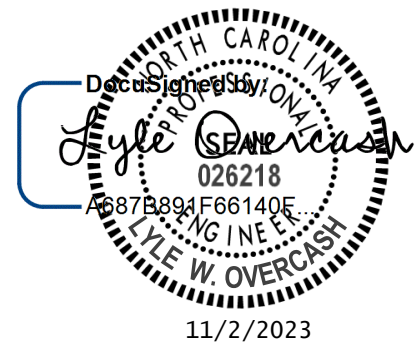


MEMORANDUM

To: Russell Dalton, P.E., Town of Apex
From: Lyle Overcash, P.E., Kimley-Horn and Associates, Inc.
Date: November 2, 2023
Subject: Apex CTP Amendments - Seymour PUD



Background

As per the Town of Apex website, “Advance Apex was a 20-month planning process conducted between July 2017 and February 2019 that resulted in two plans – a long-range Transportation Plan and an updated future land use map. At the February 5, 2019 meeting, the Town Council voted unanimously to adopt *Advance Apex: The 2045 Transportation Plan and Advance Apex: The 2045 Land Use Map Update*. The maps depicting the Town’s long-range transportation and land use plans are “living” documents, regularly updated based on new information and development. Any updates to the maps are presented during a public hearing for consideration by both the Planning Board and Town Council.”

The Seymour PUD property falls within an area that has the following long-range transportation facilities planned that are proposed for modifications with the Seymour PUD project:

- Major Collector – 2-lanes on new location from Tingen Road east to realigned Perry Road
- Tingen Road/Veridea Parkway – 4-lane with median via widening from south of US 1 to Apex Peakway

The previously submitted and approved *Seymour PUD TIA* (Kimley-Horn, June 2023) proposed a few changes to the Town of Apex Comprehensive Transportation Plan (CTP) to provide a safer and more equitable roadway system for all users, particularly bicycles and pedestrians. These proposed changes have been discussed with the Town of Apex staff and are described and analyzed in this traffic assessment. Town Transportation staff have expressed support for the following amendments.

Major Collector Alignment

A Major Collector is proposed through the eastern portion of the site, ultimately connecting Tingen Road and realigned Perry Road. This Major Collector was incorporated into the street network as shown in the site plan. It will be the primary access for the residential development along the eastern side of Tingen Road, as well as the proposed neighborhood commercial site in the northeast corner of the intersection of Tingen Road and the collector street.

The location of the intersection of the collector street and Tingen Road as shown on the CTP is approximately 500 north of Widger Lane. Widger Lane and Irongate Drive are already offset in a poor direction with only 200 feet between them. It is not recommended from an intersection spacing perspective to locate the Major Collector intersection where currently shown on the CTP.

The proposed location of the Major Collector intersection is approximately 630 feet north of where this intersection is shown on the CTP. This proposed location is more appropriately spaced between the intersections of Apex Peakway and Widger Lane. The node-to-node distance between Widger Lane and Apex Peakway is approximately 2,260 feet. The proposed Major Collector intersection is equidistant from both Apex Peakway and Widger Lane at approximately 1,130 feet, which provides better intersection spacing than currently shown in the CTP.

The relocation of the Major Collector to the north will project eastward through the adjacent parcel over to realigned Perry Road. Within that parcel, often referred to as the Hopson Gateway, a future Local Connection was envisioned in the CTP. This Local Connection was an extension of Shackleton Road south to Irongate Drive. It is still recommended that Shackleton Road be extended to the Major Collector, however the connection to Irongate Drive would encounter numerous environmental obstacles that were uncovered during the plan development for the Seymour PUD. Therefore, that portion of the Local Connection should be considered for removal from the CTP as well, however it should be noted that these connections are outside the Seymour PUD project boundaries.

Town Transportation Staff Conclusions

In the TIA review for the Seymour PUD property development issued on August 30, 2023 (attached), Town Transportation staff found the relocation of the Major Collector acceptable based on traffic projections.

Tingen Road/Veridea Parkway Cross-Section

The current NCDOT annual average daily traffic (AADT) volume along Tingen Road/Veridea Parkway is approximately 2,100 vehicles per day (vpd). The forecasted 2027 average daily traffic (ADT) volume, based on the TIA peak hour volumes just north of the future Major Collector, is approximately 6,000 vpd. The traffic counts utilized in the TIA were grown from the build-out year of 2027 to the future year of 2050 using an annual growth rate of 3.2%. This growth rate is based on the growth rate used in the Apex Peakway SW Connector Traffic Capacity Analysis memorandum. The calculated ADT using this methodology results in an ADT of approximately 12,400 vpd.

To compare the calculated 2050 ADT based on growth rates, the Triangle Regional Model (TRMG2) was consulted. The TRMG2 is the next generation model for the Triangle Region. It was released for planning work in January 2023 and provides a base year of 2020 and a future year of 2050. The model is based on the most recent home interview survey data and includes the most up-to-date forecasted development information as part of the 2050 socio-economic data. The model includes enhancements to several sub-models and sub-routines including Mode and Destination Choice, Accessibility, and Parking Cost and Availability. An updated fact sheet on the model is included in the attachments.

