

ORDINANCE 20-21

AN ORDINANCE AMENDING ORDINANCE NO. 18-21, ADOPTED AUGUST 20, 2018, BY CHANGING THE ZONING CLASSIFICATION OF APPROXIMATELY 50.6 ACRES OF LAND FROM I-1, LIGHT INDUSTRIAL, TO PLANNED DEVELOPMENT (PDP 889-2020), WITH THE UNDERLYING BASE DISTRICT OF C-4, AND ADOPTING THE PRELIMINARY PLAN FOR SPRING HILL TOWN CROSSING, BEING TAX MAP 027, PARCEL 026.00.

WHEREAS, the City of Spring Hill Zoning Ordinance, adopted via ordinance 18-21, authorizes the Planning Commission to make recommendations on Planned Development applications to the Board of Mayor and Alderman; and

WHEREAS, the Planning Commission reviewed Planned Development application PDP 889-2020, Spring Hill Town Crossing Mixed Use Development, at its October 12, 2020 regularly scheduled meeting; and

WHEREAS, the Planning Commission determined that the application met the minimum requirements and approval standards for a Planned Development contained in Article 13.5 of the Unified Development Code; and

WHEREAS, the Planning Commission recommended, by a vote of 6-0, approval of Planned Development application PDP 889-2020, Spring Hill Town Crossing, with conditions; and

WHEREAS, the Board of Mayor and Aldermen find that Planned Development application PDP 889-2020, Spring Hill Town Crossing, meets the requirements and approval standards contained in Article 13.5 of the Unified Development Code, the same being the Zoning Ordinance for the City of Spring Hill; and

WHEREAS, The City of Spring Hill Board of Mayor and Alderman desires to rezone the subject property from I-1, Light Industrial, to Planned Development (PD) and approve the Preliminary Plan for Spring Hill Town Crossing.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY OF SPRING HILL, TENNESSEE, BOARD OF MAYOR AND ALDERMEN, WHILE IN REGULAR SESSION ON THE 16th DAY OF February, 2021 as follows:

SECTION 1: REZONING. Zoning Ordinance No. 18-21 (Zoning Map), adopted August 20, 2018, be and is hereby amended by rezoning those certain parcels of real property known as Spring Hill Town Crossing, described below and as shown in the attached exhibits, from I-1 to Planned Development (PD) subject to the underlying base zoning classification of C-4 as designated therein.

In the State of Tennessee, County of Maury, City of Spring Hill, and being more particularly described as follows:

Maury County Tax Map 027, Parcel 026.00 consisting of approximately 50.6 acres.

SECTION 2: EXHIBITS. The Preliminary Plan for Spring Hill Town Crossing shall consist of the following Exhibits all dated October 5, 2020:

Exhibit A: Preliminary Plans – Spring Hill Town Crossing, by Kimley-Horn, dated Oct. 5, 2020

Exhibit B: Vision Book for Spring Hill Town Crossing, by Kimley-Horn, dated Oct. 5, 2020

Exhibit C: Planned Development (PD) Criteria Request, by Kimley-Horn, dated Oct. 5, 2020

Exhibit D: Public Utility & Roadway Infrastructure Phasing, by Kimley-Horn, dated Oct. 5, 2020

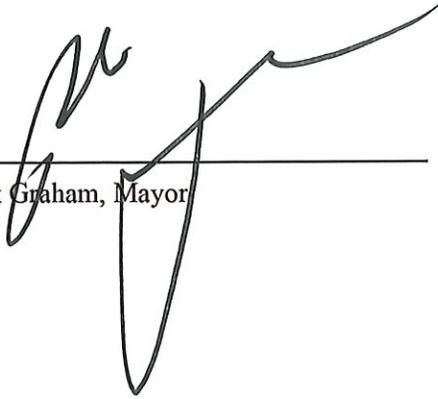
Except as modified herein and explicitly on the approved Preliminary Master Plan (Exhibit A-D), the Spring Hill Town Crossing PD shall comply with the requirements of the underlying C-4 and R-7 (multi-family site) zoning districts, in Ordinance 18-21, (Zoning Ordinance) as amended, be in substantial conformance with Exhibits A-D attached hereto, all other applicable rules, regulations and ordinances of the City of Spring Hill, as well as the following conditions:

1. Applicant is to construct and implement all recommendations of the traffic impact study.
2. Any modifications proposed to the existing floodway/flood plain shall require Tennessee Department of Environment and Conservation review, approval and permitting with copies of all documentation being provided to the City of Spring Hill.
3. Metal panel siding shall be limited to a maximum of 20% of any façade unless greater allowances are requested and approved by the Planning Commission during site plan review.
4. The property owner/developer of Spring Hill Town Crossing shall acquire the land required to construct Jim Warren Parkway eastward for the purpose of making a road connection to Old Port Royal Road/Jim Warren Road in Phase 2 of the project. The property owner/developer shall also upon closing on the property submit a petition to annex the property and then include said property in the right-of-way dedication plat required to dedicate the new Jim Warren Parkway.

SECTION 3: PUBLIC HEARING. The zoning change was the subject of a public hearing held on February 16, 2021

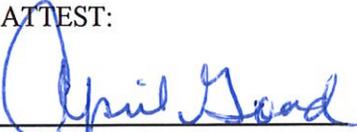
BE IT FURTHER ORDAINED

In case of conflict between this ordinance or any part hereof, and the whole part of any existing ordinance of the City, the conflicting ordinance is repealed to the extent of the conflict but no further. If any section, clause, or provision or portion of this ordinance is held to be invalid or unconstitutional by any court of competent jurisdiction, such holding shall not affect any other section, clause, or provision or portion of this ordinance.



Rick Graham, Mayor

ATTEST:



April Goad, City Recorder

LEGAL FORM APPROVED:



Patrick Carter, City Attorney

Passed on First Reading: January 19, 2021

Passed on Second Reading: February 16, 2021

DATE: February 16, 2021
TO: Board of Mayor and Aldermen (BOMA)
FROM: Austin Page, Associate Planner
SUBJECT: PDP 889-2020 (Spring Hill Town Crossing)
Ordinance No. 20-21 – 2nd Reading



PDP 889-2020: Submitted by Kimley-Horn for Spring Hill Town Crossing. The property is currently zoned I-1, contains approximately 50.6 acres, and is located at the southeast corner of Port Royal Road and Saturn Parkway. The applicant requests Planned Development Preliminary Plan approval for a mixed-use development with a C-4 based zoning. Multi-family is requested per the R-7 district. Requested by Josh Rowland of Kimley-Horn.

Plan Update: Exhibit A has been modified and includes the preliminary plans that were acted upon by the Planning Commission at their October 12, 2020, Regular Meeting.

Exhibit A.1 has been provided by the applicant following the action by the Planning Commission. This Exhibit is separate from the plan package approved by the Planning Commission, and is being provided by the applicant's representative for consideration, should the Board of Mayor and Alderman desire to incorporate the updated plan as a plan element of the Planned Development Preliminary Plan. Staff has also provided the applicant's correspondence from MTEMC, which is attached to this report.

In the event that the Board of Mayor and Alderman elects to incorporate the updated utility plan, as provided as Exhibit A.1, the BOMA will need to amend Ordinance No. 20-1, adding the Exhibit into the overall Planned Development Preliminary Plan.

Planning Commission Recommendation: The Planning Commission considered this request at their meeting on October 12, 2020, and a motion to recommend approval of the rezoning request was approved by a 6-0 vote (PC Resolution 20-99).

Property Description and History: The subject site is currently zoned I-1 and is located on the eastern side of Port Royal Road, directly to the south of Saturn Parkway. While the property has frontage on Port Royal Road and Old Port Royal Road, there is no existing roadway connecting the two ends of the property or providing internal access. The concept plan proposes the construction of a new arterial road named Jim Warren Parkway, which connects Port Royal Road and Jim Warren Road, along the southern edge of the property. A planned development concept plan (PDC 821-2020) was reviewed by the Planning Commission at the April 27, 2020, Work Session and May 11, 2020, Regular Meeting. The concept plan proposed a C-G base zoning which has since been changed to C-4.

Spring Hill Rising: 2040: The future land use classification for this site is Innovation Area which describes the purpose of the area as follows:

Innovation Areas accommodate a concentration of regional medical, technology, research facilities and ancillary uses. This area incorporates transit-oriented development principles and design. Building development should be variable to promote the specific needs of an area that accommodates a variety of scale and building design that supports the goal of encouraging a walkable development form, and mixed-use opportunities are encouraged. Appropriate landscaping and open space between buildings and adjacent land uses should be provided to enhance the appearance of the area and buffer

negative visual and noise impacts of activity within these areas on surrounding areas. Open space should be retained and landscaping incorporated into site design and parking areas. Front-yard parking should be discouraged. Future development should reflect unified a development pattern that includes connectivity between uses with moderate density and intensity. Primary future and uses include technology ad research centers, hospitals, clinics, specialized medical offices, professional offices, restaurants, lodging, and municipal services.

While the proposed mixed-use project is not completely aligned with the primary emphasis of “medical, technology, and research” mentioned above, the applicant is proposing a mixed-use development that aligns with several design and use considerations of the property’s future land use designation. Uses include lodging, restaurants, and possible medical/professional offices of a small scale. Housing is also recognized in the Innovation Area. The site design includes extensive pedestrian paths and open space.

The 2040 Plan has identified a large number of acres as Innovation Area. This use classification parallels a significant portion of Saturn Parkway and extends east of I-65. The recently considered land use map revisions from the Planning Commission recommend classifying Northfield and land owned by the Industrial Development Board of Maury County to Innovation Area. The location of this property at a major intersection of Saturn Parkway and Port Royal Road makes it attractive for a mixed-use project. Commercial in this area will reduce the number of cross Saturn Parkway trips for residents living south of the freeway and reduce congestion on Port Royal Road.

Analysis: The Planned Development preliminary plan proposes the following mix of uses:

- 48,500 square feet of grocery space
- 4,500 square feet of gas station/convenience store with 20 gas pumps
- 5,000 square feet of out parcel restaurant space
- 4,500 square feet of drive-thru restaurant space
- 12,500 square feet of retail space
- 11,000 sf of office and retail space
- 334 multi-family apartments at 18 du/ac
- 120-room hotel

This development anticipates a build-out period projected around mid-2023.

Staff believes the commercial/residential mix is a reasonable request for the subject property and location. All of the requested uses are currently permitted in the C-4 district (base zone requested), with the exception of multi-family dwellings. Drive-throughs are considered a special use in the C-4 zoning district and are requested to be allowed by right for Lot 3. A car wash was previously proposed but is not presently noted on the plans. This request is to allow all uses specifically identified on Sheet C2-00 in the lot table by right as part of this development. More information on these uses is provided below.

Streets and Sidewalk: Although off-site improvements are still being discussed, the project proposes to make improvements to Port Royal Road and to construct a new arterial street, named Jim Warren Parkway. The new road will run from Port Royal Road to Old Port Royal Road South, offering a connection to Jim Warren Road. The proposed road is just over a half-mile in length and proposes a three-lane cross-section with bike lanes.

Internal sidewalks are provided throughout the site. The four driveways that connect to the future arterial road, Jim Warren Parkway, are shown as 25’ wide and include two lanes (one in and one out). A “Main Street” is provided with dual entry and exit lanes separated by a median.

Access: The site abuts Port Royal Road and Old Port Royal Road South. The concept plan shows the site having four access points off of Jim Warren Road. The applicant has explained to staff that the delivery

trucks will enter the site through the middle access road via Jim Warren Parkway and exit the site to the west. No access is proposed to Old Port Royal Road South.

Uses, Bulk Area Regulations: This site is currently zoned I-1, but if rezoned will be subject to the C-4 District's use, zoning, and bulk and area requirements, except as explicitly modified by the approved PD Master Plan. The applicant has provided a document (PD Criteria Request) which outlines the areas of the UDC they are requesting relief or waiver from. These modifications and waivers are attached as Exhibit C, and are generally outlined in the table on Sheet C2-00, and listed below. Staff comments, where applicable, are provided below (*italicized*).

1. UDC Section 4.3 – (R-7) Multi-family District Residential Dimensional Standards

- Maximum Building Length - Multi-Family Structure
 - Per UDC: 175'
 - PD Request: 325' – as shown on the Preliminary Plan for a continuous building footprint in one direction, to provide an urban style multifamily product that reinforces a mixed-use development pattern
 - *This is a typical request since the UDC was adopted. Extended building lengths have been approved in the past.*
- Maximum Building Height
 - Per UDC: 50'
 - PD Request: 60' and four (4) floors maximum – to allow for a taller ground level that reinforces the mixed-use development pattern
 - *Within the C-4 District heights are permitted up to 75' provided proper separation from residential zoning and a stepped setback. In this case, the context is that the residential seeks additional height adjacent to commercial uses. Setbacks from commercial buildings are sufficient.*
- Maximum Impervious Surface
 - Per UDC: 70% of development site
 - PD Request: 85% of development - to allow for an urban style multifamily project that reinforces a mixed-use development pattern
 - *Applicant seeks higher ISR (impervious surface ratio) for individual lots. Offers partial justification based on open space preserved to the east and south borders of the site.*
- Minimum Interior Side Setback
 - Per UDC: 10' for a two-story building, 20' for a four-story building
 - PD Request: 10' for a four-story building – to allow for the mixed-use development pattern where property lines are closer to the building due to internal driveways and parking areas of adjacent uses

2. UDC Section 5.3 – (C-4) General Commercial Dimensional Standards

- Maximum Building Height
 - Per UDC: 50' or 75' if meeting standards of Section 5.3.C
 - PD Request: 75' – project meets standards of Section 5.3.C as multi-family is a commercial use in the mixed-use development and does not qualify as a “residential lot”
 - *Staff does not view multi-family as a “commercial use” in the mixed-use development, but does not object to the request for additional height.*
- Maximum Impervious Surface
 - Per UDC: 80%
 - PD Request: Provide reduced ISR percentages on individual lots while the project as a whole provides an average ISR of +/- 75% in preserved open space and buffer areas not included in the commercial lots;
 - Lot 1 (Gas & C-Store) – 85%
 - Lot 2 (Restaurant/Standalone) – 85%

- Lot 3 (Restaurant/Drive-thru) – 85%
- Lot 4 (Grocery/Retail) – 90%
- Lot 5 (Hotel) – 90%
- Lot 6 (Multi-family) – 85%
- *Averaging of the ISR across the development indicates that the overall ISR is consistent with the C-4 and R-7 districts as a whole.*

3. UDC Section 8.2 (Table 8-1: Use Matrix for C-4 Zone District – whole site)

- Principal Use – Drive-Through Facility
 - Per UDC: allowed as a Special Use
 - PD Request: allowed as a Permitted Use
- Principal Use – Dwelling Multi-Family
 - Per UDC: use not allowed
 - PD Request: allowed as a Permitted Use
- Principal Use – Public Park
 - Per UDC: use not allowed (*park may not be public, but privately held*)
 - PD Request: allowed as a Permitted Use
- Other uses are permitted in the C-4 District.

4. UDC Section 8.3.K (Principal Use Standards / Dwelling – Multi-Family)

- 1.b.i.(B) Required minimum perimeter yard abutting a street, oriented away from (backing up to) a public street, in this case, Saturn Parkway
 - Per UDC: 25 feet, however, the requirement is only 10 feet per Section 11.7.D when abutting a collector or arterial street, these standards conflict with one another
 - PD Request: 10 feet with required tree and shrub plantings. Given that the nearest travel lane of Saturn Parkway is over 100' from the property line, the smaller of the two standards is appropriate.
 - *Buildings comply with the perimeter yard requirement. Encroachment is due to parking lots.*
- 1.b.ii. (C) Required minimum perimeter yard abutting other zoning districts, in this case C-4/PD
 - Per UDC: 25 feet, assumes the multi-family development is separate from the zoning district that it abuts
 - PD Request: 10 feet; to match the required minimum interior side setback, may contain sidewalks and required landscape yard plantings

5. UDC Section 10.3 Required Off-Street Vehicle Spaces (Table 10-2)

- Dwelling Multi-Family
 - Per UDC: 2 per dwelling unit + 1 visitor space per 8 dwelling units
 - PD Request: PD will meet the required minimum parking, allows for 72 of the required spaces, roughly 10%, to be provided in garages and tandem parking spaces in front of garages. The multi-family operator is required to keep the garage spaces occupied as rental spaces or incentives for an apartment lease.
 - *While staff does not generally support this type of request, if the multi-family manager operates this as stated and the garage spaces are in continuous use, this is supportable.*
- Hotel
 - Per UDC: 2 per room
 - PD Request: 1.5 per room
 - *This request is normal for a hotel and is tagged for a UDC code amendment.*

6. UDC Section 11 Landscape .6. – Interior Parking Lot Landscape

- 11.6.F. Interior Parking Lot Landscape – Minimum Total Landscape Area
 - Per UDC: 10% of the total parking lot area
 - PD Request: The required landscape islands at the ends of parking rows and between 15 or more spaces shall be provided. Remove the minimum 10% landscape requirement for the interior of a parking lot in lieu of the urban park, enhanced streetscape elements, and enhanced landscaping treatments along retail building frontages.
 - *Staff believes that the perimeter landscape strips, parking lot islands, and foundation plantings will provide for a well-landscaped lot.*
- 11.7.C.1. Site Landscape – Landscape strip along interior side lot lines
 - Per UDC: provide a 10' wide landscape strip
 - PD Request: This criterion is waived when the interior side lot line runs along a parking lot area or driveway shared by the adjacent uses as shown on the Preliminary Plan.
 - *This request is reasonable for a common unified development plan.*

7. UDC Section 12.6. Sign Permit Required: Permanent Signs

- 12.6.D.4.b. Freestanding Signs – Multi-Tenant Retail Center (>10 acres)
 - Per UDC: One (1) freestanding sign (20' tall/150 sf area) allowed per entry, total of 3 signs.
 - PD Request: Move sign allowed at entry drive between Lot 1 and 2 to the northeast corner of the intersection of Port Royal Road and Jim Warren Parkway. The sign is required to be placed at least 20' back from a road right-of-way.
 - *The request is much improved from the original submittal. The request now represents a relocation of a permitted sign that otherwise conforms to code. As requested with a 20' setback from adjacent streets, staff supports this request.*

Building & Site Design: The site is designed with all of the development on the north side of the proposed arterial street. A convenience store and gas pumps are located on the far western end of the site. As you move to the east, the development includes two restaurant out parcels and a large parking lot for the strip commercial and grocery store areas. The center of the site contains all of the retail and office space with a central boulevard acting as the main entrance to the site. Directly to the east of the boulevard sits the hotel and the four multi-family related buildings and their associated parking. The eastern side of the site contains a dog park, playground, park space, and a 12' greenway trail. The southeastern corner of the site shows open space and contains existing trees that are to be preserved. The area south of the new arterial street will be improved with trails that are available for public use. The applicant is considering placing the land in a private non-profit trust.

The Vision Book provides allowable materials for each type of use including retail, hotel, and multi-family buildings. Primary building materials include masonry (min. 30%), stone, fiber cement board, engineered wood products, and metal panels. Staff recommends that metal panels be limited to a maximum of 20% of the façade. More details on building architecture and façade materials will be provided with future site plan applications.

Open Space & Amenities: A greenway trail (12') is shown on the eastern side of the site along Aeon Creek and continuing west along the north side of the new arterial street to Port Royal Road. Other amenities include a park, playground and a plaza/seating area. A 6' soft surface nature trail is shown on the south side of the arterial street along with a number of interpretive exhibits along the trail. This trail is within the floodplain and follows the natural area. Amenities shown for the multi-family site include a dog park, pool, and pool house. The applicant has provided information to confirm ADA requirements for non-paved paths.

Landscaping & Buffering: The preliminary plan shows trees along the arterial street, interior drives, parking lot islands, and scattered throughout the development. Existing trees and vegetation are proposed to be preserved along the eastern and southern portions of the site. These are called out on the site layout and need to be clearly labeled on the landscape plan. Little vegetation is existing along Saturn Parkway.

A 10' landscape strip is shown along Saturn Parkway, Port Royal, the western side of the multi-family building adjacent to the hotel and around the restaurant sites on Lot 2. A 15' parking lot perimeter landscape yard has been provided south of the central parking lot along Jim Warren Parkway and just north of the proposed detention area on the multi-family site. Foundation plantings have only been provided along the south façade of the multi-family buildings near the arterial road. Details for each buffer or landscape yard have been provided on the submitted landscape plans. More detailed site plans including, but not limited to; foundation plantings, island plantings and perimeter yards will be reviewed at individual site plan submittals.

The landscaping on the site will follow the requirements of Article 11 of the UDC unless modified by the PD approval. The applicant is also proposing to follow the street frontage landscape requirement below along Saturn Parkway.

- *PD Standard – perimeter landscape yard requirements for parking lots shall be applied to rear loading and service areas to provide additional screening with the following standards: 10' minimum, one (1) shrub every 3'. One (1) canopy tree every 30' or one (1) ornamental tree every 15'.*

Bicycle & Greenway Plan: According to the Spring Hill Bicycle and Greenway Plan, the site is responsible for a section of the Summit Greenway (labeled Saturn Greenway on GIS) at the eastern border of the property and a trailhead sign. The multi-use trail shown on the preliminary plan satisfies this requirement. Trailhead markers have been provided.

A bike lane is to be constructed along Jim Warren Parkway (shown). A multi-use trail is recommended for Port Royal Road. A multi-use trail was requested in front of the commercial development along the north side of the new arterial street and through the park area on the east end of the site along Aeon Creek.

Parking: As part of the planned development, the applicant is requesting changes to the parking requirements for multi-family and hotel uses in the Unified Development Code. This information is presented above. Bicycle parking is required and will need to be addressed in detail at the Planned Development Final Plan submittal for individual parcels.

Phasing: The applicant has provided a Phasing Plan inside of the Spring Hill Town Crossing Vision Book. The Phasing Plan portrays four phases. Phase 1 includes Lot 1 (Gas Station & Convenience Store), as well as the majority of the Jim Warren Parkway. The applicant is proposing the construction of Jim Warren Parkway in 2 phases. Phase 2 includes Lots 2 through 4, which includes all of the commercial uses; i.e., restaurants, grocery, retail and office space, and the remainder of Jim Warren Parkway. Phase 3 includes the multi-family site, as well as the public open space and amenities. The final phase 4 includes the hotel, as well as additional parking. Exhibit D addresses infrastructure phasing and shows the connection to Jim Warren Road taking place with Phase 2.

They have indicated the following general development timeline in their application.

“Spring Hill Town Crossing is anticipated to start development in mid-2021, beginning with development of the commercial parcels. Development of the multifamily project will begin after the commercial development is underway and infrastructure is extended to the rear of the property. The project requires that mass grading and utility improvements for the overall development occur in the first phase as the various parcels share drainage and utility infrastructure. The new public roadway and bridge will be completed prior to opening the grocery, retail and restaurant uses. The project is anticipated to take 2-3 years for full build out.”

Public Utility and Roadway Infrastructure Phasing: The applicant has provided a phasing matrix and public improvements (attached as Exhibit D).

Adequacy of Utilities: Water Service is available to the subject property and is served by an 18” water line along Port Royal Road. The site is located within the City’s Southside Pressure Zone. Modeling Results of Spring Hill’s water system show that with Tanks at 50% capacity (elevation 883), the site (at elevation 690) will see static pressures in the range of 83 psi. The site can also meet Spring Hill’s minimum requirement to flow a 750 gpm fire flow while maintaining 30 psi. Sewer service is also available. The memo for sewer and water is attached to the report.

Traffic Impact Study: The applicant met with City staff to discuss potential traffic impacts associated with the development project. A traffic impact study has been provided and addresses internal vehicular and pedestrian circulation, as well as external impacts upon the surrounding street network. Recommendations from the Traffic Impact Analysis dated September 2020 are as follows:

- Realign Jim Warren Road to intersect Port royal Road approximately 1,200 feet north of its current location, just north of the Aenon Creek bridge.
- Install a traffic signal with protected-southbound left-turn phasing and westbound right-turn overlap phasing.
- Develop and implement coordinated traffic signal timings along Port Royal Road for four (4) traffic signals; reserve Boulevard/North Old Port Royal Road, Saturn Parkway Westbound Ramps, Saturn Parkway Eastbound Ramps and the proposed Jim Warren Road realignment.
- Construct a southbound left-turn lane along Port Royal Road with storage extending approximately 400 feet north to the intersection of Port Royal Road at Saturn Parkway Eastbound Ramps.
- Construct a northbound shared through and right-turn lane along Port Royal Road with 150 feet of storage.
- Construct an additional northbound receiving lane along the northern intersection leg.
- Construct Jim Warren Road with three (3) lanes for vehicular traffic – one (1) westbound left-turn lane, one (1) west bound right-turn lane and one eastbound receiving lane with the westbound left-turn lane extending into the development site as a two-way left-turn lane.

Public Benefit: Page 3 of the Vision Book addresses the public benefits associated with this development. The applicant is also acquiring property to connect the new road to the existing Jim Warren Road.

Public Comments: Staff has received no public comment via the PCPublicComment@springhilltn.org email address.

Submitted Exhibits: The applicant has provided various plans and documents that staff is organizing as Zoning Exhibits to Ordinance 20-21. They include the following:

1. Exhibit A: Preliminary Plans – Spring Hill Town Crossing, by Kimley-Horn, dated Oct. 5, 2020
2. Exhibit B: Vision Book for Spring Hill Town Crossing, by Kimley-Horn, dated Oct. 5, 2020
3. Exhibit C: Planned Development (PD) Criteria Request, by Kimley-Horn, dated Oct. 5, 2020
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In the event that the Board of Mayor and Alderman elects to incorporate the updated utility plan, as provided as Exhibit A.1, the BOMA will need to amend Ordinance No. 20-1, adding the Exhibit into the overall Planned Development Preliminary Plan.

Zoning Map Amendments: Approval standards for zoning map amendments, as found in the Unified Development Code, Article 13, are below:

E. Approval Standards

The Board of Mayor and Aldermen decision on any zoning text or map amendment is a matter of legislative discretion that is not controlled by any particular standard. However, in making their recommendation and decision, the Planning Commission and the Board of Mayor and Aldermen must consider the following standards. The approval of amendments is based on a balancing of these standards.

1. Approval Standards for Map Amendments and Staff narrative.

- a. The consistency of the proposed amendment with the Comprehensive Plan and any adopted land use policies. As stated above, although the mixed-use plan is not perfectly aligned with all recommendations of the 2040 plan, the proposed plan will provide much-needed commercial services to residents on the south side of town. Individual parts of the plan are supported by the Innovation Area designation.*
- b. The compatibility with the existing use and zoning of nearby property. The proposal is compatible with the surrounding and adjacent development.*
- c. The extent to which the proposed amendment creates nonconformities. Staff is not aware of any non-conformities that would be created by the proposed rezoning.*
- d. The trend of development, if any, in the general area of the property in question. Commercial growth is extending into the area and additional rooftops have been approved in the last few years. This is an important development for the city and will be beneficial to area residents.*
- e. That there are no adverse impacts on public health, safety, and welfare. During discussions with other city departments, no adverse impacts to the public health, safety, or welfare have been identified.*
- f. Whether adequate public facilities are available including, but not limited to, schools, parks, police and fire protection, roads, sanitary sewers, storm sewers, and water lines, or are reasonably capable of being provided prior to or concurrent with the development of the site, which would be permitted on the subject property if the amendment were adopted. The development is performing off-site improvements to Port Royal Road and extending a new arterial street. Water and sewer are available to the site.*

Findings: Staff has reviewed the required findings listed above from Section 13.2.E of the UDC and determined that the request is consistent with the required review criteria.

Recommendation: Staff supports and forwards the Planning Commission recommendation for approval via PC Resolution 20-99, subject to the conditions below. If the Board of Mayor and Alderman agrees with this determination approval is recommended.

1. Applicant is to construct and implement all recommendations of the traffic impact study.
2. Any modifications proposed to the existing floodway/flood plain shall require Tennessee Department of Environment and Conservation review, approval, and permitting with copies of all documentation being provided to the City of Spring Hill.

3. Metal panel siding shall be limited to a maximum of 20% of any façade unless greater allowances are requested and approved by the Planning Commission during site plan review.
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SECTION 1: REZONING. Zoning Ordinance No. 18-21 (Zoning Map), adopted August 20, 2018, be and is hereby amended by rezoning those certain parcels of real property known as Spring Hill Town Crossing, described below and as shown in the attached exhibits, from I-1 to Planned Development (PD) subject to the underlying base zoning classification of C-4 as designated therein.

In the State of Tennessee, County of Maury, City of Spring Hill, and being more particularly described as follows:

Maury County Tax Map 027, Parcel 026.00 consisting of approximately 50.6 acres.

SECTION 2: EXHIBITS. The Preliminary Plan for Spring Hill Town Crossing shall consist of the following Exhibits all dated October 5, 2020:

Exhibit A: Preliminary Plans – Spring Hill Town Crossing, by Kimley-Horn, dated Oct. 5, 2020

Exhibit B: Vision Book for Spring Hill Town Crossing, by Kimley-Horn, dated Oct. 5, 2020

Exhibit C: Planned Development (PD) Criteria Request, by Kimley-Horn, dated Oct. 5, 2020

Exhibit D: Public Utility & Roadway Infrastructure Phasing, by Kimley-Horn, dated Oct. 5, 2020

Except as modified herein and explicitly on the approved Preliminary Master Plan (Exhibit A-D), the Spring Hill Town Crossing PD shall comply with the requirements of the underlying C-4 and R-7 (multi-family site) zoning districts, in Ordinance 18-21, (Zoning Ordinance) as amended, be in substantial conformance with Exhibits A-D attached hereto, all other applicable rules, regulations and ordinances of the City of Spring Hill, as well as the following conditions:

1. Applicant is to construct and implement all recommendations of the traffic impact study.
2. Any modifications proposed to the existing floodway/flood plain shall require Tennessee Department of Environment and Conservation review, approval and permitting with copies of all documentation being provided to the City of Spring Hill.
3. Metal panel siding shall be limited to a maximum of 20% of any façade unless greater allowances are requested and approved by the Planning Commission during site plan review.
4. The property owner/developer of Spring Hill Town Crossing shall acquire the land required to construct Jim Warren Parkway eastward for the purpose of making a road connection to Old Port Royal Road/Jim Warren Road in Phase 2 of the project. The property owner/developer shall also upon closing on the property submit a petition to annex the property and then include said property in the right-of-way dedication plat required to dedicate the new Jim Warren Parkway.

SECTION 3: PUBLIC HEARING. The zoning change was the subject of a public hearing held on

_____.

BE IT FURTHER ORDAINED

In case of conflict between this ordinance or any part hereof, and the whole part of any existing ordinance of the City, the conflicting ordinance is repealed to the extent of the conflict but no further. If any section, clause, or provision or portion of this ordinance is held to be invalid or unconstitutional by any court of competent jurisdiction, such holding shall not affect any other section, clause, or provision or portion of this ordinance.

Rick Graham, Mayor

ATTEST:

April Goad, City Recorder

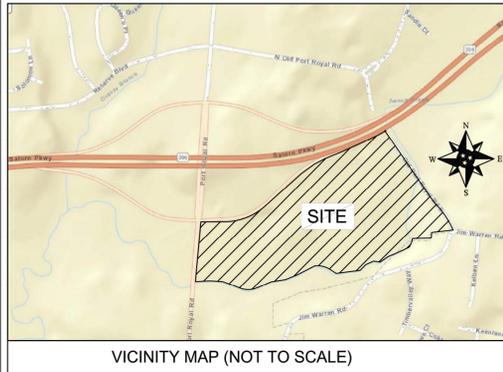
LEGAL FORM APPROVED:

Patrick Carter, City Attorney

Passed on First Reading: January 19, 2021

Passed on Second Reading: _____

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VICINITY MAP (NOT TO SCALE)



THIS SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. ABOVE GRADE AND UNDERGROUND UTILITIES SHOWN WERE TAKEN FROM VISIBLE APPURTENANCES AT THE SITE, 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 (3) THREE NOR MORE THAN (10) TEN WORKING DAYS PRIOR TO THE DATE OF THEIR INTENT TO EXCAVATE AND ALSO TO AVOID ANY POSSIBLE HAZARD OR CONFLICT. TENNESSEE ONE CALL 811.

CURVE	RADIUS	ARC LENGTH	CHORD BEARING	CHORD LENGTH	DELTA ANGLE
C1	800.00'	576.94'	N 67°12'10" E	564.52'	41°19'12"
C2	480.31'	152.81'	N 58°07'32" E	152.17'	18°13'43"

ALTA/NSPS LAND TITLE SURVEY OF THE N. HOUSTON PARKS, ETAL; PROPERTY 3RD CIVIL DISTRICT JIM WARREN ROAD SPRING HILL, MAURY COUNTY, TN

DEED REFERENCE

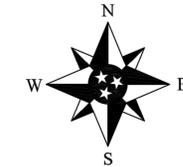
PARCEL 026.00 BEING THE SAME PROPERTY CONVEYED TO N HOUSTON PARKS, ETAL, OF RECORD IN BOOK 2025, PAGE 452 REGISTERS OFFICE MAURY COUNTY, TENNESSEE.

PROPERTY MAP REFERENCE

BEING PARCEL NUMBER 026.00 AS SHOWN ON MAURY COUNTY TAX MAP 027.



OHM ADVISORS
209 10th AVENUE SOUTH
SUITE 154
NASHVILLE, TN 37203
615-649-5264



TENNESSEE GRID NORTH
HORIZONTAL DATUM = NAD83
VERTICAL DATUM = NAVD83
TDOT CORS STATION No. 37



GENERAL NOTES:

- FLOOD LINES SHOWN WERE SCALED FROM MAPS AND ARE APPROXIMATE. NO FLOOD STUDY WAS PERFORMED DURING THIS SURVEY. MAP No. 4719C0185E, APRIL 16, 2007 THEREFORE THIS SURVEY IS SUBJECT TO THE FINDINGS OF AN ACCURATE TITLE SEARCH.
- NO TITLE REPORT FURNISHED TO THIS SURVEYOR.
- PROPERTY CURRENTLY ZONED: AR2A (AGRICULTURAL)
- SUBSURFACE AND ENVIRONMENTAL CONDITIONS WERE NOT EXAMINED OR CONSIDERED AS PART OF THIS SURVEY. NO STATEMENT IS MADE CONCERNING THE EXISTENCE OF UNDERGROUND OR OVERHEAD CONTAINERS OR FACILITIES THAT MAY AFFECT THE USE OR DEVELOPMENT OF THE PARCEL.
- THIS SURVEY WAS COMPLETED TO THE MINIMUM STANDARDS AS REGULATED UNDER THE AUTHORITY OF SECTION 0820-3-.07 OF THE TENNESSEE LAND SURVEYORS LAWS AND REGULATIONS, 2011 EDITION.
- THIS SURVEY WAS PREPARED FOR THE EXCLUSIVE USE OF THE PERSON, PERSONS, OR ENTITY, IF ANY, NAMED HEREON. THIS DOES NOT EXTEND TO ANY UNNAMED PERSON WITHOUT AN EXPRESS WRITTEN CONSENT BY THE SURVEYOR.
- HEREON PROPERTY IS SUBJECT TO THE RESTRICTIONS AND REGULATIONS SET FORTH BY THE CITY OF SPRING HILL AND MAURY COUNTY PLANNING COMMISSION.
- NO LIABILITY WILL BE ACCEPTED BEYOND THAT OF THE FOUR (4) YEAR STATUTE OF LIMITATIONS (T.C.A. 28-3-114 & T.C.A. 28-3-202) ORIGINATING FROM THE FIELD DATE SHOWN HEREON.

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REVISION TABLE

NO.	DATE	BY	REVISIONS
1.			

SURVEY ORDERED BY: STEADFAST COMPANIES

PROPERTY ADDRESS: JIM WARREN ROAD
SPRING HILL, TENNESSEE 37174

PROPERTY OWNER(S):
N. HOUSTON PARKS, J. STEVE PARKS, and JAMES E. PARKS
P.O. BOX 1732 COLUMBIA, TENNESSEE 38402

DEED REFERENCE: BOOK 2025, PAGE 452 R.O.M.C.T.
PLAT REFERENCE: N/A
TAX MAP: 027 GROUP: PARCEL: 26.00
SPRING HILL, MAURY COUNTY, TENNESSEE

OHM PROJECT#: 0642-19-0010

DRAWN BY: DC/SS DATE: JANUARY 17, 2020

FIELD WORK: MH/ES DATE: JANUARY 10, 2020

P:0001_0990042190010_Port_Royal_and_Saturn_Mixed_Use_SurveyPORT ROYAL ALTA.DWG

SHEET 1 OF 2

MONUMENTATION

○	IRON PIN (SET)
○	IRON PIN (FOUND)
○	CONCRETE MONUMENT (FOUND)
○	MAGNETIC NAIL
○	REMARK
---	SUBJECT PROPERTY LINE
---	ADJOINING PROPERTY LINE
---	CONTROL LINE OF PAYMENT
---	FENCE
---	STORM CREEK/NATURAL DRAINAGE
---	OVERHEAD ELECTRICAL LINE
---	OVERHEAD TELEPHONE LINE
---	UNDERGROUND ELECTRICAL
---	UNDERGROUND TELEPHONE
---	UNDERGROUND GAS LINE
---	WATER LINE
---	GATE
---	UNDERGROUND CABLE
---	UNDERGROUND FIBER OPTIC



SURVEYOR'S CERTIFICATE
I, DOUGLAS W. BALL-CHANDLER, CHICAGO TITLE INSURANCE COMPANY,
do hereby certify that this map or plat and the survey on which it is based were made in accordance with the 2016 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS, and include items 1, 2, 3, 4, 5(a), 7(a), 7(b)(1), 8, 9, 11, 13, 16, 17, 18 AND 20 of Table A thereof. This field work was completed on JANUARY 10, 2020.

Date: _____
Douglas W. Ball-Chandler, TN RLS # 2588

ACREAGE: 2,204,246 SQUARE FEET OR 50.60 ACRES +/-

NOT FOR CONSTRUCTION

Kimley»Horn
214 OceanSide Drive, Nashville, TN 37204
Main: 615.564.2701 | www.kimley-horn.com
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SPRING HILL TOWN CROSSING
SPRING HILL, TN

NO.	DATE	BY	REVISIONS
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DESIGNED BY: _____
DRAWN BY: _____
CHECKED BY: _____
DATE: 09/21/2020
KIMLEY-HORN PROJECT NO. 118332001

EXISTING CONDITIONS
SHEET NUMBER
C1-00

This document, together with the concepts and designs presented herein, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.



PD LOT DATA, BULK STANDARDS & CRITERIA

Lot	Use	Size	Bulk Stnds.	Gross Floor Area / Units	Minimum Lot Width	Maximum Building Height	Maximum Impervious Surface	Setbacks	Parking Criteria Required/Provided	Landscaping Standards	Sign Standards	Additional PD Criteria
1	Gas & C-Store	2.52 ACERS 109,713 S.F.		4,500 sf 20 Pumps	60'	50'	85%	Street: 10' Interior Side: 0' Rear: 10'	1 Space Per Pump (not including pump space) + 1/500 s.f. of Retail 29 Spaces / 33 Spaces	Per U.D.C.	Per U.D.C.	1. interior side setback for any building height 2. 72 of the required parking spaces may be provided in garage spaces and tandem surface spaces in front of garages.
2	Restaurant (Stand Alone)	1.86 ACERS 81,007 S.F.		5,000 s.f. GFA	60'	50'	85%	10' 0' 10'	1/100 s.f. Indoor Dining, 1/150 s.f. Outdoor Dining 50 Spaces / 80 Spaces	Per U.D.C.	Per U.D.C.	3. Permitted uses shall be per Article 8 of the U.D.C. unless otherwise listed below: • Drive Thru Facility / Permitted Use • Dwelling Multifamily / Permitted Use
3	Restaurant (Drive Thru)	1.38 ACERS 60,273 S.F.		4,500 s.f. GFA	60'	50'	85%	10' 0' 10'	1/100 s.f. Indoor Dining, 1/150 s.f. Outdoor Dining 45 Spaces / 60 Spaces	Per U.D.C.	Per U.D.C.	4. Non-residential lots sharing a common interior lot line do not require an interior landscape strip when adjacent to a common parking area or driveway.
4	Grocery, Retail & Office	8.95 ACERS 389,867 S.F.		72,250 s.f. GFA	60'	50'	90%	10' 0' 10'	Multi-Tenant Retail 1 Space / 250 s.f. GFA 289 Spaces / 327 Spaces	Per U.D.C.	Per U.D.C.	5. The freestanding multi-tenant sign allowed by the UDC at the entry between Lots 1 and 2 may be placed at the intersection of Port Royal Road and Jim Warren Parkway.
5	Hotel	2.62 ACERS 114,253 S.F.		120 Rooms	60'	75'	90%	10' 0' 10'	1.5 Space per Hotel Room 180 Spaces / 180 Spaces	Per U.D.C.	Per U.D.C.	6. Maximum multi-family building footprint length in one direction of 325' as shown approximately on the Preliminary Plan. Footprints may be modified to accommodate final building design.
6	Multifamily	18.73 ACERS 816,287 S.F.		334 Units 18 D.U./Ac.	60'	4 Floors / 60'	85%	Street: 20' Interior Side: 10' Rear: 20'	2 Spaces Per Unit + 1 guest space per 8 units 710 Spaces / 730 Spaces	Per U.D.C.	Per U.D.C.	
7	Open Space Park	9.24 ACERS 402,516 S.F.		N/A	60'	N/A	N/A	10' 0' 10'	N/A	N/A	N/A	

NOT FOR CONSTRUCTION



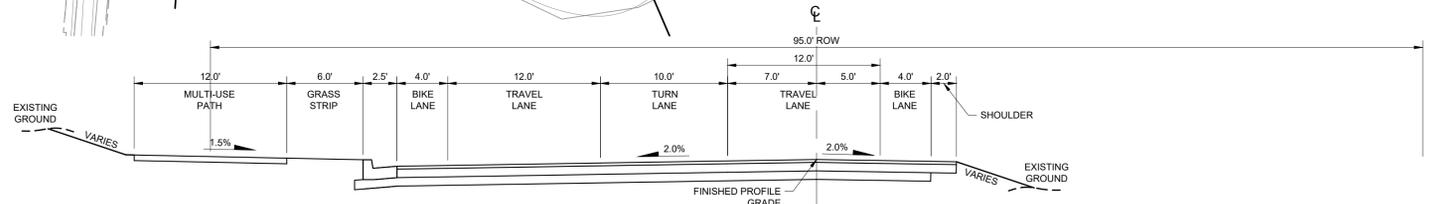
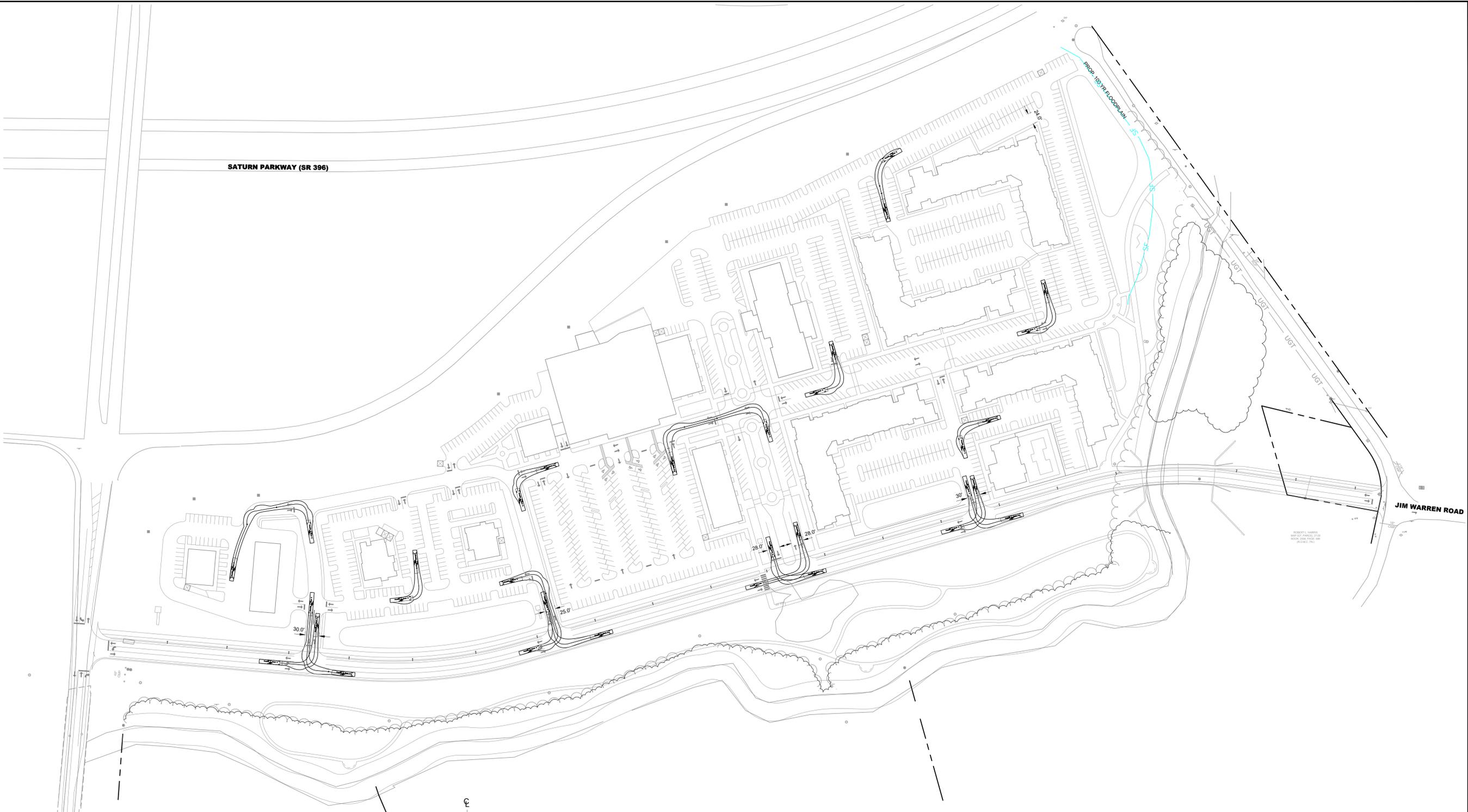
SPRING HILL TOWN
CROSSING

SPRING HILL, TN

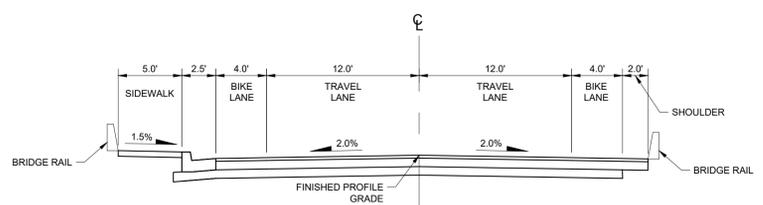


DESIGNED BY:	KKF
DRAWN BY:	RCR
CHECKED BY:	JLR
DATE:	09/21/2020
KIMLEY-HORN PROJECT NO.:	118332001

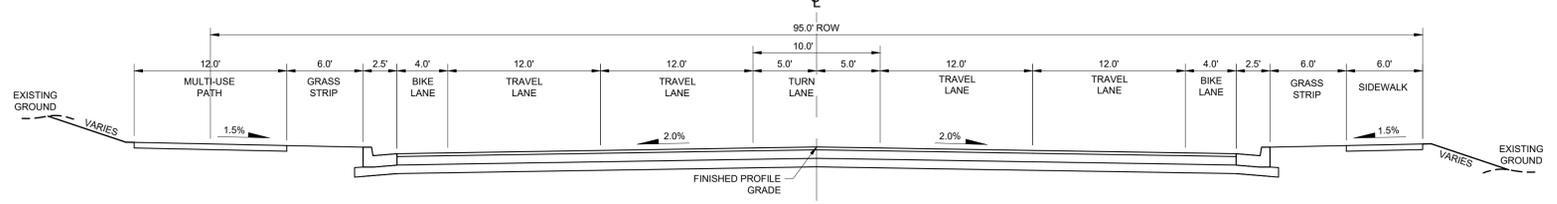
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TYPICAL SECTION - JIM WARREN PKWY. (3-LANE)

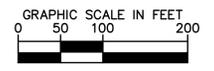


TYPICAL SECTION - JIM WARREN PKWY. (BRIDGE SECTION)



TYPICAL SECTION - JIM WARREN PKWY. (5-LANE) - FUTURE EXPANSION BY CITY

NOT FOR CONSTRUCTION



SPRING HILL TOWN
CROSSING
SPRING HILL, TN



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DESIGNED BY: KKF
DRAWN BY: RCR
CHECKED BY: JLR
DATE: 09/21/2020
KIMLEY-HORN PROJECT NO. 118332001

VEHICLE TRACKING AND TYPICAL SECTIONS

SHEET NUMBER
C3-00

PLANT SCHEDULE

TREES	QTY	BOTANICAL NAME	COMMON NAME	SPACING	SIZE	ROOT	CONDITION
	40	ACER GINNALA 'FLAME'	FLAME AMUR MAPLE	AS SHOWN	2" CAL. MIN.	B&B	FULL; MATCHED
	37	GINKGO BILOBA 'GOLDEN GLOBE'	GOLDEN GLOBE GINKGO	AS SHOWN	3" CAL; 10'-12' HT.	B&B	FULL CANOPY, MATCHED
	56	LIRIODENDRON TULIPIFERA	TULIP POPLAR	AS SHOWN	3" CAL; 10'-12' HT.	B&B	FULL CANOPY, MATCHED
	66	NYSSA SYLVATICA 'WILDFIRE'	WILDFIRE BLACK GUM	AS SHOWN	3" CAL; 10'-12' HT.	B&B	FULL CANOPY, MATCHED
	71	QUERCUS LYRATA	OVERCUP OAK	AS SHOWN	3" CAL; 10'-12' HT.	B&B	FULL CANOPY, MATCHED
	42	QUERCUS PHELLOS	WILLOW OAK	AS SHOWN	3" CAL; 10'-12' HT.	B&B	FULL CANOPY, MATCHED
	56	TAXODIUM DISTICHUM	BALD CYPRESS	AS SHOWN	3" CAL; 10'-12' HT.	B&B	FULL CANOPY, MATCHED
	82	ULMUS PARVIFOLIA 'LACEBARK ELM'	CHINESE ELM TREE	AS SHOWN	3" CAL; 10'-12' HT.	B&B	FULL CANOPY, MATCHED
EVERGREEN TREES	QTY	BOTANICAL NAME	COMMON NAME	SPACING	SIZE	ROOT	CONDITION
	29	MAGNOLIA GRANDIFLORA	SOUTHERN MAGNOLIA	AS SHOWN	3" CAL; 10'-12' HT.	B&B	FULL CANOPY, MATCHED
	29	PICEA PUNGENS 'GLAUCA'	COLORADO BLUE SPRUCE	AS SHOWN	2" CAL. MIN; 8'-10' HT.	B&B	FULL CANOPY, MATCHED
	29	PINUS ECHINATA	SHORT LEAF PINE	AS SHOWN	2" CAL. MIN; 8'-10' HT.	B&B	FULL CANOPY, MATCHED
UNDERSTORY TREES	QTY	BOTANICAL NAME	COMMON NAME	SPACING	SIZE	ROOT	CONDITION
	55	AMELANCHIER CANADENSIS 'AUTUMN BRILLIANCE'	AUTUMN BRILLIANCE SERVICEBERRY	AS SHOWN	2" CAL. MIN; 8'-10' HT.	B&B	FULL CANOPY, MATCHED
	100	CERCIS CANADENSIS 'FOREST PANSY'	FOREST PANSY REDBUD	AS SHOWN	2" CAL. MIN; 8'-10' HT.	B&B	FULL CANOPY, MATCHED
	86	CORNUS X 'RUTGAN'	STELLAR PINK DOGWOOD	AS SHOWN	2" CAL. MIN; 8'-10' HT.	B&B	FULL CANOPY, MATCHED
SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	SPACING	SIZE	ROOT	CONDITION
	217	CORNUS ALBA 'SIBIRICA'	RED TWIG DOGWOOD	AS SHOWN	3 GAL; 32" MIN HT	CONT	MATCHED; FULL
	217	DISTYLIIUM 'COPPERTONE'	COPPERTONE DISTYLIIUM	AS SHOWN	3 GAL; 24" MIN. HT.	CONT	MATCHED; FULL
	217	DISTYLIIUM 'VINTAGE JADE' PP23, 128	VINTAGE JADE DISTYLIIUM	AS SHOWN	3 GAL; 16" MIN. HT	CONT	MATCHED; FULL
	217	HYDRANGEA QUERCIFOLIA 'RUBY SLIPPERS'	RUBY SLIPPERS HYDRANGEA	AS SHOWN	3 GAL; 24" MIN. HT.	CONT	MATCHED; FULL
	217	ILEX CRENATA 'SOFT TOUCH'	SOFT TOUCH JAPANESE HOLLY	AS SHOWN	3 GAL; 16" MIN. HT	CONT	MATCHED; FULL
	217	ILEX GLABRA 'SHAMROCK'	SHAMROCK HOLLY	AS SHOWN	3 GAL; 24" MIN. HT.	CONT	MATCHED; FULL
	217	ILEX X 'NELLIE R. STEVENS'	NELLIE R. STEVENS HOLLY	AS SHOWN	5 GAL; 48" MIN. HT.	CONT	MATCHED; FULL
	217	MUHLENBERGIA CAPILLARIS 'PLUMETASTIC'	PLUMTASTIC PINK MUHLY	AS SHOWN	1 GAL.	CONT	MATCHED; FULL; FREE OF WEEDS
	217	PENNISETUM ORIENTALE 'KARLEY ROSE'	KARLEY ROSE FOUNTAIN GRASS	AS SHOWN	1 GAL.	CONT	MATCHED; FULL; FREE OF WEEDS
	217	TAXUS X MEDIA	DENSE YEW	AS SHOWN	3 GAL; 24" MIN. HT.	CONT	MATCHED; FULL

LANDSCAPE NOTE

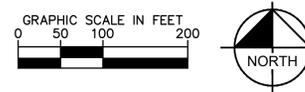
- SHRUB AND EVERGREEN QUANTITIES ARE ACCOUNTED FOR IN THE LANDSCAPE YARD AND BUFFER AREAS AND ARE AN ESTIMATE AT THIS TIME BASED ON CITY REQUIREMENTS. EXACT QUANTITIES WILL BE DETERMINED AT FINAL DESIGN.

DETAIL LEGEND

	10' FOUNDATION PLANTING AT STREET LOT LINE SEE DETAIL #3, SHEET L1-50
	10' LANDSCAPE YARD ON ARTERIAL STREET FOR MULTIFAMILY SEE DETAIL #6, SHEET L1-50
	10' LANDSCAPE STRIP FOR NON-RESIDENTIAL INTERIOR SIDE/REAR LOT LINES SEE DETAIL #5, SHEET L1-50
	15' PARKING LOT PERIMETER LANDSCAPE YARD SEE DETAIL #4, SHEET L1-50



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DESIGNED BY: KHA
 DRAWN BY: KHA
 CHECKED BY: JLR
 DATE: 029 mmdd/yyyy
 KIMLEY-HORN PROJECT NO. 011 project number

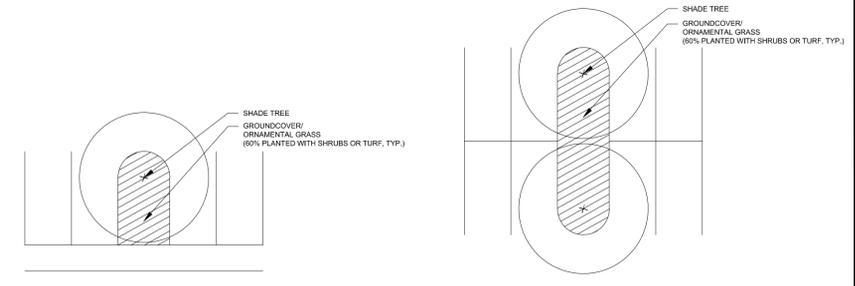
GENERAL LANDSCAPE SPECIFICATIONS AND NOTES

- 1.01 SCOPE OF WORK
- THE WORK CONSISTS OF: FURNISHING ALL LABOR, MATERIALS, EQUIPMENT, TOOLS, TRANSPORTATION, AND ANY OTHER APPURTENANCES NECESSARY FOR THE COMPLETION OF THIS PROJECT AS SHOWN ON THE DRAWINGS, AS INCLUDED IN THE PLANT LIST, AND AS HEREIN SPECIFIED.
 - WORK SHALL INCLUDE MAINTENANCE AND WATERING OF ALL CONTRACT PLANTING AREAS UNTIL CERTIFICATION OF ACCEPTABILITY BY THE OWNER.
 - THE CONTRACTOR SHALL CONTACT THE OWNER AND TENNESSEE ONE CALL AT (615) 351-1111, TWO (2) FULL BUSINESS DAYS PRIOR TO THE BEGINNING OF WORK.
 - THE CITY MUST APPROVE ALL WORK HOURS AND LANE CLOSURE REQUESTS AT LEAST TWO (2) FULL WORKING DAYS IN ADVANCE OF THE START OF ANY SUCH WORK ON A LOCATION BY LOCATION BASIS. THE INDIVIDUAL(S) INSTALLING THE MAINTENANCE OF TRAFFIC SETUP SHALL HAVE COMPLETED A TDOT APPROVED WORK ZONE TRAFFIC CONTROL TRAINING COURSE. DOCUMENTATION SHALL BE FURNISHED TO THE CITY AT THE PRE-CONSTRUCTION MEETING OR PRIOR TO START OF WORK.
 - ALL LANDSCAPE MATERIAL SHALL BE INSTALLED AND MAINTAINED IN A MANNER WHEREBY TRAFFIC CONTROL SIGNAGE AND DEVICES ARE VISIBLE TO MOTORISTS AND PEDESTRIANS.
- 1.02 PROTECTION OF EXISTING STRUCTURES
- ALL EXISTING BUILDINGS, WALKS, WALLS, PAVING, PIPING, OTHER SITE CONSTRUCTION ITEMS, AND PLANTING ALREADY COMPLETED OR ESTABLISHED SHALL BE PROTECTED FROM DAMAGE BY THE CONTRACTOR UNLESS OTHERWISE SPECIFIED. ALL DAMAGE RESULTING FROM NEGLIGENCE SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE OWNER AND AT NO COST TO THE OWNER.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL NECESSARY BMP DEVICES ACCORDING TO TDOT, COUNTY, OR CITY STANDARDS THROUGH THE DURATION OF ALL CONSTRUCTION ACTIVITIES.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UTILITIES, WHETHER PUBLIC OR PRIVATE, PRIOR TO EXCAVATION. THE OWNER AND DESIGN PROFESSIONAL SHALL NOT BE RESPONSIBLE FOR THE ACCURACY AND COMPLETENESS OF ANY SUCH INFORMATION OR DATA, AND THE CONTRACTOR SHALL HAVE FULL RESPONSIBILITY FOR REVIEWING AND CHECKING ALL SUCH INFORMATION AND DATA, FOR LOCATING ALL UNDERGROUND FACILITIES DURING CONSTRUCTION, FOR THE SAFETY AND PROTECTION THEREOF, AND REPAIRING ANY DAMAGE THERE TO RESULTING FROM THE WORK. THE COST OF COMPLIANCE WITH THIS SECTION WILL BE CONSIDERED AS HAVING BEEN INCLUDED IN THE CONTRACT PRICE. THE CONTRACTOR SHALL NOTIFY ANY AFFECTED UTILITY COMPANIES OR AGENCIES IN WRITING AT LEAST 48 HOURS PRIOR TO BEGINNING CONSTRUCTION.
- 1.03 PROTECTION OF EXISTING PLANT MATERIALS OUTSIDE LIMIT OF WORK
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL UNAUTHORIZED CUTTING OR DAMAGE TO TREES AND SHRUBS EXISTING OR OTHERWISE, CAUSED BY CARELESS EQUIPMENT OPERATION, MATERIAL STOCKPILES, ETC. THIS SHALL INCLUDE COMPACTION BY DRIVING OR PARKING INSIDE THE DRIP-LINE AND SPILLING OIL, GASOLINE, OR OTHER DELETERIOUS MATERIALS WITHIN THE DRIP-LINE. NO MATERIALS SHALL BE BURNED ON SITE. EXISTING TREES KILLED OR DAMAGED SO THAT THEY ARE MISSHAPEN AND/OR UNSIGHTLY SHALL BE REPLACED AT THE COST TO THE CONTRACTOR OF ONE HUNDRED DOLLARS (\$100) PER CALIPER INCH ON AN ESCALATING SCALE WHICH ADDS AN ADDITIONAL TWENTY (20) PERCENT PER INCH OVER FOUR (4) INCHES CALIPER AS FIXED AND AGREED LIQUIDATED DAMAGES. CALIPER SHALL BE MEASURED SIX (6) INCHES ABOVE GROUND LEVEL FOR TREES UP TO AND INCLUDING FOUR (4) INCHES IN CALIPER AND TWELVE (12) INCHES ABOVE GROUND LEVEL FOR TREES OVER FOUR (4) INCHES IN CALIPER.
- 1.04 MATERIALS
- GENERAL

MATERIAL SAMPLES LISTED BELOW SHALL BE SUBMITTED FOR APPROVAL, ON SITE OR AS DETERMINED BY THE LANDSCAPE ARCHITECT. UPON APPROVAL, DELIVERY OF MATERIALS MAY COMMENCE.

