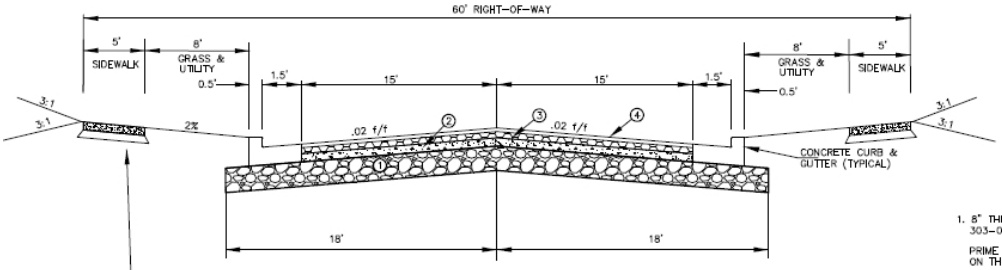


50' ROADWAY SECTION
NTS

1. 8" THICK MINERAL AGGREGATE BASE COURSE:
   303-01 MINERAL AGGREGATE TYPE 'A' BASE GRADING 'D'

   PRIME COAT:
   ON THE SURFACE OF THE BASE AT A MINIMUM RATE OF 0.3 – 0.4 GAL./SQ. YD..
2. 2" BITUMINOUS PLANT MIX BASE (HOT MIX):
   307-01.08 ASPHALT CONCRETE MIX (PG64-22)(BPMB-HM) GRADING 'B-M2'

   TACK COAT:
   ON THE POWER CLEANED SURFACE AT A RATE OF 0.03 – 0.05 GAL./SQ. YD..
3. 1.5" ASPHALTIC CONCRETE WEARING SURFACE:
   411-01.10 ASPHALT CONCRETE MIX (PG64-22)(ACS) GRADING 'D'



60' ROADWAY SECTION
NTS

1. 8" THICK MINERAL AGGREGATE BASE COURSE:
   303-01 MINERAL AGGREGATE TYPE 'A' BASE GRADING 'D'

   PRIME COAT:
   ON THE SURFACE OF THE BASE AT A MINIMUM RATE OF 0.3 – 0.4 GAL./SQ. YD..
2. 4" BITUMINOUS AGGRGATE BASE
   307-01.01 ASPHALT CONCRETE MIX (PG64-22)(BPMB-HM) GRADING 'A'

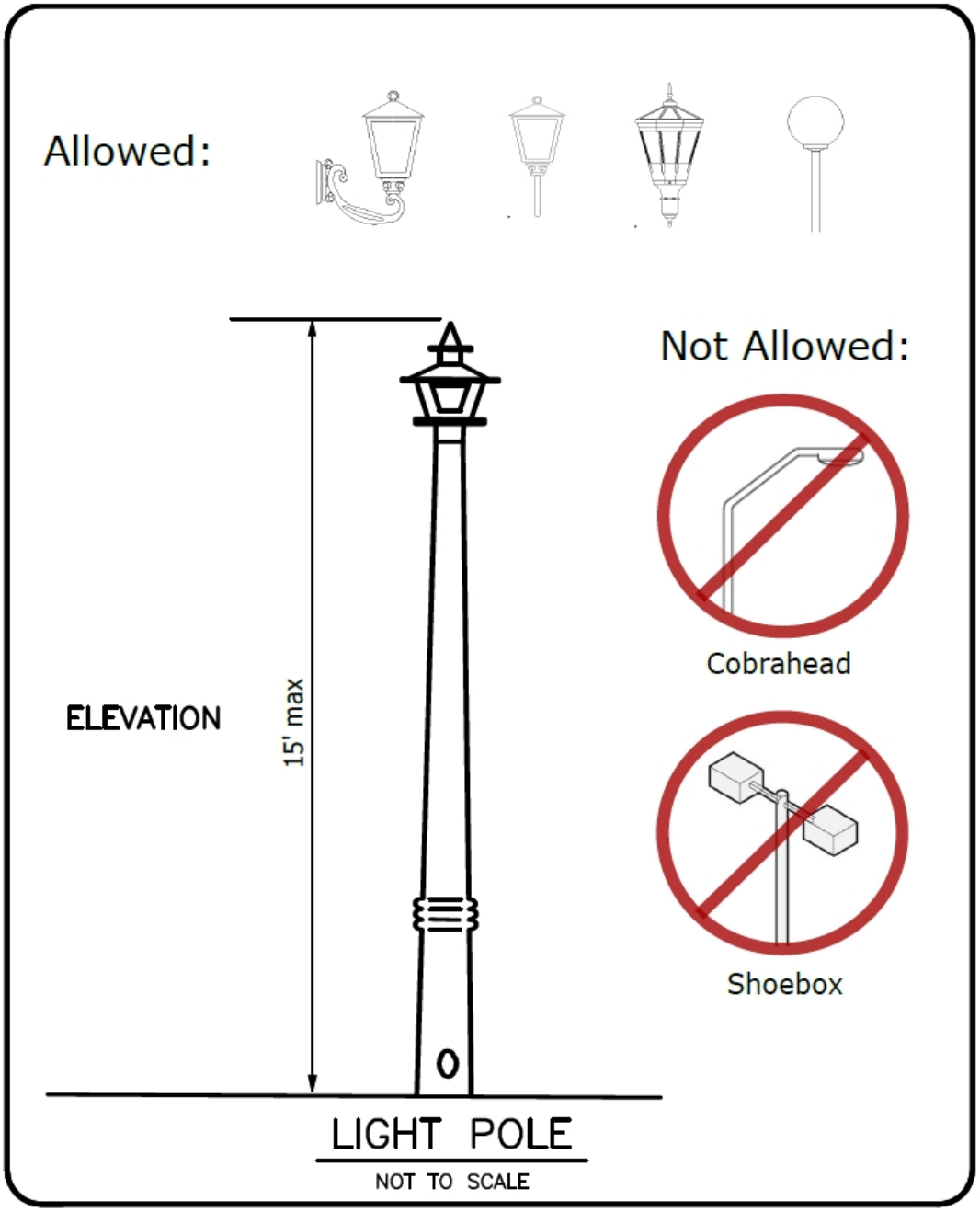
   TACK COAT:
   ON THE POWER CLEANED SURFACE AT A RATE OF 0.03 – 0.05 GAL./SQ. YD..
3. 2" BITUMINOUS PLANT MIX BASE (HOT MIX):
   307-01.08 ASPHALT CONCRETE MIX (PG64-22)(BPMB-HM) GRADING 'B-M2'

   TACK COAT:
   ON THE POWER CLEANED SURFACE AT A RATE OF 0.03 – 0.05 GAL./SQ. YD..
4. 1.5" ASPHALTIC CONCRETE WEARING SURFACE:
   411-01.10 ASPHALT CONCRETE MIX (PG64-22)(ACS) GRADING 'D'

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

Appendix F
Street Lamp Detail



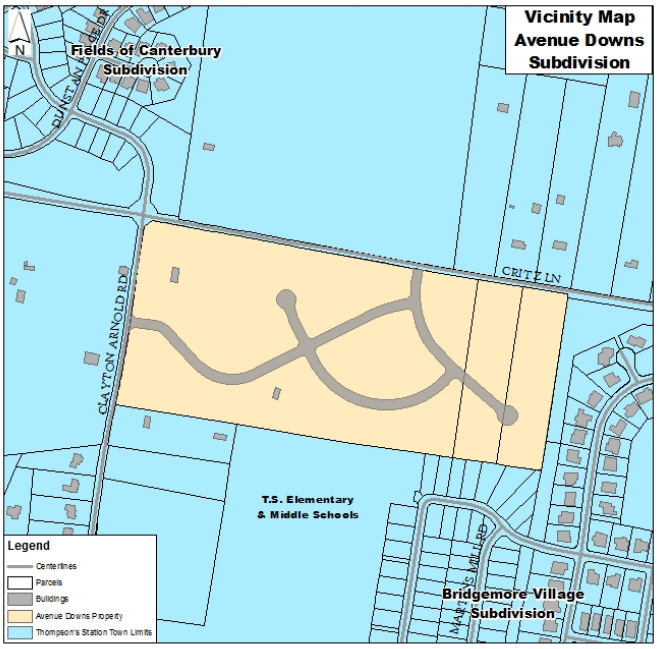
TOWN OF THOMPSON'S STATION 1550 THOMPSON'S STATION RD WEST P.O. BOX 100 THOMPSON'S STATION TN, 37179	Residential Street Lamp (DETAIL)	
NOT TO SCALE	DATE: 6/11/18	

Thompson's Station Planning Commission
Staff Report – Item 3 (PP 2018-004)
July 24, 2018

Avenue Downs Preliminary Plat for the creation of 69 single family lots, five open space lots, a pump station lot and the removal of 18 trees totaling 455 inches of trees.

PROJECT DESCRIPTION

Ragan Smith & Associates, on behalf of Amber Lane Development, submitted a request for a preliminary plat for a two-phase project which will include 69 single family lots, a pump station lot and open space lots. The plat also includes the removal of 18 trees for a total of 455 inches.



ANALYSIS

Land Use/Density

The development is located within the D2 – Medium Intensity zoning district which permits one and a half units an acre and permits housing options that include single-family. This project includes 69 single family lots on 46.4 acres for a density of one and a half units per acre.

Lot Width and Setbacks

The single family lots will vary in size from .21 acres to .40 acres with lot widths greater than 65 feet. The proposed setbacks are 20 feet for the front and rear yard setbacks and 10 feet for the side yard setback. Therefore, the lot widths and setbacks comply with Land Development Ordinance (LDO).

Roadways

The standard for local roadways is 50 feet. Three new roads are proposed and will have a 50-foot right-of-way. A street section is not provided, however, a five-foot sidewalk and a five-foot landscape strip between the sidewalk and the road is required. Road A will connect to Clayton Arnold Road, Road B is an internal roadway and Road C will connect to Critz Lane. Street lights are not shown on the plat; however, Staff recommends street lights be required and installed within the landscape strip between the sidewalk and the roadway. Critz Lane is currently in design for improvements and there is a slight elevation change at the connection of Road C. Therefore, Staff

would recommend that the developer coordinate with the Town during the construction to ensure no conflicts occur between the construction of the proposed road and the improvements to Critz Lane. The applicant is working on an agreement with Encompass Land Group and the Town for Critz Lane improvements. Therefore, Staff would recommend a contingency related to the execution of such agreement prior to any approvals.

Names of all new public ways as approved are required at the preliminary plat phase. No approvals were submitted with this plat application. Therefore, Staff would recommend a contingency that all road names be approved by Williamson County and submitted to the Town.

Open Space/Amenities
The minimum open space requirement is 45%. Five open space lots are proposed for a total of approximately 25 acres or 54% of the project site. Therefore, the project complies with the LDO.

The LDO requires that neighborhoods with greater than 50 lots shall incorporate one of the following amenities: children's playground, swimming pool with amenities center, passive recreation areas, and trails throughout the open space where feasible. No amenity is shown on the plat, however the trail as shown on the concept plan will be incorporated into the overall landscape plan. The project site has frontage along Clayton Arnold and a portion of the trail should run along Clayton Arnold to provide a link to what will ultimately connect the Town's sidewalks and trails. Therefore, Staff would recommend a contingency that the trail have an alignment that includes the Clayton Arnold frontage. Staff has discussed this with the development team and they are agreeable to incorporate the trail along the Clayton Arnold frontage.

Trees
Development of site, as proposed, will result in the removal of 18 trees for a total of 455 inches. The LDO requires the replacement of trees 18 inches and greater at a ratio of one and a half inches for every inch removed. Therefore, 682.5 inches of trees are required to be replaced within the development. A landscape plan was submitted and the developer proposes to install/plant 342 trees for a total of 684 inches of replacement trees. The proposed trees will include street trees along the proposed roads with the remaining trees within the open space area. This includes a buffer type 2 (broken screen) between the neighboring properties zoned D1 and the neighborhood zoned D2 as required by the LDO. The LDO also requires that one two-inch caliper tree be planted on each lot (Section 4.10.1) which will be required during review of individual building permits.

Traffic Study
A traffic study was submitted and reviewed by the Town's traffic engineer. Comments were sent to the developer's traffic engineer and no response has been received. However, at a work session held on July 10, 2018, the developer in conjunction with the Town and the developer for the Fields of Canterbury to discuss a possible agreement with the Town for improvements to Critz Lane. Therefore, Staff would recommend that prior to the approval of any construction drawings, the developer obtain approval of an agreement related to the roadway improvements.

Utilities
The developer requested approval of wastewater from the Board of Mayor and Aldermen on June 12, 2018. The request was not approved; therefore, the project does not have sewer availability. The LDO states "land shall not be subdivided until proper provisions have been made for drainage, water, sewerage, telecommunications and other public utilities . . ." (Section 3.1.1). Therefore, Staff cannot recommend approval of a project that does not have access to sewer. However, the

developer is working on an agreement with the Town which may resolve issues related to sewer availability. Therefore, Staff recommends deferral of this plat to provide additional time for the developer to work with the Town.

RECOMMENDATION

Based on the lack of utilities, specifically sewer, Staff recommends deferral of the preliminary plat to the August Planning Commission meeting.

ATTACHMENTS

Preliminary Plat
Landscape Plan
Traffic Study
Traffic Memo

GENERAL NOTES

1. THE PURPOSE OF THIS PLAT IS TO CREATE 69 SINGLE FAMILY LOTS, A PUMP STATION LOT, OPEN SPACE TRACTS, AND PUBLIC RIGHT OF WAY.

2. BEARINGS SHOWN HEREON ARE BASED ON THE TENNESSEE STATE PLANE COORDINATE SYSTEM NAD 1983). GPS EQUIPMENT WAS USED TO DETERMINE THE POSITION OF TWO CONTROL POINTS ON THE SURVEYED PROPERTY IN ORDER TO ESTABLISH THE BEARING BASE FOR THE SURVEY. TYPE EQUIPMENT USED: LEICA, MODEL GX1230, DUAL FREQUENCY RECEIVER. THE TYPE OF GPS SURVEY: NETWORK ADJUSTED REAL TIME KINEMATIC. THE RELATIVE POSITIONAL ACCURACY IS 0.05'.

3. THE PROPERTY IS ZONED D2 (MEDIUM DENSITY RESIDENTIAL).
   MAXIMUM LOT COVERAGE (SINGLE FAMILY) – 55%.
   MINIMUM BUILDING SETBACKS:
   FRONT – 20'
   SIDE – 10'
   REAR – 20'

4. BY SCALED MAP LOCATION AND GRAPHIC PLOTTING ONLY, THIS PROPERTY LIES WITHIN FLOOD ZONES "X" (OTHER FLOOD AREAS) AND "X" (OTHER AREAS), AS DESIGNATED ON CURRENT FEDERAL EMERGENCY MANAGEMENT AGENCY MAP NOS. 47187C0345F AND 47187C0365F WITH AN EFFECTIVE DATE OF SEPTEMBER 29, 2006, WHICH MAKES UP A PART OF THE NATIONAL FLOOD INSURANCE ADMINISTRATION REPORT; COMMUNITY NO. 470424, PANEL NOS. 0345 AND 0365, SUFFIX F, WHICH IS THE CURRENT FLOOD INSURANCE RATE MAP FOR THE COMMUNITY IN WHICH SAID PREMISES IS SITUATED. SAID MAP DEFINES ZONE "AE" UNDER "SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD" AS BASE FLOOD ELEVATIONS DETERMINED. SAID MAP DEFINES ZONE "X" (OTHER FLOOD AREAS) UNDER "OTHER FLOOD AREAS" AS AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD. SAID MAP DEFINES ZONE "X" (OTHER AREAS) UNDER "OTHER AREAS" AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

5. THIS SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. ABOVE GRADE AND UNDERGROUND UTILITIES SHOWN WERE TAKEN FROM VISIBLE APPURTENANCES, PUBLIC RECORDS, AND/OR MAPS PREPARED BY OTHERS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THEREFORE, RELIANCE UPON THE TYPE, SIZE AND LOCATION OF UTILITIES SHOWN SHOULD BE DONE SO WITH THIS CIRCUMSTANCE CONSIDERED. DETAILED VERIFICATION OF EXISTENCE, LOCATION AND DEPTH SHOULD ALSO BE MADE PRIOR TO ANY DECISION RELATIVE THERETO IS MADE. AVAILABILITY AND COST OF SERVICE SHOULD BE CONFIRMED WITH THE APPROPRIATE UTILITY COMPANY. IN TENNESSEE, IT IS A REQUIREMENT, PER "THE UNDERGROUND UTILITY DAMAGE PREVENTION ACT", THAT ANYONE WHO ENGAGES IN EXCAVATION MUST NOTIFY ALL KNOWN UNDERGROUND UTILITY OWNERS NO LESS THAN THREE (3) NOR MORE THAN TEN (10) WORKING DAYS PRIOR TO THE DATE OF THEIR INTENT TO EXCAVATE AND ALSO TO AVOID ANY POSSIBLE HAZARD OR CONFLICT. TENNESSEE ONE CALL, DIAL 811.

6. SANITARY SEWER LINES AND STORM LINES SHOWN HEREON WERE TAKEN FROM A PRELIMINARY DESIGN. FINAL PLACEMENT OF UTILITIES WILL BE DEPICTED ON THE FINAL PLAT.

7. DOMESTIC WATER SUPPLY INFORMATION SHOWN HEREON IS BASED ON A PRELIMINARY DESIGN.

8. ALL PUBLIC STREETS AND DRAINAGE STRUCTURES WITHIN THE RIGHTS–OF–WAY WILL BE MAINTAINED BY THE TOWN OF THOMPSON'S STATION.

9. HOMEOWNER'S ASSOCIATION WILL BE RESPONSIBLE FOR LONG TERM OPERATION AND MAINTENANCE OF STORMWATER INFRASTRUCTURE LOCATED IN DRAINAGE EASEMENTS AND ALL OPEN SPACE, INCLUDING LANDSCAPE AND DETENTION/RETENTION AREAS.

10. ELEVATIONS SHOWN HEREON ARE BASED ON NAVD 88. CONTOURS ARE AT TWO FOOT INTERVALS AND ARE BASED ON A FIELD RUN SURVEY USING RANDOM SPOT ELEVATIONS. CONTOURS WERE DERIVED USING SURFACE MODELING TECHNIQUES.

11. LOTS SHOWN THUS (*) ARE DESIGNATED AS CRITICAL LOTS AND HAVE NATURAL SLOPES IN EXCESS OF 15%. PER SECTION 3–102.104 OF THE SUBDIVISION REGULATIONS, PRIOR TO THE ISSUANCE OF A BUILDING PERMIT, A SITE GRADING PLAN FOR DEVELOPMENT OF THE LOT SHALL BE SUBMITTED ADDRESSING SITE SPECIFIC NATURAL RESOURCE ISSUES TO THE TOWN OF THOMPSON'S STATION FOR REVIEW AND APPROVAL. NO BUILDING PERMIT WILL BE ISSUED ON SAID LOTS UNTIL AND UNLESS THE TOWN ENGINEER HAS RECEIVED AND APPROVED THE SITE PLAN.

12. I HEREBY STATE THAT THIS SURVEY WAS DONE IN COMPLIANCE WITH THE CURRENT TENNESSEE MINIMUM STANDARDS OF PRACTICE AND THIS IS A CATEGORY I SURVEY AND THE RATIO OF PRECISION OF THE UNADJUSTED SURVEY IS 1:15,715.

BY: _____ DATE: JUNE 15, 2018
JOHN T. DARNALL, TN RLS #1571

13. ALL OPEN SPACE IS A PUBLIC UTILITY AND DRAINAGE EASEMENT.

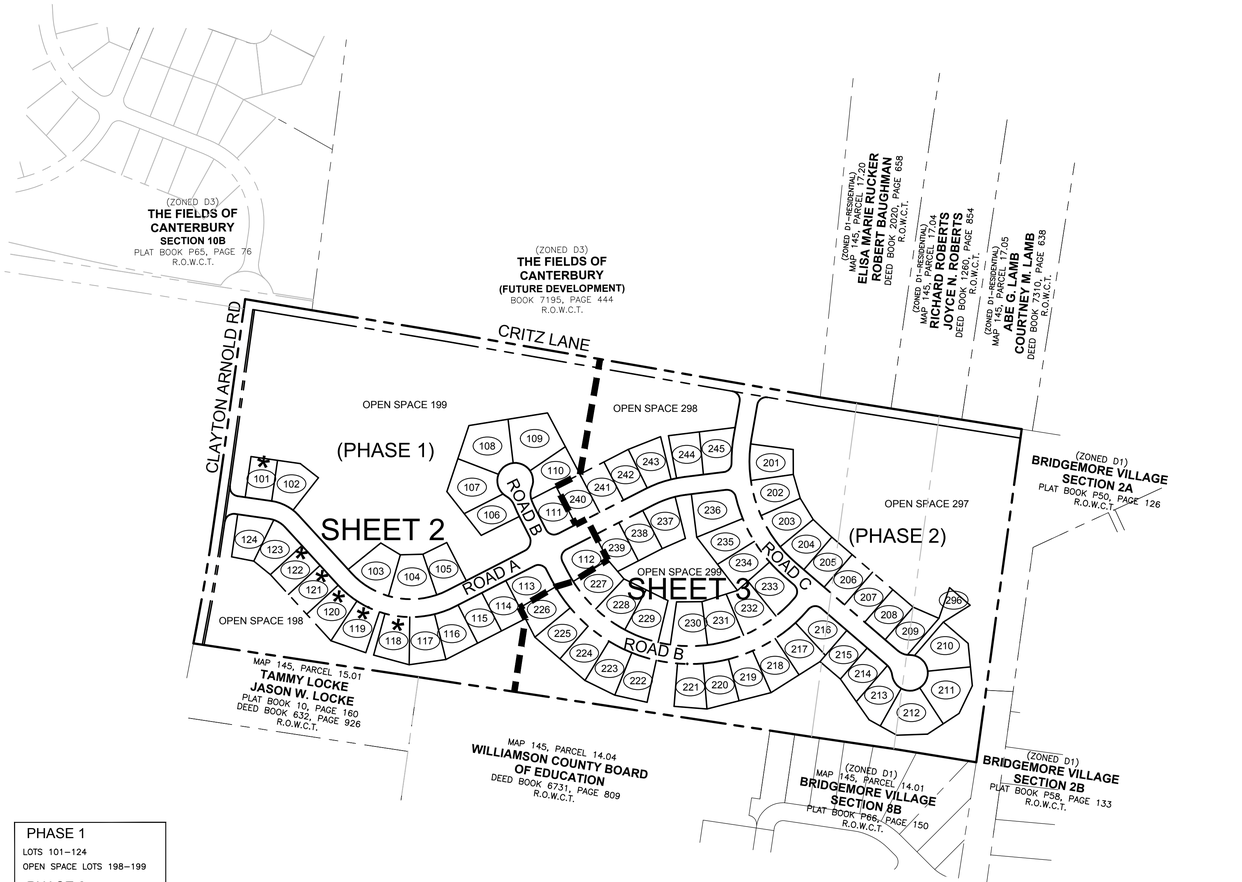
DEED REFERENCE

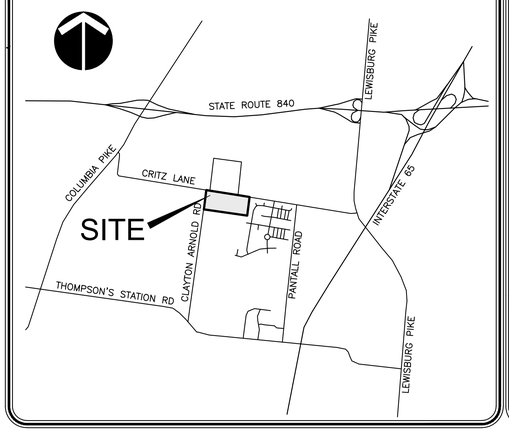
BEING THE SAME PROPERTY CONVEYED TO BYRD D. CAIN, JR. FROM AMBER LANE DEVELOPMENT, LLC BY WARRANTY DEED OF RECORD IN BOOK 7258, PAGE 303, REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TENNESSEE.

PROPERTY MAP REFERENCE

BEING PARCEL NUMBERS 6.01, 6.02, AND 6.03 AS SHOWN ON WILLIAMSON COUNTY PROPERTY MAP NUMBER 145.

0 200 400 600





LOCATION MAP
N.T.S.

PHASE 1
LOTS 101–124
OPEN SPACE LOTS 198–199
PHASE 2
LOTS 201–245
OPEN SPACE LOTS 297–299
PUMP STATION LOT 296

SITE DATA TABLE (PH. 1 & 2)

TOTAL LOT AREA	– 16.61 ACRES±
TOTAL OPEN SPACE AREA	– 25.08 ACRES±
PUMP STATION LOT 296	– 0.14 ACRES±
TOTAL CRITZ LN R.O.W. IN USE AREA	– 1.26 ACRES±
TOTAL CLAYTON ARNOLD RD. R.O.W. IN USE AREA	– 0.54 ACRES±
TOTAL CLAYTON ARNOLD RD. R.O.W. DEDICATION	– 0.11 ACRES±
TOTAL INTERNAL R.O.W. AREA	– 4.48 ACRES±
TOTAL SITE AREA	– 48.22 ACRES±
TOTAL LINEAR FEET OF ROAD	– 3,797 FEET

Know what's below. Call before you dig.