Based on coordination with the Town, two scenarios were analyzed in the TRMG2: with the proposed Perry Road Interchange and with the Perry Road Bridge. At the request of the Town, an additional model run was generated without the Perry Road Extension entirely, which is included for information in the appendix material.

Utilizing the base TRMG2 model, which includes the Perry Road Interchange, the unadjusted model ADT on the portion of Tingen Road between Apex Peakway and US 1 averages approximately 12,800 vpd. For the Perry Road Bridge scenario, this section of Perry Road was analyzed as a 4-lane bridge

only. For comparison, the average 2050 ADT on Tingen Road with the Perry Road Bridge is approximately 13,200 vpd. The 2050 model runs for these scenarios are attached. This further supports the request to reduce the ultimate cross-section of Tingen Road and is similar to the estimate (12,400 vpd) using the Apex Peakway forecast growth rate. Table 1 below provides a breakdown of the 2050 ADT volumes on different system links along Tingen Road for both scenarios analyzed.

System Links	With Perry Road Interchange	With Perry Road Bridge
James Street to Apex Peakway	2,400	2,100
Apex Peakway to Widger Lane	15,000	14,600
Widger Lane to Prince Dead End Road	10,600	11,700

The Seymour PUD property spans along both sides of Tingen Road; therefore, it would be the Town’s desire that the project widen this portion of roadway to the ultimate section. The Town’s CTP designates Tingen Road/Veridea Parkway as a 4-lane cross section, however the forecasted 2050 volumes presented do not reveal the need for such a wide cross-section. An over-designed street will result in higher speeds, longer crossing distances for pedestrians and bicycles, and more difficult turning maneuvers for vehicles, likely resulting in unnecessary crashes. Therefore, it is recommended to convert this portion of Tingen Road to a 3-lane thoroughfare with left-turn lanes at Apex Peakway. A landscaped median is also proposed to enforce the proposed right-in/right-out (RTOR) driveways north and south of the Major Collector intersection.

Town Transportation Staff Conclusions

In the TIA review for the Seymour PUD property development issued on August 30, 2023 (attached), Town staff concurs with the recommendation to change Tingen Road from a 4-lane median divided thoroughfare facility to a 3-lane thoroughfare facility in the CTP. Based on the daily traffic forecasts shown in Table 1 above, Tingen Road is forecasted to operate below capacity for a 3-lane facility in the forecast year. The Town estimated the capacity of this 3-lane portion would be approximately 18,000-19,000 vpd, therefore as a reduced cross-section, Tingen Road is forecasted to remain below capacity in 2050.

Major Collector Roundabout

The intersection of the Major Collector (Site Driveway 4) and Tingen Road is proposed as a single-lane roundabout in the previously submitted TIA; however, a roundabout was not assumed in the CTP. As detailed in the TIA analysis, the two other site driveways along Tingen Road, one to the north and one to the south of the Major Collector intersection are both proposed as right-in/right-outs (RTOR). A roundabout at this location would enable U-turns from the site driveways to enhance mobility on the corridor.

In addition, while not technically a traffic calming device, a roundabout is a traffic control measure that will improve safety on the Tingen Road corridor and will slow speeds through this area. Slower speeds along Tingen Road will be critical in the future as Grace Christian School is proposed just to the south of the Seymour PUD project and will span across both sides of Veridea Parkway.

The roundabout will enable vehicles from either side of Tingen Road to safely access the other portion of the development and ultimately over to Perry Road through a safer intersection design than a conventional intersection. As a conventional intersection, it is unlikely to meet traffic signal warrants in the future with the development, therefore will remain two-way stop control into the future with multiple turn lanes, making the intersection much wider and difficult to cross for pedestrians, bicycles, and vehicles.

An AM and PM peak hour 2050 roundabout analysis was conducted utilizing the same growth rate as the segmental analysis utilizing HCM6/SIDRA. These results are summarized in **Table 2**, located on the following page, and the roundabout capacity reports are attached. As shown in **Table 2**, a single lane roundabout in 2050 is forecasted to operate at LOS A in the AM peak hour and LOS B in the PM peak hour.

Table 2: Level-of-Service Summary		
Condition	AM Peak Hour LOS (Delay)	PM Peak Hour LOS (Delay)
Tingen Road at Major Collector Street (Site Driveway 4) - Roundabout		
Future (2050)	Overall – A (8.8) V/C Ratio – 0.52 EB – A (6.7) WB – B (11.7) NB – A (8.5) SB – A (7.3)	Overall – B (10.3) V/C Ratio – 0.65 EB – A (8.0) WB – A (8.1) NB – B (10.1) SB – B (11.5)