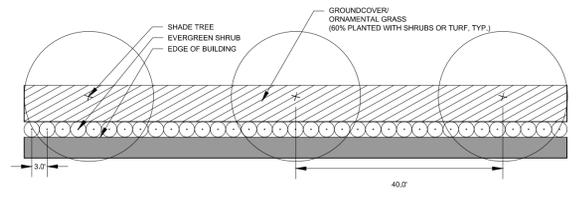
MATERIAL	SAMPLE SIZE
MULCH	ONE (1) CUBIC FOOT
TOPSOIL MIX	ONE (1) CUBIC FOOT
PLANTS	ONE (1) OF EACH VARIETY (OR TAGGED IN NURSERY)
 - PLANT MATERIALS
 - PLANT SPECIES AND SIZE SHALL CONFORM TO THOSE INDICATED ON THE DRAWINGS. ALL NURSERY STOCK SHALL BE IN ACCORDANCE WITH GRADES AND STANDARDS AS SET FORTH IN ANSI Z60.1-2014-AMERICAN STANDARD FOR NURSERY STOCK. ALL PLANTS SHALL BE HEALTHY, VIGOROUS, SOUND, WELL-BRANCHED, AND FREE OF DISEASE AND INSECTS. INSECT EGGS AND LARVAE AND SHALL HAVE ADEQUATE ROOT SYSTEMS. TREES FOR PLANTING IN ROWS SHALL BE UNIFORM IN SIZE AND SHAPE. ALL MATERIALS SHALL BE SUBJECT TO APPROVAL BY THE OWNER, WHERE ANY REQUIREMENTS ARE OMITTED FROM THE PLANT LIST, THE PLANTS FURNISHED SHALL BE NORMAL FOR THE VARIETY. PLANTS SHALL BE PRUNED PRIOR TO DELIVERY ONLY WITH APPROVAL FROM OWNER OR LANDSCAPE ARCHITECT. NO SUBSTITUTIONS SHALL BE MADE WITHOUT WRITING PERMISSION FROM THE LANDSCAPE ARCHITECT.
 - MEASUREMENTS: THE HEIGHT AND/OR WIDTH OF TREES SHALL BE MEASURED FROM THE GROUND OR ACROSS THE NORMAL SPREAD OF BRANCHES WITH THE PLANTS IN THEIR NORMAL POSITION. THIS MEASUREMENT SHALL NOT INCLUDE THE IMMEDIATE TERMINAL GROWTH. PLANTS LARGER IN SIZE THAN THOSE SPECIFIED IN THE PLANT LIST MAY BE USED IF APPROVED BY THE OWNER. IF THE USE OF LARGER PLANTS IS APPROVED, THE ROOTBALL OR SPREAD OF ROOTS SHALL BE INCREASED IN PROPORTION TO THE SIZE OF THE PLANT.
 - INSPECTION: PLANTS SHALL BE SUBJECT TO INSPECTION AND APPROVAL AT THE PLACE OF GROWTH, OR UPON DELIVERY TO THE SITE, AS DETERMINED BY THE OWNER, FOR QUALITY, SIZE, AND VARIETY. SUCH APPROVAL SHALL NOT IMPAIR THE RIGHT OF INSPECTION AND REJECTION AT THE SITE DURING PROGRESS OF THE WORK OR AFTER COMPLETION FOR SIZE AND CONDITION OF ROOT BALLS OR ROOTS, LATENT DEFECTS OR INJURIES. REJECTED PLANTS SHALL BE REMOVED IMMEDIATELY FROM THE SITE. NOTICE REQUESTING INSPECTION SHALL BE SUBMITTED IN WRITING BY THE CONTRACTOR AT LEAST ONE (1) WEEK PRIOR TO ANTICIPATED DATE.
- 1.05 SOIL MIXTURE (PLANTING MEDIUM, PLANTING MIX, TOPSOIL MIX)
- SOIL MIXTURE (PLANTING MEDIUM FOR PLANT PITS) SHALL CONSIST OF 2/3 LOOSE COMPOST (NO GREATER THAN 1" SIV), 1/3 PEAT AND 1/3 SAND, AS DESCRIBED BELOW.
 - TOPSOIL FOR USE IN PREPARING SOIL MIXTURE FOR BACKFILLING PLANT PITS SHALL BE FERTILE, FRIABLE, AND OF A LOAMY CHARACTER, REASONABLY FREE OF SUBSOIL, CLAY LUMPS, BRUSH WEEDS AND OTHER LITTER, FREE OF ROOTS, STUMPS, STONES LARGER THAN 2" IN ANY DIRECTION, AND OTHER EXTRANEOUS OR TOXIC MATTER HARMFUL TO PLANT GROWTH. IT SHALL CONTAIN THREE (3) TO FIVE (5) PERCENT DECOMPOSED ORGANIC MATTER AND A PH BETWEEN 5.5 AND 7.0 - SUBMIT SAMPLE AND PH TESTING RESULTS FOR APPROVAL.
 - SAND SHALL BE COARSE, CLEAN, WELL-DRAINING, NATIVE SAND. CONTRACTOR SHALL SUBMIT RESULTS OF SOIL TESTS FOR TOPSOIL AND SAND PROPOSED FOR APPROVAL BY THE OWNER.
 - TREES SHALL BE PLANTED IN THE EXISTING NATIVE SOIL ON SITE, UNLESS DETERMINED TO BE UNSUITABLE, AT WHICH POINT THE CONTRACTOR SHALL CONTACT OWNER'S REPRESENTATIVE TO DISCUSS ALTERNATE RECOMMENDATION PRIOR TO PLANTING.
 - CONTRACTOR TO SUBMIT SAMPLES OF SOIL MIXTURE FOR OWNER'S REPRESENTATIVE APPROVAL PRIOR TO PLANT INSTALLATION OPERATIONS COMMENCE.
- 1.06 WATER
- WATER NECESSARY FOR PLANTING AND MAINTENANCE SHALL BE OF SATISFACTORY QUALITY TO SUSTAIN ADEQUATE PLANT GROWTH AND SHALL NOT CONTAIN HARMFUL, NATURAL OR MAN-MADE ELEMENTS DETRIMENTAL TO PLANTS. WATER MEETING THE ABOVE STANDARD SHALL BE OBTAINED ON THE SITE FROM THE OWNER, IF AVAILABLE, AND THE CONTRACTOR SHALL BE RESPONSIBLE TO MAKE ARRANGEMENTS FOR ITS USE BY HIS TANKS, HOSES, SPRINKLERS, ETC. IF SUCH WATER IS NOT AVAILABLE AT THE SITE, THE CONTRACTOR SHALL PROVIDE SATISFACTORY WATER FROM SOURCES OFF THE SITE AT NO ADDITIONAL COST TO THE OWNER.
- * WATERING/IRRIGATION RESTRICTIONS MAY APPLY - REFER TO PROPERTY'S JURISDICTIONAL AUTHORITY.
- 1.07 FERTILIZER
- CONTRACTOR SHALL PROVIDE FERTILIZER APPLICATION SCHEDULE TO OWNER, AS APPLICABLE TO SOIL TYPE, PLANT INSTALLATION TYPE, AND SITE'S PROPOSED USE. SUGGESTED FERTILIZER TYPES SHALL BE ORGANIC OR OTHERWISE NATURALLY-DERIVED.
- * FERTILIZER RESTRICTIONS MAY APPLY - REFER TO PROPERTY'S JURISDICTIONAL AUTHORITY.
- 1.08 MULCH
- MULCH MATERIAL SHALL BE MOISTENED AT THE TIME OF APPLICATION TO PREVENT WIND DISPLACEMENT, AND APPLIED AT A DEPTH OF THREE (3) INCHES FOR ALL PLANTINGS UNLESS OTHERWISE NOTED. MULCH AT ALL PLANTING BEDS SHALL BE TRIPLE SHREDDED HARDWOOD.
- 1.09 DIGGING AND HANDLING
- PROTECT ROOTS OR ROOT BALLS OF PLANTS AT ALL TIMES FROM SUN, DRYING WINDS, WATER AND FREEZING AS NECESSARY UNTIL PLANTING. PLANT MATERIALS SHALL BE ADEQUATELY PACKED TO PREVENT DAMAGE DURING TRANSIT.
 - BALLED AND BURLAPPED PLANTS (B&B) SHALL BE DUG WITH FIRM, NATURAL BALLS OF SOIL OF SUFFICIENT SIZE TO ENCOMPASS THE FIBROUS AND FEEDING ROOTS OF THE PLANTS. NO PLANTS MOVED WITH A ROOT BALL SHALL BE PLANTED IF THE BALL IS CRACKED OR BROKEN. PLANTS SHALL NOT BE HANDLED BY STEMS.
 - EXCAVATION OF TREE PITS SHALL BE PERFORMED USING EXTREME CARE TO AVOID DAMAGE TO SURFACE AND SUBSURFACE ELEMENTS SUCH AS UTILITIES OR HARDSCAPE ELEMENTS, FOOTERS AND PREPARED SUB-BASES. ALL TREES SHALL BE PLANTED AS INDICATED ON DRAWINGS. COORDINATE WITH PLANTING DETAILS FOR EXACT DEPTH OF PLANTING SOIL.
- 1.10 CONTAINER GROWN STOCK
- ALL TREES SPECIFIED SHALL BE BALL AND BURLAP, UNLESS OTHERWISE APPROVED BY LANDSCAPE ARCHITECT.
 - ALL SHRUB SPECIES SHALL BE CONTAINER GROWN.
 - ALL CONTAINER GROWN MATERIAL SHALL BE HEALTHY, VIGOROUS, WELL-ROOTED PLANTS ESTABLISHED IN THE CONTAINER IN WHICH THEY ARE SOLD. THE PLANTS SHALL HAVE TOPS WHICH ARE OF GOOD QUALITY AND ARE IN A HEALTHY GROWING CONDITION.
 - AN ESTABLISHED CONTAINER GROWN PLANT SHALL BE TRANSPLANTED INTO A CONTAINER AND GROWN IN THAT CONTAINER SUFFICIENTLY LONG ENOUGH FOR THE NEW FIBROUS ROOTS TO HAVE DEVELOPED SO THAT THE ROOT MASS WILL RETAIN ITS SHAPE AND HOLD TOGETHER WHEN REMOVED FROM THE CONTAINER. CONTAINER GROWN STOCK SHALL NOT BE HANDLED BY THEIR STEMS.
 - PLANT ROOTS BOUND IN CONTAINERS ARE NOT ACCEPTABLE.
- 1.11 MATERIALS LIST
- QUANTITIES NECESSARY TO COMPLETE THE WORK ON THE DRAWINGS SHALL BE FURNISHED BY THE CONTRACTOR. QUANTITY ESTIMATES HAVE BEEN MADE CAREFULLY, BUT THE LANDSCAPE ARCHITECT OR OWNER ASSUMES NO LIABILITY FOR OMISSIONS OR ERRORS. SHOULD A DISCREPANCY OCCUR BETWEEN THE PLANS AND THE PLANT LIST QUANTITY, THE OWNER'S REPRESENTATIVE SHALL BE NOTIFIED FOR CLARIFICATION PRIOR TO BIDDING OR INSTALLATION. ALL DIMENSIONS AND/OR SIZES SPECIFIED SHALL BE THE MINIMUM ACCEPTABLE SIZE.
- 1.12 FINE GRADING
- FINE GRADING UNDER THIS CONTRACT SHALL CONSIST OF FINAL FINISHED GRADING OF LAWN AND PLANTING AREAS THAT HAVE BEEN DISTURBED DURING CONSTRUCTION.
 - THE CONTRACTOR SHALL FINE GRADE THE LAWN AND PLANTING AREAS TO BRING THE ROUGH GRADE UP TO FINAL FINISHED GRADE ALLOWING FOR THICKNESS OF SOD AND/OR MULCH DEPTH. CONTRACTOR SHALL FINE GRADE BY HAND AND/OR WITH ALL EQUIPMENT NECESSARY INCLUDING A GRADING TRACTOR WITH FRONT-END LOADER FOR TRANSPORTING SOIL WITHIN THE SITE.
 - ALL PLANTING AREAS SHALL BE GRADED AND MAINTAINED FOR POSITIVE DRAINAGE TO SURFACE/SUBSURFACE STORM DRAIN SYSTEMS. AREAS ADJACENT TO BUILDINGS SHALL SLOPE AWAY FROM THE BUILDINGS. REFER TO CIVIL ENGINEER'S PLANS FOR FINAL GRADES, IF APPLICABLE.

- 1.13 PLANTING PROCEDURES
- CLEANING UP BEFORE COMMENCING WORK: THE CONTRACTOR SHALL CLEAN WORK AND SURROUNDING AREAS OF ALL RUBBISH OR OBJECTIONABLE MATTER DAILY. ALL MORTAR, CEMENT, AND TOXIC MATERIAL SHALL BE REMOVED FROM THE SURFACE OF ALL PLANT BEDS. THESE MATERIALS SHALL NOT BE MIXED WITH THE SOIL. SHOULD THE CONTRACTOR FIND SUCH SOIL CONDITIONS BENEATH THE SOIL WHICH WILL IN ANY WAY ADVERSELY AFFECT THE PLANT GROWTH, CONTRACTOR SHALL IMMEDIATELY CALL IT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE. FAILURE TO DO SO BEFORE PLANTING SHALL MAKE THE CORRECTIVE MEASURES THE RESPONSIBILITY OF THE CONTRACTOR.
 - SUBGRADE EXCAVATION: THE CONTRACTOR IS RESPONSIBLE TO REMOVE ALL EXISTING AND IMPORTED LIMEROCK AND LIMEROCK SUB-BASE FROM ALL LANDSCAPE PLANTING AREAS TO A MINIMUM DEPTH OF 36" AT TREES AND 18" AT SHRUBS AND PERENNIALS. CONTRACTOR IS RESPONSIBLE TO BACKFILL THESE PLANTING AREAS TO ROUGH FINISH GRADE WITH CLEAN TOPSOIL FROM AN ON-SITE SOURCE OR AN IMPORTED SOURCE. IF LIMEROCK OR OTHER ADVERSE CONDITIONS OCCUR IN PLANTED AREAS AFTER 36" AND DEEP EXCAVATION BY THE CONTRACTOR AND POSITIVE DRAINAGE CANNOT BE ACHIEVED, THE CONTRACTOR SHALL UTILIZE PLANTING DETAIL THAT ADDRESSES POOR DRAINAGE.
 - VERIFY LOCATIONS OF ALL UTILITIES, CONDUITS, SUPPLY LINES AND CABLES, INCLUDING BUT NOT LIMITED TO: ELECTRIC, GAS (LINES AND TANKS), WATER, SANITARY SEWER, STORMWATER SYSTEMS, CABLE, AND TELEPHONE. PROPERLY MAINTAIN AND PROTECT EXISTING UTILITIES. CONTACT TENNESSEE ONE CALL AT (615) 351-1111 TO LOCATE ALL UTILITIES.
 - FURNISH NURSERY'S CERTIFICATE OF COMPLIANCE WITH ALL REQUIREMENTS AS HEREIN SPECIFIED AND REQUIRED. INSPECT AND SELECT PLANT MATERIALS BEFORE PLANTS ARE DUG AT NURSERY OR GROWING SITE.
 - GENERAL: COMPLY WITH APPLICABLE FEDERAL, STATE, COUNTY, AND LOCAL REGULATIONS GOVERNING LANDSCAPE MATERIALS AND WORK. CONFORM TO ACCEPTED HORTICULTURAL PRACTICES AS USED IN THE TRADE. UPON ARRIVAL AT THE SITE, PLANTS SHALL BE THOROUGHLY WATERED AND PROPERLY MAINTAINED UNTIL PLANTED. PLANTS STORED ON-SITE SHALL NOT REMAIN UNPLANTED OR APPROPRIATELY HEALED IN FOR A PERIOD EXCEEDING TWENTY-FOUR (24) HOURS. AT ALL TIMES WORKMANLIKE METHODS CUSTOMARY IN GOOD HORTICULTURAL PRACTICES SHALL BE EXERCISED.
 - THE WORK SHALL BE COORDINATED WITH OTHER TRADES TO PREVENT CONFLICTS. COORDINATE PLANTING WITH IRRIGATION WORK TO ASSURE AVAILABILITY OF WATER AND PROPER LOCATION OF IRRIGATION APPURTENANCES AND PLANTS.
 - ALL PLANTING PITS SHALL BE EXCAVATED TO SIZE AND DEPTH IN ACCORDANCE WITH ANSI Z60.1-2014 - AMERICAN STANDARD FOR NURSERY STOCK, UNLESS SHOWN OTHERWISE ON THE DRAWINGS, AND BACK FILLED WITH THE PREPARED PLANTING SOIL MIXTURE AS SPECIFIED IN SECTION 1.05. TEST ALL TREE PITS WITH WATER BEFORE PLANTING TO ASSURE PROPER DRAINAGE PERCOLATION IS AVAILABLE. NO ALLOWANCE WILL BE MADE FOR LOST PLANTS DUE TO IMPROPER DRAINAGE. TREES SHALL BE SET PLUMB AND HELD IN POSITION UNTIL THE PLANTING MIXTURE HAS BEEN FLUSHED INTO PLACE WITH A SLOW, FULL HOSE STREAM. ALL PLANTING SHALL BE PERFORMED BY PERSONNEL FAMILIAR WITH PLANTING PROCEDURES AND UNDER THE SUPERVISION OF A QUALIFIED LANDSCAPE FOREMAN.
 - TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO BUILDINGS AND BUILDING STRUCTURES WHILE INSTALLING TREES.
 - SOIL MIXTURE SHALL BE AS SPECIFIED IN SECTION 1.05 OF THESE SPECIFICATIONS.
 - TREES AND SHRUBS SHALL BE SET STRAIGHT AT AN ELEVATION THAT, AFTER SETTLEMENT, THE PLANT CROWN WILL STAND ONE (1) TO TWO (2) INCHES ABOVE GRADE. EACH PLANT SHALL BE SET IN THE CENTER OF THE PIT. PLANTING SOIL MIXTURE SHALL BE BACK FILLED, THOROUGHLY TAMPED AROUND THE BALL, AND SETTLED BY WATER (AFTER TAMPING).
 - SHRUBS AND GROUND COVER PLANTS SHALL BE EVENLY SPACED IN ACCORDANCE WITH THE DRAWINGS AND AS INDICATED ON THE PLANT LIST. MATERIALS INSTALLED SHALL MEET MINIMUM SPECIMEN REQUIREMENTS OR QUANTITIES SHOW ON PLANS, WHICHEVER IS GREATER. CULTIVATE ALL PLANTING AREAS TO A MINIMUM DEPTH OF 12". REMOVE AND DISPOSE ALL DEBRIS. COORDINATE WITH PLANTING DETAILS FOR EXACT DEPTH. MIX TOP 4" OF THE PLANTING SOIL MIXTURE AS SPECIFIED IN SECTION 1.05. THOROUGHLY WATER ALL PLANTS AFTER INSTALLATION.
 - TREE GUYING AND BRACING SHALL BE INSTALLED BY THE CONTRACTOR IN ACCORDANCE WITH THE PLANS TO INSURE STABILITY AND MAINTAIN TREES IN AN UPRIGHT POSITION. IF THE CONTRACTOR AND OWNER DECIDE TO WAIVE THE TREE GUYING AND BRACING, THE OWNER SHALL NOTIFY THE PROJECT LANDSCAPE ARCHITECT IN WRITING AND AGREE TO INDEMNIFY AND HOLD HARMLESS THE PROJECT LANDSCAPE ARCHITECT IN THE EVENT UNSUPPORTED TREES PLANTED UNDER THIS CONTRACT FALL AND DAMAGE PERSON OR PROPERTY.
 - HERBICIDE WEED CONTROL: ALL PLANT BEDS SHALL BE KEPT FREE OF NOXIOUS WEEDS UNTIL FINAL ACCEPTANCE OF WORK. IF DIRECTED BY THE OWNER, "ROUND-UP" SHALL BE APPLIED FOR WEED CONTROL. BY QUALIFIED PERSONNEL TO ALL PLANTING AREAS IN SPOT APPLICATIONS PER MANUFACTURER'S PRECAUTIONS AND SPECIFICATIONS. PRIOR TO FINAL INSPECTION, TREAT ALL PLANTING BEDS WITH AN APPROVED PRE-EMERGENT HERBICIDE AT AN APPLICATION RATE RECOMMENDED BY THE MANUFACTURER (AS ALLOWED BY JURISDICTIONAL AUTHORITY).
- 1.14 LAWN SODDING
- THE WORK CONSISTS OF LAWN BED PREPARATION, SOIL PREPARATION, AND SODDING COMPLETE, IN STRICT ACCORDANCE WITH THE SPECIFICATIONS AND THE APPLICABLE DRAWINGS TO PRODUCE A TURF GRASS LAWN ACCEPTABLE TO THE OWNER.
 - LAWN BED PREPARATION: ALL AREAS THAT ARE TO BE SODDED SHALL BE CLEARED OF ANY ROUGH GRASS, WEEDS, AND DEBRIS BY MEANS OF A SOD CUTTER TO A DEPTH OF THREE (3) INCHES, AND THE GROUND BROUGHT TO AN EVEN GRADE. THE ENTIRE SURFACE SHALL BE ROLLED WITH A ROLLER WEIGHING NOT MORE THAN ONE-HUNDRED (100) POUNDS PER FOOT OF WIDTH. DURING THE ROLLING, ALL DEPRESSIONS CAUSED BY SETTLEMENT SHALL BE FILLED WITH ADDITIONAL SOIL, AND THE SURFACE SHALL BE REGRADED AND ROLLED UNTIL PRESENTING A SMOOTH AND EVEN FINISH TO THE REQUIRED GRADE.
 - SOIL PREPARATION: PREPARE LOOSE BED FOUR (4) INCHES DEEP. HAND RAKE UNTIL ALL BUMPS AND DEPRESSIONS ARE REMOVED. WET PREPARED AREA THOROUGHLY.
- D. SODDING
- THE CONTRACTOR SHALL SOD ALL DISTURBED AREAS WITHIN THE CONTRACT LIMITS NOT COVERED BY HARDSCAPE OR VEGETATIVE MATERIAL, UNLESS SPECIFICALLY NOTED OTHERWISE.
 - SOD PANELS SHALL BE LAID TIGHTLY TOGETHER SO AS TO MAKE A SOLID SODDED LAWN AREA. SOD SHALL BE LAID UNIFORMLY AGAINST THE EDGES OF ALL CURBS AND OTHER HARDSCAPE ELEMENTS, PAVED AND PLANTED AREAS. IMMEDIATELY FOLLOWING SOD LAYING, THE LAWN AREAS SHALL BE ROLLED WITH A LAWN ROLLER CUSTOMARILY USED FOR SUCH PURPOSES, AND THEN THOROUGHLY IRRIGATED. IF, IN THE OPINION OF THE OWNER, TOP-DRESSING IS NECESSARY AFTER ROLLING TO FILL THE VOIDS BETWEEN THE SOD PANELS AND TO EVEN OUT INCONSISTENCIES IN THE SOD, CLEAN SAND, AS APPROVED BY THE OWNER'S REPRESENTATIVE, SHALL BE UNIFORMLY SPREAD OVER THE ENTIRE SURFACE OF THE SOD AND THOROUGHLY WATERED IN. FERTILIZE INSTALLED SOD AS ALLOWED BY PROPERTY'S JURISDICTIONAL AUTHORITY.
 - DURING DELIVERY, PRIOR TO, AND DURING THE PLANTING OF THE LAWN AREAS, THE SOD PANELS SHALL AT ALL TIMES BE PROTECTED FROM EXCESSIVE DRYING AND UNNECESSARY EXPOSURE OF THE ROOTS TO THE SUN. ALL SOD SHALL BE STACKED SO AS NOT TO BE DAMAGED BY SWEATING OR EXCESSIVE HEAT AND MOISTURE.
- E. LAWN MAINTENANCE
- WITHIN THE CONTRACT LIMITS, THE CONTRACTOR SHALL PRODUCE A DENSE, WELL ESTABLISHED LAWN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR AND RE-SODDING OF ALL ERODED, SUNKEN OR BARE SPOTS (LARGER THAN 12"x12") UNTIL CERTIFICATION OF ACCEPTABILITY BY THE OWNER'S REPRESENTATIVE. REPAIRED SODDING SHALL BE ACCOMPLISHED AS IN THE ORIGINAL WORK (INCLUDING RE-GRADING IF NECESSARY).
 - CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING AND MAINTAINING SOD/LAWN UNTIL ACCEPTANCE BY THE OWNER'S REPRESENTATIVE. PRIOR TO AND UPON ACCEPTANCE, CONTRACTOR TO PROVIDE WATERING/IRRIGATION SCHEDULE TO OWNER. OBSERVE ALL APPLICABLE WATERING RESTRICTIONS AS SET FORTH BY THE PROPERTY'S JURISDICTIONAL AUTHORITY.
- 1.15 CLEANUP
- UPON COMPLETION OF ALL PLANTING WORK AND BEFORE FINAL ACCEPTANCE, THE CONTRACTOR SHALL REMOVE ALL MATERIAL, EQUIPMENT, AND DEBRIS RESULTING FROM HIS WORK. ALL PAVED AREAS SHALL BE BROOM-CLEANED AND THE SITE LEFT IN A NEAT AND ACCEPTABLE CONDITION AS APPROVED BY THE OWNER'S REPRESENTATIVE.
- 1.16 PLANT MATERIAL MAINTENANCE
- ALL PLANTS AND PLANTING INCLUDED UNDER THIS CONTRACT SHALL BE MAINTAINED BY WATERING, CULTIVATING, SPRAYING, AND ALL OTHER OPERATIONS (SUCH AS RE-STAKING OR REPAIRING GUY SUPPORTS) NECESSARY TO INSURE A HEALTHY PLANT CONDITION BY THE CONTRACTOR UNTIL CERTIFICATION OF ACCEPTABILITY BY THE OWNER'S REPRESENTATIVE.
- 1.17 FINAL INSPECTION AND ACCEPTANCE OF WORK
- FINAL INSPECTION AT THE END OF THE WARRANTY PERIOD SHALL BE ON PLANTING, CONSTRUCTION AND ALL OTHER INCIDENTAL WORK PERTAINING TO THIS CONTRACT. ANY REPLACEMENT AT THIS TIME SHALL BE SUBJECT TO THE SAME ONE (1) YEAR WARRANTY (OR AS SPECIFIED BY THE LANDSCAPE ARCHITECT OR OWNER IN WRITING) BEGINNING WITH THE TIME OF REPLACEMENT AND ENDING WITH THE SAME INSPECTION AND ACCEPTANCE HEREIN DESCRIBED.
- 1.18 WARRANTY
- THE LIFE AND SATISFACTORY CONDITION OF ALL PLANT MATERIAL INSTALLED (INCLUDING SOD) BY THE LANDSCAPE CONTRACTOR SHALL BE WARRANTED BY THE CONTRACTOR FOR A MINIMUM OF ONE (1) CALENDAR YEAR COMMENCING AT THE TIME OF CERTIFICATION OF ACCEPTABILITY BY THE OWNER'S REPRESENTATIVE.
 - REPLACEMENT: ANY PLANT NOT FOUND IN A HEALTHY GROWING CONDITION DURING THE WARRANTY PERIOD SHALL BE REMOVED FROM THE SITE AND REPLACED WITHIN TEN (10) DAYS OF NOTICE, OR BETWEEN SEPTEMBER-NOVEMBER, MARCH-MAY. ALL REPLACEMENTS SHALL BE PLANTS OF THE SAME KIND AND SIZE AS SPECIFIED IN THE PLANT LIST. THEY SHALL BE FURNISHED, PLANTED AND MULCHED AS SPECIFIED AT NO ADDITIONAL COST TO THE OWNER.
 - IN THE EVENT THE OWNER DOES NOT CONTRACT WITH THE CONTRACTOR FOR LANDSCAPE MAINTENANCE, THE CONTRACTOR IS ENCOURAGED TO VISIT THE PROJECT SITE PERIODICALLY DURING THE ONE (1) YEAR WARRANTY PERIOD TO EVALUATE MAINTENANCE PROCEDURES BEING PERFORMED BY THE OWNER, AND SHALL NOTIFY THE OWNER IN WRITING OF MAINTENANCE PROCEDURES OR CONDITIONS WHICH THREATEN VIGOROUS AND HEALTHY PLANT GROWTH. IT IS SUGGESTED SUCH SITE VISITS SHALL BE CONDUCTED A MINIMUM OF ONCE PER MONTH FOR A PERIOD OF TWELVE (12) MONTHS FROM THE DATE OF ACCEPTANCE.

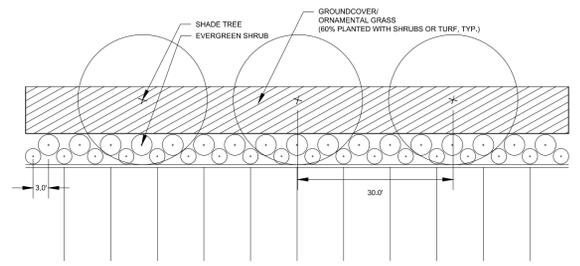


1 SINGLE PARKING ISLAND
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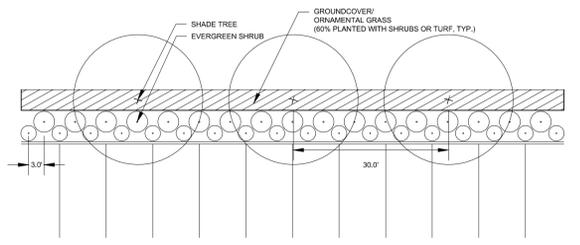
2 DOUBLE PARKING ISLAND
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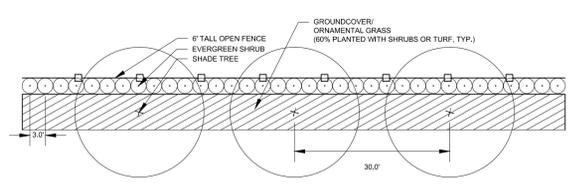
3 10' FOUNDATION PLANTING AT STREET LOT LINE
NOT TO SCALE



4 15' PARKING LOT PERIMETER LANDSCAPE YARD
NOT TO SCALE



5 10' LANDSCAPE STRIP FOR NON-RESIDENTIAL INTERIOR SIDE/REAR LOT LINES
NOT TO SCALE



6 10' LANDSCAPE YARD ON ARTERIAL STREET FOR MULTIFAMILY
NOT TO SCALE

NOT FOR CONSTRUCTION

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SPRING HILL TOWN CROSSING
SPRING HILL, TN



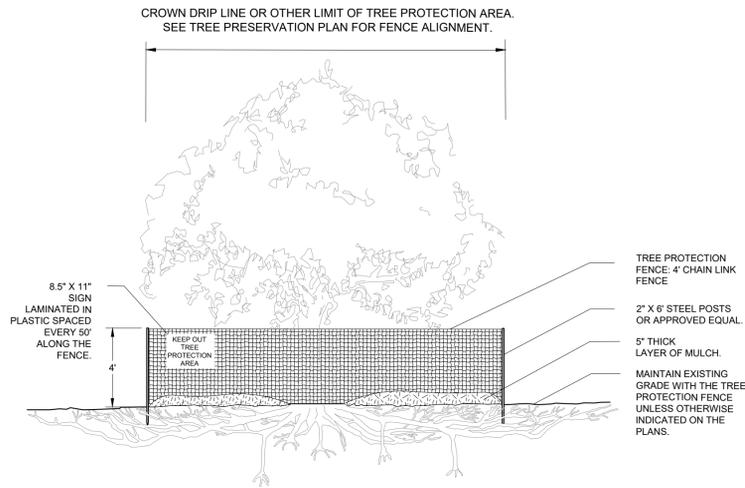
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DESIGNED BY:	KHA
DRAWN BY:	KHA
CHECKED BY:	JLR
DATE:	09/21/2020
KIMLEY-HORN PROJECT NO. 118332001	

LANDSCAPE NOTES

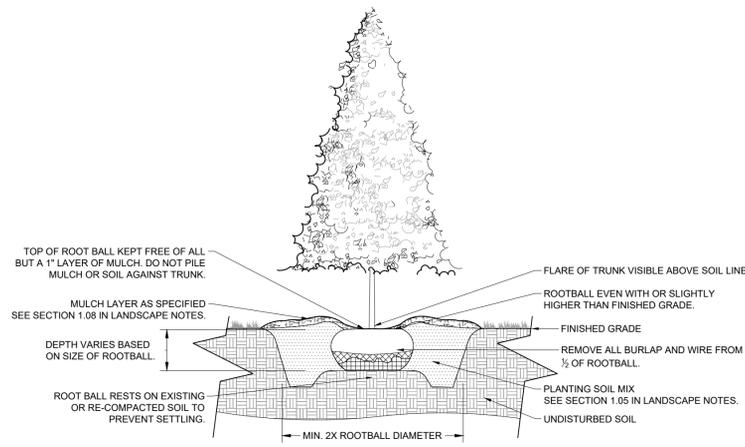
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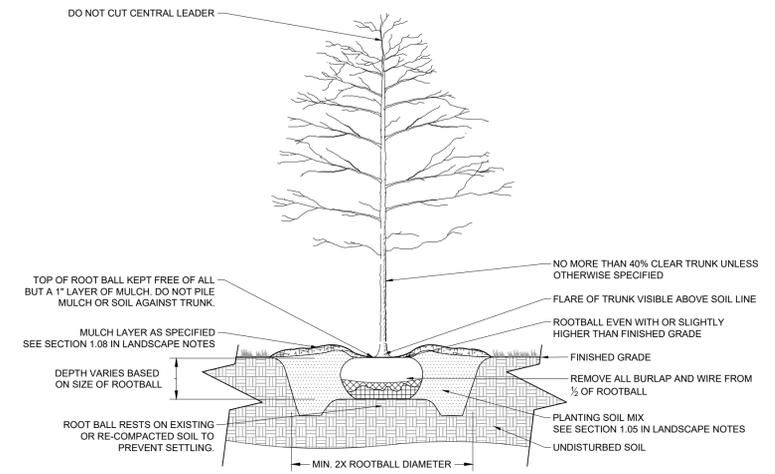
7 TREE PROTECTION FENCING

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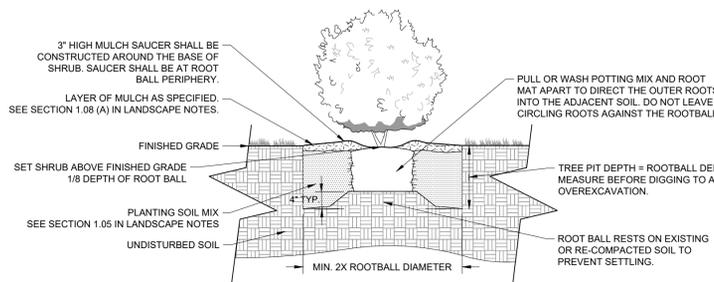
4 EVERGREEN TREE PLANTING

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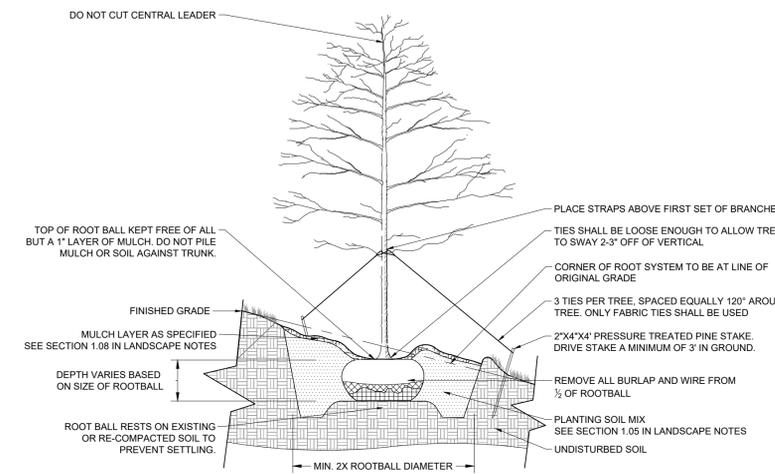
1 B&B TREE PLANTING

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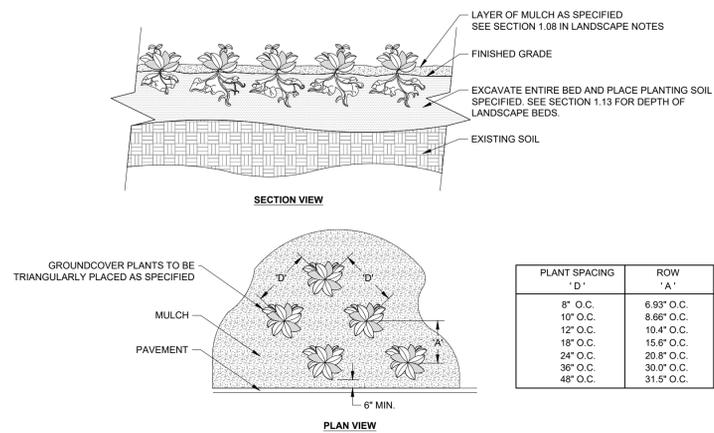
5 CONTAINER SHRUB PLANTING

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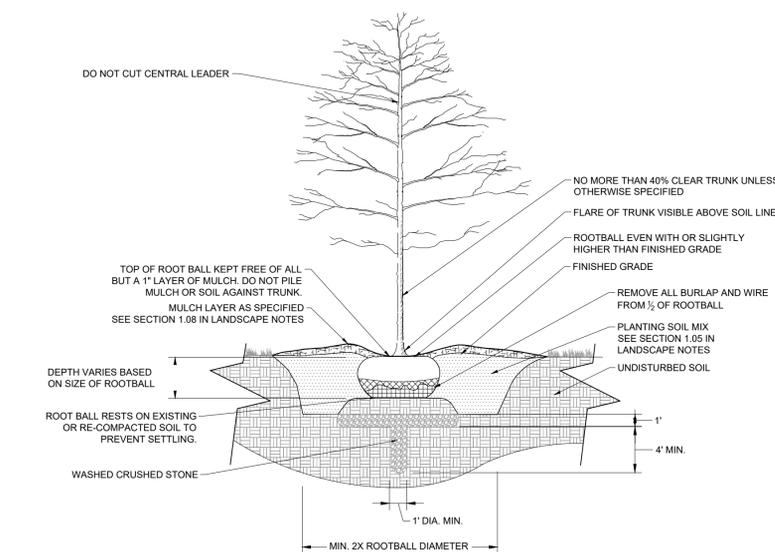
2 B&B TREE PLANTING ON SLOPE

NOT TO SCALE



6 GROUNDCOVER PLANTING

NOT TO SCALE



3 B&B TREE PLANTING IN POOR DRAINAGE

NOT TO SCALE

NOT FOR CONSTRUCTION



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DESIGNED BY: KHA
DRAWN BY: KHA
CHECKED BY: JLR
DATE: 09/21/2020
KIMLEY-HORN PROJECT NO. 118332001

MASS GRADING AND STORMWATER MANAGEMENT

J.W.R PROPERTIES

SPRING HILL WILLIAMSON COUNTY, TENNESSEE JULY, 2020

OWNER/DEVELOPER



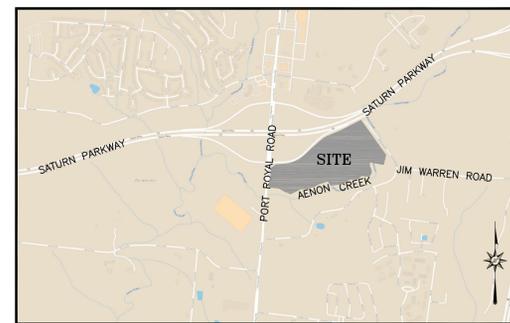
STEADFAST
COMPANIES

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VICINITY MAP
NTS

CAUTION:

THE SIZES, TYPES, AND RELATIVE POSITIONS OF GAS, WATER, TELEPHONE, AND ELECTRIC UTILITIES SHOWN ON THESE DRAWINGS WERE FURNISHED BY THE RESPECTIVE UTILITY COMPANIES AND WERE NOT VERIFIED BY THE ENGINEER. THE CONTRACTOR MUST VERIFY ALL UTILITIES WHETHER OR NOT THEY ARE INDICATED ON THE DRAWINGS.
CALL 1-800-752-6007 48 HOURS BEFORE YOU DIG

INDEX OF DRAWINGS

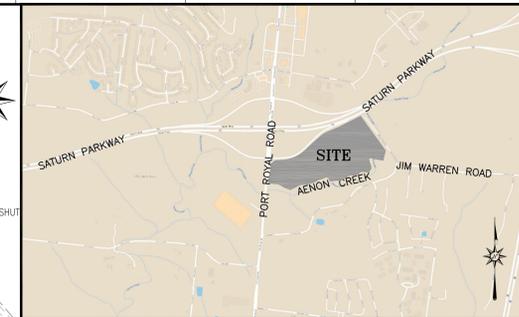
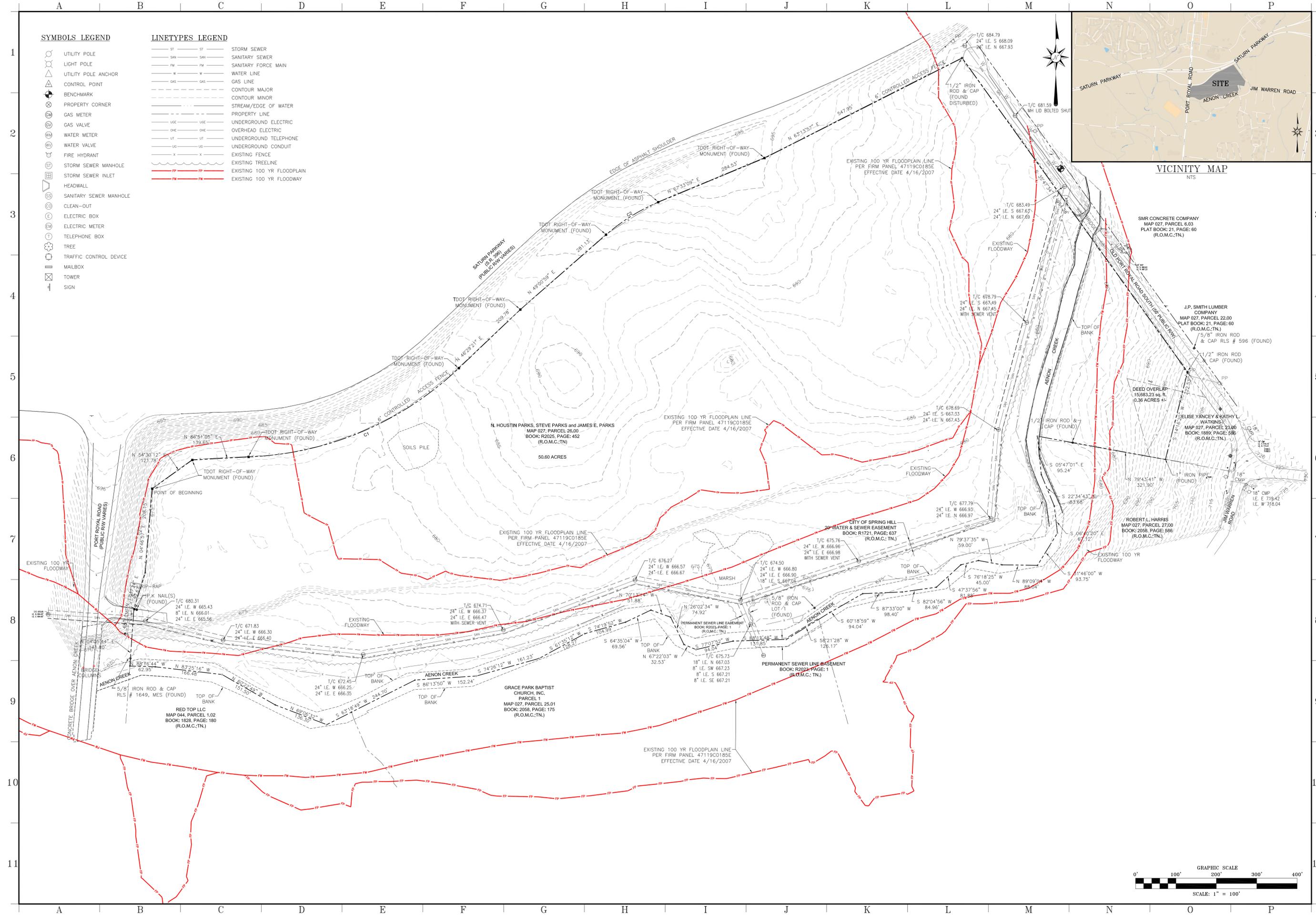
C1.0	SITE SURVEY
C2.0	MASS GRADING PLAN AND EROSION CONTROL PLAN
C3.0	OUTLET STRUCTURES
C4.0	DETAILS
C5.0	POST DEVELOPMENT CONDITION
C6.0	POST DEVELOPMENT CONDITION
C7.0	CLOMR

SYMBOLS LEGEND

- UTILITY POLE
- LIGHT POLE
- UTILITY POLE ANCHOR
- CONTROL POINT
- BENCHMARK
- PROPERTY CORNER
- GAS METER
- GAS VALVE
- WATER METER
- WATER VALVE
- FIRE HYDRANT
- STORM SEWER MANHOLE
- STORM SEWER INLET
- HEADWALL
- SANITARY SEWER MANHOLE
- CLEAN-OUT
- ELECTRIC BOX
- ELECTRIC METER
- TELEPHONE BOX
- TREE
- TRAFFIC CONTROL DEVICE
- MAILBOX
- TOWER
- SIGN

LINETYPES LEGEND

- ST ST STORM SEWER
- SAN SAN SANITARY SEWER
- FM FM SANITARY FORCE MAIN
- W W WATER LINE
- GAS GAS GAS LINE
- CONTOUR MAJOR
- CONTOUR MINOR
- STREAM/EDGE OF WATER
- PROPERTY LINE
- UOE UOE UNDERGROUND ELECTRIC
- OHE OHE OVERHEAD ELECTRIC
- UT UT UNDERGROUND TELEPHONE
- UG UG UNDERGROUND CONDUIT
- X X EXISTING FENCE
- EXISTING TREE LINE
- FP FP EXISTING 100 YR FLOODPLAIN
- FW FW EXISTING 100 YR FLOODWAY



VICINITY MAP
NTS

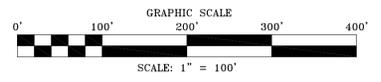
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SPRING HILL DEVELOPMENT
PORT ROYAL ROAD
SPRING HILL, TENNESSEE
MASS GRADING & STORMWATER MANAGEMENT

DATE: JULY 24, 2020

SITE SURVEY
C1.0



SYMBOLS LEGEND

- UTILITY POLE
- LIGHT POLE
- UTILITY POLE ANCHOR
- CONTROL POINT
- BENCHMARK
- PROPERTY CORNER
- GAS METER
- GAS VALVE
- WATER METER
- WATER VALVE
- FIRE HYDRANT
- STORM SEWER MANHOLE
- STORM SEWER INLET
- HEADWALL
- SANITARY SEWER MANHOLE
- CLEAN-OUT
- ELECTRIC BOX
- ELECTRIC METER
- TELEPHONE BOX
- TREE
- TRAFFIC CONTROL DEVICE
- MAILBOX
- TOWER
- SIGN
- FLOW OF WATER/SEDIMENT

LINETYPES LEGEND

- ST ST STORM SEWER
- SAW SAW SANITARY SEWER
- FM FM SANITARY FORCE MAIN
- W W WATER LINE
- GAS GAS GAS LINE
- CONTOUR MAJOR
- CONTOUR MINOR
- STREAM/EDGE OF WATER
- PROPERTY LINE
- UNDERGROUND ELECTRIC
- OHE OHE OVERHEAD ELECTRIC
- UT UT UNDERGROUND TELEPHONE
- UC UC UNDERGROUND CONDUIT
- X X X EXISTING FENCE
- EXISTING TREELINE
- EXISTING 100 YR FLOODPLAIN
- EXISTING 100 YR FLOODWAY
- PROPOSED 100 YR FLOODWAY
- EXISTING 100 YR FLOODWAY

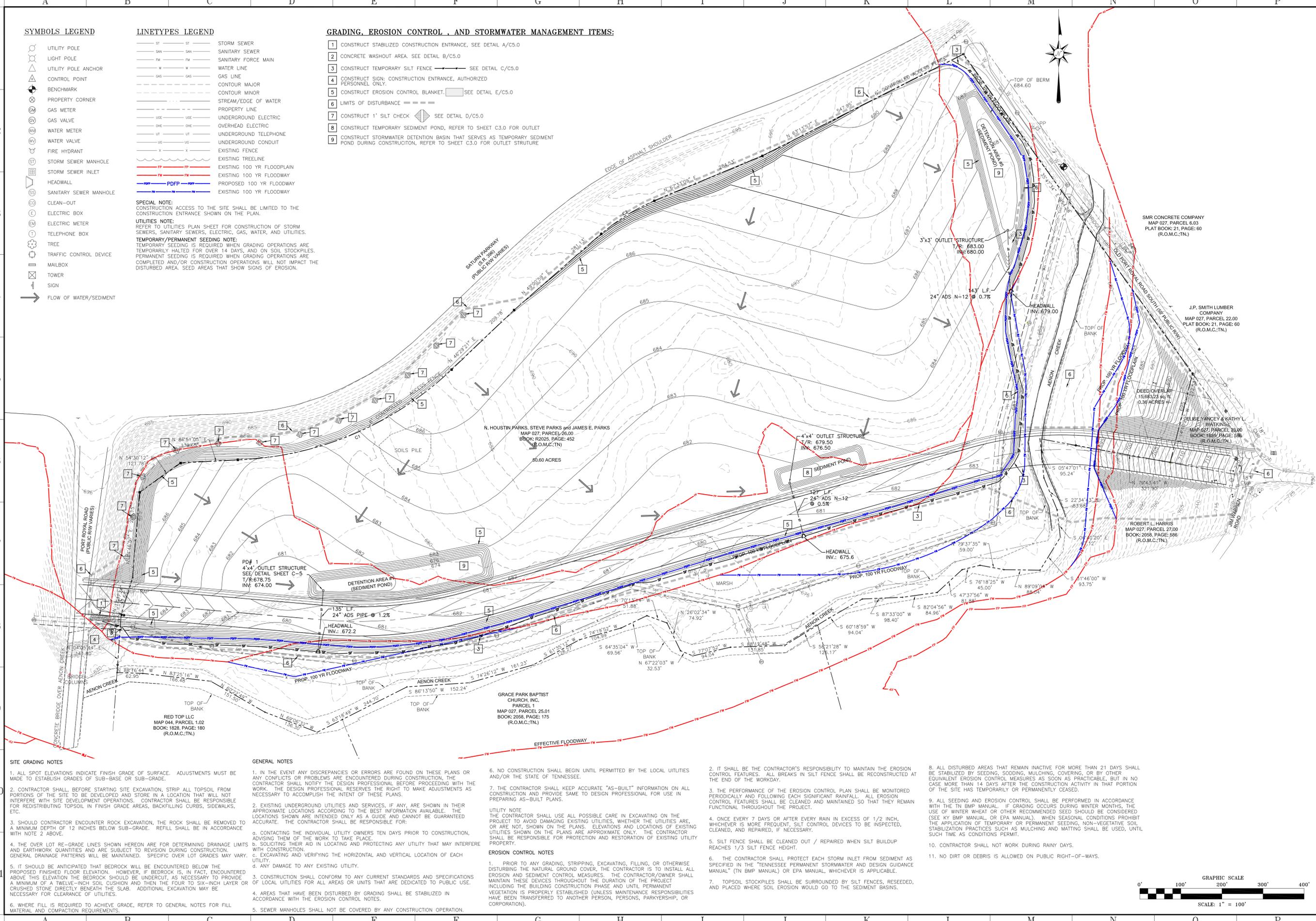
SPECIAL NOTE:
CONSTRUCTION ACCESS TO THE SITE SHALL BE LIMITED TO THE CONSTRUCTION ENTRANCE SHOWN ON THE PLAN.

UTILITIES NOTE:
REFER TO UTILITIES PLAN SHEET FOR CONSTRUCTION OF STORM SEWERS, SANITARY SEWERS, ELECTRIC, GAS, WATER, AND UTILITIES.

TEMPORARY/PERMANENT SEEDING NOTE:
TEMPORARY SEEDING IS REQUIRED WHEN GRADING OPERATIONS ARE TEMPORARILY HALTED FOR OVER 14 DAYS, AND ON SOIL STOCKPILES. PERMANENT SEEDING IS REQUIRED WHEN GRADING OPERATIONS ARE COMPLETED AND/OR CONSTRUCTION OPERATIONS WILL NOT IMPACT THE DISTURBED AREA. SEED AREAS THAT SHOW SIGNS OF EROSION.

GRADING, EROSION CONTROL, AND STORMWATER MANAGEMENT ITEMS:

- 1 CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE, SEE DETAIL A/C5.0
- 2 CONCRETE WASHOUT AREA. SEE DETAIL B/C5.0
- 3 CONSTRUCT TEMPORARY SILT FENCE. SEE DETAIL C/C5.0
- 4 CONSTRUCT SIGN: CONSTRUCTION ENTRANCE, AUTHORIZED PERSONNEL ONLY.
- 5 CONSTRUCT EROSION CONTROL BLANKET. SEE DETAIL E/C5.0
- 6 LIMITS OF DISTURBANCE
- 7 CONSTRUCT 1' SILT CHECK. SEE DETAIL D/C5.0
- 8 CONSTRUCT TEMPORARY SEDIMENT POND, REFER TO SHEET C3.0 FOR OUTLET
- 9 CONSTRUCT STORMWATER DETENTION BASIN THAT SERVES AS TEMPORARY SEDIMENT POND DURING CONSTRUCTION, REFER TO SHEET C3.0 FOR OUTLET STRUCTURE



SITE GRADING NOTES

- ALL SPOT ELEVATIONS INDICATE FINISH GRADE OF SURFACE. ADJUSTMENTS MUST BE MADE TO ESTABLISH GRADES OF SUB-BASE OR SUB-GRADE.
- CONTRACTOR SHALL, BEFORE STARTING SITE EXCAVATION, STRIP ALL TOPSOIL FROM PORTIONS OF THE SITE TO BE DEVELOPED AND STORE IN A LOCATION THAT WILL NOT INTERFERE WITH SITE DEVELOPMENT OPERATIONS. CONTRACTOR SHALL BE RESPONSIBLE FOR REDISTRIBUTING TOPSOIL IN FINISH GRADE AREAS, BACKFILLING CURBS, SIDEWALKS, ETC.
- SHOULD CONTRACTOR ENCOUNTER ROCK EXCAVATION, THE ROCK SHALL BE REMOVED TO A MINIMUM DEPTH OF 12 INCHES BELOW SUB-GRADE. REFILL SHALL BE IN ACCORDANCE WITH NOTE 2 ABOVE.
- THE OVER LOT RE-GRADE LINES SHOWN HEREON ARE FOR DETERMINING DRAINAGE LIMITS AND EARTHWORK QUANTITIES AND ARE SUBJECT TO REVISION DURING CONSTRUCTION. GENERAL DRAINAGE PATTERNS WILL BE MAINTAINED. SPECIFIC OVER LOT GRADES MAY VARY.
- IT SHOULD BE ANTICIPATED THAT BEDROCK WILL BE ENCOUNTERED BELOW THE PROPOSED FINISHED FLOOR ELEVATION. HOWEVER, IF BEDROCK IS, IN FACT, ENCOUNTERED ABOVE THIS ELEVATION THE BEDROCK SHOULD BE UNDERCUT, AS NECESSARY TO PROVIDE A MINIMUM OF A TWELVE-INCH SOIL CUSHION AND THEN THE FOUR TO SIX-INCH LAYER OF CRUSHED STONE DIRECTLY BENEATH THE SLAB. ADDITIONAL EXCAVATION MAY BE NECESSARY FOR CLEARANCE OF UTILITIES.
- WHERE FILL IS REQUIRED TO ACHIEVE GRADE, REFER TO GENERAL NOTES FOR FILL MATERIAL AND COMPACTION REQUIREMENTS.

GENERAL NOTES

- IN THE EVENT ANY DISCREPANCIES OR ERRORS ARE FOUND ON THESE PLANS OR ANY CONFLICTS OR PROBLEMS ARE ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE DESIGN PROFESSIONAL BEFORE PROCEEDING WITH THE WORK. THE DESIGN PROFESSIONAL RESERVES THE RIGHT TO MAKE ADJUSTMENTS AS NECESSARY TO ACCOMPLISH THE INTENT OF THESE PLANS.
- EXISTING UNDERGROUND UTILITIES AND SERVICES, IF ANY, ARE SHOWN IN THEIR APPROXIMATE LOCATIONS ACCORDING TO THE BEST INFORMATION AVAILABLE. THE LOCATIONS SHOWN ARE INTENDED ONLY AS A GUIDE AND CANNOT BE GUARANTEED ACCURATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR:
 - CONTACTING THE INDIVIDUAL UTILITY OWNERS TEN DAYS PRIOR TO CONSTRUCTION, ADVISING THEM OF THE WORK TO TAKE PLACE.
 - SOLICITING THEIR AID IN LOCATING AND PROTECTING ANY UTILITY THAT MAY INTERFERE WITH CONSTRUCTION.
 - EXCAVATING AND VERIFYING THE HORIZONTAL AND VERTICAL LOCATION OF EACH UTILITY.
 - ANY DAMAGE TO ANY EXISTING UTILITY.
- CONSTRUCTION SHALL CONFORM TO ANY CURRENT STANDARDS AND SPECIFICATIONS OF LOCAL UTILITIES FOR ALL AREAS OR UNITS THAT ARE DEDICATED TO PUBLIC USE.
- AREAS THAT HAVE BEEN DISTURBED BY GRADING SHALL BE STABILIZED IN ACCORDANCE WITH THE EROSION CONTROL NOTES.
- SEWER MANHOLES SHALL NOT BE COVERED BY ANY CONSTRUCTION OPERATION.

6. NO CONSTRUCTION SHALL BEGIN UNTIL PERMITTED BY THE LOCAL UTILITIES AND/OR THE STATE OF TENNESSEE.

7. THE CONTRACTOR SHALL KEEP ACCURATE "AS-BUILT" INFORMATION ON ALL CONSTRUCTION AND PROVIDE SAME TO DESIGN PROFESSIONAL FOR USE IN PREPARING AS-BUILT PLANS.

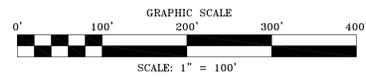
UTILITY NOTE
THE CONTRACTOR SHALL USE ALL POSSIBLE CARE IN EXCAVATING ON THE PROJECT TO AVOID DAMAGING EXISTING UTILITIES, WHETHER THE UTILITIES ARE, OR ARE NOT, SHOWN ON THE PLANS. ELEVATIONS AND LOCATIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION AND RESTORATION OF EXISTING UTILITY PROPERTY.

EROSION CONTROL NOTES

- PRIOR TO ANY GRADING, STRIPPING, EXCAVATING, FILLING, OR OTHERWISE DISTURBING THE NATURAL GROUND COVER, THE CONTRACTOR IS TO INSTALL ALL EROSION AND SEDIMENT CONTROL MEASURES. THE CONTRACTOR/OWNER SHALL MAINTAIN THESE DEVICES THROUGHOUT THE DURATION OF THE PROJECT INCLUDING THE BUILDING CONSTRUCTION PHASE AND UNTIL PERMANENT VEGETATION IS PROPERLY ESTABLISHED (UNLESS MAINTENANCE RESPONSIBILITIES HAVE BEEN TRANSFERRED TO ANOTHER PERSON, PERSONS, PARTNERSHIP, OR CORPORATION).

- IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN THE EROSION CONTROL FEATURES. ALL BREAKS IN SILT FENCE SHALL BE RECONSTRUCTED AT THE END OF THE WORKDAY.
- THE PERFORMANCE OF THE EROSION CONTROL PLAN SHALL BE MONITORED PERIODICALLY AND FOLLOWING EACH SIGNIFICANT RAINFALL. ALL EROSION CONTROL FEATURES SHALL BE CLEANED AND MAINTAINED SO THAT THEY REMAIN FUNCTIONAL THROUGHOUT THE PROJECT.
- ONCE EVERY 7 DAYS OR AFTER EVERY RAIN IN EXCESS OF 1/2 INCH, WHICHEVER IS MORE FREQUENT, SILT CONTROL DEVICES TO BE INSPECTED, CLEANED, AND REPAIRED, IF NECESSARY.
- SILT FENCE SHALL BE CLEANED OUT / REPAIRED WHEN SILT BUILDUP REACHES 1/3 SILT FENCE HEIGHT.
- THE CONTRACTOR SHALL PROTECT EACH STORM INLET FROM SEDIMENT AS SPECIFIED IN THE "TENNESSEE PERMANENT STORMWATER AND DESIGN GUIDANCE MANUAL" (TN BMP MANUAL) OR EPA MANUAL, WHICHEVER IS APPLICABLE.
- TOPSOIL STOCKPILES SHALL BE SURROUNDED BY SILT FENCES, RESEEDED, AND PLACED WHERE SOIL EROSION WOULD GO TO THE SEDIMENT BASINS.

- ALL DISTURBED AREAS THAT REMAIN INACTIVE FOR MORE THAN 21 DAYS SHALL BE STABILIZED BY SEEDING, SODDING, MULCHING, COVERING, OR BY OTHER EQUIVALENT EROSION CONTROL MEASURES AS SOON AS PRACTICABLE, BUT IN NO CASE MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED.
- ALL SEEDING AND EROSION CONTROL SHALL BE PERFORMED IN ACCORDANCE WITH THE TN BMP MANUAL. IF GRADING OCCURS DURING WINTER MONTHS, THE USE OF WINTER WHEAT OR OTHER RECOMMENDED SEED SHOULD BE CONSIDERED (SEE TN BMP MANUAL, OR EPA MANUAL). WHEN SEASONAL CONDITIONS PROHIBIT THE APPLICATION OF TEMPORARY OR PERMANENT SEEDING, NON-VEGETATIVE SOIL STABILIZATION PRACTICES SUCH AS MULCHING AND MATTING SHALL BE USED, UNTIL SUCH TIME AS CONDITIONS PERMIT.
- CONTRACTOR SHALL NOT WORK DURING RAINY DAYS.
- NO DIRT OR DEBRIS IS ALLOWED ON PUBLIC RIGHT-OF-WAYS.



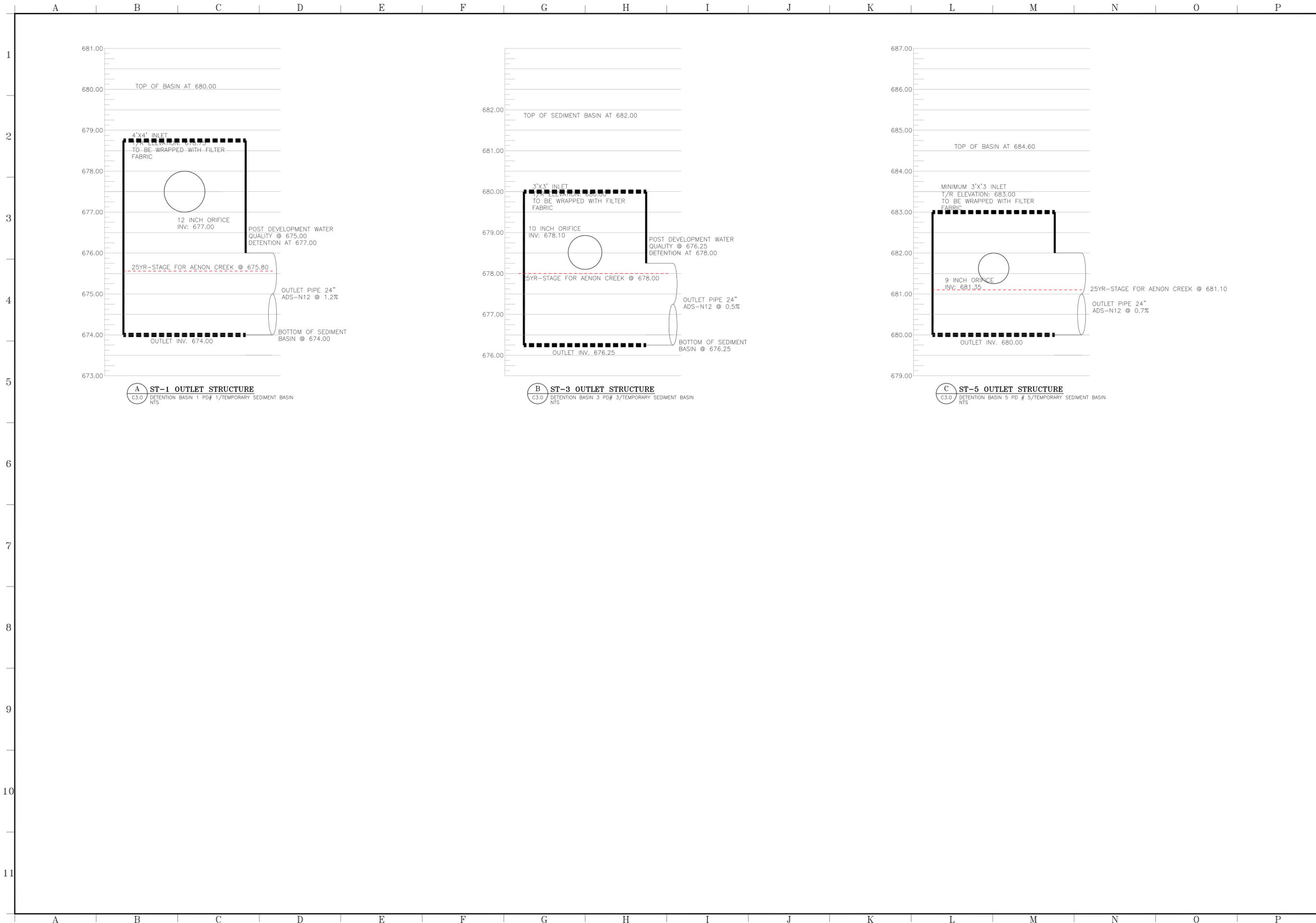
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SPRING HILL DEVELOPMENT
PORT ROYAL ROAD
SPRING HILL, TENNESSEE
MASS GRADING & STORMWATER MANAGEMENT

DATE: JULY 24, 2020

MASS GRADING AND
EROSION CONTROL PLAN
C2.0

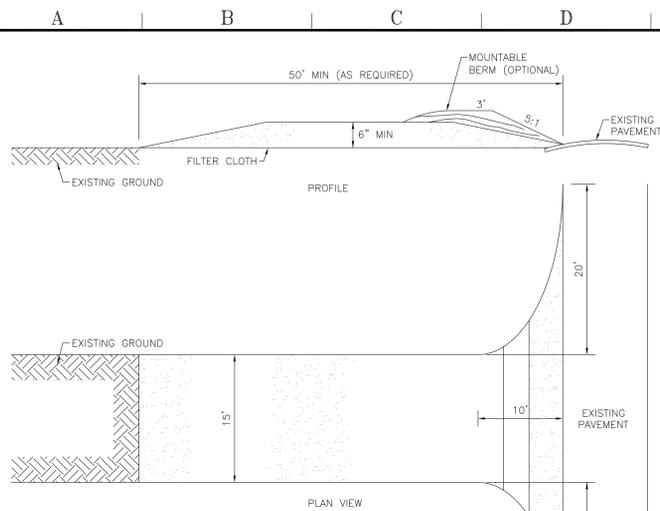


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 IRVINE CA 92612

SPRING HILL DEVELOPMENT
 PORT ROYAL ROAD
 SPRING HILL, TENNESSEE
 MASS GRADING & STORMWATER MANAGEMENT

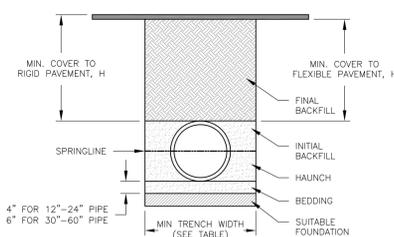
DATE: JULY 24, 2020

STORMWATER
 MANAGEMENT PLAN
 C3.0



1. PLACE 6 INCHES MINIMUM OF COARSE AGGREGATE OVER A STABLE SUBGRADE.
2. CONSTRUCT THE DRIVE AT LEAST 15' WIDE AND 50' LONG OR THE DISTANCE TO THE FOUNDATION.
3. ADD STONE AS NEEDED TO MAINTAIN 6 INCHES OF CLEAN DEPTH.
4. TO IMPROVE STABILITY OR IF WET CONDITIONS ARE ANTICIPATED, PLACE GEOTEXTILE FABRIC ON THE GRADED FOUNDATION (NON-WOVEN 6 OUNCE OR EQUIVALENT).
5. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE.
6. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAYS. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURE USED TO TRAP ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC RIGHT-OF-WAYS MUST BE REMOVED IMMEDIATELY.
7. WASHING - WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO RIGHT-OF-WAYS. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
8. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

A STABILIZED CONSTRUCTION ENTRANCE
C9.0 SCALE: 1"=10'



1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST EDITION, WITH THE EXCEPTION THAT THE INITIAL BACKFILL MAY EXTEND TO THE CROWN OF THE PIPE. SOIL CLASSIFICATIONS ARE PER THE LATEST VERSION OF ASTM D2321. CLASS I/IV MATERIALS (MH, CH) AS DEFINED IN PREVIOUS VERSIONS OF ASTM D2321 ARE NOT APPROPRIATE BACKFILL MATERIALS.
2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.
3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. COMPACTION SHALL BE SPECIFIED BY THE ENGINEER IN ACCORDANCE WITH TABLE 3 FOR THE APPLICABLE FILL HEIGHTS LISTED. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 12"-24" (300mm-600mm) DIAMETER PIPE; 6" (150mm) FOR 30"-60" (750mm-1500mm) DIAMETER PIPE. THE MIDDLE 1/3 BENEATH THE PIPE INVERT SHALL BE LOOSELY PLACED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.
5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV IN THE PIPE ZONE EXTENDING TO THE CROWN OF THE PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION. COMPACTION SHALL BE SPECIFIED BY THE ENGINEER IN ACCORDANCE WITH TABLE 3 FOR THE APPLICABLE FILL HEIGHTS LISTED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.
6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" (300mm) FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOTATION. FOR TRAFFIC APPLICATIONS; CLASS I OR II MATERIAL COMPACTED TO 90% SPD AND CLASS III COMPACTED TO 95% SPD IS REQUIRED. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 12" (300mm) UP TO 48" (1200mm) DIAMETER PIPE AND 24" (600mm) OF COVER FOR 60" (1500mm) DIAMETER PIPE. MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.
7. FOR ADDITIONAL INFORMATION SEE TECHNICAL NOTE 2.04.