LEGEND

OS	OPEN SPACE
R.O.W.	R.O.W.
R.O.W.C.T.	REGISTER'S OFFICE WILLIAMSON COUNTY, TENNESSEE
*	CRITICAL LOT (SEE NOTE 12)

SURVEYOR:
RAGAN–SMITH ASSOCIATES, INC.
TOM DARNALL, RLS
315 WOODLAND STREET
NASHVILLE, TENNESSEE 37206
(615) 244–8591

OWNER / DEVELOPER
AMBER LANE DEVELOPMENT, LLC
C/O JORDAN CLARK
1804 WILLIAMSON COURT, SUITE 107
BRENTWOOD, TENNESSEE 37027
(615) 794–6401

LOT AREA TABLE		
LOT	SQ. FT.±	ACRES±
101	8,625	0.20
102	11,334	0.26
103	12,166	0.28
104	12,270	0.28
105	9,978	0.23
106	9,532	0.22
107	14,521	0.33
108	16,625	0.38
109	17,293	0.40
110	10,498	0.24
111	9,456	0.22
112	9,432	0.22
113	9,308	0.21
114	9,000	0.21
115	9,000	0.21
116	10,447	0.24
117	11,238	0.26
118	10,690	0.25
119	10,665	0.24
120	10,473	0.24
121	9,000	0.21
122	9,000	0.21
123	10,475	0.24
124	10,145	0.23
201	10,452	0.24
202	10,452	0.24
203	10,452	0.24
204	9,908	0.23
205	9,000	0.21
206	9,000	0.21
207	9,000	0.21
208	9,000	0.21
209	9,805	0.23
210	13,160	0.30
211	15,026	0.34

LOT AREA TABLE		
LOT	SQ. FT.±	ACRES±
212	15,026	0.34
213	10,496	0.24
214	9,326	0.21
215	8,625	0.20
216	10,110	0.23
217	10,154	0.23
218	10,101	0.23
219	10,036	0.23
220	10,036	0.23
221	10,036	0.23
222	10,036	0.23
223	10,428	0.24
224	10,113	0.23
225	10,113	0.23
226	9,878	0.23
227	9,838	0.23
228	10,270	0.24
229	10,436	0.24
230	10,800	0.25
231	10,946	0.25
232	10,901	0.25
233	10,773	0.25
234	9,765	0.22
235	10,628	0.24
236	13,053	0.30
237	10,237	0.24
238	9,000	0.21
239	8,795	0.20
240	9,000	0.21
241	9,000	0.21
242	9,081	0.21
243	10,041	0.23
244	9,757	0.22
245	10,433	0.24

OPEN SPACE LOT AREA TABLE		
LOT	SQ. FT.±	ACRES±
198	113,106	2.60
199	436,381	10.02
297	424,739	9.75
298	74,390	1.71
299	44,025	1.01

PUMP STATION LOT AREA		
LOT	SQ. FT.±	ACRES±
296	5,939	0.14

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
CHATTANOOGA
1420 GUNBARREL ROAD
SUITE 200
CHATTANOOGA, TENNESSEE 37421
(423) 490-9400
NASHVILLE
315 WOODLAND STREET
P.O. BOX 60070 37206
NASHVILLE, TENNESSEE 37206
(615) 244-8591
• www.ragansmith.com •

JOHN T. DARNALL REGISTERED LAND SURVEYOR STATE OF TENNESSEE AGRICULTURE COMMERCE TENNESSEE NO. 1571

AVENUE DOWNS
PHASES 1 AND 2
TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

REV #	DATE:	DESCRIPTION:

JOB NO.	16-107	DESIGNED:	N/A	SCALE:	1"=200'
WK. ORDER:	0646	DRAWN:	AMR	DATE:	JUNE 15, 2018

PRELIMINARY PLAT

1 OF 3

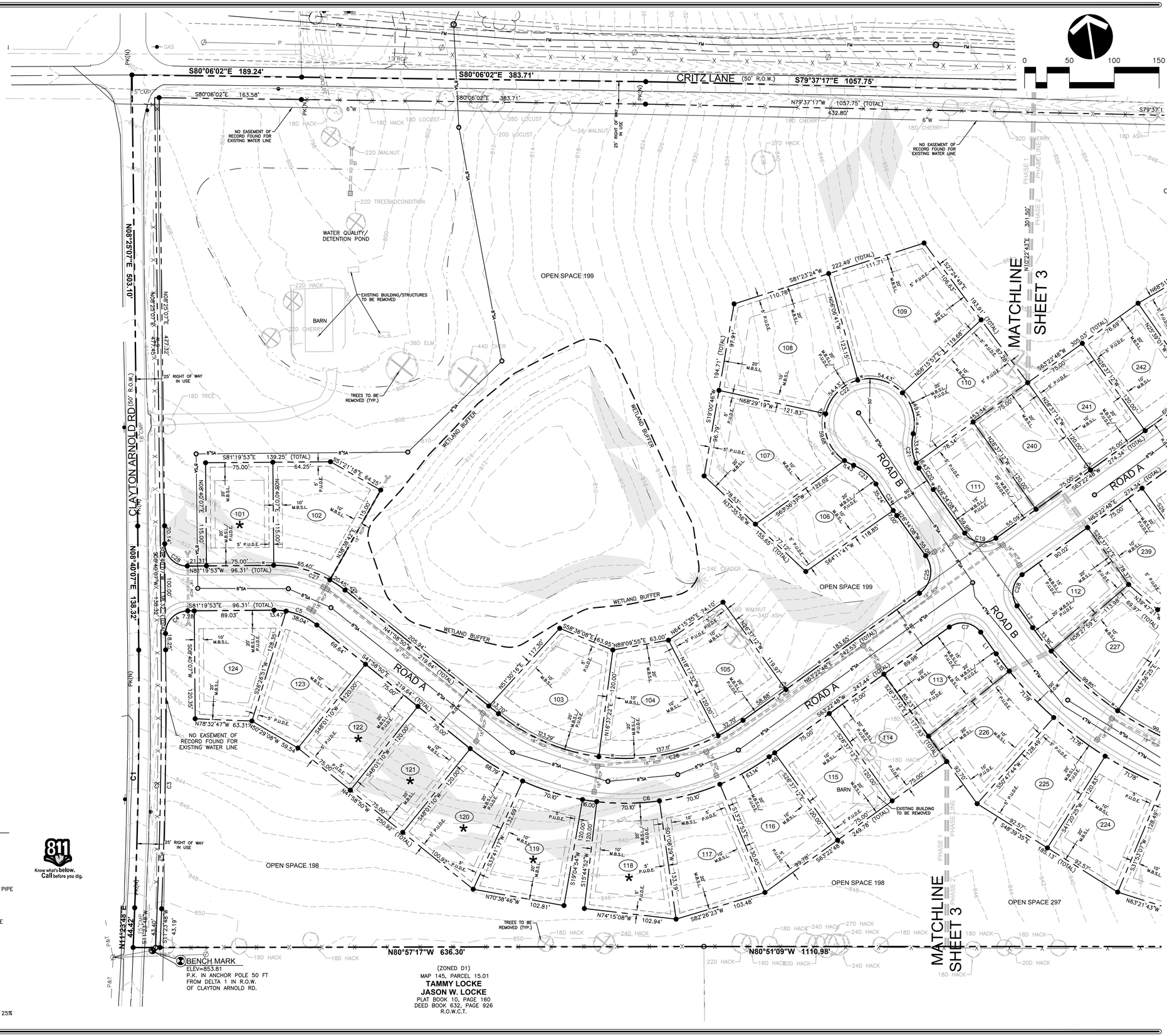
G:\16107.0646\1-SURVEY\PLAT\PRELIMINARY PLAT\0646 PRELIM PLAT.DWG
PLOTTED BY AMANDA REED ON 6/15/2018 11:02 AM LAST UPDATED BY AMR ON 6/15/2018 11:37 AM

GENERAL NOTES

SEE SHEET 1 FOR NOTES, REFERENCES AND AREA TABLES.

CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C8	435.00'	851.74'	112°11'13"	647.19	722.06'	S82°39'44"E
C9	25.00'	39.27'	90°00'00"	25.00	35.36'	S86°14'40"W
C10	50.00'	36.14'	41°24'35"	18.90	35.36'	N28°03'03"W
C11	50.00'	229.35'	262°49'09"	56.69	75.00'	N41°14'40"E
C12	50.00'	36.14'	41°24'35"	18.90	35.36'	S69°27'38"E
C13	375.00'	387.03'	59°08'03"	212.75	370.08'	S19°11'19"E
C14	25.00'	39.27'	90°00'00"	25.00	35.36'	S55°22'43"W
C15	25.00'	39.27'	90°00'00"	25.00	35.36'	N34°37'17"W
C16	425.00'	77.99'	10°30'51"	39.11	77.88'	S05°07'17"W
C17	25.00'	36.49'	83°37'14"	22.36	33.33'	N41°40'29"E
C18	325.00'	114.04'	20°06'18"	57.61	113.46'	S73°25'57"W
C29	275.00'	96.50'	20°06'18"	48.75	96.00'	S73°25'57"W
C30	25.00'	36.49'	83°37'14"	22.36	33.33'	N54°42'17"W
C31	425.00'	266.01'	35°51'41"	137.52	261.69'	S30°49'30"E
C32	25.00'	39.27'	90°00'00"	25.00	35.36'	N03°45'20"W
C33	385.00'	753.84'	112°11'13"	572.80	639.06'	S82°39'44"E

LINE TABLE		
LINE	BEARING	DISTANCE
L1	S26°34'08"E	29.75'
L2	S26°34'08"E	29.84'



LEGEND

●	IRON ROD (NEW) (1/2" x 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")	FH	FIRE HYDRANT
○	IRON ROD (OLD)	WV	WATER VALVE
CATV	CABLE TV BOX	WM	WATER METER
E	ELECTRIC BOX	—SA—	SANITARY SEWER LINE
	CATCH BASIN	RCP	REINFORCED CONCRETE PIPE
	SANITARY SEWER MANHOLE	ST	PROPOSED STORM PIPE
	LIGHT STANDARD	-X—X-	FENCE
XXX	LOT NUMBER	P.U.D.E.	PUBLIC UTILITY DRAINAGE EASEMENT
R.O.W.	RIGHT-OF-WAY	R.O.W.	RIGHT-OF-WAY
	DECIDUOUS TREE	M.B.S.L.	MINIMUM BUILDING SETBACK LINE
	EVERGREEN TREE		CONCRETE SURFACE
*	CRITICAL LOT (SEE NOTE 12)		15-25% SLOPES
R.O.W.C.T.	REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN		SLOPES IN EXCESS OF 25%

811 Know what's below. Call before you dig.

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
NASHVILLE
211 COMMERCE STREET
SUITE 200
P.O. BOX 63070
NASHVILLE, TN 37206
(615) 244-8591
CHATTANOOGA
1301 RIVERFRONT PARKWAY
SUITE 200
CHATTANOOGA, TN 37402
(423) 490-9400
• www.ragansmith.com •

JOHN T. DARNALL
REGISTERED
LAND SURVEYOR
TENNESSEE NO. 1571

AVENUE DOWNS

PHASES 1 AND 2

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

REV.	DESCRIPTION:	DATE:
B		

JOB NO.	WK. ORDER	DESIGNED:	DRAWN:	SCALE:	DATE:
16107	0646	N/A	AMR	1"=50'	JUNE 15, 2018

PRELIMINARY PLAT

2 OF 3

G:\16107\0646\SURVEY\PRELIMINARY PLAT\0646 PRELIM PLAT.DWG
PLOTTED BY AMANDA REED ON 6/15/2018 11:07 AM
LAST UPDATED BY AMR ON 6/15/2018 10:21 AM

GENERAL NOTES

SEE SHEET 1 FOR NOTES, REFERENCES AND AREA TABLES.

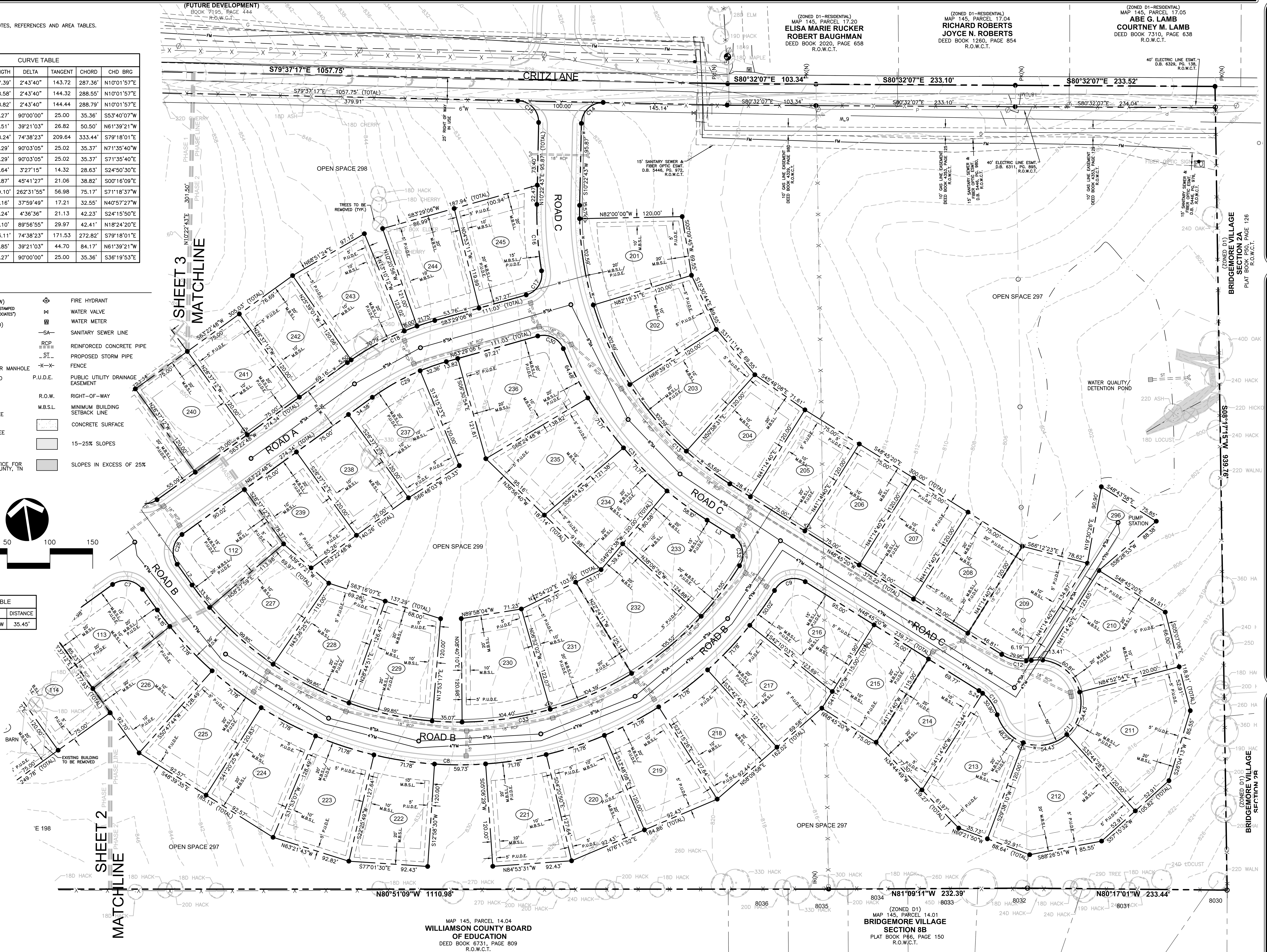
CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C1	6036.20'	287.39'	2°43'40"	143.72	287.36'	N10°01'57"E
C2	6061.20'	288.58'	2°43'40"	144.32	288.55'	N10°01'57"E
C3	6066.20'	288.82'	2°43'40"	144.44	288.79'	N10°01'57"E
C4	25.00'	39.27'	90°00'00"	25.00	35.36'	S53°40'07"W
C5	75.00'	51.51'	39°21'03"	26.82	50.50'	N61°39'21"W
C6	275.00'	358.24'	74°38'23"	209.64	333.44'	S79°18'01"E
C7	25.00'	39.29'	90°03'05"	25.02	35.37'	N71°35'40"W
C19	25.00'	39.29'	90°03'05"	25.02	35.37'	S71°35'40"E
C20	475.00'	28.64'	3°27'15"	14.32	28.63'	S24°50'30"E
C21	50.00'	39.87'	45°41'27"	21.06	38.82'	S00°16'09"E
C22	50.00'	229.10'	262°31'55"	56.98	75.17'	S71°18'37"W
C23	50.00'	33.16'	37°59'49"	17.21	32.55'	N40°57'27"W
C24	525.00'	42.24'	4°36'36"	21.13	42.23'	S24°15'50"E
C25	30.00'	47.10'	89°56'55"	29.97	42.41'	N18°24'20"E
C26	225.00'	293.11'	74°38'23"	171.53	272.82'	S79°18'01"E
C27	125.00'	85.85'	39°21'03"	44.70	84.17'	N61°39'21"W
C28	25.00'	39.27'	90°00'00"	25.00	35.36'	S36°19'53"E

LEGEND

●	IRON ROD (NEW) (1/2" X 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")		FIRE HYDRANT
○	IRON ROD (OLD)		WATER VALVE
	CABLE TV BOX		WATER METER
	ELECTRIC BOX	—SA—	SANITARY SEWER LINE
	CATCH BASIN	RCP	REINFORCED CONCRETE PIPE
	SANITARY SEWER MANHOLE	—ST—	PROPOSED STORM PIPE
	LIGHT STANDARD	—X—X—	FENCE
(XXX)	LOT NUMBER	P.U.D.E.	PUBLIC UTILITY DRAINAGE EASEMENT
R.O.W.	RIGHT-OF-WAY	R.O.W.	RIGHT-OF-WAY
	DECIDUOUS TREE	M.B.S.L.	MINIMUM BUILDING SETBACK LINE
	EVERGREEN TREE		CONCRETE SURFACE
*	CRITICAL LOT (SEE NOTE 12)		15-25% SLOPES
R.O.W.C.T.	REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN		SLOPES IN EXCESS OF 25%

0 50 100 150

LINE TABLE		
LINE	BEARING	DISTANCE
L3	N48°45'20"W	35.45'



RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
NASHVILLE 315 WOODLAND STREET P.O. BOX 60070 NASHVILLE, TN 37206 (615) 244-8591
CHATTANOOGA 1410 COWART STREET SUITE 200 CHATTANOOGA, TN 37408 (423) 490-9400
www.ragansmith.com

JOHN T. DARNALL REGISTERED LAND SURVEYOR TENNESSEE NO. 1571

AVENUE DOWNS

PHASES 1 AND 2

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

REV. #	DATE:	DESCRIPTION:

JOB NO.	WK. ORDER
16107	0646
DESIGNED:	N/A
DRAWN:	AMR
SCALE:	1"=50'
DATE:	JUNE 15, 2018

PRELIMINARY PLAT

LEGEND

EXISTING TREES TO REMAIN

EXISTING TREES TO BE REMOVED

TREE PROTECTION FENCING

NOTE:
SEE SHEET L1.1 FOR TREE PROTECTION/ REPLACEMENT DATA TABLE AND TREE PROTECTION FENCING DETAIL

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
Chattanooga 423-490-9400
Nashville 615-244-8591
Murfreesboro 615-546-6050
ragansmith.com

HEATHER HOUSER GRIMES
LANDSCAPE ARCHITECT

AVENUE DOWNS
FOR
AMBER LANE DEVELOPMENT, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

REV. #	DATE:	DESCRIPTION:
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

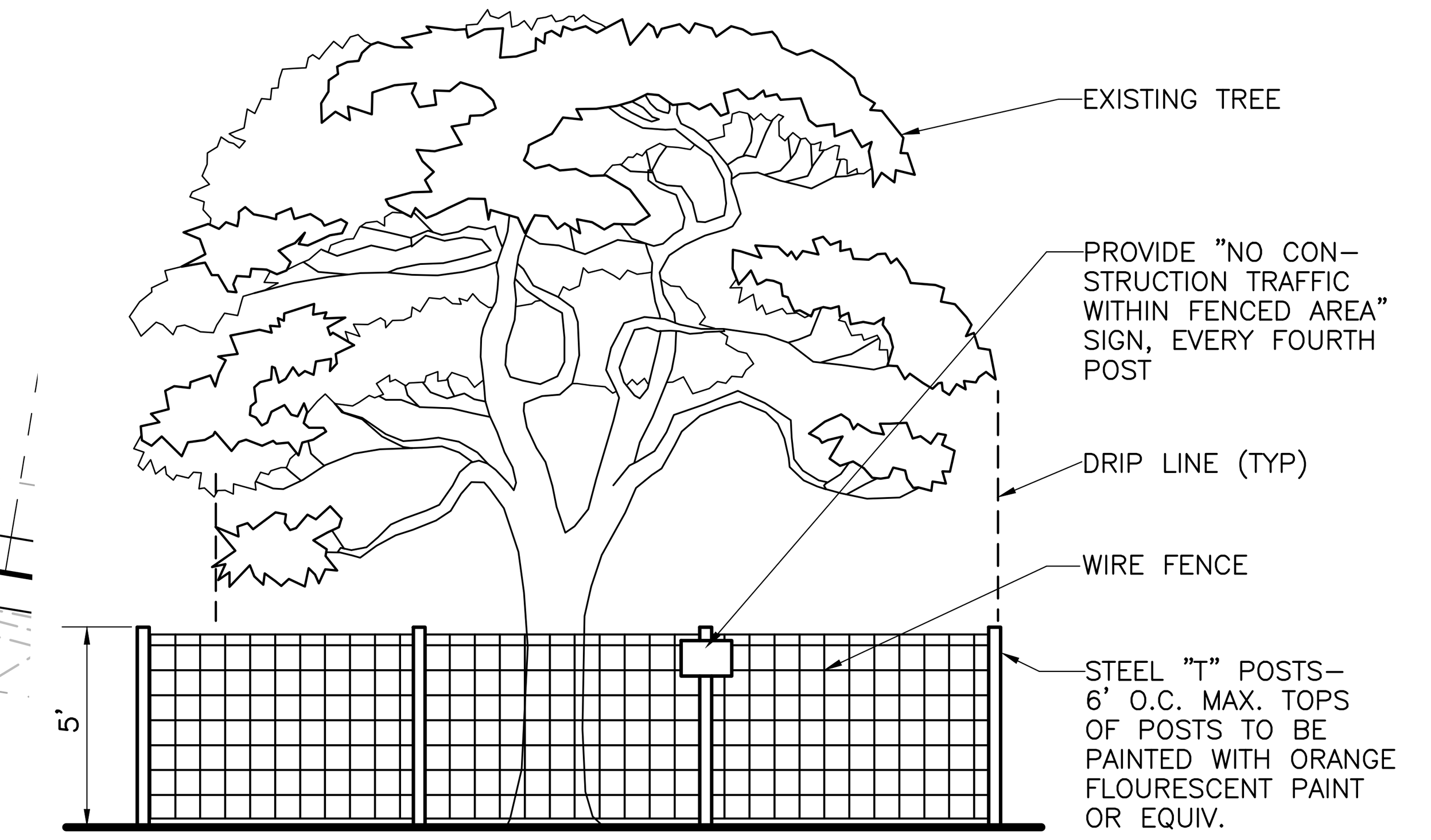
JOB NO. 16107	WK. ORDER 0646
DESIGNED:	H.GRIMES
DRAWN:	H.GRIMES
SCALE:	1"=50'
DATE:	JUNE 15, 2018

TREE REMOVAL PLAN

L1.0

TREE PROTECTION DETAIL

NOT TO SCALE



NOTE:
POSTS TO BE PLACED AT 1.5 x DRIP LINE– SEE PLANS FOR FENCE LOCATION.

NOTE:

ALL TREE PROTECTION FENCING SHALL BE IN PLACE PRIOR TO THE ISSUANCE OF A GRADING PERMIT.

TREE PROTECTION / REPLACEMENT DATA TABLE		
TREE UNITS PROVIDED FROM EXISTING TREES		
REMOVED TREE SIZES	QUANTITY	UNITS PER TREE
18"	6	108
19"	1	19
22"	4	88
24"	1	24
33"	2	66
34"	1	34
36"	2	72
44	1	44
TOTAL TREES TO BE REMOVED	18	
TOTAL UNITS TO BE REMOVED		455
TOTAL REPLACEMENT UNITS REQUIRED		455x1.5 = 682.5
TOTAL REPLACEMENT UNITS PROVIDED		684

LEGEND

EXISTING TREES TO REMAIN

EXISTING TREES TO BE REMOVED

TREE PROTECTION FENCING

0 50 100 150

811 Know what's below. Call before you dig.

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
Chattanooga 423-490-9400 · Nashville 615-244-8591 · Murfreesboro 615-546-6050
ragansmith.com

HEATHER HOUSER GRIMES · REGISTERED LANDSCAPE ARCHITECT

AVENUE DOWNS

FOR

AMBER LANE DEVELOPMENT, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

REV. #	DATE:	DESCRIPTION:

JOB NO. 16107 · WK. ORDER 0646
DESIGNED: H.GRIMES
DRAWN: H.GRIMES
SCALE: 1"=50'
DATE: JUNE 15, 2018

TREE REMOVAL PLAN

L1.1

G:\16107-0646\1-LANDSCAPE ARCHITECTURE\0646 LANDSCAPE PLAN.DWG
PLOTTED BY: HEATHER H. GRIMES ON: 6/15/2018 10:30 AM LAST UPDATED BY: HHG ON: 6/15/2018 10:22 AM

L2.0 LANDSCAPE PLAN

JOB NO.	WK. ORDER
16107	0646
DESIGNED:	H.GRIMES
DRAWN:	H.GRIMES
SCALE:	1"=50'
DATE:	JUNE 15, 2018

REV. #	DATE:	DESCRIPTION:
-	–	–
-	–	–
-	–	–
-	–	–
-	–	–

AVENUE DOWNS

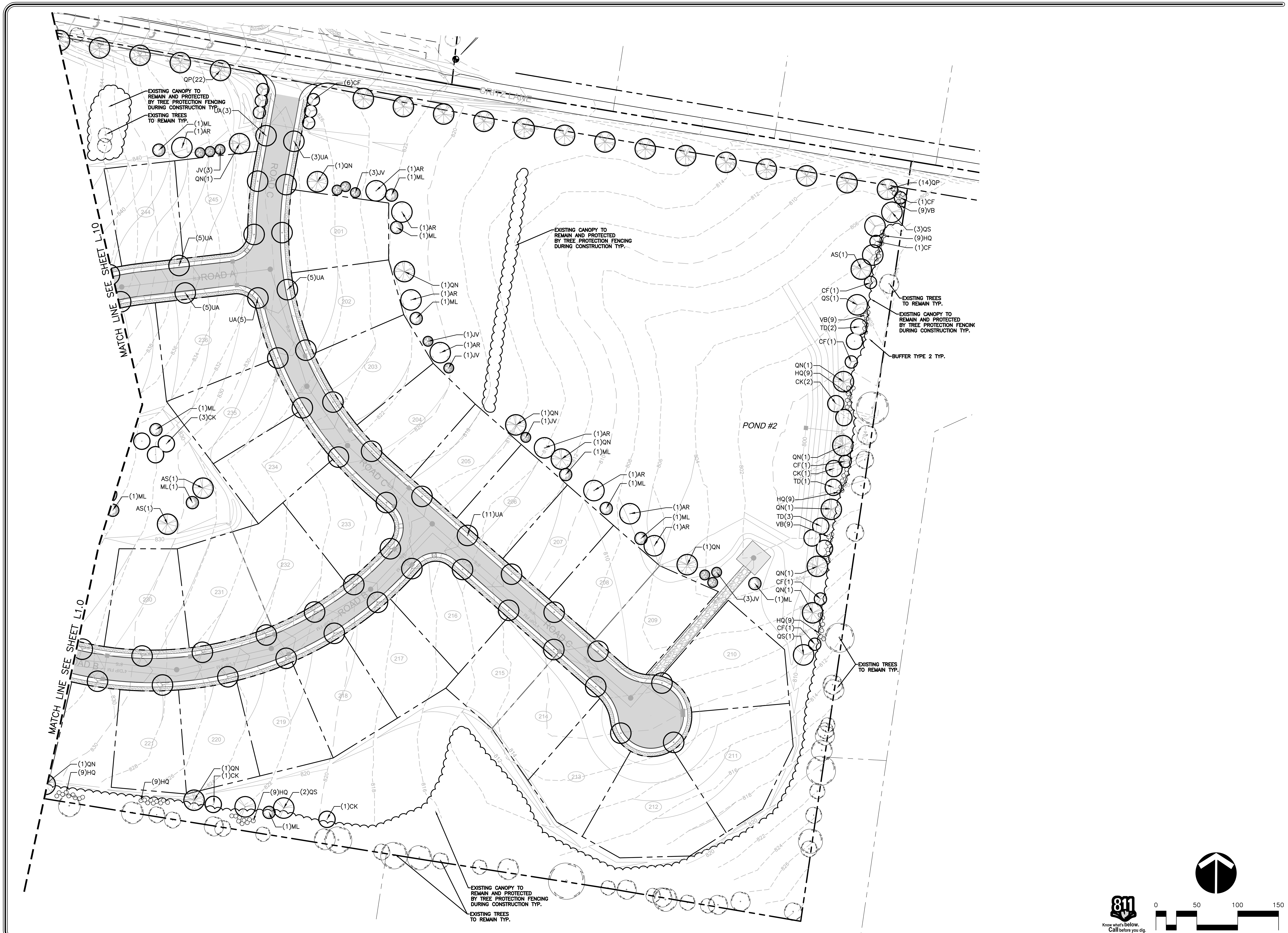
FOR

AMBER LANE DEVELOPMENT, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

HEATHER HOOSER GRIMES LANDSCAPE ARCHITECT

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
Chattanooga 423-490-9400 | Nashville 615-244-8591 | Murfreesboro 615-546-6050
ragansmith.com