Town Transportation Staff Conclusions

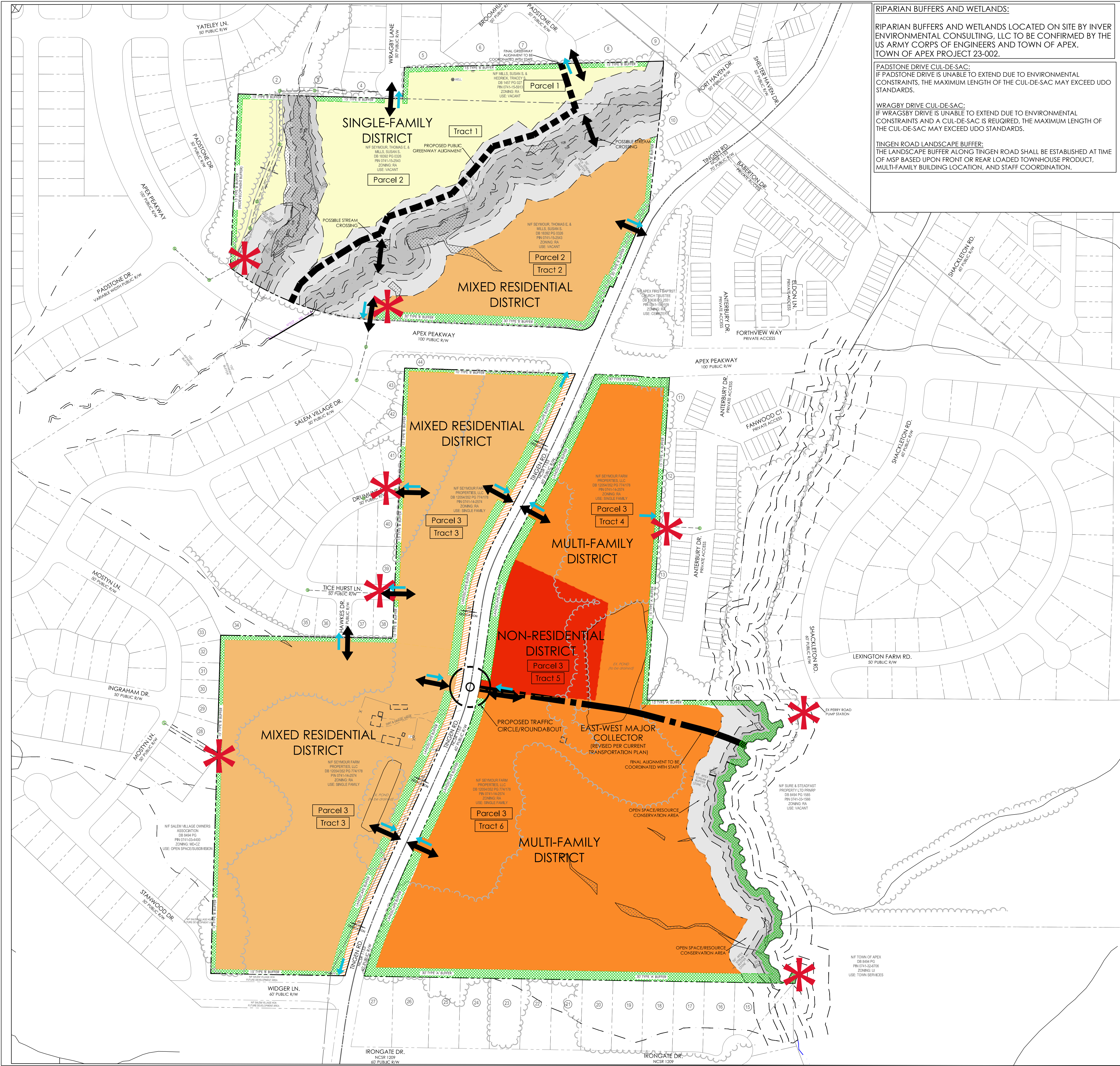
In the TIA review for the Seymour PUD property development issued on August 30, 2023 (attached), Town staff concurs with the recommendation for a roundabout to be added to the CTP at the intersection of Tingen Road at Major Collector (Site Driveway 4), with the relocation of the Major Collector north to that location. Town staff conducted further analysis to determine operations of the roundabout with 2050 forecast year volumes. Daily volumes on Tingen Road with the Perry Road interchange were used to develop a design hourly volume on Tingen Road between Apex Peakway and Widger Lane. Likewise, traffic on the minor street approaches were grown assuming a 3.2% growth rate to the forecast year 2050. Traffic analysis showed the roundabout is projected to operate at LOS D or better in the forecast year. The highest volume-to-capacity ratio was 0.83, which indicates there is additional capacity at the roundabout beyond the forecast year.

Recommendations & Conclusions

Analyses indicate that the realignment of the Major Street Collector, a 3-lane ultimate cross-section along Tingen Road, and a roundabout at the intersection of Tingen Road at Major Street Collector (Site Driveway 4) can accommodate future traffic volumes at acceptable levels-of-service. The realignment of the Major Collector is expected to provide better intersection spacing than currently shown in the CTP and Town Transportation staff finds this relocation acceptable based on traffic projections. Based on traffic forecast models, a 3-lane thoroughfare facility is expected to be more appropriate for the daily traffic volumes expected along Tingen Road. Town staff concurs with this recommendation as Tingen Road is forecasted to operate below capacity for a 3-lane facility in the forecast year. Town staff also agreed with the recommendation for a roundabout to be added to the CTP at the intersection of Tingen Road at Major Collector (Site Driveway 4), with the relocation of the Major Collector north to that location. Traffic analysis showed that the roundabout is projected to operate with acceptable levels of service in the 2050 forecast year with reserve capacity beyond the forecast year.