B TRENCH INSTALLATION DETAIL-ADS PIPE
C9.0 NTS

TABLE 1. RECOMMENDED MINIMUM TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
12" (300mm)	30" (762mm)
18" (450mm)	34" (864mm)
24" (600mm)	39" (991mm)
30" (750mm)	48" (1219mm)
36" (900mm)	56" (1422mm)
42" (1050mm)	64" (1626mm)
48" (1200mm)	72" (1829mm)
60" (1500mm)	80" (2032mm)
	1500mm (2438mm)

TABLE 2. MINIMUM RECOMMENDED COVER BASED ON VEHICLE LOADING CONDITIONS

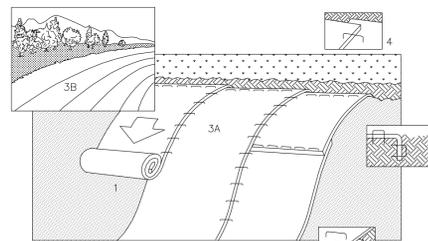
PIPE DIAM.	SURFACE LIVE LOADING CONDITION	
	H-20 (75T AXLE LOAD)	HEAVY CONSTRUCTION
12" - 48" (300mm - 1200mm)	12" (305mm)	48" (1219mm)
60" (1500mm)	24" (610mm)	60" (1524mm)

TABLE 3. MAXIMUM COVER FOR ADS HP STORM PIPE, ft

PIPE DIA	CLASS I			CLASS II			CLASS III			CLASS IV		
	COMPACTED	95%	90%	85%	95%	90%	85%	95%	90%	85%	95%	90%
12"	41	28	21	16	20	16	16	16	16	16	16	16
15"	42	29	21	16	21	16	16	16	16	16	16	16
18"	44	30	21	16	22	17	16	16	16	16	16	16
24"	37	26	18	14	19	14	14	14	14	14	14	14
30"	39	27	19	14	19	15	14	14	14	14	14	14
36"	28	20	14	10	14	11	10	10	10	10	10	10
42"	30	21	14	10	15	11	10	10	10	10	10	10
48"	29	20	14	9	14	10	10	10	10	10	10	10
60"	29	20	14	9	14	10	9	9	9	9	9	9

FILL HEIGHT TABLE GENERATED USING AASHTO SECTION 12. LOAD RESISTANCE FACTOR DESIGN (LRFD) PROCEDURE WITH THE FOLLOWING ASSUMPTIONS:
NO HYDROSTATIC PRESSURE
UNIT WEIGHT OF SOIL (γ_s) = 120 PCF

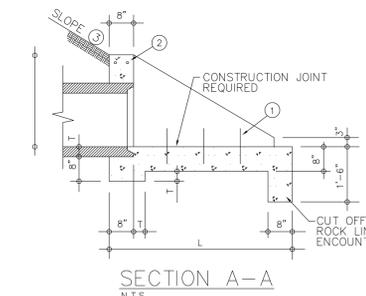
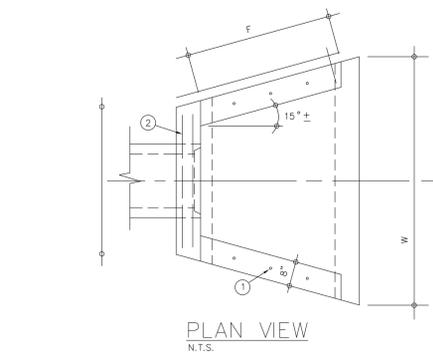
B CONCRETE WASHOUT AREA
C9.0 NTS



- NOTE: REFER TO GENERAL STAPLE PATTERN GUIDE FOR CORRECT STAPLE PATTERN RECOMMENDATIONS FOR SLOPE INSTALLATIONS.
1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING APPLICATION OF LIME, FERTILIZER AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
 2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
 3. ROLL THE BLANKETS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE.
 4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2" OVERLAP.
 5. WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKETS END OVER END (SINGLE STYLED WITH APPROXIMATELY 4" OVERLAP, STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART.

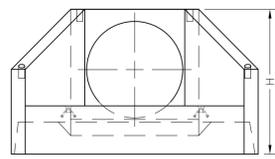
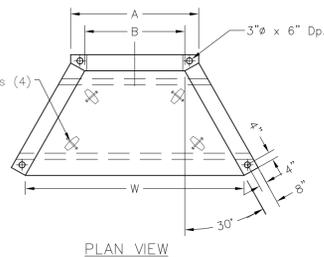
E EROSION CONTROL BLANKET
C9.0 NTS

C TEMPORARY SILT FENCE
C9.0 NTS



GENERAL NOTES:

1. Concrete: 28 Day Compressive Strength f_c = 4,500 psi
2. Steel Reinforcement: ASTM A-615, Grade 60
3. Minimum Reinforcing Cover - 2"
4. 3/4" Chamfer On All Exposed Edges
5. 3"φ x 6" Dp. Holes Required As Shown For Pipe Culvert Headwall Only As Shown For Handrail Or Fence Pipe By Others



FRONT VIEW

STANDARD HEADWALL DETAIL
N.T.S.

SILT FENCE NOTES:

1. FENCE POSTS SHALL BE AT LEAST 5 FEET LONG AND METAL FENCE FABRIC SHALL BE AT LEAST 14 GAUGE, 36 INCHES HIGH, AND WITH OPENINGS NO LARGER THAN 6 INCHES X 6 INCHES. GEOTEXTILE FABRIC SHALL BE A MATERIAL RECOMMENDED FOR USE BY THE MANUFACTURER.
2. THE BOTTOM 12 INCHES OF FABRIC SHALL BE BURIED IN A 6 INCH TRENCH CUT INTO THE GROUND TO PREVENT SEDIMENT ESCAPING UNDER THE FENCE. ALL EARTHWORK SHALL BE ON THE UPSTREAM SIDE OF THE FENCE.
3. FENCE POSTS AND FABRIC WILL BE ACCEPTED BASED ON A VISUAL INSPECTION BY THE CITY ENGINEER IN THE FIELD. GEOTEXTILE FABRIC WILL BE ACCEPTED UPON RECEIPT OF A CERTIFICATION FROM THE MANUFACTURER THAT IT IS SUITABLE FOR THIS USE.
4. THE SILT FENCE SHALL BE CONSTRUCTED AT LOCATIONS SHOWN ON THE PLANS OR AS DIRECTED BY THE COUNTY ENGINEER. THE SILT FENCE SHALL BE ERECTED BEFORE GRADING IS BEGUN IN THE AREA TO BE PROTECTED. POSTS SHALL BE INSTALLED AT 6 TO 10 FOOT SPACING (THE CLOSER SPACING SHOULD BE USED IN AREAS WHERE RAPID RUNOFF CAN BE EXPECTED) AND FENCE FABRIC ATTACHED. THE GEOTEXTILE FABRIC SHALL BE ATTACHED TO THE FENCE ON THE UPSTREAM SIDE USING STAPLES, HOG-RINGS, OR ANOTHER APPROVED METHOD.
5. DURING THE USEFUL LIFE OF THE SILT FENCE, IT SHALL BE MAINTAINED BY THE CONTRACTOR AND SILT ACCUMULATIONS THAT THREATEN DAMAGE TO THE FENCE SHALL BE REMOVED. AFTER THE USEFULNESS OF THE FENCE HAS ENDED, IT SHALL BE REMOVED AND DISPOSED OF, AND THE ACCUMULATED SILT SHALL EITHER BE REMOVED OR DRESSED IN PLACE AS DIRECTED AND THE ENTIRE AREA SEEDED OR SODDED AND PROTECTED.

PIPE DIA. OR EQV. DIA.	SHAPE	DIMENSIONS						CLASS I, OMS, STEEL	REINFT. STEEL
		C	E	F	L	W	T		
12"	○	1'-9"	2'-6"	2'-3"	3'-6"	4'-0"	2"	0.58	7
15"	○	1'-9"	3'-0"	2'-6"	3'-6"	4'-9"	2-1/4"	0.68	8
18"	○	2'-3"	3'-0"	3'-6"	4'-6"	5'-3"	2-1/2"	0.93	9
21"	○	2'-6"	3'-3"	4'-0"	5'-0"	6'-0"	2-3/4"	1.14	10
24"	○	2'-9"	3'-6"	4'-6"	5'-6"	6'-6"	3"	1.35	8
27"	○	3'-0"	3'-9"	5'-0"	6'-0"	7'-0"	3-1/4"	1.57	9
	○	2'-9"	4'-6"	4'-3"	5'-3"	7'-3"	3-1/2"	1.51	10

DIMENSIONS AND QUANTITIES BASED ON CONCRETE PIPE AND WILL VARY INSIGNIFICANTLY FOR CORRUGATED METAL PIPE.

NOTES:

1. 6 - #4 X 1'-0" DOWEL BARS.
 2. 2 - #4 X (E DIMENSION MINUS 4")
 3. SLOPES SHALL BE WARPED TO FIT HEADWALL WHEN PIPE IS SKEWED AND/OR NORMAL SLOPE VARIES FROM 2:1
- VOLUME DISPLACED BY PIPE COMPUTED USING INSIDE DIAMETER OF PIPE.
- WING ANGLES AND/OR DIMENSIONS MAY BE ALTERED DURING CONST. TO ACCOMMODATE FLOW OF WATER

APRON BETWEEN WINGS SHALL BE SLOPED IN THE DIRECTION OF FLOW EQUAL TO SLOPE OF PIPE. FRONT FACE OF HEADWALL SHALL REMAIN VERTICAL.

PIPE SIZE	HOLE SIZE	"W"	"L"	"H"	"A"	"B"	"C"	"D"	"E"	"F"	"G"	WT.
30" RCP	40"	110"	60"	72"	64"	50"	48"	18"	13"	14 1/2"	5"	9615 Lbs.
36" RCP	48"	146"	74"	87"	80"	70"	63"	27"	16"	16 1/2"	6"	15,065 Lbs.
42" RCP	54"	172"	88"	98"	89"	80"	74"	33"	16"	16 1/2"	7"	20,428 Lbs.
48" RCP	62"											
54" RCP	70"											
60" RCP	76"											

Hole Size For All Other Pipe Types Will Be Pipe O.D. + 2"-4"

TEMPORARY SEEDING			
SEEDING DATES	SPECIES	LB PER 1000 SF	PER ACRE
MARCH 1 TO AUGUST 15	OATS	3	4 BUSHEL
	TALL FESCUE	1	40 LB
	ANNUAL RYEGRASS	1	40 LB
	PERENNIAL RYEGRASS	1	40 LB
	TALL FESCUE	1	40 LB
AUGUST 16 TO NOVEMBER 1	RYE	3	2 BUSHEL
	TALL FESCUE	1	40 LB
	ANNUAL RYEGRASS	1	40 LB
	WHEAT	3	2 BUSHEL
	TALL FESCUE	1	40 LB
NOV. 1 TO SPRING SEEDING	ANNUAL RYEGRASS	1	40 LB
	TALL FESCUE	1	40 LB
	ANNUAL RYEGRASS	1	40 LB
	TALL FESCUE	1	40 LB
	ANNUAL RYEGRASS	1	40 LB

NOTE: OTHER APPROVED SEED SPECIES MAY BE SUBSTITUTED.

PERMANENT SEEDING			
SEED MIX	SEEDING RATE		NOTES
	LB/ACRE	LB/1000SF	
GENERAL USE			
CREeping RED FESCUE	20-40	1/2-1	
DOMESTIC RYEGRASS	10-20	1/4-1/2	
KENTUCKY BLUEGRASS	10-20	1/4-1/2	
TALL FESCUE	40	1	
DWARF FESCUE	40	1	
STEep BANKS OR CUT SLOPES			
TALL FESCUE	40	1	
CROWN VETCH	10	1/4	DO NOT SEED LATER THAN AUGUST
TALL FESCUE	20	1/4	THAN AUGUST
FLAT PEA	20	1/2	DO NOT SEED LATER THAN AUGUST
TALL FESCUE	20	1/2	THAN AUGUST
ROAD DITCHES AND SWALES			
TALL FESCUE	40	1	
DWARF FESCUE	90	2 1/4	
KENTUCKY BLUEGRASS	5		
LAWNS			
KENTUCKY BLUEGRASS	60	1 1/2	
PERENNIAL RYEGRASS	60	1 1/2	
KENTUCKY BLUEGRASS	60	1 1/2	FOR SHADED AREAS
CREeping RED FESCUE	60	1 1/2	

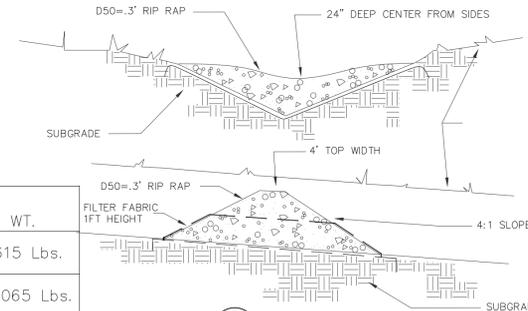
NOTE: OTHER APPROVED SEED SPECIES MAY BE SUBSTITUTED.

TEMPORARY AND PERMANENT SEEDING THE LIMITS OF SEEDING AND MULCHING ARE AS SHOWN WITHIN THE PLAN. SEEDING HAS BEEN ASSUMED TO BE 5'-0" OUTSIDE THE WORK LIMITS OR THE RIGHT-OF-WAY, WHICHEVER IS GREATER. ALL AREAS NOT DESIGNATED TO BE SEEDED SHALL REMAIN UNDER NATURAL GROUND COVER. THOSE AREAS DISTURBED OUTSIDE THE SEEDING LIMITS SHALL BE SEEDED AND MULCHED AT THE CONTRACTOR'S EXPENSE.

TEMPORARY SEEDING: ANY AREA WHICH WILL BE LEFT DORMANT (UNDISTURBED) FOR MORE THAN 45 DAYS SHALL BE SEEDED WITHIN 7 DAYS OF TERMINATED WORK. DISTURBED AREAS WITHIN 50 FEET OF A STREAM, FIRST ORDER OR LARGER, SHALL BE STABILIZED WITHIN 2 DAYS OF INACTIVITY. TEMPORARY SEEDING CONSISTS OF SEEDBED PREPARATION AND APPLICATION OF SEED, FERTILIZER, AND WATER. SOIL TEST IS RECOMMENDED TO DETERMINE PROPER APPLICATION RATE OF FERTILIZER AND IF LIME IS NECESSARY.

FERTILIZER 12-12-12	12 LB/1000 SQ FT
STRAW MULCH	2 TONS/ACRE
WATER	300 G/1000 SQ FT

PERMANENT SEEDING: ANY AREA THAT IS AT FINAL GRADE SHALL BE SEEDED WITHIN 7 DAYS OF TERMINATED WORK. PERMANENT SEEDING CONSISTS OF SEEDBED PREPARATION AND APPLICATION OF SEED, FERTILIZER, AND WATER. SOIL TEST IS RECOMMENDED TO DETERMINE PROPER APPLICATION RATE OF FERTILIZER AND IF LIME IS NECESSARY. IDEAL CONDITIONS FOR PERMANENT SEEDING IS MARCH 1-MAY 31 AND AUGUST 1-SEPTEMBER 30.



D SILT CHECK
C9.0 NTS

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SPRING HILL DEVELOPMENT
PORT ROYAL ROAD
SPRING HILL, TENNESSEE
MASS GRADING & STORMWATER MANAGEMENT

DATE: JULY 24, 2020

C4.0

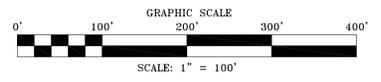
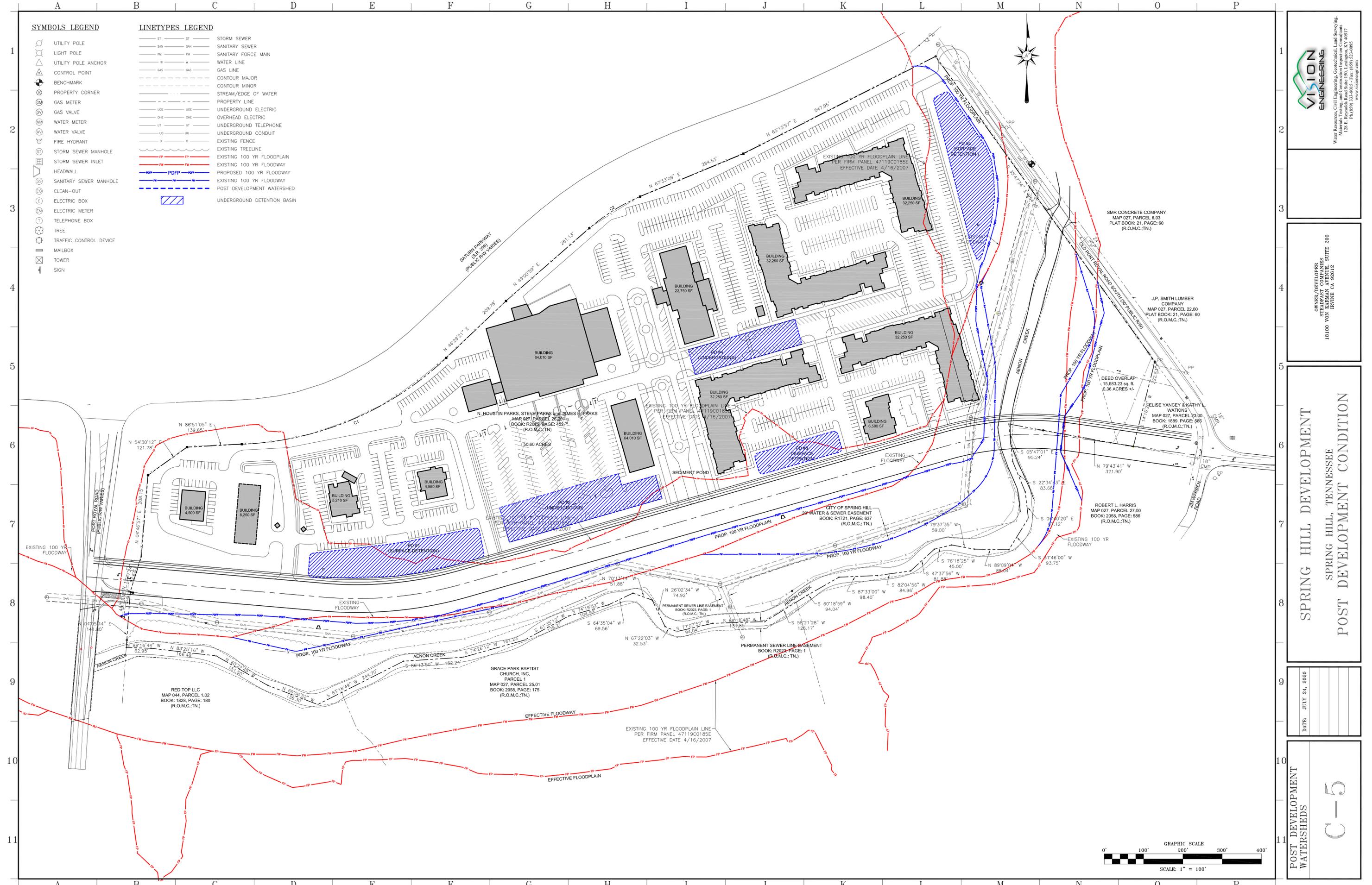
DETAILS

SYMBOLS LEGEND

- UTILITY POLE
- LIGHT POLE
- △ UTILITY POLE ANCHOR
- CONTROL POINT
- ⊕ BENCHMARK
- ⊙ PROPERTY CORNER
- ⊙ GAS METER
- ⊙ GAS VALVE
- ⊙ WATER METER
- ⊙ WATER VALVE
- ⊙ FIRE HYDRANT
- ⊙ STORM SEWER MANHOLE
- ⊙ STORM SEWER INLET
- ⊙ HEADWALL
- ⊙ SANITARY SEWER MANHOLE
- ⊙ CLEAN-OUT
- ⊙ ELECTRIC BOX
- ⊙ ELECTRIC METER
- ⊙ TELEPHONE BOX
- ⊙ TREE
- ⊙ TRAFFIC CONTROL DEVICE
- ⊙ MAILBOX
- ⊙ TOWER
- ⊙ SIGN

LINETYPES LEGEND

- ST — ST — STORM SEWER
- SAN — SAN — SANITARY SEWER
- FM — FM — SANITARY FORCE MAIN
- W — W — WATER LINE
- GAS — GAS — GAS LINE
- — — CONTOUR MAJOR
- · — · — CONTOUR MINOR
- · — · — STREAM/EDGE OF WATER
- — — PROPERTY LINE
- UGE — UGE — UNDERGROUND ELECTRIC
- OHE — OHE — OVERHEAD ELECTRIC
- UT — UT — UNDERGROUND TELEPHONE
- UG — UG — UNDERGROUND CONDUIT
- X — X — EXISTING FENCE
- — — EXISTING TREELINE
- — — EXISTING 100 YR FLOODPLAIN
- — — EXISTING 100 YR FLOODWAY
- — — PROPOSED 100 YR FLOODWAY
- — — EXISTING 100 YR FLOODWAY
- — — POST DEVELOPMENT WATERSHED
- ▨ UNDERGROUND DETENTION BASIN



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 IRVINE, CA 92612

SPRING HILL DEVELOPMENT
 SPRING HILL, TENNESSEE
 POST DEVELOPMENT CONDITION

DATE: JULY 24, 2020

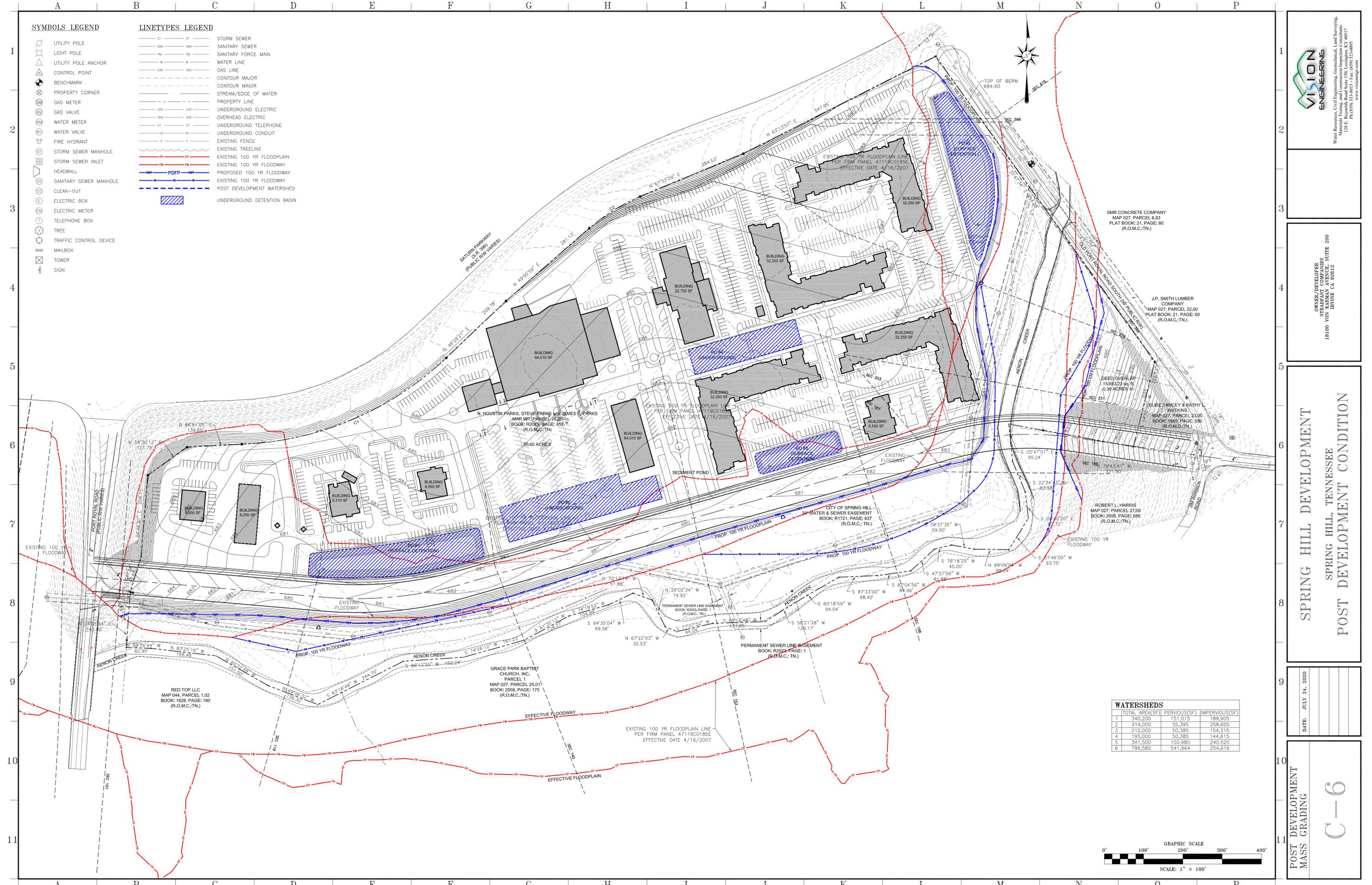
POST DEVELOPMENT
 WATERSHEDS
C-5

SYMBOLS LEGEND

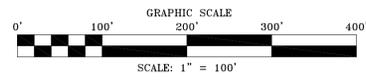
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LINETYPES LEGEND

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- — — PROPOSED 100 YR FLOODWAY
- — — EXISTING 100 YR FLOODWAY
- — — POST DEVELOPMENT WATERSHED
- ▨ UNDERGROUND DETENTION BASIN



WATERSHEDS			
	TOTAL AREA(SF)	PERVIOUS(SF)	IMPERVIOUS(SF)
1	340,200	151,015	189,305
2	314,000	55,395	258,605
3	212,000	50,385	154,315
4	195,000	50,385	144,615
5	341,500	100,980	240,520
6	796,580	541,964	254,616



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SPRING HILL DEVELOPMENT
 SPRING HILL, TENNESSEE
 POST DEVELOPMENT CONDITION

DATE: JULY 24, 2020

POST DEVELOPMENT
 MASS GRADING
C-6

SYMBOLS LEGEND

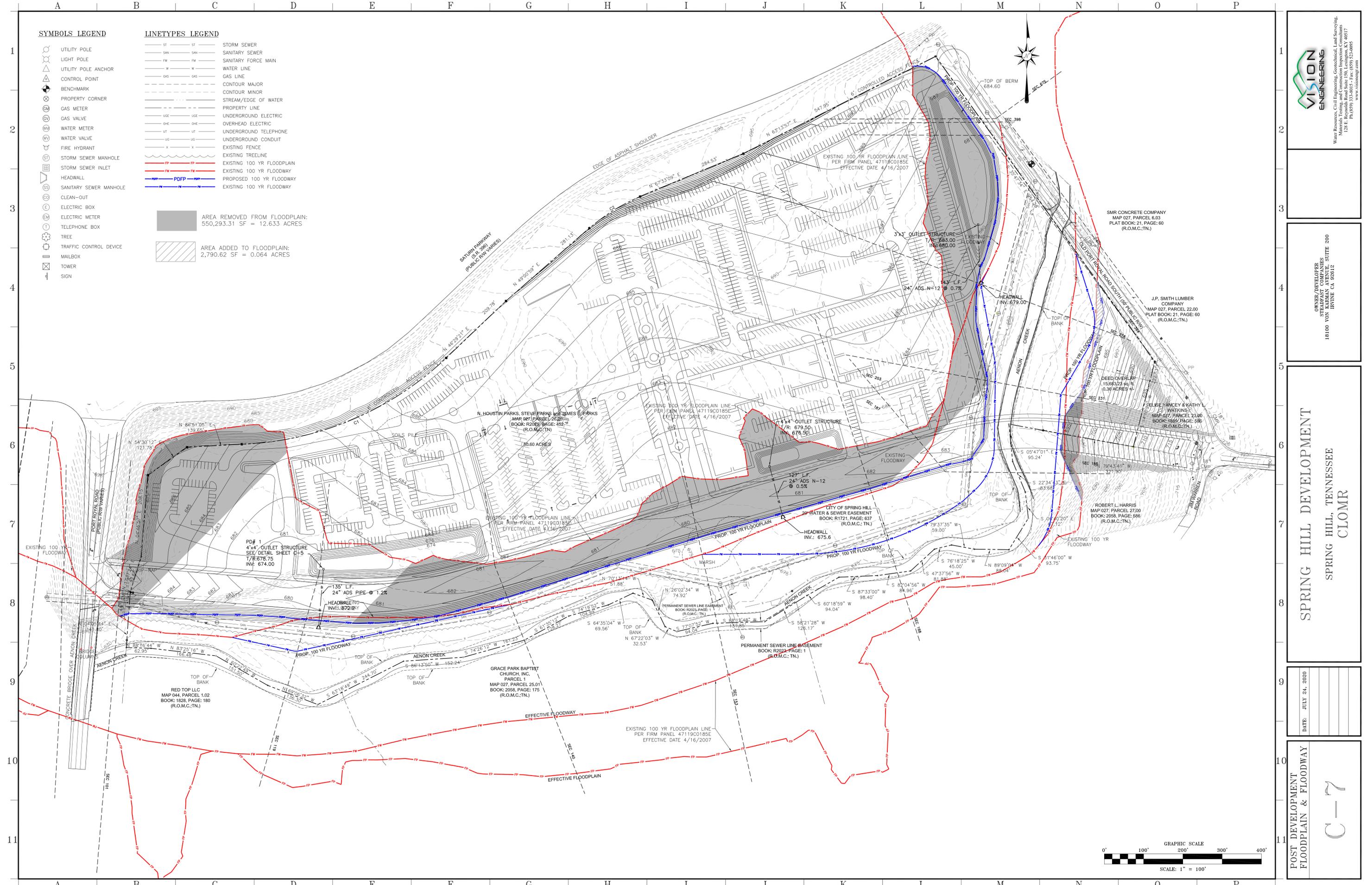
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LINETYPES LEGEND

- ST STORM SEWER
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- EXISTING FENCE
- EXISTING TREELINE
- EXISTING 100 YR FLOODPLAIN
- EXISTING 100 YR FLOODWAY
- PROPOSED 100 YR FLOODWAY

AREA REMOVED FROM FLOODPLAIN:
550,293.31 SF = 12.633 ACRES

AREA ADDED TO FLOODPLAIN:
2,790.62 SF = 0.064 ACRES



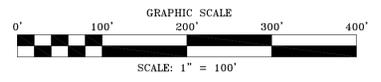
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 CLOMR

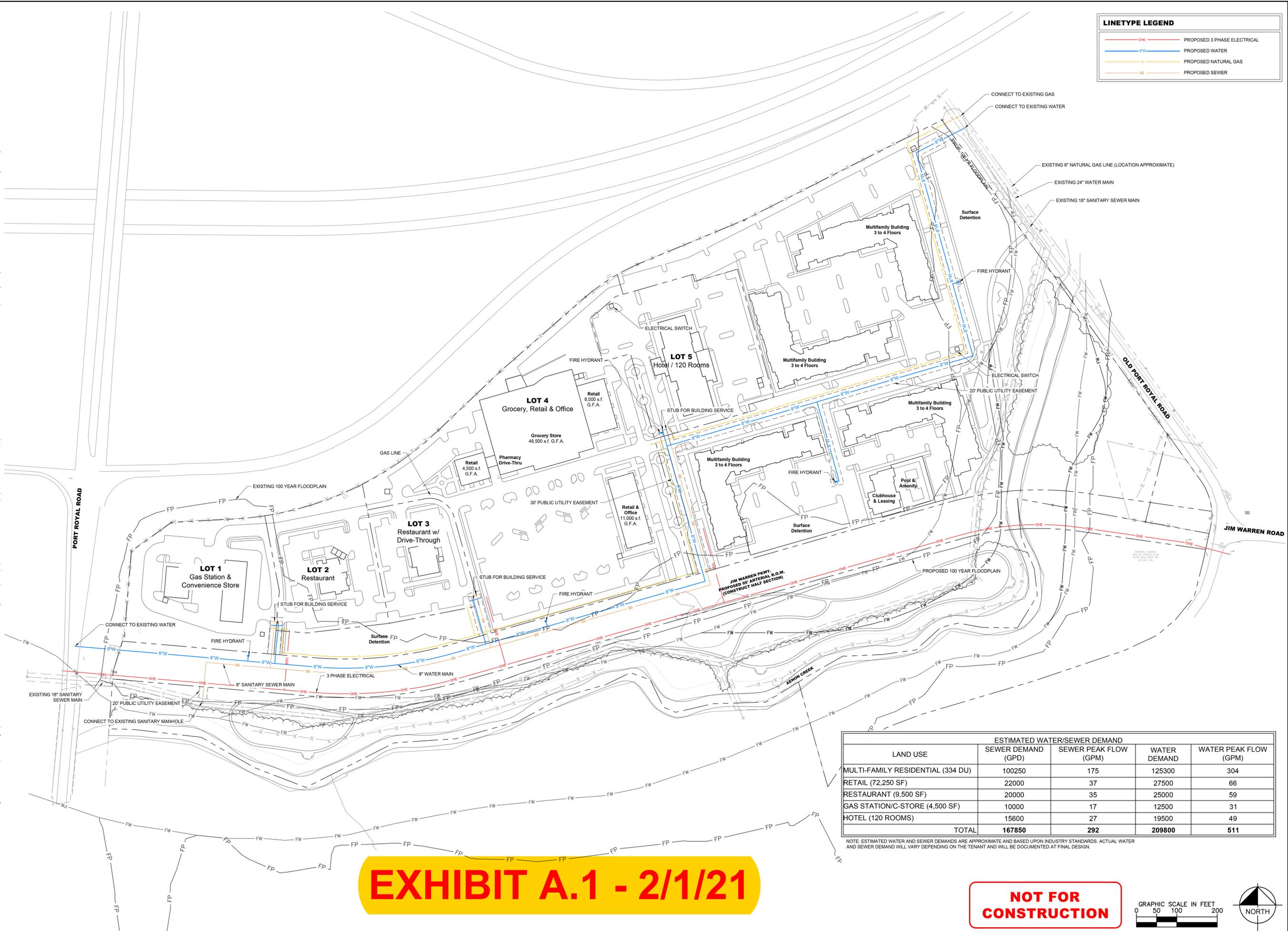
DATE: JULY 24, 2020

POST DEVELOPMENT
 FLOODPLAIN & FLOODWAY
 C-7



This document, together with the concepts and designs presented herein, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

LINETYPE LEGEND	
	PROPOSED 3 PHASE ELECTRICAL
	PROPOSED WATER
	PROPOSED NATURAL GAS
	PROPOSED SEWER



**SPRING HILL TOWN
 CROSSING**
 SPRING HILL, TN



NO.	DATE	REVISIONS
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

DESIGNED BY: KKF
 DRAWN BY: RCR
 CHECKED BY: JLR
 DATE: 12/18/2020
 KIMLEY-HORN PROJECT NO. 118332001

LAND USE	ESTIMATED WATER/SEWER DEMAND			
	SEWER DEMAND (GPD)	SEWER PEAK FLOW (GPM)	WATER DEMAND	WATER PEAK FLOW (GPM)
MULTI-FAMILY RESIDENTIAL (334 DU)	100250	175	125300	304
RETAIL (72,250 SF)	22000	37	27500	66
RESTAURANT (9,500 SF)	20000	35	25000	59
GAS STATION/C-STORE (4,500 SF)	10000	17	12500	31
HOTEL (120 ROOMS)	15600	27	19500	49
TOTAL	167850	292	209800	511

NOTE: ESTIMATED WATER AND SEWER DEMANDS ARE APPROXIMATE AND BASED UPON INDUSTRY STANDARDS. ACTUAL WATER AND SEWER DEMAND WILL VARY DEPENDING ON THE TENANT AND WILL BE DOCUMENTED AT FINAL DESIGN.

EXHIBIT A.1 - 2/1/21

NOT FOR CONSTRUCTION



From: [Rowland, Josh](#)
To: [Chuck Downham](#)
Cc: [Austin Page](#)
Subject: [External] FW: Spring Hill Town Crossing - Public Power Line Extension
Date: Wednesday, January 20, 2021 5:45:02 PM
Attachments: [Attachments.html](#)

****External Email****

Chuck,

In response to your VM from today, I sent you and Austin the email below on 1/11 with an updated Prelim Plan set putting back the original utility plan as directed by Fitterer for the BOMA package. As stated in the email, the link also includes the new utility plan and this email chain (see highlighted below) includes the correspondence from MTEC stating how they intend to install the 3 Phase distribution lines. City ordinance also states that all new power lines must be underground EXCEPT for 3 Phase distribution lines.

The applicant requests that this info be provided to the BOMA so that they can recommend to update the plan if they so choose.

Thanks,

Josh Rowland, PLA | Planning & Landscape Architecture
Kimley-Horn | 214 Oceanside Drive, Nashville, Tennessee 37204
Direct: 615-823-2209 | Main: 615-564-2701 | Mobile: 303-345-1555
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Celebrating 12 years as one of FORTUNE's 100 Best Companies to Work For

From: Rowland, Josh
Sent: Monday, January 11, 2021 3:11 PM
To: Chuck Downham <cdownham@springhilltn.org>; Austin Page <apage@springhilltn.org>
Cc: April Goad <agoad@springhilltn.org>
Subject: RE: Spring Hill Town Crossing - Public Power Line Extension

Chuck and Austin,

Here is a revised Exhibit A for your use that has the original utility plan, however, C2.00 has a few notes added for the two ROW parcels to the east per comments from staff since the PC meeting, so this set should be the most up to date version and appease Alderman Fitterer's comments. I have included the updated utility plan as a separate document and ask that a request be put into the record to have the BOMA consider it as an addendum for the reasons I stated in my previous email.

[Click here](#) to download attachments.

Thanks,

Josh Rowland, PLA | Planning & Landscape Architecture
Kimley-Horn | 214 Oceanside Drive, Nashville, Tennessee 37204
Direct: 615-823-2209 | Main: 615-564-2701 | Mobile: 303-345-1555
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Celebrating 12 years as one of FORTUNE's 100 Best Companies to Work For

From: Heginbottom, Roger <Roger.Heginbottom@mtmc.com>

Sent: Friday, January 8, 2021 12:19 PM

To: Rowland, Josh <Josh.Rowland@kimley-horn.com>; Frank, Kelley <Kelley.Frank@kimley-horn.com>; Hale, Erik <Erik.Hale@mtmc.com>

Cc: Robinson, Rachel <Rachel.Robinson@kimley-horn.com>

Subject: RE: Spring Hill Town Crossing - Public Power Line Extension

Thanks for spending the time to talk today regarding the electrification of the Town Crossing project. To recap, MTE plans on extending 3 phase overhead powerline along the southern side of the new Jim Warren Pkwy extension. The cost of this line to be burdened by the developer is estimated to be around \$40,000. From this new overhead line, underground feeds will be utilized to supply power to the parcels of the development. These conduits will be supplied and installed by the developer underneath the new Jim Warren Pkwy. Attached is MTE's street light manual. MTE will maintain developer installed lights, per our spec, on public roads, at an unmetered use fee. City of Springhill currently has an account with many of these installations existing.

Thanks,

Roger Heginbottom

MTEMC

2156 Curd Ln Franklin TN 37067

615.595.4675

rogerh@mtmc.com

From: Rowland, Josh <Josh.Rowland@kimley-horn.com>

Sent: Wednesday, January 6, 2021 8:58 AM

To: Heginbottom, Roger <Roger.Heginbottom@mtmc.com>; Frank, Kelley <Kelley.Frank@kimley-horn.com>; Hale, Erik <Erik.Hale@mtmc.com>

Cc: Robinson, Rachel <Rachel.Robinson@kimley-horn.com>

Subject: RE: Spring Hill Town Crossing - Public Power Line Extension

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Roger and Kelley,

Let's do 11am on Friday if that works for everyone.

Thanks,

Josh Rowland, PLA | Planning & Landscape Architecture
Kimley-Horn | 214 Oceanside Drive, Nashville, Tennessee 37204
Direct: 615-823-2209 | Main: 615-564-2701 | Mobile: 303-345-1555
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Celebrating 12 years as one of FORTUNE's 100 Best Companies to Work For

From: Heginbottom, Roger <Roger.Heginbottom@mtmc.com>
Sent: Wednesday, January 6, 2021 8:53 AM
To: Frank, Kelley <Kelley.Frank@kimley-horn.com>; Hale, Erik <Erik.Hale@mtmc.com>
Cc: Rowland, Josh <Josh.Rowland@kimley-horn.com>; Robinson, Rachel <Rachel.Robinson@kimley-horn.com>
Subject: RE: Spring Hill Town Crossing - Public Power Line Extension

Kelley,

Thanks for the update. How about 1 pm Thursday, or 11am Friday for a meeting call?

Roger Heginbottom

MTEMC
2156 Curd Ln Franklin TN 37067
615.595.4675
rogerh@mtmc.com

From: Frank, Kelley <Kelley.Frank@kimley-horn.com>
Sent: Tuesday, January 5, 2021 3:47 PM
To: Hale, Erik <Erik.Hale@mtmc.com>; Heginbottom, Roger <Roger.Heginbottom@mtmc.com>
Cc: Rowland, Josh <Josh.Rowland@kimley-horn.com>; Robinson, Rachel <Rachel.Robinson@kimley-horn.com>
Subject: RE: Spring Hill Town Crossing - Public Power Line Extension

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Erik, Roger –

Hope you're both doing well! This project is moving forward and we're at a point where we better understand the future power demands for the overall site. Would one or both of you be available for a call later this week to discuss those needs and the manner of the extension of the public line along our proposed arterial road?

The attached site layout represents our latest submission to the City. We want to confirm the availability of 3 phase power and the potential to run the line on the south side of Jim Warren Road

with underground service connections across to the development. We will also need to energize public street lights on the north side of Jim Warren Road.

I am happy to set up a Microsoft Teams meeting – please let me know if there are dates and times that work for you.

Thanks,

Kelley Frank, P.E.

Kimley-Horn | 214 Oceanside Drive, Nashville, Tennessee 37204
Direct: 615 564 2717 | Mobile: 571 212 2664

From: Hale, Erik <Erik.Hale@mtmc.com>

Sent: Tuesday, June 30, 2020 6:49 AM

To: Robinson, Rachel <Rachel.Robinson@kimley-horn.com>; Heginbottom, Roger <Roger.Heginbottom@mtmc.com>

Cc: Frank, Kelley <Kelley.Frank@kimley-horn.com>

Subject: RE: Spring Hill Development - Request for Feedback

Hi Rachel,

The cost for an overhead line would be in the neighborhood of \$40,000.00. The developer would also be responsible for clearing the ROW. The development could then be fed underground from this line. Let us know if you have any other questions.

Thanks

From: Robinson, Rachel <Rachel.Robinson@kimley-horn.com>

Sent: Monday, June 29, 2020 4:49 PM

To: Heginbottom, Roger <Roger.Heginbottom@mtmc.com>; Hale, Erik <Erik.Hale@mtmc.com>

Cc: Frank, Kelley <Kelley.Frank@kimley-horn.com>

Subject: RE: Spring Hill Development - Request for Feedback

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hi Roger/ Erik,

I wanted to follow up on the request below.

Thanks!

Rachel Robinson, E.I. | Analyst

Kimley-Horn | 214 Oceanside Drive Nashville, TN 37204

Direct: 615-432-5523 | Main: 615-564-2701

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From: Robinson, Rachel

Sent: Tuesday, June 23, 2020 8:42 AM

To: Heginbottom, Roger <Roger.Heginbottom@mtmc.com>; Hale, Erik <Erik.Hale@mtmc.com>

Cc: Frank, Kelley <Kelley.Frank@kimley-horn.com>

Subject: RE: Spring Hill Development - Request for Feedback

Hi Roger/ Erik,

We are considering underground electric installation for the public line, and we are curious what the approximate cost of overhead electrical might be. Can you provide a ballpark figure for overhead installation?

Thank you!

Rachel Robinson, E.I. | Analyst

Kimley-Horn | 214 Oceanside Drive Nashville, TN 37204

Direct: 615-432-5523 | Mobile: 256-497-7955 | Main: 615-564-2701

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From: Heginbottom, Roger <Roger.Heginbottom@mtmc.com>
Sent: Wednesday, May 13, 2020 2:00 PM
To: Hale, Erik <Erik.Hale@mtmc.com>; Robinson, Rachel <Rachel.Robinson@kimley-horn.com>
Subject: RE: Spring Hill Development - Request for Feedback

Please see attached.

Roger Heginbottom

MTEMC
2156 Curd Ln Franklin TN 37067
615.595.4675
rogerh@mtmc.com

From: Hale, Erik <Erik.Hale@mtmc.com>
Sent: Wednesday, May 13, 2020 1:48 PM
To: Robinson, Rachel <Rachel.Robinson@kimley-horn.com>
Cc: Heginbottom, Roger <Roger.Heginbottom@mtmc.com>
Subject: Re: Spring Hill Development - Request for Feedback

Hi Rachel. MTEMC would require a line along the arterial road connecting the existing lines at Port Royal and Jim Warren. This could be overhead or underground. If underground, it would likely require a 4x6" concrete encased duct bank. From there, we would work with you on a layout for service to the site.

Roger Heginbottom is our Service Designer for this area. Roger, could you provide the availability letter for Rachel? I'll forward the concept plan she sent as well.

Rachel, let us know if there is anything else you need for now.

Thank you

From: Robinson, Rachel <Rachel.Robinson@kimley-horn.com>
Sent: Wednesday, May 13, 2020 11:36 AM
To: Hale, Erik <Erik.Hale@mtmc.com>
Subject: RE: Spring Hill Development - Request for Feedback

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Hi Erik,

I wanted to follow up on this request. Have you had a chance to review this concept plan?

Thank you!

Rachel Robinson, E.I. | Analyst

Kimley-Horn | 214 Oceanside Drive Nashville, TN 37204

Direct: 615-432-5523 | Mobile: 256-497-7955 | Main: 615-564-2701

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From: Hale, Erik <Erik.Hale@mtemc.com>

Sent: Thursday, May 7, 2020 3:45 PM

To: Robinson, Rachel <Rachel.Robinson@kimley-horn.com>

Subject: RE: Spring Hill Development - Request for Feedback

I'll review and respond accordingly.

Thank you

Erik Hale

Development Engineer

MTEMC

615-595-4669

From: Robinson, Rachel <Rachel.Robinson@kimley-horn.com>

Sent: Thursday, May 7, 2020 1:21 PM

To: Hale, Erik <Erik.Hale@mtemc.com>

Subject: Spring Hill Development - Request for Feedback

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

2020-0504 JWR PD CONCEPT PLAN_PS FIL...ROP.pdf

204.9 MB

Download Attachments

Rachel Robinson uses Citrix Files to share documents securely.

Hi Erik,

We are beginning the preliminary engineering work on a development in Spring Hill, located in the southeast quadrant of Saturn Parkway and Port Royal Road on a single parcel (parcel ID 060027 02600) The parcel is approximately 50.62 acres.

The proposed development summary and concept layout is attached.

We had a couple of questions for you:

1. What will Middle Tennessee Electric need to do from an infrastructure standpoint to meet the demand of this development?
2. Will Middle Tennessee Electric provide a will serve letter?

Please let me know if you need any additional information. Thank you!

Rachel Robinson, E.I. | Analyst

Kimley-Horn | 214 Oceanside Drive Nashville, TN 37204

Direct: 615-432-5523 | Mobile: 256-497-7955 | Main: 615-564-2701

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SPRING HILL

TOWN CROSSING



VISION BOOK for a MIXED USE DEVELOPMENT

DEVELOPER



18100 VON KARMAN AVE. SUITE 500
IRVINE, CA, 92612
PHONE: 949-623-9144
CONTACT: CHASE EMERY

PLANS PREPARED BY

Kimley-Horn and Associates
214 Oceanside Drive, Nashville, TN 37204
Main: 615.564.2701 | www.kimley-horn.com
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EXHIBIT B



Introduction

Spring Hill Town Crossing is envisioned as a mixed-use community where residents can live, work and play, by providing dining and retail establishments, a hotel, and a multi-family community, all oriented around picturesque urban and natural park settings. Careful planning integrates the various uses along "main street" and natural park settings to activate each area of the project and provide a diverse pedestrian experience.

Project Vision

The vision for the development is to create a place that serves all residents of the City of Spring Hill, Tennessee; a new address for residents seeking to live in an active town center environment, a new place to shop for groceries and goods for residents in the neighborhood, a destination for dining and an evening out for the community at large, a new place to stay for people visiting the area, and new park and open space amenities providing a multi-use green way trail and a nature trail with learning opportunities for local schools and clubs. As more fully described in this vision book, Spring Hill Town Crossing seeks to provide a diverse and integrated mixed-use development that serves, enhances and benefits the greater City of Spring Hill community.



Character & Lifestyle

Residents and patrons will enjoy a diverse offering of activities and services including shopping, restaurant and residential establishments situated along a main street urban park with architecture and pedestrian spaces designed with cohesive styles and materials. For those seeking more adventure, you can venture the to fringes of the project and enjoy the green way trail and park, or the nature learning trail, both situated along the preserved banks of Aenon Creek.

Regional Community

The development will be a destination that serves both nearby residents and the regional community by providing a grocery store anchor, standalone restaurants, hotel, convenience store with gas, and public park areas and trails. Many attributes of this 50-acre site are especially desirable as they relate to the uses proposed for the project, including;

- Frontage along a major thoroughfare for visibility of commercial and hospitality uses
- Easy access in and out of the project for commercial patrons and residents
- Easy access to employment opportunities along the I-65 for residents of the development

The addition of this project in Spring Hill will also establish a gateway from Saturn Parkway to future development opportunities in the southeast areas of the Spring Hill Rising 2040 comprehensive plan map.





Public Benefits

In addition to the creation of a lifestyle destination offering shopping, restaurants, and residences, the project also provides many public benefits to the community of Spring Hill. This PD zoning application for the Spring Hill Town Crossing development addresses the following public benefits described in the U.D.C. ordinance;

1. The provision of community amenities; plazas, malls, gardens, and pedestrian facilities along the mixed use main street area
2. The provision of public infrastructure; 5+ acres of land dedication for the full 95' wide arterial right-of-way of the new Jim Warren Parkway alignment and construction of the first half-section of roadway and bridge crossing of Aenon Creek. This addition will serve as a gateway and "paves the way" for future development in the southeast areas of Spring Hill.
3. Preservation of environmental features; conservation of 9+ acres of private open space land along Aenon Creek to preserve native habitat and ecology in the stream buffer areas. Land may be dedicated to a private non-private entity, otherwise it will be owned and maintained by a commercial POA.
4. New open space amenities; construction of a portion of the Summit Green Way multi-use trail and linear park, construction of a 12' wide multi-use trail along the north side of Jim Warren Parkway upgraded from a the required 5' wide sidewalk, and construction of a wildlife and ecology interpretive learning trail on private open space land, accessible to the public.
5. Reduction of Impervious Surface; the PD requests higher ISR percentages for specific parcels than are normally allowed (80%) in the C-4 zoning category, however with the 9+ acres of open space dedication and other park areas and water quality ponds planned for the project, the overall ISR for the project will be greatly reduced (<70%).

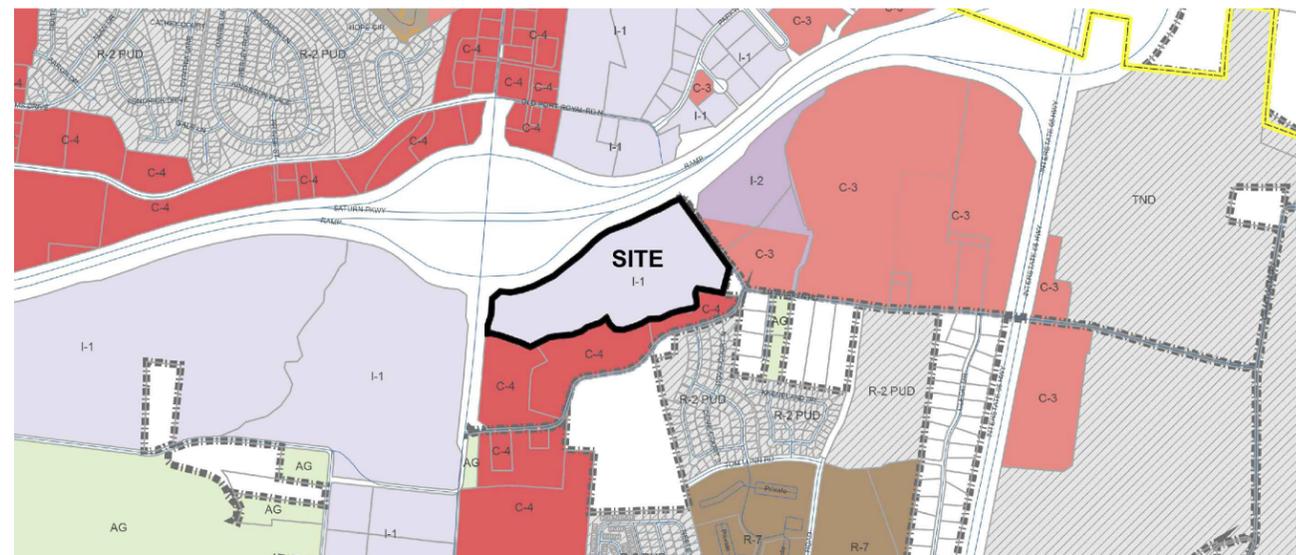
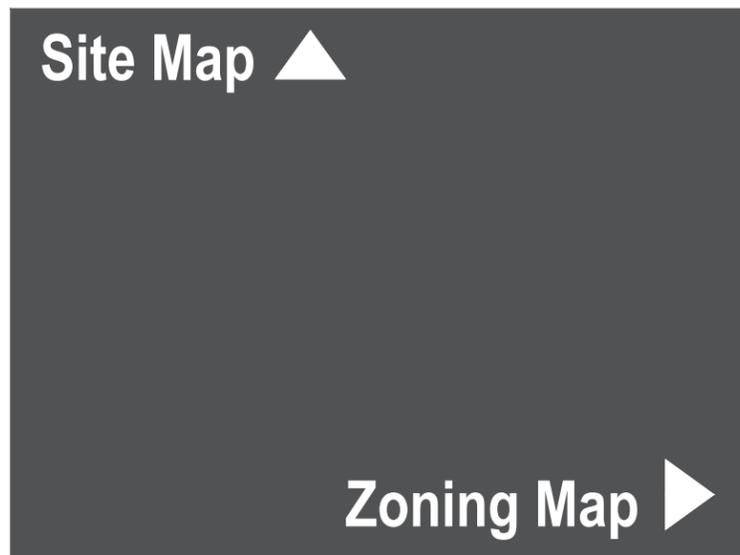
Location & Zoning

The project site is located in the south east quadrant of the intersection with Saturn Parkway and Port Royal Road. The undeveloped 50-acre property is bordered on the north by Saturn Parkway, on the west by Port Royal Road, on the south by Aeonon Creek, on the east by Old Port Royal Road S. and Jim Warren Road

LAND USE & ENTITLEMENTS

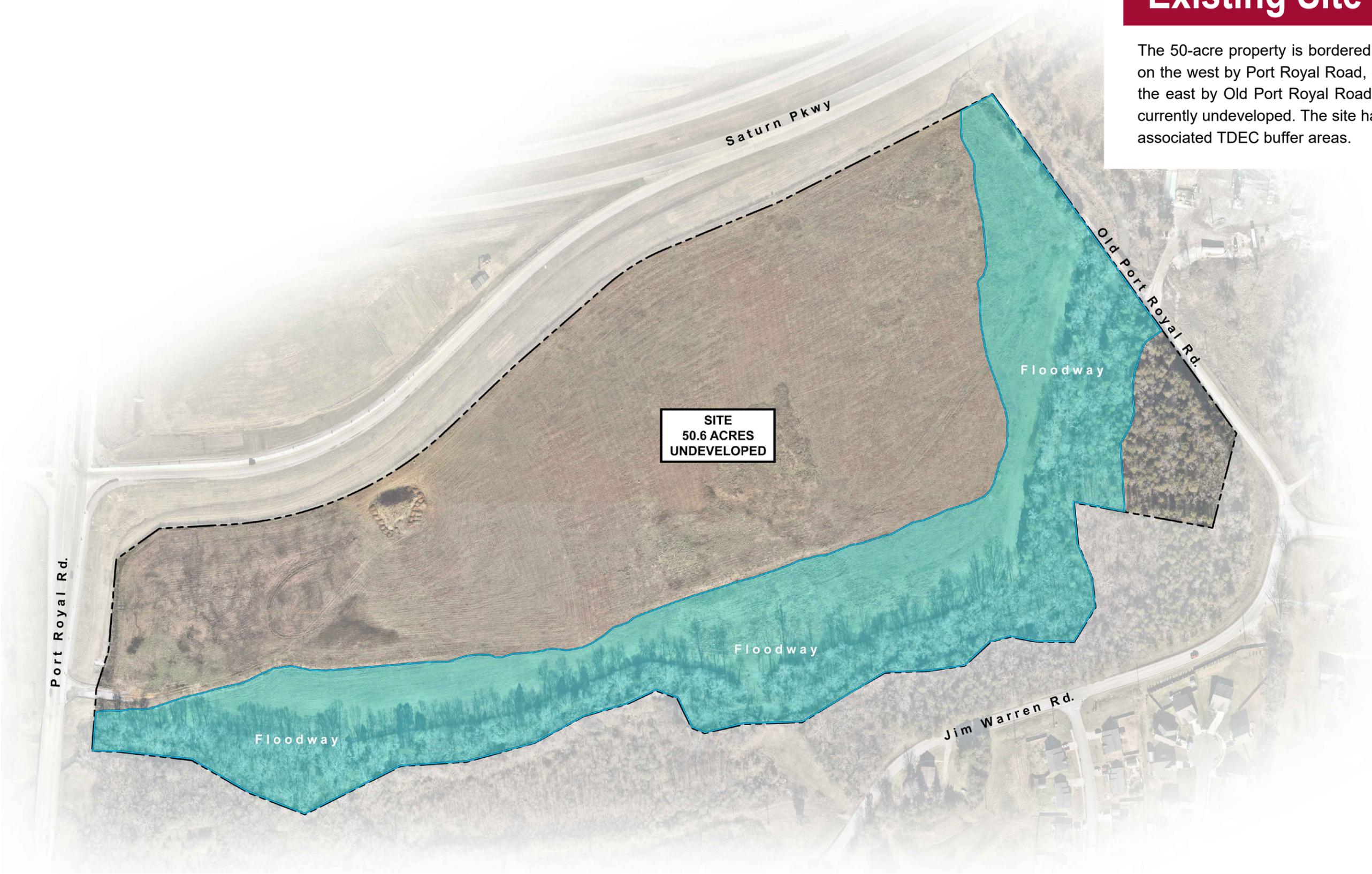
The property is currently zoned Industrial (I-1) in the City of Spring Hill, TN. This new development requires rezoning the property to a commercial zoning category with a Planned Development overlay to accommodate the proposed mix of uses. The development proposal is aligned with the goals of the Spring Hill Rising 2040 Comprehensive Plan as follows;

- Establishes a Mixed-Use Activity Center
- Provides transportation opportunities for future development
- Takes advantage of Saturn Parkway/I-65 visibility
- Creates walkable streets in commercial and mixed-use areas
- Provides connections to future green ways and trail heads



Existing Site Conditions

The 50-acre property is bordered on the north by Saturn Parkway, on the west by Port Royal Road, on the south by Aeon Creek, on the east by Old Port Royal Road S. and Jim Warren Road and is currently undeveloped. The site has mapped FEMA floodway and a associated TDEC buffer areas.



Master Plan

LEGEND

- Restaurant & Gas / Convenience Store Parcels (14,000 sf GFA)
- Main Street Retail/Office, Restaurants & Grocery Store (72,250 sf GFA)
- Hotel (120 Rooms)
- Multifamily (334 Dwelling Units)



Phasing Plan

PHASING LEGEND

- PHASE 1
- PHASE 2
- PHASE 3
- PHASE 4



Spring Hill Town Crossing is anticipated to start development in mid 2021, beginning with development of the commercial parcels. Development of the multifamily project will begin after the commercial development is underway and infrastructure is extended to the rear of the property. The project requires that mass grading and utility improvements for the overall development occur in the first phase as the various parcels share drainage and utility infrastructure. The new public roadway and bridge will be completed prior to opening the grocery, retail and restaurant uses. The project is anticipated to take 2-3 years for full build out.



Standalone Retail Parcels

The development parcels, located near the intersection of Port Royal Road and the proposed Jim Warren Parkway, offer standalone restaurants and a convenience store with a gas station. These parcels will include freestanding buildings that will front the public streets and offer architectural diversity in detailing and signage to distinguish each individual use and occupant.

Allowable Materials;

1. Masonry (front facades along streets to be 30% masonry minimum)
 - brick
 - cultured or natural stone
 - calcium silicate block
- b. Fiber cement board
- c. Engineered wood products
- d. Metal Panels





grocery anchor for main street retail area



storefronts lining main street

Main Street Retail

The main development parcel, located at the heart of the project, is anchored by a 48,000 sf grocery store and offers inline retail, office and restaurant space oriented along a pedestrian main street setting. Buildings will be predominantly one-story, but may also be up to two-stories to accommodate roof top dining and office space above the street level. Architectural styles and materials will create a consistent character for the area.

Allowable Materials;

- a. Masonry (front facades along the main street elevations to be 30% masonry minimum)
 - brick
 - cultured or natural stone
 - calcium silicate block
- b. Fiber cement board
- c. Engineered wood products
- d. Metal Panels



pedestrian areas & plantings along main street



on-street parking and streetscape





5 to 6 floor hotel massing

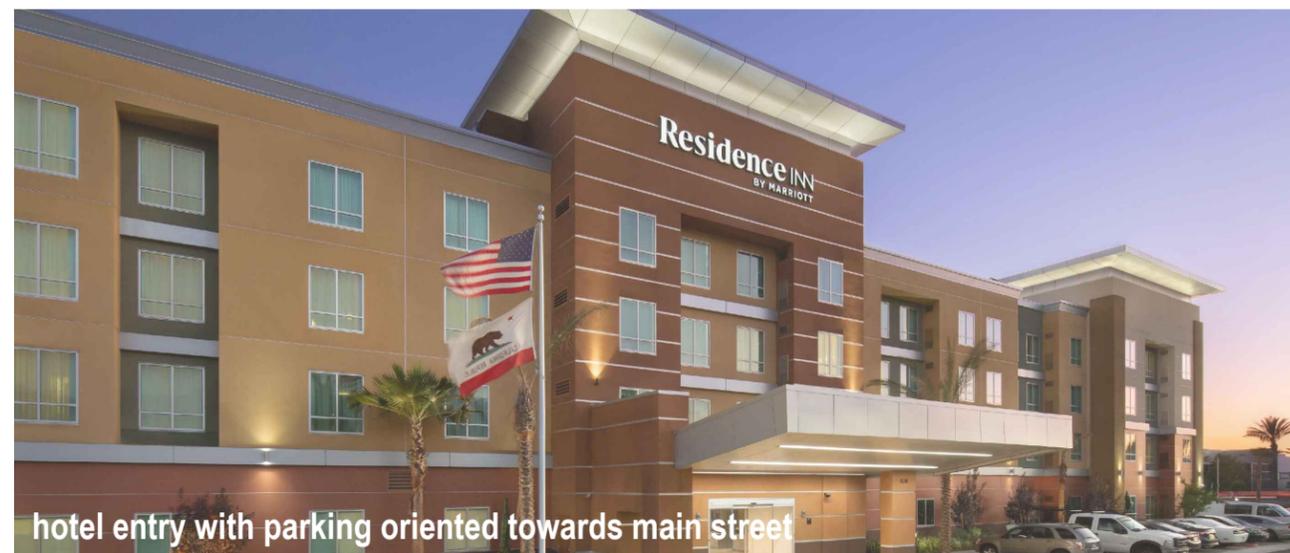


Hotel

The hotel development parcel, also located at the heart of the project, is situated along the main street corridor with the building entry and check-in parking oriented on the urban park and pedestrian setting. The architectural massing requirements allow for a 5 to 6 story building.