RAGAN•SMITH

LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS

Chattanooga 423-490-9400
Nashville 615-244-8591
Murfreesboro 615-546-6050
ragansmith.com

HEATHER HOUSER GRIMES
REGISTERED LANDSCAPE ARCHITECT
STATE OF TENNESSEE

AVENUE DOWNS

FOR

AMBER LANE DEVELOPMENT, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

REV #	DATE:	DESCRIPTION:
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

JOB NO. 16107	WK. ORDER 0646
DESIGNED:	H.GRIMES
DRAWN:	H.GRIMES
SCALE:	1"=50'
DATE:	JUNE 15, 2018

LANDSCAPE PLAN

L2.1

PLANTING NOTES

1. ANY SERIES OF TREES TO BE PLACED IN A PARTICULAR ARRANGEMENT WILL BE FIELD CHECKED FOR ACCURACY. ANY PLANTS MISARRANGED WILL BE RELOCATED.
2. SOIL USED IN BACKFILLING PLANTING PITS SHALL BE TOPSOIL AND MIXED WITH 25% PEAT BY VOLUME. EXCEPT FOR ERICACEOUS PLANTS, VERY ACID OR SOUR SOIL (SOIL HAVING A pH less than 6) SHALL BE MIXED WITH SUFFICIENT LIME TO PRODUCE A SLIGHTLY ACID REACTION (A pH of 6.0 to 6.5). ADD 10-10-10 COMMERCIAL FERTILIZER AT THE RATE OF 2 POUNDS PER CUBIC YARD. MIX BOTH FERTILIZER AND PEAT THOROUGHLY BY HAND OR ROTARY TILLER.
3. SOIL USED IN BACKFILLING ERICACEOUS PLANTS SHALL BE TOPSOIL MIXED WITH 50% PEAT BY VOLUME. ADD 5-10-5 COMMERCIAL FERTILIZER AT THE RATE OF 5 POUNDS PER CUBIC YARD. MIX BOTH FERTILIZER AND PEAT THOROUGHLY BY HAND OR ROTARY TILLER.
4. UPON SECURING PLANT MATERIAL AND BEFORE INSTALLATION, THE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT OR OWNER'S REPRESENTATIVE FOR A PRE-INSTALLATION INSPECTION TO VERIFY ALL PLANT MATERIAL MEETS SPECIFICATION. MATCH TREES OF SAME SPECIES IN GROWTH CHARACTER AND UNIFORMITY.
5. APPLY HERBICIDE (TREFLAN OR EQUIVALENT) TO ALL PLANT BEDS PRIOR TO PLANTING FOR NOXIOUS WEED CONTROL AT A RATE OF 2 POUNDS PER 1,000 SQUARE FEET.
6. CONTRACTOR SHALL SUBMIT A 10 OUNCE SAMPLE OF THE TOPSOIL PROPOSED TO A TESTING LABORATORY FOR ANALYSIS. SUBMIT TEST RESULTS WITH RECOMMENDATIONS FOR SUITABILITY TO THE OWNER'S REPRESENTATIVE FOR APPROVAL.
7. PLANTS SHALL BE ORIENTED FOR BEST APPEARANCE AND VERTICAL. ALL NON-BIODEGRADABLE ROOT CONTAINERS SHALL BE REMOVED.
8. SELECTIVELY TRIM TREE BRANCHES BY 25%, MAINTAINING NATURAL SHAPE. PRUNE ALL DEAD AND BROKEN BRANCHES IN TREES AND SHRUBS. REMOVE TAGS, TWINE OR OTHER NON-BIODEGRADABLE MATERIAL.
9. SCARIFY SUBSOIL IN PLANTING BEDS TO A DEPTH OF 3 INCHES. ALL PLANTING BEDS SHALL RECEIVE A MINIMUM OF 6 INCHES OF TOPSOIL.
10. CONTRACTOR SHALL PROVIDE SMOOTH, NEATLY TRENCHED (3 INCH DEEP) BED EDGES.
11. ALL PLANTING BEDS TO HAVE A MINIMUM 4 INCH DEEP PINE BARK MULCH, PINE STRAW MULCH OR OTHER MULCH AS SPECIFIED.
12. DIMENSIONS FOR TRUNK CALIPER, HEIGHTS, AND SPREAD SPECIFIED ON THE MATERIAL SCHEDULE ARE A GENERAL GUIDE FOR THE MINIMUM REQUIRED SIZE OF EACH PLANT. QUALITY AND SIZE OF PLANTS, SPREAD OF ROOTS AND SIZE OF BALLS SHALL BE IN ACCORDANCE WITH A.N.S.I. Z80 "AMERICAN STANDARD FOR NURSERY STOCK" (CURRENT EDITION) AS PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN, INC.
13. THE QUANTITIES INDICATED ON THE MATERIAL SCHEDULE ARE PROVIDED FOR THE BENEFIT OF THE CONTRACTOR, BUT SHOULD NOT BE ASSUMED TO ALWAYS BE CORRECT. IN THE EVENT OF A DISCREPANCY, THE PLANTING PLAN (PLANT SYMBOLS) WILL TAKE PRECEDENCE OVER THE MATERIAL SCHEDULE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HIS/HER OWN QUANTITY CALCULATIONS AND THE LIABILITY PERTAINING TO THOSE QUANTITIES AND ANY RELATED CONTRACT DOCUMENTS AND/OR PRICE QUOTATIONS.
14. CONTRACTOR TO WARRANTY ALL MATERIAL FOR ONE YEAR AFTER DATE OF FINAL ACCEPTANCE.

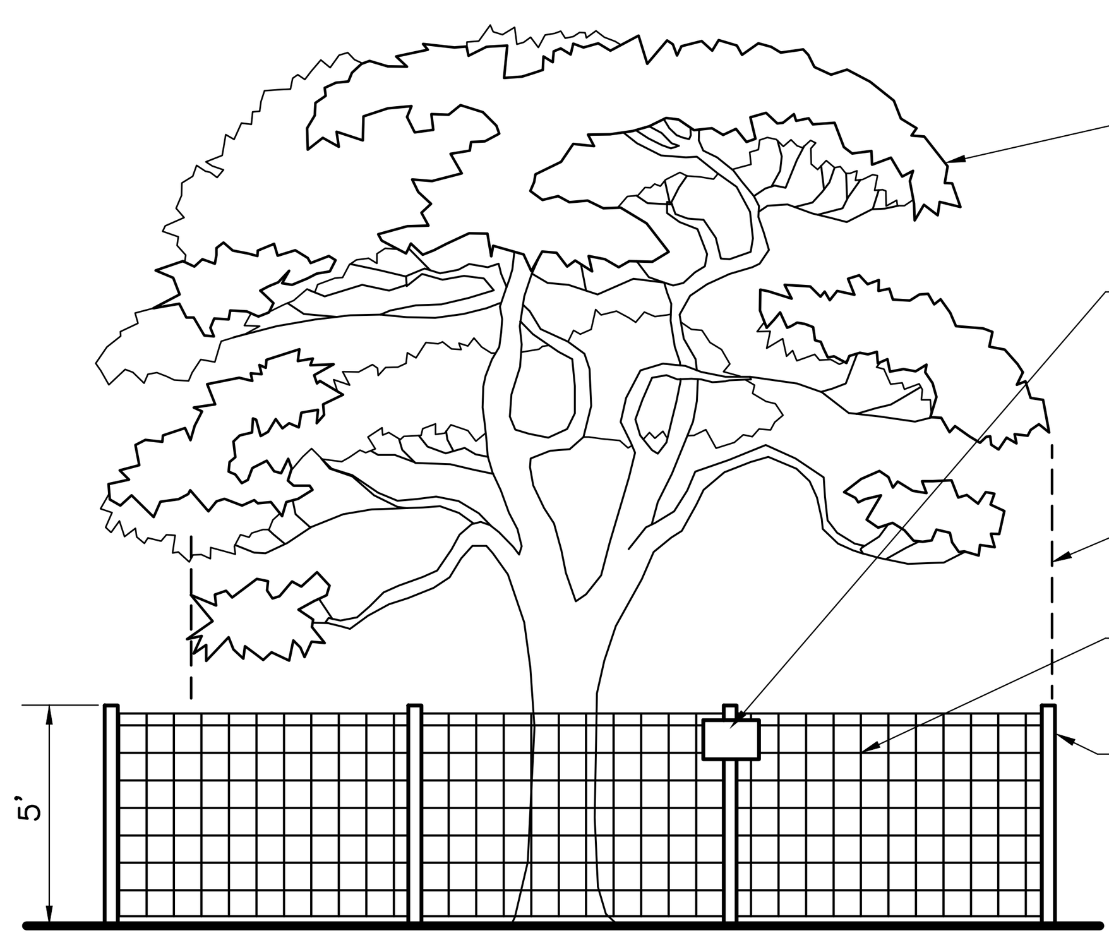
SEEDING NOTES

1. SEED ALL DISTURBED AREAS WITH KY-31 AT THE RATE OF 5 POUNDS PER 1,000 S.F. ALL SEED TO BE 98% PURE WITH 85% GERMINATION AND CONFORM TO ALL STATE REQUIREMENTS FOR GRASS SEED. THE FERTILIZER TO BE 6-12-12 COMMERCIAL TYPE WITH 50% OF ITS ELEMENTS DERIVED FROM ORGANIC SOURCES.
2. PLACE STRAW MULCH ON SEEDED AREAS. STRAW TO BE OATS OR WHEAT STRAW, FREE FROM WEEDS, FOREIGN MATTER DETRIMENTAL TO PLANT LIFE, AND DRY. HAY OR CHOPPED CORNSTALKS ARE NOT ACCEPTABLE.
3. THE CONTRACTOR SHALL VERIFY THAT THE PREPARED SOIL BASE IS READY TO RECEIVE WORK. CULTIVATE THE TOPSOIL TO A DEPTH OF 4 INCHES WITH A MECHANICAL TILLER AND SUBSEQUENTLY RAKE UNTIL SMOOTH. REMOVE FOREIGN MATERIALS COLLECTED DURING CULTIVATION AND RAKING OPERATIONS.
4. APPLY FERTILIZER ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. LIMESTONE MAY BE APPLIED WITH THE FERTILIZER. APPLY FERTILIZER AFTER SMOOTH RAKING AND PRIOR TO ROLLER COMPACTION AND MIX THOROUGHLY IN THE UPPER 2 INCHES OF TOPSOIL.
5. APPLY SEED EVENLY IN TWO INTERSECTING DIRECTIONS AND RAKE IN LIGHTLY. WATER TOPSOIL LIGHTLY PRIOR TO APPLYING SEED. DO NOT SEED AREA IN EXCESS OF THAT WHICH CAN BE MULCHED ON THE SAME DAY.
6. ROLL SEEDED AREA WITH ROLLER NOT EXCEEDING 112 POUNDS.
7. IMMEDIATELY FOLLOWING SEEDING AND COMPACTING, APPLY STRAW MULCH AT THE RATE OF ONE AND ONE HALF BALES PER 1,000 SQUARE FEET. IMMEDIATELY AFTER MULCHING, APPLY WATER WITH A FINE SPRAY AND SATURATE THE GROUND TO A DEPTH OF 4 INCHES.
8. CONTRACTOR IS RESPONSIBLE FOR WATERING SEEDED AREAS TO PREVENT GRASS AND SOIL FROM DRYING OUT UNTIL THE INSTALLATION IS INSPECTED AND ACCEPTED BY THE OWNER'S REPRESENTATIVE.
9. CONTRACTOR IS RESPONSIBLE FOR RESEEDING BARE SPOTS FOR A PERIOD OF ONE YEAR AFTER ACCEPTANCE OF INSTALLATION.

ROOT PRUNING NOTES

1. ROOT PRUNING SHALL BE PERFORMED ADJACENT TO ALL EXCAVATION NEXT TO THE CRITICAL ROOT ZONE TO A DEPTH OF 24 INCHES WITH A SHARP TRENCHER OR AN AIRSPADE. ROOTS 1.0 INCHES AND LESS IN DIAMETER SHOULD BE PRUNED WITH A SHARP BYPASS TYPE LOPPER. ROOTS GREATER THAN 1.0 INCH IN DIAMETER SHOULD BE PRUNED WITH A SHARP PRUNING SAW. THE TRENCH CREATED BY THE ROOT PRUNING SHALL BE BACKFILLED AS SOON AS POSSIBLE WITH TOPSOIL THIS PROCEDURE SHALL BE PREFORMED OR SUPERVISED BY AN ISA CERTIFIED ARBORIST
2. ALL EQUIPMENT OPERATION, PARKING, SERVICING AND REFUELING SHOULD BE LOCATED AS FAR AWAY FROM THE CRITICAL ROOT ZONE OF PROTECTED TREES AS POSSIBLE. CEMENT TRUCK DISCHARGES AND RINSING SHOULD ALSO BE KEPT AT LEAST 50' AWAY FROM THE CRITICAL ROOT ZONE OF PROTECTED TREES
3. REMOVAL OF VEGETATION WITHIN THE CRITICAL ROOT ZONE INSIDE TREE PROTECTION AREAS SHALL BE SUPERVISED BY AN ISA CERTIFIED ARBORIST
4. TREES IMPACTED BY CONSTRUCTION SHOULD BE GETTING A VOLUME OF WATER COMPARABLE TO 1 INCH OF RAINFALL PER WEEK DURING THE GROWING SEASON (MARCH TO NOVEMBER). IF THERE IS NOT ADEQUATE RAINFALL TO PROVIDE THIS VOLUME, THE ROOT ZONE SHOULD BE SOAKED EVERY 7 TO 10 DAYS TO MAKE UP THE DEFICIT. THIS CAN BE ACCOMPLISHED WITH A LAWN SPRINKLER AND PLASTIC RAIN GAUGE
5. SUPERVISION OF DEMOLITION OF EXISTING STRUCTURES OR REMOVAL OF TREES ADJACENT TO TREES SELECTED FOR PRESERVATION SHALL BE SUPERVISED BY AN ISA CERTIFIED ARBORIST

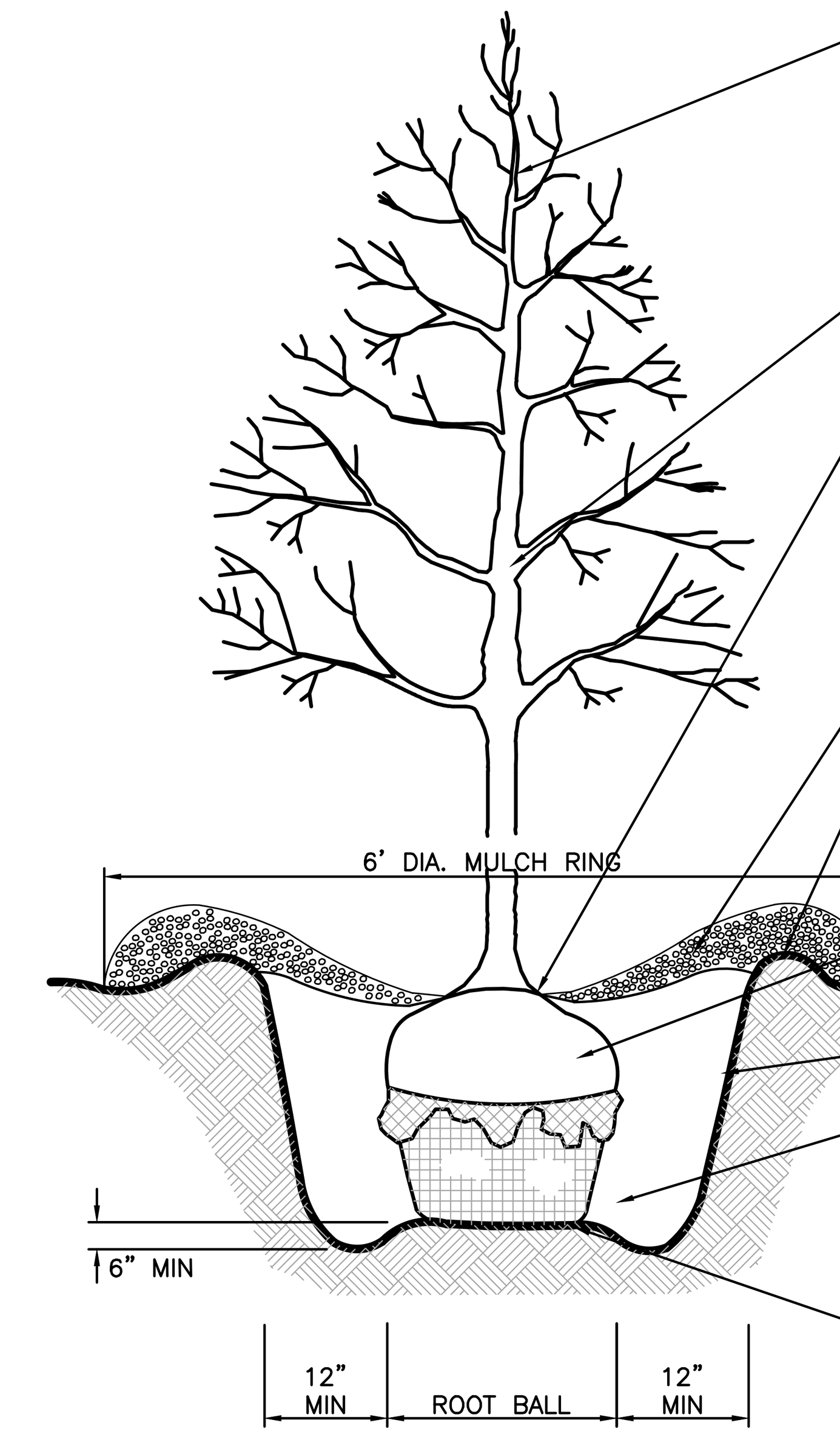
TREE PROTECTION / REPLACEMENT DATA TABLE		
TREE UNITS PROVIDED FROM EXISTING TREES		
REMOVED TREE SIZES	QUANTITY	UNITS PER TREE
18"	6	108
19"	1	19
22"	4	88
24"	1	24
33"	2	66
34"	1	34
36"	2	72
44	1	44
TOTAL TREES TO BE REMOVED	18	
TOTAL UNITS TO BE REMOVED		455
TOTAL REPLACEMENT UNITS REQUIRED		455x1.5 = 682.5
TOTAL REPLACEMENT UNITS PROVIDED		684



NOTE:
POSTS TO BE PLACED AT 1.5 x DRIP LINE- SEE PLANS FOR FENCE LOCATION.

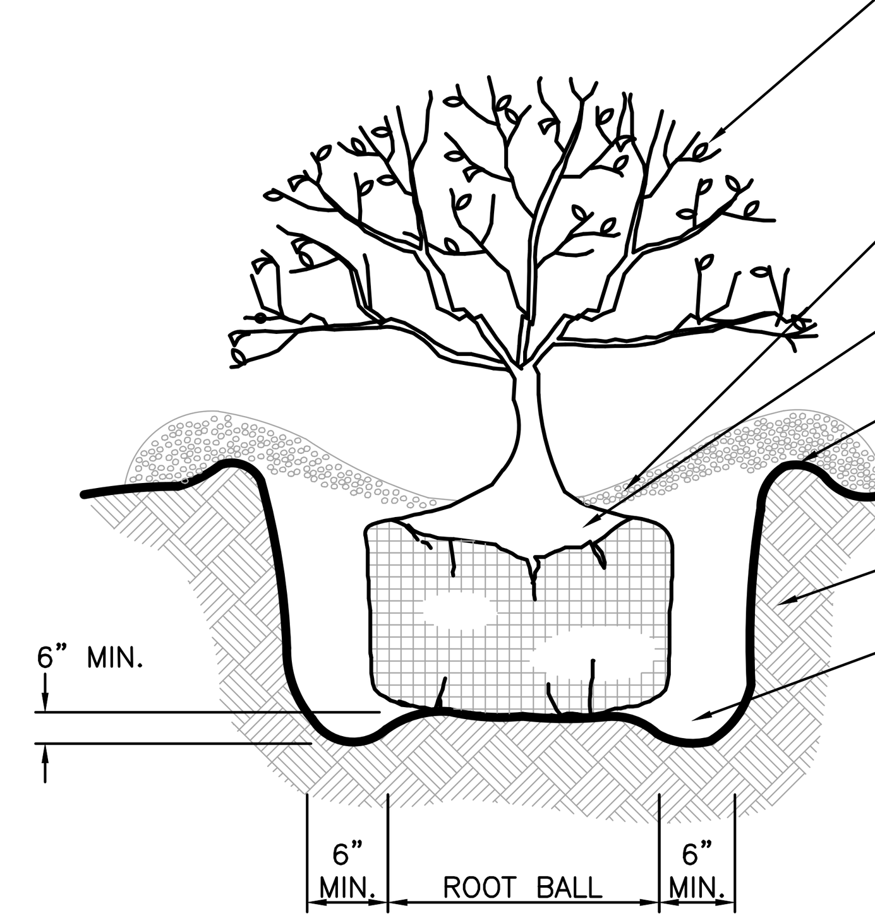
TREE PROTECTION DETAIL
NOT TO SCALE

NOTE:
ALL TREE PROTECTION FENCING SHALL BE IN PLACE PRIOR TO THE ISSUANCE OF A GRADING PERMIT.



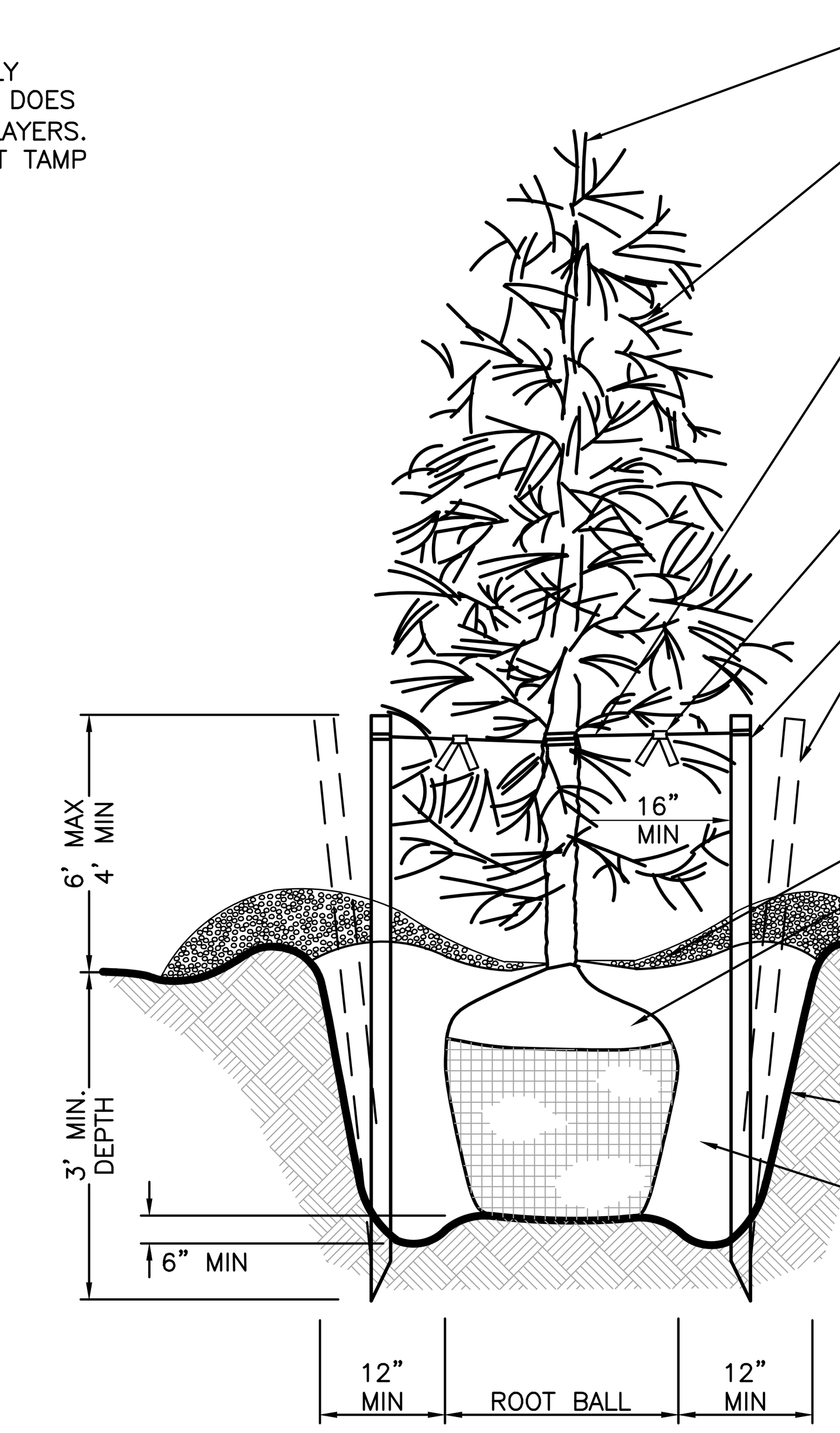
NOTES:
1. DO NOT STAKE TREES UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. IF STAKED, REMOVE AFTER ONE GROWING SEASON.
2. DO NOT WRAP TREE TRUNKS UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. REMOVE WRAP AFTER PLANTING.
3. NON-BIODEGRADABLE BURLAP TO BE REMOVED OR ROLLED UNDER ROOT BALL AFTER PLANT IS PLACED IN HOLE.