Based on these findings, we believe there is sufficient justification to support these modifications to the Town of Apex CTP.

Please feel free to contact me at 919-678-4131 or lyle.overcash@kimley-horn.com with any questions or comments.



RIPARIAN BUFFERS AND WETLANDS:
 RIPARIAN BUFFERS AND WETLANDS LOCATED ON SITE BY INVER ENVIRONMENTAL CONSULTING, LLC TO BE CONFIRMED BY THE US ARMY CORPS OF ENGINEERS AND TOWN OF APEX. TOWN OF APEX PROJECT 23-002.

PADSTONE DRIVE CUL-DE-SAC:
 IF PADSTONE DRIVE IS UNABLE TO EXTEND DUE TO ENVIRONMENTAL CONSTRAINTS, THE MAXIMUM LENGTH OF THE CUL-DE-SAC MAY EXCEED UDO STANDARDS.

WRAGSBY DRIVE CUL-DE-SAC:
 IF WRAGSBY DRIVE IS UNABLE TO EXTEND DUE TO ENVIRONMENTAL CONSTRAINTS AND A CUL-DE-SAC IS REQUIRED, THE MAXIMUM LENGTH OF THE CUL-DE-SAC MAY EXCEED UDO STANDARDS.

TINGEN ROAD LANDSCAPE BUFFER:
 THE LANDSCAPE BUFFER ALONG TINGEN ROAD SHALL BE ESTABLISHED AT TIME OF MSP BASED UPON FRONT OR REAR LOADED TOWNHOUSE PRODUCT, MULTI-FAMILY BUILDING LOCATION, AND STAFF COORDINATION.

	SINGLE-FAMILY (SINGLE-FAMILY)		NON-RESIDENTIAL DISTRICT
	MIXED RESIDENTIAL (SINGLE-FAMILY AND/OR TOWNHOUSE)		BUFFERS/RCA/ OPEN SPACE
	MULTI-FAMILY (MULTI-FAMILY/APARTMENT AND/OR SMALL SCALE MULTI-FAMILY)		RIGHT-OF-WAY DEDICATION
			STREAM BUFFERS

	PROJECT PERIMETER BOUNDARY
	PRELIMINARY PUBLIC GREENWAY (FINAL ALIGNMENT COORDINATED WITH STAFF)
	POTENTIAL WATER CONNECTIONS
	POTENTIAL SEWER CONNECTIONS
	POTENTIAL ACCESS POINTS

PLAN SHEETS ARE INTENDED FOR ILLUSTRATIVE PURPOSES ONLY

- SITE AND UTILITY NOTES:**
- DEVELOPMENT ACCESS AND STUB STREET LOCATIONS SHALL BE FINALIZED AT MASTER SUBDIVISION PLAN DESIGN AND APPROVAL.
 - FINAL RESOURCE CONSERVATION AREA (RCA), OPEN SPACE, AND PLAY LAWN LOCATIONS SHALL BE COORDINATED WITH STAFF AND BUILDER DURING MASTER SUBDIVISION PLAN DESIGN AND APPROVAL.
 - ALL ZONING PLAN SHEETS ARE PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY. FINAL DESIGN COMPONENTS ARE DETERMINED AT MASTER SUBDIVISION PLAN.
 - REFER TO PD TEXT DOCUMENTS FOR A LIST OF ALLOWABLE USES, ZONING CONDITIONS, AND OTHER DESIGN STANDARDS FOR THE DEVELOPMENT.
 - ENVIRONMENTAL FEATURES ARE SUBJECT TO FINAL REVIEW CONCURRENCE WITH VARIOUS REGULATING AGENCIES.
 - PUBLIC PEDESTRIAN AND VEHICULAR ACCESS IS SHOWN FOR CONCEPTUAL PURPOSES AND ARE SUBJECT TO REVISIONS DURING THE MASTER SUBDIVISION DESIGN AND APPROVAL.
 - ALL SITE ELEMENTS ARE REQUIRED TO MEET OR EXCEED TOWN OF APEX, NCDOT, OR OTHER REVIEW AUTHORITY STANDARD DESIGN SPECIFICATIONS.
 - PROJECT WILL COMPLY WITH ADOPTED TOWN MASTER PLANS INCLUDING TRANSPORTATION, WATER, SEWER, AND GREENWAYS.
 - THE PROJECT IS REQUESTING FULL TOWN SERVICES, INCLUDING BUT NOT LIMITED TO WATER, SEWER AND ELECTRICITY.
 - THE PROJECT WILL NOT UTILIZE PRIVATE SEWAGE DISPOSAL.
 - NO SITE DEVELOPMENT ACTIVITY INCLUDING, BUT NOT LIMITED TO, TESTING, CLEARING, INSTALLATION OF S&E MEASURES, OR GRADING SHALL OCCUR UNTIL REQUIRED TREE PROTECTION FENCING HAS BEEN INSTALLED AND INSPECTED. A TREE PROTECTION FENCING INSTALLATION PERMIT MAY BE OBTAINED AT THE PLANNING DEPARTMENT OR ONLINE AT [HTTP://WWW.APEXNC.ORG/215/APPLICATIONS-SCHEDULES](http://www.apexnc.org/215/APPLICATIONS-SCHEDULES).
 - TREE PROTECTION FENCING MUST BE PLACED:
 - ONE FOOT AWAY FROM ANY SAVED TREE FOR EACH INCH OF DIAMETER AT BREAST HEIGHT;
 - ALONG THE OUTSIDE LINE OF THE 100-YEAR FLOODPLAIN AND THE OUTSIDE EDGE OF ANY RIPARIAN BUFFER; AND
 - AT LEAST 10 FEET AWAY FROM ANY OTHER DESIGNATED RCA SUCH AS, BUT NOT LIMITED TO, HISTORIC BUILDINGS AND STRUCTURES, WETLANDS, AND PONDS.
 - ADDITIONAL TREE PROTECTION FENCING MAY BE REQUIRED IN OTHER LOCATIONS CLOSE TO CONSTRUCTION ACTIVITY WHERE IT IS DEEMED NECESSARY BY THE ZONING ENFORCEMENT OFFICER. SUCH AREAS MAY INCLUDE, BUT ARE NOT LIMITED TO, COMMON PROPERTY LINES OR NEAR PUBLIC AREAS (SIDEWALKS, ETC.).