Allowable Materials;

- a. Masonry (ground floor front facades along the main street elevations to be 30% masonry minimum)
 - brick
 - cultured or natural stone
 - calcium silicate block
- b. Fiber cement board
- c. Engineered wood products
- d. Metal Panels
- e. Glass



hotel entry with parking oriented towards main street



Multifamily

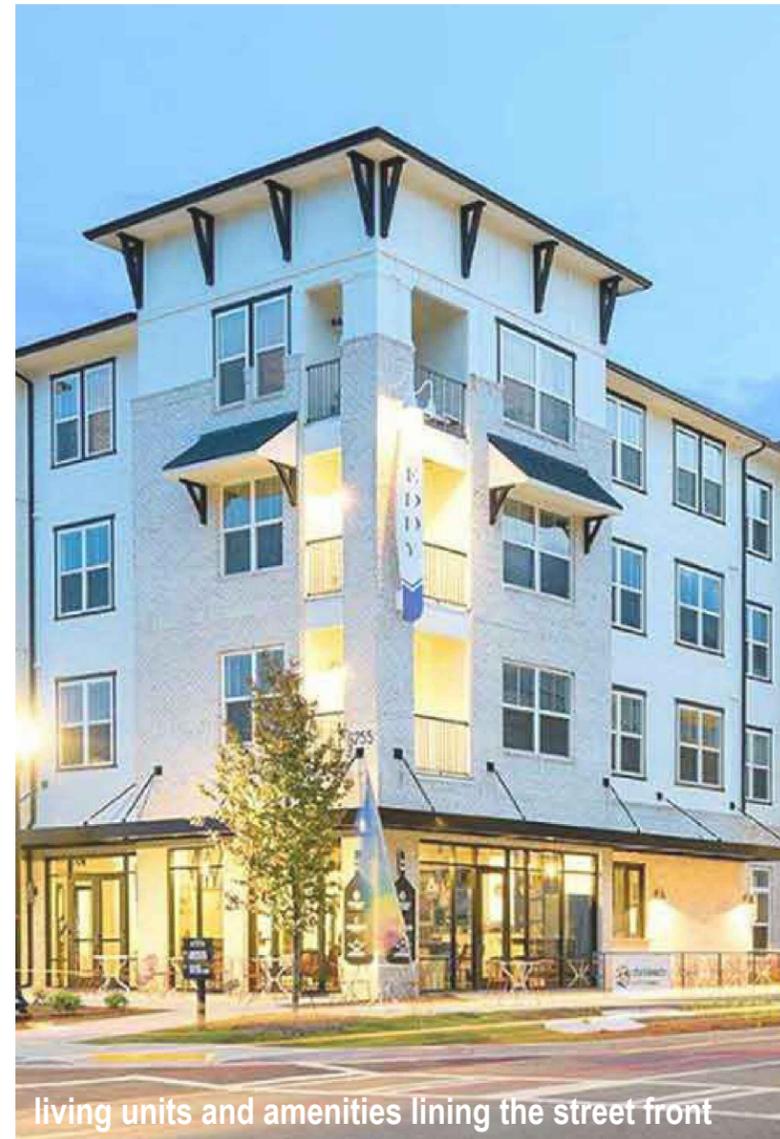
The multifamily parcel, also located along the main street corridor and extending to the back of the site, provides a high quality rental community in a desirable location set between the vibrant town center and the natural open space along Aeon Creek. Buildings will be three and four-story, to accommodate studio, one, and two bedroom units. Architectural styles and materials will be consistent with the character of the main street area.

Allowable Materials;

- a. Masonry (front facades along the main street elevations to be 30% masonry minimum)
 - brick
 - cultured or natural stone
 - calcium silicate block
- b. Fiber cement board
- c. Engineered wood products
- d. Metal Panels



outdoor amenities and common areas for residents



living units and amenities lining the street front



park / greenway trail for residents and the public



urban building massing to compliment streetscape



EXHIBIT C



MEMO

Project: Spring Hill Town Crossing, Steadfast Companies

Date: October 5, 2020

Subject: Preliminary Plan – PD Criteria Request

PLANNED DEVELOPMENT (PD) CRITERIA REQUEST

1. UDC Section 4.3 – (R-7) Multi-family District Residential Dimensional Standards
 - Maximum Building Length - Multi-Family Structure
 - Per UDC: 175'
 - PD Request: 325' – as shown on the Preliminary Plan for a continuous building footprint in one direction, to provide an urban style multifamily product that reinforces a mixed-use development pattern
 - Maximum Building Height
 - Per UDC: 50'
 - PD Request: 60' and four (4) floors maximum – to allow for a taller ground level that reinforces the mixed-use development pattern
 - Maximum Impervious Surface
 - Per UDC: 70% of development site
 - PD Request: 80% of development - to allow for an urban style multifamily project that reinforces a mixed-use development pattern
 - Minimum Interior Side Setback
 - Per UDC: 10' for a two-story building, 20' for a four-story building
 - PD Request: 10' for a four-story building – to allow for the mixed-use development pattern where property lines are closer to the building due to internal driveways and parking areas of adjacent uses
2. UDC Section 5.3 – (C-4) General Commercial Dimensional Standards
 - Maximum Building Height
 - Per UDC: 50' or 75' if meeting standards of Section 5.3.C
 - PD Request: 75' – project meets standards of Section 5.3.C as multifamily is a commercial use in the mixed-use development and does not qualify as a “residential lot”
 - Maximum Impervious Surface
 - Per UDC: 80%

- PD Request: Provide reduced ISR percentages on individual lots while project as a whole provides an average ISR of +/- 75% in preserved open space and buffer areas not included in the commercial lots;
 - Lot 1 (Gas & C-Store) – 85%
 - Lot 2 (Restaurant/Standalone) – 85%
 - Lot 3 (Restaurant/Drive-thru) – 85%
 - Lot 4 (Grocery/Retail) – 90%
 - Lot 5 (Hotel) – 90%
 - Lot 6 (Multi-family) – 85%

- 3. UDC Section 8.2 (Table 8-1:Use Matrix for C-4 Zone District)
 - Principal Use – Drive-Through Facility
 - Per UDC: allowed as a Special Use
 - PD Request: allowed as a Permitted Use
 - Principal Use – Dwelling Multi-Family
 - Per UDC: use not allowed
 - PD Request: allowed as a Permitted Use
 - Principal Use – Public Park
 - Per UDC: use not allowed
 - PD Request: allowed as a Permitted Use

- 4. UDC Section 8.3.K (Principal Use Standards / Dwelling – Multi-Family)
 - 1.b.i.(B) Required minimum perimeter yard abutting a street, oriented away from (backing up to) a public street, in this case Saturn Parkway
 - Per UDC: 25 feet, however the requirement is only 10 feet per Section 11.7.D when abutting a collector or arterial street, these standards conflict with one another
 - PD Request: 10 feet with required tree and shrub plantings. Given that the nearest travel lane of Saturn Parkway is over 100' from the property line, the smaller of the two standards is appropriate.
 - 1.b.ii.(C) Required minimum perimeter yard abutting other zoning districts, in this case C-4/PD
 - Per UDC: 25 feet, assumes the multi-family development is separate from the zone district that it abuts
 - PD Request: 10 feet; to match the required minimum interior side setback, may contain sidewalks and required landscape yard plantings

- 5. UDC Section 10.3 Required Off-Street Vehicle Spaces (Table 10-2)
 - Dwelling Multi-Family
 - Per UDC: 2 per dwelling unit + 1 visitor space per 8 dwelling units
 - PD Request: PD will meet the required minimum parking, allows for 72 of the required spaces, roughly 10%, to be provided in garages and tandem parking spaces in front of garages. The multi-family operator is required to keep the garage spaces occupied as rental spaces or incentives for an apartment lease.

- Hotel
 - Per UDC: 2 per room
 - PD Request: 1.5 per room

- 6. UDC Section 11 Landscape .6. – Interior Parking Lot Landscape
 - 11.6.F. Interior Parking Lot Landscape – Minimum Total Landscape Area
 - Per UDC: 10% of the total parking lot area
 - PD Request: The required landscape islands at the ends of parking rows and between 15 or more spaces shall be provided. Remove the minimum 10% landscape requirement for the interior of a parking lot in lieu of the urban park, enhanced streetscape elements, and enhanced landscaping treatments along retail building frontages.
 - 11.7.C.1. Site Landscape – Landscape strip along interior side lot lines
 - Per UDC: provide a 10' wide landscape strip
 - PD Request: This criteria is waived when the interior side lot line runs along a parking lot area or driveway shared by the adjacent uses as shown on the Preliminary Plan.

- 7. UDC Section 12.6. Sign Permit Required: Permanent Signs
 - 12.6.D.4.b. Freestanding Signs – Multi-Tenant Retail Center (>10 acres)
 - Per UDC: One (1) freestanding sign (20' tall/150 sf area) allowed per entry, total of 3 signs.
 - PD Request: Move sign allowed at entry drive between Lot 1 and 2 to the northeast corner of the intersection of Port Royal Road and Jim Warren Parkway. The sign is required to be placed at least 20' back from a road right-of-way.

MEMO

Project: Spring Hill Town Crossing, Steadfast Companies

Date: October 5, 2020

Subject: Preliminary Plan – PD Phasing Matrix

PUBLIC UTILITY & ROADWAY INFRASTRUCTURE PHASING

(Public infrastructure improvements listed below will be completed by the developer, or their assigns)

PHASE 1

- Development Program
 - Mass grading and temporary sediment ponds for entire site to establish proposed flood elevations, rough grades of all development parcels, and roadbed for proposed Jim Warren Parkway
 - Record Final Plat for Jim Warren Parkway right-of-way, public water and sanitary sewer utility easements, and all development parcels
 - Finalize purchase of adjacent Harris parcel, record plat for Jim Warren Parkway right-of-way dedication.
 - Finalize purchase of adjacent Watkins parcel, annex and zone property C-4 in Spring Hill, record plat for Jim Warren Parkway right-of-way dedication.
 - Develop Gas Station parcel
- Public Utility Improvements
 - Water System Improvements – install all 8” water main for connection from Old Port Royal Road S. to Port Royal Road and service stubs to development parcels per the Preliminary Plan / Overall Utility Plan (Sheet C4-00)
 - Sanitary Sewer System Improvements – install all 8” sanitary sewer main and connections to existing manhole locations per the Preliminary Plan / Overall Utility Plan (Sheet C4-00)
- Public Road/Intersection Improvements
 - Construct 2,300 LF of Jim Warren Parkway 3-lane cross section from Port Royal Road and 12’ multi-use trail to the future crossing of Aenon Creek per the Preliminary Plan / Typical Sections (Sheet C3-00)
 - Re-stripe traffic lanes and install traffic signage on Port Royal Road at new Jim Warren Parkway intersection per recommendations of the Traffic Impact Study
 - Complete FEMA and TDEC permitting for Aenon Creek bridge crossing

PHASE 2

- Development Program
 - Develop Restaurant and Grocery/Retail parcels
- Public Road/Intersection Improvements
 - Construct 2-lane bridge crossing of Aenon Creek per the Preliminary Plan / Typical Sections (Sheet C3-00)
 - Construct remaining 400 LF of Jim Warren Parkway 2-lane cross section from Old Port Royal Road S. to the crossing of Aenon Creek per the Preliminary Plan / Site Plan (Sheet C2-00)
 - Re-stripe traffic lanes and install traffic signage at the intersection of Jim Warren Road and the new Jim Warren Parkway intersection per recommendations of the Traffic Impact Study

PHASE 3

- Development Program
 - Develop Multifamily parcel (development may occur in conjunction with Phase 2 improvements)
- Public Trail/Open Space Improvements
 - Construct the 12' wide Greenway trailhead, multi-use trail, and park along Aenon Creek adjacent to the multi-family development per the Preliminary Plan / Site Plan (Sheet C2-00)
 - Construct Lot 7 / Open Space Park trailhead, soft-surface trails and interpretive exhibit improvements

PHASE 4

- Development Program
 - Develop Hotel parcel (development may occur in conjunction with Phase 2 or 3 improvements)

MEMO

Project: Spring Hill Town Crossing, Steadfast Companies
Date: October 5, 2020
Subject: Planned Development Preliminary Plan – Planning Commission Staff Report and Work Session Comment Responses

PLANNING COMMISSION DISCUSSION ITEMS

1. The applicant shall submit a bulleted list of all requests being made with this Planned Development application.
 - Response: a PD Criteria Request memo list is provided with this resubmittal
2. The PD Lot Table calls for 72,250 sf of grocery, retail and office space. The plan only shows 72,000 sf. Please make sure the plan and its labels are consistent with the totals on the PD Lot Data Table..
 - Response: The plan and PD Lot Data Table have been updated with this resubmittal.
3. Show the existing and proposed 100-year floodplain line, floodway line, and stream buffers on Sheet C2-00 (site plan).
 - Response: The site plan was updated to show these items with this resubmittal.
4. All tree preservation areas will be protected during construction.
 - Response: Trees being preserved will have tree protection measures installed during the construction of the project.
5. Provide a road and utility infrastructure phasing plan.
 - Response: A road and utility infrastructure phasing matrix has been provided with this resubmittal.
6. Bicycle parking will be required onsite.
 - Response: Bicycle parking will be provided per Article 10.7 with this project and will be addressed in detail and the Final Plan submittal for individual parcels.

7. Address all recommendations of the traffic impact study.
 - Response: The project will comply with all recommendations of the traffic study as a part of the Final Plan and Construction Document process.
8. I recommend access around lot #4 for fire apparatus. All buildings of 4 stories will require a standpipe system to be installed in addition to the fire sprinkler system.
 - Response: The applicant discussed Lot 4 access with the Fire Chief during the staff review meeting, a fire apparatus hammerhead turn around on the west side of the building was requested in lieu of providing continuous access around the building. Standpipe and sprinkler systems will be provided for all buildings 4 stories and greater.
9. Hatch 30 ft by 30 ft sight triangles on all street intersections shown on the landscaping plan to ensure no obstruction to vision between a height of 3.5 feet and 8 feet..
 - Response: Sight triangles have been added to the landscape plan.
10. Any modifications proposed to the existing floodway/flood plain shall require TDEC review, approval and permitting with copies of all documentation being provided to the City of Spring Hill.
 - Response: The applicant will complete all necessary TDEC and FEMA permitting for construction activities and provide copies to the City of Spring Hill.

EXHIBIT D - INFRASTRUCTURE PHASING

PHASE - 1

DURATION: Q2, 2021 - Q2, 2022

DEVELOPMENT PROGRAM

- Mass grading and temporary sediment ponds to establish proposed flood elevations, rough grades of all development parcels, and roadbed for Jim Warren Parkway
- Record Final Plat for Jim Warren Parkway right-of-way, public water and sanitary sewer utility easements, and all development parcels
- Finalize entitlements of adjacent parcels for Jim Warren Parkway right-of-way dedication.
- Develop Gas Station parcel

UTILITY IMPROVEMENTS

- Water System Improvements - install all 8" water main for connection from Old Port Royal Road S. to Port Royal Road and service stubs to development parcels.
- Sanitary Sewer System Improvements - install all 8" sanitary sewer main and connections to existing manhole locations.

PUBLIC ROADWAY IMPROVEMENTS

- Construct 2,000 LF of Jim Warren Parkway 3-lane cross section and 12' multi-use trail
- Re-stripe traffic lanes and install traffic signage on Port Royal Road per recommendations of the Traffic Impact Study
- Complete FEMA and TDEC permitting for Anon Creek bridge crossing



DEVELOPMENT PROGRAM: CONSTRUCTED BY DEVELOPER

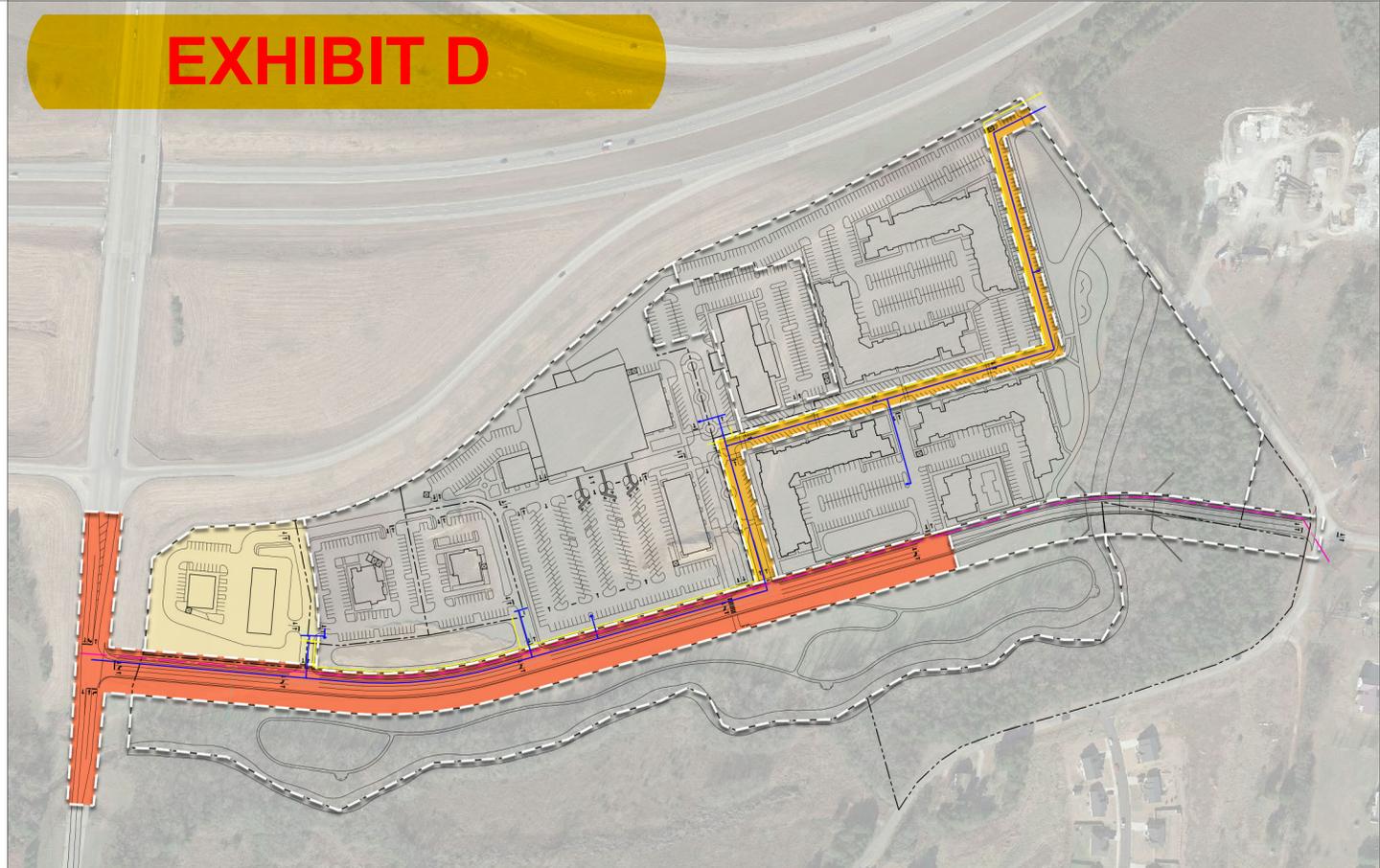


UTILITY IMPROVEMENTS: CONSTRUCTED BY DEVELOPER



PUBLIC ROADWAY IMPROVEMENTS: CONSTRUCTED BY DEVELOPER

EXHIBIT D



NOTES

1. Easements shall be provided for utilities through private development parcels.
2. Building permits may be issued for commercial projects before roadway improvements are complete. Certificates of Occupancy will not be issued until improvements are completed and initially accepted within the applicable phase.

EXHIBIT D - INFRASTRUCTURE PHASING

PHASE - 2

DURATION: Q4, 2021 - Q4, 2022



DEVELOPMENT PROGRAM: CONSTRUCTED BY DEVELOPER



UTILITY IMPROVEMENTS: CONSTRUCTED BY DEVELOPER



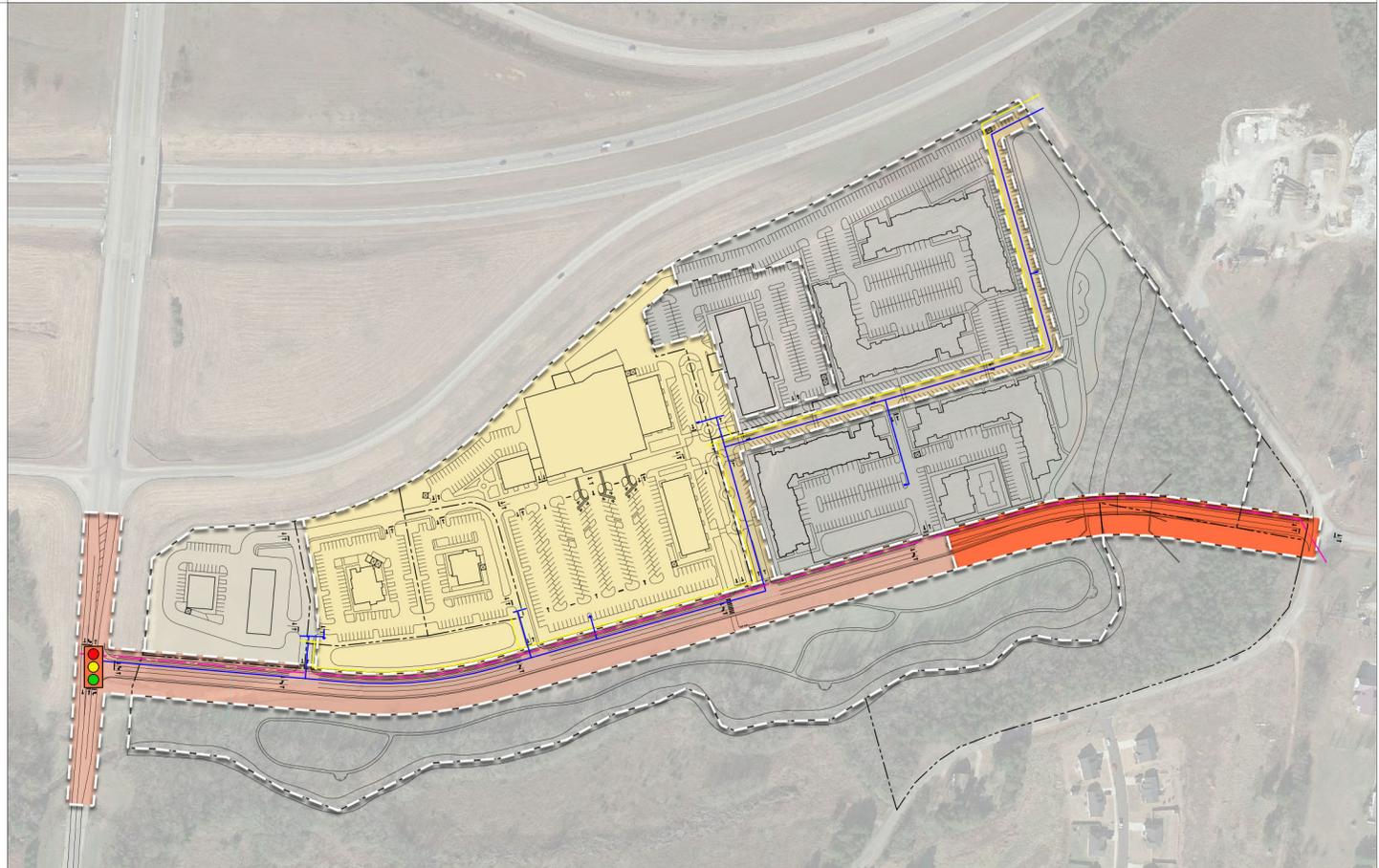
PUBLIC ROADWAY IMPROVEMENTS: CONSTRUCTED BY DEVELOPER

DEVELOPMENT PROGRAM

- Develop restaurant, retail, and grocery parcels

PUBLIC ROADWAY IMPROVEMENTS

- Construct 2-lane bridge crossing of Aenon Creek
- Construct remaining portions of Jim Warren Parkway 3-lane cross section to the Aenon Creek crossing and 2-lane cross section from Old Port Royal Road S. to the crossing of Aenon Creek
- Re-stripe traffic lanes and install traffic signage at the intersection of Jim Warren Road and the new Jim Warren Parkway intersection per recommendations of the Traffic Impact Study
- Final intersection striping and installation of traffic signal at the intersection of Jim Warren Parkway and Port Royal Road per the recommendations of the Traffic Impact Study. A warrant study will be required to ensure the installation meets the required warrants prior to installation.



NOTES

1. Building permits may be issued for commercial projects before roadway improvements are complete. Certificates of Occupancy will not be issued until improvements are completed and initially accepted within the applicable phase.
2. Signal proposed at Port Royal Road and Jim Warren Parkway constructed in Phase 4 per the TIS.

EXHIBIT D - INFRASTRUCTURE PHASING

PHASE - 3

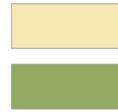
DURATION: Q2, 2022 - Q2, 2023

DEVELOPMENT PROGRAM

- Develop multifamily parcel (development may occur in conjunction with Phase 2)

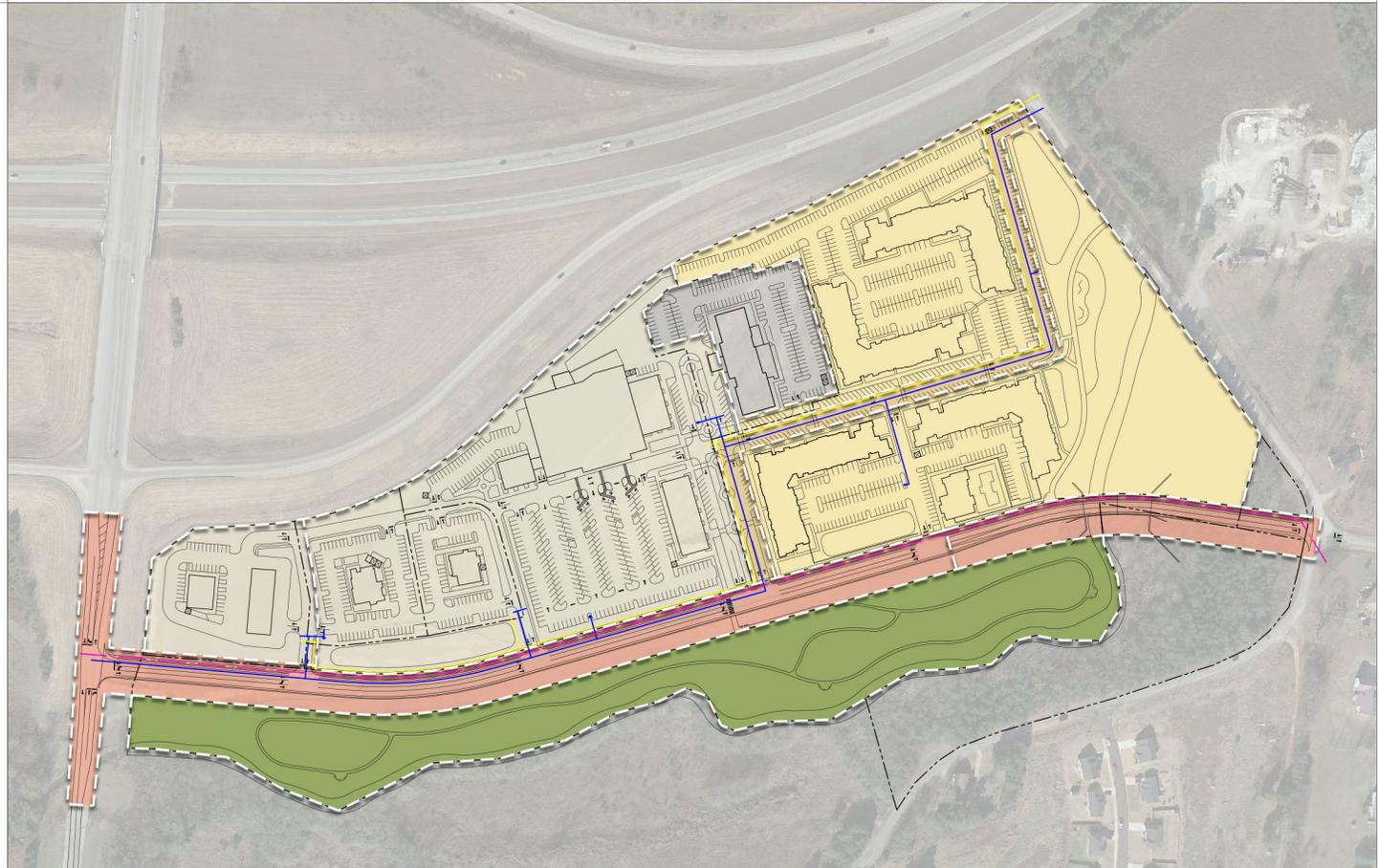
GREENWAY / OPEN SPACE

- Construct the 12' wide Green Way trail head, multi-use trail, and park along Aeonon Creek adjacent to the multi-family development per the Preliminary Plan / Site Plan (Sheet C2-00)
- Construct Lot 7 / Open Space Park trail head, soft-surface trails and interpretive exhibit improvements



DEVELOPMENT PROGRAM: CONSTRUCTED BY DEVELOPER

GREEN WAY / OPEN SPACE IMPROVEMENTS: CONSTRUCTED BY DEVELOPER



NOTES

1. Lot 7 Open Space Park to be privately owned and maintained by the commercial POA or a private non-profit group. At no time will the City be required to maintain the facilities.
2. Signal proposed at Port Royal Road and Jim Warren Parkway constructed in Phase 4 per the TIS.

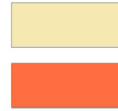
EXHIBIT D - INFRASTRUCTURE PHASING

PHASE - 4

DURATION: Q4, 2022 - Q4, 2023

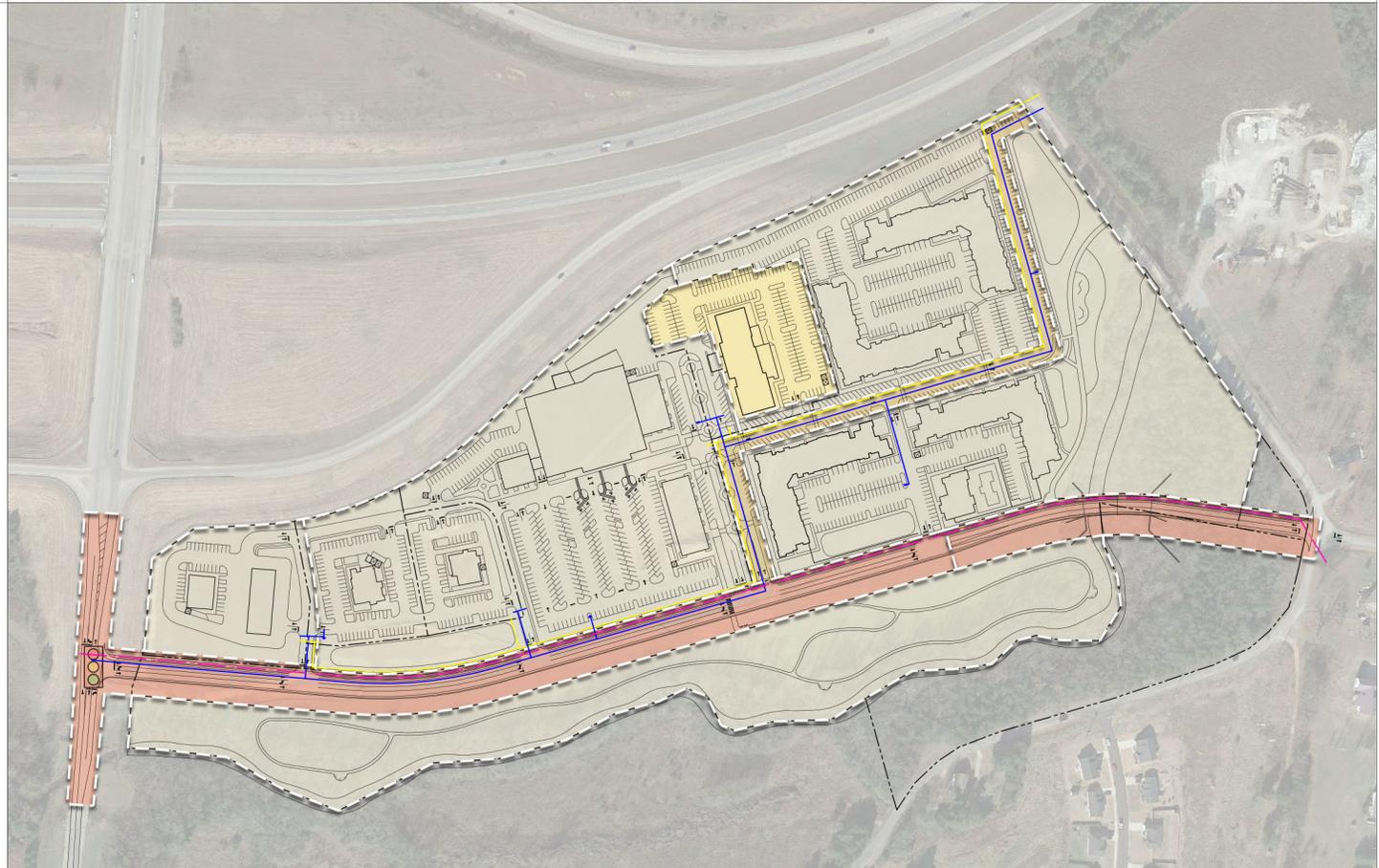
DEVELOPMENT PROGRAM

- Develop hotel parcel (development may occur in conjunction with Phase 2 or 3 improvements)



DEVELOPMENT PROGRAM: CONSTRUCTED BY DEVELOPER

PUBLIC ROADWAY IMPROVEMENTS: CONSTRUCTED BY DEVELOPER



NOTES

1. Building permits may be issued for commercial projects before roadway improvements are complete. Certificates of Occupancy will not be issued until improvements are completed and initially accepted within the applicable phase.

RESOLUTION 20-99

**OF THE PLANNING COMMISSION
OF THE CITY OF SPRING HILL, TENNESSEE**

**A RESOLUTION TO RECOMMEND APPROVAL OF APPLICATION
PDP 889-2020 (Spring Hill Town Crossing) TO THE BOARD OF MAYOR
AND ALDERMAN**

WHEREAS, pursuant to TCA 13-4-103, authority is granted to the Municipal Planning Commission to make recommendations relating to the plan and development of the municipality to public officials; and

WHEREAS, the Planning Commission had a regular meeting on the 12th day of October, 2020 and heard public testimony and input regarding application PDP 889-2020; and

WHEREAS, the Planning Commission considered the materials submitted by the applicant and the reports written by City Staff;

NOW, THEREFORE BE IT RESOLVED, that the Spring Hill Planning Commission forwards a recommendation of approval for application PDP 889-2020 to the Board of Mayor and Alderman, subject to the following conditions:

Passed and adopted this 12th day of October, 2020.



Paul Downing, Chairman



Steve Foote, Secretary

Project: Spring Hill Town Crossing

Summary:

Water Service is available to the subject property and is served by an 18" water line along Port Royal Road. The site is located within the City's Southside Pressure Zone. Modeling Results of Spring Hill's water system show that with Tanks at 50% capacity (elevation 883), the site (at elevation 690) will see static pressures in the range of 83 psi. The site can also meet Spring Hill's minimum requirement to flow a 750 gpm fire flow while maintaining 30 psi.

Model inputs:

Demands:	209,800 gpd	<i>(Provided by Applicant)</i>
	Approximately 158 gpm	
	Fire flow 750 gpm (30 min psi required)	
Tanks at 50%	Elevation 883 feet (Southside)	
Fed from:	18" line on Port Royal Rd	
Site elevation:	Approx. 690 feet (high ground elevation at site)	

Results:

Static Pressures available at the site:	83 psi
Residual pressure with 750 gpm Fire flow:	80 psi

Meets minimum pressure requirements.

Results are based on the assumptions listed above, any variation would require additional analysis to be performed during a site plan application process

SPRING HILL TOWN CROSSING - PD PRELIMINARY PLAN

PD LOT DATA, BULK STANDARDS & CRITERIA

Lot	Use	Size	Bulk Stnds.	Gross Floor Area / Units	Minimum Lot Width	Maximum Building Height	Maximum Impervious Surface	Setbacks	Street Setback	Interior Side Setback	Rear Setback	Site Stnds.	Parking Criteria Required/Provided	Landscape Standards	Sign Standards	Additional PD Criteria
1	Gas & C-Store	2.52 ACERS 109,713 S.F.		4,500 sf GFA 20 Pumps	60'	50'	85%		10'	0'	10'		1 Space Per Pump (not including pump space) + 1/500 s.f. of Retail 29 Spaces / 33 Spaces	Per U.D.C.	Per U.D.C.	<ol style="list-style-type: none"> 1. 20 required hotel parking spaces may be accounted for in surplus multi-tenant retail center provided parking. 2. 20 feet minimum building separation for one and two story buildings, plus 10 feet for each additional story. 3. Up to 10% of required parking spaces may be provided in garage spaces and tandem surface spaces in front of garages. 4. Permitted uses shall be per Article 8 of the U.D.C. unless otherwise listed below; <ul style="list-style-type: none"> • Drive Through Facility / Permitted Use • Dwelling Multifamily / Permitted Use 5. Non-residential lots that do not abut perimeter lots lines of the project are do not require an interior landscape strip when adjacent to common parking area drive isle or driveway. 6. One of the three freestanding multi-tenant signs allowed at project entry drives per the U.D.C. may be placed at the intersection of Port Royal Road and Jim Warren Parkway. 7. Multifamily building footprint configurations shall be allowed as shown approximately on the preliminary plan in lengths of up to 575 feet. Footprints may be modified to accommodate final building design.
2	Restaurant (Stand Alone)	1.86 ACERS 81,007 S.F.		5,000 s.f. GFA	60'	50'	85%		10'	0'	10'		1/100 s.f. Indoor Dining, 1/150 s.f. Outdoor Dining 50 Spaces / 80 Spaces	Per U.D.C.	Per U.D.C.	
3	Restaurant (Drive Thru)	1.38 ACERS 60,273 S.F.		4,500 s.f. GFA	60'	50'	85%		10'	0'	10'		1/100 s.f. Indoor Dining, 1/150 s.f. Outdoor Dining 45 Spaces / 60 Spaces	Per U.D.C.	Per U.D.C.	
4	Grocery, Retail & Office	8.95 ACERS 389,867 S.F.		72,250 s.f. GFA	60'	50'	85%		10'	0'	10'		Multi-Tenant Retail 1 Space / 250 s.f. GFA 289 Spaces / 327 Spaces	Per U.D.C.	^{6.} Per U.D.C.	
5	Hotel	2.62 ACERS 114,253 S.F.		120 Rooms	60'	60'	90%		10'	^{1.} 0'	10'		1.5 Space per Hotel Room 180 Spaces / 180 Spaces	^{5.} Per U.D.C.	Per U.D.C.	
6	Mulifamily	18.73 ACERS 816,287 S.F.		334 Units 18 D.U./Ac.	60'	^{7.} 4 Floors / 50'	80%		20'	^{2.} 10'	20'		^{3.} 2 Spaces Per Unit + 1 guest space per 8 units 710 Spaces / 730 Spaces	Per U.D.C.	Per U.D.C.	
7	Park & Open Space	9.24 ACERS 402,516 S.F.		N/A	60'	N/A	N/A		10'	0'	10'		N/A	N/A	N/A	
C-4	^{4.} Per U.D.C.	10,000 s.f. Min. Lot		Max. Comm. GFA - None MF - 18 DU/Ac	60'	50'	80%		10'	0'	10'		Per U.D.C.			

COUNTER OFFER # 1 TO
COMMERCIAL PURCHASE AND SALE AGREEMENT

1 This is a Counter Offer from Seller to Buyer OR Buyer to Seller
2 The undersigned agree to and accept the Commercial Purchase and Sale Agreement with an offer date of
3 03/09/20 for the purchase of real property commonly known as:
4

5 _____
6 Address, City, State, Zip

7 With the following exceptions:

8 Price shall be \$68,000.

9 Correction of spelling of Seller's last. Last name is Watkins.
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46 ALL OTHER TERMS AND CONDITIONS OF THE ORIGINAL ATTACHED COMMERCIAL PURCHASE AND
47 SALE AGREEMENT ARE ACCEPTABLE TO THE UNDERSIGNED. ALL TERMS AND CONDITIONS
48 PROPOSED IN PREVIOUS COUNTER OFFERS, IF ANY, ARE NOT INCLUDED IN THIS COUNTER OFFER
49 UNLESS RESTATED HEREIN.

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50 This Counter Offer form will not be a part of the Commercial Purchase and Sale Agreement and be binding until
51 accepted and signed by all parties.

52 *Until notice of acceptance is delivered* this offer may be revoked at any time with notice, and the Property may be sold to any
53 other party.

54 **Time Limit of Offer:** This Offer may be withdrawn at any time before acceptance with notice. Offer terminates if not accepted
55 by 5:00 o'clock am/ pm, local time, on the 23rd day of March, 2020.

	
<u>Kathy Watkins</u>	
<small>03/16/2020 6:59:28 PM EDT</small>	
SELLER/BUYER (Party making counter offer)	SELLER/BUYER (Party making counter offer)
By: <u>Kathy Wilkins</u>	By: _____
Title: _____	Title: _____
Entity: _____	Entity: _____
<u>03/16/2020</u> at _____ o'clock <input type="checkbox"/> am/ <input type="checkbox"/> pm	_____ at _____ o'clock <input type="checkbox"/> am/ <input type="checkbox"/> pm
Date	Date

63 The undersigned has received and:

64 **ACCEPTS** – accepts this counter offer.

65 **REJECTS** this counter offer

66 **COUNTERED** this offer with Counter Offer # _____.

_____ Seller/Buyer (Responding Party)	_____ Seller/Buyer (Responding Party)
By: <u>Steadfast Development Holdings, Inc.</u>	By: _____
Title: _____	Title: _____
Entity: _____	Entity: _____
_____ at _____ o'clock <input type="checkbox"/> am/ <input type="checkbox"/> pm	_____ at _____ o'clock <input type="checkbox"/> am/ <input type="checkbox"/> pm
Date	Date

74 **Acknowledgement of Receipt.** _____ hereby acknowledges receipt of the final accepted offer
75 on _____ at _____ o'clock am/ pm, and this shall be referred to as the Binding Agreement Date for
76 purposes of establishing performance deadlines as set forth in the Agreement.

NOTE: This form is provided by TAR to its members for their use in real estate transactions and is to be used as is. By downloading and/or using this form, you agree and covenant not to alter, amend, or edit said form or its contents except as where provided in the blank fields, and agree and acknowledge that any such alteration, amendment or edit of said form is done at your own risk. Use of the TAR logo in conjunction with any form other than standardized forms created by TAR is strictly prohibited. This form is subject to periodic revision and it is the responsibility of the member to use the most recent available form.

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47 Earnest Money/Trust Money into a court of competent jurisdiction. Holder shall be reimbursed for, and may deduct from,
48 any funds interpleaded, its costs and expenses, including reasonable attorney's fees. The prevailing party in the
49 interpleader action shall be entitled to collect from the other party the costs and expenses reimbursed to Holder, and upon
50 payment of such funds into the court clerk's office, Holder shall be released from all further liability in connection with
51 the funds delivered.

52 4. **Inspection.** Prior to closing, Buyer and Buyer's agents shall have the right to enter upon the Property at Buyer's expense
53 and at reasonable times, to inspect, survey, examine, and test the Property as Buyer may deem necessary as part of Buyer's
54 acquisition of the Property. Buyer may, for a fee, obtain a septic system inspection letter from the Tennessee Department
55 of Environment and Conservation, Division of Ground Water Protection. Buyer shall indemnify and hold Seller and all
56 Brokers harmless from and against any and all claims, injuries, and damages to persons and/or property arising out of or
57 related to the exercise of Buyer's rights hereunder. Buyer shall have 90 days after the Binding Agreement Date ("Due
58 Diligence Period") to evaluate the Property, the feasibility of the transaction, the availability and cost of financing, and
59 any other matter of concern to Buyer. During the Due Diligence Period, Buyer shall have the right to terminate this
60 Agreement upon notice to Seller if Buyer determines, based on an evaluation of the above, that it is not desirable to proceed
61 with the transaction, and Buyer will be entitled to a refund of the Earnest Money/ Trust Money. Within 10 days
62 after the Binding Agreement Date, Seller shall deliver to Buyer copies of materials concerning the Property referenced in
63 Exhibit "B" (collectively "Due Diligence Materials"), which materials shall be promptly returned by Buyer if Agreement
64 does not close for any reason. If Buyer fails to timely notify Seller that it is not proceeding with the transaction, Buyer
65 shall waive its rights to terminate this Agreement pursuant to this section.

66 A. **Building Permit.** This Agreement is contingent upon Buyer's ability to acquire all required licenses and
67 permits from the appropriate governmental authority to make specific improvements on the Property. If Buyer
68 provides a copy of the governmental report along with written notification to Seller and/or Seller's Broker within
69 _____ days after the Binding Agreement Date that Buyer is unable to acquire all required licenses and permits
70 from the appropriate governmental authority to make specific improvements on the Property, then in such event this
71 Agreement shall automatically terminate and Holder shall promptly refund the Earnest Money/ Trust Money to
72 Buyer. If Buyer fails to provide said report and notice, then this contingency shall be deemed to have been waived
73 by Buyer.

74 B. **Permit for Sanitary Septic Disposal System.** This Agreement is contingent upon the Buyer's ability to obtain
75 a permit for a sanitary septic disposal system from the respective Tennessee Ground Water Protection Office for the
76 county in which the Property is located (generally, located at the local Health Department) to be placed on the Property
77 in a location consistent with Buyer's planned improvements. If Buyer is unable to meet this condition, Buyer must
78 notify Seller and/or Seller's Broker in writing within _____ days after the Binding Agreement Date along with
79 documentation reflecting denial of permit from the appropriate governmental entity. With proper notice, the
80 Agreement is voidable by Buyer and Earnest Money/ Trust Money refunded. If Buyer fails to provide said notice,
81 this contingency shall be deemed to have been waived by Buyer.

82 C. **Rezoning.** This Agreement is contingent upon the Property being rezoned to Unknown
83 by the appropriate governmental authorities on or before _____. (Buyer or Seller)
84 _____ shall be responsible for pursuing such rezoning, and paying all associated cost. All
85 rezoning applications shall be submitted to Seller for Seller's approval prior to filing, which approval shall not be
86 unreasonably withheld. All parties agree to cooperate, to sign the necessary documentation and to support the rezoning
87 application. If Buyer provides documentation and written notification to Seller and/or Seller's Broker within 48 hours
88 after the above date that the Property cannot be so zoned, then in such event this Agreement shall automatically
89 terminate, and Holder shall promptly refund the Earnest Money/ Trust Money to Buyer. If Buyer fails to provide said
90 documentation and notice, then this contingency shall be deemed to have been waived by Buyer.

91 D. **Other Inspections.** See Special Stipulations for additional inspections required by Buyer.

92 5. **Title.**

93 A. **Warranties of Seller.** Seller warrants that at Closing Seller shall convey good and marketable, fee simple title to
94 the Property to Buyer, subject only to the following exceptions ("Permitted Exceptions"):

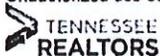
95 (1) Liens for ad valorem taxes not yet due and payable.

96 (2) Those exceptions to which Buyer does not object or which Buyer waives in accordance with the Title Issues and
97 Objections section below. "Good and marketable, fee simple title" with respect to the Property shall be such
98 title:

99 (a) as is classified as "marketable" under the laws of Tennessee; and

100 (b) as is acceptable to and insurable by a title company doing business in Tennessee ("Title Company"), at

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standard rates on an American Land Title Association Owner's Policy ("Title Policy").

B. Title Issues and Objections. Buyer shall have _____ days after the Binding Agreement Date to furnish Seller with a written statement of any title objections, UCC-1 or UCC-2 Financing Statements, and encroachments, and other facts affecting the marketability of the Property as revealed by a current title examination. Seller shall have _____ days after the receipt of such objections (the "Title Cure Period") to cure all valid title objections. Seller shall satisfy any existing liens or monetary encumbrances identified by Buyer as title objections which may be satisfied by the payment of a sum certain prior to or at Closing. Except for Seller's obligations in the preceding sentence, if Seller fails to cure any other valid title objections of Buyer within the Title Cure Period (and fails to provide Buyer with evidence of Seller's cure satisfactory to Buyer and to Title Company), then within five (5) days after the expiration of the Title Cure Period, Buyer may as Buyer's sole remedies: (1) rescind the transaction contemplated hereby, in which case Buyer shall be entitled to the return of Buyer's Earnest Money/Trust Money; (2) waive any such objections and elect to Close the transaction contemplated hereby irrespective of such title objections and without reduction of the Purchase Price; or (3) extend the Closing Date period for a period of up to fifteen (15) days to allow Seller further time to cure such valid title objections. Failure to act in a timely manner under this section shall constitute a waiver of Buyer's rights hereunder. Buyer shall have the right to reexamine title prior to Closing and notify Seller at Closing of any title objections which appear of record after the date of Buyer's initial title examination and before Closing.

6. Closing.

A. Closing Date. This transaction shall be consummated at the office of _____ on _____, _____ (the "Closing Date") or at such other time and place(s) the parties may agree upon in writing.

B. Possession. Seller shall deliver possession and occupancy of the Property to Buyer at Closing, subject only to the rights of tenants in possession and the Permitted Exceptions.

7. Seller's Obligations at Closing. At Closing, Seller shall deliver to Buyer:

- (a) a Closing Statement;
- (b) deed (mark the appropriate deed below)
 - General Warranty Deed Special Warranty Deed
 - Quit Claim Deed Other: _____
- (c) all documents which Seller must execute under the terms of this Agreement to cause the Title Company to deliver to Buyer the Title Policy including, without limitation, a title affidavit from Seller to Buyer and to the Title Company in the form customarily used in Tennessee commercial real estate transactions so as to enable the Title Company to issue Buyer the Title Policy with all standard exceptions deleted and subject only to Permitted Exceptions; and
- (d) evidence reasonably satisfactory to Buyer at Closing of all documents/items indicated in Exhibit "C", if any (all documents to be delivered by Seller under this section, including all documents/items indicated in Exhibit "C" are collectively "Seller's Closing Documents").

8. Conditions to Closing.

Closing date and due diligence period to be contingent on a clear title. Due Diligence period shall start after clear title is obtained and closing date shall be 30 days after due diligence period has ended. Due Diligence period shall be 90 days.

9. Costs.

A. Seller's Costs. Seller shall pay all existing loans and/or liens affecting the Property; the cost of recording any title curative documents, including without limitation, satisfactions of deeds to secure debt, quitclaim deeds and financing statement termination; any accrued and/or outstanding association dues or fees; fee (if any) to obtain lien payoff/estoppel letters/statement of accounts from any and all associations, property management companies,

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152 mortgage holders or other liens affecting the Property; all deed recording fees; the fees of Seller's counsel and, if
153 checked, all transfer taxes, otherwise Buyer is responsible for transfer taxes.

154 In the event Seller is subject to Tax Withholding as required by the Foreign Investment in Real Property Tax
155 Act, (hereinafter "FIRPTA"), Seller additionally agrees that such Tax Withholding must be collected from
156 Seller by Buyer's Closing Agent at the time of Closing. In the event Seller is not subject to FIRPTA, Seller shall be
157 required as a condition of Closing to sign appropriate affidavits certifying that Seller is not subject to FIRPTA. It is
158 Seller's responsibility to seek independent tax advice or counsel prior to the Closing Date regarding such tax
159 matters.

160 B. Buyer's Costs. Buyer shall pay the cost of Buyer's counsel and consultants; any costs in connection with Buyer's
161 inspection of the Property and any costs associated with obtaining financing for the acquisition of the Property
162 (including any intangibles tax, all deed recording fees and the cost of recording Buyer's loan documents.)

163 C. Additional Costs. In addition to the costs identified above, the following costs shall be paid by the parties hereto as
164 indicated below:

165 Item to be Paid	Paid by Seller	Paid by Buyer
166 Survey	<input type="checkbox"/>	<input checked="" type="checkbox"/>
167 Title Examination	<input type="checkbox"/>	<input checked="" type="checkbox"/>
168 Premium for Standard Owner's Title Insurance Policy [JCV]	<input type="checkbox"/>	<input checked="" type="checkbox"/>
169 Other: 3% Commission to Rose Rainey	<input type="checkbox"/>	<input checked="" type="checkbox"/>
170 Other: Great South Real Estate	<input type="checkbox"/>	<input type="checkbox"/>
171 Other: & Development, LLC	<input type="checkbox"/>	<input type="checkbox"/>

172 10. Taxes and Prorations. Real estate taxes on the Property for the calendar year in which the Closing takes place shall be
173 prorated as of 12:01 a.m. local time on the Closing Date. Seller shall be responsible (even after Closing) for paying all
174 taxes (including previous reassessments) on the Property for the time period during which Seller owned the Property and
175 shall indemnify the Buyer therefore. In addition, the following items shall also be prorated as of 12:01 a.m. local time on
176 the Closing Date [Select only those that apply to this transaction; the items not checked do not apply to this Agreement]:

- 177 Utilities Service Contracts Tenant Improvement Costs
- 178 Rents Leasing Commissions Other: _____
- 179 Other: _____ Other: _____

180 11. Greenbelt. If property is currently classified by the property tax assessor as "Greenbelt" (minimum of 15 acres or
181 otherwise qualifies), does the Buyer intend to keep the property in the Greenbelt? (Select the appropriate boxes below.
182 Unselected items will not be part of this Agreement):

- 183 Buyer intends to maintain the property's Greenbelt classification and acknowledges that it is Buyer's
184 responsibility to make timely and proper application to insure such status. Buyer's failure to timely and
185 properly make application will result in the assessment of rollback taxes for which Buyer shall be obligated to
186 pay. Buyer should consult the tax assessor for the county where the property is located prior to making this
187 offer to verify that their intended use will qualify for greenbelt classification.
- 188 Buyer does not intend to maintain the property's Greenbelt status and Rollback taxes shall be payable by the
189 Seller at time of closing.

190 12. Representations and Warranties.

191 A. Seller's Representations and Warranties. As of the Binding Agreement Date and the Closing Date, Seller
192 represents and warrants to Buyer that Seller has the right, power, and authority to enter into this Agreement and to
193 convey the Property in accordance with the terms and conditions of this Agreement. The persons executing this
194 Agreement on behalf of Seller have been duly and validly authorized by Seller to execute and deliver this Agreement
195 and shall have the right, power, and authority to enter into this Agreement and to bind Seller. Seller also makes the
196 additional representations and warranties to Buyer, if any, as indicated on Exhibit "D".

197 B. Buyer's Representations and Warranties. As of the Binding Agreement Date and the Closing Date, Buyer
198 represents and warrants to Seller that Buyer has the right, power, and authority to enter into this Agreement and to
199 consummate the transaction contemplated by the terms and conditions of this Agreement. The persons executing
200 this Agreement on behalf of Buyer have been duly and validly authorized by Buyer to execute and deliver this
201 Agreement and shall have the right, power, and authority to enter into this Agreement and bind Buyer. Upon
202 Seller's request, Buyer shall furnish such documentation evidencing signor's authority to bind Buyer.

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□ a dual agent.

(3) **Dual Agency Disclosure.** *[Applicable only if dual agency has been selected above]* Seller and Buyer are aware that Broker is acting as a dual agent in this transaction and consent to the same. Seller and Buyer have been advised that:

1. In serving as a dual agent the Broker is representing two clients whose interests are, or at times could be, different or even adverse.
2. The Broker will disclose all adverse, material facts relevant to the transaction, and actually known to the dual agent, to all parties in the transaction except for information made confidential by request or instructions from another client which is not otherwise required to be disclosed by law.
3. The Buyer and Seller do not have to consent to dual agency, and
4. The consent of the Buyer and Seller to dual agency has been given voluntarily and the parties have read and understand their brokerage engagement agreements.
5. Notwithstanding any provision to the contrary contained herein, Seller and Buyer each hereby direct Broker, if acting as a dual agent, to keep confidential and not reveal to the other party any information which could materially and adversely affect their negotiating position unless otherwise prohibited by law.

(4) **Material Relationship Disclosure.** *[Required with dual Agency]* The Broker and/or affiliated licensees have no material relationship with either client except as follows: _____. A material relationship means one of a personal, familial or business nature between the Broker and affiliate licensees and a client which would impair their ability to exercise fair judgment relative to another client.

Seller Initials _____ Buyer Initials _____

C. Brokerage. Seller agrees to pay Listing Broker at Closing the compensation specified by separate agreement. The Listing Broker will direct the closing agency/attorney to pay the Selling Broker, from the commission received, an amount, if any, in accordance with the terms and provisions specified by separate agreement. The parties agree and acknowledge that the Brokers involved in this transaction may receive compensation from more than one party. All parties to this Agreement agree and acknowledge that any real estate firm involved in this transaction shall be deemed a third party beneficiary only for the purposes of enforcing their commission rights, and as such, shall have the right to maintain an action on this Agreement for any and all compensations due and any reasonable attorney's fees and court costs.

15. Destruction of Property Prior to Closing. If the Property is destroyed or substantially destroyed prior to Closing, Seller shall give Buyer prompt notice thereof, which notice shall include Seller's reasonable estimate of: (1) the cost to restore and repair the damage; (2) the amount of insurance proceeds, if any, available for the same; and (3) whether the damage will be repaired prior to Closing. Upon notice to Seller, Buyer may terminate this Agreement within seven (7) days after receiving such notice from Seller. If Buyer does not terminate this Agreement, Buyer shall be deemed to have accepted the Property with the damage and shall receive at Closing (1) any insurance proceeds which have been paid to Seller but not yet spent to repair the damage and (2) an assignment of all unpaid insurance proceeds on the claim. Buyer may request in writing, and Seller shall provide within five (5) business days, all documentation necessary to confirm insurance coverage and/or payment or assignment of insurance proceeds.

16. Other Provisions.

A. Binding Effect, Entire Agreement, Modification, Assignment, and Binding Agreement Date. This Agreement shall be for the benefit of, and be binding upon, the parties hereto, their heirs, successors, legal representatives and assigns. This Agreement constitutes the sole and entire agreement between the parties hereto and no modification of this Agreement shall be binding unless signed by all parties or assigns to this Agreement. No representation, promise, or inducement not included in this Agreement shall be binding upon any party hereto. It is hereby agreed by both Buyer and Seller that any real estate agent working with or representing either party shall not have the authority to bind the Buyer, Seller, or any assignee to any contractual agreement unless specifically authorized in writing within this Agreement. Any assignee shall fulfill all the terms and conditions of this Agreement. The parties hereby authorize either licensee to insert the time and date of receipt of the notice of acceptance of the final offer. The foregoing time and date will be referred to for convenience as the Binding Agreement Date for purposes of establishing performance deadlines.

B. Survival Clause. Any provision contained herein, which by its nature and effect is required to be performed after Closing shall survive the Closing and delivery of the deed, and shall remain binding upon the parties to this Agreement and shall be fully enforceable thereafter. Notwithstanding the above, the representations and warranties made in

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Exhibit "D" shall survive the Closing for a period of 90 days after the date of Closing.

C. **Governing Law and Venue.** This Agreement is intended as a contract for the purchase and sale of real property and shall be interpreted in accordance with the laws and in the courts of the State of Tennessee.

D. **Time of Essence.** Time is of the essence in this Agreement.

E. **Terminology.** As the context may require in this Agreement: (1) the singular shall mean the plural and vice versa; (2) all pronouns shall mean and include the person, entity, firm or corporation to which they relate; (3) the masculine shall mean the feminine and vice versa; and (4) the term day(s) used throughout this Agreement shall be deemed to be calendar day(s) ending at 11:59 p.m. local time unless otherwise specified in this Agreement. Local time shall be determined by the location of Property. In the event a performance deadline, other than the Closing Date (as defined herein), Date of Possession (as defined herein), and Offer Expiration Date (as defined herein), occurs on a Saturday, Sunday or legal holiday, the performance deadline shall extend to the next following business day. Holidays as used herein are those days deemed federal holidays pursuant to 5 U.S.C. § 6103. In calculating any time period under this Agreement, the commencement day shall be the day following the initial date (e.g. Binding Agreement Date).

F. **Responsibility to Cooperate.** Buyer and Seller agree to timely take such actions and produce, execute, and/or deliver such information and documentation as is reasonably necessary to carry out the responsibilities and obligations of this Agreement. Except as to matters which are occasioned by clerical errors or omissions or erroneous information, the approval of the closing documents by the parties shall constitute their approval of any differences between this Agreement and the Closing. Buyer and Seller agree that if requested after Closing, they will correct any documents and pay any amounts due where such corrections or payments are appropriate by reason of mistake, clerical errors or omissions, or the result of erroneous information.

G. **Notices.** Except as otherwise provided herein, all notices and demands required or permitted hereunder shall be in writing and delivered either (1) in person; (2) by a prepaid overnight delivery service; (3) by facsimile transmission (FAX); (4) by the United States Postal Service, postage prepaid, registered or certified, return receipt requested; or (5) Email. NOTICE shall be deemed to have been given as of the date and time it is actually received. Receipt of notice by the real estate licensee or the Broker assisting a party as a client or customer shall be deemed to be notice to that party for all purposes under this Agreement as may be amended, unless otherwise provided in writing.

H. **Remedies.** In the event of a breach of this Agreement, the non-breaching party may pursue all remedies available at law or in equity except where the parties have agreed to arbitrate. Notwithstanding the above, if Buyer breaches Buyer's obligations or warranties herein Seller shall have the option to request that Holder pay the Earnest Money/Trust Money to Seller, which if disbursed to Seller by Holder shall constitute liquidated damages in full settlement of all claims by Seller. Such liquidated damages are agreed to by the parties not to be a penalty and to be a good faith estimate of Seller's actual damages, which damages are difficult to ascertain. In the event that any party hereto shall file suit for breach or enforcement of this Agreement (including suits filed after Closing which are based on or related to the Agreement), the prevailing party shall be entitled to recover all costs of such enforcement, including reasonable attorney's fees. The parties hereby agree that all remedies are fair and equitable and neither party will assert the lack of mutuality of remedies as a defense in the event of a dispute.

I. **Equal Opportunity.** This Property is being sold without regard to race, color, creed, sex, religion, handicap, familial status, or national origin.

J. **Termination by Buyer.** In the event that Buyer legally and properly invokes his right to terminate this Agreement under any of the provisions contained herein, Buyer shall pay the sum of one hundred dollars (\$100.00) to Seller as consideration for Buyer's said right to terminate, the sufficiency and adequacy of which is hereby acknowledged. Earnest Money/Trust Money shall be disbursed according to the terms stated herein.

K. **Severability.** If any portion or provision of this Agreement is held or adjudicated to be invalid or unenforceable for any reason, each such portion or provision shall be severed from the remaining portions or provisions of this Agreement, and the remaining portions or provisions shall be unaffected and remain in full force and effect.

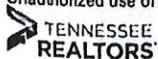
L. **Contract Construction.** This Agreement or any uncertainty or ambiguity herein shall not be construed against any party but shall be construed as if all parties to this Agreement jointly prepared this Agreement.

17. **Method of Execution.** The parties agree that signatures and initials transmitted by facsimile, other photocopy transmittal, or by transmittal of digital signature as defined by the applicable State or Federal law will be acceptable and may be treated as originals and that the final Lot/Land Purchase and Sale Agreement containing all signatures and initials may be executed partially by original signature and partially on facsimile, other photocopy documents, or by digital signature as defined by the applicable State or Federal law.

18. **Exhibits and Addenda.** All exhibits and/or addenda attached hereto, listed below, or referenced herein are made a part of this Agreement. If any such exhibit or addendum conflicts with any preceding section, said exhibit or addendum shall control:

- Exhibit "A" Legal Description

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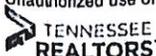
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Independent Licensee: Rose M Rainey
Licensee Email: raineyrose@yahoo.com

Selling Company: Great South Real Estate & Dev, LLC
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CONTRACT FOR SALE OF REAL ESTATE

This Contract for Sale of Real Estate ("Contract") is entered into as of the 12 day of October, 2020 (the "Effective Date") by and between Robert L. Harris ("Seller") and Steadfast Development Holdings, Inc., or Assigns ("Buyer").

1. PURCHASE AND SALE. Seller agrees to sell and convey to Buyer and Buyer agrees to buy from Seller the Property (as hereinafter defined) for the consideration and upon and subject to the terms, matters, provisions and conditions herein set forth.

2. PROPERTY. Real estate consisting of approximately 4.6 acres situated in Maury County, Tennessee, with Tax Parcel ID Number 060027 02700 and depicted as Parcel 27 on Exhibit A attached hereto and incorporated herein, together with all improvements and fixtures, privileges, appurtenances and easements pertaining thereto (the "Property").

3. CONTRACT PURCHASE PRICE. The purchase price for the Property (herein called the "Purchase Price") shall be \$350,000.00.

4. FINANCING. Buyer will pay cash at Closing.

5. EARNEST MONEY; INDEPENDENT CONSIDERATION. Within five (5) business days after the Effective Date, Buyer shall deliver to Ticor Title Insurance Company ("Escrow Agent") the sum of Twenty-Five Thousand and No/100 Dollars (\$25,000.00) as earnest money (the "Earnest Money") to be held by Escrow Agent in an interest bearing account according to the terms and conditions of this Contract. The Earnest Money shall be applied against the Purchase Price at closing. At the same time as the deposit of the Earnest Money with the Escrow Agent, Buyer shall deliver to Escrow Agent the amount of One Hundred and No/100 Dollars (\$100.00) (the "Independent Consideration"), which amount has been bargained for and agreed to as consideration for Buyer's exclusive right or option to purchase the Property, the right to inspect the Property as provided herein, and Buyer's other rights and remedies herein. The Independent Consideration is in addition to and independent of all other consideration provided in this Contract and is nonrefundable in all events.

6. TITLE. Buyer shall, at Buyer's expense, obtain a title insurance commitment (ALTA Form B, or equivalent) in the amount of the Purchase Price from Escrow Agent, along with a legible copy of all exceptions listed therein (the "Commitment"), which shall disclose the state of the title to the Property and shall constitute the commitment of such company to insure the title following closing in the name of Buyer. The Commitment shall be updated through the Closing Date (as hereinafter defined). An owner's title policy in the full amount of the Purchase Price (the "Title Policy") shall be issued to Buyer promptly after Closing, insuring marketability of title and subject only to taxes for the year in which Closing occurs and such other special exceptions shown on the Commitment as are specifically approved by Buyer in writing (the "Permitted Exceptions").