TREE PLANTING
NOT TO SCALE



NOTES:
1. WHERE PLANTS ARE SHOWN IN BEDS, MULCH SHALL COVER ENTIRE BED AS DENOTED ON THE PLANS.
2. CONTAINER GROWN PLANT MATERIAL MAY BE SUBSTITUTED FOR BURLAP MATERIAL

SHRUB PLANTING
NOT TO SCALE



NOTES:
1. REMOVE TREE WRAP AFTER PLANTING
2. REMOVE STAKES AFTER ONE FULL GROWING SEASON
3. NON-BIODEGRADABLE BURLAP TO BE REMOVED OR ROLLED UNDER ROOT BALL AFTER PLANT IS PLACED IN HOLE

EVERGREEN TREE PLANTING
NOT TO SCALE

PLANT SCHEDULE

TREES	QTY	BOTANICAL NAME / COMMON NAME	TYPE	SIZE	HEIGHT	SPACING	REMARKS
AR	14	ACER RUBRUM 'OCTOBER GLORY' TM / OCTOBER GLORY MAPLE	DECIDUOUS	2" CAL.	12-14' HT	AS SHOWN	B&B, MIN. 4' CLEAR TRUNK, STRONG CENTRAL LEADER
AS	11	ACER SACCHARUM / SUGAR MAPLE	DECIDUOUS	2" CAL.	12-14' HT	AS SHOWN	B&B, MIN. 4' CLEAR TRUNK, STRONG CENTRAL LEADER
AG	8	AMELANCHIER X GRANDIFLORA 'AUTUMN BRILLIANCE' / 'AUTUMN BRILLIANCE' SERVICEBERRY	DECIDUOUS	2" CAL.	8-10' HT	AS SHOWN	B&B, MULTI-TRUNK, 3-5 CANES MAX., NO CROSSING LEADERS, MIN. CANE CAL. .75"
CF	30	CERCIS CANADENSIS 'FOREST PANSY' TM / FOREST PANSY REDBUD	DECIDUOUS	2" CAL.	8-10' HT	AS SHOWN	B&B, STRONG CENTRAL LEADER
CK	11	CLADRASTIS KENTUKEA / AMERICAN YELLOWWOOD	DECIDUOUS	2" CAL.	12-14' HT	AS SHOWN	B&B, MIN. 4' CLEAR TRUNK, STRONG CENTRAL LEADER
JV	31	JUNIPERUS VIRGINIANA 'BURKII' / BURKII RED CEDAR	EVERGREEN	2" CAL.	6'-8' HT.	AS SHOWN	B&B, FULL TO BASE
ML	19	MAGNOLIA GRANDIFLORA 'LITTLE GEM' / DWARF SOUTHERN MAGNOLIA	EVERGREEN	2" CAL.	6-8' HT	AS SHOWN	B&B, FULL TO BASE
QN	28	QUERCUS NUTTALLII / NUTTALL OAK	DECIDUOUS	2" CAL.	12-14' HT	AS SHOWN	B&B, MIN. 4' CLEAR TRUNK, STRONG CENTRAL LEADER
QP	36	QUERCUS PHELLOS / WILLOW OAK	DECIDUOUS	2" CAL.	12-14' HT	AS SHOWN	B&B, MIN. 4' CLEAR TRUNK, STRONG CENTRAL LEADER, WELL-MATCHED
QS	51	QUERCUS SHUMARDII / SHUMARD RED OAK	DECIDUOUS	2" CAL.	12-14' HT	AS SHOWN	B&B, MIN. 4' CLEAR TRUNK, STRONG CENTRAL LEADER
TD	32	TAXODIUM DISTICHUM 'AUTUMN GOLD' / AUTUMN GOLD BALD CYPRESS	DECIDUOUS	3" CAL.	14-16' HT	AS SHOWN	B&B, MIN. 4' CLEAR TRUNK, STRONG CENTRAL LEADER
UA	71	ULMUS PARVIFOLIA 'ALLEE' / ALLEE LACEBARK ELM	DECIDUOUS	2" CAL.	12-14' HT	AS SHOWN	B&B, MIN. 4' CLEAR TRUNK, STRONG CENTRAL LEADER, WELL-MATCHED, STREET TREE

SHRUBS	QTY	BOTANICAL NAME / COMMON NAME	TYPE	SIZE/HT	SPREAD	SPACING	REMARKS
HQ	126	HYDRANGEA QUERCIFOLIA / OAKLEAF HYDRANGEA	DECIDUOUS	24-30" HT.	30"	48"O.C.	B&B OR FULL CONTAINER
VB	81	VIBURNUM X 'BURKWOODII' / BURKWOOD VIBURNUM	SEMI-EVERGREEN	24-30" HT.	30"	60"O.C.	B&B OR FULL CONTAINER

NOTES:
1. ALL DISTURBED LAND NOT OTHERWISE PLANTED SHALL BE SEEDED PER SEEDING NOTES ON THIS SHEET.
2. ALL TREES MUST BE A MINIMUM OF 2" CALIPER UNLESS OTHERWISE NOTED
3. TREE PROTECTION FENCING SHALL BE PLACED AT THE DRIP LINE OF ALL EXISTING TREES TO REMAIN AND NOT TO BE REMOVED UNTIL CONSTRUCTION IS COMPLETE.
4. PROPOSED LANDSCAPING WITHIN THE TREE PROTECTION FENCING SHALL BE INSTALLED BY HAND AND EXISTING TREES TO BE ROOT PRUNED AS NECESSARY. SEE ROOT PRUNING NOTES ON THIS SHEET.
5. LOCATIONS OF PROPOSED PLANT MATERIAL WITHIN THE EXISTING CANOPY MUST BE FIELD VERIFIED BEFORE INSTALLATION.

811 Know what's below. Call before you dig.

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
Chattanooga 423-490-9400
Nashville 615-244-8591
Murfreesboro 615-546-6050
ragansmith.com

AVENUE DOWNS
FOR
AMBER LANE DEVELOPMENT, LLC
TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

REV. #	DATE:	DESCRIPTION:
-	-	-
-	-	-
-	-	-
-	-	-

JOB NO. 16107 | WK. ORDER 0646
DESIGNED: H.GRIMES
DRAWN: H.GRIMES
SCALE: NTS
DATE: JUNE 15, 2018

LANDSCAPE NOTES AND DETAILS

L2.2

TRAFFIC IMPACT STUDY

for

AVENUE DOWNS

Thompson's Station, Tennessee

February 16, 2018

Prepared for:

BARLOW BUILDERS
1804 Williamson Court, Suite 107
Brentwood, Tennessee 37027

Prepared by:

RAGAN-SMITH ASSOCIATES, INC.
315 Woodland Street, P.O. Box 60070
Nashville, Tennessee 37206-0070
(615) 244-8591

16-107 / 0646

AVENUE DOWNS
TRAFFIC IMPACT STUDY

TABLE OF CONTENTS

AVENUE DOWNS
TRAFFIC IMPACT STUDY

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

INTRODUCTION

Avenue Downs is located on the southeast corner of Critz Lane and Clayton Arnold Road in the Town of Thompson's Station, Tennessee. When completed, Avenue Downs will consist of 69 single family homes. The purpose of this traffic impact study is to review the traffic impact of Avenue Downs.

BACKGROUND TRAFFIC

Based upon the proposed development schedule, the year 2021 will be used to analyze the impact of Avenue Downs.

To establish background traffic growth, TDOT historical traffic data was obtained in the project vicinity. Traffic growth due to outside developments and general population growth was based upon linear regression analysis of the historical traffic count data. Background traffic growth was established by increasing existing traffic by ***2 percent annually*** for the period from 2017 to 2021. In addition to the annual growth rate, specific traffic growth estimates from three (3) underway, approved, or proposed developments were included in the determination of background traffic.

SITE TRAFFIC

The traffic impact of Avenue Downs is based upon a calculation of the number of vehicle trips that will enter and/or exit the site. The analysis periods of this report are the a.m. and p.m. peak hours of a typical weekday. Therefore, trips were generated according to the *Trip Generation Manual, 10th Edition* published by the Institute of Transportation Engineers (ITE). The total estimated trip generation for Avenue Downs is shown in the table below.

TOTAL TRIP GENERATION: AVENUE DOWNS								
Land Use	Total Units	Daily Trips	A.M. Peak Hour			P.M. Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Single Family Homes	69 Units	739	14	40	54	45	26	71

TRAFFIC ANALYSIS

The following public intersections were analyzed for capacity deficiencies and improvement needs:

- Critz Lane at Clayton Arnold Road
- Clayton Arnold Road at Proposed Access

For these intersections, the following traffic scenarios were analyzed, where applicable:

- 2017 Existing Traffic
- 2021 Background Traffic
- 2021 Total Traffic that contains all traffic projected in the study area, including the completion of Avenue Downs

CONCLUSIONS AND RECOMMENDATIONS

Critz Lane at Clayton Arnold Road

- The Town of Thompson's Station's proposal to construct a roundabout at this intersection is appropriate based on the operational and safety advantages that a roundabout will have over two-way stop control at this location.

- The improvements proposed to be constructed as part of the Town of Thompson's Station's Critz Lane project will continue to be appropriate after development of Avenue Downs.

Clayton Arnold Road at Proposed Access

- The Proposed Access should consist of one lane in each direction with pavement widths in compliance with the appropriate roadway section shown in the Town's Land Development Ordinance.

- Proposed grading, landscaping, and development monumentation or signage should be designed so that AASHTO intersection sight distance is not obstructed for the proposed access.

I. INTRODUCTION

The purpose of this study is to review the traffic impact of the proposed Avenue Downs development in the Town of Thompson's Station, Tennessee. Avenue Downs will include 69 new residential units and one project access. This report has been requested by Town of Thompson's Station staff in order to address transportation impacts and to identify recommended mitigating measures as part of development plan review process.

In order to evaluate the traffic impact of Avenue Downs, an inventory of the existing transportation system was carried out along with an assessment of its adequacy. Based on the anticipated project schedule, a design year was established and system-wide growth rates as well as traffic growth due to specific developments in the area were applied to existing traffic volumes. Site traffic was generated, distributed and assigned to the roadway to quantify the impact of Avenue Downs. Transportation analyses were performed in order to assess any site or non-site related impacts on the system. Finally, recommendations for project access and mitigating measures related to Avenue Downs were offered.

II. PROJECT DESCRIPTION

A. Existing Development

As shown in Figure 1, Avenue Downs is located on the southeast corner of Critz Lane and Clayton Arnold Road in the Town of Thompson's Station, Tennessee. Avenue Downs Concept Plan includes a total area of 48.22 acres. The Avenue Downs proposal consists of 69 single family homes.

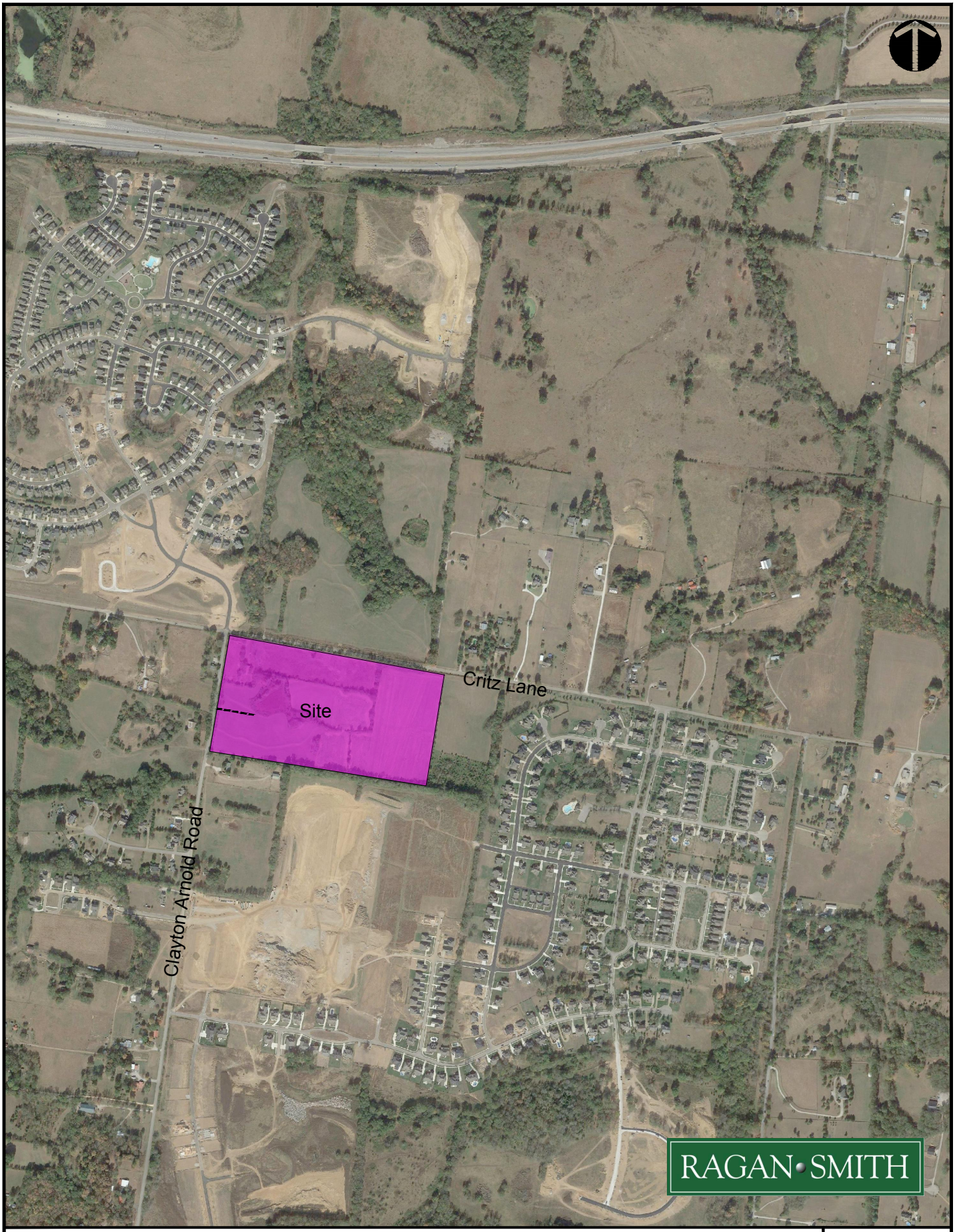
Figure 2 shows the concept plan for Avenue Downs.

B. Project Access

Access to Avenue Downs will be provided from one access to Clayton Arnold Road approximately 600 feet south of the intersection with Critz Lane.

C. Phasing and Timing

For the analysis of this report, the full build-out of Avenue Downs has been assumed to occur in the year 2021. The year 2021 is established as the horizon year for this study.



Avenue Downs
Location Map

Figure
1

SITE DATA:

PROPERTY INFORMATION:

STREET ADDRESS:	CLAYTON ARNOLD RD.
TAX MAP:	145
PARCELS:	6.02, 6.03, 6.04
GROSS SITE AREA:	48.22± AC (2,100,679 SF)
LESS PRESCRIPTIVE R.O.W. AREA:	1.81± AC.
NET AREA:	46.41± AC.

OWNER:

AMBER LANE DEVELOPMENT
1804 WILLIAMSON CT.
SUITE 107
BRENTWOOD, TN. 37027
ATTN: JORDAN CLARK
jordan@barlowbuilders.com

PROJECT PLANNER:

RAGAN-SMITH ASSOCIATES, INC.
315 WOODLAND STREET
NASHVILLE, TN. 37206
(615) 244-8591
ATTN: BRETT SMITH, RLA
bsmith@ragansmith.com

ZONING INFORMATION:

ZONING:	D2 (MEDIUM INTENSITY)
DWELLING UNITS:	69 SINGLE FAMILY UNITS
DENSITY ALLOWED:	1.5 UNITS/ACRE
DENSITY PROPOSED:	1.49 UNITS/ACRE (69D.U./46.41AC)
OPEN SPACE REQUIRED:	45.0% (20.88 AC)
OPEN SPACE PROVIDED:	47.0% (21.76 AC)
MAX. BLOCK LENGTH ALLOWED:	1000'
MAX CUL-DE-SAC LENGTH ALLOWED:	500'

Site Development Notes

1. Stormwater management facilities will be located as shown on the plan. The locations are in the northwest and northeast corners of the site, adjacent to the southerly margin of Critz Lane. A detailed hydrologic analysis will be prepared during the design phase of the project to determine the extent of stormwater detention measures warranted for the project. Water quality measures will be implemented as per best management practices recognized by Thompson's Station. An estimate of the total impervious area generated by the development of the property was determined by taking the proposed acreage occupied by proposed roadways and single family lots and applying a runoff coefficient of 0.75 as follows:

27.2 acres (roadways/lots) x 0.75 = 20.4 acres impervious area

2. Water service to the project will be provided by the HB&TS Utility District via a connection to the existing 12" line in the easterly margin of Clayton Arnold Road. Existing HB&TS water system flows and pressures are assumed to adequately serve the proposed 69 single family lots. Design and subsequent approvals of the water system necessary to serve the project will be the responsibility of HB&TS.

Sanitary sewer service to the project will be provided by Thompson's Station. Aveune Downs will require an internal 8" gravity line collection system that will convey wastewater flows to two separate on site pump stations. The pump stations will be located at the northeast and northwest margins of the site, adjacent to the southerly margin of Critz Lane. The northeast pumping station will convey flows to an onsite gravity manhole and on to the northwest pumping station. A new force main will then convey flows to the northerly margin of Critz Lane via a bore and jack arrangement and on to the existing gravity manhole on the 10-inch line adjacent to the northerly margin of Critz Lane along the Canterbury project frontage. A detailed hydraulic analysis of the existing sewer system will be prepared during the design phase to determine the routing and discharge points of the new force main that results in the least amount of impact to the overall system.

3. Technical studies addressing endangered species, natural and cultural resources, traffic impacts and geotechnical considerations have been prepared as applicable and will be supplemented as necessary pending evaluation of the Concept Plan submittal by Thompson's Station.

4. A proposed phasing plan has been shown based upon the most logical and economical sequence of construction for the amended project.

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
315 WOODLAND ST. P.O. BOX 60070
NASHVILLE, TN 37206 PH (615) 244-8591
FAX (615) 244-6739 WWW.RAGANSMITH.COM

Avenue Downs

Development Concept Presentation

0 100 200 300

JOB NO: 16-107 / 0646
DATE: 2-16-18

III. EXISTING CONDITIONS

A. Transportation System

The existing transportation system in the area that provides access to Avenue Downs consists of collector and local roadways. The following roadways will comprise the study area for consideration of traffic mitigation measures at Avenue Downs.

- **Critz Lane** is listed as a collector roadway in the General Plan for Thompson's Station. Critz Lane is a two-lane roadway that connects Columbia Pike and Lewisburg Pike with a total length of approximately 2.6 miles. The posted speed limit on Critz Lane is 40 mph.

- **Clayton Arnold Road** is listed as a collector roadway in the General Plan for Thompson's Station. Clayton Arnold Road is a two-lane roadway that connects Critz Lane and Thompson's Station Road with a total length of approximately 1.3 miles. The posted speed limit on Clayton Arnold Road is 35 mph.

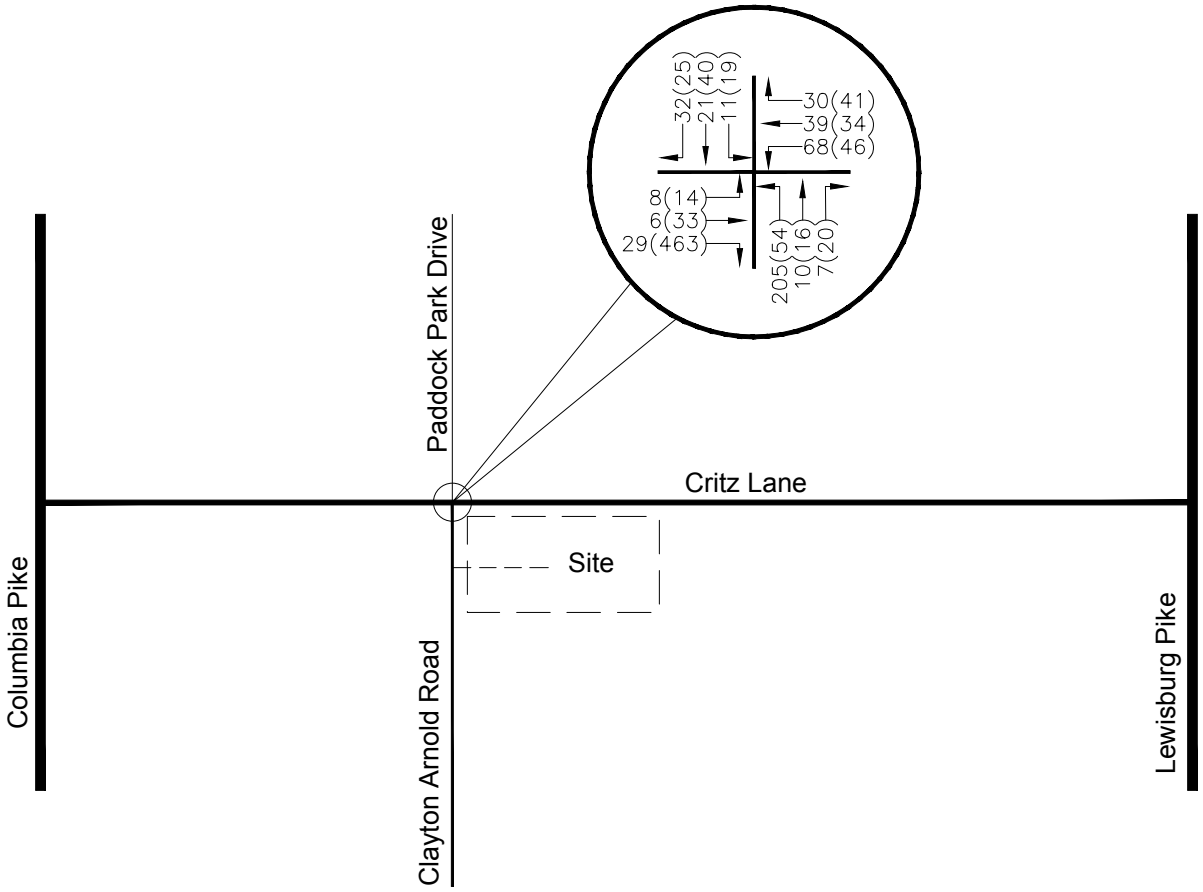
The Town of Thompson's Station is currently preparing a project to improve Critz Lane between Columbia Pike and Lewisburg Pike including widening Critz Lane to provide 11' travel lanes and 4' shoulders, constructing roundabout intersections at Clayton Arnold Road and Pantall Road, constructing turn lanes at other appropriate intersections, and correcting vertical alignment deficiencies. Survey work for this project was initiated in the fall of 2016 and a preliminary set of construction plans was provided by the Town in November 2017. The current construction schedule is not known for this project but previously the Town did anticipate bidding the project and awarding a contract in 2018. Based on the work that is underway and the previously available schedules for this project, it is anticipated that the Critz Lane improvements will be complete prior to the horizon year of this study.

B. Traffic Volumes

In order to assess the adequacy of the local transportation system, an evaluation of the current operational quality of intersections within the study area was required.

The peak hour of the adjacent street traffic was used to evaluate the traffic operations for Avenue Downs. In order to identify the peak periods for analysis, traffic counts were conducted in December 2017 at the intersection of Critz Lane at Clayton Arnold Road. The peak hours for analysis are 6:30 – 7:30 a.m. and 4:30 – 5:30 p.m.

Figure 3 shows the existing peak hour traffic volumes for the intersections in the study area.



Peak Hours
AM (PM)

RAGAN•SMITH

Avenue Downs
2017 Existing Traffic Volumes

Figure
3

IV. FORECASTED BACKGROUND TRAFFIC

A. Introduction

Before any impacts to the study area can be addressed, some estimate of background traffic volumes for the horizon year 2021 must be established. Background traffic volumes were established by segregating potential growth into two categories:

- Specific development traffic growth within the immediate study area
- Growth due to small scale development and/or general population growth

B. Specific Development Growth

Traffic growth from the three (3) specific developments described below was included in the background traffic forecasts for the analysis of this report.

- The Fields at Canterbury – The existing approved portions of The Fields at Canterbury include approximately 90 single family homes and 54 townhomes that are not yet constructed or occupied. Site traffic from these units has been included in the background traffic growth forecast of this report.

- Thompson's Station Elementary and Middle Schools – Williamson County Schools is currently constructing a new campus on Clayton Arnold Road south of Critz Lane that will include a new Elementary School and a new Middle School, each with a capacity of 800 students. While it is unlikely that both schools will have arrival or dismissal times coinciding with the peak hour of the adjacent streets, the analysis of this report conservatively applies trips for both schools to the peak hour analysis.

- Proposed Additions to The Fields at Canterbury – The proposed additions to The Fields at Canterbury are proposed, but not yet approved, for east of the existing sections of The Fields at Canterbury. The proposed additions to The Fields at Canterbury will consist of 179 single family homes and 141 townhomes. Due to the proximity of The Fields at Canterbury to Avenue Downs, site traffic from the proposed additions has been included in the background traffic growth forecast of this report.

Trip generation for the specific background developments is shown in Table 1. The trip distribution for these background developments is shown in the appendix of this report.

TABLE 1

TRIP GENERATION: BACKGROUND SPECIFIC DEVELOPMENTS

Land Use and Total Units	Daily Trips	A.M. Peak Hour			P.M. Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
The Fields at Canterbury Approved but not Constructed Units (90 Single Family and 54 Townhomes)	1,311	23	73	96	79	47	126
Proposed School 1,600 Students	3,216	540	460	1,000	132	140	272
50% of Proposed Additions to The Fields at Canterbury	1,401	24	75	99	81	48	129
TOTAL	**5,928**	**587**	**608**	**1,195**	**292**	**235**	**527**

C. Annual Growth

To establish traffic growth due to population growth or small scale development, TDOT historical traffic count data was obtained at locations within the general project vicinity. The TDOT historical traffic count data includes traffic volume counts conducted annually on Columbia Pike beginning in 1985. The available historical count data was tabulated and analyzed to identify patterns or growth trends.

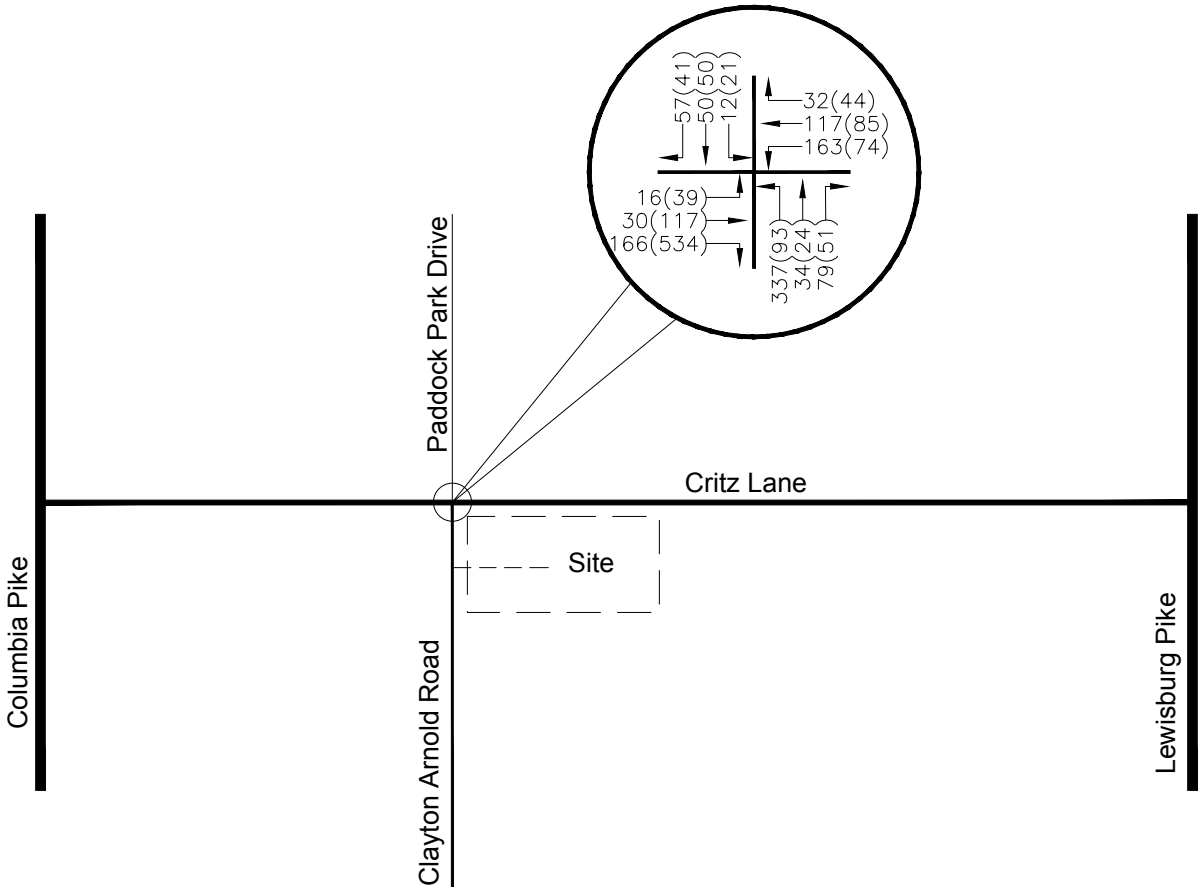
Based upon linear regression analysis of this data, we will use a ***2 percent annual growth rate*** as the base growth for the existing traffic volumes. This annual growth rate is consistent with the Comprehensive Traffic Impact Study prepared by RPM Transportation Consultants, LLC for the Town of Thompson's Station.