POTENTIAL ACCESS POINTS:
 Potential Access Points shown on the Conceptual Site Plan / Conceptual Utility Plan (C100) are not shown in exact locations but show proposed connections. Connections can only be removed from the subdivision connectivity requirements of the PUD if the developer shows to the satisfaction of the Planning Director, in consultation with the Technical Review Committee (TRC), that the construction of the connection would be impractical based on environmental conditions found in the field at the time of Master Subdivision Plan approval.

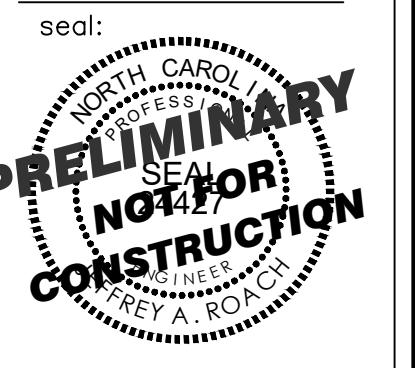
0 75 150 300
 SCALE: 1" = 150'

**CONCEPTUAL SITE PLAN/
 CONCEPTUAL UTILITY PLAN**

1
 C100 SCALE: 1"=150'

NC License #P-0673

project:
SEYMOUR MIXED-USE PUD
 TINGEN ROAD @ APEX PEAKWAY
 WHITE OAK TOWNSHIP
 APEX, NORTH CAROLINA 27502



NO.	DATE	REVISION
1	September 8, 2023	TOWN OF APEX - ZONING COMMENTS
2	October 6, 2023	TOWN OF APEX - ZONING COMMENTS
3	November 3, 2023	TOWN OF APEX - ZONING COMMENTS

title:
**CONCEPTUAL SITE PLAN/
 CONCEPTUAL UTILITY PLAN**

proj #:
 221101

date:
 JULY 3, 2023

dwg by: chkd by:
 FS JR

scale:
 As Noted

sheet:
C100
 (PUD PLAN)



August 30, 2023

Lyle Overcash, PE.
Kimley-Horn and Associates, Inc.
421 Fayetteville Street, Suite 600
Raleigh, NC 27601
(919) 677-2000

Subject: **Final staff summary and comments for the Seymour PUD TIA, 06/29/2023**

Mr. Overcash:

Please review the following summary of my comments and recommendations. You may schedule a meeting with me and your client to discuss at your convenience.

Study Area

The TIA studied access to the proposed development at the following five (5) intersections:

- Apex Peakway and Salem Village Drive/Site Driveway 1
- Tingen Road and Site Driveway 2
- Tingen Road and Site Driveway 3
- Tingen Road and Site Driveway 4
- Tingen Road and Site Driveway 5

The following ten (10) intersections were also included for analysis in the TIA study area:

- Tingen Road and Widger Lane
- Tingen Road and James Street
- James Street and Minley Way
- Apex Peakway and Apex Peakway Connector
- S Salem Street and Apex Peakway Connector
- James Street and Apex Peakway
- NC 55 and Apex Peakway
- Apex Peakway and S Hughes Street
- Apex Peakway and Perry Road
- Apex Peakway and Tingen Road

TOWN OF APEX

The Peak of Good Living

PO Box 250 Apex, NC 27502 | (919) 249-3400 | www.apexnc.org

Trip Generation

The proposed development is expected to consist of 100 single family detached housing units, 300 townhomes, 400 mid-rise apartment units, and a 15,000 square-foot daycare facility. The development is projected to generate approximately 191 new trips entering and 362 new trips exiting the site during the weekday A.M. peak hour and 335 new trips entering and 263 new trips exiting the site during the weekday P.M. peak hour. The development is projected to add an additional 5,822 new daily trips onto the adjacent roadway network.