7. CLOSING. The closing of the sale of the Property ("Closing") shall be on or before thirty (30) days from the last day of the Entitlement Period (defined below) (the "Closing Date") in Williamson County, Tennessee, at the offices of Stites & Harbison, PLLC, or such other location or through such escrow arrangement with Escrow Agent as the parties may agree in writing.

A At Closing, Seller shall deliver to Buyer the following:

1 A duly executed and acknowledged special warranty deed conveying good and indefeasible title in fee simple to the Property, free and clear of any and all liens, encumbrances, conditions, easements, assessments, reservations and restrictions except for the Permitted Exceptions;

2 A certification satisfying the requirements of Section 1445 of the Internal Revenue Code (FIRPTA);

3 Evidence of the termination of all leases and contracts affecting the Property in recordable form;

4 An owner's affidavit in the form prescribed by the title company;
and

5 All other documents reasonably required to close this transaction in accordance with the terms of this Contract.

B At Closing, Buyer shall perform the following:

1 Pay the Purchase Price, subject to the prorations and adjustments provided for in this Contract;

2 Furnish evidence of Buyer's capacity and authority for the closing of this transaction; and

3 Execute all other documents reasonably required to close this transaction in accordance with the terms of this Contract.

8. COMMISSION. At Closing, Buyer will pay any commissions owed to Buyer's broker and commissions owed to Seller's broker in an amount not to exceed six percent (6.0%) of the Purchase Price. Buyer and Seller each agree to indemnify, defend and hold harmless the other from any claims for other commissions by any real estate agents or brokers claiming by, through or under the indemnitor. The provisions of this Section shall survive the Closing or termination of this Contract, as applicable. In the event that the sale of the Property is not closed for any reason, no real estate agent's commission shall be due.

9. INSPECTIONS; ENTITLEMENT PERIOD.

A Between the Effective Date and the Closing Date, Buyer shall have the right to study the Property and conduct such inspections as Buyer may require. Such studies may include, without limitation, an engineering exam of the Property and soil and environmental

testing. Buyer and its experts shall have access to the Property at all times before Closing for the purposes of conducting Buyer's inspection of the Property. Buyer shall give at least 24 hours' notice to seller of inspection visits. Buyer shall have the right to terminate this Contract for any reason between the Effective Date and the end of the Entitlement Period by giving Seller written notice of Buyer's election to terminate, which notice must be dated on or before the expiration of the Entitlement Period. Upon termination all Earnest Money shall be returned to Buyer, the Independent Consideration shall be released to Seller, and the parties shall be released of all obligations under this Contract except for those that expressly survive termination.

B Buyer shall have until 5:00 p.m. Pacific Time on March 27, 2021 (the "Entitlement Period") to obtain (1) all final, non-appealable zoning approvals (including, if applicable, a conditional use permit, variances, and waivers), and final, non-appealable approval of Buyer's development plan (the "Development Plan") to permit the construction and operation of Buyer's intended development of a parcel of land adjoining the Property in its sole discretion ("Buyer's Development"), and (2) confirmation that all rights-of-way and all water, sewer, gas, electric, telephone, and drainage facilities and all other utilities required by law or reasonably necessary or proper and usual for the full construction, operation, use, and occupancy of Buyer's Development are available to Buyer's Development (collectively, the "Development Approvals").

C Buyer shall promptly restore the Property to its prior condition subsequent to any such inspections or tests, at Buyer's sole cost and expense. Buyer agrees to protect, indemnify, defend and hold Seller harmless from and against any claim for liabilities, losses, costs, expenses (including reasonable attorneys' fees and court costs), damages or injuries arising out of or resulting from the inspection of the Property by Buyer or its agents or consultants, and such obligation to indemnify and hold harmless Seller shall survive Closing or any termination of this Contract. Buyer's obligations under the preceding sentence shall not apply to any claim, loss, cost, expense, damage, or injury arising out of (i) the mere discovery of matters or conditions existing at the Property, or (ii) Seller's negligence or willful misconduct.

D Seller agrees to cooperate with Buyer in connection with the zoning, rezoning, site plan approval, plat approval or other matters concerning Buyer's pursuit of the Development Approvals, but shall not be obligated to incur any out of pocket expenses in cooperating therewith.

10. POSSESSION OF PREMISES. Buyer shall have possession of Property at Closing.

11. SALES EXPENSES TO BE PAID IN CASH AT OR PRIOR TO CLOSING. Buyer shall pay the costs of preparing and recording the deed, any closing or escrow fee charged by Escrow Agent, all of the state transfer tax, all costs related to obtaining the Development Approvals, all fees and expenses related to Buyer's financing and environmental tests, and expenses stipulated to be paid by Buyer under the provisions of this Contract, including Buyer's attorney fees and closing costs. Ad valorem taxes and assessments upon the Property will be prorated in accordance with local custom.

12. DEFAULT AND REMEDIES. In the event of Buyer's breach of this Contract by failing to close when required to do so, Seller's sole remedy at law and in equity shall be the right to either retain the Earnest Money as liquidated damages for such default, the parties

acknowledging that it is impossible to more precisely estimate the damages to be suffered by Seller upon Buyer's default, or Seller may pursue the specific performance of this Contract. In the event of a breach of this Contract by Seller, Buyer shall be entitled to terminate this Contract and immediately recover all Earnest Money paid hereunder, or Buyer may pursue the specific performance of this Contract. The prevailing party in any dispute arising under this Contract shall be entitled to recover from the other all reasonable costs and attorneys' fees related to the enforcement of this Contract.

13. MISCELLANEOUS.

A Any notice required or permitted to be delivered hereunder shall be deemed received when (i) personally delivered, (ii) deposited with a nationally recognized courier service for overnight delivery, (iii) three (3) days after deposit of the delivered item in the United States mail, postage prepaid, certified mail, return receipt requested, or (iv) or sent by email, provided that a hard copy of the notice is delivered or mailed in the manner set forth above no later than one business day after transmission by email, in each case addressed to Buyer or Seller, as the case may be, at the address set forth below:

Buyer: Steadfast Development Holdings, Inc.
18100 Von Karman Ave., Suite 500
Irvine, CA 92612
Attn: Ana Marie del Rio, Esq.
E-mail: AnaMarie.delRio@steadfastco.com

With a copy to:
E-mail: Chase.Emery@Steadfastco.com

And with a copy to:

Stites & Harbison, PLLC
400 West Market Street, Suite 1800
Louisville, Kentucky 40202
Attn: Greg Ehrhard
E-mail: gehrhard@stites.com

Seller: Robert L. Harris

E-mail: widetracker1@msn.com

B This Contract shall be binding upon and inure to the benefit of the parties hereto and such parties' respective heirs, executors, administrators, legal representatives, successors and assigns.

C Time is of the essence of this Contract.

D Except as expressly provided otherwise in this Contract, each party shall be responsible for the cost of such party's compliance with the terms hereof and such party's attorneys' fees. Risk of loss shall remain with Seller until delivery of the deed. Seller will take all actions to dispossess tenants in possession of the Property, if any, prior to Closing so that the Property shall be free and clear of tenants and all occupants on the date of Closing.

E The provisions of this Contract shall survive the Closing unless this Contract expressly provides to the contrary.

F If the time for performance of any action hereunder shall fall on a Saturday, Sunday or legal holiday, then the date of such performance shall be extended until the next business day.

G Seller has the right to sell the Property subject to an exchange qualifying transaction as defined under Section 1031 of the IRS code. Buyer will cooperate with Seller in such a transaction, however, Buyer will not incur any expenses or costs associated with such exchange and such exchange shall not delay or be a condition to the Closing.

14. EARNEST MONEY ESCROW. Escrow Agent hereby acknowledges the receipt of one (1) fully executed copy of this Contract. Except as modified by written settlement instructions executed by all parties and accepted by the Escrow Agent, the following conditions of escrow shall apply to this escrow or settlement, and the property received hereunder:

A Upon receipt of the Earnest Money, Escrow Agent agrees to hold the same in accordance with the terms hereof and subject to the conditions and limitations contained herein.

B In performing its duties hereunder, Escrow Agent shall not incur liability to any party for damages, losses, or expenses, except for willful default or breach of trust. Accordingly, Escrow Agent shall not incur liability with respect to any action taken or omitted in reliance upon any instrument, including any written notice or instructions provided for in this Contract, not only as to its due execution and the validity and effectiveness of its provisions but also as to the truth and accuracy of any information contained herein which Escrow Agent shall, in good faith, believe to be genuine, to have been signed or presented by a proper person or persons and to conform with the provisions of this Contract.

C In the event of any dispute among the parties hereto, Escrow Agent shall render into the registry or custody of any court of competent jurisdiction all money or property in its hands under this Contract, together with such pleadings as it deemed appropriate, and thereupon be discharged from all further duties and liabilities under this Contract.

D Escrow Agent may consult with and obtain advice from legal counsel (other than counsel to any of the parties to the Contract) in the event of any questions as to any of the provisions of this Contract or its duties hereunder, and it shall incur no liability and shall be fully protected in acting in good faith in accordance with the opinion and instructions of such counsel.

E The Earnest Money shall be deposited in an interest-bearing account backed by the United States Government. Interest accruing thereunder shall be to the benefit of the parties that receive the Earnest Money. In the event the Earnest Money exceeds Two Hundred Fifty

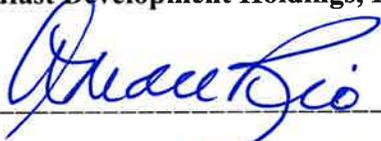
Thousand and No/100 (\$250,000.00) Dollars, Escrow Agent shall not be liable due to the fact that the amounts exceed the maximum amount insured by the Federal Deposit Insurance Corporation.

F In the event that Escrow Agent is in doubt as to duties or liabilities under the provisions hereof it may, in its sole discretion, continue to hold the monies which are subject to this escrow until the parties hereto mutually agree to the disbursement thereof, or until a judgment of a court of competent jurisdiction shall determine the rights of the parties thereto, or Escrow Agent may deposit all of the monies then held pursuant hereto with the Clerk of the Circuit Court of Maury County, Tennessee, and upon notifying all parties concerned of such action, all liability on the part of Escrow Agent shall fully cease and terminate, except to the extent of accounting for all monies thereto delivered out of escrow.

[end of page]

BUYER:

Steadfast Development Holdings, Inc.

By: 

Date Signed: 10-12-2020

SELLER:

Robert L. Harris

DocuSigned by:


U93E384ZD9ZB8U8
Date Signed: 10-12-2020

ESCROW AGENT:

Ticor Title Insurance Company



Date Signed: 10/13/2020

EXHIBIT A





Traffic Impact Analysis

Spring Hill Towne Crossing

September 2020

FOR SUBMITTAL TO:

City of Spring Hill, Tennessee

PREPARED FOR:

Steadfast Companies

Kimley»»Horn

Traffic Impact Analysis

Spring Hill Towne Crossing

FOR SUBMITTAL TO:

City of Spring Hill, Tennessee

PREPARED FOR:

Steadfast Companies

PREPARED BY:

Kimley»»Horn

214 Oceanside Drive
Nashville, Tennessee 37204
615.564.2701

September 2020

Project Number 118332001

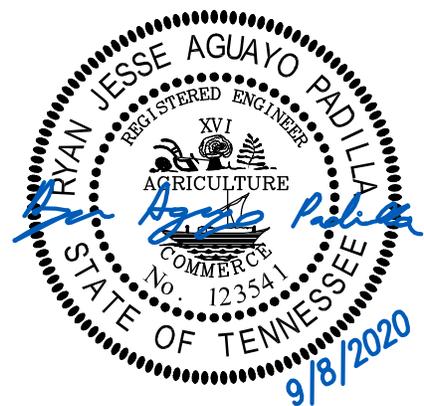


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1.0 EXECUTIVE SUMMARY

This Traffic Impact Analysis has been performed for a proposed development located in the city of Spring Hill in Maury County, Tennessee. The 50.66-acre proposed development is located east of Port Royal Road and north of Jim Warren Road. The anticipated completion of this development is year 2023.

The proposed development consists of:

- Multi-family Residential Housing – 334 units
- Hotel – 120 rooms
- Retail/Commercial – 23,750 s.f.
- Supermarket – 48,500 s.f.
- Quality Restaurant – 5,000 s.f.
- High-Turnover (Sit-Down) Restaurant – 4,500 s.f.
- Gasoline/Service Station with Convenience Market – 20 pumps

The study intersections are:

1. Port Royal Road at Saturn Parkway Westbound Ramps
2. Port Royal Road at Saturn Parkway Eastbound Ramps
3. Port Royal Road at Jim Warren Road
4. Port Royal Road at Tom Lunn Road

As part of TDOT's interchange improvements for Saturn Parkway at Port Royal Road, the following improvements will improve traffic operations under the Background 2023 scenario. This project is under construction and expected to be completed in 2020.

Port Royal Road at Saturn Parkway Westbound Ramps

- Install a traffic signal with protected only southbound left-turn phasing.
- Construct a southbound right-turn lane along Port Royal Road.
- Construct two (2) additional westbound approach lanes along the Saturn Parkway Westbound Off-Ramp. This will provide two (2) left-turn lanes and one (1) right-turn lane.

Port Royal Road at Saturn Parkway Eastbound Ramps

- Install a traffic signal with protected only northbound left-turn phasing.
- Construct an additional southbound left-turn lane along Port Royal Road. This will provide two (2) left-turn lanes.
- Construct a northbound exclusive right-turn lane along Port Royal Road.
- Construct one (1) additional westbound approach lane along the Saturn Parkway Eastbound Off-Ramp. This will provide one (1) left-turn lane and one (1) shared left-turn / right-turn lane.

Related to the proposed development, the following mitigation improvements will improve traffic operations under the Future 2023 scenario:

Port Royal Road at Jim Warren Road

- The existing Jim Warren Road is proposed to be realigned to intersect Port Royal Road approximately 1,200 feet north of its current location, just north of the Aenon Creek bridge. The proposed Jim Warren Road alignment would provide vehicle access to the proposed development and promote the City of Spring Hill's vision to improve connectivity to land parcels that are located east of I-65.
 - NOTE: The location of the proposed Jim Warren Road realignment is located approximately 500 feet south of the Saturn Parkway Eastbound Ramps along Port Royal Road.
- Install a traffic signal with protected-permitted southbound left-turn phasing and westbound right-turn overlap phasing.
- Develop and implement coordinated traffic signal timings along Port Royal Road for four (4) traffic signals: Reserve Boulevard / North Old Port Royal Road, Saturn Parkway Westbound Ramps, Saturn Parkway Eastbound Ramps, and the proposed Jim Warren Road realignment.
- Construct a southbound left-turn lane along Port Royal Road with storage extending approximately 400 feet north to the intersection of Port Royal Road at Saturn Parkway Eastbound Ramps.
- Construct a northbound shared through and right-turn lane along Port Royal Road with 150 feet of storage.
 - This improvement was identified to improve operations on the Port Royal Road while adequately serving development traffic onto Jim Warren Road instead of constructing a right-turn only lane.
- Construct an additional northbound receiving lane along the northern intersection leg.
 - This additional receiving lane will transition to the northbound right-turn lane at Port Royal Road at Saturn Parkway Eastbound Ramps.

Port Royal Road at Jim Warren Road (continued)

- Construct Jim Warren Road with three (3) lanes for vehicular traffic – one (1) westbound left-turn lane, one (1) westbound right-turn lane, and one (1) eastbound receiving lane. The westbound left-turn lane will extend into the development site as a two-way left-turn lane.

2.0 INTRODUCTION

The proposed development is located within the City of Spring Hill in Maury County, Tennessee. The 50.66-acre proposed development is located east of Port Royal Road and north of Jim Warren Road.

The proposed development consists of:

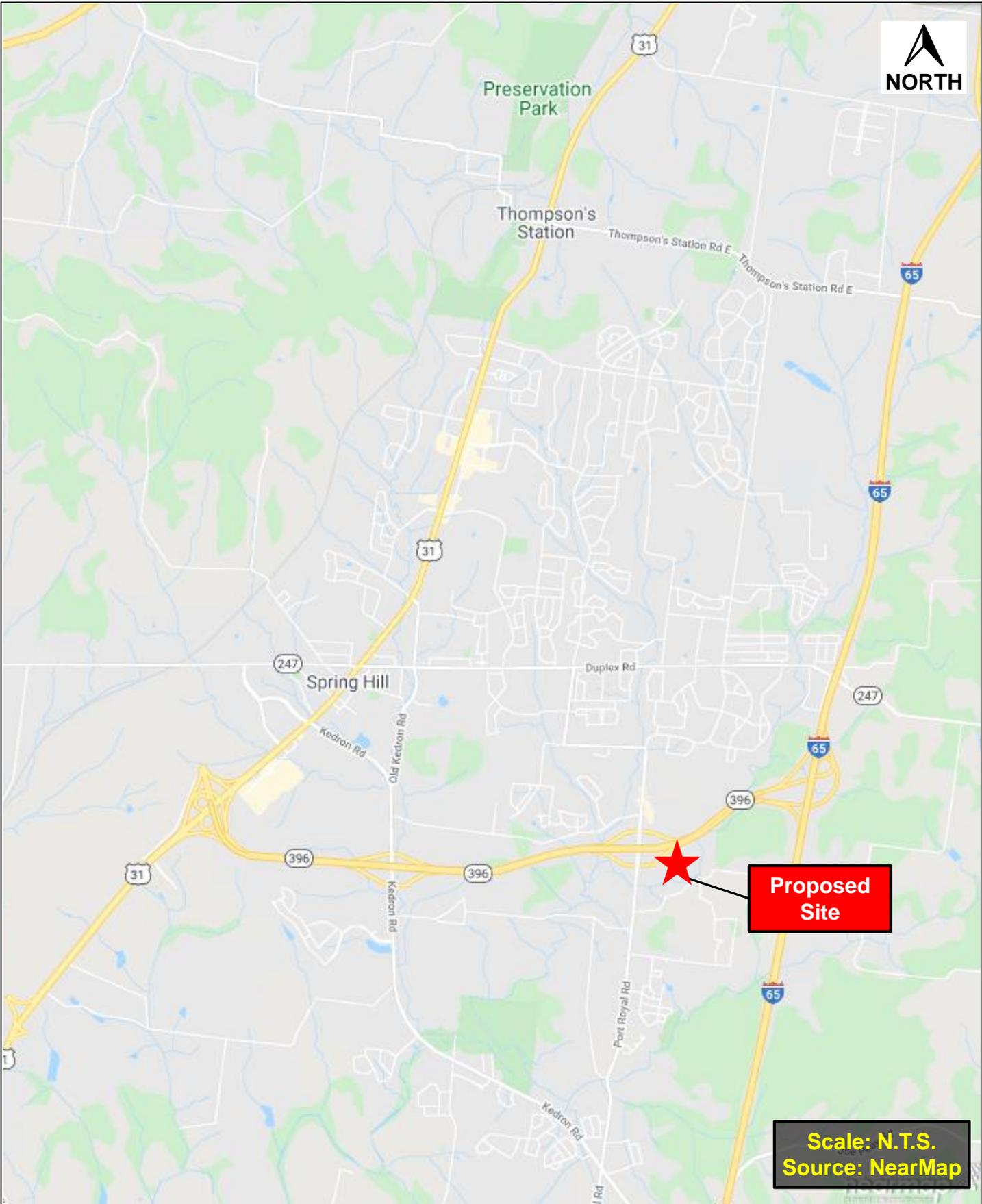
- Multi-family Residential Housing – 334 units
- Hotel – 120 rooms
- Retail/Commercial – 23,750 s.f.
- Supermarket – 48,500 s.f.
- Quality Restaurant – 5,000 s.f.
- High-Turnover (Sit-Down) Restaurant – 4,500 s.f.
- Gasoline/Service Station with Convenience Market – 20 pumps

The study intersections are:

1. Port Royal Road at Saturn Parkway Westbound Ramps
2. Port Royal Road at Saturn Parkway Eastbound Ramps
3. Port Royal Road at Jim Warren Road
4. Port Royal Road at Tom Lunn Road

The Project Location of the proposed development is illustrated in **Figure 1** and **Figure 2**.

The proposed site plan for the development is provided in **Appendix A**.





3.0 EXISTING CONDITIONS

3.1 Study Intersections

The study intersections and existing traffic control are summarized in **Table 1**.

Table 1 – Study Intersections	
Intersection	Existing Traffic Control
Port Royal Road at Saturn Parkway Westbound Off Ramps	Unsignalized
Port Royal Road at Saturn Eastbound Off Ramps	Unsignalized
Port Royal Road at Jim Warren Road	Unsignalized
Port Royal Road at Tom Lunn Road	Unsignalized

Photographs depicting the study intersections are provided in **Appendix B**.

3.2 Roadway Network

Roadway geometry and posted speed limits were obtained by field inventory. Functional classifications for the roadways were obtained from the Functional Classification Maps provided by the Tennessee Department of Transportation. Additionally, the functional classifications as defined by the City of Spring Hill were obtained from the Major Thoroughfare Plan. This roadway network information is summarized in **Table 2**.

Table 2 – Roadway Network				
Roadway	Number of Lanes	Posted Speed Limit (mph)	TDOT Classification	City of Spring Hill Classification
Port Royal Road	4/2	35	Major Collector	Arterial
Saturn Parkway	4	70	Freeway	Interstate/Highway
Jim Warren Road	2	Not Posted	N/A	Arterial
Tom Lunn Road	2	Not Posted	N/A	Collector

Port Royal Road is primarily at two-lane, undivided roadway. Between the Saturn Parkway Eastbound and Westbound ramps, Port Royal Road is a four-lane roadway with a raised median.

Saturn Parkway is a four-lane, divided freeway.

Jim Warren Road and Tom Lunn Road are both two-lane undivided roadways.

3.3 Pedestrian/Bicycle Network

Currently, no existing pedestrian infrastructure exists at any project intersection or roadway. Due to the rural character of Port Royal Road, there is very little pedestrian activity in the project area.

The Spring Hill Bicycle and Greenway Plan was referenced for any existing or planned bicycle facilities in the project area. Per the Bicycle and Greenway Plan, no current bicycle infrastructure lies within the study area.

3.4 Transit Network

WeGo Nashville was researched to identify transit routes in the vicinity of the proposed development.

Route 95 (Spring Hill Express) travels along Port Royal Road in the vicinity of the proposed development. Route 95 provides a transit connection between the City of Spring Hill and downtown Nashville with stops north of the project area on Port Royal Road and in central Nashville at Music City Central and the Bicentennial Mall.

3.5 Traffic Data

Annualized average daily traffic (AADT) volumes were obtained from TDOT along roads in proximity to the proposed development. **Table 3** provides a summary of the AADT. During the last three (3) years in the vicinity of the proposed development, the aggregate traffic volumes have experienced a growth of approximately 9.8% per year; for the past ten (10) years, approximately 3.2% per year.

Table 3 – TDOT Traffic History			
Year	Station 000126 Duplex Road West of Candlewicke Drive	Station 000196 Saturn Parkway West of Port Royal Road	Station 000222 Saturn Parkway East of Port Royal Road
2008	4,647	23,877	29,233
2009	5,760	24,593	29,425
2010	5,428	21,860	29,059
2011	5,955	23,712	28,063
2012	6,652	23,554	28,268
2013	6,338	25,083	30,186
2014	6,503	25,832	29,296
2015	6,703	24,940	30,176
2016	8,486	25,571	29,913
2017	8,668	32,994	31,063
2018	8,897	29,970	39,938

An additional TDOT count station (Station 244) is located on Port Royal Road near the project site. This count station currently only has traffic data from 2016 through 2018. The 2018 AADT volume at this station was 14,153 vehicles per day.

Weekday morning and afternoon peak period turning movement counts were performed to determine the volume of vehicles at the study intersections. The traffic data was collected on Thursday, February 13, 2020. The volumes were collected in 5-minute intervals to determine the AM and PM peak hour volumes as well as the peak hour factors.

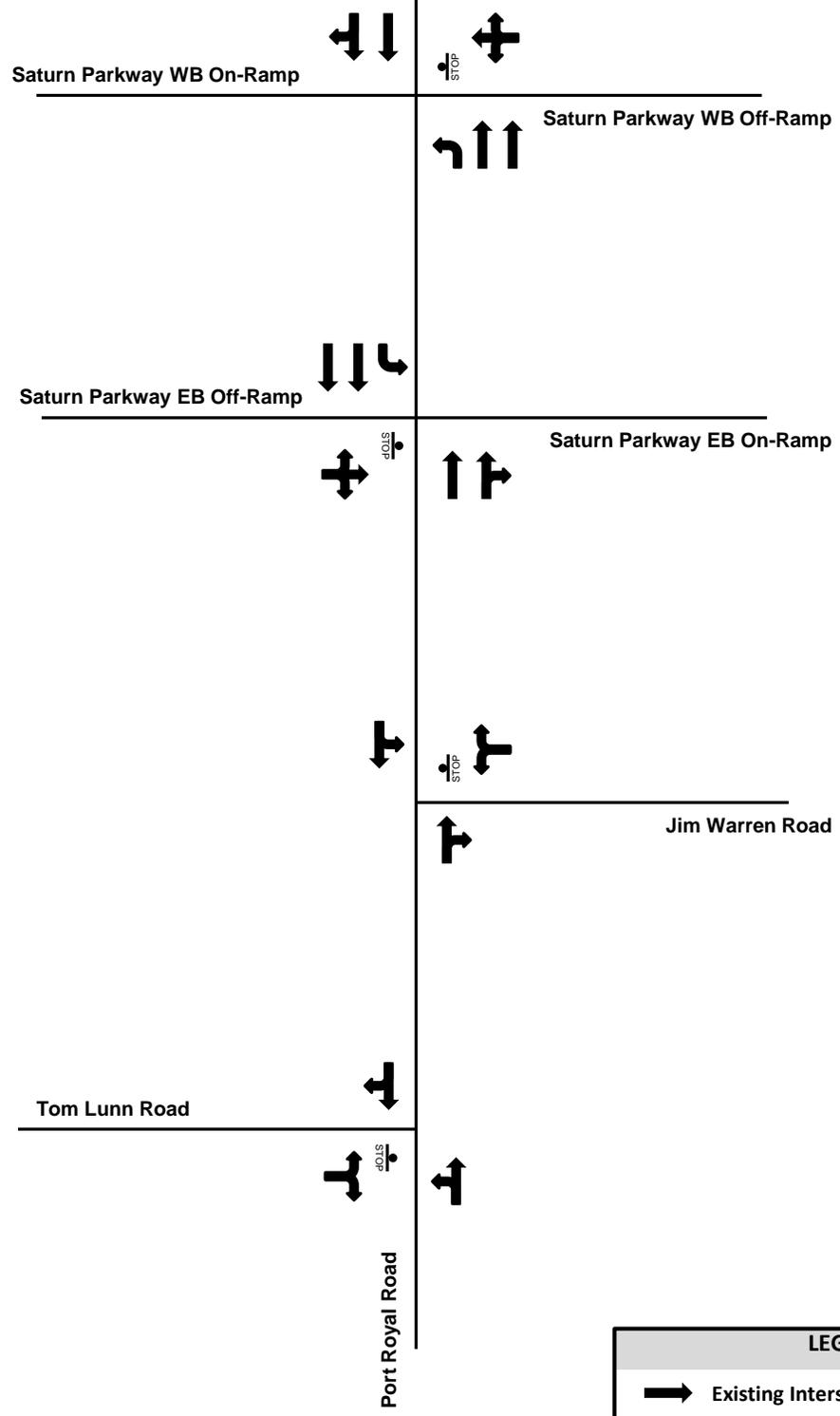
Intersection peak hours are summarized in **Table 4**.

Table 4 – Intersection Peak Hours		
Intersection	AM Peak Hour	PM Peak Hour
Port Royal Road at Saturn Parkway Westbound Ramps	7:05 – 8:05	4:15 – 5:15
Port Royal Road at Saturn Parkway Eastbound Ramps	7:20 – 8:20	4:50 – 5:50
Port Royal Road at Jim Warren Road	7:20 – 8:20	4:20 – 5:20
Port Royal Road at Tom Lunn Road	7:10 – 8:10	4:15 – 5:15

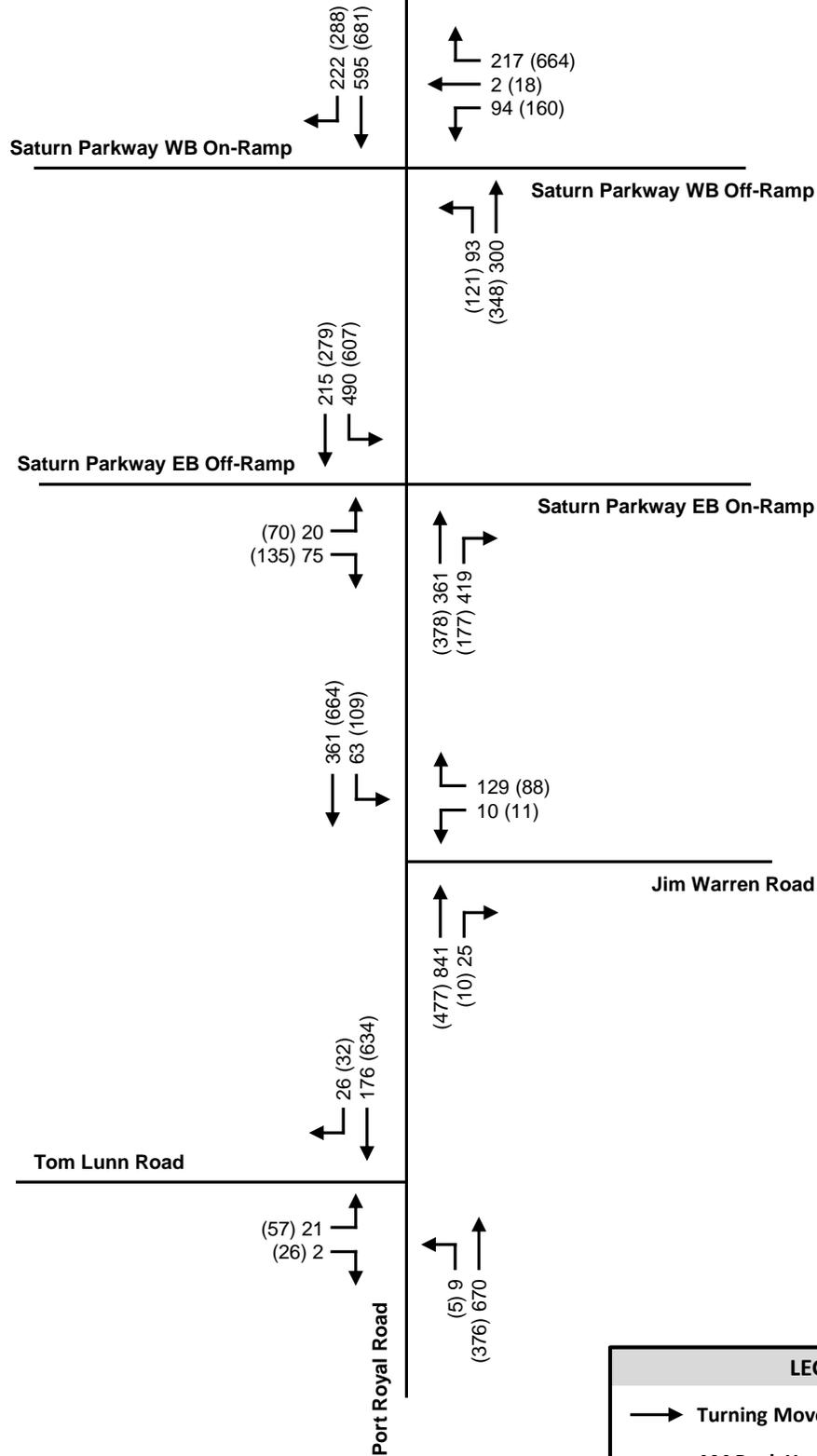
A 24-hour tube count was collected along Port Royal Road between Jim Warren Road and Saturn Parkway Eastbound Ramps, and along Jim Warren Road east of Port Royal Road. The daily (24-hour), AM peak hour, and PM peak hour traffic data from this tube count are summarized in **Table 5**.

Table 5 – 24-Hour Tube Counts			
Location	Daily (24-Hour)	AM Peak Hour	PM Peak Hour
Port Royal Road North of Jim Warren Road	16,640	1,204	1,327
Jim Warren Road East of Port Royal Road	2,158	183	185

The Existing 2020 Intersection Geometry is documented in **Figure 3**, and the Existing 2020 Peak Hour Traffic Volumes are included in **Figure 4**. The AADT data as well as the peak hour turning movement counts are provided in **Appendix C**.



LEGEND	
	Existing Intersection Geometry
	Existing STOP Control



LEGEND	
	Turning Movement
XX	AM Peak Hour Traffic Volumes
(XX)	PM Peak Hour Traffic Volumes

4.0 BACKGROUND CONDITIONS

The Background 2023 conditions are the forecasted traffic conditions, without the proposed development. This includes background traffic growth, traffic associated with other planned / approved developments, and anticipated transportation infrastructure improvements.

4.1 *Background Traffic Growth*

Based on coordination with the City of Spring Hill, an annual growth rate of 5% was applied to the existing traffic volumes.

4.2 *Other Future Developments*

No planned / approved future developments identified within the project limits.

4.3 *Future Transportation Infrastructure Improvements*

The City of Spring Hill's Roadway Improvement projects were researched to identify transportation improvement projects near the proposed development:

- Interchange improvements for Saturn Parkway at Port Royal Road – TDOT is nearing completion of construction for improvements to the two (2) unsignalized intersections along Port Royal Road at the Saturn Parkway ramps. Both intersections will receive traffic signals and intersection geometry improvements. This TDOT project is currently under construction and is expected to be completed by December 2020.
- Tom Lunn Road Improvement Project – This project is proposed to widen Tom Lunn Road between Port Royal Road and John Lunn Road. Tom Lunn Road currently consists of two 9-foot lanes with no curb and gutter and is proposed to be widened to two 12-foot lanes with a 2-foot wide shoulder on each side of the roadway.

The City of Spring Hill Bicycle and Greenway Plan was referenced to identify projects near the proposed development. The following improvements to the existing network intersect with the project study area:

- Port Royal Road is proposed to receive bike lanes between Kedron Road and Burgess Lane.
- Tom Lunn Road is proposed to receive bike lanes between Port Royal Road and Kedron Road via John Lunn Road, Timberline Drive, and Royal Park Boulevard.
- Jim Warren Road is proposed to receive bike lanes between Port Royal Road and Rutherford Creek.

- A greenway is proposed between Old Port Royal Road (north of Saturn Parkway) and Jim Warren Road, with a trailhead near the eastern limits of the expected realignment of Jim Warren Road

As part of the TDOT project at the Saturn Parkway at Port Royal Road interchange, the following improvements were incorporated into the Background 2023 conditions:

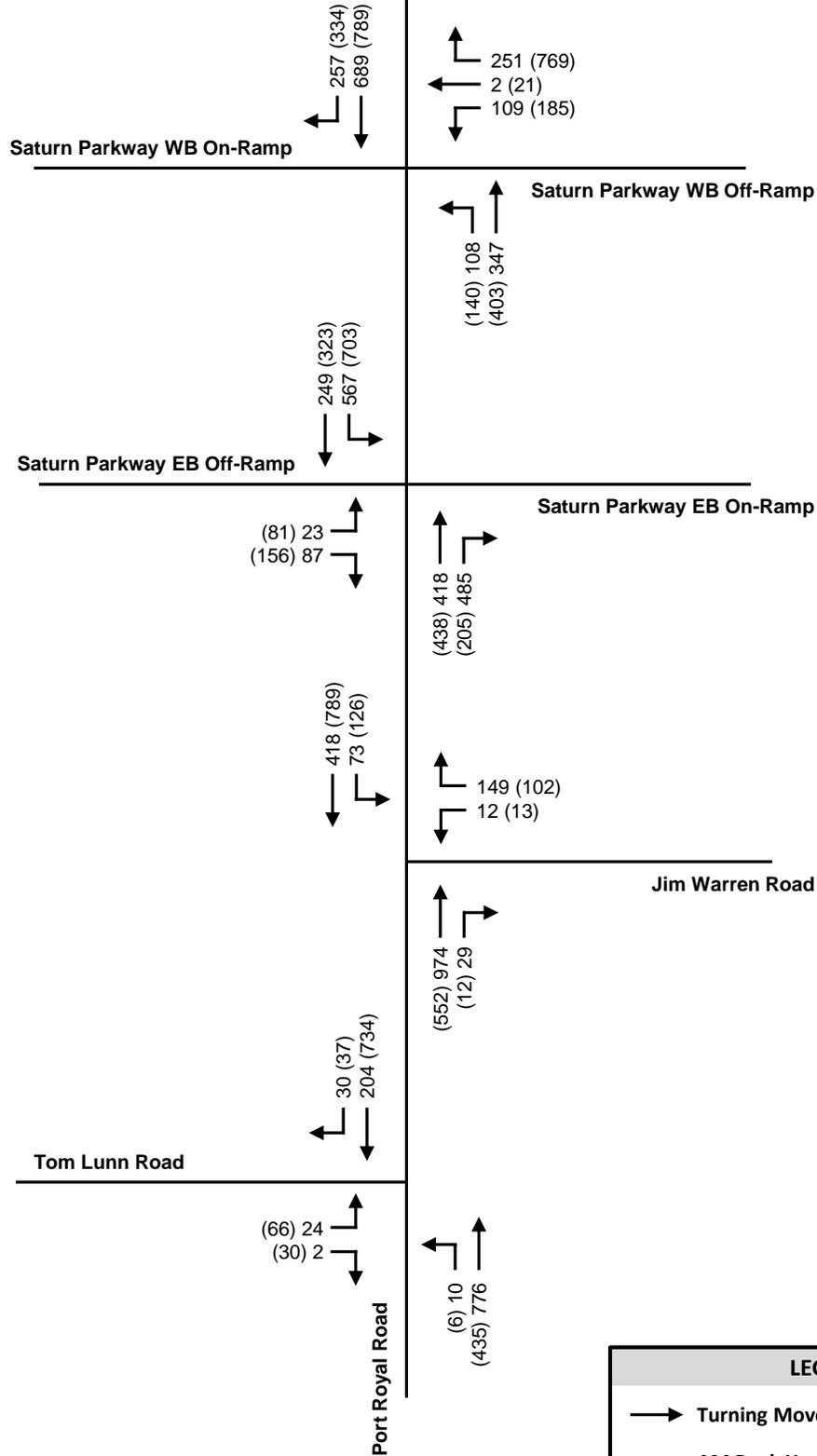
Port Royal Road at Saturn Parkway Westbound Ramps

- Install a traffic signal with protected only southbound left-turn phasing.
- Construct a southbound right-turn lane along Port Royal Road.
- Construct two (2) additional westbound approach lanes along the Saturn Parkway Westbound Off-Ramp. This will provide two (2) left-turn lanes and one (1) right-turn lane.

Port Royal Road at Saturn Parkway Eastbound Ramps

- Install a traffic signal with protected only northbound left-turn phasing.
- Construct an additional southbound left-turn lane along Port Royal Road. This will provide two (2) left-turn lanes.
- Construct a northbound exclusive right-turn lane along Port Royal Road.
- Construct one (1) additional westbound approach lane along the Saturn Parkway Eastbound Off-Ramp. This will provide one (1) left-turn lane and one (1) shared left-turn / right-turn lane.

The Background 2023 Peak Hour Traffic Volumes are included in **Figure 5**.



LEGEND	
	Turning Movement
XX	AM Peak Hour Traffic Volumes
(XX)	PM Peak Hour Traffic Volumes

5.0 DEVELOPMENT FEATURES

5.1 *Site Access and Vehicle Circulation*

The existing Jim Warren Road is proposed to be realigned to intersect Port Royal Road approximately 1,200 feet north of the current location, just north of the Aenon Creek bridge. The proposed Jim Warren Road alignment would provide vehicle access to the proposed development and promote the City of Spring Hill's vision to improve connectivity to land parcels that are located east of I-65.

The proposed development will provide multiple driveways along Jim Warren Road (Proposed Alignment), with connections within the development to promote internal vehicle circulation.

5.2 *Planned Improvements to Transportation Infrastructure*

The proposed development will improve the transportation infrastructure by enhancing existing roads. Those planned improvements are summarized below:

Roadway Improvements

- The existing Jim Warren Road is proposed to be realigned to intersect Port Royal Road approximately 1,200 feet north of its current location, just north of the Aenon Creek bridge. The proposed Jim Warren Road alignment would provide vehicle access to the proposed development and promote the City of Spring Hill's vision to improve connectivity to land parcels that are located east of I-65.
 - NOTE: The location of the proposed Jim Warren Road realignment is located approximately 500 feet south of the Saturn Parkway Eastbound Ramps along Port Royal Road.
- Construct Jim Warren Road with three (3) lanes for vehicular traffic – one (1) westbound left-turn lane, one (1) westbound right-turn lane, and one (1) eastbound receiving lane. The westbound left-turn lane will extend into the development site as a two-way left-turn lane.

6.0 PROJECT TRAFFIC

Project traffic is the magnitude of vehicle trips forecasted to be generated by the proposed development. This project traffic is calculated and dispersed throughout the road network and onto the study intersections by using trip generation, trip distribution, and trip assignment.

6.1 Trip Generation

The proposed development will consist of:

- Multi-family Residential Housing – 334 units
- Hotel – 120 rooms
- Retail/Commercial – 23,750 s.f.
- Supermarket – 48,500 s.f.
- Quality Restaurant – 5,000 s.f.
- High-Turnover (Sit-Down) Restaurant – 4,500 s.f.
- Gasoline/Service Station with Convenience Market – 20 pumps

Traffic expected to be generated by the proposed development was calculated using equations provided in the *Trip Generation Manual, 10th Edition*, published by the Institute of Transportation Engineers (ITE). These calculations result in the gross trips generated by the site prior to reductions.

Internal capture (or mixed-use) represents the concept that trips generated by individual land uses within a site may remain internal to the site. Mixed-use vehicle trip reductions were taken according to the *ITE Trip Generation Handbook, 3rd Edition*. Total internal capture and vehicle trip reduction between the proposed land uses is expected to be 7.3% for the weekday, 8.8% for the AM peak hour, and 19.8% for the PM peak hour.

A pass-by trip occurs when a proposed development diverts traffic that is already traveling on a street adjacent to the site. The pass-by reductions were taken according to the *ITE Trip Generation Handbook, 3rd Edition*.

The trip generation for the proposed development is summarized in **Table 6**.

Table 6 – Trip Generation								
ITE Land Use	Density	Daily	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
Multifamily Housing (Mid-Rise) (LUC 221)	334 d.u.	1,819	112	29	83	141	86	55
Hotel (LUC 310)	120 rooms	928	54	32	22	64	33	31
Shopping Center (LUC 820)	23,750 s.f.	2,262	22	14	8	188	90	98
Supermarket (LUC 850)	48,500 s.f.	4,641	185	111	74	455	232	223
Quality Restaurant (LUC 931)	5,000 s.f.	419	4	2	2	39	26	13
High-Turnover (Sit-Down) Restaurant (LUC 932)	4,500 s.f.	505	45	25	20	44	27	17
Gasoline/Service Station with Convenience Market (LUC 945)	20 f.p.	4,208	284	145	139	280	143	137
Gross Trips		14,792	706	358	348	1,211	637	574
<i>Internal Capture Reduction</i>		<i>-1,080</i>	<i>-62</i>	<i>-31</i>	<i>-31</i>	<i>-240</i>	<i>-120</i>	<i>-120</i>
Driveway Volumes		13,712	644	327	317	971	517	454
<i>Pass-By Reduction</i>		<i>-4,839</i>	<i>-250</i>	<i>-125</i>	<i>-125</i>	<i>-358</i>	<i>-179</i>	<i>-179</i>
New Trips		8,873	394	202	192	613	338	275

d.u. = dwelling units ----- s.f. = square feet

6.2 *Trip Distribution and Assignment*

Trip distribution has been forecasted by evaluating the existing traffic patterns, considering the internal vehicle circulation and driveway configuration of the proposed development, and reviewing the surrounding land uses and considering how they will interact with the proposed development. The trip distribution along the roadway network is forecasted to be:

Residential Trip Distribution:

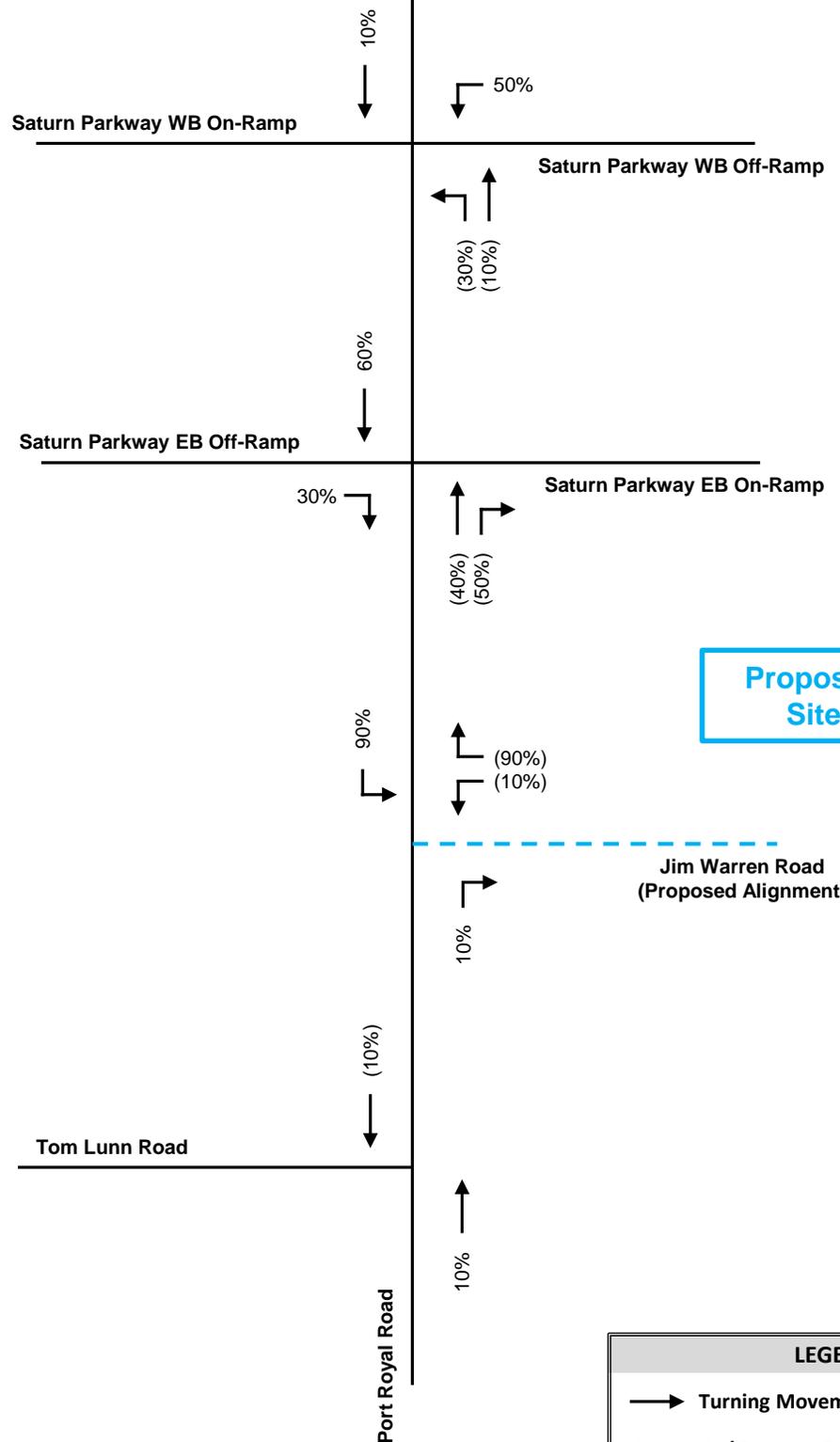
- 10% to/from the north along Port Royal Road
- 10% to/from the south along Port Royal Road
- 30% to/from the west along Saturn Parkway
- 50% to/from the east along Saturn Parkway

Commercial Trip Distribution:

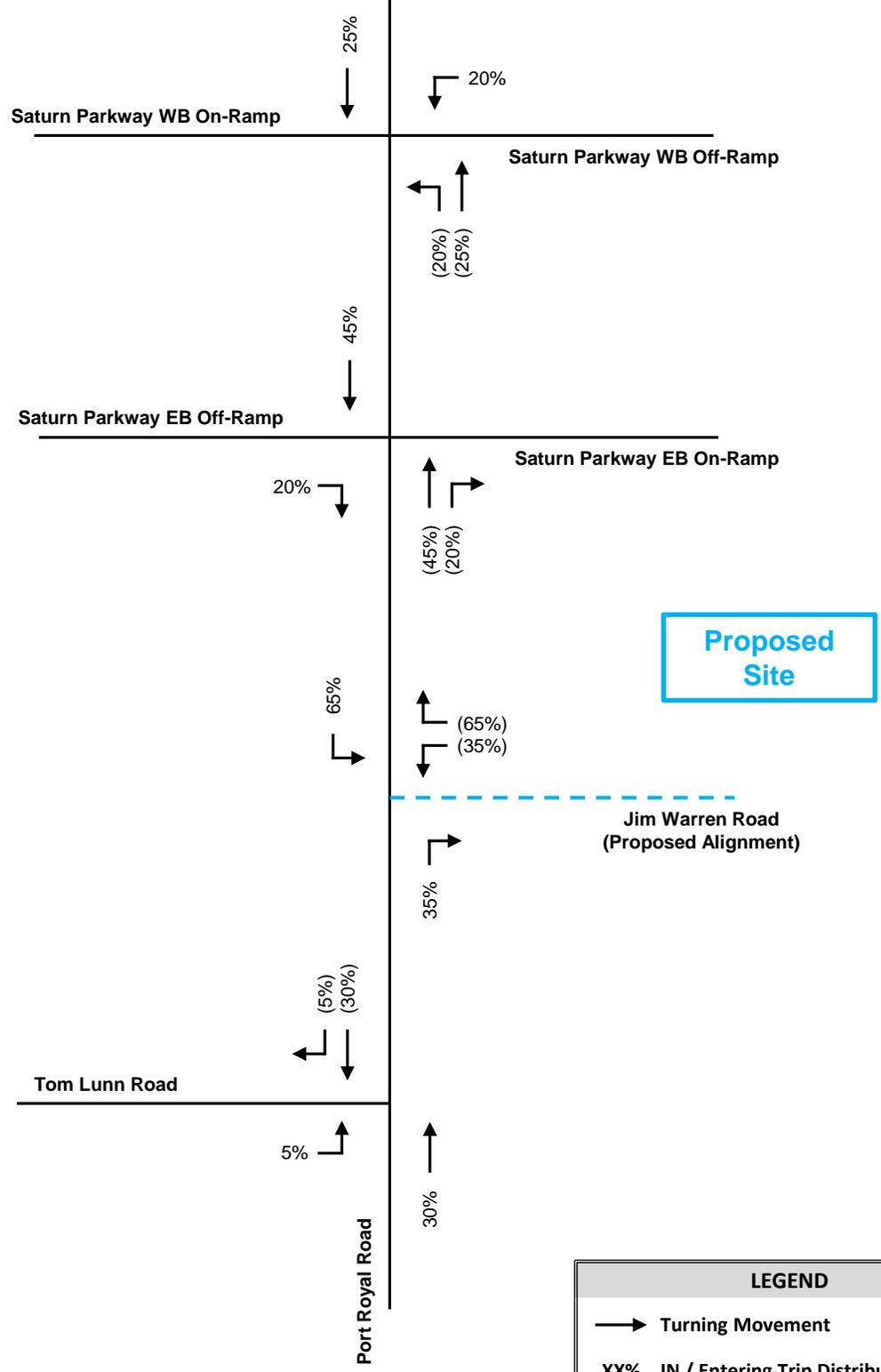
- 25% to/from the north along Port Royal Road
- 30% to/from the south along Port Royal Road
- 20% to/from the west along Saturn Parkway
- 20% to/from the east along Saturn Parkway
- 5% to/from the east along Tom Lunn Road

The Trip Distribution is illustrated in **Figure 6 and Figure 7**. Project Trips for the proposed development are summarized in **Figure 8**.

Worksheets that illustrate the trip generation for the proposed development and the volume worksheets for each of the study intersections are provided in **Appendix D**.

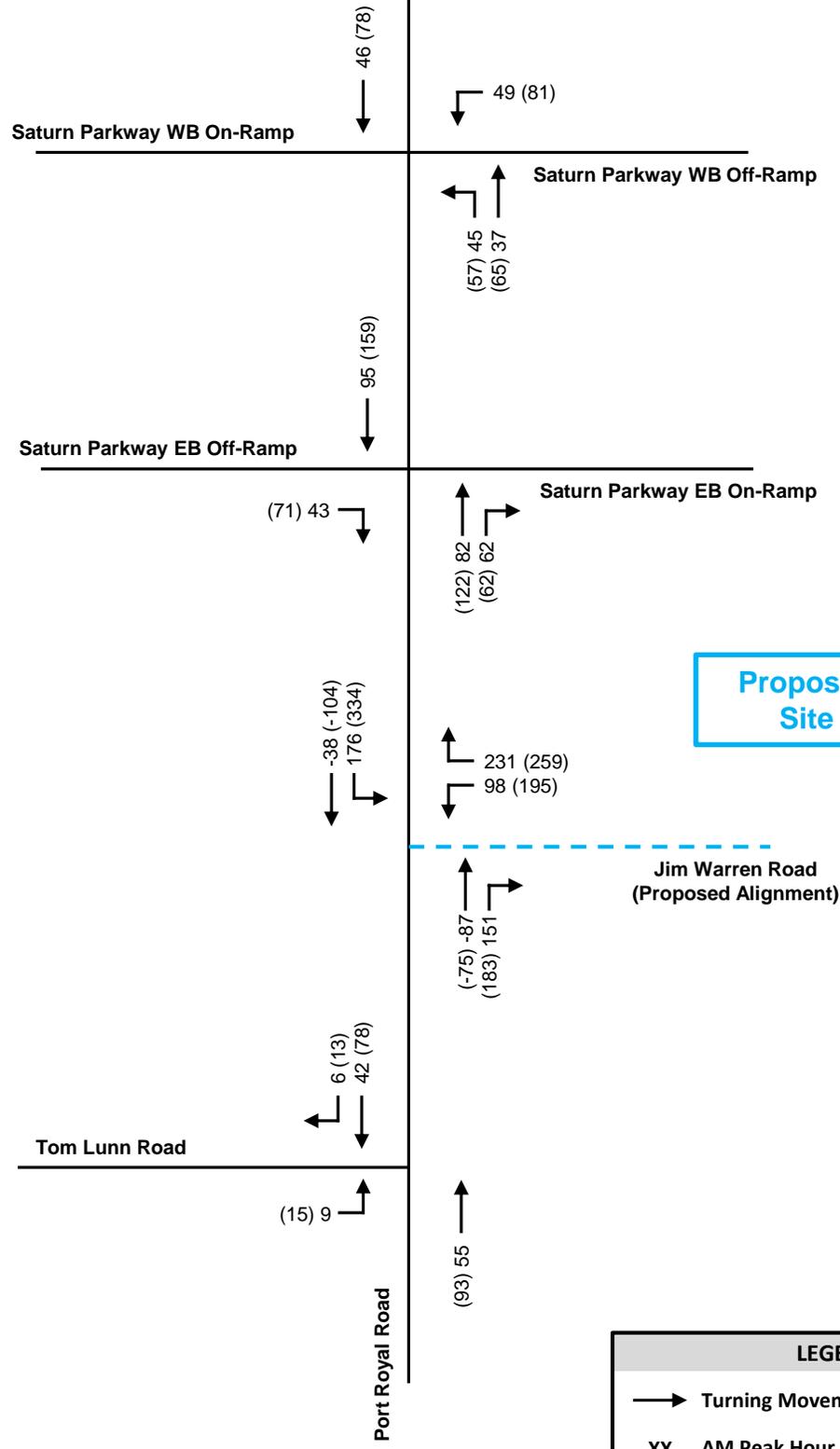


LEGEND	
	Turning Movement
XX%	IN / Entering Trip Distribution
(XX%)	OUT / Exiting Trip Distribution



LEGEND

- Turning Movement
- XX% IN / Entering Trip Distribution
- (XX%) OUT / Exiting Trip Distribution



Proposed Site

LEGEND	
	Turning Movement
XX	AM Peak Hour Traffic Volumes
(XX)	PM Peak Hour Traffic Volumes

7.0 FUTURE CONDITIONS

The Future 2023 conditions are defined as the forecasted traffic conditions on the roadway network in the year 2023, with the proposed development. This includes background traffic growth, traffic associated with other planned or approved private developments, future transportation infrastructure improvements, and trips generated by the proposed development.

The Future 2023 Peak Hour Traffic Volumes are shown in **Figure 9**.

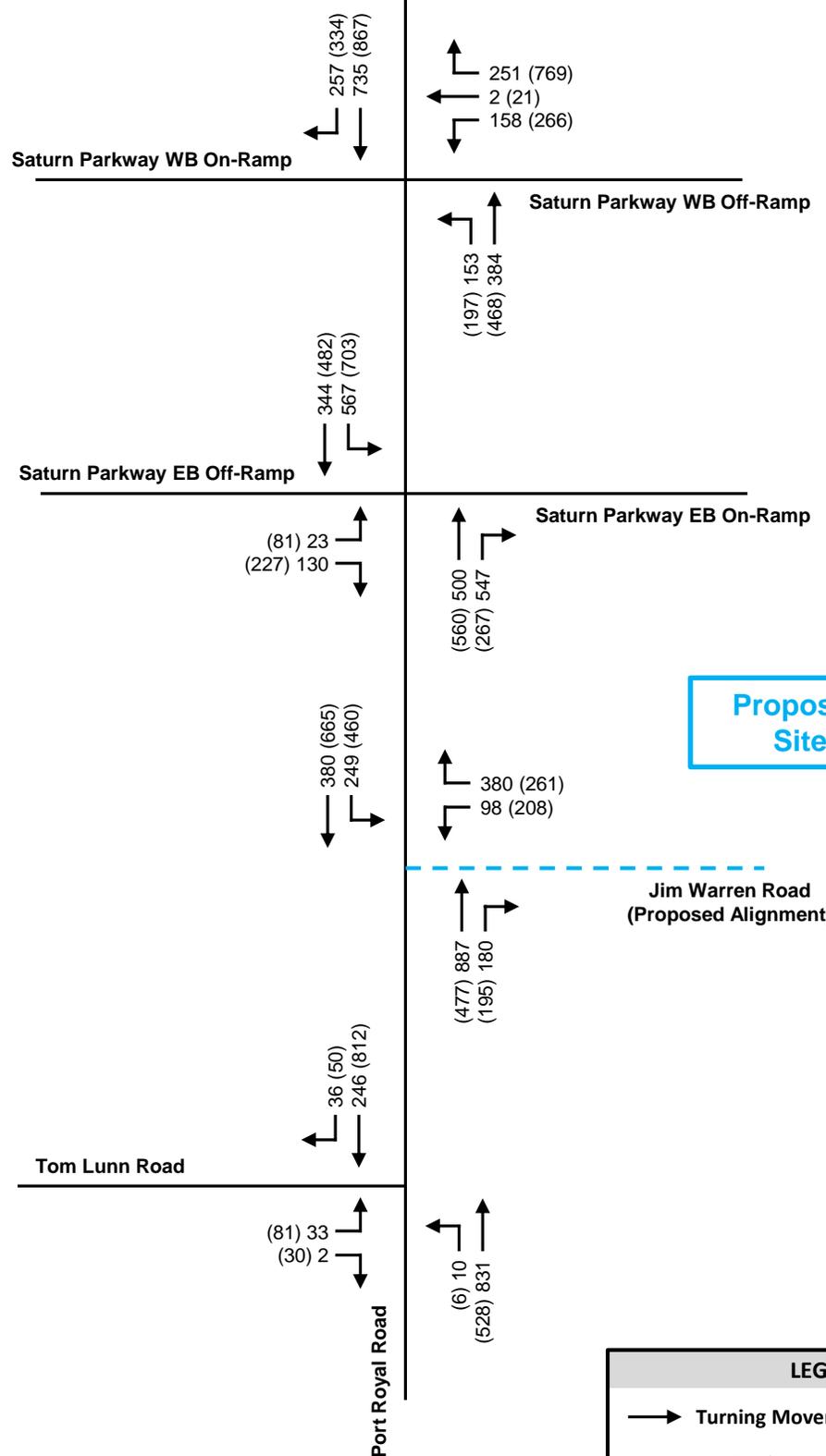
8.0 DAILY (24-HOUR) TRAFFIC VOLUME FORECASTS

The daily (24-hour) traffic volume forecast was developed along the roadway segment where the 24-hour tube count was obtained.

A summary of the daily (24-hour) traffic volume forecast is provided in **Table 7**.

Table 7 – Daily (24-Hour) Traffic Volume Forecasts				
Location	Daily (24-Hour)	Background Growth	Project Trips	Future 2023
Port Royal Road North of Jim Warren Road	16,640	2,629	6,188	25,457
Jim Warren Road East of Port Royal Road	2,158	341	8,873	11,372

The calculations of the daily (24-hour) traffic volume forecasts are included in **Appendix D**.



LEGEND	
	Turning Movement
XX	AM Peak Hour Traffic Volumes
(XX)	PM Peak Hour Traffic Volumes

9.0 TURN LANE EVALUATION

National Cooperative Highway Research Program (NCHRP) Report 457, “Evaluating Intersection Improvements: An Engineering Study Guide”, was used to evaluate if left-turn and/or right-turn lanes should be implemented along the major road at a two-way stop-controlled intersection. From within the NCHRP Report 457, the following methodology were applied to perform these evaluations:

- Figure 2-5 (“Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection”)
- Figure 2-6 (“Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection”)

Turn lane evaluations were performed for Port Royal Road at Jim Warren Road (Proposed Alignment).

The results of the turn-lane warrants, based on the NCHRP Report 457, are summarized in **Table 8** (for left-turn lanes) and in **Table 9** (for right-turn lanes). The calculations are provided in **Appendix E**.

Table 8 – Left-Turn Lane Evaluation (NCHRP Report 457)			
Turning Movement	Analysis Scenario	AM Peak Hour	PM Peak Hour
Southbound Left-Turn Port Royal Road at Jim Warren Road	Existing 2020	---	---
	Background 2023	---	---
	Future 2023	WARRANTED	WARRANTED

A left-turn lane is warranted for the Future 2023 scenario, during the AM peak hour and PM peak hour, at the intersection of Port Royal Road at Jim Warren Road. Providing a left-turn lane will reduce the possibility of a ‘left-turn movement’ motorist causing significant delay to ‘through movement’ motorists behind them.

Table 9 – Right-Turn Lane Evaluation (NCHRP Report 457)			
Turning Movement	Analysis Scenario	AM Peak Hour	PM Peak Hour
Northbound Right-Turn Port Royal Road at Jim Warren Road	Existing 2020	---	---
	Background 2023	---	---
	Future 2023	WARRANTED	WARRANTED

A right-turn lane is warranted for the Future 2023 scenario, during the AM peak hour and PM peak hour, at the intersection of Port Royal Road at Jim Warren Road. However, a 'right-turn movement' vehicle is unlikely to cause significant delay to a 'through movement' motorist behind them.

10.0 TRAFFIC SIGNAL WARRANT ANALYSIS

Preliminary traffic signal warrant analysis was performed using the methodology provided in Chapter 4C of the *Manual on Uniform Traffic Control Devices (MUTCD)*, 2009 Edition published by the Federal Highway Administration (FHWA). The *MUTCD* provides the following standard, among others, regarding justification for traffic control signals:

“The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.” (Source: *MUTCD 2009*, Section 4C.01, Paragraph 03)

According to the *MUTCD*, the investigation of the need for a traffic control signal shall include an analysis of the applicable factors contained in the following traffic signal warrants and other factors related to existing operation and safety at the study location:

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour
- Warrant 4, Pedestrian Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network
- Warrant 9, Intersection Near a Grade Crossing

Warrant 1 (Eight Hour Vehicular Volume) Condition 1A is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic signal. Warrant 1 Condition 1B is intended for application where Condition 1A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street. If both Condition 1A and Condition 1B are 80% satisfied, Warrant 1C would be satisfied.

Warrant 2 (Four Hour Vehicular Volume) is intended to be applied at locations where the volume of intersecting traffic is the principal reason to consider installing a traffic signal.

Warrant 3 (Peak Hour) is intended for use at locations where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

Warrant 4 (Pedestrian Volume) is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

A traffic signal was evaluated for the intersection of Port Royal Road at Jim Warren Road.

The results of the preliminary traffic signal warrant analysis based upon vehicular traffic volumes are summarized in **Table 10**.

Table 10 – Preliminary Traffic Signal Warrant Analysis					
Location	Warrant	Hours Required	Existing 2020	Background 2023	Future 2023
Port Royal Road at Jim Warren Road (Proposed Alignment)	1A	8	1 / 8 (Not Met)	4 / 8 (Not Met)	4 / 8 (Not Met)
	1B	8	4 / 8 (Not Met)	4 / 8 (Not Met)	4 / 8 (Not Met)
	1C	8	1 / 8 (Not Met)	2 / 8 (Not Met)	4 / 8 (Not Met)
	2	4	4 / 4 (MET)	4 / 4 (MET)	4 / 4 (MET)
	3	1	1 / 1 (MET)	1 / 1 (MET)	1 / 1 (MET)
	4	1	N/A	N/A	N/A

For the traffic signal warrant analysis, available data was limited to the AM and PM peak periods. Therefore, only four (4) hours of data were evaluated. For the intersection of Port Royal Road at Jim Warren Road, both the AM and PM peak hours satisfy Warrant 2 and Warrant 3.