D. Background Traffic

Background traffic for the future traffic forecasts was compiled based on the following:

- 2017 existing traffic data
- Specific development expected traffic volumes
    - The Fields at Canterbury – approved but not yet constructed units
    - Thompson's Station Elementary and Middle Schools
    - Proposed Additions to The Fields at Canterbury
- 2% annual increase of traffic volumes for the period from 2017 to 2021

Background traffic volumes on the future roadway, representing existing traffic volumes plus background growth, for the year 2021 are shown in Figure 4.



Peak Hours
AM (PM)

RAGAN SMITH

Avenue Downs
2021 Background Traffic Volumes

Figure
4

V. PROPOSED SITE TRAFFIC

A. Site Trip Generation

In order to quantify site-related impacts within the study area, some estimates of site trip generation and traffic assignment had to be established. Trip generation rates for the development were established using information for the weekday a.m. and p.m. peak hour of the adjacent street as shown in the *Trip Generation Manual, 10th Edition* published by the Institute of Transportation Engineers (ITE). For this study, horizon year 2021 will include the completion of Avenue Downs. Trip generation for Avenue Downs is shown in Table 2.

TABLE 2

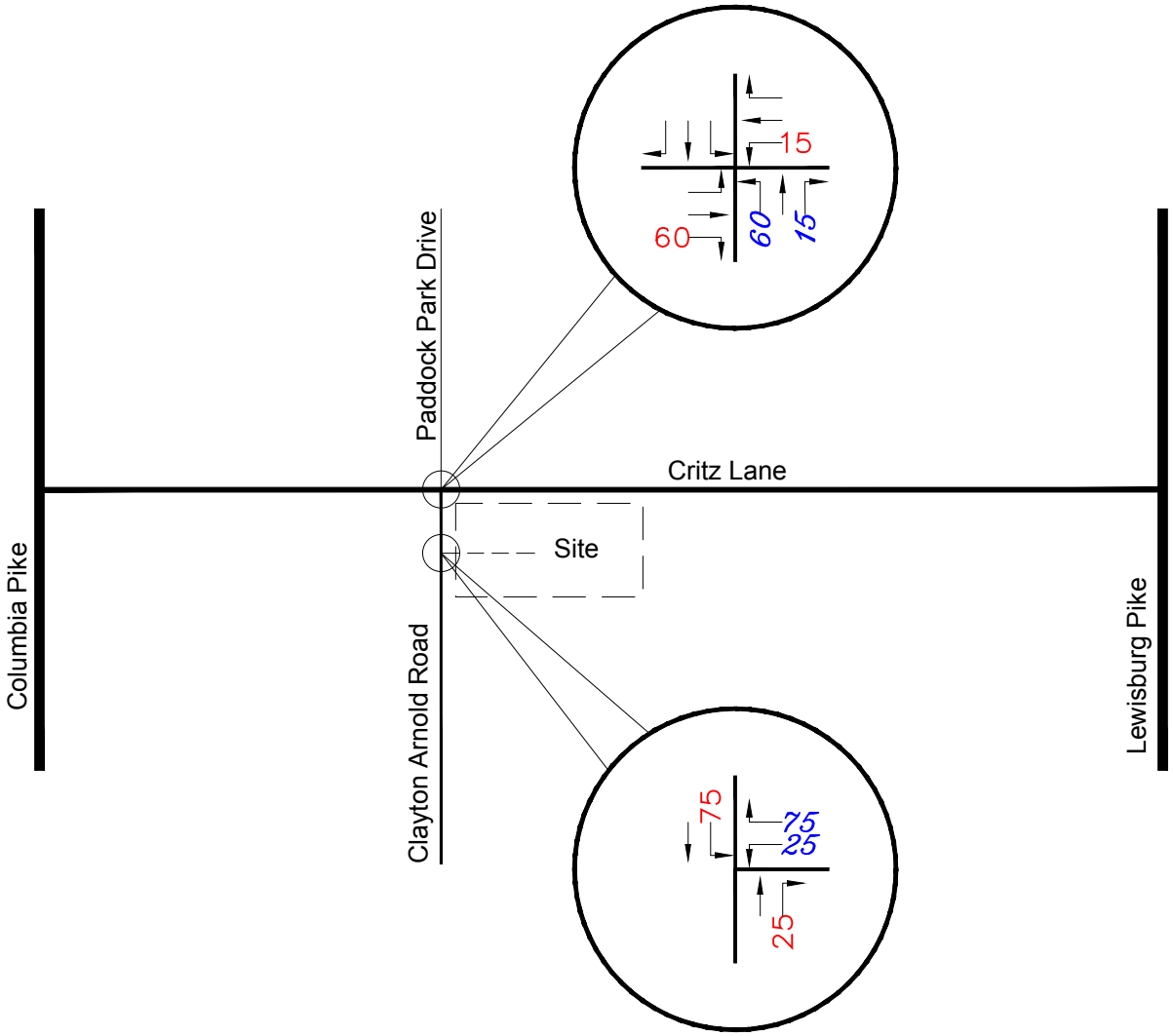
TRIP GENERATION: AVENUE DOWNS

Land Use	Total Units	Daily Trips	A.M. Peak Hour			P.M. Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Single Family Homes	69 units	739	14	40	54	45	26	71

B. Site Trip Distribution and Assignment

Site trips were distributed based primarily upon the prevalent commuter patterns in the area and the proximity and routes to major transportation facilities. Figure 5 shows the distribution of the residential trips for Avenue Downs on the adjacent roadway.

Site traffic volumes generated by Avenue Downs in the horizon year 2021 are shown in Figure 6. The accumulation of existing, background growth, and site-generated traffic for the horizon year 2021 is shown in Figure 7.

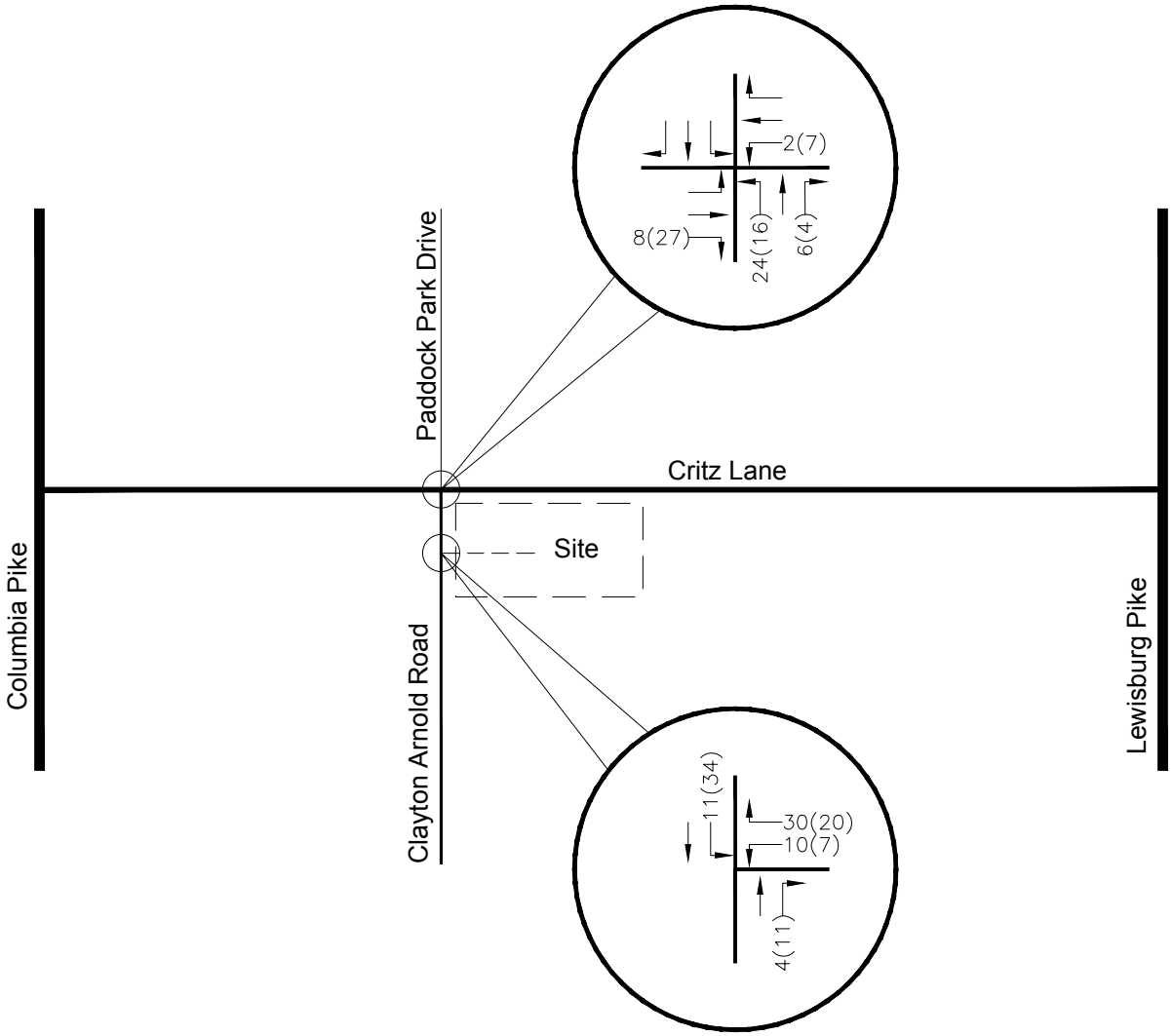


XX INBOUND
XX OUTBOUND

RAGAN·SMITH

Avenue Downs
Site Trip Distribution

Figure
5

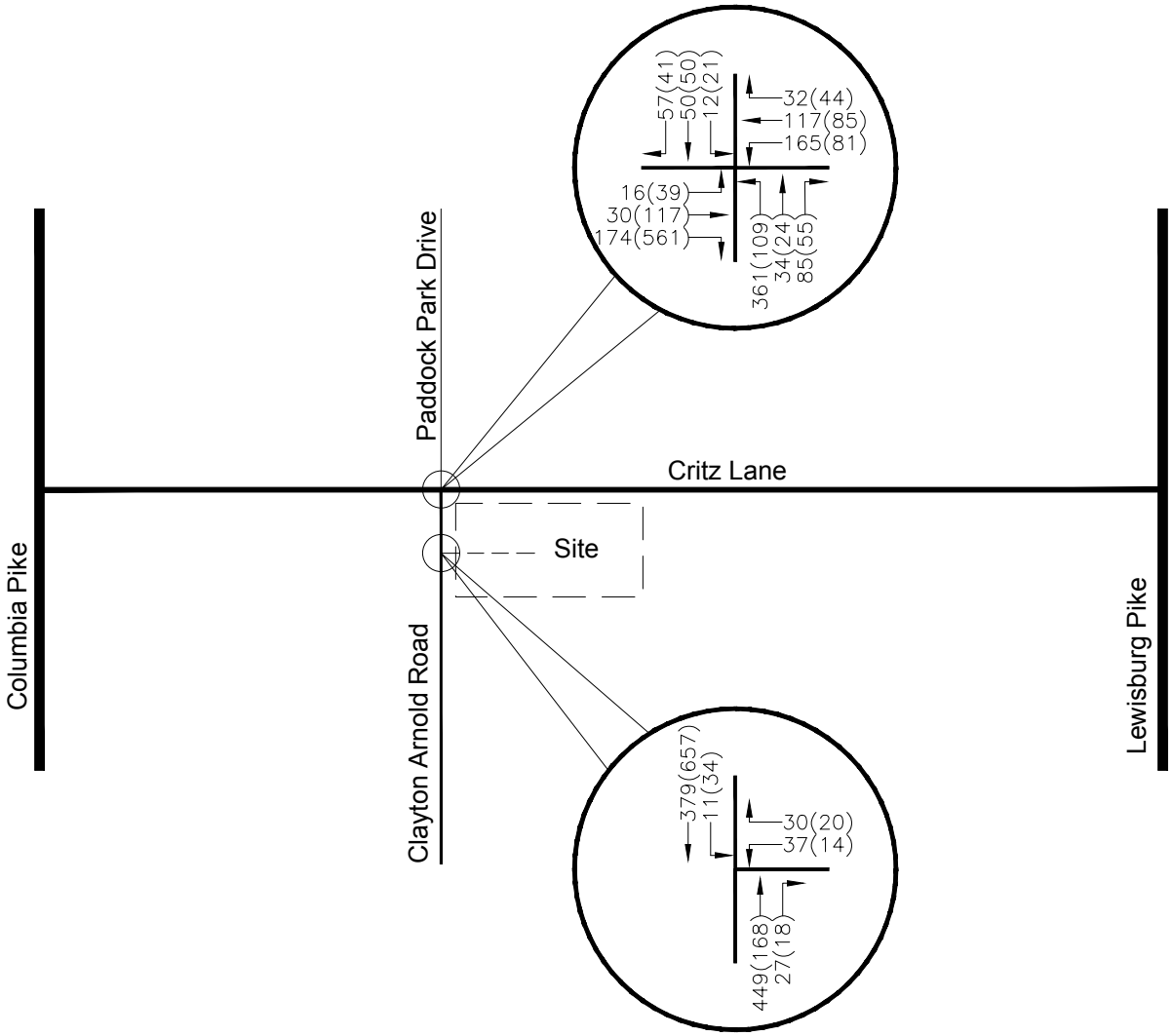


Peak Hours
AM (PM)

RAGAN SMITH

Avenue Downs
Site Traffic Volumes

Figure
6



Peak Hours
AM (PM)

RAGAN•SMITH

Avenue Downs
2021 Total Traffic Volumes

Figure
7

VI. TRANSPORTATION ANALYSIS

A. Intersection Capacity Analysis

In order to determine the quality of existing traffic operations and identify capacity deficiencies, intersection capacity analyses were conducted at the following intersections.

- Critz Lane at Clayton Arnold Road
- Clayton Arnold Road at Proposed Access

Capacity analyses were conducted according to the methodology and procedures outlined in the *Highway Capacity Manual*, HCM 2010, published by Transportation Research Board. Capacity analysis results for the a.m. peak hour are shown in Table 3.

TABLE 3

INTERSECTION CAPACITY ANALYSIS RESULTS – A.M. PEAK HOUR

Intersection	Condition[(1)]	Level of Service (avg. delay/vehicle – sec.)		
		2017 Existing	2021 Background	2021 Total
Critz Lane at Clayton Arnold Road	EB Left	A (7.4)	-	-
	WB Left	A (7.4)	-	-
	TWSC NB	C (16.3)	-	-
	TWSC SB	B (10.4)	-	-
	Overall Roundabout	-	B (10.8)	B (11.4)
Clayton Arnold Road at Project Access	SB Left	-	-	A (8.5)
	TWSC WB	-	-	C (17.1)

(1) TWSC = Two-way Stop Control

Capacity analysis results for the p.m. peak hour are shown in Table 4.

TABLE 4

INTERSECTION CAPACITY ANALYSIS RESULTS – P.M. PEAK HOUR

Intersection	Condition[(1)]	Level of Service (avg. delay/vehicle – sec.)		
		2017 Existing	2021 Background	2021 Total
Critz Lane at Clayton Arnold Road	EB Left	A (7.4)	-	-
	WB Left	A (8.7)	-	-
	TWSC NB	C (15.2)	-	-
	TWSC SB	C (15.3)	-	-
	Overall Roundabout	-	B (14.7)	C (16.5)
Clayton Arnold Road at Project Access	SB Left	-	-	A (7.7)
	TWSC WB	-	-	B (13.8)

(1) TWSC = Two-way Stop Control

Level of service (LOS) criteria for unsignalized intersections is shown in Table 5.

TABLE 5		
LEVEL OF SERVICE DESCRIPTIONS FOR UNSIGNALIZED INTERSECTIONS		
Level of Service	**Description**	**Control Delay (sec. /veh.)**
A	Usually no conflicting traffic	0 - 10
B	Occasionally some delay due to conflicting traffic	> 10 - 15
C	Delay is noticeable but not inconveniencing	> 15 - 25
D	Delay is noticeable and irritating, increased risk taking	> 25 - 35
E	Delay approaches tolerance level, risk taking likely	> 35 - 50
F	Delay exceeds tolerance level, high likelihood of risk taking	> 50
Source: Highway Capacity Manual, HCM 2010		

B. Analysis Impact Thresholds

The Town of Thompson's Station has developed traffic impact thresholds for this project to determine the quality of future traffic operations and identify capacity deficiencies. The following thresholds indicate unsatisfactory conditions that would require mitigation:

- Overall intersections or intersection approaches operating at or below LOS E.
- Individual turning movements operating at LOS F.
- 95th percentile turn lane queues exceeding the available storage length.
- 95th percentile thru movement queues stretching back far enough to block an adjacent intersection or major driveway.

After conducting the capacity analysis, the intersections and individual turning movements are expected to operate at acceptable level of service based on the guidelines presented above and the queue lengths are not expected to exceed the storage length provided.

C. Turn Lane Warrants

The National Cooperative Highway Research Program (NCHRP) Report 457 provides guidance for evaluating intersection improvements at unsignalized intersections. Specific volume-based warrants have been checked to evaluate the need for right turn and left turn deceleration and storage lanes.

Table 6 below details pertinent right turn lane warrant information for applicable intersections in the study area.

TABLE 6					
RIGHT TURN LANE WARRANT ANALYSIS					
Location	**Peak Hour**	**Speed**	**Major-Road Volume**	**Right-Turn Volume**	**Right-Turn Bay Warranted**
Clayton Arnold Road (NB) at Project Access	A.M.	30	476	27	No
	P.M.		186	18	No

Table 7 below details pertinent left turn lane warrant information for applicable intersections in the study area.

TABLE 7						
LEFT TURN LANE WARRANT ANALYSIS						
Location	**Peak Hour**	**Speed**	**Opposing Volume**	**Advancing Volume**	**L%**	**Left-Turn Bay Warranted**
Clayton Arnold Road (SB) at Project Access	A.M.	30	476	390	3	No
	P.M.		186	691	5	No

D. Safety Analysis

A summary of historic crash data on Critz Lane between Columbia Pike and Lewisburg Pike for the period between 2010 and 2017 is shown below in Table 11.

TABLE 8					
HISTORIC CRASH SUMMARY					
Year	**Crash Type**				**Total Crashes**
	Fatal	**Incapacitating Injury**	**Other Injury**	**Property Damage**	
2010	0	0	0	1	1
2011	0	0	2	1	3
2012	0	0	3	1	4
2013	0	1	2	7	10
2014	0	0	1	3	4
2015	0	0	1	7	8
2016	0	0	2	3	5
2017	1	0	2	5	8
Source: TDOT Enhanced Tennessee Roadway Information Management System (E-TRIMS)					

Even though there are not sufficient historical traffic counts available on Critz Lane to determine average crash rates and make comparisons to regional or statewide averages, the Highway Safety Manual and Crash Modification Factors Clearinghouse indicated that the planned improvements to Critz Lane can improve safety as described below.

- The crash reduction factor for increasing the lane width is 28 percent. The lane width on Critz Lane is being increased to 11 feet.

- The reduction factor for property damage crashes when providing a new shoulder that is 4 feet wide is 19 percent. The Critz Lane improvements will provide a shoulder with a width of 4 feet.

- The reduction factor for all crash types is 25 percent and the reduction factor for injury and fatal crashes is 35% when replacing a two-way stop intersection with a roundabout. On Critz Lane, the two-way stop intersections at Clayton Arnold Road / Paddock Park Drive and at Pantall Road will be replaced with roundabouts.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. Introduction

Based upon a review of the existing and future proposed conditions within the study area, recommendations have been developed to provide efficient ingress and egress for Avenue Downs while managing the impact to non-site trips on the roadway network. Additionally, recommendations for offsite intersections have also been provided to confirm improvement plans underway by others or to provide specific improvements that will mitigate a development impact.

B. Critz Lane at Clayton Arnold Road

The Critz Lane improvements proposed by the Town of Thompson's Station include a single lane roundabout at this intersection with one lane entrances and exits on all four approaches. The roundabout layout provided by the Town appears to incorporate many of the accepted methods of modern roundabout design.

Traffic operations in the horizon year 2021 for total traffic conditions at the intersection of Critz Lane at Clayton Arnold Road are expected to be characterized by level of service D during the a.m. peak hour and level of service B in the p.m. peak hour.

The following improvements are recommended at the intersection of Critz Lane at Clayton Arnold Road:

- The Town of Thompson's Station's proposal to construct a roundabout at this intersection is appropriate based on the operational and safety advantages that a roundabout will have over two-way stop control at this location.

- The improvements proposed to be constructed as part of the Town of Thompson's Station's Critz Lane project will continue to be appropriate after development of Avenue Downs.

C. Clayton Arnold Road at Proposed Access

Traffic operations in the horizon year 2021 for total traffic conditions at the unsignalized intersection of Critz Lane at the proposed access is expected to be characterized by level of service C during the a.m. peak hour and level of service B during the p.m. peak hour.

Right turn and left turn lane warrants were conducted at the intersection of Critz Lane at the proposed access. It was concluded that turn lanes are not warranted at this intersection based on the forecasted traffic volumes.

The following improvements are recommended at the intersection of Critz Lane at the proposed access:

- The Proposed Access should consist of one lane in each direction with pavement widths in compliance with the appropriate roadway section shown in the Town's Land Development Ordinance.

- Proposed grading, landscaping, and development monumentation or signage should be designed so that AASHTO intersection sight distance is not obstructed for the proposed access.

APPENDIX

A. **TRAFFIC COUNT DATA**

B. **TRIP GENERATION & FUTURE TRAFFIC DERIVATION**

C. **2017 EXISTING CONDITIONS CAPACITY ANALYSIS WORKSHEETS**

D. **2021 BACKGROUND CONDITIONS CAPACITY ANALYSIS WORKSHEETS**

E. **2021 TOTAL CONDITIONS CAPACITY ANALYSIS WORKSHEETS**

APPENDIX A

TRAFFIC COUNT DATA

RAGAN • SMITH

Date: 13-Dec-17
Location: Critz Lane at Clayton Arnold Road / Paddock
Time Interval: AM

	Clayton Arnold Road			Paddock Park Drive			Critz Lane			Critz Lane		
Time	NB Left	NB Thru	NB Right	SB Left	SB Thru	SB Right	EB Left	EB Thru	EB Right	WB Left	WB Thru	WB Right
0:00 - 0:15												
0:15 - 0:30												
0:30 - 0:45												
0:45 - 1:00												
1:00 - 1:15												
1:15 - 1:30												
1:30 - 1:45												
1:45 - 2:00												
2:00 - 2:15												
2:15 - 2:30												
2:30 - 2:45												
2:45 - 3:00												
3:00 - 3:15												
3:15 - 3:30												
3:30 - 3:45												
3:45 - 4:00												
4:00 - 4:15												
4:15 - 4:30												
4:30 - 4:45												
4:45 - 5:00												
5:00 - 5:15												
5:15 - 5:30												
5:30 - 5:45												
5:45 - 6:00												
6:00 - 6:15	12	3	1	0	1	4	2	1	2	3	1	1
6:15 - 6:30	36	2	1	1	6	4	2	0	6	12	9	1
6:30 - 6:45	55	1	1	0	1	6	2	2	3	14	7	3
6:45 - 7:00	47	0	0	1	6	13	1	1	7	15	13	11
7:00 - 7:15	56	2	5	2	12	9	1	2	7	26	13	6
7:15 - 7:30	47	7	1	8	2	4	4	1	12	13	6	10
7:30 - 7:45	30	3	5	0	2	5	2	1	13	12	8	10
7:45 - 8:00	36	6	6	5	12	6	4	2	10	11	7	10
8:00 - 8:15	26	3	3	4	12	5	1	5	14	9	4	6
8:15 - 8:30	31	6	2	13	5	7	2	2	5	11	12	4
8:30 - 8:45	26	2	2	5	7	12	1	4	6	4	8	5
8:45 - 9:00	16	4	2	1	9	6	3	5	11	6	5	13
9:00 - 9:15												
9:15 - 9:30												
9:30 - 9:45												
9:45 - 10:00												
10:00 - 10:15												
10:15 - 10:30												
10:30 - 10:45												
10:45 - 11:00												
11:00 - 11:15												
11:15 - 11:30												
11:30 - 11:45												
11:45 - 12:00												

RAGAN • SMITH

Date: 13-Dec-17
Location: Critz Lane at Clayton Arnold Road / Paddock
Time Interval: PM

	Clayton Arnold Road			Paddock Park Drive			Critz Lane			Critz Lane		
Time	NB Left	NB Thru	NB Right	SB Left	SB Thru	SB Right	EB Left	EB Thru	EB Right	WB Left	WB Thru	WB Right
12:00 - 12:15												
12:15 - 12:30												
12:30 - 12:45												
12:45 - 13:00												
13:00 - 13:15												
13:15 - 13:30												
13:30 - 13:45												
13:45 - 14:00												
14:00 - 14:15												
14:15 - 14:30												
14:30 - 14:45												
14:45 - 15:00												
15:00 - 15:15												
15:15 - 15:30												
15:30 - 15:45												
15:45 - 16:00												
16:00 - 16:15	12	8	5	4	2	4	2	7	51	9	13	13
16:15 - 16:30	17	3	6	3	7	2	4	5	53	15	7	18
16:30 - 16:45	13	2	2	1	12	11	1	5	121	16	7	11
16:45 - 17:00	16	6	3	4	8	3	5	7	108	9	6	8
17:00 - 17:15	16	7	9	8	9	7	3	14	114	9	17	6
17:15 - 17:30	9	1	6	6	11	4	5	7	120	12	4	16
17:30 - 17:45	11	4	6	3	5	2	3	4	97	8	9	13
17:45 - 18:00	9	2	6	15	4	3	1	8	45	4	7	4
18:00 - 18:15	5	5	1	3	5	2	3	8	36	8	5	8
18:15 - 18:30	9	2	3	4	4	3	0	5	31	7	2	6
18:30 - 18:45	3	0	4	0	1	1	0	6	31	2	1	10
18:45 - 19:00	6	1	1	2	4	2	3	7	28	5	5	8
19:00 - 19:15												
19:15 - 19:30												
19:30 - 19:45												
19:45 - 20:00												
20:00 - 20:15												
20:15 - 20:30												
20:30 - 20:45												
20:45 - 21:00												
21:00 - 21:15												
21:15 - 21:30												
21:30 - 21:45												
21:45 - 22:00												
22:00 - 22:15												
22:15 - 22:30												
22:30 - 22:45												
22:45 - 23:00												
23:00 - 23:15												
23:15 - 23:30												
23:30 - 23:45												
23:45 - 24:00												

RAGAN • SMITH

Date: 13-Dec-17
Location: Critz Lane at Clayton Arnold Road / Paddock

A.M. Peak Hour (6:00 - 9:00)

	Clayton Arnold Road			Paddock Park Drive			Critz Lane			Critz Lane		
Time	NB Left	NB Thru	NB Right	SB Left	SB Thru	SB Right	EB Left	EB Thru	EB Right	WB Left	WB Thru	WB Right
6:30 - 6:45	55	1	1	0	1	6	2	2	3	14	7	3
6:45 - 7:00	47	0	0	1	6	13	1	1	7	15	13	11
7:00 - 7:15	56	2	5	2	12	9	1	2	7	26	13	6
7:15 - 7:30	47	7	1	8	2	4	4	1	12	13	6	10
6:30 - 7:30	**205**	**10**	**7**	**11**	**21**	**32**	**8**	**6**	**29**	**68**	**39**	**30**