Background traffic

Background traffic consists of 3% annual background traffic growth compounded to build out year 2027, and the following two (2) background developments.

- Fast Food Restaurant (Chick-fil-a)
- Veridea Phase 1

It should also be noted that TIP project U-5928 *Apex Peakway Southwest Connector* is projected to be constructed prior to the development build out date. This project will change traffic patterns within the development's study area and impact traffic conditions in the No Build and Build conditions. Town of Apex has shared the traffic forecast analysis report for the project, and changes to traffic patterns were incorporated into the TIA analysis for this development.

Trip Distribution and Assignment

The trip distributions to and from the development site are as follows:

- 30% to/from the south on NC 55
- 25% to/from the south on Tingen Road
- 10% to/from the north on Apex Peakway Connector
- 10% to/from the north on Perry Road
- 10% to/from the west on S Salem Street
- 5% to/from the east on S Salem Street
- 5% to/from the east on James Street
- 5% to/from the north on NC 55

Traffic Capacity Analysis and Recommendations

Level of Service (LOS) is a grade of A through F assigned to an intersection, approach, or movement to describe how well or how poorly it operates. LOS A through D is considered acceptable for peak hour operation. LOS E or F describes potentially unacceptable operation and developers may be required to mitigate their anticipated traffic impact to improve LOS based on the Apex Unified Development Ordinance (UDO).

Tables 1 through 15 describe the levels of service (LOS) for the scenarios analyzed in the TIA. "NA" is shown when the scenario does not apply. The scenarios are as follows:

- **Existing 2023** - Existing year 2023 traffic.
- **No Build 2027** – Projected year (2027) with background traffic growth and background development.
- **Build 2027** – Projected year (2027) with background traffic, and site build-out including recommended improvements where applicable.

Apex Peakway and Salem Village Drive/Site Driveway 1

Table 1. A.M. / P.M. Unsignalized Peak Hour Levels of Service Apex Peakway and Salem Village Drive/Site Driveway 1			
	Existing 2023	No Build 2027	Build 2027
<u>Overall</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
<i>Eastbound (Apex Peakway)</i>	NA	NA	A / A ²
<i>Westbound (Apex Peakway)</i>	A / A ²	A / A ²	A / A ²
<i>Northbound (Salem Village Drive)</i>	A / A ¹	C / C ¹	D / D ¹
<i>Southbound (Site Driveway 1)</i>	NA	NA	C / C ¹

1. Level of service for stop-controlled minor street approaches.
2. Level of service for left turn movements on free-flowing approaches

TIA recommendations:

- The TIA recommends construction of a full movement stop-controlled driveway for the planned development that ties into the existing intersection of Apex Peakway and Salem Village Drive as a fourth leg. The TIA recommends the driveway to consist of one ingress lane and one egress lane. Additionally, the TIA recommends an eastbound left turn lane with 50 feet of storage and appropriate deceleration length and taper, as well as a westbound right turn only lane extending from Tingen Road and dropping at Site Driveway 1 on Apex Peakway.

Apex staff recommendations:

Apex staff concur with the recommendations in the TIA. The two stop-controlled approaches are projected to operate at LOS D or better with the proposed improvements during the peak hours in the Build scenario. The proposed storage of the left turn lanes on the free-flow Apex Peakway approaches are projected to adequately meet storage demand of the 95th percentile queues in the Build scenario. It should be noted that sight distance to the west is limited through the roadway curve on Apex Peakway and offsite sight easements may be necessary to permit this driveway access.

Tingen Road and Site Driveway 2

Table 2. A.M. / P.M. Unsignalized Peak Hour Levels of Service Tingen Road and Site Driveway 2	
	Build 2027
Overall	NA
<i>Eastbound (Site Driveway 2)</i>	<i>B / B¹</i>
<i>Northbound (Tingen Road)</i>	<i>A / A²</i>
<i>Southbound (Tingen Road)</i>	<i>NA</i>

1. Level of service for stop-controlled minor street approaches.
2. Level of service for left turn movements on free-flowing approaches

TIA recommendations:

- The TIA recommends construction of a two-lane, two-way, full movement site driveway with stop-control approximately 480 feet north of Apex Peakway on Tingen Road.

Apex staff recommendations:

Apex staff recommends Site Driveway 2 to be constructed as a right-in/right-out only driveway due to close proximity to the 4-leg intersection of Apex Peakway and Tingen Road. Both Apex Peakway and Tingen Road are thoroughfares on Apex's transportation plan, and are subject to Apex's and NCDOT's intersection spacing guidelines. The stop-controlled approach of Site Driveway 2 is projected to operate at LOS B during both peak hours in the Build scenario.