11.0 CAPACITY ANALYSIS

11.1 Intersection Capacity Analysis

The *Highway Capacity Manual (HCM) 6th Edition* provides insight and guidance on control delay, level of service (LOS), signalized intersection LOS, and unsignalized intersection LOS.

Control Delay:

“Control delay – the delay brought about by the presence of a traffic control device – is the principal HCM service measure for evaluating LOS at signalized and unsignalized intersections. Control delay includes delay when vehicles slow in advance of an intersection, time spent stopped on an intersection approach, time spent as vehicles move up in the queue, and time needed for vehicles to accelerate to their desired speed.” (Source: *Highway Capacity Manual 6th Edition*, Chapter 4)

LOS:

“LOS is a quantitative stratification of a performance measure or measures representing quality of service. The measures used to determine LOS for transportation system elements are called service measures. The HCM defines six levels of service, ranging from A to F, for each service measure or combination of service measures. LOS A represents the best operating conditions from the traveler’s perspective and LOS F the worst. For cost, environmental impact, and other reasons, roadways are typically designed not to provide LOS A conditions during peak periods but instead to provide some lower LOS that balances individual travelers’ desires against society’s desires and financial resources. Nevertheless, during low-volume periods of the day, a system element may operate at LOS A.” (Source: *Highway Capacity Manual 6th Edition*, Chapter 5)

Signalized Intersection LOS:

- Control delay alone is used to characterize LOS for the entire intersection or an approach
- Control delay and volume-to-capacity ratio are used to characterize LOS for a lane group.
- Delay quantifies the increase in travel time due to traffic signal control. It is also a surrogate measure of driver discomfort and fuel consumption.
- The volume-to-capacity ratio quantifies the degree to which a phase’s capacity is utilized by a lane group.

The LOS criteria for signalized intersections are summarized in **Table 11**.

Table 11 – Signalized Intersection Level of Service		
LOS	Control Delay (seconds/vehicle)	Comments
A	≤ 10	LOS A describes operations with a control delay of 10 s/veh or less and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If LOS A is the result of favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.
B	> 10 – 20	LOS B describes operations with control delay between 10 and 20 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.
C	> 20 – 35	LOS C describes operations with control delay between 20 and 35 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual cycle failures (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.
D	> 35 – 55	LOS D describes operations with control delay between 35 and 55 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.
E	> 55 – 80	LOS E describes operations with control delay between 55 and 80 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.
F	> 80	LOS F describes operations with control delay exceeding 80 s/veh or a volume-to-capacity ratio greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Source: *Highway Capacity Manual 6th Edition*, Chapter 19

Unsignalized (two-way stop-controlled) intersection LOS:

- For motor vehicles, LOS is determined for each minor-street movement (or shared movement), as well as the major-street left turns.
- LOS is not defined for the intersection as a whole or for major-street approaches.
- The LOS criteria for unsignalized intersections differ somewhat from the criteria for signalized intersections, primarily because user perceptions differ among transportation facility types. The expectation is that a signalized intersection is designed to carry higher traffic volumes and will present greater delay than an unsignalized intersection. Unsignalized intersections are also associated with more uncertainty for users, as delays are less predictable than they are at signals.

The LOS criteria for unsignalized intersections are summarized in **Table 12**.

Table 12 – Unsignalized Intersection Level of Service		
LOS	Control Delay (seconds/vehicle)	Comments
A	0 – 10	Usually no conflicting traffic
B	> 10 – 15	Occasionally some delay due to conflicting traffic
C	> 15 – 25	Delay noticeable to vehicles, but not inconveniencing
D	> 25 – 35	Delay noticeable and irritating, increased likelihood of risk taking
E	> 35 – 50	Delay approaches tolerance level, risk-taking behavior likely
F	> 50	Delay exceeds tolerance level, high likelihood of vehicle risk taking

Source: *Highway Capacity Manual 6th Edition*, Chapter 20

For existing roadways, municipalities typically consider LOS A through LOS D as the range of acceptable overall intersection operations, while LOS E and LOS F are generally considered unacceptable. Roadway laneage, traffic signalization, or other improvements are normally required at those intersections which operate within the range of unacceptable LOS.

The operating conditions were analyzed for the weekday AM and PM peak hours using the *Synchro 10* software which uses the methodologies contained in the *Highway Capacity Manual 6th Edition*. The following intersections were analyzed:

- Port Royal Road at Saturn Parkway Westbound Ramps
- Port Royal Road at Saturn Parkway Eastbound Ramps
- Port Royal Road at Jim Warren Road
- Port Royal Road at Tom Lunn Road

Intersection capacity analyses were conducted for the following conditions within the study area:

- Existing 2020 Conditions
- Background 2023 Conditions
- Future 2023 Conditions

A summary of the capacity analyses for the AM peak hour and PM peak hour are provided in **Table 13** and **Table 14**, respectively. The intersection capacity analysis reports are included in **Appendix F**.

Table 13 – Intersection Capacity Analysis Results – AM Peak Hour				
Intersection	Approach	Existing 2020 Conditions	Background 2023 Conditions	Future 2023 Conditions
Port Royal Road at Saturn Parkway Westbound Ramps (Unsignalized / Signalized)	Westbound STOP*	A (9.0)	E (60.3)	E (57.8)
	Northbound Left-Turn*	B (10.2)	B (14.2)	B (15.8)
	Southbound	---	B (15.0)	B (17.2)
	Overall	---	C (24.1)	C (25.4)
Port Royal Road at Saturn Parkway Eastbound Ramps (Unsignalized / Signalized)	Eastbound STOP*	A (8.5)	E (62.1)	E (60.4)
	Northbound	---	C (20.5)	C (25.6)
	Southbound Left-Turn*	C (20.0)	C (32.5)	C (29.1)
	Overall	---	C (28.4)	C (30.1)
Port Royal Road at Jim Warren Road (Unsignalized)	Westbound STOP	E (46.6)	F (126.8)	F (434.4)
	Southbound Left-Turn	B (10.7)	B (11.8)	C (16.9)
Port Royal Road at Tom Lunn Road (Unsignalized)	Eastbound STOP	C (21.4)	D (26.9)	D (34.5)
	Northbound Left-Turn	A (7.7)	A (7.8)	A (7.9)

*Delay is by approach in Background and Future conditions

Table 14 – Intersection Capacity Analysis Results – PM Peak Hour				
Intersection	Approach	Existing 2020 Conditions	Background 2023 Conditions	Future 2023 Conditions
Port Royal Road at Saturn Parkway Westbound Ramps (Unsignalized / Signalized)	Westbound STOP*	F (551.8)	F (118.1)	F (110.9)
	Northbound Left-Turn*	B (11.4)	C (20.5)	D (35.5)
	Southbound	---	D (43.5)	D (50.4)
	Overall	---	E (66.3)	E (68.8)
Port Royal Road at Saturn Parkway Eastbound Ramps (Unsignalized / Signalized)	Eastbound STOP*	F (212.2)	E (56.4)	E (56.2)
	Northbound	---	C (23.3)	C (32.4)
	Southbound Left-Turn*	B (14.7)	C (29.9)	C (25.1)
	Overall	---	C (31.0)	C (31.8)
Port Royal Road at Jim Warren Road (Unsignalized)	Westbound STOP	D (25.8)	F (51.7)	F (65.6)
	Southbound Left-Turn	A (9.1)	A (9.6)	C (16.4)
Port Royal Road at Tom Lunn Road (Unsignalized)	Eastbound STOP	C (24.7)	E (36.0)	F (70.2)
	Northbound Left-Turn	A (9.1)	A (9.5)	A (9.9)

*Delay is by approach in Background and Future conditions

High delays were observed at the off-ramps for both eastbound and westbound Saturn Parkway at Port Royal Road during the AM and PM peak hours. For coordinated signalized intersections along an arterial such as Port Royal Road, higher than normal side street delays are typically acceptable to improve coordination and operations along the main corridor. In addition, high side street delays at the intersection of Port Royal Road and Saturn Parkway Westbound Ramps are mainly attributed to westbound right-turn traffic traveling north into Spring Hill and not development related traffic.

In addition, high delays at the unsignalized westbound approach of Jim Warren Road at Port Royal Road were shown during the Future 2023 conditions for the AM and PM peak hours. This is mainly attributed to the lack of gaps in traffic on the mainline to allow westbound development trips to enter Port Royal Road.

At this intersection of Port Royal Road at Tom Lunn Road, side street delays we high during the PM peak hour for the Background and Future conditions. As is the case for Port Royal Road and Saturn Parkway Ramp intersections, higher than normal side street delays are generally acceptable to improve mainline operations.

11.2 Queuing Analysis

The *Highway Capacity Manual 6th Edition* provides insight and guidance regarding the back of queue for both signalized and unsignalized intersections.

Signalized:

“The back-of-queue position is the position of the vehicle stopped farthest from the stop line during the cycle as a consequence of the display of a red signal indication. The back-of-queue size depends on the arrival pattern of vehicles and on the number of vehicles that do not clear the intersection during the previous cycle.” (Source: *Highway Capacity Manual 6th Edition*, Chapter 19)

Unsignalized:

“Queue length is an important consideration at unsignalized intersections. Theoretical studies and empirical observations have demonstrated that the probability distribution of queue lengths for any minor movement at an unsignalized intersection is a function of the capacity of the movement and the volume of traffic being served during the analysis period.” (Source: *Highway Capacity Manual 6th Edition*, Chapter 20)

A queuing analysis was performed using the *Synchro 10* software to evaluate and determine the forecasted 50th percentile queue lengths and 95th percentile queue lengths. The queue lengths are summarized in **Table 15** and **Table 16**, respectively. The 50th and 95th percentile queuing reports are included in **Appendix F**.

The queue lengths reported for signalized intersections are measured in feet. For unsignalized intersections, the *Highway Capacity Manual 6th Edition* provides 95th percentile queue lengths reported in the number of vehicles.

Table 15 – Queue Length Results – AM Peak Hour								
Intersection		Existing Storage Length	50 th Percentile			95 th Percentile		
			Exist. 2020	Back. 2023	Future 2023	Exist. 2020	Back. 2023	Future 2023
Port Royal Road at Saturn Parkway Westbound Ramps (Unsignalized / Signalized)	Westbound Left-Turn	---	.*	45	65	25	87	115
	Westbound	---	.*	44	64	-	86	113
	Westbound Right-Turn	---	.*	0	0	-	79	77
	Northbound Left-Turn	200	.*	87	125	10	146	201
	Northbound	---	.*	24	30	-	88	77
	Southbound	---	.*	121	149	-	199	240
	Southbound Right-Turn	200	.*	0	0	-	38	43
Port Royal Road at Saturn Parkway Eastbound Ramps (Unsignalized / Signalized)	Eastbound Left-Turn	---	.*	17	17	8	45	45
	Eastbound	---	.*	0	2	-	55	68
	Northbound	---	.*	212	273	-	365	460
	Northbound Right-Turn	300	.*	18	44	-	100	167
	Southbound Left-Turn	300	.*	268	224	148	327	326
	Southbound	---	.*	14	19	-	23	37
Port Royal Road at Jim Warren Road (Unsignalized)	Westbound Left-Turn	---	.*	.*	.*	103	208	358
	Westbound Right-Turn	---	.*	.*	.*	-	-	733
	Southbound Left-Turn	406**	.*	.*	.*	8	13	65
Port Royal Road at Tom Lunn Road (Unsignalized)	Eastbound Left-Turn / Right-Turn	---	.*	.*	.*	10	10	23
	Northbound Thru / Left-Turn	---	.*	.*	.*	0	0	0

NOTE: All numbers represent distance in feet

*50th Percentile Queue Lengths are not an output of HCM 6th Edition TWSC analysis.

**Storage length is distance approximate distance between signals.

Table 16 – Queue Length Results – PM Peak Hour								
Intersection		Existing Storage Length	50 th Percentile			95 th Percentile		
			Exist. 2020	Back. 2023	Future 2023	Exist. 2020	Back. 2023	Future 2023
Port Royal Road at Saturn Parkway Westbound Ramps (Unsignalized / Signalized)	Westbound Left-Turn	---	.*	51	74	1585	91	125
	Westbound	---	.*	53	74	-	94	125
	Westbound Right-Turn	---	.*	377	435	-	669	725
	Northbound Left-Turn	200	.*	120	176	18	219	333
	Northbound	---	.*	90	184	-	199	233
	Southbound	---	.*	305	346	-	383	454
	Southbound Right-Turn	200	.*	21	38	-	102	125
Port Royal Road at Saturn Parkway Eastbound Ramps (Unsignalized / Signalized)	Eastbound Left-Turn	---	.*	60	60	313	110	109
	Eastbound	---	.*	6	6	-	75	88
	Northbound	---	.*	238	334	-	400	522
	Northbound Right-Turn	300	.*	0	6	-	49	60
	Southbound Left-Turn	300	.*	304	310	118	363	369
	Southbound	---	.*	26	9	-	73	15
Port Royal Road at Jim Warren Road	Westbound Left-Turn	---	.*	.*	.*	45	98	790
	Westbound Right-Turn	---	.*	.*	.*	-	-	285
	Southbound Left-Turn	406**	.*	.*	.*	10	13	113
Port Royal Road at Tom Lunn Road (Unsignalized)	Eastbound Left-Turn / Right-Turn	---	.*	.*	.*	35	58	110
	Northbound Thru / Left-Turn	---	.*	.*	.*	0	0	0

NOTE: All numbers represent distance in feet

*50th Percentile Queue Lengths are not an output of HCM 6th Edition TWSC analysis.

**Storage length is distance approximate distance between signals.

The queue analyses demonstrate significant queuing for northbound left-turn vehicles entering westbound Saturn Parkway and southbound left-turn vehicles entering eastbound Saturn Parkway in both the AM and PM peak hours during the Background and Future conditions. This is likely due to the high volumes of background traffic entering Saturn Parkway and not a result of development traffic.

11.3 Analysis with Improvements

An alternate traffic analysis was performed for the intersection of Port Royal Road at Jim Warren Road. These improvements were identified due to the Level of Service (LOS) based on the Future 2023 conditions.

Port Royal Road at Jim Warren Road

- Install a traffic signal with protected-permitted southbound left-turn phasing and westbound right-turn overlap phasing.
- Develop and implement coordinated traffic signal timings along Port Royal Road for four (4) traffic signals: Reserve Boulevard / North Old Port Royal Road, Saturn Parkway Westbound Ramps, Saturn Parkway Eastbound Ramps, and the proposed Jim Warren Road realignment.
- Construct a southbound left-turn lane along Port Royal Road with storage extending approximately 400 feet north to the intersection of Port Royal Road at Saturn Parkway Eastbound Ramps.
- Construct a northbound shared through and right-turn lane along Port Royal Road with 150 feet of storage.
 - This improvement was identified to improve operations on the Port Royal Road while adequately serving development traffic onto Jim Warren Road instead of constructing a right-turn only lane.
- Construct an additional northbound receiving lane along the northern intersection leg.
 - This additional receiving lane will transition to the northbound right-turn lane at Port Royal Road at Saturn Parkway Eastbound Ramps.
- Construct Jim Warren Road with three (3) lanes for vehicular traffic – one (1) westbound left-turn lane, one (1) westbound right-turn lane, and one (1) eastbound receiving lane. The westbound left-turn lane will extend into the development site as a two-way left-turn lane.

A summary of the capacity analyses with these improvements are provided in **Table 17** and **Table 18** for the Future 2023 conditions.

Table 17 – Intersection Capacity Analysis Results – With Improvements – AM Peak Hour			
Intersection	Approach	Future 2023	
		Unimproved	Improved
Port Royal Road at Jim Warren Road (Signalized)	Westbound STOP*	F (304.7)	D (48.3)
	Northbound	---	C (23.4)
	Southbound Left-Turn*	B (13.8)	A (8.8)
	Overall	---	C (24.7)

*Delay is by approach in Unimproved scenario

Table 18 – Intersection Capacity Analysis Results – With Improvements – PM Peak Hour			
Intersection	Approach	Future 2023	
		Unimproved	Improved
Port Royal Road at Jim Warren Road (Signalized)	Westbound STOP*	F (404.6)	D (38.6)
	Northbound	---	C (26.3)
	Southbound Left-Turn*	B (11.9)	A (9.3)
	Overall	---	C (21.2)

*Delay is by approach in Unimproved scenario

A summary of the queue lengths at Port Royal Road and Saturn Parkway Eastbound Ramps with these improvements are provided in **Table 19** and **Table 20** for the Future 2023 conditions. The 50th and 95th percentile queuing reports are included in **Appendix F**.

Table 19 – Queue Length Results – Improved – AM Peak Hour						
Intersection		Storage Length	50 th Percentile		95 th Percentile	
			Unimproved	Improved	Unimproved	Improved
Port Royal Road at Saturn Parkway Eastbound Ramps (Unsignalized / Signalized)	Eastbound Left-Turn	---	17	17	45	45
	Eastbound	---	2	2	68	68
	Northbound	406*	273	190	460	246
	Northbound Right-Turn	300	44	27	167	27
	Southbound Left-Turn	300	224	246	326	318
	Southbound	---	19	19	37	97
Port Royal Road at Jim Warren Road (Signalized)	Westbound Left-Turn	300	---**	81	358	136
	Westbound Right-Turn	---	---**	256	733	359
	Northbound	---	---**	283	---	393
	Southbound Left-Turn	---	---**	82	65	187
	Southbound	406*	---**	75	---	246

*Storage length is distance approximate distance between signals.

**50th Percentile Queue Lengths are not an output of HCM 6th Edition TWSC analysis.

Table 20 – Queue Length Results – Improved – PM Peak Hour						
Intersection		Storage Length	50 th Percentile		95 th Percentile	
			Unimproved	Improved	Unimproved	Improved
Port Royal Road at Saturn Parkway Eastbound Ramps (Unsignalized / Signalized)	Eastbound Left-Turn	---	60	60	109	109
	Eastbound	---	6	6	88	88
	Northbound	406*	334	214	522	292
	Northbound Right-Turn	300	6	12	60	35
	Southbound Left-Turn	300	310	310	369	362
	Southbound	---	9	11	15	31
Port Royal Road at Jim Warren Road (Signalized)	Westbound Left-Turn	300	---**	176	790	254
	Westbound Right-Turn	---	---**	108	285	178
	Northbound	---	---**	204	---	264
	Southbound Left-Turn	---	---**	232	113	378
	Southbound	406*	---**	170	---	273

*Storage length is distance approximate distance between signals.

**50th Percentile Queue Lengths are not an output of HCM 6th Edition TWSC analysis.

Queue analysis shows that by coordinating the intersections mentioned above, northbound queue lengths at the Port Royal Road and Saturn Parkway Eastbound Ramps are not expected to extend to the proposed Jim Warren Road traffic signal. In addition, southbound queue lengths at the proposed Port Royal Road and Jim Warren Road intersection are not expected to extend to the Port Royal Road and Saturn Parkway Eastbound Ramps intersection.

The Future 2023 Intersection Geometry is illustrated in **Figure 10**.



Saturn Parkway WB On-Ramp
Saturn Parkway WB Off-Ramp

Saturn Parkway EB Off-Ramp
Saturn Parkway EB On-Ramp

Proposed Site

Jim Warren Road
(Proposed Alignment)

150' Storage Length

Tom Lunn Road

Port Royal Road

LEGEND	
	Existing Intersection Geometry
	Background Intersection Geometry
	Future Intersection Geometry
	Background Traffic Signal Control
	Future Traffic Signal Control
	Existing Stop Control

12.0 INTERSECTION SIGHT DISTANCE

Intersection sight distance has been measured using methodology provided in Chapter 3.2 and Chapter 9.5 of *A Policy on Geometric Design of Highways and Streets, 6th Edition (2011)*, published by the American Association of State Highways and Transportation Officials (AASHTO). This methodology is also consistent with TDOT Standard Roadway Drawings for Intersection Sight Distance. The height of the driver's eye is considered to be 3.5 feet above the road surface, and the object height is also considered to be 3.5 feet. The location of the driver on the minor road is considered to be a minimum of 14.5 feet from the edge of traveled way along the major road.

Port Royal Road is a two (2) lane undivided roadway with a posted speed limit of 35 MPH; the minimum intersection sight distance is:

- 390 feet, using passenger vehicle as the design vehicle.
- 490 feet, using single unit vehicle as the design vehicle.
- 595 feet, using combination vehicle (i.e. heavy truck) as the design vehicle.

The following field measurements were obtained for intersection sight distance:

- Port Royal Road at Jim Warren Road (Proposed Alignment)
 - Looking left (to the south) the intersection sight distance is greater than 1,000 feet.
 - Looking right (to the north) the intersection sight distance is approximately 500 feet.

13.0 RECOMMENDATIONS

As part of TDOT's interchange improvements for Saturn Parkway at Port Royal Road, the following improvements will improve traffic operations under the Background 2023 scenario. This project is under construction and expected to be completed in 2020.

Port Royal Road at Saturn Parkway Westbound Ramps

- Install a traffic signal with protected only southbound left-turn phasing.
- Construct a southbound right-turn lane along Port Royal Road.
- Construct two (2) additional westbound approach lanes along the Saturn Parkway Westbound Off-Ramp. This will provide two (2) left-turn lanes and one (1) right-turn lane.

Port Royal Road at Saturn Parkway Eastbound Ramps

- Install a traffic signal with protected only northbound left-turn phasing.
- Construct an additional southbound left-turn lane along Port Royal Road. This will provide two (2) left-turn lanes.
- Construct a northbound exclusive right-turn lane along Port Royal Road.
- Construct one (1) additional westbound approach lane along the Saturn Parkway Eastbound Off-Ramp. This will provide one (1) left-turn lane and one (1) shared left-turn / right-turn lane.

Related to the proposed development, the following mitigation improvements will improve traffic operations under the Future 2023 scenario:

Port Royal Road at Jim Warren Road

- The existing Jim Warren Road is proposed to be realigned to intersect Port Royal Road approximately 1,200 feet north of its current location, just north of the Aenon Creek bridge. The proposed Jim Warren Road alignment would provide vehicle access to the proposed development and promote the City of Spring Hill's vision to improve connectivity to land parcels that are located east of I-65.
 - NOTE: The location of the proposed Jim Warren Road realignment is located approximately 500 feet south of the Saturn Parkway Eastbound Ramps along Port Royal Road.
- Install a traffic signal with protected-permitted southbound left-turn phasing and westbound right-turn overlap phasing.
- Develop and implement coordinated traffic signal timings along Port Royal Road for four (4) traffic signals: Reserve Boulevard / North Old Port Royal Road, Saturn Parkway Westbound Ramps, Saturn Parkway Eastbound Ramps, and the proposed Jim Warren Road realignment.

Port Royal Road at Jim Warren Road (continued)

- Construct a southbound left-turn lane along Port Royal Road with storage extending approximately 400 feet north to the intersection of Port Royal Road at Saturn Parkway Eastbound Ramps.
- Construct a northbound shared through and right-turn lane along Port Royal Road with 150 feet of storage.
 - This improvement was identified to improve operations on the Port Royal Road while adequately serving development traffic onto Jim Warren Road instead of constructing a right-turn only lane.
- Construct an additional northbound receiving lane along the northern intersection leg.
 - This additional receiving lane will transition to the northbound right-turn lane at Port Royal Road at Saturn Parkway Eastbound Ramps.
- Construct Jim Warren Road with three (3) lanes for vehicular traffic – one (1) westbound left-turn lane, one (1) westbound right-turn lane, and one (1) eastbound receiving lane. The westbound left-turn lane will extend into the development site as a two-way left-turn lane.

Appendix A

Site Plan

Appendix B

Photos

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 1



Comments: Port Royal Road at Saturn Parkway Westbound Ramp
Northbound approach facing north

Photo No. 2



Comments: Port Royal Road at Saturn Parkway Westbound Ramp
Northbound approach facing south

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 3



Comments: Port Royal Road at Saturn Parkway Westbound Ramp
Southbound approach facing south

Photo No. 4



Comments: Port Royal Road at Saturn Parkway Westbound Ramp
Southbound approach facing north

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 5



Comments: Port Royal Road at Saturn Parkway Westbound Ramp
Westbound approach facing west

Photo No. 6



Comments: Port Royal Road at Saturn Parkway Westbound Ramp
Westbound approach facing east

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 7



Comments: Port Royal Road at Saturn Parkway Eastbound Ramp
Northbound approach facing north

Photo No. 8



Comments: Port Royal Road at Saturn Parkway Eastbound Ramp
Northbound approach facing south

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 9



Comments: Port Royal Road at Saturn Parkway Eastbound Ramp
Southbound approach facing south

Photo No. 10



Comments: Port Royal Road at Saturn Parkway Eastbound Ramp
Southbound approach facing north

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 11



Comments: Port Royal Road at Saturn Parkway Eastbound Ramp
Eastbound approach facing east

Photo No. 12



Comments: Port Royal Road at Saturn Parkway Eastbound Ramp
Eastbound approach facing west

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 13



Comments: Port Royal Road at Jim Warren Road
Northbound approach facing north

Photo No. 14



Comments: Port Royal Road at Jim Warren Road
Northbound approach facing south

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 15



Comments: Port Royal Road at Jim Warren Road
Southbound approach facing south

Photo No. 16



Comments: Port Royal Road at Jim Warren Road
Southbound approach facing north

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 17



Comments: Port Royal Road at Jim Warren Road
Westbound approach facing west

Photo No. 18



Comments: Port Royal Road at Jim Warren Road
Westbound approach facing east

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 19



Comments: Port Royal Road at Jim Warren Road (Proposed Alignment)
Northbound approach facing north

Photo No. 20



Comments: Port Royal Road at Jim Warren Road (Proposed Alignment)
Northbound approach facing south

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 21



Comments: Port Royal Road at Jim Warren Road (Proposed Alignment)
Southbound approach facing south

Photo No. 22



Comments: Port Royal Road at Jim Warren Road (Proposed Alignment)
Southbound approach facing north

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 23



Comments: Port Royal Road at Jim Warren Road (Proposed Alignment)
Westbound approach facing west

Photo No. 24



Comments: Port Royal Road at Jim Warren Road (Proposed Alignment)
Westbound approach facing east

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 25



Comments: Port Royal Road at Tom Lunn Road
Northbound approach facing north

Photo No. 26



Comments: Port Royal Road at Tom Lunn Road
Northbound approach facing south

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 27



Comments: Port Royal Road at Tom Lunn Road
Southbound approach facing south

Photo No. 28



Comments: Port Royal Road at Tom Lunn Road
Southbound approach facing north

Steadfast Companies
Photograph Sheet

Site Name: Spring Hill Towne Crossing

Photo No. 29



Comments: Port Royal Road at Tom Lunn Road
Eastbound approach facing east

Photo No. 30



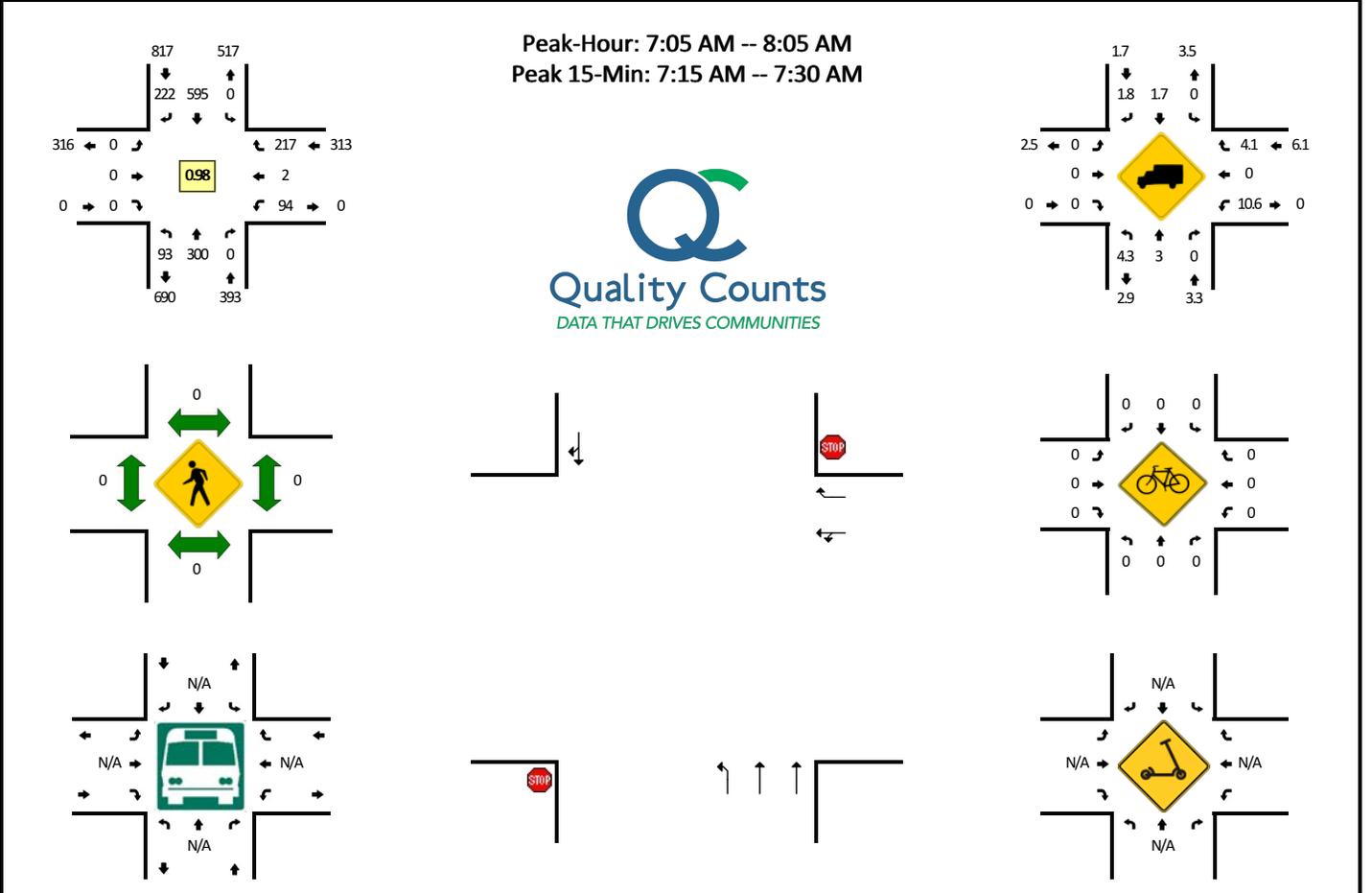
Comments: Port Royal Road at Tom Lunn Road
Eastbound approach facing west

Appendix C

Traffic Data

LOCATION: Port Royal Rd -- Saturn Pkwy WB ramps
CITY/STATE: Spring Hill, TN

QC JOB #: 15187201
DATE: Thu, Feb 13 2020

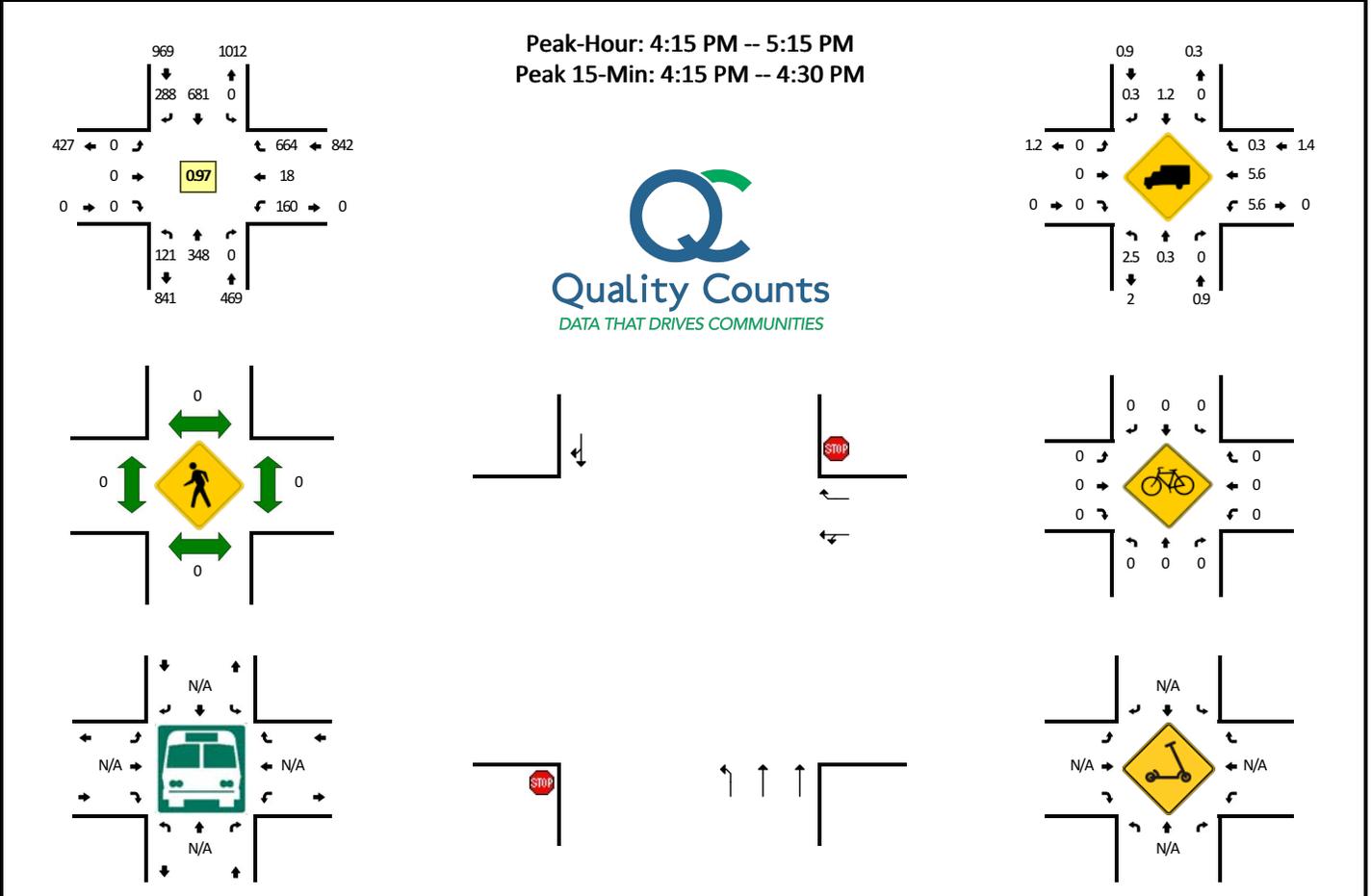


5-Min Count Period Beginning At	Port Royal Rd (Northbound)				Port Royal Rd (Southbound)				Saturn Pkwy WB ramps (Eastbound)				Saturn Pkwy WB ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	7	27	0	0	0	53	14	0	0	0	0	0	5	0	18	0	124	
7:05 AM	8	24	0	0	0	50	15	0	0	0	0	0	11	0	21	0	129	
7:10 AM	4	26	0	0	0	50	17	0	0	0	0	0	10	0	17	0	124	
7:15 AM	5	29	0	1	0	43	22	0	0	0	0	0	5	0	19	0	124	
7:20 AM	8	26	0	0	0	62	16	0	0	0	0	0	4	0	22	0	138	
7:25 AM	6	29	0	0	0	52	22	0	0	0	0	0	4	0	13	0	126	
7:30 AM	12	20	0	0	0	46	14	0	0	0	0	0	5	0	20	0	117	
7:35 AM	9	21	0	0	0	54	21	0	0	0	0	0	10	0	16	0	131	
7:40 AM	7	31	0	0	0	45	19	0	0	0	0	0	10	0	19	0	131	
7:45 AM	11	19	0	0	0	47	19	0	0	0	0	0	8	0	18	0	122	
7:50 AM	8	20	0	0	0	36	23	0	0	0	0	0	6	2	20	0	115	
7:55 AM	8	29	0	0	0	54	22	0	0	0	0	0	10	0	14	0	137	1518
8:00 AM	6	26	0	0	0	56	12	0	0	0	0	0	11	0	18	0	129	1523
8:05 AM	5	26	0	0	0	49	9	0	0	0	0	0	2	0	18	0	109	1503
8:10 AM	4	25	0	0	0	68	18	0	0	0	0	0	7	1	12	0	135	1514
8:15 AM	10	21	0	0	0	60	18	0	0	0	0	0	5	0	8	0	122	1512
8:20 AM	3	22	0	0	0	55	12	0	0	0	0	0	9	0	22	0	123	1497
8:25 AM	3	16	0	0	0	64	5	0	0	0	0	0	6	0	15	0	109	1480
8:30 AM	13	18	0	0	0	43	18	0	0	0	0	0	4	0	15	0	111	1474
8:35 AM	10	23	0	0	0	43	18	0	0	0	0	0	13	0	14	0	121	1464
8:40 AM	0	34	0	0	0	52	16	0	0	0	0	0	9	0	13	0	124	1457
8:45 AM	3	34	0	0	0	39	14	0	0	0	0	0	4	0	20	0	114	1449
8:50 AM	9	31	0	0	0	56	16	0	0	0	0	0	8	0	20	0	140	1474
8:55 AM	3	27	0	0	0	47	9	0	0	0	0	0	3	1	13	0	103	1440
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	76	336	0	4	0	628	240	0	0	0	0	0	52	0	216	0	1552	
Heavy Trucks	8	12	0	0	0	4	4	0	0	0	0	0	8	0	20	0	56	
Buses																		
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																		

Comments: Collect on 2/13/2020

LOCATION: Port Royal Rd -- Saturn Pkwy WB ramps
CITY/STATE: Spring Hill, TN

QC JOB #: 15187202
DATE: Thu, Feb 13 2020

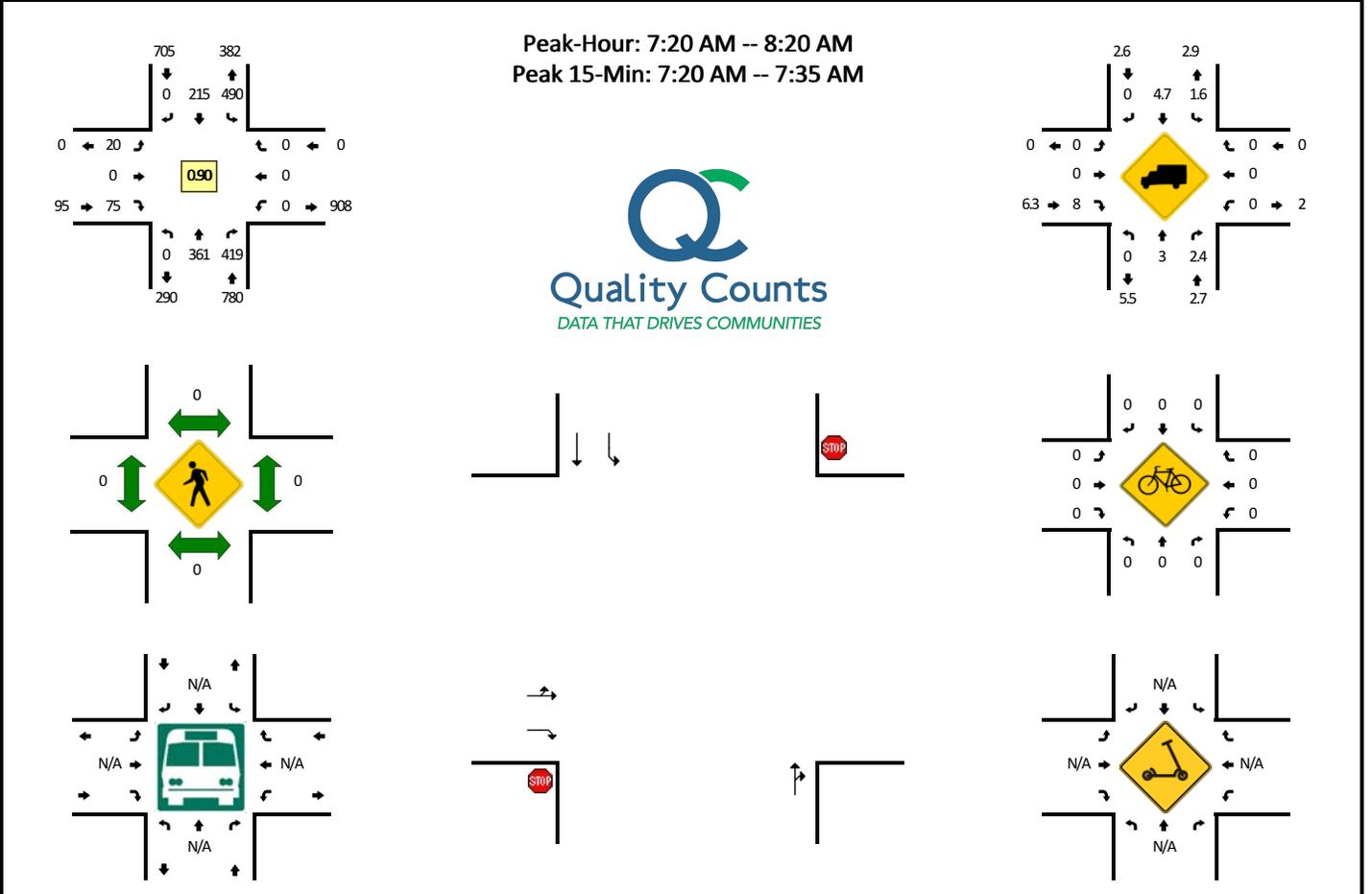


5-Min Count Period Beginning At	Port Royal Rd (Northbound)				Port Royal Rd (Southbound)				Saturn Pkwy WB ramps (Eastbound)				Saturn Pkwy WB ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	8	30	0	0	0	65	20	0	0	0	0	0	7	0	29	0	159	
4:05 PM	10	31	0	1	0	55	20	0	0	0	0	0	10	0	51	0	178	
4:10 PM	10	24	0	0	0	63	17	0	0	0	0	0	12	0	50	0	176	
4:15 PM	13	29	0	0	0	72	23	0	0	0	0	0	8	0	58	0	203	
4:20 PM	5	23	0	0	0	56	27	0	0	0	0	0	18	5	51	0	185	
4:25 PM	10	27	0	0	0	47	28	0	0	0	0	0	19	0	66	0	197	
4:30 PM	12	31	0	0	0	47	25	0	0	0	0	0	15	0	59	0	189	
4:35 PM	18	35	0	0	0	51	25	0	0	0	0	0	8	4	20	0	161	
4:40 PM	12	32	0	0	0	65	20	0	0	0	0	0	11	0	53	0	193	
4:45 PM	3	20	0	0	0	50	31	0	0	0	0	0	17	8	71	0	200	
4:50 PM	5	32	0	0	0	53	21	0	0	0	0	0	22	1	56	0	190	
4:55 PM	9	35	0	0	0	60	21	0	0	0	0	0	13	0	56	0	194	2225
5:00 PM	10	25	0	0	0	65	19	0	0	0	0	0	7	0	53	0	179	2245
5:05 PM	15	30	0	0	0	65	23	0	0	0	0	0	7	0	56	0	196	2263
5:10 PM	9	29	0	0	0	50	25	0	0	0	0	0	15	0	65	0	193	2280
5:15 PM	7	20	0	0	0	61	23	0	0	0	0	0	13	0	67	0	191	2268
5:20 PM	10	23	0	0	0	65	26	0	0	0	0	0	10	0	56	0	190	2273
5:25 PM	13	32	0	0	0	65	19	0	0	0	0	0	10	0	27	0	166	2242
5:30 PM	5	27	0	0	0	67	20	0	0	0	0	0	18	0	48	0	185	2238
5:35 PM	8	17	0	0	0	62	20	0	0	0	0	0	15	1	53	0	176	2253
5:40 PM	8	43	0	0	0	54	29	0	0	0	0	0	7	0	25	0	166	2226
5:45 PM	12	29	0	0	0	64	21	0	0	0	0	0	16	0	48	0	190	2216
5:50 PM	12	27	0	0	0	58	18	0	0	0	0	0	13	0	55	0	183	2209
5:55 PM	6	40	0	0	0	52	26	0	0	0	0	0	20	0	48	0	192	2207
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	112	316	0	0	0	700	312	0	0	0	0	0	180	20	700	0	2340	
Heavy Trucks	4	0	0	0	0	0	4	0	0	0	0	0	8	0	0	0	16	
Buses																	0	
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																	0	

Comments: Collect on 2/13/2020

LOCATION: Port Royal Rd -- Saturn Pkwy EB ramps
CITY/STATE: Spring Hill, TN

QC JOB #: 15187203
DATE: Thu, Feb 13 2020

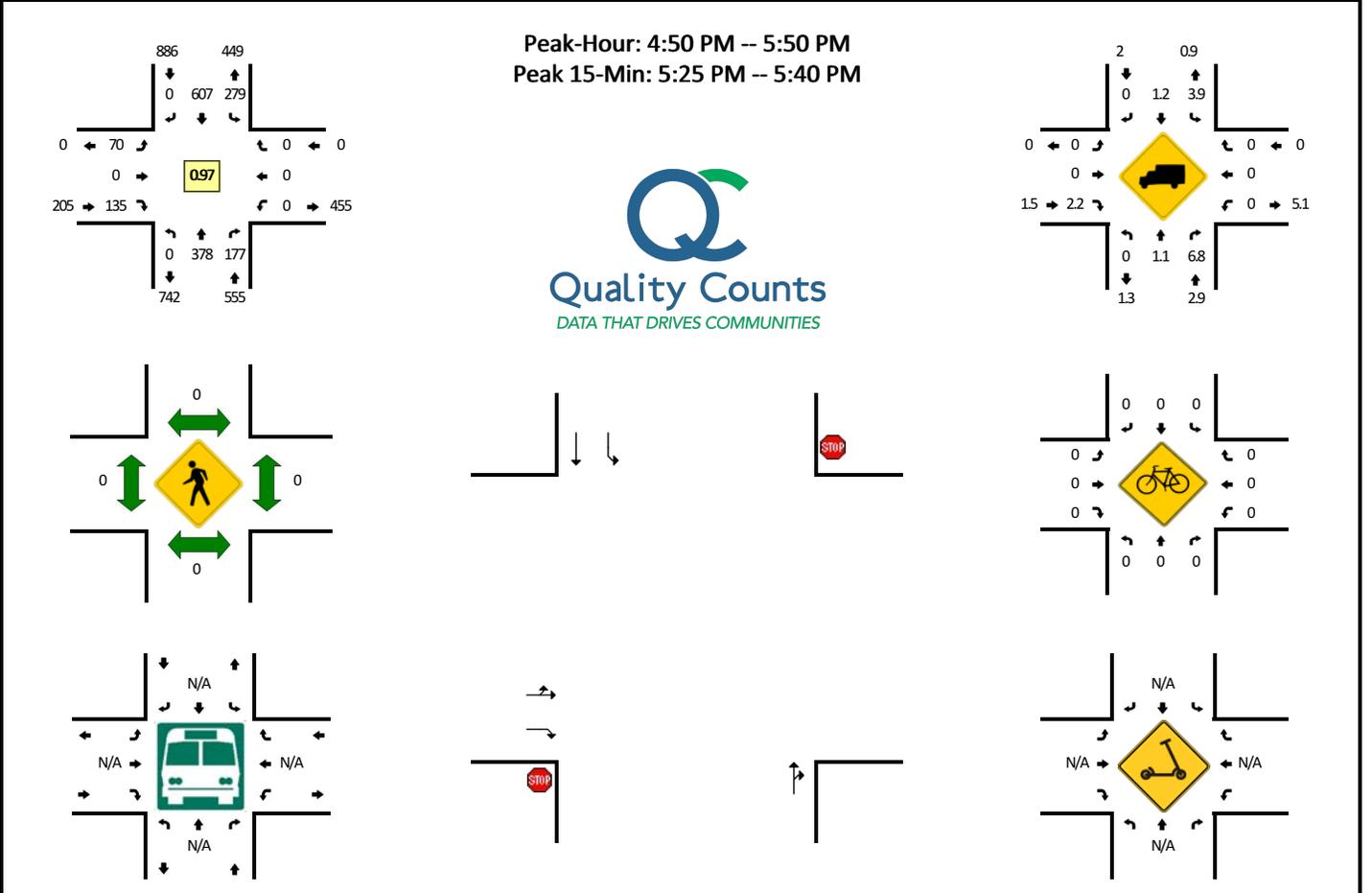


5-Min Count Period Beginning At	Port Royal Rd (Northbound)				Port Royal Rd (Southbound)				Saturn Pkwy EB ramps (Eastbound)				Saturn Pkwy EB ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	24	34	0	44	18	0	0	2	0	7	0	0	0	0	0	129	
7:05 AM	0	34	23	0	43	16	0	0	3	0	7	0	0	0	0	0	126	
7:10 AM	0	32	35	0	39	20	0	0	2	0	6	0	0	0	0	0	134	
7:15 AM	0	31	43	0	34	12	0	0	0	0	5	0	0	0	0	0	125	
7:20 AM	0	37	52	0	38	11	0	0	0	0	7	0	0	0	0	0	145	
7:25 AM	0	31	46	0	43	18	0	0	1	0	7	0	0	0	0	0	146	
7:30 AM	0	27	46	0	49	19	0	0	2	0	5	0	0	0	0	0	148	
7:35 AM	0	33	31	0	34	21	0	0	1	0	4	0	0	0	0	0	124	
7:40 AM	0	29	44	0	38	22	0	1	2	0	10	0	0	0	0	0	146	
7:45 AM	0	34	30	0	41	12	0	0	0	0	8	0	0	0	0	0	125	
7:50 AM	0	18	29	0	29	20	0	0	4	0	10	0	0	0	0	0	110	
7:55 AM	0	37	20	0	38	19	0	0	2	0	3	0	0	0	0	0	119	
8:00 AM	0	29	29	0	39	20	0	0	5	0	8	0	0	0	0	0	130	1577
8:05 AM	0	32	29	0	43	16	0	0	0	0	4	0	0	0	0	0	124	1576
8:10 AM	0	25	33	0	44	19	0	0	2	0	4	0	0	0	0	0	127	1569
8:15 AM	0	29	30	0	53	18	0	0	1	0	5	0	0	0	0	0	136	1580
8:20 AM	0	24	24	0	47	21	0	0	5	0	5	0	0	0	0	0	126	1561
8:25 AM	0	16	22	0	51	14	0	0	2	0	7	0	0	0	0	0	112	1527
8:30 AM	0	23	26	0	43	14	0	0	5	0	3	0	0	0	0	0	114	1493
8:35 AM	0	35	30	0	36	17	0	0	2	0	4	0	0	0	0	0	124	1493
8:40 AM	0	22	22	0	36	21	0	0	7	1	1	0	0	0	0	0	110	1457
8:45 AM	0	32	21	0	34	16	0	0	5	0	7	0	0	0	0	0	115	1447
8:50 AM	0	31	15	0	39	17	0	0	6	0	3	0	0	0	0	0	111	1448
8:55 AM	0	26	21	0	37	18	0	0	4	1	3	0	0	0	0	0	110	1439
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	380	576	0	520	192	0	0	12	0	76	0	0	0	0	0	1756	
Heavy Trucks	0	12	8		8	4	0		0	0	12		0	0	0	0	44	
Buses																		
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																		

Comments: Collect on 2/13/2020

LOCATION: Port Royal Rd -- Saturn Pkwy EB ramps
CITY/STATE: Spring Hill, TN

QC JOB #: 15187204
DATE: Thu, Feb 13 2020

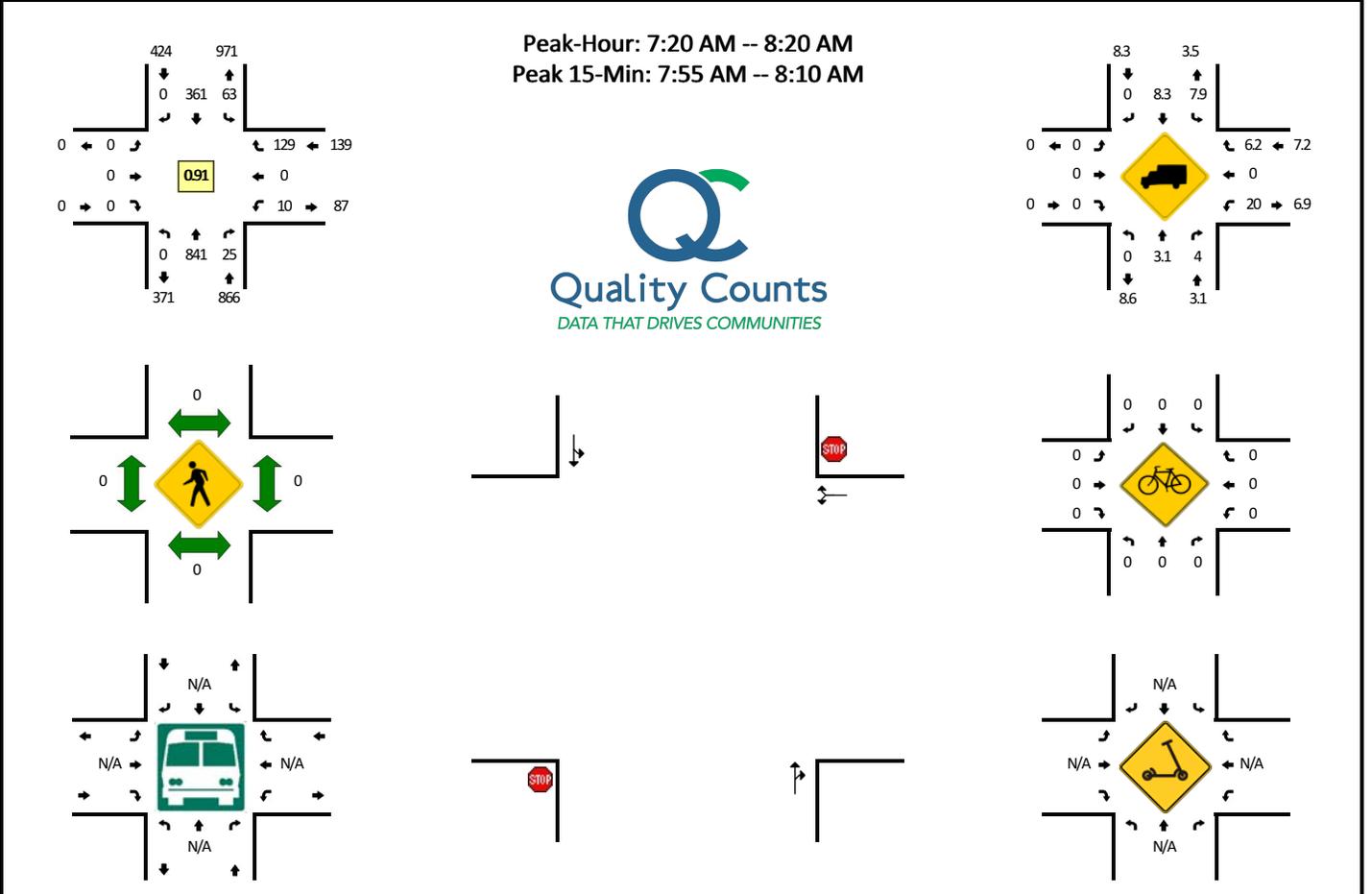


5-Min Count Period Beginning At	Port Royal Rd (Northbound)				Port Royal Rd (Southbound)				Saturn Pkwy EB ramps (Eastbound)				Saturn Pkwy EB ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	24	7	0	33	39	0	0	8	0	13	0	0	0	0	0	124	
4:05 PM	0	36	7	0	27	42	0	0	8	0	10	0	0	0	0	0	130	
4:10 PM	0	29	13	0	20	39	0	0	9	0	8	0	0	0	0	0	118	
4:15 PM	0	34	12	0	36	53	0	0	4	0	10	0	0	0	0	0	149	
4:20 PM	0	25	12	0	25	51	0	0	5	0	17	0	0	0	0	0	135	
4:25 PM	0	26	10	0	19	48	0	0	10	0	10	0	0	0	0	0	123	
4:30 PM	0	34	12	0	16	48	0	1	3	0	5	0	0	0	0	0	119	
4:35 PM	0	44	6	0	21	33	0	0	12	0	14	0	0	0	0	0	130	
4:40 PM	0	42	20	0	20	59	0	1	3	0	12	0	0	0	0	0	157	
4:45 PM	0	23	12	0	15	46	0	0	7	0	7	0	0	0	0	0	110	
4:50 PM	0	27	15	0	15	59	0	0	5	0	19	0	0	0	0	0	140	
4:55 PM	0	40	13	0	18	58	0	0	4	0	14	0	0	0	0	0	147	1582
5:00 PM	0	29	8	0	20	50	0	0	10	0	8	0	0	0	0	0	125	1583
5:05 PM	0	40	21	0	19	48	0	0	5	0	16	0	0	0	0	0	149	1602
5:10 PM	0	32	18	0	23	53	0	0	5	0	13	0	0	0	0	0	144	1628
5:15 PM	0	25	10	0	23	37	0	0	5	0	11	0	0	0	0	0	111	1590
5:20 PM	0	23	20	0	27	58	0	0	4	0	5	0	0	0	0	0	137	1592
5:25 PM	0	38	19	0	17	51	0	0	9	0	9	0	0	0	0	0	143	1612
5:30 PM	0	23	14	0	32	51	0	0	6	0	12	0	0	0	0	0	138	1631
5:35 PM	0	27	17	0	23	61	0	1	3	0	11	0	0	0	0	0	143	1644
5:40 PM	0	33	11	0	28	37	0	0	11	0	9	0	0	0	0	0	129	1616
5:45 PM	0	41	11	0	33	44	0	0	3	0	8	0	0	0	0	0	140	1646
5:50 PM	0	26	13	0	17	52	0	0	9	0	16	0	0	0	0	0	133	1639
5:55 PM	0	33	11	0	19	55	0	0	10	0	2	0	0	0	0	0	130	1622
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	352	200	0	288	652	0	4	72	0	128	0	0	0	0	0	1696	
Heavy Trucks	0	0	20		28	4	0		0	0	4		0	0	0		56	
Buses																		
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																		

Comments: Collect on 2/13/2020

LOCATION: Port Royal Rd -- Jim Warren Rd
CITY/STATE: Spring Hill, TN

QC JOB #: 15187205
DATE: Wed, Feb 26 2020

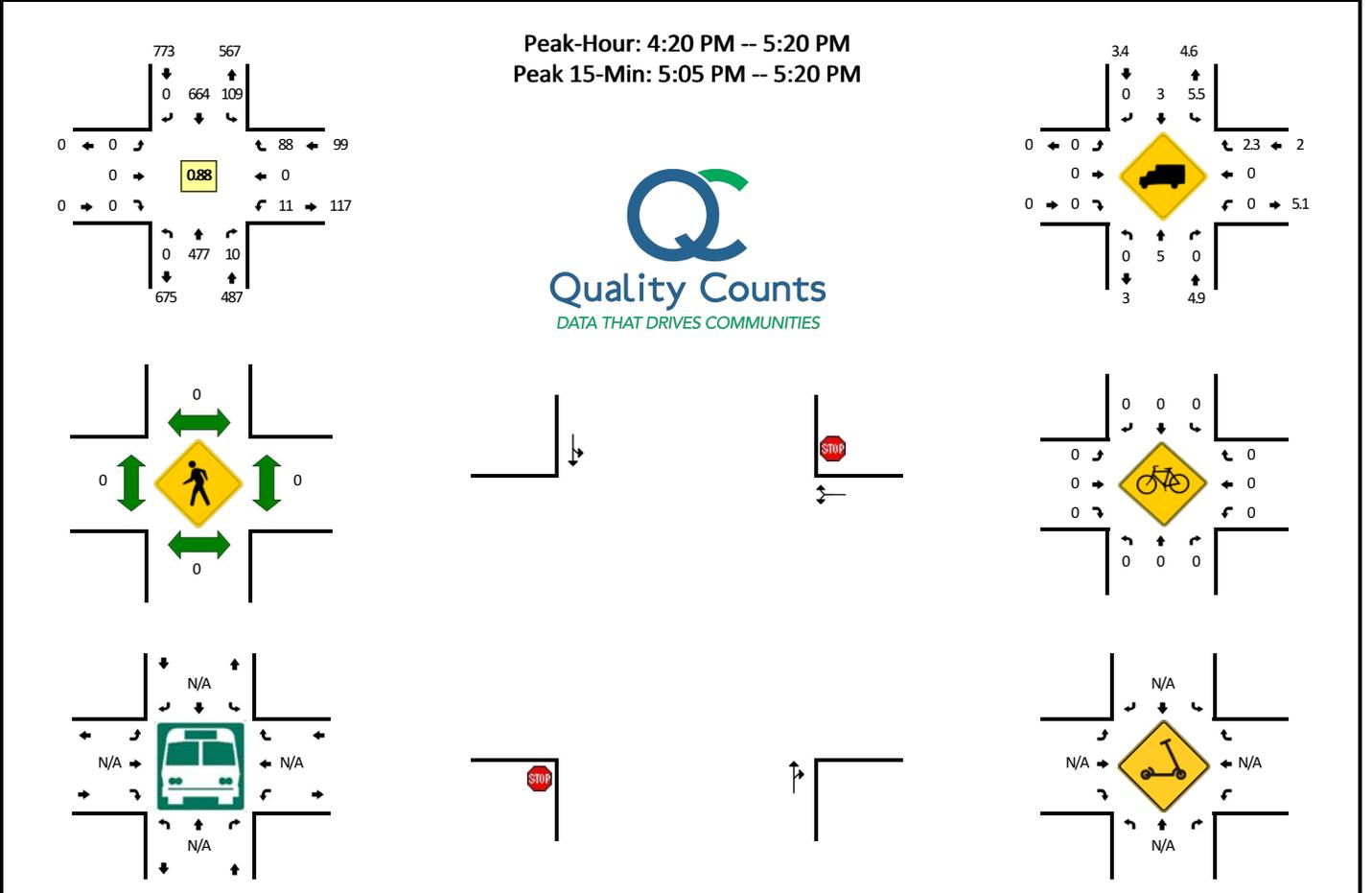


5-Min Count Period Beginning At	Port Royal Rd (Northbound)				Port Royal Rd (Southbound)				Jim Warren Rd (Eastbound)				Jim Warren Rd (Westbound)				Total	Hourly Totals	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U			
7:00 AM	0	61	1	0	6	19	0	0	0	0	0	0	0	0	12	0	99		
7:05 AM	0	60	2	0	8	8	0	0	0	0	0	0	0	1	0	8	0	87	
7:10 AM	0	55	1	0	0	19	0	0	0	0	0	0	0	0	0	7	0	82	
7:15 AM	0	64	0	0	3	26	0	0	0	0	0	0	0	1	0	8	0	102	
7:20 AM	0	62	3	0	4	17	0	0	0	0	0	0	0	1	0	12	0	99	
7:25 AM	0	66	1	0	2	27	0	0	0	0	0	0	0	1	0	10	0	107	
7:30 AM	0	72	3	0	3	20	0	0	0	0	0	0	0	1	0	14	0	113	
7:35 AM	0	77	4	0	6	35	0	0	0	0	0	0	0	0	0	12	0	134	
7:40 AM	0	59	0	0	7	27	0	0	0	0	0	0	0	0	0	10	0	103	
7:45 AM	0	68	3	0	5	27	0	0	0	0	0	0	0	1	0	9	0	113	
7:50 AM	0	59	3	0	11	37	0	0	0	0	0	0	0	1	0	11	0	122	
7:55 AM	0	66	1	0	7	43	0	0	0	0	0	0	0	2	0	9	0	128	1289
8:00 AM	0	69	3	0	7	35	0	0	0	0	0	0	0	0	0	8	0	122	1312
8:05 AM	0	84	3	0	2	43	0	0	0	0	0	0	0	1	0	10	0	143	1368
8:10 AM	0	80	1	0	2	25	0	0	0	0	0	0	0	1	0	14	0	123	1409
8:15 AM	0	79	0	0	6	25	0	1	0	0	0	0	0	1	0	10	0	122	1429
8:20 AM	0	41	0	0	8	20	0	2	0	0	0	0	0	0	0	5	0	76	1406
8:25 AM	0	44	3	0	4	17	0	0	0	0	0	0	0	0	0	4	0	72	1371
8:30 AM	0	49	1	0	2	21	0	0	0	0	0	0	0	0	0	8	0	81	1339
8:35 AM	0	49	0	0	6	20	0	0	0	0	0	0	0	0	0	5	0	80	1285
8:40 AM	0	60	1	0	3	12	0	0	0	0	0	0	0	0	0	9	0	85	1267
8:45 AM	0	52	0	0	4	25	0	0	0	0	0	0	0	0	0	8	0	89	1243
8:50 AM	0	39	2	0	2	19	0	0	0	0	0	0	0	0	0	7	0	69	1190
8:55 AM	0	43	3	0	6	14	0	0	0	0	0	0	0	0	0	5	0	71	1133
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total		
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U			
All Vehicles	0	876	28	0	64	484	0	0	0	0	0	0	12	0	108	0	1572		
Heavy Trucks	0	52	0		12	36	0		0	0	0		4	0	16		120		
Buses																			
Pedestrians	0	0	0		0	0			0	0			0	0	0		0		
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0		
Scoters																			