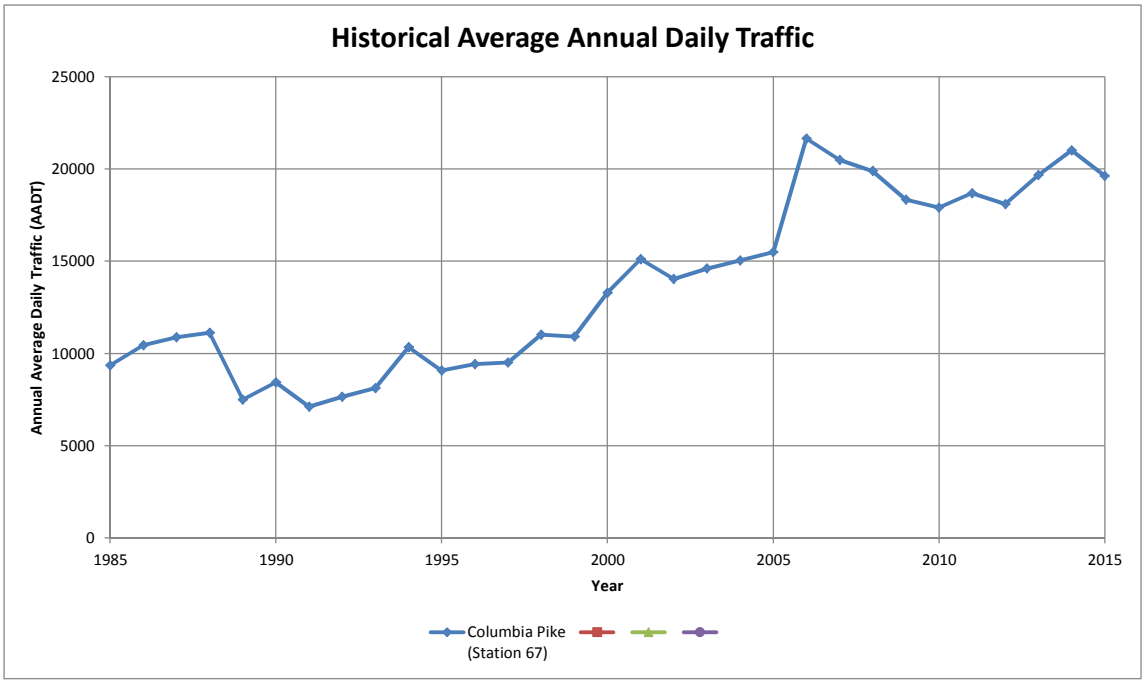
Peak Hour Factor: 0.826

P.M. Peak Hour (4:00 - 7:00)

	Clayton Arnold Road			Paddock Park Drive			Critz Lane			Critz Lane		
Time	NB Left	NB Thru	NB Right	SB Left	SB Thru	SB Right	EB Left	EB Thru	EB Right	WB Left	WB Thru	WB Right
16:30 - 16:45	13	2	2	1	12	11	1	5	121	16	7	11
16:45 - 17:00	16	6	3	4	8	3	5	7	108	9	6	8
17:00 - 17:15	16	7	9	8	9	7	3	14	114	9	17	6
17:15 - 17:30	9	1	6	6	11	4	5	7	120	12	4	16
16:30 - 17:30	**54**	**16**	**20**	**19**	**40**	**25**	**14**	**33**	**463**	**46**	**34**	**41**

Peak Hour Factor: 0.919

HISTORICAL TRAFFIC COUNT DATA				
Year	Columbia Pike (Station 67)			
1985	9342			
1986	10443			
1987	10883			
1988	11127			
1989	7490			
1990	8427			
1991	7117			
1992	7654			
1993	8121			
1994	10337			
1995	9079			
1996	9418			
1997	9499			
1998	11015			
1999	10915			
2000	13289			
2001	15108			
2002	14037			
2003	14599			
2004	15037			
2005	15488			
2006	21645			
2007	20488			
2008	19891			
2009	18342			
2010	17900			
2011	18685			
2012	18101			
2013	19666			
2014	21013			
2015	19620			
2016	19816			



		Columbia Pike (Station 67)	-	-	-
Analysis Period	Begin	2011	2008	-	-
	End	2016	2015	-	-
Future Year		2021	2017	-	-
Forecasted Traffic Volume		21960	-	-	-
Annual Growth Rate		2.08%	-	-	-
Growth Factor		1.108	-	-	-

APPENDIX B

TRIP GENERATION &
FUTURE TRAFFIC DERIVATION

TRAFFIC VOLUME WORKSHEET
SPECIFIC NON-SITE TRIP GENERATION &
PROPOSED DEVELOPMENT TRIP GENERATION

RAGAN SMITH

SPECIFIC NON-SITE DEVELOPMENT TRIP GENERATION							
Development	Daily	A.M. Peak Hour			P.M. Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Remaining Canterbury (Phase 12B, 12C, 13: 90 SF, 54 TH)	1,311	23	73	96	79	47	126
K-8 Proposed School on Clayton Arnold (1,600 Students)	3,216	540	460	1,000	132	140	272
Proposed Canterbury (50%)	1,401	24	75	99	81	48	129
				0			0
TOTAL	**5,928**	**587**	**608**	**1,195**	**292**	**235**	**527**

AVENUE DOWNS TRIP GENERATION 2021 HORIZON YEAR							
Development	Daily	A.M. Peak Hour			P.M. Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Avenue Downs (69 Single Family)	739	14	40	54	45	26	71
TOTAL	**739**	**14**	**40**	**54**	**45**	**26**	**71**

TRIP GENERATION - 10th EDITION - REMAINING CANTERBURY

Single-Family Detached Housing - 90 Dwelling Units

Use ITE Land Use Code 210 (Single-Family Detached Housing) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

Ln(T) = 0.92 Ln(X) + 2.71
Ln(T) = 0.92 Ln(90) + 2.71
T = 944

A.M. Peak Hour of Adjacent Street Traffic

T = 0.71(X) + 4.8
T = 0.71(90) + 4.8
T = 69

Enter = 0.25(69) = 17
Exit = 0.75(69) = 52

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.96 Ln(X) + 0.20
Ln(T) = 0.96 Ln(90) + 0.20
T = 92

Enter = 0.63(92) = 58
Exit = 0.37(92) = 34

TRIP GENERATION - 10th EDITION - REMAINING CANTERBURY

Multifamily H 54 Dwelling Units

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels.

Average Daily Traffic

T = 7.56(X) - 40.86
T = 7.56(54) - 40.86
T = 367

A.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.95 Ln(X) - 0.51
Ln(T) = 0.95 Ln(54) - 0.51
T = 27

Enter = 0.23(27) = 6
Exit = 0.77(27) = 21

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.89 Ln(X) - 0.02
Ln(T) = 0.89 Ln(54) - 0.02
T = 34

Enter = 0.63(34) = 21
Exit = 0.37(34) = 13

TRIP GENERATION - 10th EDITION

Elementary School - 800 Students

Use ITE Land Use Code 520 (Elementary School) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

T = 1.89(X)
T = 1.89(800)
T = 1512

A.M. Peak Hour

T = 0.67(X)
T = 0.67(800)
T = 536

Enter = 0.54(536) = 289
Exit = 0.46(536) = 247

P.M. Peak Hour of Adjacent Street Traffic

T = 0.17(X)
T = 0.17(800)
T = 136

Enter = 0.48(136) = 65
Exit = 0.52(136) = 71

TRIP GENERATION - 10th EDITION

Middle School/Junior High School - 800 Students

Use ITE Land Use Code 522 (Middle School/Junior High School) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

T = 2.13(X)
T = 2.13(800)
T = 1704

A.M. Peak Hour

T = 0.58(X)
T = 0.58(800)
T = 464

Enter = 0.54(464) = 251
Exit = 0.46(464) = 213

P.M. Peak Hour of Adjacent Street Traffic

T = 0.17(X)
T = 0.17(800)
T = 136

Enter = 0.49(136) = 67
Exit = 0.51(136) = 69

TRIP GENERATION - 10th EDITION - AVENUE DOWNS

Single-Family Detached Housing - 69 Dwelling Units

Use ITE Land Use Code 210 (Single-Family Detached Housing) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

Ln(T) = 0.92 Ln(X) + 2.71
Ln(T) = 0.92 Ln(69) + 2.71
T = 739

A.M. Peak Hour of Adjacent Street Traffic

T = 0.71(X) + 4.8
T = 0.71(69) + 4.8
T = 54

Enter = 0.25(54) = 14
Exit = 0.75(54) = 40

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.96 Ln(X) + 0.20
Ln(T) = 0.96 Ln(69) + 0.20
T = 71

Enter = 0.63(71) = 45
Exit = 0.37(71) = 26

TRIP GENERATION - 10th EDITION - PROPOSED CANTERBURY

Single-Family Detached Housing - 179 Dwelling Units

Use ITE Land Use Code 210 (Single-Family Detached Housing) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

Ln(T) = 0.92 Ln(X) + 2.71
Ln(T) = 0.92 Ln(179) + 2.71
T = 1776

A.M. Peak Hour of Adjacent Street Traffic

T = 0.71(X) + 4.8
T = 0.71(179) + 4.8
T = 132

Enter = 0.25(132) = 33
Exit = 0.75(132) = 99

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.96 Ln(X) + 0.20
Ln(T) = 0.96 Ln(179) + 0.20
T = 178

Enter = 0.63(178) = 112
Exit = 0.37(178) = 66

TRIP GENERATION - 10th EDITION - PROPOSED CANTERBURY

Multifamily H 141 Dwelling Units

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels.

Average Daily Traffic

T = 7.56(X) - 40.86
T = 7.56(141) - 40.86
T = 1025

A.M. Peak Hour of Adjacent Street Traffic

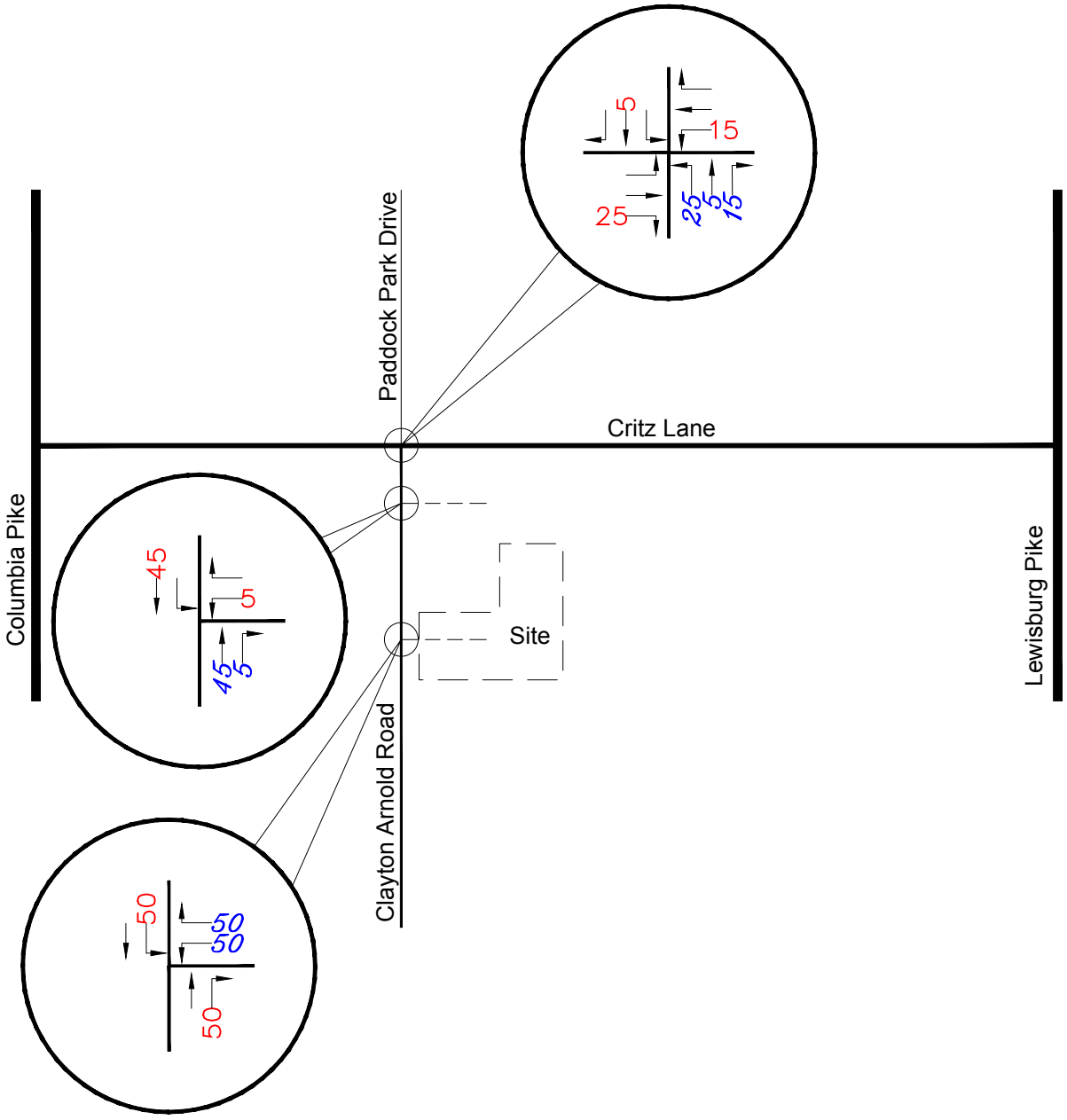
Ln(T) = 0.95 Ln(X) - 0.51
Ln(T) = 0.95 Ln(141) - 0.51
T = 66

Enter = 0.23(66) = 15
Exit = 0.77(66) = 51

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.89 Ln(X) - 0.02
Ln(T) = 0.89 Ln(141) - 0.02
T = 80

Enter = 0.63(80) = 50
Exit = 0.37(80) = 30

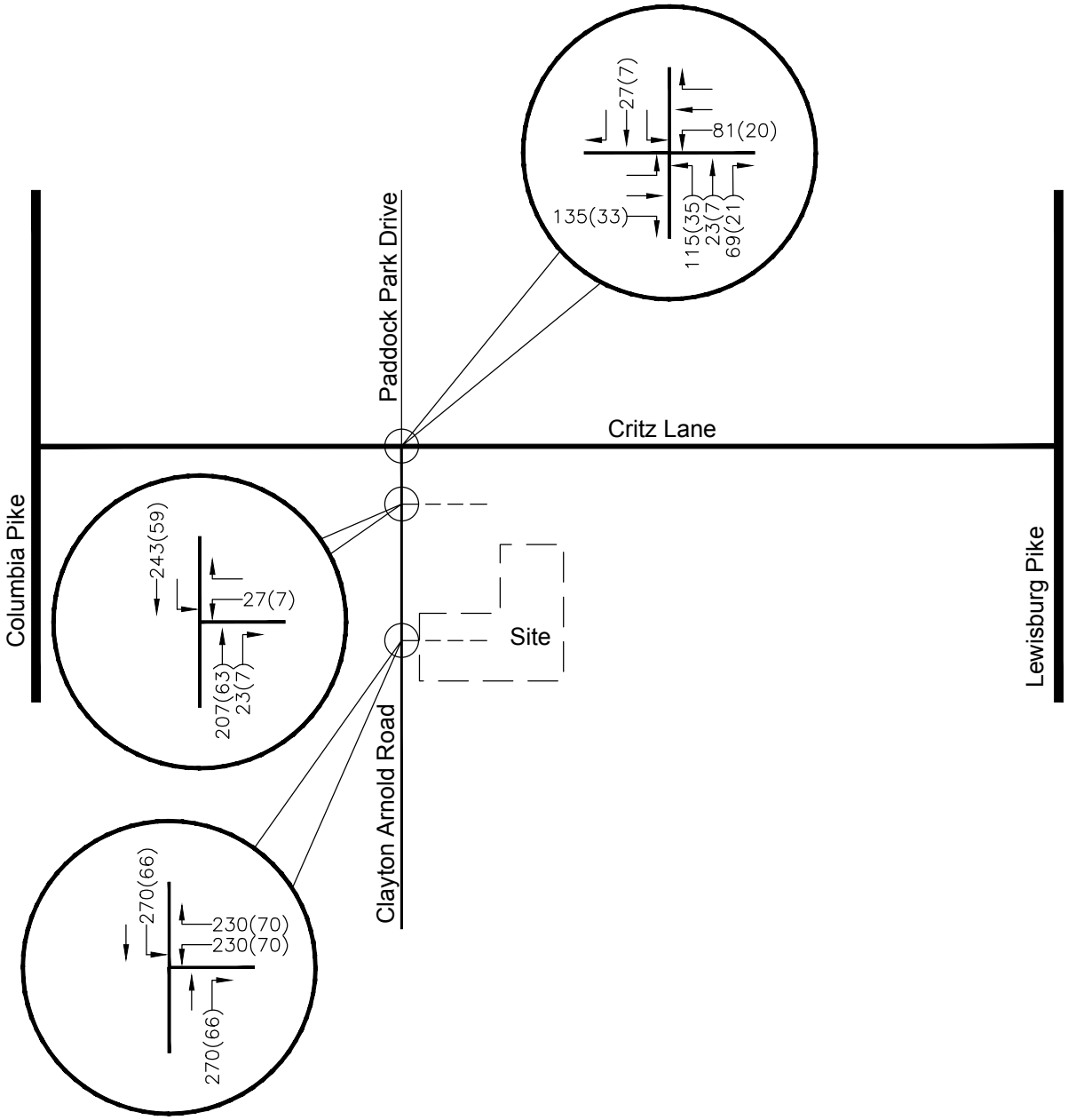


XX INBOUND
XX OUTBOUND

RAGAN·SMITH

Clayton Arnold Road School
Trip Distribution

Appendix
B-1

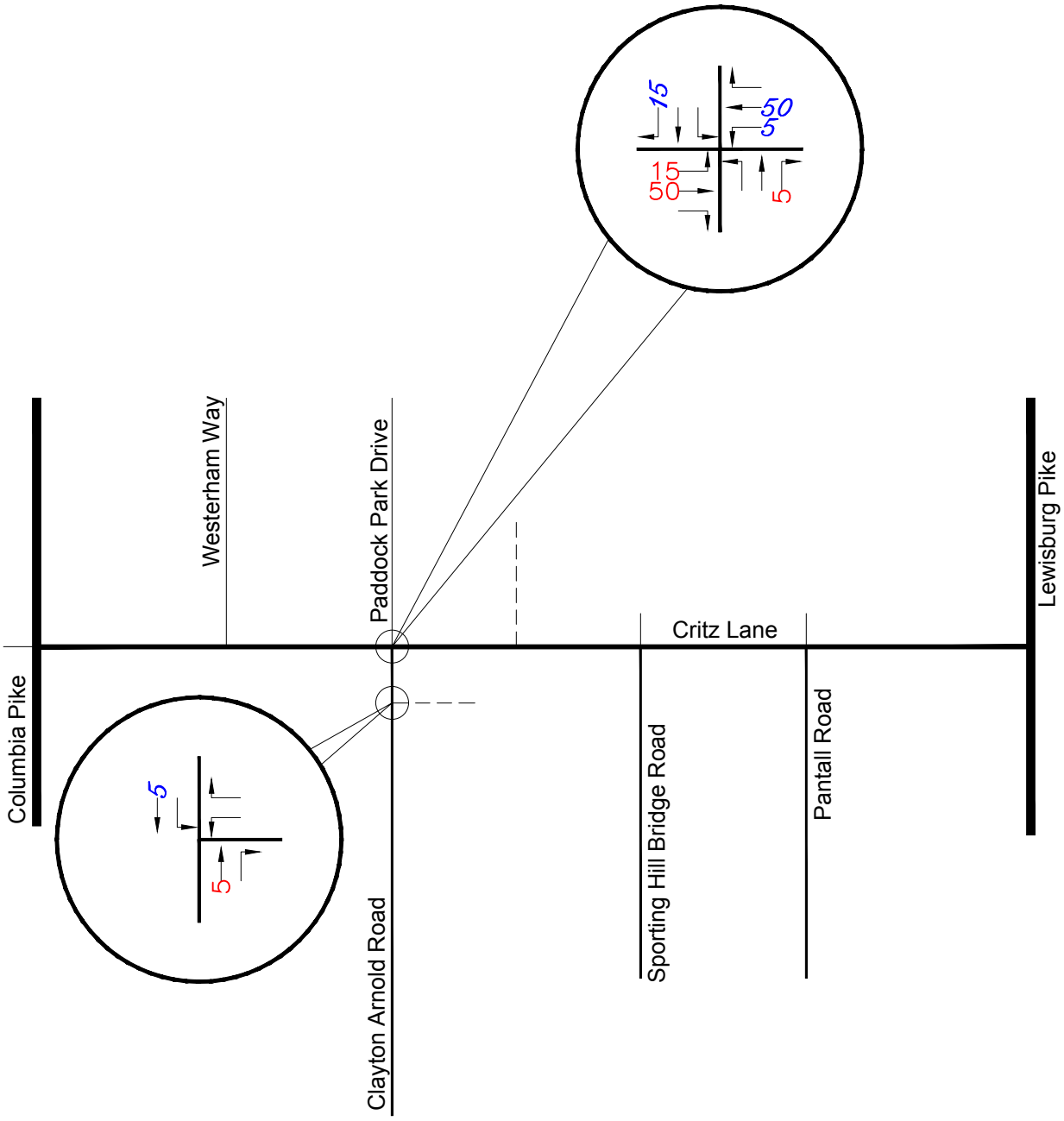


Peak Hours
AM (PM)

RAGAN SMITH

Clayton Arnold Road School
Site Volumes

Appendix
B-2

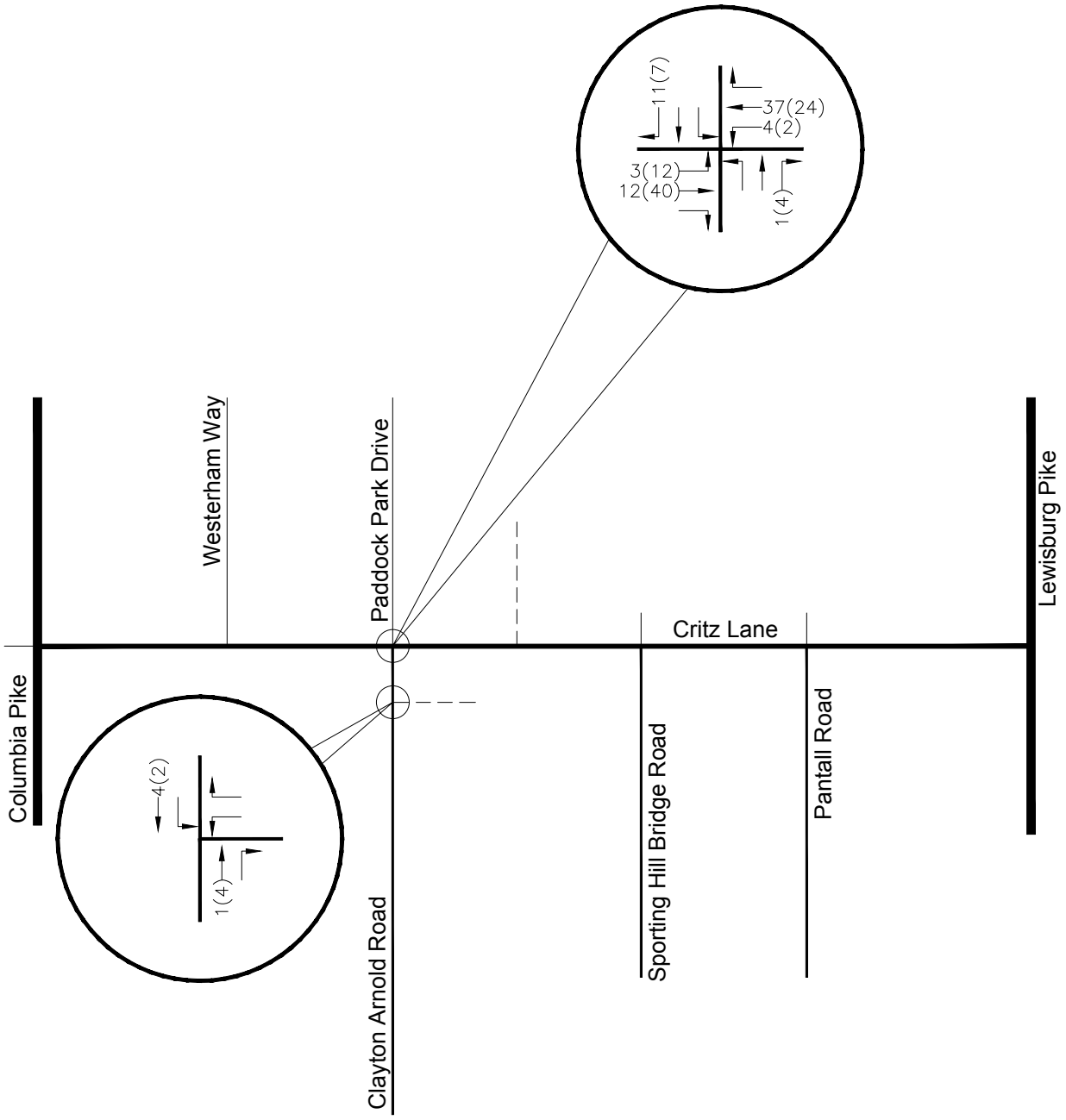


XX INBOUND
XX OUTBOUND

RAGAN SMITH

Fields of Canterbury
Trip Distribution

Appendix
B-3

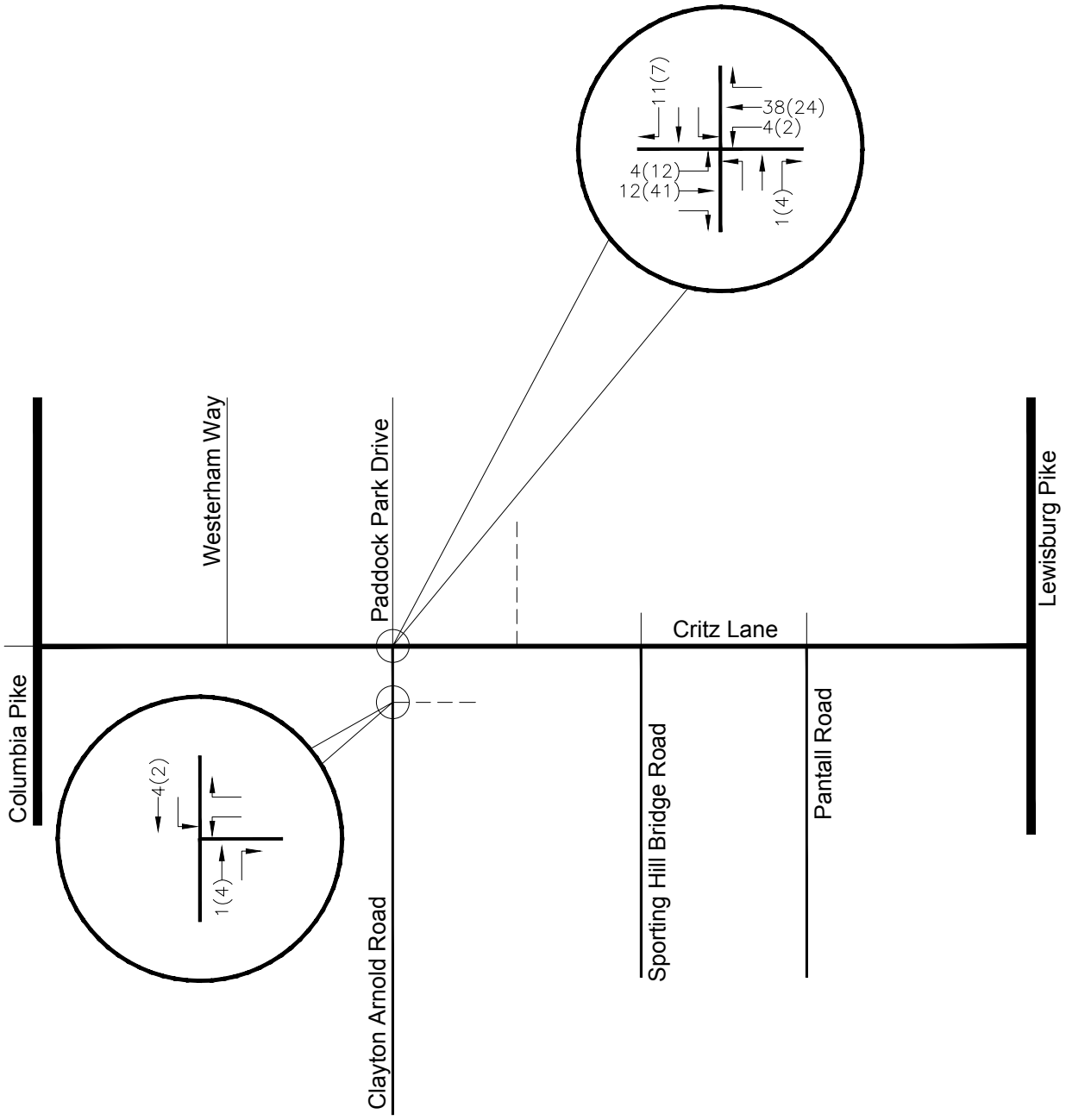


Peak Hours
AM (PM)