Tingen Road and Site Driveway 3

Table 3. A.M. / P.M. Unsignalized Peak Hour Levels of Service Tingen Road and Site Driveway 3	
	Build 2027
Overall	NA
<i>Eastbound (Site Driveway 3)</i>	<i>A / B¹</i>
<i>Westbound (Site Driveway 3)</i>	<i>B / B¹</i>
<i>Northbound (Tingen Road)</i>	NA
<i>Southbound (Tingen Road)</i>	NA

1. Level of service for stop-controlled minor street approaches.
2. Level of service for left turn movements on free-flowing approaches

TIA recommendations:

- The TIA recommends construction of Site Driveway 3 on both the east and west legs of Tingen Road approximately 550 feet south of Apex Peakway. The TIA recommends both legs to be constructed as two-lane, two-way roadways with stop-control and right-in/right-out access.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA. Apex staff recommends control of access with a center median island along Tingen Road. Both the driveway approaches are projected to operate at LOS B or better in the Build scenario.

Tingen Road and Site Driveway 4

Table 4. A.M. / P.M. Roundabout Peak Hour Levels of Service Tingen Road and Site Driveway 4 - Major Collector Street	
	Build 2027
Overall	A / A
<i>Eastbound (Site Driveway 4)</i>	A / A
<i>Westbound (Proposed Major Collector Street)</i>	A / A
<i>Northbound (Tingen Road)</i>	A / A
<i>Southbound (Tingen Road)</i>	A / A

TIA recommendations:

- The TIA recommends construction of a four-leg roundabout at the location of Site Driveway 4 and Tingen Road approximately 1,200 feet south of Apex Peakway, with yield control on each approach leg. The TIA recommends that Site Driveway 4 is constructed on both the east and west approach legs of Tingen Road as two-lane, two-way roadways.

Apex staff recommendations:

Apex staff concurs with the recommendation in the TIA to construct a single-lane roundabout, contingent on the designation for Tingen Road in the Apex Transportation Plan being changed from a 4-lane median-divided road to a 3-lane/2-lane median-divided road. The roundabout is projected to operate at LOS A with minimal delays and minimal queuing. Approval of the change in typical section for Tingen Road as well as the single-lane roundabout requires an amendment to the Transportation Plan. Justification and staff support for this change based on long term traffic projections is discussed later in the review. Additionally, the Transportation Plan identifies a future Major Collector Street heading east from the proposed location of Site Driveway 5, but the proposed PUD plan shows the Major Collector Street aligned further north with Site Driveway 4. This proposed northern shift in alignment of the Major Collector Street also requires an amendment to the Transportation Plan, which is acceptable to staff based on the traffic projections.

Tingen Road and Site Driveway 5

Table 5. A.M. / P.M. Unsignalized Peak Hour Levels of Service Tingen Road and Site Driveway 5	
	Build 2027
Overall	NA
<i>Eastbound (Site Driveway 5)</i>	A / A ¹
<i>Westbound (Site Driveway 5)</i>	A / A ¹
<i>Northbound (Tingen Road)</i>	NA
<i>Southbound (Tingen Road)</i>	NA

1. Level of service for stop-controlled minor street approaches.
2. Level of service for left turn movements on free-flowing approaches

TIA recommendations:

- The TIA recommends construction of Site Driveway 5 on both the east and west legs of Tingen Road approximately 1,750 feet south of Apex Peakway. The TIA recommends both legs to be constructed as two-lane, two-way roadways with stop-control and right-in/right-out access.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA, contingent on the aforementioned Transportation Plan amendments to realign the Major Collector Street northward to the proposed single-lane roundabout at Site Driveway 4. Apex staff recommends control of access with a center median island along Tingen Road in order to ensure right-in/right-out operations. Both of the driveway approaches are projected to operate at LOS A or better in the Build scenario.

Tingen Road and Widger Lane

Table 6. A.M. / P.M. Unsignalized Peak Hour Levels of Service Tingen Road and Widger Lane			
	Existing 2023	No Build 2027	Build 2027
Overall	<u>NA</u>	<u>NA</u>	<u>NA</u>
<i>Eastbound (Widger Lane)</i>	<i>A / A¹</i>	<i>A / A¹</i>	<i>B / B¹</i>
<i>Northbound (Tingen Road)</i>	<i>A / A²</i>	<i>A / A²</i>	<i>A / A²</i>
<i>Southbound (Tingen Road)</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>

1. Level of service for stop-controlled minor street approaches.
2. Level of service for left turn movements on free-flowing approaches

TIA recommendations:

- The TIA recommends no improvements at this intersection.

Apex staff recommendations:

Apex staff concurs with the recommendation in the TIA. The stop-controlled minor street approaches are projected to operate at LOS B in the Build scenario. The development is not projected to add any turning movement traffic at this intersection. Additionally, turning movement traffic is not high enough to warrant turn lanes per NCDOT guidelines.