Comments: Collect on 2/13/2020

LOCATION: Port Royal Rd -- Jim Warren Rd
CITY/STATE: Spring Hill, TN

QC JOB #: 15187206
DATE: Wed, Feb 26 2020



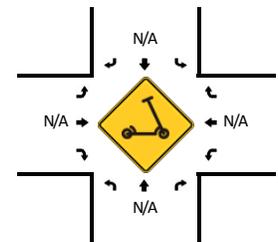
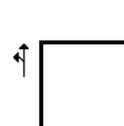
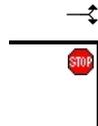
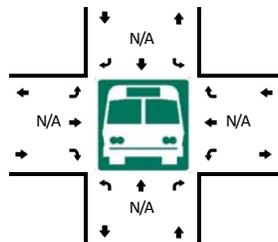
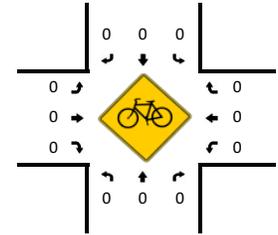
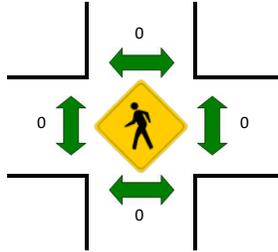
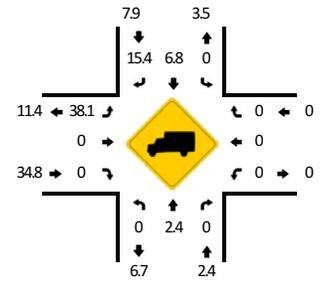
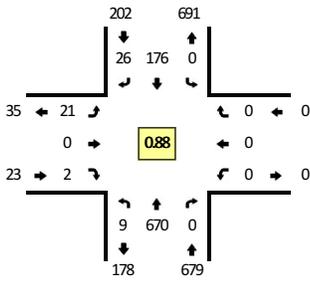
5-Min Count Period Beginning At	Port Royal Rd (Northbound)				Port Royal Rd (Southbound)				Jim Warren Rd (Eastbound)				Jim Warren Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	35	1	0	6	44	0	0	0	0	0	0	2	0	12	0	100	
4:05 PM	0	41	2	0	9	57	0	0	0	0	0	0	0	0	4	0	113	
4:10 PM	0	41	1	0	4	50	0	0	0	0	0	0	1	0	2	0	99	
4:15 PM	0	40	0	0	9	45	0	1	0	0	0	0	1	0	6	0	102	
4:20 PM	0	44	1	0	8	48	0	0	0	0	0	0	0	0	8	0	109	
4:25 PM	0	47	0	0	8	45	0	0	0	0	0	0	0	0	7	0	107	
4:30 PM	0	38	4	0	8	47	0	0	0	0	0	0	2	0	8	0	107	
4:35 PM	0	32	0	0	9	62	0	0	0	0	0	0	1	0	5	0	109	
4:40 PM	0	41	2	0	5	53	0	0	0	0	0	0	2	0	7	0	110	
4:45 PM	0	32	0	0	10	64	0	0	0	0	0	0	2	0	5	0	113	
4:50 PM	0	24	1	0	9	57	0	1	0	0	0	0	0	0	7	0	99	
4:55 PM	0	33	1	0	8	61	0	0	0	0	0	0	2	0	5	0	110	1278
5:00 PM	0	38	0	0	12	52	0	1	0	0	0	0	0	0	6	0	109	1287
5:05 PM	0	45	0	0	10	58	0	0	0	0	0	0	1	0	10	0	124	1298
5:10 PM	0	47	1	0	8	53	0	0	0	0	0	0	0	0	10	0	119	1318
5:15 PM	0	56	0	0	12	64	0	0	0	0	0	0	1	0	10	0	143	1359
5:20 PM	0	32	0	0	7	43	0	0	0	0	0	0	0	0	8	0	90	1340
5:25 PM	0	46	1	0	8	53	0	2	0	0	0	0	1	0	4	0	115	1348
5:30 PM	0	28	0	0	11	63	0	0	0	0	0	0	0	0	7	0	109	1350
5:35 PM	0	35	3	0	8	43	0	1	0	0	0	0	0	0	6	0	96	1337
5:40 PM	0	32	0	0	9	50	0	0	0	0	0	0	2	0	6	0	99	1326
5:45 PM	0	29	0	0	4	56	0	1	0	0	0	0	0	0	6	0	96	1309
5:50 PM	0	32	0	0	12	61	0	0	0	0	0	0	0	0	4	0	109	1319
5:55 PM	0	35	0	0	11	49	0	0	0	0	0	0	2	0	5	0	102	1311
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	592	4	0	120	700	0	0	0	0	0	0	8	0	120	0	1544	
Heavy Trucks	0	8	0	0	8	32	0	0	0	0	0	0	0	0	4	0	52	
Buses																	0	
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																	0	

Comments: Collect on 2/13/2020

LOCATION: Port Royal Rd -- Tom Lunn Rd
CITY/STATE: Spring Hill, TN

QC JOB #: 15187207
DATE: Thu, Feb 13 2020

Peak-Hour: 7:10 AM -- 8:10 AM
 Peak 15-Min: 7:15 AM -- 7:30 AM

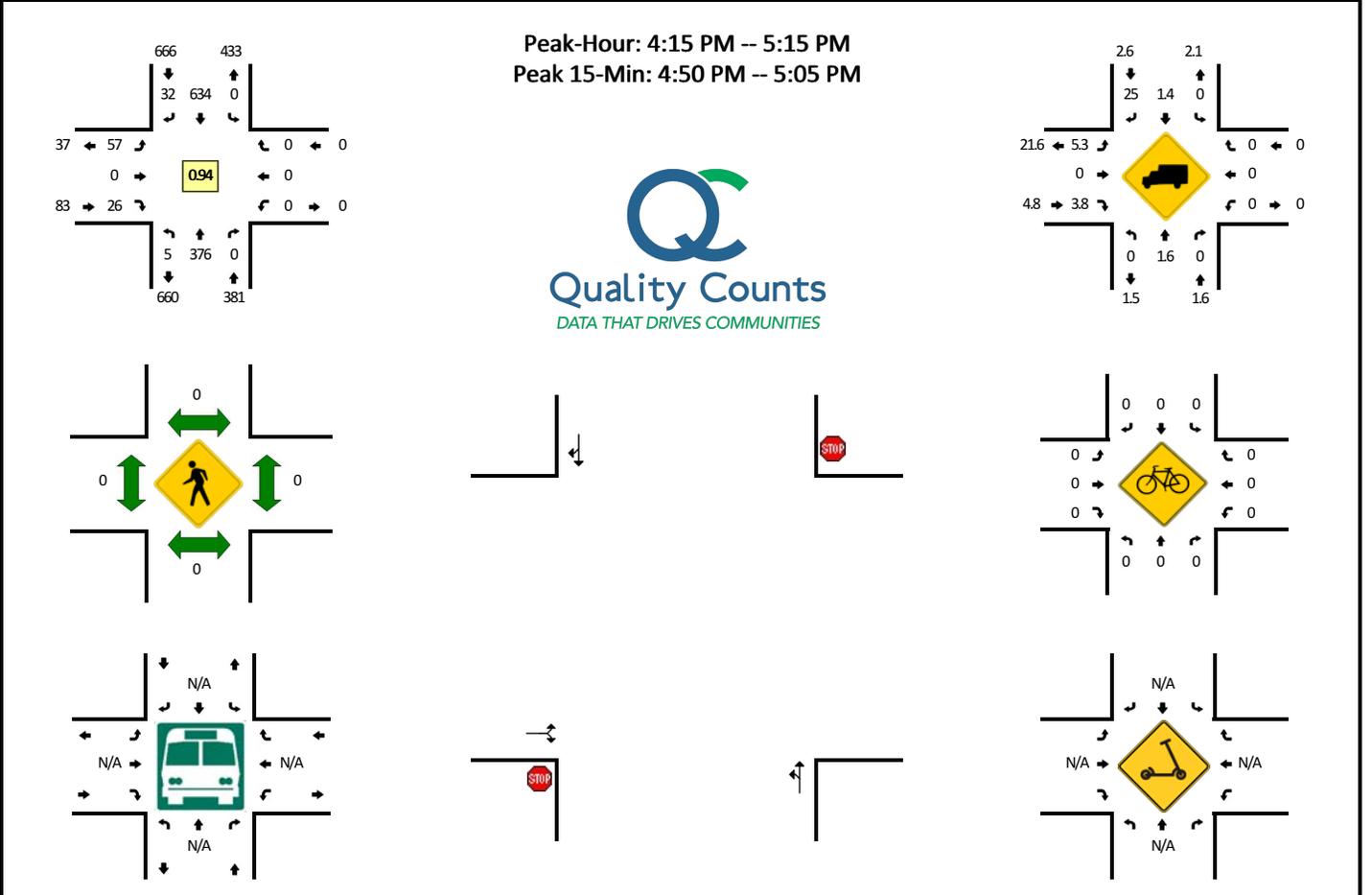


5-Min Count Period Beginning At	Port Royal Rd (Northbound)				Port Royal Rd (Southbound)				Tom Lunn Rd (Eastbound)				Tom Lunn Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	1	47	0	0	0	15	3	0	0	0	0	0	0	0	0	0	66	
7:05 AM	1	50	0	0	0	12	4	0	1	0	0	0	0	0	0	0	68	
7:10 AM	0	57	0	0	0	16	1	0	0	0	0	0	0	0	0	0	74	
7:15 AM	1	64	0	0	0	10	1	0	2	0	1	0	0	0	0	0	79	
7:20 AM	0	65	0	0	0	13	1	0	2	0	0	0	0	0	0	0	81	
7:25 AM	0	76	0	0	0	16	2	0	2	0	0	0	0	0	0	0	96	
7:30 AM	0	51	0	0	0	13	2	0	0	0	0	0	0	0	0	0	66	
7:35 AM	2	54	0	0	0	13	4	0	1	0	0	0	0	0	0	0	74	
7:40 AM	2	64	0	0	0	25	0	0	2	0	1	0	0	0	0	0	94	
7:45 AM	1	50	0	0	0	10	1	0	3	0	0	0	0	0	0	0	65	
7:50 AM	0	39	0	0	0	18	5	0	1	0	0	0	0	0	0	0	63	
7:55 AM	2	52	0	0	0	11	3	0	2	0	0	0	0	0	0	0	70	896
8:00 AM	1	40	0	0	0	18	4	0	4	0	0	0	0	0	0	0	67	897
8:05 AM	0	58	0	0	0	13	2	0	2	0	0	0	0	0	0	0	75	904
8:10 AM	0	52	0	0	0	15	3	0	1	0	0	0	0	0	0	0	71	901
8:15 AM	1	44	0	0	0	18	2	0	0	0	1	0	0	0	0	0	66	888
8:20 AM	0	41	0	0	0	15	3	0	0	0	0	0	0	0	0	0	59	866
8:25 AM	0	37	0	0	0	14	1	0	0	0	0	0	0	0	0	0	52	822
8:30 AM	0	49	0	0	0	13	2	0	0	0	0	0	0	0	0	0	64	820
8:35 AM	1	48	0	0	0	14	2	0	1	0	0	0	0	0	0	0	66	812
8:40 AM	1	42	0	0	0	21	1	0	1	0	0	0	0	0	0	0	66	784
8:45 AM	0	43	0	0	0	16	2	0	2	0	0	0	0	0	0	0	63	782
8:50 AM	0	31	0	0	0	20	3	0	5	0	0	0	0	0	0	0	59	778
8:55 AM	0	41	0	0	0	14	0	0	4	0	0	0	0	0	0	0	59	767
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	4	820	0	0	0	156	16	0	24	0	4	0	0	0	0	0	1024	
Heavy Trucks	0	32	0	0	0	8	4	0	8	0	0	0	0	0	0	0	52	
Buses																		
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																		

Comments: Collect on 2/13/2020

LOCATION: Port Royal Rd -- Tom Lunn Rd
CITY/STATE: Spring Hill, TN

QC JOB #: 15187208
DATE: Thu, Feb 13 2020



5-Min Count Period Beginning At	Port Royal Rd (Northbound)				Port Royal Rd (Southbound)				Tom Lunn Rd (Eastbound)				Tom Lunn Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	33	0	0	0	19	3	0	2	0	1	0	0	0	0	0	58	
4:05 PM	1	27	0	0	0	39	2	0	5	0	1	0	0	0	0	0	75	
4:10 PM	1	29	0	0	0	39	4	0	5	0	1	0	0	0	0	0	79	
4:15 PM	0	33	0	0	0	55	1	0	5	0	2	0	0	0	0	0	96	
4:20 PM	1	25	0	0	0	53	1	0	5	0	1	0	0	0	0	0	86	
4:25 PM	1	23	0	0	0	55	3	0	4	0	3	0	0	0	0	0	89	
4:30 PM	0	32	0	0	0	41	1	0	4	0	4	0	0	0	0	0	82	
4:35 PM	0	34	0	0	0	44	4	0	9	0	3	0	0	0	0	0	94	
4:40 PM	0	45	0	0	0	51	4	0	3	0	3	0	0	0	0	0	106	
4:45 PM	0	18	0	0	0	55	1	0	6	0	0	0	0	0	0	0	80	
4:50 PM	1	31	0	0	0	58	3	0	2	0	2	0	0	0	0	0	97	
4:55 PM	1	34	0	0	0	62	6	0	5	0	2	0	0	0	0	0	110	1052
5:00 PM	1	31	0	0	0	52	1	0	5	0	2	0	0	0	0	0	92	1086
5:05 PM	0	37	0	0	0	51	2	0	4	0	1	0	0	0	0	0	95	1106
5:10 PM	0	33	0	0	0	57	5	0	5	0	3	0	0	0	0	0	103	1130
5:15 PM	1	20	0	0	0	45	0	0	2	0	1	0	0	0	0	0	69	1103
5:20 PM	0	38	0	0	0	55	2	0	2	0	1	0	0	0	0	0	98	1115
5:25 PM	1	37	0	0	0	50	1	0	2	0	0	0	0	0	0	0	91	1117
5:30 PM	0	32	0	0	0	52	1	0	3	0	1	0	0	0	0	0	89	1124
5:35 PM	0	20	0	0	0	65	1	0	5	0	0	0	0	0	0	0	91	1121
5:40 PM	1	39	0	0	0	42	0	0	2	0	0	0	0	0	0	0	84	1099
5:45 PM	0	36	0	0	0	39	2	0	1	0	0	0	0	0	0	0	78	1097
5:50 PM	0	36	0	0	0	54	2	0	1	0	0	0	0	0	0	0	93	1093
5:55 PM	0	45	0	0	0	54	1	0	1	0	1	0	0	0	0	0	102	1085
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	12	384	0	0	0	688	40	0	48	0	24	0	0	0	0	0	1196	
Heavy Trucks	0	8	0	0	0	4	4	0	4	0	0	0	0	0	0	0	20	
Buses																		
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																		

Comments: Collect on 2/13/2020

Type of report: Tube Count - Volume Data

LOCATION: Jim Warren Rd east of Port Royal Rd SPECIFIC LOCATION: CITY/STATE: Spring Hill, TN							QC JOB #: 15187209 DIRECTION: EB, WB DATE: Feb 26 2020 - Feb 26 2020			
Start Time	Mon	Tue	Wed 26 Feb 20	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			9			9			9	
01:00 AM			6			6			6	
02:00 AM			5			5			5	
03:00 AM			8			8			8	
04:00 AM			10			10			10	
05:00 AM			48			48			48	
06:00 AM			148			148			148	
07:00 AM			183			183			183	
08:00 AM			139			139			139	
09:00 AM			87			87			87	
10:00 AM			77			77			77	
11:00 AM			116			116			116	
12:00 PM			110			110			110	
01:00 PM			133			133			133	
02:00 PM			121			121			121	
03:00 PM			169			169			169	
04:00 PM			180			180			180	
05:00 PM			185			185			185	
06:00 PM			147			147			147	
07:00 PM			81			81			81	
08:00 PM			93			93			93	
09:00 PM			58			58			58	
10:00 PM			31			31			31	
11:00 PM			14			14			14	
Day Total			2158			2158			2158	
% Weekday Average			100%							
% Week Average			100%			100%				
AM Peak Volume			7:00 AM 183			7:00 AM 183			7:00 AM 183	
PM Peak Volume			5:00 PM 185			5:00 PM 185			5:00 PM 185	

Comments:

Type of report: Tube Count - Volume Data

LOCATION: Jim Warren Rd east of Port Royal Rd SPECIFIC LOCATION: CITY/STATE: Spring Hill, TN							QC JOB #: 15187209 DIRECTION: EB DATE: Feb 26 2020 - Feb 26 2020			
Start Time	Mon	Tue	Wed 26 Feb 20	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			5			5			5	
01:00 AM			6			6			6	
02:00 AM			4			4			4	
03:00 AM			2			2			2	
04:00 AM			5			5			5	
05:00 AM			7			7			7	
06:00 AM			43			43			43	
07:00 AM			66			66			66	
08:00 AM			52			52			52	
09:00 AM			31			31			31	
10:00 AM			32			32			32	
11:00 AM			55			55			55	
12:00 PM			58			58			58	
01:00 PM			69			69			69	
02:00 PM			63			63			63	
03:00 PM			98			98			98	
04:00 PM			109			109			109	
05:00 PM			114			114			114	
06:00 PM			78			78			78	
07:00 PM			57			57			57	
08:00 PM			71			71			71	
09:00 PM			36			36			36	
10:00 PM			24			24			24	
11:00 PM			12			12			12	
Day Total			1097			1097			1097	
% Weekday Average			100%							
% Week Average			100%			100%				
AM Peak Volume			7:00 AM 66			7:00 AM 66			7:00 AM 66	
PM Peak Volume			5:00 PM 114			5:00 PM 114			5:00 PM 114	

Comments:

Type of report: Tube Count - Volume Data

LOCATION: Jim Warren Rd east of Port Royal Rd SPECIFIC LOCATION: CITY/STATE: Spring Hill, TN							QC JOB #: 15187209 DIRECTION: WB DATE: Feb 26 2020 - Feb 26 2020			
Start Time	Mon	Tue	Wed 26 Feb 20	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			4			4			4	
01:00 AM			0			0			0	
02:00 AM			1			1			1	
03:00 AM			6			6			6	
04:00 AM			5			5			5	
05:00 AM			41			41			41	
06:00 AM			105			105			105	
07:00 AM			117			117			117	
08:00 AM			87			87			87	
09:00 AM			56			56			56	
10:00 AM			45			45			45	
11:00 AM			61			61			61	
12:00 PM			52			52			52	
01:00 PM			64			64			64	
02:00 PM			58			58			58	
03:00 PM			71			71			71	
04:00 PM			71			71			71	
05:00 PM			71			71			71	
06:00 PM			69			69			69	
07:00 PM			24			24			24	
08:00 PM			22			22			22	
09:00 PM			22			22			22	
10:00 PM			7			7			7	
11:00 PM			2			2			2	
Day Total			1061			1061			1061	
% Weekday Average			100%							
% Week Average			100%			100%				
AM Peak Volume			7:00 AM 117			7:00 AM 117			7:00 AM 117	
PM Peak Volume			3:00 PM 71			3:00 PM 71			3:00 PM 71	

Comments:

Type of report: Tube Count - Volume Data

LOCATION: Port Royal Rd north of Jim Warren Rd (just south of Aenon Creek bridge)							QC JOB #: 15187210			
SPECIFIC LOCATION:							DIRECTION: NB			
CITY/STATE: Spring Hill, TN							DATE: Feb 13 2020 - Feb 13 2020			
Start Time	Mon	Tue	Wed	Thu 13 Feb 20	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM				39		39			39	
01:00 AM				27		27			27	
02:00 AM				54		54			54	
03:00 AM				73		73			73	
04:00 AM				149		149			149	
05:00 AM				430		430			430	
06:00 AM				758		758			758	
07:00 AM				806		806			806	
08:00 AM				637		637			637	
09:00 AM				481		481			481	
10:00 AM				453		453			453	
11:00 AM				476		476			476	
12:00 PM				465		465			465	
01:00 PM				484		484			484	
02:00 PM				406		406			406	
03:00 PM				413		413			413	
04:00 PM				521		521			521	
05:00 PM				569		569			569	
06:00 PM				366		366			366	
07:00 PM				266		266			266	
08:00 PM				215		215			215	
09:00 PM				163		163			163	
10:00 PM				106		106			106	
11:00 PM				65		65			65	
Day Total				8422		8422			8422	
% Weekday Average				100%						
% Week Average				100%		100%				
AM Peak Volume				7:00 AM 806		7:00 AM 806			7:00 AM 806	
PM Peak Volume				5:00 PM 569		5:00 PM 569			5:00 PM 569	

Comments:

Type of report: Tube Count - Volume Data

LOCATION: Port Royal Rd north of Jim Warren Rd (just south of Aenon Creek bridge)							QC JOB #: 15187210			
SPECIFIC LOCATION:							DIRECTION: NB, SB			
CITY/STATE: Spring Hill, TN							DATE: Feb 13 2020 - Feb 13 2020			
Start Time	Mon	Tue	Wed	Thu 13 Feb 20	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM				91		91			91	
01:00 AM				68		68			68	
02:00 AM				101		101			101	
03:00 AM				110		110			110	
04:00 AM				236		236			236	
05:00 AM				571		571			571	
06:00 AM				997		997			997	
07:00 AM				1137		1137			1137	
08:00 AM				935		935			935	
09:00 AM				717		717			717	
10:00 AM				783		783			783	
11:00 AM				874		874			874	
12:00 PM				985		985			985	
01:00 PM				984		984			984	
02:00 PM				907		907			907	
03:00 PM				1039		1039			1039	
04:00 PM				1279		1279			1279	
05:00 PM				1302		1302			1302	
06:00 PM				1089		1089			1089	
07:00 PM				772		772			772	
08:00 PM				622		622			622	
09:00 PM				493		493			493	
10:00 PM				354		354			354	
11:00 PM				194		194			194	
Day Total				16640		16640			16640	
% Weekday Average				100%						
% Week Average				100%		100%				
AM Peak Volume				7:00 AM 1137		7:00 AM 1137			7:00 AM 1137	
PM Peak Volume				5:00 PM 1302		5:00 PM 1302			5:00 PM 1302	

Comments:

Type of report: Tube Count - Volume Data

LOCATION: Port Royal Rd north of Jim Warren Rd (just south of Aenon Creek bridge)							QC JOB #: 15187210			
SPECIFIC LOCATION:							DIRECTION: SB			
CITY/STATE: Spring Hill, TN							DATE: Feb 13 2020 - Feb 13 2020			
Start Time	Mon	Tue	Wed	Thu 13 Feb 20	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM				52		52			52	
01:00 AM				41		41			41	
02:00 AM				47		47			47	
03:00 AM				37		37			37	
04:00 AM				87		87			87	
05:00 AM				141		141			141	
06:00 AM				239		239			239	
07:00 AM				331		331			331	
08:00 AM				298		298			298	
09:00 AM				236		236			236	
10:00 AM				330		330			330	
11:00 AM				398		398			398	
12:00 PM				520		520			520	
01:00 PM				500		500			500	
02:00 PM				501		501			501	
03:00 PM				626		626			626	
04:00 PM				758		758			758	
05:00 PM				733		733			733	
06:00 PM				723		723			723	
07:00 PM				506		506			506	
08:00 PM				407		407			407	
09:00 PM				330		330			330	
10:00 PM				248		248			248	
11:00 PM				129		129			129	
Day Total				8218		8218			8218	
% Weekday Average				100%						
% Week Average				100%		100%				
AM Peak Volume				11:00 AM 398		11:00 AM 398			11:00 AM 398	
PM Peak Volume				4:00 PM 758		4:00 PM 758			4:00 PM 758	

Comments:

Appendix D

Trip Generation Volume Worksheets

Trip Generation - Spring Hill Towne Crossing

ITE Code	Land Use	Setting/Location	Density		Daily	AM Peak Hour			PM Peak Hour		
						Total	Enter	Exit	Total	Enter	Exit
221	Multifamily Housing (Mid-Rise)	General Urban/Suburban	334	d.u.	1,819	112	29	83	141	86	55
310	Hotel	General Urban/Suburban	120	rooms	928	54	32	22	64	33	31
820	Shopping Center	General Urban/Suburban	23,750	s.f.	2,262	22	14	8	188	90	98
850	Supermarket	General Urban/Suburban	48,500	s.f.	4,651	185	111	74	455	232	223
931	Quality Restaurant	General Urban/Suburban	5,000	s.f.	419	4	2	2	39	26	13
932	High-Turnover (Sit-Down) Restaurant	General Urban/Suburban	4,500	s.f.	505	45	25	20	44	27	17
945	Gasoline/Service Station With Convenience Market	General Urban/Suburban	20	f.p.	4,208	284	145	139	280	143	137
GROSS TRIPS					14,792	706	358	348	1,211	637	574
Gross Trips - Before Reductions					14,792	706	358	348	1,211	637	574
Residential					1,819	112	29	83	141	86	55
Hotel					928	54	32	22	64	33	31
Retail					11,121	491	270	221	923	465	458
Restaurant					924	49	27	22	83	53	30
Reduction - Internal Capture					-1,080	-62	-31	-31	-240	-120	-120
Residential					-137	-8	-2	-6	-77	-45	-32
Hotel					-107	-6	-1	-5	-18	-10	-8
Retail					-388	-22	-7	-15	-101	-40	-61
Restaurant					-448	-26	-21	-5	-44	-25	-19
Reduction - Pass-By					-4,839	-250	-125	-125	-358	-179	-179
820	Shopping Center	General Urban/Suburban	34%	34%	-742	-8	-4	-4	-56	-28	-28
850	Supermarket	General Urban/Suburban	36%	36%	-1,616	-64	-32	-32	-146	-73	-73
931	Quality Restaurant	General Urban/Suburban	44%	44%	-95	0	0	0	-8	-4	-4
932	High-Turnover (Sit-Down) Restaurant	General Urban/Suburban	43%	43%	-112	-10	-5	-5	-8	-4	-4
945	Gasoline/Service Station With Convenience Market	General Urban/Suburban	62%	56%	-2,274	-168	-84	-84	-140	-70	-70
NEW TRIPS					8,873	394	202	192	613	338	275
Residential					1,682	104	27	77	64	41	23
Commercial					7,191	290	175	115	549	297	252
DRIVEWAY VOLUMES					13,712	644	327	317	971	517	454
Residential					1,682	104	27	77	64	41	23
Commercial					12,030	540	300	240	907	476	431

INTERSECTION VOLUME WORKSHEET

Port Royal Road at Saturn Parkway WB Ramps

AM PEAK HOUR

Description	Eastbound				Saturn Parkway WB Off-Ramp Westbound				Port Royal Road Northbound				Port Royal Road Southbound				Total Intersection
	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	
Existing 2020 AM Volumes						94	2	217		93	300				595	222	1523
Existing Peak Hour Factor						0.98	0.98	0.98		0.98	0.98				0.98	0.98	
Conflicting Pedestrians																	
Heavy Vehicle %						11	2	4		4	3				2	2	
Annual Growth Rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Growth Factor	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	
Growth Trips	0	0	0	0	0	15	0	34	0	15	47	0	0	0	94	35	240
Background 2023 AM Volumes	0	0	0	0	0	109	2	251	0	108	347	0	0	0	689	257	1763
Future Peak Hour Factor	0.00	0.00	0.00	0.00	0.00	0.98	0.98	0.98	0.00	0.98	0.98	0.00	0.00	0.00	0.98	0.98	
Residential - Trip Distribution IN						50%									10%		
Residential - Trip Distribution OUT										30%	10%						
Residential - Project Trips	0	0	0	0	0	14	0	0	0	23	8	0	0	0	3	0	48
Commerical - Trip Distribution IN						20%									25%		
Commerical - Trip Distribution OUT										20%	25%						
Commercial - Project Trips	0	0	0	0	0	35	0	0	0	23	29	0	0	0	44	0	131
Project Trips (unbalanced)	0	0	0	0	0	49	0	0	0	46	37	0	0	0	47	0	179
Balancing Adjustment										-1					-1		
Pass-By Adjustment																	
Project Trips	0	0	0	0	0	49	0	0	0	45	37	0	0	0	46	0	177
Future 2023 AM Volumes	0	0	0	0	0	158	2	251	0	153	384	0	0	0	735	257	1940
% from Existing	0.0%	0.0%	0.0%	0.0%	0.0%	59.5%	100.0%	86.5%	0.0%	60.8%	78.1%	0.0%	0.0%	0.0%	81.0%	86.4%	78.5%
% from Background Growth	0.0%	0.0%	0.0%	0.0%	0.0%	9.5%	0.0%	13.5%	0.0%	9.8%	12.2%	0.0%	0.0%	0.0%	12.8%	13.6%	12.4%
% from Project Trips	0.0%	0.0%	0.0%	0.0%	0.0%	31.0%	0.0%	0.0%	0.0%	29.4%	9.6%	0.0%	0.0%	0.0%	6.3%	0.0%	9.1%

INTERSECTION VOLUME WORKSHEET

Port Royal Road at Saturn Parkway WB Ramps

PM PEAK HOUR

Description	Eastbound				Saturn Parkway WB Off-Ramp Westbound				Port Royal Road Northbound				Port Royal Road Southbound				Total Intersection
	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	
Existing 2020 PM Volumes						160	18	664		121	348				681	288	2280
Existing Peak Hour Factor						0.97	0.97	0.97		0.97	0.97				0.97	0.97	
Conflicting Pedestrians																	
Heavy Vehicle %						6	6	2		3	2				2	2	
Annual Growth Rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Growth Factor	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	
Growth Trips	0	0	0	0	0	25	3	105	0	19	55	0	0	0	108	46	361
Background 2023 PM Volumes	0	0	0	0	0	185	21	769	0	140	403	0	0	0	789	334	2641
Future Peak Hour Factor	0.00	0.00	0.00	0.00	0.00	0.97	0.97	0.97	0.00	0.97	0.97	0.00	0.00	0.00	0.97	0.97	
Residential - Trip Distribution IN						50%									10%		
Residential - Trip Distribution OUT										30%	10%						
Residential - Project Trips	0	0	0	0	0	21	0	0	0	7	2	0	0	0	4	0	34
Commerical - Trip Distribution IN						20%									25%		
Commerical - Trip Distribution OUT										20%	25%						
Commercial - Project Trips	0	0	0	0	0	59	0	0	0	50	63	0	0	0	74	0	246
Project Trips (unbalanced)	0	0	0	0	0	80	0	0	0	57	65	0	0	0	78	0	280
Balancing Adjustment						1											
Pass-By Adjustment																	
Project Trips	0	0	0	0	0	81	0	0	0	57	65	0	0	0	78	0	281
Future 2023 PM Volumes	0	0	0	0	0	266	21	769	0	197	468	0	0	0	867	334	2922
% from Existing	0.0%	0.0%	0.0%	0.0%	0.0%	60.2%	85.7%	86.3%	0.0%	61.4%	74.4%	0.0%	0.0%	0.0%	78.5%	86.2%	78.0%
% from Background Growth	0.0%	0.0%	0.0%	0.0%	0.0%	9.4%	14.3%	13.7%	0.0%	9.6%	11.8%	0.0%	0.0%	0.0%	12.5%	13.8%	12.4%
% from Project Trips	0.0%	0.0%	0.0%	0.0%	0.0%	30.5%	0.0%	0.0%	0.0%	28.9%	13.9%	0.0%	0.0%	0.0%	9.0%	0.0%	9.6%

INTERSECTION VOLUME WORKSHEET

Port Royal Road at Saturn Parkway EB Ramps

AM PEAK HOUR

Description	Saturn Parkway EB Off-Ramp Eastbound				- Westbound				Port Royal Road Northbound				Port Royal Road Southbound				Total Intersection
	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	
Existing 2020 AM Volumes		20	0	75							361	419		490	215		1580
Existing Peak Hour Factor		0.90	0.90	0.90							0.90	0.90		0.90	0.90		
Conflicting Pedestrians																	
Heavy Vehicle %		2	2	8							3	2		2	5		
Annual Growth Rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Growth Factor	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	
Growth Trips	0	3	0	12	0	0	0	0	0	0	57	66	0	77	34	0	249
Background 2023 AM Volumes	0	23	0	87	0	0	0	0	0	0	418	485	0	567	249	0	1829
Future Peak Hour Factor	0.00	0.90	0.90	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.90	0.00	0.90	0.90	0.00	
Residential - Trip Distribution IN				30%												60%	
Residential - Trip Distribution OUT											40%	50%					
Residential - Project Trips	0	0	0	8	0	0	0	0	0	0	31	39	0	0	16	0	94
Commerical - Trip Distribution IN				20%												45%	
Commerical - Trip Distribution OUT											45%	20%					
Commercial - Project Trips	0	0	0	35	0	0	0	0	0	0	52	23	0	0	79	0	189
Project Trips (unbalanced)	0	0	0	43	0	0	0	0	0	0	83	62	0	0	95	0	283
Balancing Adjustment											-1						
Pass-By Adjustment																	
Project Trips	0	0	0	43	0	0	0	0	0	0	82	62	0	0	95	0	282
Future 2023 AM Volumes	0	23	0	130	0	0	0	0	0	0	500	547	0	567	344	0	2111
% from Existing	0.0%	87.0%	0.0%	57.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	72.2%	76.6%	0.0%	86.4%	62.5%	0.0%	74.8%
% from Background Growth	0.0%	13.0%	0.0%	9.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.4%	12.1%	0.0%	13.6%	9.9%	0.0%	11.8%
% from Project Trips	0.0%	0.0%	0.0%	33.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.4%	11.3%	0.0%	0.0%	27.6%	0.0%	13.4%

INTERSECTION VOLUME WORKSHEET

Port Royal Road at Saturn Parkway EB Ramps

PM PEAK HOUR

Description	Saturn Parkway EB Off-Ramp Eastbound				Westbound				Port Royal Road Northbound				Port Royal Road Southbound				Total Intersection
	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	
Existing 2020 PM Volumes		70	0	135							378	177		607	279		1646
Existing Peak Hour Factor		0.97	0.97	0.97							0.97	0.97		0.97	0.97		
Conflicting Pedestrians																	
Heavy Vehicle %		2	2	2							2	7		4	2		
Annual Growth Rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Growth Factor	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	
Growth Trips	0	11	0	21	0	0	0	0	0	0	60	28	0	96	44	0	260
Background 2023 PM Volumes	0	81	0	156	0	0	0	0	0	0	438	205	0	703	323	0	1906
Future Peak Hour Factor	0.00	0.97	0.97	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.97	0.97	0.00	0.97	0.97	0.00	
Residential - Trip Distribution IN				30%											60%		
Residential - Trip Distribution OUT											40%	50%					
Residential - Project Trips	0	0	0	12	0	0	0	0	0	0	9	12	0	0	25	0	58
Commerical - Trip Distribution IN				20%											45%		
Commerical - Trip Distribution OUT											45%	20%					
Commercial - Project Trips	0	0	0	59	0	0	0	0	0	0	113	50	0	0	134	0	356
Project Trips (unbalanced)	0	0	0	71	0	0	0	0	0	0	122	62	0	0	159	0	414
Balancing Adjustment																	
Pass-By Adjustment																	
Project Trips	0	0	0	71	0	0	0	0	0	0	122	62	0	0	159	0	414
Future 2023 PM Volumes	0	81	0	227	0	0	0	0	0	0	560	267	0	703	482	0	2320
% from Existing	0.0%	86.4%	0.0%	59.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	67.5%	66.3%	0.0%	86.3%	57.9%	0.0%	70.9%
% from Background Growth	0.0%	13.6%	0.0%	9.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.7%	10.5%	0.0%	13.7%	9.1%	0.0%	11.2%
% from Project Trips	0.0%	0.0%	0.0%	31.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	21.8%	23.2%	0.0%	0.0%	33.0%	0.0%	17.8%

INTERSECTION VOLUME WORKSHEET

Port Royal Road at Jim Warren Road

AM PEAK HOUR

Description	Eastbound				Jim Warren Road Westbound				Port Royal Road Northbound				Port Royal Road Southbound				Total Intersection
	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	
Existing 2020 AM Volumes						10		129			841	25		63	361		1429
Existing Peak Hour Factor						0.91		0.91			0.91	0.91		0.91	0.91		
Conflicting Pedestrians																	
Heavy Vehicle %						20		6			3	4		8	8		
Annual Growth Rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Growth Factor	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	
Growth Trips	0	0	0	0	0	2	0	20	0	0	133	4	0	10	57	0	226
Background 2023 AM Volumes	0	0	0	0	0	12	0	149	0	0	974	29	0	73	418	0	1655
Future Peak Hour Factor	0.00	0.00	0.00	0.00	0.00	0.91	0.00	0.91	0.00	0.00	0.91	0.91	0.00	0.91	0.91	0.00	
Residential - Trip Distribution IN												10%		90%			
Residential - Trip Distribution OUT						10%		90%									
Residential - Project Trips	0	0	0	0	0	8	0	69	0	0	0	3	0	24	0	0	104
Commerical - Trip Distribution IN												35%		65%			
Commerical - Trip Distribution OUT						35%		65%									
Commercial - Project Trips	0	0	0	0	0	40	0	75	0	0	0	61	0	114	0	0	290
Project Trips (unbalanced)	0	0	0	0	0	48	0	144	0	0	0	64	0	138	0	0	394
Balancing Adjustment																	
Pass-By Adjustment						38		87			-87	87		38	-38		
Project Trips	0	0	0	0	0	86	0	231	0	0	-87	151	0	176	-38	0	519
Future 2023 AM Volumes	0	0	0	0	0	98	0	380	0	0	887	180	0	249	380	0	2174
% from Existing	0.0%	0.0%	0.0%	0.0%	0.0%	10.2%	0.0%	33.9%	0.0%	0.0%	94.8%	13.9%	0.0%	25.3%	95.0%	0.0%	65.7%
% from Background Growth	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	5.3%	0.0%	0.0%	15.0%	2.2%	0.0%	4.0%	15.0%	0.0%	10.4%
% from Project Trips	0.0%	0.0%	0.0%	0.0%	0.0%	87.8%	0.0%	60.8%	0.0%	0.0%	-9.8%	83.9%	0.0%	70.7%	-10.0%	0.0%	23.9%

INTERSECTION VOLUME WORKSHEET

Port Royal Road at Jim Warren Road

PM PEAK HOUR

Description	Eastbound				Jim Warren Road Westbound				Port Royal Road Northbound				Port Royal Road Southbound				Total Intersection
	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	
Existing 2020 PM Volumes						11		88			477	10		109	664		1359
Existing Peak Hour Factor						0.88		0.88			0.88	0.88		0.88	0.88		
Conflicting Pedestrians																	
Heavy Vehicle %						2		2			5	2		6	3		
Annual Growth Rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Growth Factor	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	
Growth Trips	0	0	0	0	0	2	0	14	0	0	75	2	0	17	105	0	215
Background 2023 PM Volumes	0	0	0	0	0	13	0	102	0	0	552	12	0	126	769	0	1574
Future Peak Hour Factor	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.88	0.00	0.00	0.88	0.88	0.00	0.88	0.88	0.00	
Residential - Trip Distribution IN												10%		90%			
Residential - Trip Distribution OUT						10%		90%									
Residential - Project Trips	0	0	0	0	0	2	0	21	0	0	0	4	0	37	0	0	64
Commerical - Trip Distribution IN												35%		65%			
Commerical - Trip Distribution OUT						35%		65%									
Commercial - Project Trips	0	0	0	0	0	88	0	164	0	0	0	104	0	193	0	0	549
Project Trips (unbalanced)	0	0	0	0	0	90	0	185	0	0	0	108	0	230	0	0	613
Balancing Adjustment						1		-1									
Pass-By Adjustment						104		75			-75	75		104	-104		
Project Trips	0	0	0	0	0	195	0	259	0	0	-75	183	0	334	-104	0	792
Future 2023 PM Volumes	0	0	0	0	0	208	0	361	0	0	477	195	0	460	665	0	2366
% from Existing	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	0.0%	24.4%	0.0%	0.0%	100.0%	5.1%	0.0%	23.7%	99.8%	0.0%	57.4%
% from Background Growth	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	3.9%	0.0%	0.0%	15.7%	1.0%	0.0%	3.7%	15.8%	0.0%	9.1%
% from Project Trips	0.0%	0.0%	0.0%	0.0%	0.0%	93.8%	0.0%	71.7%	0.0%	0.0%	-15.7%	93.8%	0.0%	72.6%	-15.6%	0.0%	33.5%

INTERSECTION VOLUME WORKSHEET

Port Royal Road at Tom Lunn Road

AM PEAK HOUR

Description	Tom Lunn Road Eastbound				- Westbound				Port Royal Road Northbound				Port Royal Road Southbound				Total Intersection
	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	
Existing 2020 AM Volumes		21		2						9	670				176	26	904
Existing Peak Hour Factor		0.88		0.88						0.88	0.88				0.88	0.88	
Conflicting Pedestrians																	
Heavy Vehicle %		38		2						2	2				7	15	
Annual Growth Rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Growth Factor	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	
Growth Trips	0	3	0	0	0	0	0	0	0	1	106	0	0	0	28	4	142
Background 2023 AM Volumes	0	24	0	2	0	0	0	0	0	10	776	0	0	0	204	30	1046
Future Peak Hour Factor	0.00	0.88	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.88	0.88	0.00	0.00	0.00	0.88	0.88	
Residential - Trip Distribution IN											10%						
Residential - Trip Distribution OUT															10%		
Residential - Project Trips	0	0	0	0	0	0	0	0	0	0	3	0	0	0	8	0	11
Commerical - Trip Distribution IN		5%									30%						
Commerical - Trip Distribution OUT															30%	5%	
Commercial - Project Trips	0	9	0	0	0	0	0	0	0	0	53	0	0	0	35	6	103
Project Trips (unbalanced)	0	9	0	0	0	0	0	0	0	0	56	0	0	0	43	6	114
Balancing Adjustment											-1				-1		
Pass-By Adjustment																	
Project Trips	0	9	0	0	0	0	0	0	0	0	55	0	0	0	42	6	112
Future 2023 AM Volumes	0	33	0	2	0	0	0	0	0	10	831	0	0	0	246	36	1158
% from Existing	0.0%	63.6%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	90.0%	80.6%	0.0%	0.0%	0.0%	71.5%	72.2%	78.1%
% from Background Growth	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	12.8%	0.0%	0.0%	0.0%	11.4%	11.1%	12.3%
% from Project Trips	0.0%	27.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.6%	0.0%	0.0%	0.0%	17.1%	16.7%	9.7%

INTERSECTION VOLUME WORKSHEET

Port Royal Road at Tom Lunn Road

PM PEAK HOUR

Description	Tom Lunn Road Eastbound				- Westbound				Port Royal Road Northbound				Port Royal Road Southbound				Total Intersection
	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	U-Turn	Left	Through	Right	
Existing 2020 PM Volumes		57		26						5	376				634	32	1130
Existing Peak Hour Factor		0.94		0.94						0.94	0.94				0.94	0.94	
Conflicting Pedestrians																	
Heavy Vehicle %		5		4						2	2				2	25	
Annual Growth Rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Growth Factor	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	1.158	
Growth Trips	0	9	0	4	0	0	0	0	0	1	59	0	0	0	100	5	178
Background 2023 PM Volumes	0	66	0	30	0	0	0	0	0	6	435	0	0	0	734	37	1308
Future Peak Hour Factor	0.00	0.94	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.94	0.94	0.00	0.00	0.00	0.94	0.94	
Residential - Trip Distribution IN											10%						
Residential - Trip Distribution OUT															10%		
Residential - Project Trips	0	0	0	0	0	0	0	0	0	0	4	0	0	0	2	0	6
Commerical - Trip Distribution IN		5%									30%						
Commerical - Trip Distribution OUT															30%	5%	
Commercial - Project Trips	0	15	0	0	0	0	0	0	0	0	89	0	0	0	76	13	193
Project Trips (unbalanced)	0	15	0	0	0	0	0	0	0	0	93	0	0	0	78	13	199
Balancing Adjustment																	
Pass-By Adjustment																	
Project Trips	0	15	0	0	0	0	0	0	0	0	93	0	0	0	78	13	199
Future 2023 PM Volumes	0	81	0	30	0	0	0	0	0	6	528	0	0	0	812	50	1507
% from Existing	0.0%	70.4%	0.0%	86.7%	0.0%	0.0%	0.0%	0.0%	0.0%	83.3%	71.2%	0.0%	0.0%	0.0%	78.1%	64.0%	75.0%
% from Background Growth	0.0%	11.1%	0.0%	13.3%	0.0%	0.0%	0.0%	0.0%	0.0%	16.7%	11.2%	0.0%	0.0%	0.0%	12.3%	10.0%	11.8%
% from Project Trips	0.0%	18.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	17.6%	0.0%	0.0%	0.0%	9.6%	26.0%	13.2%

TRAFFIC SIGNAL WARRANT ANALYSIS

City/County:	Spring Hill	85th-percentile speed on the major street exceeds 40 mph? (Y or N)	Y	Analyzed by:	SW
State:	TN	Isolated community with a population of less than 10,000? (Y or N)	N	Analyzed by:	Kimley-Horn
Date:	3/16/2020	Apply 56% warrant to Warrant 1, Combination Warrant? (Y or N)	N		
Major Street:	Port Royal Road	Approach Lanes - Major? (1 or 2)	1		
Minor Street:	Jim Warren Road	Approach Lanes - Minor? (1 or 2)	1		

24-Hour Volume Summary	Major Street Total of Both Approaches	Minor Street Higher Volume Approach	Warrant 1, Condition A		Warrant 1, Condition B		Warrant 1, Combination Warrant				Warrant 2	Warrant 3, Condition A			Warrant 3, Condition B	
			70%		70%		80%		80%		70%	70%			70%	
			Major Street	Minor Street	Major Street	Minor Street	Major Street	Minor Street	Major Street	Minor Street	Figure 4C-1	Minor Delay	Minor Volume	Total Intrsectn	Figure 4C-3	
12:00 AM TO 01:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
01:00 AM TO 02:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
02:00 AM TO 03:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
03:00 AM TO 04:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
04:00 AM TO 05:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
05:00 AM TO 06:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
06:00 AM TO 07:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
07:00 AM TO 08:00 AM	1158	131	331%	125%	221%	247%	290%	109%	193%	218%	218%				175%	
08:00 AM TO 09:00 AM	1034	96	295%	91%	197%	181%	259%	80%	172%	160%	160%				123%	
09:00 AM TO 10:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
10:00 AM TO 11:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
11:00 AM TO 12:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
12:00 PM TO 01:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
01:00 PM TO 02:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
02:00 PM TO 03:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
03:00 PM TO 04:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
04:00 PM TO 05:00 PM	1187	89	339%	85%	226%	168%	297%	74%	198%	148%	148%				119%	
05:00 PM TO 06:00 PM	1217	89	348%	85%	232%	168%	304%	74%	203%	148%	148%				119%	
06:00 PM TO 07:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
07:00 PM TO 08:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
08:00 PM TO 09:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
09:00 PM TO 10:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
10:00 PM TO 11:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
11:00 PM TO 12:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
Source:	MUTCD, 2009 Edition		Threshold 350 105		Threshold 525 53		Threshold 400 120		Threshold 600 60		MUTCD Figure 4C-1 and 4C-2	Warranting Volumes			MUTCD Figure 4C-3 and 4C-4	
Created By:	Kimley-Horn and Associates, Inc.		Summary		Summary		Summary		Summary		Summary	Summary			Summary	
			TOTAL	1	TOTAL	4	TOTAL	1	TOTAL	4	TOTAL	4	TOTAL	4	TOTAL	4
			Met?	NO	Met?	NO	Met?	NO	Met?	NO	Met?	YES	Met?	YES	Met?	YES

COMMENTS/NOTES: Existing 2020	COMMENTS/NOTES:

TRAFFIC SIGNAL WARRANT ANALYSIS

City/County:	Spring Hill	85th-percentile speed on the major street exceeds 40 mph? (Y or N)	Y	Analyzed by:	SW
State:	TN	Isolated community with a population of less than 10,000? (Y or N)	N	Analyzed by:	Kimley-Horn
Date:	3/16/2020	Apply 56% warrant to Warrant 1, Combination Warrant? (Y or N)	N		
Major Street:	Port Royal Road	Approach Lanes - Major? (1 or 2)	1		
Minor Street:	Jim Warren Road	Approach Lanes - Minor? (1 or 2)	1		

24-Hour Volume Summary	Major Street Total of Both Approaches	Minor Street Higher Volume Approach	Warrant 1, Condition A		Warrant 1, Condition B		Warrant 1, Combination Warrant				Warrant 2	Warrant 3, Condition A			Warrant 3, Condition B	
			70%		70%		80%		80%		70%	70%			70%	
			Major Street	Minor Street	Major Street	Minor Street	Major Street	Minor Street	Major Street	Minor Street	Figure 4C-1	Minor Delay	Minor Volume	Total Intrsectn	Figure 4C-3	
12:00 AM TO 01:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
01:00 AM TO 02:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
02:00 AM TO 03:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
03:00 AM TO 04:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
04:00 AM TO 05:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
05:00 AM TO 06:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
06:00 AM TO 07:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
07:00 AM TO 08:00 AM	1341	152	383%	145%	255%	287%	335%	127%	224%	253%	253%				203%	
08:00 AM TO 09:00 AM	1198	112	342%	107%	228%	211%	300%	93%	200%	187%	187%				149%	
09:00 AM TO 10:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
10:00 AM TO 11:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
11:00 AM TO 12:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
12:00 PM TO 01:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
01:00 PM TO 02:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
02:00 PM TO 03:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
03:00 PM TO 04:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
04:00 PM TO 05:00 PM	1375	104	393%	99%	262%	196%	344%	87%	229%	173%	173%				139%	
05:00 PM TO 06:00 PM	1410	104	403%	99%	269%	196%	353%	87%	235%	173%	173%				139%	
06:00 PM TO 07:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
07:00 PM TO 08:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
08:00 PM TO 09:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
09:00 PM TO 10:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
10:00 PM TO 11:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
11:00 PM TO 12:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
Source:	MUTCD, 2009 Edition		Threshold 350 105		Threshold 525 53		Threshold 400 120		Threshold 600 60		MUTCD Figure 4C-1 and 4C-2	Warranting Volumes			MUTCD Figure 4C-3 and 4C-4	
Created By:	Kimley-Horn and Associates, Inc.		Summary		Summary		Summary		Summary		Summary	Summary			Summary	
			TOTAL	2	TOTAL	4	TOTAL	1	TOTAL	4	TOTAL	4	TOTAL	4	TOTAL	4
			Met?	NO	Met?	NO	Met?	NO	Met?	YES	Met?	YES	Met?	YES	Met?	YES

COMMENTS/NOTES: Background 2023	COMMENTS/NOTES:

TRAFFIC SIGNAL WARRANT ANALYSIS

City/County:	Spring Hill	85th-percentile speed on the major street exceeds 40 mph? (Y or N)	Y	Analyzed by:	SW
State:	TN	Isolated community with a population of less than 10,000? (Y or N)	N	Analyzed by:	Kimley-Horn
Date:	3/16/2020	Apply 56% warrant to Warrant 1, Combination Warrant? (Y or N)	N		
Major Street:	Port Royal Road	Approach Lanes - Major? (1 or 2)	1		
Minor Street:	Jim Warren Road	Approach Lanes - Minor? (1 or 2)	2		

24-Hour Volume Summary	Major Street Total of Both Approaches	Minor Street Higher Volume Approach	Warrant 1, Condition A		Warrant 1, Condition B		Warrant 1, Combination Warrant				Warrant 2	Warrant 3, Condition A			Warrant 3, Condition B	
			70%		70%		80%		80%		70%	70%			70%	
			Major Street	Minor Street	Major Street	Minor Street	Major Street	Minor Street	Major Street	Minor Street	Figure 4C-1	Minor Delay	Minor Volume	Total Intrsectn	Figure 4C-3	
12:00 AM TO 01:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
01:00 AM TO 02:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
02:00 AM TO 03:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
03:00 AM TO 04:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
04:00 AM TO 05:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
05:00 AM TO 06:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
06:00 AM TO 07:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
07:00 AM TO 08:00 AM	1645	472	470%	337%	313%	674%	411%	295%	274%	590%	590%				472%	
08:00 AM TO 09:00 AM	1586	475	453%	339%	302%	679%	397%	297%	264%	594%	594%				475%	
09:00 AM TO 10:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
10:00 AM TO 11:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
11:00 AM TO 12:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
12:00 PM TO 01:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
01:00 PM TO 02:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
02:00 PM TO 03:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
03:00 PM TO 04:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
04:00 PM TO 05:00 PM	2024	697	578%	498%	386%	996%	506%	436%	337%	871%	871%				697%	
05:00 PM TO 06:00 PM	2093	713	598%	509%	399%	1019%	523%	446%	349%	891%	891%				713%	
06:00 PM TO 07:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
07:00 PM TO 08:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
08:00 PM TO 09:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
09:00 PM TO 10:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
10:00 PM TO 11:00 PM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
11:00 PM TO 12:00 AM			0%	0%	0%	0%	0%	0%	0%	0%	0%				0%	
Source:	MUTCD, 2009 Edition		Threshold 350 140		Threshold 525 70		Threshold 400 160		Threshold 600 80		MUTCD Figure 4C-1 and 4C-2	Warranting Volumes			MUTCD Figure 4C-3 and 4C-4	
Created By:	Kimley-Horn and Associates, Inc.		Summary		Summary		Summary		Summary		Summary	Summary			Summary	
			TOTAL	4	TOTAL	4	TOTAL	4	TOTAL	4	TOTAL	4	TOTAL	4	TOTAL	4
			Met?	NO	Met?	NO	Met?	NO	Met?	YES	Met?	YES	Met?	YES	Met?	YES

COMMENTS/NOTES: Future 2023	COMMENTS/NOTES:

Appendix E

Turn Lane Evaluations

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	35
Percent of left-turns in advancing volume (V_A), %:	40%
Advancing volume (V_A), veh/h:	629
Opposing volume (V_O), veh/h:	1067

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	123
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

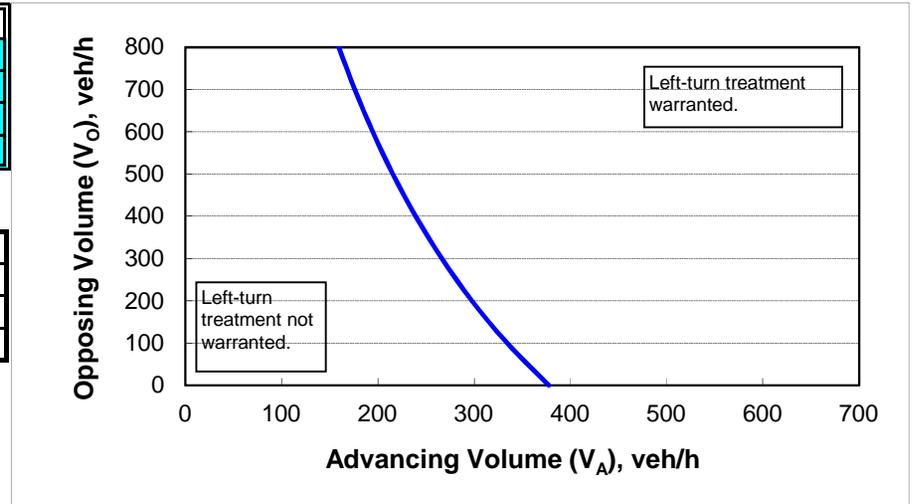


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

INPUT

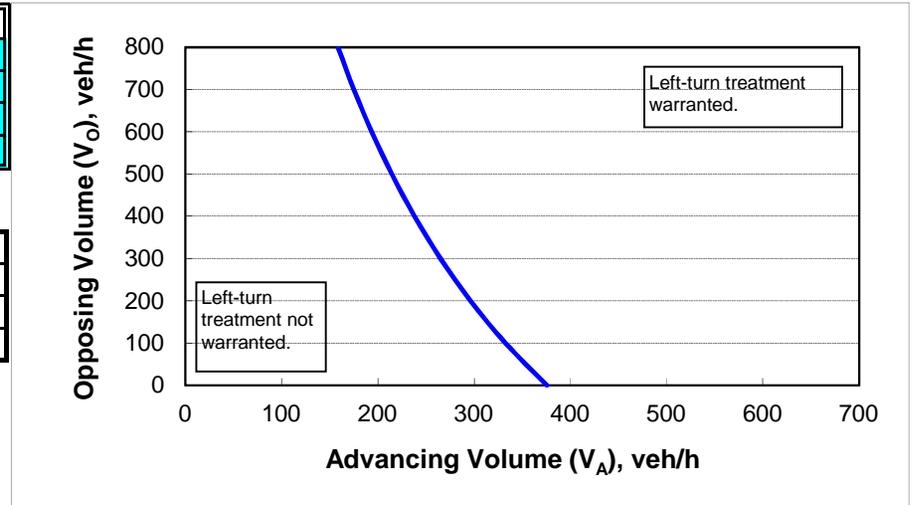
Variable	Value
85 th percentile speed, mph:	35
Percent of left-turns in advancing volume (V_A), %:	41%
Advancing volume (V_A), veh/h:	1125
Opposing volume (V_O), veh/h:	672

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	180
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9



Port Royal Road at Jim Warren Road (Proposed Alignment) - Northbound Right-Turn Lane Warrant - AM Existing

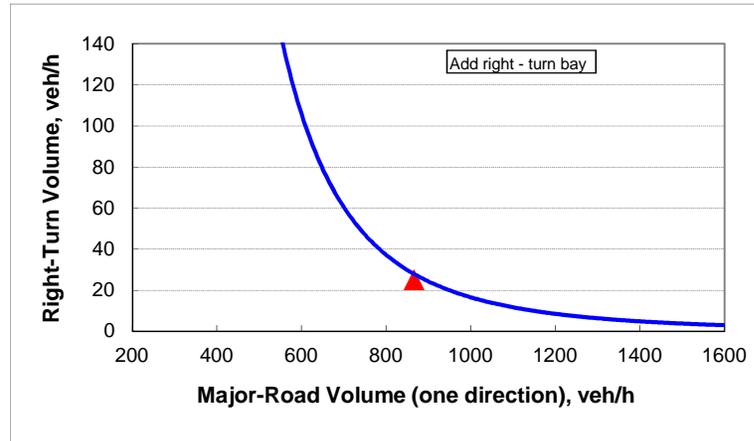
Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	35
Major-road volume (one direction), veh/h:	866
Right-turn volume, veh/h:	25

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	28
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Port Royal Road at Jim Warren Road (Proposed Alignment) - Northbound Right-Turn Lane Warrant - PM Existing

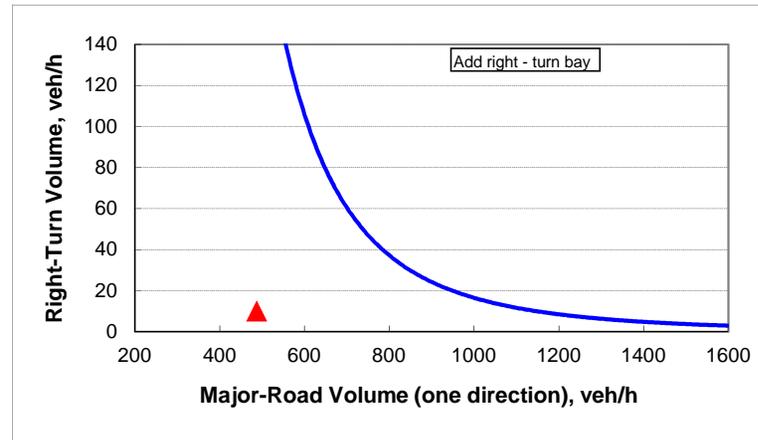
Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	35
Major-road volume (one direction), veh/h:	487
Right-turn volume, veh/h:	10

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	226
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Port Royal Road at Jim Warren Road (Proposed Alignment) - Northbound Right-Turn Lane Warrant - AM Background

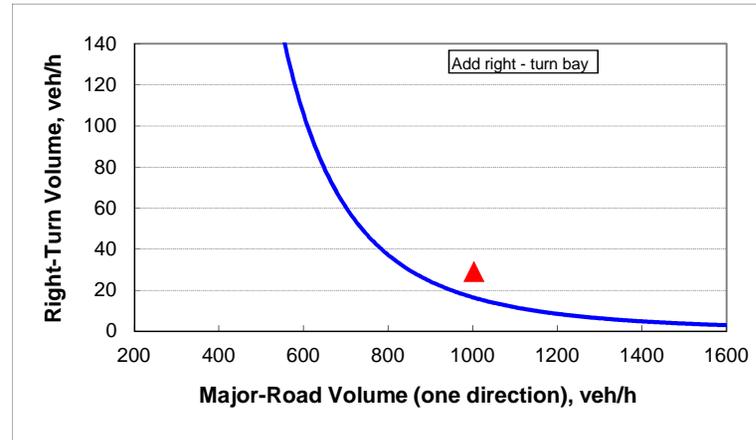
Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	35
Major-road volume (one direction), veh/h:	1003
Right-turn volume, veh/h:	29

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	16
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	



Port Royal Road at Jim Warren Road (Proposed Alignment) - Northbound Right-Turn Lane Warrant - PM Background

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	35
Major-road volume (one direction), veh/h:	564
Right-turn volume, veh/h:	12

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	133
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

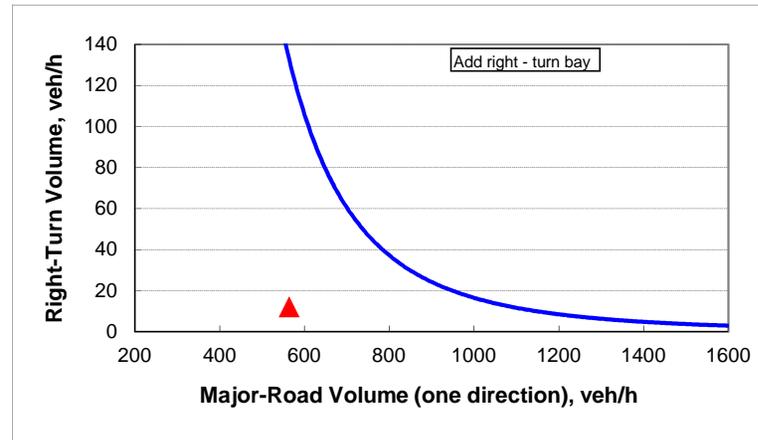


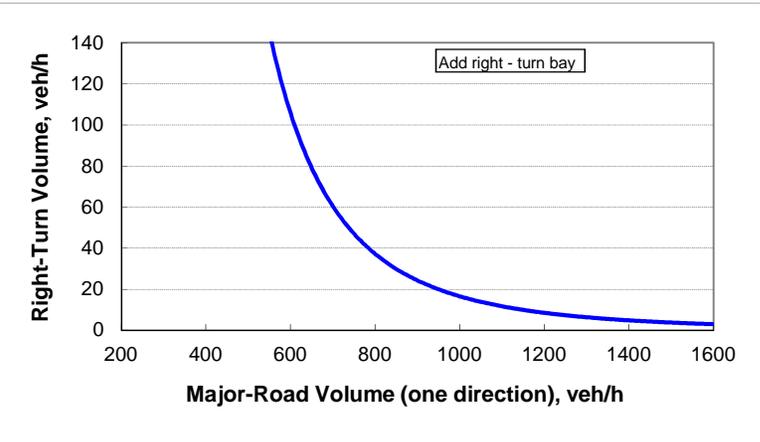
Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	35
Major-road volume (one direction), veh/h:	1067
Right-turn volume, veh/h:	180

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	13
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	



Port Royal Road at Jim Warren Road (Proposed Alignment) - Northbound Right-Turn Lane Warrant - PM Future

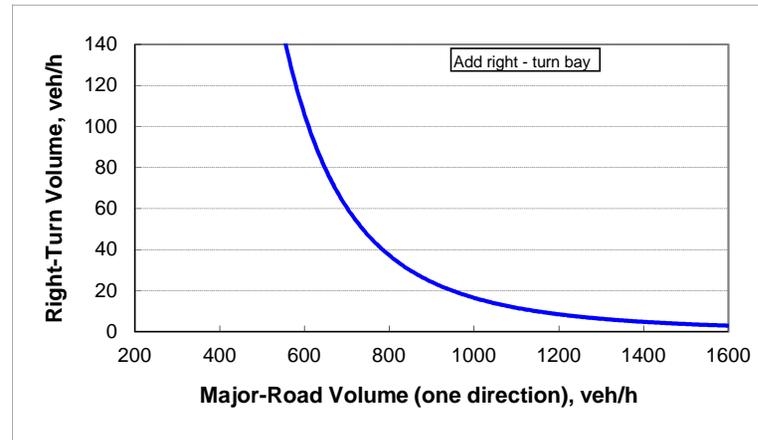
Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	35
Major-road volume (one direction), veh/h:	672
Right-turn volume, veh/h:	195

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	70
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	



Appendix F

Capacity Analyses and Queue Analyses

Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕		↕	↑↑			↕	
Traffic Vol, veh/h	0	0	0	94	2	217	93	300	0	0	595	222
Future Vol, veh/h	0	0	0	94	2	217	93	300	0	0	595	222
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	200	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	3	-	-	-1	-	-	2	-
Peak Hour Factor	25	25	25	98	98	98	98	98	25	25	98	98
Heavy Vehicles, %	0	0	0	11	2	4	4	3	0	0	2	2
Mvmt Flow	0	0	0	96	2	221	95	306	0	0	607	227

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1217	1330	153
Stage 1	496	496	-
Stage 2	721	834	-
Critical Hdwy	7.365	7.13	7.26
Critical Hdwy Stg 1	6.565	6.13	-
Critical Hdwy Stg 2	6.165	6.13	-
Follow-up Hdwy	3.6045	4.019	3.338
Pot Cap-1 Maneuver	143	123	850
Stage 1	513	501	-
Stage 2	408	333	-
Platoon blocked, %			
Mov Cap-1 Maneuver	126	0	850
Mov Cap-2 Maneuver	126	0	-
Stage 1	451	0	-
Stage 2	408	0	-