RAGAN SMITH

Approved Fields of Canterbury (Phases 12B, 12C and 13) Site Volumes

Appendix
B-4



Peak Hours
AM (PM)

RAGAN SMITH

Proposed Fields of Canterbury (50%)
Site Volumes

Appendix
B-5

TRAFFIC VOLUME WORKSHEET
CRITZ LANE AT CLAYTON ARNOLD ROAD
A.M. PEAK HOUR

RAGAN·SMITH

Description		Northbound Clayton Arnold Road			Southbound Paddock Park Drive			Eastbound Critz Lane			Westbound Critz Lane		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2017 EXISTING TRAFFIC VOLUMES		205	10	7	11	21	32	8	6	29	68	39	30
2021 BACKGROUND TRAFFIC VOLUMES													
Annual Background Growth													
Growth Rate (%/year)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Growth Factor		1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08
Annual Background Growth Trips		17	1	1	1	2	3	1	0	2	6	3	2
Specific Development Background Growth													
Remaining Canterbury (Phase 12B, 12C, 13: 90 SF, 54 TH)	% In			5				15	50				
	% Out						15				5	50	
	Trips	0	0	1	0	0	11	3	12	0	4	37	0
K-8 Proposed School on Clayton Arnold (1,600 Students)	% In					5				25	15		
	% Out	25	5	15									
	Trips	115	23	69	0	27	0	0	0	135	81	0	0
Proposed Canterbury (50%)	% In			5				15	50				
	% Out						15				5	50	
	Trips	0	0	1	0	0	11	4	12	0	4	38	0
Specific Development Background Growth Trips		115	23	71	0	27	22	7	24	135	89	75	0
2021 Background Traffic Volumes		337	34	79	12	50	57	16	30	166	163	117	32
2021 SITE TRAFFIC VOLUMES													
Avenue Downs (69 Single Family)	% In									60	15		
	% Out	60		15									
	Trips	24	0	6	0	0	0	0	0	8	2	0	0
2021 Site Traffic Volumes		24	0	6	0	0	0	0	0	8	2	0	0
2021 TOTAL TRAFFIC VOLUMES		361	34	85	12	50	57	16	30	174	165	117	32

TRAFFIC VOLUME WORKSHEET
CRITZ LANE AT CLAYTON ARNOLD ROAD
P.M. PEAK HOUR

RAGAN·SMITH

Description		Northbound Clayton Arnold Road			Southbound Paddock Park Drive			Eastbound Critz Lane			Westbound Critz Lane		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2017 EXISTING TRAFFIC VOLUMES		54	16	20	19	40	25	14	33	463	46	34	41
2021 BACKGROUND TRAFFIC VOLUMES													
Annual Background Growth													
Growth Rate (%/year)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Growth Factor		1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08
Annual Background Growth Trips		4	1	2	2	3	2	1	3	38	4	3	3
Specific Development Background Growth													
Remaining Canterbury (Phase 12B, 12C, 13: 90 SF, 54 TH)	% In			5				15	50				
	% Out						15				5	50	
	Trips	0	0	4	0	0	7	12	40	0	2	24	0
K-8 Proposed School on Clayton Arnold (1,600 Students)	% In					5				25	15		
	% Out	25	5	15									
	Trips	35	7	21	0	7	0	0	0	33	20	0	0
Proposed Canterbury (50%)	% In			5				15	50				
	% Out						15				5	50	
	Trips	0	0	4	0	0	7	12	41	0	2	24	0
Specific Development Background Growth Trips		35	7	29	0	7	14	24	81	33	24	48	0
2021 Background Traffic Volumes		93	24	51	21	50	41	39	117	534	74	85	44
2021 SITE TRAFFIC VOLUMES													
Avenue Downs (69 Single Family)	% In									60	15		
	% Out	60		15									
	Trips	16	0	4	0	0	0	0	0	27	7	0	0
2021 Site Traffic Volumes		16	0	4	0	0	0	0	0	27	7	0	0
2021 TOTAL TRAFFIC VOLUMES		109	24	55	21	50	41	39	117	561	81	85	44

TRAFFIC VOLUME WORKSHEET
CLAYTON ARNOLD ROAD AT PROJECT ACCESS
A.M. PEAK HOUR

RAGAN·SMITH

Description		Northbound Clayton Arnold Road			Southbound Clayton Arnold Road			Eastbound			Westbound Project Access		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2017 EXISTING TRAFFIC VOLUMES			222			118							
2021 BACKGROUND TRAFFIC VOLUMES													
Annual Background Growth													
Growth Rate (%/year)			2.0			2.0							
Growth Factor		1.00	1.08	1.00	1.00	1.08	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Annual Background Growth Trips		0	18	0	0	10	0	0	0	0	0	0	0
Specific Development Background Growth													
Remaining Canterbury (Phase 12B, 12C, 13: 90 SF, 54 TH)	% In		5										
	% Out					5							
	Trips	0	1	0	0	4	0	0	0	0	0	0	0
K-8 Proposed School on Clayton Arnold (1,600 Students)	% In					45					5		
	% Out		45	5									
	Trips	0	207	23	0	243	0	0	0	0	27	0	0
Proposed Canterbury (50%)	% In		5										
	% Out					5							
	Trips	0	1	0	0	4	0	0	0	0	0	0	0
Specific Development Background Growth Trips		0	209	23	0	251	0	0	0	0	27	0	0
2021 Background Traffic Volumes		0	449	23	0	379	0	0	0	0	27	0	0
2021 SITE TRAFFIC VOLUMES													
Avenue Downs (69 Single Family)	% In			25	75								
	% Out										25		75
	Trips	0	0	4	11	0	0	0	0	0	10	0	30
2021 Site Traffic Volumes		0	0	4	11	0	0	0	0	0	10	0	30
2021 TOTAL TRAFFIC VOLUMES		0	449	27	11	379	0	0	0	0	37	0	30

TRAFFIC VOLUME WORKSHEET
CLAYTON ARNOLD ROAD AT PROJECT ACCESS
P.M. PEAK HOUR

RAGAN·SMITH

Description		Northbound Clayton Arnold Road			Southbound Clayton Arnold Road			Eastbound			Westbound Project Access		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2017 EXISTING TRAFFIC VOLUMES			90			549							
2021 BACKGROUND TRAFFIC VOLUMES													
Annual Background Growth													
Growth Rate (%/year)			2.0			2.0							
Growth Factor		1.00	1.08	1.00	1.00	1.08	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Annual Background Growth Trips		0	7	0	0	45	0	0	0	0	0	0	0
Specific Development Background Growth													
Remaining Canterbury (Phase 12B, 12C, 13: 90 SF, 54 TH)	% In		5										
	% Out					5							
	Trips	0	4	0	0	2	0	0	0	0	0	0	0
K-8 Proposed School on Clayton Arnold (1,600 Students)	% In					45					5		
	% Out		45	5									
	Trips	0	63	7	0	59	0	0	0	0	7	0	0
Proposed Canterbury (50%)	% In		5										
	% Out					5							
	Trips	0	4	0	0	2	0	0	0	0	0	0	0
Specific Development Background Growth Trips		0	71	7	0	63	0	0	0	0	7	0	0
2021 Background Traffic Volumes		0	168	7	0	657	0	0	0	0	7	0	0
2021 SITE TRAFFIC VOLUMES													
Avenue Downs (69 Single Family)	% In			25	75								
	% Out										25		75
	Trips	0	0	11	34	0	0	0	0	0	7	0	20
2021 Site Traffic Volumes		0	0	11	34	0	0	0	0	0	7	0	20
2021 TOTAL TRAFFIC VOLUMES		0	168	18	34	657	0	0	0	0	14	0	20

APPENDIX C

2017 EXISTING CONDITIONS CAPACITY ANALYSIS WORKSHEETS

Intersection	
Int Delay, s/veh	10.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	8	6	29	68	39	30	205	10	7	11	21	32
Future Vol, veh/h	8	6	29	68	39	30	205	10	7	11	21	32
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	7	35	82	47	36	247	12	8	13	25	39

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	42	0	0	305	291	25	283	290	65
Stage 1	-	-	-	-	-	-	44	44	-	229	229	-
Stage 2	-	-	-	-	-	-	261	247	-	54	61	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1514	-	-	1567	-	-	647	619	1051	669	620	999
Stage 1	-	-	-	-	-	-	970	858	-	774	715	-
Stage 2	-	-	-	-	-	-	744	702	-	958	844	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1514	-	-	1567	-	-	573	581	1051	622	582	999
Mov Cap-2 Maneuver	-	-	-	-	-	-	573	581	-	622	582	-
Stage 1	-	-	-	-	-	-	963	852	-	769	676	-
Stage 2	-	-	-	-	-	-	651	663	-	930	838	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	3.7	16.3	10.4
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	582	1514	-	-	1567	-	-	746
HCM Lane V/C Ratio	0.46	0.006	-	-	0.052	-	-	0.103
HCM Control Delay (s)	16.3	7.4	0	-	7.4	0	-	10.4
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	2.4	0	-	-	0.2	-	-	0.3

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	14	33	463	46	34	41	54	16	20	19	40	25
Future Vol, veh/h	14	33	463	46	34	41	54	16	20	19	40	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	36	503	50	37	45	59	17	22	21	43	27

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	82	0	0	539	0	0	513	500	288	497	729	59
Stage 1	-	-	-	-	-	-	318	318	-	159	159	-
Stage 2	-	-	-	-	-	-	195	182	-	338	570	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1515	-	-	1029	-	-	472	473	751	483	350	1007
Stage 1	-	-	-	-	-	-	693	654	-	843	766	-
Stage 2	-	-	-	-	-	-	807	749	-	676	505	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1515	-	-	1029	-	-	392	442	751	432	327	1007
Mov Cap-2 Maneuver	-	-	-	-	-	-	392	442	-	432	327	-
Stage 1	-	-	-	-	-	-	683	644	-	830	727	-
Stage 2	-	-	-	-	-	-	701	711	-	629	497	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	3.3	15.2	15.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	449	1515	-	-	1029	-	-	439
HCM Lane V/C Ratio	0.218	0.01	-	-	0.049	-	-	0.208
HCM Control Delay (s)	15.2	7.4	0	-	8.7	0	-	15.3
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.8	0	-	-	0.2	-	-	0.8

APPENDIX D

2021 BACKGROUND CONDITIONS CAPACITY ANALYSIS WORKSHEETS

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	255	376	542	143
Demand Flow Rate, veh/h	260	384	553	145
Vehicles Circulating, veh/h	275	475	70	758
Vehicles Exiting, veh/h	628	148	465	101
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.6	14.1	9.9	10.9
Approach LOS	A	B	A	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	260	384	553	145
Cap Entry Lane, veh/h	858	703	1054	529
Entry HV Adj Factor	0.982	0.980	0.980	0.985
Flow Entry, veh/h	255	376	542	143
Cap Entry, veh/h	843	688	1033	521
V/C Ratio	0.303	0.546	0.525	0.274
Control Delay, s/veh	7.6	14.1	9.9	10.9
LOS	A	B	A	B
95th %tile Queue, veh	1	3	3	1

Intersection	
Intersection Delay, s/veh	14.7
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	749	220	182	122
Demand Flow Rate, veh/h	765	225	186	124
Vehicles Circulating, veh/h	160	173	196	279
Vehicles Exiting, veh/h	243	209	729	119
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	20.7	6.3	5.9	5.7
Approach LOS	C	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	765	225	186	124
Cap Entry Lane, veh/h	963	950	929	855
Entry HV Adj Factor	0.980	0.978	0.981	0.983
Flow Entry, veh/h	749	220	182	122
Cap Entry, veh/h	943	930	911	841
V/C Ratio	0.794	0.237	0.200	0.145
Control Delay, s/veh	20.7	6.3	5.9	5.7
LOS	C	A	A	A
95th %tile Queue, veh	9	1	1	1

APPENDIX E

2021 TOTAL CONDITIONS CAPACITY ANALYSIS WORKSHEETS

Intersection	
Intersection Delay, s/veh	11.4
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	265	379	578	143
Demand Flow Rate, veh/h	270	387	590	145
Vehicles Circulating, veh/h	278	505	70	791
Vehicles Exiting, veh/h	658	155	478	101
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.8	15.1	10.6	11.3
Approach LOS	A	C	B	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	270	387	590	145
Cap Entry Lane, veh/h	856	682	1054	512
Entry HV Adj Factor	0.982	0.980	0.980	0.985
Flow Entry, veh/h	265	379	578	143
Cap Entry, veh/h	841	668	1032	505
V/C Ratio	0.316	0.568	0.560	0.283
Control Delay, s/veh	7.8	15.1	10.6	11.3
LOS	A	C	B	B
95th %tile Queue, veh	1	4	4	1

Intersection	
Intersection Delay, s/veh	16.5
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	779	228	204	122
Demand Flow Rate, veh/h	795	233	208	124
Vehicles Circulating, veh/h	168	190	196	304
Vehicles Exiting, veh/h	260	214	767	119
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	23.8	6.5	6.2	5.9
Approach LOS	C	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	795	233	208	124
Cap Entry Lane, veh/h	955	934	929	834
Entry HV Adj Factor	0.980	0.979	0.983	0.983
Flow Entry, veh/h	779	228	204	122
Cap Entry, veh/h	937	915	913	820
V/C Ratio	0.832	0.249	0.224	0.149
Control Delay, s/veh	23.8	6.5	6.2	5.9
LOS	C	A	A	A
95th %tile Queue, veh	10	1	1	1

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	37	30	449	27	11	379
Future Vol, veh/h	37	30	449	27	11	379
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	33	488	29	12	412

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	939	503	0	0	517	0
Stage 1	503	-	-	-	-	-
Stage 2	436	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	293	569	-	-	1049	-
Stage 1	607	-	-	-	-	-
Stage 2	652	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	289	569	-	-	1049	-
Mov Cap-2 Maneuver	289	-	-	-	-	-
Stage 1	607	-	-	-	-	-
Stage 2	642	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.1	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	371	1049	-
HCM Lane V/C Ratio	-	-	0.196	0.011	-
HCM Control Delay (s)	-	-	17.1	8.5	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	20	168	18	34	657
Future Vol, veh/h	14	20	168	18	34	657
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	22	183	20	37	714

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	980	192	0	0	202	0
Stage 1	192	-	-	-	-	-
Stage 2	788	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	277	850	-	-	1370	-
Stage 1	841	-	-	-	-	-
Stage 2	448	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	265	850	-	-	1370	-
Mov Cap-2 Maneuver	265	-	-	-	-	-
Stage 1	841	-	-	-	-	-
Stage 2	428	-	-	-	-	-

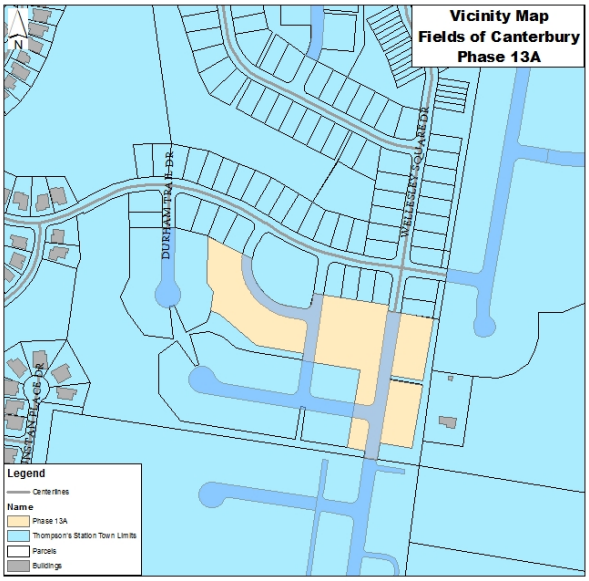
Approach	WB	NB	SB
HCM Control Delay, s	13.8	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	445	1370	-
HCM Lane V/C Ratio	-	-	0.083	0.027	-
HCM Control Delay (s)	-	-	13.8	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Thompson's Station Planning Commission
Staff Report - Item 4 (FP 2018-011)
July 24, 2018
Final Plat Request for Fields of Canterbury, Section 13A for the creation of 26 lots.

PROJECT DESCRIPTION

A request for a final plat was submitted by Ragan Smith Associates on behalf of Hood Development, LLC for the creation of 25 single-family lots and one open space lot within section 13A of the Fields of Canterbury.



BACKGROUND

On March 28, 2017, the Planning Commission approved the preliminary plat for phase 13 which consisted of 57 single-family lots and four (4) open space lots along with the removal of 39 trees. This phase was also approved with a reduced right-of-way for Weeping Willow Lane and Sturry Cove Drive. Section 13A consists of 25 single family lots leaving 32 lots remaining for the future section (13B).

ANALYSIS

Final Plat

The purpose of the final plat is to provide a legal instrument where the transfer of ownership of lots is allowed and shall constitute a way where streets and other infrastructure can be accepted (LDO Section 5.2.7).

Section 13A consists of 25 single-family lots along Bramblewood Lane, Carena Terrace, Weeping Willow Lane and Sturry Cove. The setbacks are 20 feet for the front yard, 7.5 feet for the side yard, and 20 feet for the rear yard. Lot widths vary; however, the minimum lot width will be maintained at 50 feet, except where less width is permitted on the curve of a road. Bramblewood Lane, Sturry Cove and Weeping Willow are partially and will be extended into this section. The right of way includes a five-foot sidewalk and a five-foot landscape strip.

Open Space

This plat includes one .09-acre open space lot. All other open space is recorded.

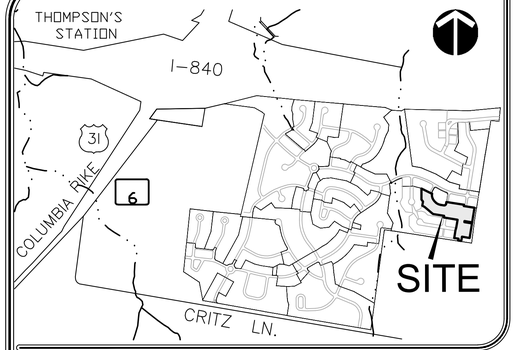
Sureties
Sureties are required prior to the recordation of any final plat to ensure that all necessary improvements are guaranteed to be installed per approved construction plans. The Fields of Canterbury Phase 13 construction plans are approved and improvements have been started within this phase. Roadway work is completed to base with curbs, drainage and utilities in place and erosion control is installed. After an evaluation of this section and the progress of the construction, the Town Engineer recommends that the roads, drainage and erosion control surety should be set at $118,000.

Sewer is installed with the services in place, however the system has not been tested and flow is not applied to the system. After an evaluation of the progress of the sewer, the Town Engineer recommends that the sewer surety be set at $106,000.

RECOMMENDATION
Based on the project's compliance with the approved Phase 13 preliminary plat, Staff recommends that the Planning Commission approve the final plat with the following contingencies:

1. Prior to recordation of the final plat, a surety shall be submitted to the Town in the amount of $118,000 for roadways, drainage and utilities.
2. Prior to recordation of the final plat, a surety shall be submitted to the Town in the amount of $106,000 for sewer.
3. All tree replacements shall be installed in accordance with the approved replacement plan for phase 13.
4. As built drawings shall be required for the drainage and sewer system with a letter from the Design Engineer that they are constructed per the approved drawings and functioning as intended.

ATTACHMENTS
Final Plat for Section 13A



LOCATION MAP
(NOT TO SCALE)

GENERAL NOTES

1. THE PURPOSE OF THIS PLAT IS TO CREATE 25 SINGLE FAMILY LOTS AND 1 OPEN SPACE TRACT.
2. BEARINGS SHOWN HEREON ARE BASED ON SURVEYS BY CRAWFORD LAND SURVEYORS, P.C. DATED AUGUST 10, 2004 AND MARCH 25, 2005.
3. THE PROPERTY IS ZONED D3 (HIGH DENSITY RESIDENTIAL).
   MAXIMUM LOT COVERAGE (SINGLE FAMILY) – 55%.
   MINIMUM BUILDING SETBACKS:
   FRONT – 20'
   SIDE – 7.5'
   REAR – 20'
4. WITHIN ALL NEW DEVELOPMENTS AND FOR OFF–SITE LINES CONSTRUCTED AS A RESULT OF, OR TO PROVIDE SERVICE TO, THE NEW DEVELOPMENT, ALL UTILITIES, SUCH AS CABLE TELEVISION, ELECTRICAL (EXCLUDING TRANSFORMERS AND THE MTEMC FEEDER LINE RUNNING NORTH/SOUTH ALONG THE DISTANCE OF THE TVA TRANSMISSION LINE EASEMENT), GAS, SEWER, TELEPHONE, AND WATERLINES SHALL BE PLACED UNDERGROUND. SEE VARIANCE GRANTED BY THE TOWN OF THOMPSON'S STATION M.P.C. APRIL 16, 2007 FOR THE FIELDS OF CANTERBURY REGARDING M.T.E.M.C. OVERHEAD POWER LINES.
5. BY SCALED MAP LOCATION AND GRAPHIC PLOTTING ONLY, THE PROPERTY LIES WITHIN FLOOD ZONE "X", AS DESIGNATED ON CURRENT FEDERAL EMERGENCY MANAGEMENT AGENCY MAPS NO. 47187C0355F, WITH AN EFFECTIVE DATE OF SEPTEMBER 29, 2006, WHICH MAKES UP A PART OF THE NATIONAL FLOOD INSURANCE ADMINISTRATION REPORT; COMMUNITY NO. 470424, PANEL NO. 0355, SUFFIX F, WHICH IS THE CURRENT FLOOD INSURANCE RATE MAP FOR THE COMMUNITY IN WHICH SAID PREMISES IS SITUATED. SAID MAP DEFINES ZONE "X" UNDER OTHER AREAS" AS "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN."
6. THIS SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. ABOVE GRADE AND UNDERGROUND UTILITIES SHOWN WERE TAKEN FROM VISIBLE APPURTENANCES, PUBLIC RECORDS, AND/OR MAPS PREPARED BY OTHERS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THEREFORE, RELIANCE UPON THE TYPE, SIZE AND LOCATION OF UTILITIES SHOWN SHOULD BE DONE SO WITH THIS CIRCUMSTANCE CONSIDERED. DETAILED VERIFICATION OF EXISTENCE, LOCATION AND DEPTH SHOULD ALSO BE MADE PRIOR TO ANY DECISION RELATIVE THERETO IS MADE. AVAILABILITY AND COST OF SERVICE SHOULD BE CONFIRMED WITH THE APPROPRIATE UTILITY COMPANY. IN TENNESSEE, IT IS A REQUIREMENT, PER "THE UNDERGROUND UTILITY DAMAGE PREVENTION ACT", THAT ANYONE WHO ENGAGES IN EXCAVATION MUST NOTIFY ALL KNOWN UNDERGROUND UTILITY OWNERS NO LESS THAN THREE (3) NOR MORE THAN TEN (10) WORKING DAYS PRIOR TO THE DATE OF THEIR INTENT TO EXCAVATE AND ALSO TO AVOID ANY POSSIBLE HAZARD OR CONFLICT. TENNESSEE ONE CALL, DIAL 811.
7. DOMESTIC WATER SUPPLY INFORMATION TAKEN FROM PLANS FOR HB&TS BY JAMES C. HAILEY AND CO., DATED JULY 21, 2016.
8. HOMEOWNER'S ASSOCIATION WILL BE RESPONSIBLE FOR LONG TERM OPERATION AND MAINTENANCE OF STORMWATER INFRASTRUCTURE LOCATED IN DRAINAGE EASEMENTS AND ALL OPEN SPACE, INCLUDING LANDSCAPE AND DETENTION/RETENTION AREAS.
9. ALL SIDEWALKS, PUBLIC STREETS AND DRAINAGE STRUCTURES WITHIN THE RIGHTS–OF–WAY WILL BE MAINTAINED BY THE TOWN OF THOMPSON'S STATION.
10. LOTS SHOWN THUS (*) ARE DESIGNATED AS CRITICAL LOTS AND HAVE NATURAL SLOPES IN EXCESS OF 15%. PER SECTION 3.3.7 OF THE LAND DEVELOPMENT ORDINANCE (SUBDIVISION REGULATIONS) PRIOR TO THE ISSUANCE OF A BUILDING PERMIT, A SITE GRADING PLAN FOR DEVELOPMENT OF THE LOT SHALL BE SUBMITTED ADDRESSING SITE SPECIFIC NATURAL RESOURCE ISSUES TO THE TOWN OF THOMPSON'S STATION FOR REVIEW AND APPROVAL. NO BUILDING PERMIT WILL BE ISSUED ON SAID LOTS UNTIL AND UNLESS THE TOWN ENGINEER HAS RECEIVED AND APPROVED THE SITE PLAN.
11. I HEREBY STATE THAT THIS SURVEY WAS DONE IN COMPLIANCE WITH THE CURRENT TENNESSEE MINIMUM STANDARDS OF PRACTICE AND THIS IS A CATEGORY I SURVEY AND THE RATIO OF PRECISION OF THE UNADJUSTED SURVEY IS 1:18,845.
12. BY: _____ DATE: 6/15/18
    JOHN T. DARNALL, TN RLS #1571
13. ALL OPEN SPACE IS A PUBLIC UTILITY AND DRAINAGE EASEMENT.

PROPERTY MAP REFERENCE

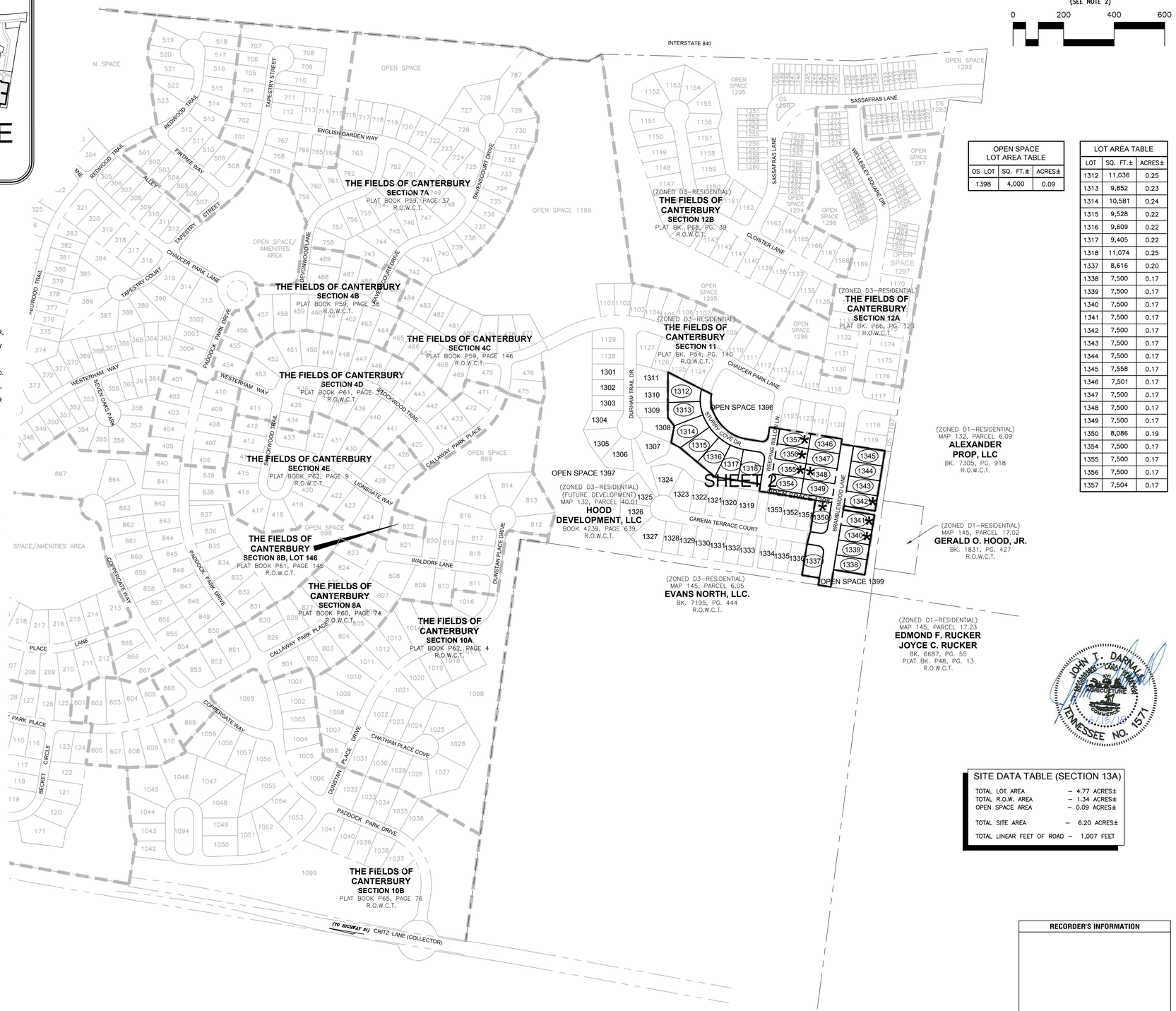
BEING A PORTION OF PARCEL NUMBER 40.01 AS SHOWN ON WILLIAMSON COUNTY PROPERTY MAP NUMBER 132.

DEED REFERENCE

BEING A PORTION OF THE SAME PROPERTY CONVEYED TO HOOD DEVELOPMENT, LLC (HOOD SINGLE DEVELOPMENT, LLC HAVING SINCE MERGED INTO HOOD DEVELOPMENT, LLC BY MERGER OF RECORD IN BOOK 5481, PAGE 558) BY DEED OF RECORD IN BOOK 4239, PAGE 639, REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TENNESSEE.

LEGEND

R.O.W.C.T.	REGISTER'S OFFICE WILLIAMSON COUNTY, TENNESSEE
*	CRITICAL LOT (SEE NOTE 10)
OS	OPEN SPACE



OPEN SPACE LOT AREA TABLE		
OS LOT	SQ. FT.±	ACRES±
1398	4,000	0.09

LOT AREA TABLE		
LOT	SQ. FT.±	ACRES±
1312	11,036	0.25
1313	9,852	0.23
1314	10,581	0.24
1315	9,528	0.22
1316	9,609	0.22
1317	9,405	0.22
1318	11,074	0.25
1337	8,616	0.20
1338	7,500	0.17
1339	7,500	0.17
1340	7,500	0.17
1341	7,500	0.17
1342	7,500	0.17
1343	7,500	0.17
1344	7,500	0.17
1345	7,558	0.17
1346	7,501	0.17
1347	7,500	0.17
1348	7,500	0.17
1349	7,500	0.17
1350	8,086	0.19
1354	7,500	0.17
1355	7,500	0.17
1356	7,500	0.17
1357	7,504	0.17

SITE DATA TABLE (SECTION 13A)		
TOTAL LOT AREA	–	4.77 ACRES±
TOTAL R.O.W. AREA	–	1.34 ACRES±
OPEN SPACE AREA	–	0.09 ACRES±
TOTAL SITE AREA	–	6.20 ACRES±
TOTAL LINEAR FEET OF ROAD	–	1,007 FEET

TOTAL SITE AREA = 270,083 SQUARE FEET OR 6.20 ACRES ±

RECORDER'S INFORMATION

CERTIFICATE OF OWNERSHIP & DEDICATION

I (WE) HEREBY CERTIFY THAT I AM (WE ARE) THE OWNER(S) OF THE PROPERTY SHOWN AND DESCRIBED HEREON AS EVIDENCED IN BOOK 4239, PAGE 639, R.O.W.C., AND THAT I (WE) HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY (OUR) FREE CONSENT, ESTABLISH THE MINIMUM BUILDING RESTRICTION LINE, AND THAT OFFERS OF IRREVOCABLE DEDICATION FOR ALL PUBLIC STREETS, UTILITIES AND OTHER FACILITIES HAVE BEEN FILED AS REQUIRED BY THESE REGULATIONS.

_____, 20__
DATE

HOOD DEVELOPMENT, LLC

TITLE: _____

CERTIFICATE OF ACCURACY

I HEREBY CERTIFY THAT THE PLAN SHOWN AND DESCRIBED HEREON IS A TRUE AND CORRECT SURVEY TO THE ACCURACY REQUIRED BY THE THOMPSON'S STATION MUNICIPAL PLANNING COMMISSION AND THAT THE MONUMENTS HAVE BEEN OR WILL BE PLACED AS SHOWN HEREON TO THE SPECIFICATIONS OF THE SUBDIVISION REGULATIONS, AS APPROVED BY THE TOWN ENGINEER. THIS IS A CATEGORY 1 SURVEY AND THE RATIO OF PRECISION OF THE UNADJUSTED SURVEY IS GREATER THAN 1:10000 AS SHOWN HEREON.

RAGAN – SMITH – ASSOCIATES, INC.

6/15/18
DATE

JOHN T. DARNALL, RLS NO. 1571

CERTIFICATE OF APPROVAL OF UTILITY SYSTEMS

I HEREBY CERTIFY THAT THE FOLLOWING UTILITY SYSTEMS OUTLINED OR INDICATED ON THE PLAN SHOWN HEREON HAVE BEEN INSTALLED IN ACCORDANCE WITH CURRENT LOCAL AND/OR STATE GOVERNMENT REQUIREMENTS OR THAT A SURETY BOND HAS BEEN POSTED WITH THE PLANNING COMMISSION TO ASSURE COMPLETION OF ALL REQUIRED IMPROVEMENTS IN CASE OF DEFAULT. ALSO, I CERTIFY THAT THE HYDRAULIC DESIGN CRITERIA SPECIFIED IN SECTION 3–106 OF THE THOMPSON'S STATION SUBDIVISION REGULATIONS HAVE BEEN MET.

WATER SYSTEM

_____
DATE

HB&TS UTILITY DISTRICT GENERAL MANAGER

SEWER SYSTEM

_____
DATE

NAME, TITLE, AND AGENCY OF AUTHORIZED APPROVING AGENT

CERTIFICATION OF THE APPROVAL OF STREETS

I HEREBY CERTIFY: (1) THAT ALL STREETS DESIGNATED ON THIS FINAL SUBDIVISION PLAT HAVE BEEN INSTALLED IN AN ACCEPTABLE MANNER AND ACCORDING TO THOMPSON'S STATION'S SUBDIVISION REGULATIONS, OR (2) THAT A SURETY BOND HAS BEEN POSTED WITH THE PLANNING COMMISSION TO ASSURE COMPLETION OF ALL REQUIRED IMPROVEMENTS IN CASE OF DEFAULT.

_____
DATE

TOWN ENGINEER

CERTIFICATE OF APPROVAL OF MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORPORATION

I HEREBY CERTIFY THAT THE REQUIREMENTS SET FORTH IN RULES, REGULATIONS, BY–LAWS, POLICY AND OPERATIONAL BULLETINS, PLAT APPROVAL CHECKLIST AND TREE PLANTING GUIDELINES HAVE BEEN MET FOR MTEMC. ANY APPROVAL IS AT ALL TIMES CONTINGENT UPON CONTINUING COMPLIANCE WITH THE AFOREMENTIONED REQUIREMENTS.

_____
DATE

MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORPORATION

CERTIFICATE OF APPROVAL FOR RECORDING

I HEREBY CERTIFY THAT THE SUBDIVISION PLAT SHOWN HEREON HAS BEEN FOUND TO COMPLY WITH THOMPSON'S STATION SUBDIVISION REGULATIONS WITH THE EXCEPTION OF SUCH VARIANCES, IF ANY, AS ARE NOTED IN THE MINUTES OF THE PLANNING COMMISSION AND THAT IT HAS BEEN APPROVED FOR RECORDING IN THE OFFICE OF THE COUNTY REGISTER.

_____
DATE:

SECRETARY OF PLANNING COMMISSION

CERTIFICATE OF APPROVAL OF SUBDIVISION NAME AND STREET NAMES

I DO HEREBY CERTIFY THAT THE SUBDIVISION NAME AND STREET NAMES DENOTED ON THIS FINAL PLAT HAVE BEEN APPROVED BY THE WILLIAMSON COUNTY EMERGENCY COMMUNICATIONS AGENCY.

_____
DATE

WILLIAMSON COUNTY PUBLIC SAFETY

CERTIFICATE FOR ADDRESSES

I DO HEREBY CERTIFY THAT THE ADDRESSES DENOTED ON THIS FINAL PLAT ARE THOSE ASSIGNED BY DEPARTMENT OF INFORMATION TECHNOLOGY (IT).

_____
DATE

IT DEPT. E–911 ADDRESSING COORDINATOR

FINAL PLAT

THE FIELDS OF CANTERBURY

SECTION 13A

LOTS 1312-1318, 1337-1350, 1354-1357, AND OPEN SPACE 1398

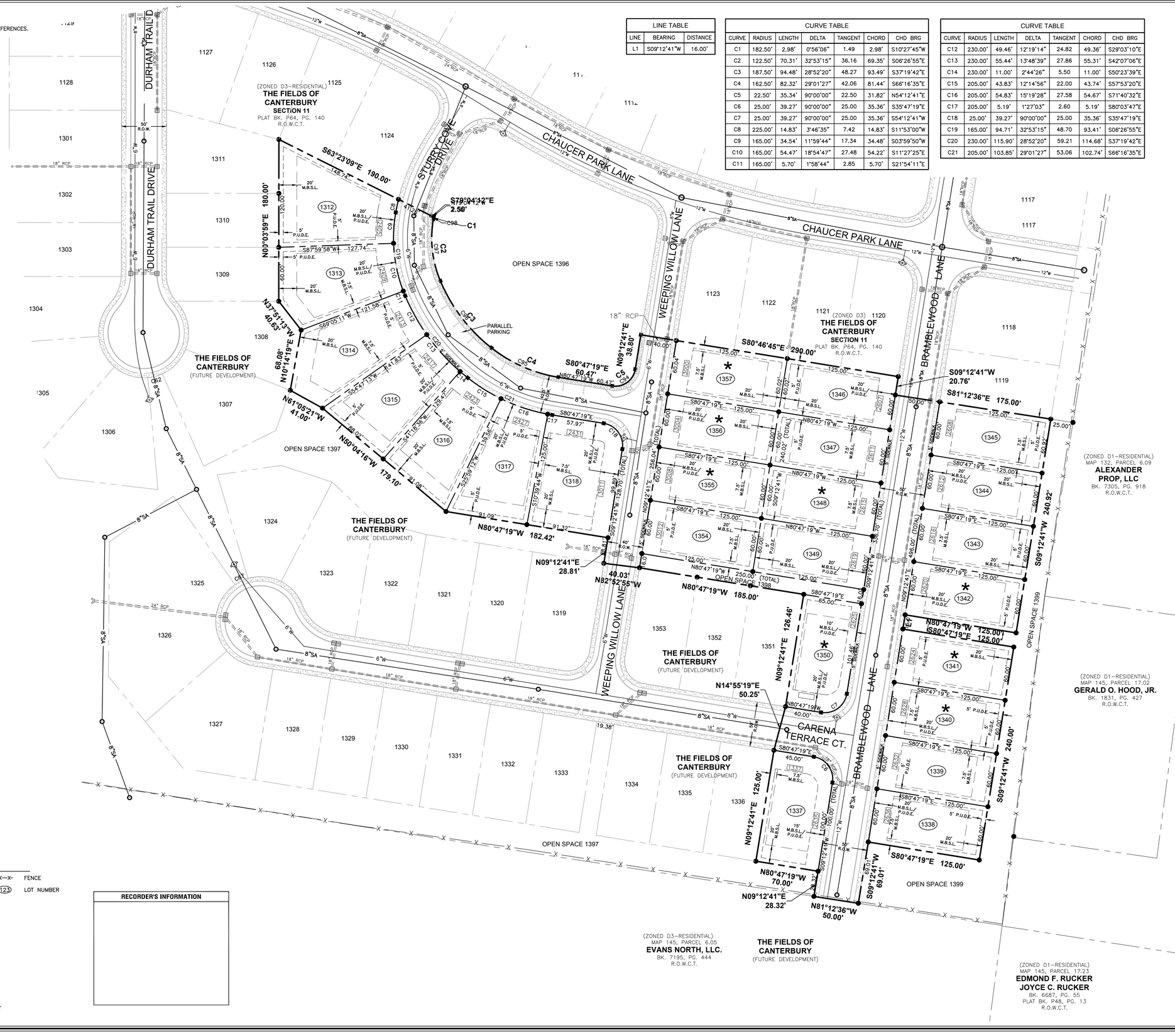
11TH CIVIL DISTRICT OF WILLIAMSON COUNTY,
TOWN OF THOMPSON'S STATION, TENNESSEE

DATE: JUNE 15, 2018 SCALE: 1"=200'
JOB NO. 05–043 W.O. 7878

OWNER / DEVELOPER
HOOD DEVELOPMENT, LLC
C/O PRESTON INGRAM
121 FIRST AVENUE SOUTH, SUITE 210
FRANKLIN, TENNESSEE 37064
(615) 794–6401

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
315 WOODLAND ST. P.O. BOX 60070 NASHVILLE, TN. 37206
(615) 244-8591 FAX (615)244-6739 tdarnall@ragansmith.com
CONTACT: TOM DARNALL, RLS

G:\05043-7878\1-SURVEY\PLATS\FINAL\SECTION 13A\7878 SEC 13A FINAL PLAT.DWG
PLOTTED BY AMANDA REED ON 6/14/2018 8:01 AM LAST UPDATED BY AMR ON 6/5/2018 1:35 PM



GENERAL NOTES
1. SEE SHEET 1 OF 2 FOR NOTES, AREAS, AND REFERENCES.

LINE TABLE		
LINE	BEARING	DISTANCE
L1	S09°12'41"W	16.00'

CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C1	182.50'	2.98'	0°56'06"	1.49	2.98'	S10°27'45"W
C2	122.50'	70.31'	32°53'15"	36.16	69.35'	S06°26'55"E
C3	187.50'	94.48'	28°52'20"	48.27	93.49'	S37°19'42"E
C4	162.50'	82.32'	29°01'27"	42.06	81.44'	S66°16'35"E
C5	22.50'	35.34'	90°00'00"	22.50	31.82'	N54°12'41"E
C6	25.00'	39.27'	90°00'00"	25.00	35.36'	S35°47'19"E
C7	25.00'	39.27'	90°00'00"	25.00	35.36'	S54°12'41"W
C8	225.00'	14.83'	3°46'35"	7.42	14.83'	S11°53'00"W
C9	165.00'	34.54'	11°59'44"	17.34	34.48'	S03°59'50"W
C10	165.00'	54.47'	18°54'47"	27.48	54.22'	S11°27'25"E
C11	165.00'	5.70'	1°58'44"	2.85	5.70'	S21°54'11"E

CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C12	230.00'	49.46'	12°19'14"	24.82	49.36'	S29°03'10"E
C13	230.00'	55.44'	13°48'39"	27.86	55.31'	S42°07'06"E
C14	230.00'	11.00'	2°44'26"	5.50	11.00'	S50°23'39"E
C15	205.00'	43.83'	12°14'56"	22.00	43.74'	S57°53'20"E
C16	205.00'	54.83'	15°19'28"	27.58	54.67'	S71°40'32"E
C17	205.00'	5.19'	1°27'03"	2.60	5.19'	S80°03'47"E
C18	25.00'	39.27'	90°00'00"	25.00	35.36'	S35°47'19"E
C19	165.00'	94.71'	32°53'15"	48.70	93.41'	S06°26'55"E
C20	230.00'	115.90'	28°52'20"	59.21	114.68'	S37°19'42"E
C21	205.00'	103.85'	29°01'27"	53.06	102.74'	S66°16'35"E

JOHN T. DARNALL
TENNESSEE NO. 1571
6/15/18

LEGEND

●	IRON ROD (NEW) (1/2" X 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")	-X—X-	FENCE
■	MONUMENT (NEW) (4" DIAMETER ALUMINUM DISC W/ 1/2" IRON ROD MARKED "RAGAN-SMITH ASSOCIATES")	(123)	LOT NUMBER
RCP ====	REINFORCED CONCRETE PIPE		
▤	CATCH BASIN		
◎	SANITARY SEWER MANHOLE		
—SA—	SANITARY SEWER LINE		
—W—	WATER LINE		
⊕	FIRE HYDRANT		
⋈	WATER VALVE		
R.O.W.	RIGHT-OF-WAY		
R.O.W.C.T.	REGISTER'S OFFICE WILLIAMSON COUNTY, TENNESSEE		
P.U.D.E.	PUBLIC UTILITY & DRAINAGE EASEMENT		
M.B.S.L.	MINIMUM BUILDING SETBACK LINE		

RECORDER'S INFORMATION

G:\05043-7878\1-SURVEY\PLATS\FINAL\SECTION 13A\7878 SEC 13A FINAL PLAT.DWG
PLOTTED BY AMANDA REED ON: 6/14/2018 7:58 AM LAST UPDATED BY AMR ON: 6/5/2018 1:35 PM

FINAL PLAT

**THE FIELDS
OF
CANTERBURY**

**SECTION 13A
LOTS 1312-1318, 1337-1350,
1354-1357, AND OPEN SPACE 1398**

11TH CIVIL DISTRICT OF WILLIAMSON COUNTY,
TOWN OF THOMPSON'S STATION, TENNESSEE

DATE: JUNE 15, 2018 SCALE: 1"=50'
JOB NO. 05-043 W.O. 7878

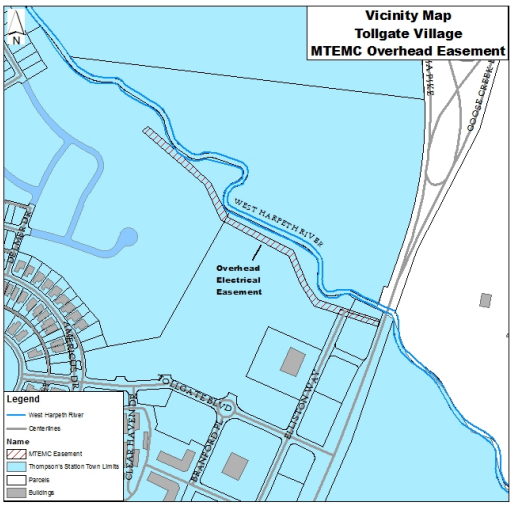
OWNER / DEVELOPER
HOOD DEVELOPMENT, LLC
C/O PRESTON INGRAM
121 FIRST AVENUE SOUTH, SUITE 210
FRANKLIN, TENNESSEE 37064
(615) 794-6401

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
315 WOODLAND ST. P.O. BOX 60070 NASHVILLE, TN. 37206
(615) 244-8591 FAX (615)244-6739 tdarnall@ragansmith.com
CONTACT: TOM DARNALL, RLS

Thompson's Station Planning Commission
Staff Report – Item 5 (File: SP 2018-004)
July 24, 2018
A site plan request for the installation of electric lines within Tollgate Village in phases 16 and 17.

PROJECT DESCRIPTION

Ragan Smith has submitted a proposal for the installation/expansion of electric lines through phases 16 and 17 of Tollgate Village.



BACKGROUND

Electricity is provided to Tollgate Village by Middle Tennessee Electric Membership Corporation (MTEMC). Based upon a recent submittal from the developer of Tollgate Village, it was determined that additional lines are necessary to provide electricity to the neighborhood. Therefore, the developer has submitted a plan to install a new line along the north side of the project area in proximity to the West Harpeth River to provide this service to future phases of Tollgate.

ANALYSIS

The LDO states in Section 3.12.3 of the LDO that "all electrical and communication service lines located within any subdivision approved under authority of these regulations shall be placed underground." The proposed lines, as submitted are above ground lines and therefore not permitted by the Town's Land Development Ordinance. The utility is necessary for the subdivision; however, Staff recommends that the expansion be completed in accordance with the Town's codes. Therefore, Staff recommends a contingency to require that the utility be placed underground.

RECOMMENDATION

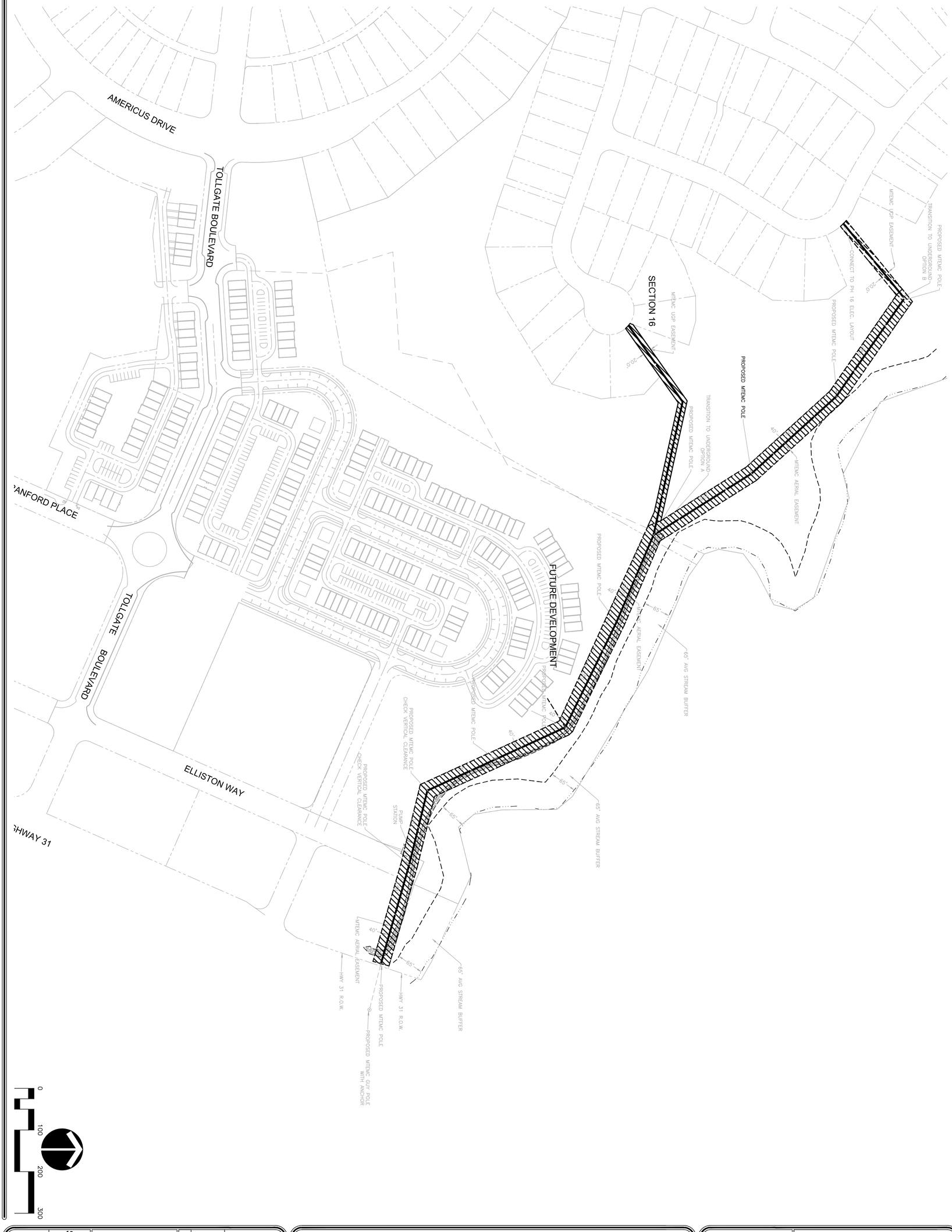
Based on the need to provide adequate service to existing and future residents, Staff recommends that the Planning Commission approve the proposal to install the electric line with the following contingency:

1. All electrical lines installation/expansion within the Tollgate Village subdivision shall be installed underground.

ATTACHMENTS

MTEMC Secondary Feed Exhibit

G:\10081-9260\1-SURVEY\ALTA\2018 MSBC ALTA REMAINDER\MTEMC SECONDARY FEED.DWG
PLOTTED BY AMANDA REED ON 7/17/2018 9:53 AM LAST UPDATED BY WCA ON 6/18/2018 11:58 AM



1.0

MTEMC SECONDARY FEED EXHIBIT

JOB NO.	WK. ORDER
10081	9260
DESIGNED:	LJK
DRAWN:	WCA
SCALE:	1"=100'
DATE:	6/14/2018

REV. #	DATE:	DESCRIPTION:
-	–	–
-	–	–
-	–	–
-	–	–
-	–	–
-	–	–

MTEMC SECONDARY FEED

FOR

TOLLGATE VILLAGE

THOMPSON STATION, WILLIAMSON COUNTY, TN

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
NASHVILLE
315 WOODLAND STREET
P.O. BOX 60070
NASHVILLE, TN. 37206
(615) 244-8591
CHATTANOOGA
1410 COWART STREET
SUITE 200
CHATTANOOGA, TN 37408
(423) 490-9400
• www.ragansmith.com •