Approach	WB	NB	SB
HCM Control Delay, s	9	2.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBTWBLn1	SBT	SBR
Capacity (veh/h)	786	-	1226	-
HCM Lane V/C Ratio	0.121	-	0.261	-
HCM Control Delay (s)	10.2	-	9	-
HCM Lane LOS	B	-	A	-
HCM 95th %tile Q(veh)	0.4	-	1	-

Intersection												
Int Delay, s/veh	6.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↕		↕	↕	
Traffic Vol, veh/h	20	0	75	0	0	0	0	361	419	490	215	0
Future Vol, veh/h	20	0	75	0	0	0	0	361	419	490	215	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	2	-	-	0	-	-	2	-	-	-1	-
Peak Hour Factor	90	90	90	25	25	25	25	90	90	90	90	25
Heavy Vehicles, %	2	2	8	0	0	0	0	3	2	2	5	0
Mvmt Flow	22	0	83	0	0	0	0	401	466	544	239	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1528	2194	120	-	0	0	867	0	0
Stage 1	1327	1327	-	-	-	-	-	-	-
Stage 2	201	867	-	-	-	-	-	-	-
Critical Hdwy	7.24	6.94	7.26	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.24	5.94	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.24	5.94	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.38	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	91	35	884	0	-	-	772	-	0
Stage 1	183	192	-	0	-	-	-	-	0
Stage 2	795	334	-	0	-	-	-	-	0
Platoon blocked, %									
Mov Cap-1 Maneuver	27	0	884	-	-	-	772	-	-
Mov Cap-2 Maneuver	27	0	-	-	-	-	-	-	-
Stage 1	183	0	-	-	-	-	-	-	-
Stage 2	235	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.5	0	13.9
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	1120	772	-
HCM Lane V/C Ratio	-	-	0.094	0.705	-
HCM Control Delay (s)	-	-	8.5	20	-
HCM Lane LOS	-	-	A	C	-
HCM 95th %tile Q(veh)	-	-	0.3	5.9	-

Intersection						
Int Delay, s/veh	5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	W	T	T	T	T
Traffic Vol, veh/h	10	129	841	25	63	361
Future Vol, veh/h	10	129	841	25	63	361
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, %	5	-	-6	-	-	3
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	20	6	3	4	8	8
Mvmt Flow	11	142	924	27	69	397

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1473	938	0	0	951
Stage 1	938	-	-	-	-
Stage 2	535	-	-	-	-
Critical Hdwy	7.6	6.76	-	-	4.18
Critical Hdwy Stg 1	6.6	-	-	-	-
Critical Hdwy Stg 2	6.6	-	-	-	-
Follow-up Hdwy	3.68	3.354	-	-	2.272
Pot Cap-1 Maneuver	84	277	-	-	699
Stage 1	272	-	-	-	-
Stage 2	476	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	73	277	-	-	699
Mov Cap-2 Maneuver	73	-	-	-	-
Stage 1	272	-	-	-	-
Stage 2	416	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	46.6	0	1.6
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	231	699
HCM Lane V/C Ratio	-	-	0.661	0.099
HCM Control Delay (s)	-	-	46.6	10.7
HCM Lane LOS	-	-	E	B
HCM 95th %tile Q(veh)	-	-	4.1	0.3

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	21	2	9	670	176	26
Future Vol, veh/h	21	2	9	670	176	26
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	-	-	1	2	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	38	2	2	2	7	15
Mvmt Flow	24	2	10	761	200	30

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	996	215	230	0	0
Stage 1	215	-	-	-	-
Stage 2	781	-	-	-	-
Critical Hdwy	6.78	6.22	4.12	-	-
Critical Hdwy Stg 1	5.78	-	-	-	-
Critical Hdwy Stg 2	5.78	-	-	-	-
Follow-up Hdwy	3.842	3.318	2.218	-	-
Pot Cap-1 Maneuver	233	825	1338	-	-
Stage 1	743	-	-	-	-
Stage 2	394	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	230	825	1338	-	-
Mov Cap-2 Maneuver	230	-	-	-	-
Stage 1	733	-	-	-	-
Stage 2	394	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.4	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1338	-	245	-	-
HCM Lane V/C Ratio	0.008	-	0.107	-	-
HCM Control Delay (s)	7.7	0	21.4	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection

Int Delay, s/veh 204.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕		↕	↑↑			↑	
Traffic Vol, veh/h	0	0	0	160	18	664	121	348	0	0	681	288
Future Vol, veh/h	0	0	0	160	18	664	121	348	0	0	681	288
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	200	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	3	-	-	-1	-	-	2	-
Peak Hour Factor	25	25	25	97	97	97	97	97	25	25	97	97
Heavy Vehicles, %	0	0	0	6	6	2	3	2	0	0	2	2
Mvmt Flow	0	0	0	165	19	685	125	359	0	0	702	297

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1460	1608	180 999 0 - - - 0
Stage 1	609	609	- - - - - - - -
Stage 2	851	999	- - - - - - - -
Critical Hdwy	7.29	7.19	7.23 4.145 - - - - -
Critical Hdwy Stg 1	6.49	6.19	- - - - - - - -
Critical Hdwy Stg 2	6.09	6.19	- - - - - - - -
Follow-up Hdwy	3.557	4.057	3.319 2.2285 - - - - -
Pot Cap-1 Maneuver	~ 99	77	820 686 - 0 0 - -
Stage 1	449	430	- - - 0 0 - -
Stage 2	355	265	- - - 0 0 - -
Platoon blocked, %			- - - - -
Mov Cap-1 Maneuver	~ 81	0	820 686 - - - - -
Mov Cap-2 Maneuver	~ 81	0	- - - - - - - -
Stage 1	367	0	- - - - - - - -
Stage 2	355	0	- - - - - - - -

Approach	WB	NB	SB
HCM Control Delay, s	\$ 551.8	2.9	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBTWBLn1	SBT	SBR
Capacity (veh/h)	686	-	402	-
HCM Lane V/C Ratio	0.182	-	2.159	-
HCM Control Delay (s)	11.4	-	\$ 551.8	-
HCM Lane LOS	B	-	F	-
HCM 95th %tile Q(veh)	0.7	-	63.4	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection												
Int Delay, s/veh	31.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↔						↔		↔	↕↕	
Traffic Vol, veh/h	70	0	135	0	0	0	0	378	177	607	279	0
Future Vol, veh/h	70	0	135	0	0	0	0	378	177	607	279	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	2	-	-	0	-	-	2	-	-	-1	-
Peak Hour Factor	97	97	97	25	25	25	25	97	97	97	97	25
Heavy Vehicles, %	2	2	2	0	0	0	0	2	7	4	2	0
Mvmt Flow	72	0	139	0	0	0	0	390	182	626	288	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	2021	2112	144	-	0	0	572	0	0
Stage 1	1540	1540	-	-	-	-	-	-	-
Stage 2	481	572	-	-	-	-	-	-	-
Critical Hdwy	7.03	6.93	7.13	-	-	-	4.16	-	-
Critical Hdwy Stg 1	6.23	5.93	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.83	5.93	-	-	-	-	-	-	-
Follow-up Hdwy	3.519	4.019	3.319	-	-	-	2.238	-	-
Pot Cap-1 Maneuver	~ 45	40	871	0	-	-	987	-	0
Stage 1	138	148	-	0	-	-	-	-	0
Stage 2	588	472	-	0	-	-	-	-	0
Platoon blocked, %									
Mov Cap-1 Maneuver	~ 16	0	871	-	-	-	987	-	-
Mov Cap-2 Maneuver	~ 16	0	-	-	-	-	-	-	-
Stage 1	138	0	-	-	-	-	-	-	-
Stage 2	215	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	212.2	0	10.1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	167	987	-
HCM Lane V/C Ratio	-	-	1.266	0.634	-
HCM Control Delay (s)	-	-	212.2	14.7	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	12.1	4.7	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	2.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	11	88	477	10	109	664
Future Vol, veh/h	11	88	477	10	109	664
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, %	5	-	-6	-	-	3
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	5	2	6	3
Mvmt Flow	13	100	542	11	124	755

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1551	548	0	0	553
Stage 1	548	-	-	-	-
Stage 2	1003	-	-	-	-
Critical Hdwy	7.42	6.72	-	-	4.16
Critical Hdwy Stg 1	6.42	-	-	-	-
Critical Hdwy Stg 2	6.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.254
Pot Cap-1 Maneuver	81	497	-	-	997
Stage 1	497	-	-	-	-
Stage 2	268	-	-	-	-
Platoon blocked, %					
Mov Cap-1 Maneuver	64	497	-	-	997
Mov Cap-2 Maneuver	64	-	-	-	-
Stage 1	497	-	-	-	-
Stage 2	211	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.8	0	1.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	284	997
HCM Lane V/C Ratio	-	-	0.396	0.124
HCM Control Delay (s)	-	-	25.8	9.1
HCM Lane LOS	-	-	D	A
HCM 95th %tile Q(veh)	-	-	1.8	0.4

Intersection						
Int Delay, s/veh	1.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	57	26	5	376	634	32
Future Vol, veh/h	57	26	5	376	634	32
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	-	-	1	2	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	5	4	2	2	2	25
Mvmt Flow	61	28	5	400	674	34

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1101	691	708	0	-	0
Stage 1	691	-	-	-	-	-
Stage 2	410	-	-	-	-	-
Critical Hdwy	6.45	6.24	4.12	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.336	2.218	-	-	-
Pot Cap-1 Maneuver	231	441	891	-	-	-
Stage 1	492	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	229	441	891	-	-	-
Mov Cap-2 Maneuver	229	-	-	-	-	-
Stage 1	489	-	-	-	-	-
Stage 2	664	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.7	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	891	-	270	-	-
HCM Lane V/C Ratio	0.006	-	0.327	-	-
HCM Control Delay (s)	9.1	0	24.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	1.4	-	-

Queues

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp Background 2023 AM



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	57	56	256	110	354	703	262
v/c Ratio	0.43	0.42	0.70	0.59	0.13	0.32	0.24
Control Delay	60.6	60.1	16.6	50.6	4.5	11.7	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.6	60.1	16.6	50.6	4.5	11.7	2.1
Queue Length 50th (ft)	45	44	0	87	24	121	0
Queue Length 95th (ft)	87	86	79	146	88	199	38
Internal Link Dist (ft)		799			1219	272	
Turn Bay Length (ft)				200			200
Base Capacity (vph)	355	357	553	334	2802	2207	1084
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.16	0.46	0.33	0.13	0.32	0.24

Intersection Summary

HCM 6th Signalized Intersection Summary

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp Background 2023 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	109	2	251	108	347	0	0	689	257
Future Volume (veh/h)	0	0	0	109	2	251	108	347	0	0	689	257
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No			No		
Adj Sat Flow, veh/h/ln				1684	1817	1788	1879	1894	0	0	1847	1847
Adj Flow Rate, veh/h				112	0	256	110	354	0	0	703	262
Peak Hour Factor				0.98	0.98	0.98	0.98	0.98	0.25	0.25	0.98	0.98
Percent Heavy Veh, %				11	2	4	4	3	0	0	2	2
Cap, veh/h				605	0	286	136	2501	0	0	1966	877
Arrive On Green				0.19	0.00	0.19	0.15	1.00	0.00	0.00	0.56	0.56
Sat Flow, veh/h				3208	0	1515	1790	3694	0	0	3601	1565
Grp Volume(v), veh/h				112	0	256	110	354	0	0	703	262
Grp Sat Flow(s),veh/h/ln				1604	0	1515	1790	1800	0	0	1754	1565
Q Serve(g_s), s				3.5	0.0	19.8	7.1	0.0	0.0	0.0	13.2	10.6
Cycle Q Clear(g_c), s				3.5	0.0	19.8	7.1	0.0	0.0	0.0	13.2	10.6
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				605	0	286	136	2501	0	0	1966	877
V/C Ratio(X)				0.19	0.00	0.90	0.81	0.14	0.00	0.00	0.36	0.30
Avail Cap(c_a), veh/h				748	0	354	343	2501	0	0	1966	877
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.88	0.88	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				40.9	0.0	47.5	50.0	0.0	0.0	0.0	14.5	13.9
Incr Delay (d2), s/veh				0.1	0.0	21.2	9.5	0.1	0.0	0.0	0.5	0.9
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.4	0.0	9.1	3.3	0.0	0.0	0.0	5.2	3.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				41.1	0.0	68.8	59.5	0.1	0.0	0.0	15.0	14.8
LnGrp LOS				D	A	E	E	A	A	A	B	B
Approach Vol, veh/h					368			464			965	
Approach Delay, s/veh					60.3			14.2			15.0	
Approach LOS					E			B			B	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		90.4			16.1	74.2		29.6				
Change Period (Y+Rc), s		7.0			7.0	7.0		7.0				
Max Green Setting (Gmax), s		78.0			23.0	48.0		28.0				
Max Q Clear Time (g_c+I1), s		2.0			9.1	15.2		21.8				
Green Ext Time (p_c), s		10.3			0.2	18.1		0.8				

Intersection Summary

HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Queues

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp Background 2023 AM



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	23	100	464	539	630	277
v/c Ratio	0.20	0.53	0.48	0.51	0.81	0.10
Control Delay	56.2	20.5	21.2	4.5	63.1	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.2	20.5	21.2	4.5	63.1	2.0
Queue Length 50th (ft)	17	0	212	18	268	14
Queue Length 95th (ft)	45	55	365	100	327	23
Internal Link Dist (ft)		563	326			1219
Turn Bay Length (ft)				300	300	
Base Capacity (vph)	318	351	967	1059	904	2816
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.28	0.48	0.51	0.70	0.10

Intersection Summary

HCM 6th Signalized Intersection Summary

Jim Warren Road TIA

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp Background 2023 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷						↑	↶	↷	↷	↷
Traffic Volume (veh/h)	23	0	87	0	0	0	0	418	485	567	249	0
Future Volume (veh/h)	23	0	87	0	0	0	0	418	485	567	249	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1847	1847	1847				0	1832	1847	1909	1864	0
Adj Flow Rate, veh/h	26	0	97				0	464	539	630	277	0
Peak Hour Factor	0.90	0.90	0.90				0.25	0.90	0.90	0.90	0.90	0.25
Percent Heavy Veh, %	2	2	2				0	3	2	2	5	0
Cap, veh/h	139	0	123				0	998	852	711	2850	0
Arrive On Green	0.08	0.00	0.08				0.00	0.54	0.54	0.34	1.00	0.00
Sat Flow, veh/h	1759	0	1565				0	1832	1565	3528	3635	0
Grp Volume(v), veh/h	26	0	97				0	464	539	630	277	0
Grp Sat Flow(s),veh/h/ln	1759	0	1565				0	1832	1565	1764	1771	0
Q Serve(g_s), s	1.7	0.0	7.3				0.0	18.5	28.7	20.3	0.0	0.0
Cycle Q Clear(g_c), s	1.7	0.0	7.3				0.0	18.5	28.7	20.3	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	139	0	123				0	998	852	711	2850	0
V/C Ratio(X)	0.19	0.00	0.79				0.00	0.47	0.63	0.89	0.10	0.00
Avail Cap(c_a), veh/h	337	0	300				0	998	852	911	2850	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.67	1.67	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	1.00	0.95	0.95	0.00
Uniform Delay (d), s/veh	51.7	0.0	54.3				0.0	16.7	19.0	38.5	0.0	0.0
Incr Delay (d2), s/veh	0.6	0.0	10.5				0.0	1.6	3.6	8.3	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	3.2				0.0	7.9	10.8	8.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.3	0.0	64.7				0.0	18.2	22.5	46.8	0.1	0.0
LnGrp LOS	D	A	E				A	B	C	D	A	A
Approach Vol, veh/h		123						1003			907	
Approach Delay, s/veh		62.1						20.5			32.5	
Approach LOS		E						C			C	
Timer - Assigned Phs	1	2	4	6								
Phs Duration (G+Y+Rc), s	31.2	72.3	16.5	103.5								
Change Period (Y+Rc), s	7.0	7.0	7.0	7.0								
Max Green Setting (Gmax), s	31.0	45.0	23.0	83.0								
Max Q Clear Time (g_c+I1), s	22.3	30.7	9.3	2.0								
Green Ext Time (p_c), s	1.9	8.5	0.3	7.8								

Intersection Summary

HCM 6th Ctrl Delay	28.4
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	12.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	149	974	29	73	418
Future Vol, veh/h	12	149	974	29	73	418
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, %	5	-	-6	-	-	3
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	20	6	3	4	8	8
Mvmt Flow	13	164	1070	32	80	459

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1705	1086	0	0	1102
Stage 1	1086	-	-	-	-
Stage 2	619	-	-	-	-
Critical Hdwy	7.6	6.76	-	-	4.18
Critical Hdwy Stg 1	6.6	-	-	-	-
Critical Hdwy Stg 2	6.6	-	-	-	-
Follow-up Hdwy	3.68	3.354	-	-	2.272
Pot Cap-1 Maneuver	57	222	-	-	612
Stage 1	221	-	-	-	-
Stage 2	424	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	47	222	-	-	612
Mov Cap-2 Maneuver	47	-	-	-	-
Stage 1	221	-	-	-	-
Stage 2	349	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	126.8	0	1.7
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	174	612
HCM Lane V/C Ratio	-	-	1.017	0.131
HCM Control Delay (s)	-	-	126.8	11.8
HCM Lane LOS	-	-	F	B
HCM 95th %tile Q(veh)	-	-	8.3	0.5

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	24	2	10	776	204	30
Future Vol, veh/h	24	2	10	776	204	30
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	-	-	1	2	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	38	2	2	2	7	15
Mvmt Flow	27	2	11	882	232	34

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1153	249	266	0	-	0
Stage 1	249	-	-	-	-	-
Stage 2	904	-	-	-	-	-
Critical Hdwy	6.78	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.78	-	-	-	-	-
Critical Hdwy Stg 2	5.78	-	-	-	-	-
Follow-up Hdwy	3.842	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	186	790	1298	-	-	-
Stage 1	715	-	-	-	-	-
Stage 2	342	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	183	790	1298	-	-	-
Mov Cap-2 Maneuver	183	-	-	-	-	-
Stage 1	703	-	-	-	-	-
Stage 2	342	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	26.9	0.1	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1298	-	194	-	-
HCM Lane V/C Ratio	0.009	-	0.152	-	-
HCM Control Delay (s)	7.8	0	26.9	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0	-	0.5	-	-

Queues

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp Background 2023 PM



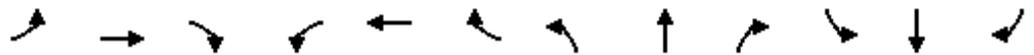
Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	105	108	793	144	415	813	344
v/c Ratio	0.17	0.17	0.97	0.79	0.24	0.72	0.48
Control Delay	23.0	23.0	44.4	83.8	26.9	41.0	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.0	23.0	44.4	83.8	26.9	41.0	8.1
Queue Length 50th (ft)	51	53	377	120	90	305	21
Queue Length 95th (ft)	91	94	#669	#219	199	383	102
Internal Link Dist (ft)		799			1219	272	
Turn Bay Length (ft)				200			200
Base Capacity (vph)	677	685	856	191	1732	1137	715
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.16	0.93	0.75	0.24	0.72	0.48

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp Background 2023 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↶	↷	↶	↶	↶	↶		↶	↶
Traffic Volume (veh/h)	0	0	0	185	21	769	140	403	0	0	789	334
Future Volume (veh/h)	0	0	0	185	21	769	140	403	0	0	789	334
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No			No		
Adj Sat Flow, veh/h/ln				1758	1758	1817	1894	1909	0	0	1847	1847
Adj Flow Rate, veh/h				207	0	793	144	415	0	0	813	344
Peak Hour Factor				0.97	0.97	0.97	0.97	0.97	0.25	0.25	0.97	0.97
Percent Heavy Veh, %				6	6	2	3	2	0	0	2	2
Cap, veh/h				1423	0	655	169	1663	0	0	1075	479
Arrive On Green				0.43	0.00	0.43	0.19	0.92	0.00	0.00	0.31	0.31
Sat Flow, veh/h				3349	0	1540	1804	3723	0	0	3601	1565
Grp Volume(v), veh/h				207	0	793	144	415	0	0	813	344
Grp Sat Flow(s),veh/h/ln				1674	0	1540	1804	1814	0	0	1754	1565
Q Serve(g_s), s				4.5	0.0	51.0	9.3	1.5	0.0	0.0	25.1	23.4
Cycle Q Clear(g_c), s				4.5	0.0	51.0	9.3	1.5	0.0	0.0	25.1	23.4
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1423	0	655	169	1663	0	0	1075	479
V/C Ratio(X)				0.15	0.00	1.21	0.85	0.25	0.00	0.00	0.76	0.72
Avail Cap(c_a), veh/h				1423	0	655	195	1663	0	0	1075	479
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.85	0.85	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				21.1	0.0	34.5	48.0	2.8	0.0	0.0	37.6	37.0
Incr Delay (d2), s/veh				0.0	0.0	108.9	22.8	0.3	0.0	0.0	5.0	8.9
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.8	0.0	38.3	4.8	0.6	0.0	0.0	11.3	10.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				21.2	0.0	143.4	70.8	3.1	0.0	0.0	42.5	45.9
LnGrp LOS				C	A	F	E	A	A	A	D	D
Approach Vol, veh/h					1000			559			1157	
Approach Delay, s/veh					118.1			20.5			43.5	
Approach LOS					F			C			D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		62.0			18.2	43.8		58.0				
Change Period (Y+Rc), s		7.0			7.0	7.0		7.0				
Max Green Setting (Gmax), s		55.0			13.0	35.0		51.0				
Max Q Clear Time (g_c+I1), s		3.5			11.3	27.1		53.0				
Green Ext Time (p_c), s		11.6			0.1	6.5		0.0				

Intersection Summary

HCM 6th Ctrl Delay	66.3
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	76	169	452	211	725	333
v/c Ratio	0.50	0.60	0.52	0.26	0.83	0.12
Control Delay	62.6	18.0	26.5	3.9	51.3	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.6	18.0	26.5	3.9	51.3	4.6
Queue Length 50th (ft)	60	6	238	0	304	26
Queue Length 95th (ft)	110	75	400	49	363	73
Internal Link Dist (ft)		563	326			1219
Turn Bay Length (ft)				300	300	
Base Capacity (vph)	443	517	874	819	962	2817
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.33	0.52	0.26	0.75	0.12

Intersection Summary

HCM 6th Signalized Intersection Summary

Jim Warren Road TIA

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp Background 2023 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷						↑	↶	↷	↷	↷
Traffic Volume (veh/h)	81	0	156	0	0	0	0	438	205	703	323	0
Future Volume (veh/h)	81	0	156	0	0	0	0	438	205	703	323	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1847	1847	1847				0	1847	1773	1879	1909	0
Adj Flow Rate, veh/h	84	0	161				0	452	211	725	333	0
Peak Hour Factor	0.97	0.97	0.97				0.25	0.97	0.97	0.97	0.97	0.25
Percent Heavy Veh, %	2	2	2				0	2	7	4	2	0
Cap, veh/h	218	0	194				0	868	706	801	2755	0
Arrive On Green	0.12	0.00	0.12				0.00	0.47	0.47	0.39	1.00	0.00
Sat Flow, veh/h	1759	0	1565				0	1847	1502	3472	3723	0
Grp Volume(v), veh/h	84	0	161				0	452	211	725	333	0
Grp Sat Flow(s),veh/h/ln	1759	0	1565				0	1847	1502	1736	1814	0
Q Serve(g_s), s	5.3	0.0	12.1				0.0	20.6	10.4	23.6	0.0	0.0
Cycle Q Clear(g_c), s	5.3	0.0	12.1				0.0	20.6	10.4	23.6	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	218	0	194				0	868	706	801	2755	0
V/C Ratio(X)	0.39	0.00	0.83				0.00	0.52	0.30	0.90	0.12	0.00
Avail Cap(c_a), veh/h	469	0	417				0	868	706	955	2755	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.67	1.67	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	1.00	0.71	0.71	0.00
Uniform Delay (d), s/veh	48.3	0.0	51.3				0.0	22.3	19.6	35.6	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.0	8.7				0.0	2.2	1.1	8.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	5.2				0.0	9.2	3.8	9.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.5	0.0	60.1				0.0	24.5	20.7	43.6	0.1	0.0
LnGrp LOS	D	A	E				A	C	C	D	A	A
Approach Vol, veh/h		245						663			1058	
Approach Delay, s/veh		56.4						23.3			29.9	
Approach LOS		E						C			C	
Timer - Assigned Phs	1	2	4	6								
Phs Duration (G+Y+Rc), s	34.7	63.4	21.9	98.1								
Change Period (Y+Rc), s	7.0	7.0	7.0	7.0								
Max Green Setting (Gmax), s	33.0	34.0	32.0	74.0								
Max Q Clear Time (g_c+I1), s	25.6	22.6	14.1	2.0								
Green Ext Time (p_c), s	2.1	6.1	0.8	9.5								

Intersection Summary

HCM 6th Ctrl Delay	31.0
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	4.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	W	T	T	T	T
Traffic Vol, veh/h	13	102	552	12	126	769
Future Vol, veh/h	13	102	552	12	126	769
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, %	5	-	-6	-	-	3
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	5	2	6	3
Mvmt Flow	15	116	627	14	143	874

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1794	634	0	0	641	0
Stage 1	634	-	-	-	-	-
Stage 2	1160	-	-	-	-	-
Critical Hdwy	7.42	6.72	-	-	4.16	-
Critical Hdwy Stg 1	6.42	-	-	-	-	-
Critical Hdwy Stg 2	6.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.254	-
Pot Cap-1 Maneuver	54	439	-	-	924	-
Stage 1	443	-	-	-	-	-
Stage 2	216	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	38	439	-	-	924	-
Mov Cap-2 Maneuver	38	-	-	-	-	-
Stage 1	443	-	-	-	-	-
Stage 2	151	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	51.7	0	1.4
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	200	924
HCM Lane V/C Ratio	-	-	0.653	0.155
HCM Control Delay (s)	-	-	51.7	9.6
HCM Lane LOS	-	-	F	A
HCM 95th %tile Q(veh)	-	-	3.9	0.5

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	66	30	6	435	734	37
Future Vol, veh/h	66	30	6	435	734	37
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	-	-	1	2	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	5	4	2	2	2	25
Mvmt Flow	70	32	6	463	781	39

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1276	801	820	0	-	0
Stage 1	801	-	-	-	-	-
Stage 2	475	-	-	-	-	-
Critical Hdwy	6.45	6.24	4.12	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.336	2.218	-	-	-
Pot Cap-1 Maneuver	181	381	809	-	-	-
Stage 1	437	-	-	-	-	-
Stage 2	619	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	179	381	809	-	-	-
Mov Cap-2 Maneuver	179	-	-	-	-	-
Stage 1	433	-	-	-	-	-
Stage 2	619	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	36	0.1	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	809	-	215	-	-
HCM Lane V/C Ratio	0.008	-	0.475	-	-
HCM Control Delay (s)	9.5	0	36	-	-
HCM Lane LOS	A	A	E	-	-
HCM 95th %tile Q(veh)	0	-	2.3	-	-

Queues

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp Future 2023 AM



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	82	81	256	156	392	750	262
v/c Ratio	0.54	0.53	0.67	0.67	0.14	0.36	0.25
Control Delay	63.4	62.8	14.9	59.1	4.4	14.6	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.4	62.8	14.9	59.1	4.4	14.6	2.5
Queue Length 50th (ft)	65	64	0	125	30	149	0
Queue Length 95th (ft)	115	113	77	201	77	240	43
Internal Link Dist (ft)		799			1219	301	
Turn Bay Length (ft)				200			200
Base Capacity (vph)	355	357	553	334	2758	2073	1034
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.23	0.46	0.47	0.14	0.36	0.25

Intersection Summary

HCM 6th Signalized Intersection Summary

Jim Warren Road TIA

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp Future 2023 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	158	2	251	153	384	0	0	735	257
Future Volume (veh/h)	0	0	0	158	2	251	153	384	0	0	735	257
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No			No		
Adj Sat Flow, veh/h/ln				1684	1817	1788	1879	1894	0	0	1847	1847
Adj Flow Rate, veh/h				162	0	256	156	392	0	0	750	262
Peak Hour Factor				0.98	0.98	0.98	0.98	0.98	0.25	0.25	0.98	0.98
Percent Heavy Veh, %				11	2	4	4	3	0	0	2	2
Cap, veh/h				608	0	287	184	2497	0	0	1869	834
Arrive On Green				0.19	0.00	0.19	0.21	1.00	0.00	0.00	0.53	0.53
Sat Flow, veh/h				3208	0	1515	1790	3694	0	0	3601	1565
Grp Volume(v), veh/h				162	0	256	156	392	0	0	750	262
Grp Sat Flow(s),veh/h/ln				1604	0	1515	1790	1800	0	0	1754	1565
Q Serve(g_s), s				5.2	0.0	19.8	10.1	0.0	0.0	0.0	15.2	11.3
Cycle Q Clear(g_c), s				5.2	0.0	19.8	10.1	0.0	0.0	0.0	15.2	11.3
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				608	0	287	184	2497	0	0	1869	834
V/C Ratio(X)				0.27	0.00	0.89	0.85	0.16	0.00	0.00	0.40	0.31
Avail Cap(c_a), veh/h				748	0	354	343	2497	0	0	1869	834
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(l)				1.00	0.00	1.00	0.81	0.81	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				41.5	0.0	47.4	46.8	0.0	0.0	0.0	16.7	15.7
Incr Delay (d2), s/veh				0.2	0.0	20.6	8.5	0.1	0.0	0.0	0.6	1.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.1	0.0	9.1	4.4	0.0	0.0	0.0	6.1	4.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				41.7	0.0	68.0	55.3	0.1	0.0	0.0	17.3	16.7
LnGrp LOS				D	A	E	E	A	A	A	B	B
Approach Vol, veh/h					418			548			1012	
Approach Delay, s/veh					57.8			15.8			17.2	
Approach LOS					E			B			B	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		90.3			19.3	70.9		29.7				
Change Period (Y+Rc), s		7.0			7.0	7.0		7.0				
Max Green Setting (Gmax), s		78.0			23.0	48.0		28.0				
Max Q Clear Time (g_c+I1), s		2.0			12.1	17.2		21.8				
Green Ext Time (p_c), s		1.2			0.3	18.5		1.0				

Intersection Summary

HCM 6th Ctrl Delay	25.4
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Queues

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp Future 2023 AM

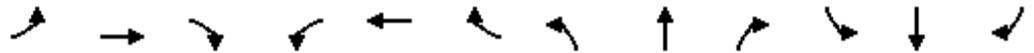


Lane Group	EBL	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	23	147	556	608	630	382
v/c Ratio	0.19	0.62	0.58	0.57	0.82	0.14
Control Delay	54.6	20.8	23.5	6.5	52.4	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.6	20.8	23.5	6.5	52.4	2.2
Queue Length 50th (ft)	17	2	273	44	224	19
Queue Length 95th (ft)	45	68	460	167	326	37
Internal Link Dist (ft)		563	414			1219
Turn Bay Length (ft)				300	300	
Base Capacity (vph)	318	387	966	1059	891	2800
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.38	0.58	0.57	0.71	0.14

Intersection Summary

HCM 6th Signalized Intersection Summary

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp Future 2023 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷						↑	↶	↷	↷	↷
Traffic Volume (veh/h)	23	0	130	0	0	0	0	500	547	567	344	0
Future Volume (veh/h)	23	0	130	0	0	0	0	500	547	567	344	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1847	1847	1847				0	1832	1847	1909	1864	0
Adj Flow Rate, veh/h	26	0	144				0	556	608	630	382	0
Peak Hour Factor	0.90	0.90	0.90				0.25	0.90	0.90	0.90	0.90	0.25
Percent Heavy Veh, %	2	2	2				0	3	2	2	5	0
Cap, veh/h	193	0	172				0	941	804	711	2740	0
Arrive On Green	0.11	0.00	0.11				0.00	0.51	0.51	0.34	1.00	0.00
Sat Flow, veh/h	1759	0	1565				0	1832	1565	3528	3635	0
Grp Volume(v), veh/h	26	0	144				0	556	608	630	382	0
Grp Sat Flow(s),veh/h/ln	1759	0	1565				0	1832	1565	1764	1771	0
Q Serve(g_s), s	1.6	0.0	10.8				0.0	25.4	37.1	20.3	0.0	0.0
Cycle Q Clear(g_c), s	1.6	0.0	10.8				0.0	25.4	37.1	20.3	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	193	0	172				0	941	804	711	2740	0
V/C Ratio(X)	0.13	0.00	0.84				0.00	0.59	0.76	0.89	0.14	0.00
Avail Cap(c_a), veh/h	337	0	300				0	941	804	911	2740	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.67	1.67	1.00
Upstream Filter(l)	1.00	0.00	1.00				0.00	1.00	1.00	0.93	0.93	0.00
Uniform Delay (d), s/veh	48.3	0.0	52.4				0.0	20.4	23.2	38.5	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	10.2				0.0	2.7	6.6	8.1	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	4.7				0.0	11.2	14.5	8.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.6	0.0	62.6				0.0	23.1	29.8	46.6	0.1	0.0
LnGrp LOS	D	A	E				A	C	C	D	A	A
Approach Vol, veh/h		170						1164			1012	
Approach Delay, s/veh		60.4						26.6			29.1	
Approach LOS		E						C			C	
Timer - Assigned Phs	1	2	4	6								
Phs Duration (G+Y+Rc), s	31.2	68.6	20.2	99.8								
Change Period (Y+Rc), s	7.0	7.0	7.0	7.0								
Max Green Setting (Gmax), s	31.0	45.0	23.0	83.0								
Max Q Clear Time (g_c+l1), s	22.3	39.1	12.8	2.0								
Green Ext Time (p_c), s	1.9	4.6	0.4	11.4								

Intersection Summary

HCM 6th Ctrl Delay	30.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	215.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖		↖	↗
Traffic Vol, veh/h	98	380	887	180	249	380
Future Vol, veh/h	98	380	887	180	249	380
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	5	-	-6	-	-	3
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	20	6	3	4	8	8
Mvmt Flow	108	418	975	198	274	418

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	2040	1074	0	0	1173
Stage 1	1074	-	-	-	-
Stage 2	966	-	-	-	-
Critical Hdwy	7.6	6.76	-	-	4.18
Critical Hdwy Stg 1	6.6	-	-	-	-
Critical Hdwy Stg 2	6.6	-	-	-	-
Follow-up Hdwy	3.68	3.354	-	-	2.272
Pot Cap-1 Maneuver	~ 31	~ 226	-	-	574
Stage 1	225	-	-	-	-
Stage 2	262	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	~ 16	~ 226	-	-	574
Mov Cap-2 Maneuver	~ 16	-	-	-	-
Stage 1	225	-	-	-	-
Stage 2	137	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	970.8	0	6.7
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	16	226	574	-
HCM Lane V/C Ratio	-	-	6.731	1.848	0.477	-
HCM Control Delay (s)	-	-	3050.5	434.4	16.9	-
HCM Lane LOS	-	-	F	F	C	-
HCM 95th %tile Q(veh)	-	-	14.3	29.3	2.6	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	33	2	10	831	246	36
Future Vol, veh/h	33	2	10	831	246	36
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	-	-	1	2	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	38	2	2	2	7	15
Mvmt Flow	38	2	11	944	280	41

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1267	301	321	0	-	0
Stage 1	301	-	-	-	-	-
Stage 2	966	-	-	-	-	-
Critical Hdwy	6.78	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.78	-	-	-	-	-
Critical Hdwy Stg 2	5.78	-	-	-	-	-
Follow-up Hdwy	3.842	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	157	739	1239	-	-	-
Stage 1	676	-	-	-	-	-
Stage 2	318	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	154	739	1239	-	-	-
Mov Cap-2 Maneuver	154	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	318	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	34.5	0.1	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1239	-	161	-	-
HCM Lane V/C Ratio	0.009	-	0.247	-	-
HCM Control Delay (s)	7.9	0	34.5	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0	-	0.9	-	-

Queues

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp Future 2023 PM



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	148	148	793	203	482	894	344
v/c Ratio	0.22	0.22	0.98	1.07	0.29	0.84	0.52
Control Delay	23.3	23.3	50.1	121.4	31.3	48.4	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.3	23.3	50.1	121.4	31.3	48.4	10.6
Queue Length 50th (ft)	74	74	435	~176	184	346	38
Queue Length 95th (ft)	125	125	#725	#333	233	#454	125
Internal Link Dist (ft)		799			1219	269	
Turn Bay Length (ft)				200			200
Base Capacity (vph)	677	683	822	190	1666	1058	666
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.22	0.96	1.07	0.29	0.84	0.52

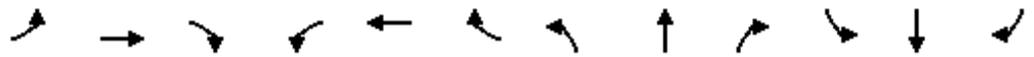
Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

Jim Warren Road TIA

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp Future 2023 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	266	21	769	197	468	0	0	867	334
Future Volume (veh/h)	0	0	0	266	21	769	197	468	0	0	867	334
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No			No		
Adj Sat Flow, veh/h/ln				1758	1758	1817	1894	1909	0	0	1847	1847
Adj Flow Rate, veh/h				290	0	793	203	482	0	0	894	344
Peak Hour Factor				0.97	0.97	0.97	0.97	0.97	0.25	0.25	0.97	0.97
Percent Heavy Veh, %				6	6	2	3	2	0	0	2	2
Cap, veh/h				1423	0	655	195	1663	0	0	1023	456
Arrive On Green				0.43	0.00	0.43	0.22	0.92	0.00	0.00	0.29	0.29
Sat Flow, veh/h				3349	0	1540	1804	3723	0	0	3601	1565
Grp Volume(v), veh/h				290	0	793	203	482	0	0	894	344
Grp Sat Flow(s),veh/h/ln				1674	0	1540	1804	1814	0	0	1754	1565
Q Serve(g_s), s				6.5	0.0	51.0	13.0	1.8	0.0	0.0	29.1	23.9
Cycle Q Clear(g_c), s				6.5	0.0	51.0	13.0	1.8	0.0	0.0	29.1	23.9
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1423	0	655	195	1663	0	0	1023	456
V/C Ratio(X)				0.20	0.00	1.21	1.04	0.29	0.00	0.00	0.87	0.75
Avail Cap(c_a), veh/h				1423	0	655	195	1663	0	0	1023	456
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(l)				1.00	0.00	1.00	0.73	0.73	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				21.7	0.0	34.5	47.0	2.8	0.0	0.0	40.4	38.6
Incr Delay (d2), s/veh				0.1	0.0	108.9	65.4	0.3	0.0	0.0	10.3	11.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.6	0.0	38.3	8.6	0.6	0.0	0.0	13.8	10.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				21.8	0.0	143.4	112.4	3.1	0.0	0.0	50.7	49.6
LnGrp LOS				C	A	F	F	A	A	A	D	D
Approach Vol, veh/h					1083			685			1238	
Approach Delay, s/veh					110.9			35.5			50.4	
Approach LOS					F			D			D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		62.0			20.0	42.0		58.0				
Change Period (Y+Rc), s		7.0			7.0	7.0		7.0				
Max Green Setting (Gmax), s		55.0			13.0	35.0		51.0				
Max Q Clear Time (g_c+I1), s		3.8			15.0	31.1		53.0				
Green Ext Time (p_c), s		13.8			0.0	3.5		0.0				

Intersection Summary

HCM 6th Ctrl Delay	68.8
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Queues

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp Future 2023 PM



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	76	242	577	275	725	497
v/c Ratio	0.49	0.69	0.65	0.32	0.86	0.18
Control Delay	61.5	17.8	29.4	4.3	76.8	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.5	17.8	29.4	4.3	76.8	0.9
Queue Length 50th (ft)	60	6	334	6	310	9
Queue Length 95th (ft)	109	88	522	60	m369	m15
Internal Link Dist (ft)		563	406			1219
Turn Bay Length (ft)				300	300	
Base Capacity (vph)	443	570	888	853	930	2809
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.42	0.65	0.32	0.78	0.18

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary

Jim Warren Road TIA

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp Future 2023 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷						↑	↶	↷	↷	↷
Traffic Volume (veh/h)	81	0	227	0	0	0	0	560	267	703	482	0
Future Volume (veh/h)	81	0	227	0	0	0	0	560	267	703	482	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1847	1847	1847				0	1847	1773	1879	1909	0
Adj Flow Rate, veh/h	84	0	234				0	577	275	725	497	0
Peak Hour Factor	0.97	0.97	0.97				0.25	0.97	0.97	0.97	0.97	0.25
Percent Heavy Veh, %	2	2	2				0	2	7	4	2	0
Cap, veh/h	300	0	267				0	782	636	801	2585	0
Arrive On Green	0.17	0.00	0.17				0.00	0.42	0.42	0.39	1.00	0.00
Sat Flow, veh/h	1759	0	1565				0	1847	1502	3472	3723	0
Grp Volume(v), veh/h	84	0	234				0	577	275	725	497	0
Grp Sat Flow(s),veh/h/ln	1759	0	1565				0	1847	1502	1736	1814	0
Q Serve(g_s), s	5.0	0.0	17.5				0.0	31.4	15.5	23.6	0.0	0.0
Cycle Q Clear(g_c), s	5.0	0.0	17.5				0.0	31.4	15.5	23.6	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	300	0	267				0	782	636	801	2585	0
V/C Ratio(X)	0.28	0.00	0.88				0.00	0.74	0.43	0.90	0.19	0.00
Avail Cap(c_a), veh/h	469	0	417				0	782	636	955	2585	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.67	1.67	1.00
Upstream Filter(l)	1.00	0.00	1.00				0.00	1.00	1.00	0.57	0.57	0.00
Uniform Delay (d), s/veh	43.3	0.0	48.5				0.0	29.0	24.4	35.6	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.0	12.1				0.0	6.2	2.1	6.6	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.0	7.7				0.0	14.8	5.8	9.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.8	0.0	60.6				0.0	35.2	26.6	42.2	0.1	0.0
LnGrp LOS	D	A	E				A	D	C	D	A	A
Approach Vol, veh/h		318						852			1222	
Approach Delay, s/veh		56.2						32.4			25.1	
Approach LOS		E						C			C	
Timer - Assigned Phs	1	2	4	6								
Phs Duration (G+Y+Rc), s	34.7	57.8	27.5	92.5								
Change Period (Y+Rc), s	7.0	7.0	7.0	7.0								
Max Green Setting (Gmax), s	33.0	34.0	32.0	74.0								
Max Q Clear Time (g_c+l1), s	25.6	33.4	19.5	2.0								
Green Ext Time (p_c), s	2.1	0.4	1.0	15.6								

Intersection Summary

HCM 6th Ctrl Delay	31.8
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	1637.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↖		↙	↗
Traffic Vol, veh/h	208	361	477	195	460	665
Future Vol, veh/h	208	361	477	195	460	665
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	5	-	-6	-	-	3
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	5	2	6	3
Mvmt Flow	236	410	542	222	523	756

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	2455	653	0	0	764
Stage 1	653	-	-	-	-
Stage 2	1802	-	-	-	-
Critical Hdwy	7.42	6.72	-	-	4.16
Critical Hdwy Stg 1	6.42	-	-	-	-
Critical Hdwy Stg 2	6.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.254
Pot Cap-1 Maneuver	~ 17	427	-	-	831
Stage 1	432	-	-	-	-
Stage 2	~ 88	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	~ 6	427	-	-	831
Mov Cap-2 Maneuver	~ 6	-	-	-	-
Stage 1	432	-	-	-	-
Stage 2	~ 33	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	6796.1	0	6.7
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	6	427	831	-
HCM Lane V/C Ratio	-	-	39.394	0.961	0.629	-
HCM Control Delay (s)	-	\$	18477.4	65.6	16.4	-
HCM Lane LOS	-	-	F	F	C	-
HCM 95th %tile Q(veh)	-	-	31.6	11.4	4.5	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	5.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	81	30	6	528	812	50
Future Vol, veh/h	81	30	6	528	812	50
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	-	-	1	2	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	5	4	2	2	2	25
Mvmt Flow	86	32	6	562	864	53

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1465	891	917	0	-	0
Stage 1	891	-	-	-	-	-
Stage 2	574	-	-	-	-	-
Critical Hdwy	6.45	6.24	4.12	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.336	2.218	-	-	-
Pot Cap-1 Maneuver	139	338	744	-	-	-
Stage 1	396	-	-	-	-	-
Stage 2	558	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	137	338	744	-	-	-
Mov Cap-2 Maneuver	137	-	-	-	-	-
Stage 1	391	-	-	-	-	-
Stage 2	558	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	70.2	0.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	744	-	163	-	-
HCM Lane V/C Ratio	0.009	-	0.724	-	-
HCM Control Delay (s)	9.9	0	70.2	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0	-	4.4	-	-

Queues

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp

Run 2023 AM Improved

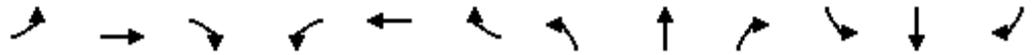


Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	82	81	256	156	392	750	262
v/c Ratio	0.54	0.53	0.67	0.67	0.14	0.36	0.25
Control Delay	63.4	62.8	14.9	82.4	0.8	14.6	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.4	62.8	14.9	82.4	0.8	14.6	2.5
Queue Length 50th (ft)	65	64	0	130	7	149	0
Queue Length 95th (ft)	115	113	77	202	9	240	43
Internal Link Dist (ft)		799			1219	301	
Turn Bay Length (ft)				200			200
Base Capacity (vph)	355	357	553	334	2758	2073	1034
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.23	0.46	0.47	0.14	0.36	0.25

Intersection Summary

HCM 6th Signalized Intersection Summary

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	158	2	251	153	384	0	0	735	257
Future Volume (veh/h)	0	0	0	158	2	251	153	384	0	0	735	257
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1684	1817	1788	1879	1894	0	0	1847	1847
Adj Flow Rate, veh/h				162	0	256	156	392	0	0	750	262
Peak Hour Factor				0.98	0.98	0.98	0.98	0.98	0.25	0.25	0.98	0.98
Percent Heavy Veh, %				11	2	4	4	3	0	0	2	2
Cap, veh/h				608	0	287	189	2497	0	0	1860	829
Arrive On Green				0.19	0.00	0.19	0.03	0.23	0.00	0.00	0.53	0.53
Sat Flow, veh/h				3208	0	1515	1790	3694	0	0	3601	1565
Grp Volume(v), veh/h				162	0	256	156	392	0	0	750	262
Grp Sat Flow(s),veh/h/ln				1604	0	1515	1790	1800	0	0	1754	1565
Q Serve(g_s), s				5.2	0.0	19.8	10.4	10.5	0.0	0.0	15.3	11.3
Cycle Q Clear(g_c), s				5.2	0.0	19.8	10.4	10.5	0.0	0.0	15.3	11.3
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				608	0	287	189	2497	0	0	1860	829
V/C Ratio(X)				0.27	0.00	0.89	0.83	0.16	0.00	0.00	0.40	0.32
Avail Cap(c_a), veh/h				748	0	354	343	2497	0	0	1860	829
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.81	0.81	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				41.5	0.0	47.4	56.8	18.2	0.0	0.0	16.9	15.9
Incr Delay (d2), s/veh				0.2	0.0	20.6	7.3	0.1	0.0	0.0	0.7	1.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.1	0.0	9.1	5.3	4.9	0.0	0.0	6.2	4.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				41.7	0.0	68.0	64.1	18.3	0.0	0.0	17.5	16.9
LnGrp LOS				D	A	E	E	B	A	A	B	B
Approach Vol, veh/h					418			548			1012	
Approach Delay, s/veh					57.8			31.3			17.4	
Approach LOS					E			C			B	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		90.3			19.7	70.6		29.7				
Change Period (Y+Rc), s		7.0			7.0	7.0		7.0				
Max Green Setting (Gmax), s		78.0			23.0	48.0		28.0				
Max Q Clear Time (g_c+I1), s		12.5			12.4	17.3		21.8				
Green Ext Time (p_c), s		1.2			0.3	18.5		1.0				

Intersection Summary

HCM 6th Ctrl Delay	29.8
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Queues

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp

2023 AM Improved



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	23	147	556	608	630	382
v/c Ratio	0.19	0.62	0.58	0.57	0.82	0.14
Control Delay	54.6	20.8	15.6	2.8	52.1	4.1
Queue Delay	0.0	0.0	0.7	0.2	0.0	0.0
Total Delay	54.6	20.8	16.3	3.0	52.1	4.1
Queue Length 50th (ft)	17	2	190	27	246	19
Queue Length 95th (ft)	45	68	246	27	318	97
Internal Link Dist (ft)		563	414			1219
Turn Bay Length (ft)					300	
Base Capacity (vph)	318	387	966	1059	891	2800
Starvation Cap Reductn	0	0	152	73	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.38	0.68	0.62	0.71	0.14

Intersection Summary

HCM 6th Signalized Intersection Summary

Jim Warren Road TIA

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp

2023 AM Improved



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷						↑	↶	↷	↷	↷
Traffic Volume (veh/h)	23	0	130	0	0	0	0	500	547	567	344	0
Future Volume (veh/h)	23	0	130	0	0	0	0	500	547	567	344	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1847	1847	1847				0	1832	1847	1909	1864	0
Adj Flow Rate, veh/h	26	0	144				0	556	608	630	382	0
Peak Hour Factor	0.90	0.90	0.90				0.25	0.90	0.90	0.90	0.90	0.25
Percent Heavy Veh, %	2	2	2				0	3	2	2	5	0
Cap, veh/h	193	0	172				0	941	804	711	2740	0
Arrive On Green	0.11	0.00	0.11				0.00	0.51	0.51	0.34	1.00	0.00
Sat Flow, veh/h	1759	0	1565				0	1832	1565	3528	3635	0
Grp Volume(v), veh/h	26	0	144				0	556	608	630	382	0
Grp Sat Flow(s),veh/h/ln	1759	0	1565				0	1832	1565	1764	1771	0
Q Serve(g_s), s	1.6	0.0	10.8				0.0	25.4	37.1	20.3	0.0	0.0
Cycle Q Clear(g_c), s	1.6	0.0	10.8				0.0	25.4	37.1	20.3	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	193	0	172				0	941	804	711	2740	0
V/C Ratio(X)	0.13	0.00	0.84				0.00	0.59	0.76	0.89	0.14	0.00
Avail Cap(c_a), veh/h	337	0	300				0	941	804	911	2740	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.67	1.67	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.73	0.73	0.93	0.93	0.00
Uniform Delay (d), s/veh	48.3	0.0	52.4				0.0	20.4	23.2	38.5	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	10.2				0.0	2.0	4.9	8.1	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	4.7				0.0	11.0	14.1	8.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.6	0.0	62.6				0.0	22.4	28.1	46.6	0.1	0.0
LnGrp LOS	D	A	E				A	C	C	D	A	A
Approach Vol, veh/h		170						1164			1012	
Approach Delay, s/veh		60.4						25.4			29.1	
Approach LOS		E						C			C	
Timer - Assigned Phs	1	2	4	6								
Phs Duration (G+Y+Rc), s	31.2	68.6	20.2	99.8								
Change Period (Y+Rc), s	7.0	7.0	7.0	7.0								
Max Green Setting (Gmax), s	31.0	45.0	23.0	83.0								
Max Q Clear Time (g_c+I1), s	22.3	39.1	12.8	2.0								
Green Ext Time (p_c), s	1.9	4.6	0.4	11.4								

Intersection Summary

HCM 6th Ctrl Delay	29.5
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Queues
 3: Port Royal Road & Jim Warren Road (Realigned)



Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	108	418	1173	274	418
v/c Ratio	0.62	0.81	0.57	0.65	0.31
Control Delay	65.3	44.2	17.7	17.9	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.4
Total Delay	65.3	44.2	17.7	17.9	5.8
Queue Length 50th (ft)	81	256	283	82	75
Queue Length 95th (ft)	136	359	393	187	246
Internal Link Dist (ft)	785		160		414
Turn Bay Length (ft)	300				
Base Capacity (vph)	354	525	2045	430	1354
Starvation Cap Reductn	0	0	0	0	490
Spillback Cap Reductn	0	0	6	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.31	0.80	0.58	0.64	0.48
Intersection Summary					

HCM 6th Signalized Intersection Summary
 3: Port Royal Road & Jim Warren Road (Realigned)

Jim Warren Road TIA
 Future 2023 AM Improved



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	98	380	887	180	249	380
Future Volume (veh/h)	98	380	887	180	249	380
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1456	1664	2091	2091	1728	1728
Adj Flow Rate, veh/h	108	418	975	198	274	418
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	20	6	3	3	8	8
Cap, veh/h	335	486	1662	337	361	1138
Arrive On Green	0.24	0.24	0.51	0.51	0.21	1.00
Sat Flow, veh/h	1387	1410	3395	667	1646	1728
Grp Volume(v), veh/h	108	418	588	585	274	418
Grp Sat Flow(s),veh/h/ln	1387	1410	1986	1971	1646	1728
Q Serve(g_s), s	7.7	29.0	25.0	25.1	9.9	0.0
Cycle Q Clear(g_c), s	7.7	29.0	25.0	25.1	9.9	0.0
Prop In Lane	1.00	1.00		0.34	1.00	
Lane Grp Cap(c), veh/h	335	486	1003	995	361	1138
V/C Ratio(X)	0.32	0.86	0.59	0.59	0.76	0.37
Avail Cap(c_a), veh/h	335	486	1003	995	452	1138
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.4	36.6	20.9	20.9	15.1	0.0
Incr Delay (d2), s/veh	0.6	14.4	2.5	2.5	5.7	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	13.2	11.9	11.8	3.2	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	38.0	50.9	23.4	23.4	20.8	0.9
LnGrp LOS	D	D	C	C	C	A
Approach Vol, veh/h	526		1173			692
Approach Delay, s/veh	48.3		23.4			8.8
Approach LOS	D		C			A
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	18.4	66.6			85.0	35.0
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	19.0	54.0			79.0	29.0
Max Q Clear Time (g_c+I1), s	11.9	27.1			2.0	31.0
Green Ext Time (p_c), s	0.5	8.9			2.8	0.0
Intersection Summary						
HCM 6th Ctrl Delay			24.7			
HCM 6th LOS			C			

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	33	2	10	831	246	36
Future Vol, veh/h	33	2	10	831	246	36
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	-	-	1	2	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	38	2	2	2	7	15
Mvmt Flow	38	2	11	944	280	41

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1267	301	321	0	-	0
Stage 1	301	-	-	-	-	-
Stage 2	966	-	-	-	-	-
Critical Hdwy	6.78	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.78	-	-	-	-	-
Critical Hdwy Stg 2	5.78	-	-	-	-	-
Follow-up Hdwy	3.842	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	157	739	1239	-	-	-
Stage 1	676	-	-	-	-	-
Stage 2	318	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	154	739	1239	-	-	-
Mov Cap-2 Maneuver	154	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	318	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	34.5	0.1	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1239	-	161	-	-
HCM Lane V/C Ratio	0.009	-	0.247	-	-
HCM Control Delay (s)	7.9	0	34.5	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0	-	0.9	-	-

Queues

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	148	148	793	203	482	894	344
v/c Ratio	0.23	0.23	0.99	0.92	0.28	0.87	0.52
Control Delay	24.5	24.4	51.2	76.9	34.1	50.3	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.5	24.4	51.2	76.9	34.1	50.3	10.8
Queue Length 50th (ft)	77	77	436	150	184	346	38
Queue Length 95th (ft)	129	128	#725	#299	248	#454	125
Internal Link Dist (ft)		799			1219	269	
Turn Bay Length (ft)				200			200
Base Capacity (vph)	650	657	809	220	1700	1033	657
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.23	0.98	0.92	0.28	0.87	0.52

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: Port Royal Road & Saturn Parkway WB On-Ramp/Saturn Parkway WB Off-Ramp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↖	↗	↘	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	266	21	769	197	468	0	0	867	334
Future Volume (veh/h)	0	0	0	266	21	769	197	468	0	0	867	334
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No			No		
Adj Sat Flow, veh/h/ln				1758	1758	1817	1894	1909	0	0	1847	1847
Adj Flow Rate, veh/h				290	0	793	203	482	0	0	894	344
Peak Hour Factor				0.97	0.97	0.97	0.97	0.97	0.25	0.25	0.97	0.97
Percent Heavy Veh, %				6	6	2	3	2	0	0	2	2
Cap, veh/h				1367	0	629	226	1723	0	0	1023	456
Arrive On Green				0.41	0.00	0.41	0.25	0.95	0.00	0.00	0.29	0.29
Sat Flow, veh/h				3349	0	1540	1804	3723	0	0	3601	1565
Grp Volume(v), veh/h				290	0	793	203	482	0	0	894	344
Grp Sat Flow(s),veh/h/ln				1674	0	1540	1804	1814	0	0	1754	1565
Q Serve(g_s), s				6.7	0.0	49.0	13.1	1.1	0.0	0.0	29.1	23.9
Cycle Q Clear(g_c), s				6.7	0.0	49.0	13.1	1.1	0.0	0.0	29.1	23.9
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1367	0	629	226	1723	0	0	1023	456
V/C Ratio(X)				0.21	0.00	1.26	0.90	0.28	0.00	0.00	0.87	0.75
Avail Cap(c_a), veh/h				1367	0	629	226	1723	0	0	1023	456
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.73	0.73	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				23.0	0.0	35.5	44.3	1.6	0.0	0.0	40.4	38.6
Incr Delay (d2), s/veh				0.1	0.0	129.9	27.5	0.3	0.0	0.0	10.3	11.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.7	0.0	40.6	6.7	0.4	0.0	0.0	13.8	10.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				23.1	0.0	165.4	71.8	1.9	0.0	0.0	50.7	49.6
LnGrp LOS				C	A	F	E	A	A	A	D	D
Approach Vol, veh/h					1083			685			1238	
Approach Delay, s/veh					127.3			22.6			50.4	
Approach LOS					F			C			D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		64.0			22.0	42.0		56.0				
Change Period (Y+Rc), s		7.0			7.0	7.0		7.0				
Max Green Setting (Gmax), s		57.0			15.0	35.0		49.0				
Max Q Clear Time (g_c+I1), s		3.1			15.1	31.1		51.0				
Green Ext Time (p_c), s		14.0			0.0	3.5		0.0				

Intersection Summary

HCM 6th Ctrl Delay	71.8
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Queues

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	76	242	577	275	725	497
v/c Ratio	0.49	0.69	0.65	0.33	0.86	0.18
Control Delay	61.5	17.8	21.8	3.8	70.6	1.6
Queue Delay	0.0	0.0	0.3	0.0	0.0	0.0
Total Delay	61.5	17.8	22.1	3.8	70.6	1.6
Queue Length 50th (ft)	60	6	214	12	310	11
Queue Length 95th (ft)	109	88	292	35	m362	m31
Internal Link Dist (ft)		563	406			1219
Turn Bay Length (ft)					300	
Base Capacity (vph)	443	570	888	833	930	2809
Starvation Cap Reductn	0	0	48	0	0	0
Spillback Cap Reductn	0	1	0	0	0	30
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.43	0.69	0.33	0.78	0.18

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary

Jim Warren Road TIA

2: Port Royal Road & Saturn Parkway EB Off-Ramp/Saturn Parkway EB On-Ramp

2023 PM Improved



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷						↑	↶	↷	↷	↷
Traffic Volume (veh/h)	81	0	227	0	0	0	0	560	267	703	482	0
Future Volume (veh/h)	81	0	227	0	0	0	0	560	267	703	482	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1847	1847	1847				0	1847	1773	1879	1909	0
Adj Flow Rate, veh/h	84	0	234				0	577	275	725	497	0
Peak Hour Factor	0.97	0.97	0.97				0.25	0.97	0.97	0.97	0.97	0.25
Percent Heavy Veh, %	2	2	2				0	2	7	4	2	0
Cap, veh/h	300	0	267				0	778	633	809	2585	0
Arrive On Green	0.17	0.00	0.17				0.00	0.28	0.28	0.31	0.95	0.00
Sat Flow, veh/h	1759	0	1565				0	1847	1502	3472	3723	0
Grp Volume(v), veh/h	84	0	234				0	577	275	725	497	0
Grp Sat Flow(s),veh/h/ln	1759	0	1565				0	1847	1502	1736	1814	0
Q Serve(g_s), s	5.0	0.0	17.5				0.0	34.0	18.0	23.9	1.1	0.0
Cycle Q Clear(g_c), s	5.0	0.0	17.5				0.0	34.0	18.0	23.9	1.1	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	300	0	267				0	778	633	809	2585	0
V/C Ratio(X)	0.28	0.00	0.88				0.00	0.74	0.43	0.90	0.19	0.00
Avail Cap(c_a), veh/h	469	0	417				0	778	633	955	2585	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.67	0.67	1.33	1.33	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.87	0.87	0.54	0.54	0.00
Uniform Delay (d), s/veh	43.3	0.0	48.5				0.0	37.1	31.4	40.0	0.9	0.0
Incr Delay (d2), s/veh	0.5	0.0	12.1				0.0	5.5	1.9	5.8	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.0	7.7				0.0	17.1	7.2	10.1	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.8	0.0	60.6				0.0	42.6	33.3	45.8	1.0	0.0
LnGrp LOS	D	A	E				A	D	C	D	A	A
Approach Vol, veh/h		318						852			1222	
Approach Delay, s/veh		56.2						39.6			27.6	
Approach LOS		E						D			C	
Timer - Assigned Phs	1	2	4	6								
Phs Duration (G+Y+Rc), s	34.9	57.6	27.5	92.5								
Change Period (Y+Rc), s	7.0	7.0	7.0	7.0								
Max Green Setting (Gmax), s	33.0	34.0	32.0	74.0								
Max Q Clear Time (g_c+I1), s	25.9	36.0	19.5	3.1								
Green Ext Time (p_c), s	2.0	0.0	1.0	15.5								

Intersection Summary

HCM 6th Ctrl Delay	35.7
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Queues
 3: Port Royal Road & Jim Warren Road (Realigned)



Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	236	410	764	523	756
v/c Ratio	0.80	0.53	0.47	0.89	0.57
Control Delay	67.8	14.1	22.4	41.8	7.8
Queue Delay	0.0	0.0	0.0	0.0	0.7
Total Delay	67.8	14.1	22.4	41.8	8.5
Queue Length 50th (ft)	176	108	204	232	170
Queue Length 95th (ft)	254	178	264	#378	273
Internal Link Dist (ft)	760		158		406
Turn Bay Length (ft)	300				
Base Capacity (vph)	345	816	1632	624	1325
Starvation Cap Reductn	0	0	0	0	266
Spillback Cap Reductn	0	1	27	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.68	0.50	0.48	0.84	0.71

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
 3: Port Royal Road & Jim Warren Road (Realigned)

Jim Warren Road TIA
 Future 2023 PM Improved

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			
Traffic Volume (veh/h)	208	361	477	195	460	665
Future Volume (veh/h)	208	361	477	195	460	665
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1723	1723	2061	2061	1758	1803
Adj Flow Rate, veh/h	236	410	542	222	523	756
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	5	5	6	3
Cap, veh/h	328	614	1164	475	619	1262
Arrive On Green	0.20	0.20	0.43	0.43	0.44	1.00
Sat Flow, veh/h	1641	1460	2815	1107	1674	1803
Grp Volume(v), veh/h	236	410	391	373	523	756
Grp Sat Flow(s),veh/h/ln	1641	1460	1958	1862	1674	1803
Q Serve(g_s), s	16.1	24.0	17.1	17.2	23.9	0.0
Cycle Q Clear(g_c), s	16.1	24.0	17.1	17.2	23.9	0.0
Prop In Lane	1.00	1.00		0.59	1.00	
Lane Grp Cap(c), veh/h	328	614	841	799	619	1262
V/C Ratio(X)	0.72	0.67	0.46	0.47	0.85	0.60
Avail Cap(c_a), veh/h	328	614	841	799	654	1262
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.99	0.99
Uniform Delay (d), s/veh	44.8	28.0	24.4	24.4	10.2	0.0
Incr Delay (d2), s/veh	7.4	2.8	1.8	2.0	9.5	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	9.8	8.2	7.9	5.5	0.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	52.3	30.8	26.3	26.4	19.7	2.1
LnGrp LOS	D	C	C	C	B	A
Approach Vol, veh/h	646		764			1279
Approach Delay, s/veh	38.6		26.3			9.3
Approach LOS	D		C			A
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	32.5	57.5			90.0	30.0
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	29.0	49.0			84.0	24.0
Max Q Clear Time (g_c+I1), s	25.9	19.2			2.0	26.0
Green Ext Time (p_c), s	0.6	5.3			6.5	0.0
Intersection Summary						
HCM 6th Ctrl Delay			21.2			
HCM 6th LOS			C			

Intersection						
Int Delay, s/veh	5.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	81	30	6	528	812	50
Future Vol, veh/h	81	30	6	528	812	50
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	-	-	1	2	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	5	4	2	2	2	25
Mvmt Flow	86	32	6	562	864	53

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1465	891	917	0	-	0
Stage 1	891	-	-	-	-	-
Stage 2	574	-	-	-	-	-
Critical Hdwy	6.45	6.24	4.12	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.336	2.218	-	-	-
Pot Cap-1 Maneuver	139	338	744	-	-	-
Stage 1	396	-	-	-	-	-
Stage 2	558	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	137	338	744	-	-	-
Mov Cap-2 Maneuver	137	-	-	-	-	-
Stage 1	391	-	-	-	-	-
Stage 2	558	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	70.2	0.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	744	-	163	-	-
HCM Lane V/C Ratio	0.009	-	0.724	-	-
HCM Control Delay (s)	9.9	0	70.2	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0	-	4.4	-	-