Tingen Road and James Street

Table 7. A.M. / P.M. Unsignalized Peak Hour Levels of Service Tingen Road and James Street			
	Existing 2023	No Build 2027	Build 2027
<u>Overall</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
<i>Eastbound (James Street)</i>	<i>D / C¹</i>	<i>B / B¹</i>	<i>B / B¹</i>
<i>Westbound (James Street)</i>	<i>D / C¹</i>	<i>B / B¹</i>	<i>B / B¹</i>
<i>Northbound (Tingen Road)</i>	<i>A / A²</i>	<i>A / A²</i>	<i>A / A²</i>
<i>Southbound (Tingen Road)</i>	<i>A / A²</i>	<i>A / A²</i>	<i>A / A²</i>

1. Level of service for stop-controlled minor street approaches.
2. Level of service for left turn movements on free-flowing approaches.

TIA recommendations:

- The TIA recommends no improvements at this intersection.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA. It should be noted that as part of Project U-5928 the Tingen Road railroad crossing will be permanently closed to traffic, cutting off the flow of traffic to/from the north on Tingen Road. Staff plans to evaluate traffic control at this intersection after the construction of Project U-5928. It is likely that either two-way stop control will be switched from the James Street approaches to the approaches on Tingen Road, or all-way stop control will be installed. Traffic volumes are projected to be low in the Build scenario, and the intersection is projected to operate at LOS B or better on the stop-controlled approaches. It should be noted that the intersection is congested during afternoon school carpool for Apex Elementary School and Apex Police currently monitors traffic during that time. However, afternoon school carpool is off-peak and thus not analyzed as part of this TIA, when the proposed PUD has very little additional traffic impact at that time of day.

James Street and Minley Way

Table 8. A.M. / P.M. Roundabout Peak Hour Levels of Service James Street and Minley Way			
	Existing 2023	No Build 2027	Build 2027
<u>Overall</u>	<u>A / A</u>	<u>A / A</u>	<u>A / A</u>
<i>Eastbound (James Street)</i>	A / A	A / A	A / A
<i>Westbound (James Street)</i>	A / A	A / A	A / A
<i>Northbound (Minley Way)</i>	A / A	A / A	A / A

TIA recommendations:

- The TIA recommends no improvements at this intersection.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA. It should be noted that with Project U-5928 and the closure of the Tingen Road railroad crossing, there is projected to be some re-distribution of traffic within the study area. However, the roundabout at this intersection is projected to operate at LOS A in both peak hours of the Build scenario, with minimal delays.

Apex Peakway and Apex Peakway Connector

Table 9. A.M. / P.M. Signalized Peak Hour Levels of Service Apex Peakway and Apex Peakway Connector		
	No Build 2027	Build 2027
<u>Overall</u>	<u>B / A</u>	<u>B / B</u>
<i>Westbound (Connector)</i>	B / B	C / B
<i>Northbound (Apex Peakway)</i>	A / A	A / B
<i>Southbound (Apex Peakway)</i>	A / A	B / A

TIA recommendations:

- The TIA recommends no improvements at this intersection.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA. The intersection is projected to operate at overall LOS B in the Build scenario with signalization and lane configuration planned in project U-5928. All intersection approaches are projected to operate at LOS C or better.

S Salem Street and Apex Peakway Connector

Table 10. A.M. / P.M. Signalized Peak Hour Levels of Service S Salem Street and Apex Peakway Connector		
	No Build 2027	Build 2027
<u>Overall</u>	<u>B / B</u>	<u>B / B</u>
<i>Eastbound (S Salem Street)</i>	<i>B / B</i>	<i>B / B</i>
<i>Westbound (S Salem Street)</i>	<i>B / B</i>	<i>B / B</i>
<i>Southbound (Connector)</i>	<i>B / B</i>	<i>B / B</i>

TIA recommendations:

- The TIA recommends no improvements at this intersection.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA. The intersection is projected to operate at overall LOS B in the Build scenario with signalization and lane configuration planned in project U-5928. All intersection approaches are projected to operate at LOS B or better.

James Street and Apex Peakway

Table 11. A.M. / P.M. Signalized Peak Hour Levels of Service James Street and Apex Peakway		
	No Build 2027	Build 2027
<u>Overall</u>	<u>A / A</u>	<u>A / A</u>
<i>Westbound (James Street)</i>	<i>B / B</i>	<i>B / B</i>
<i>Northbound (Apex Peakway)</i>	<i>B / A</i>	<i>B / A</i>
<i>Southbound (Apex Peakway)</i>	<i>A / A</i>	<i>A / A</i>

TIA recommendations:

- The TIA recommends no improvements at this intersection.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA. The intersection is projected to operate at overall LOS A in the Build scenario with signalization and improvements planned in project U-5928. All intersection approaches are projected to operate at LOS B or better.

NC 55 and Apex Peakway

Table 12. A.M. / P.M. Signalized Peak Hour Levels of Service NC 55 and Apex Peakway			
	Existing 2023	No Build 2027	Build 2027
<u>Overall</u>	<u>B / C</u>	<u>D / C</u>	<u>D / D</u>
<i>Eastbound (Apex Peakway)</i>	<i>C / E</i>	<i>C / D</i>	<i>C / D</i>
<i>Northbound (NC 55)</i>	<i>B / C</i>	<i>D / D</i>	<i>E / E</i>
<i>Southbound (NC 55)</i>	<i>A / B</i>	<i>B / B</i>	<i>B / B</i>

TIA recommendations:

- The TIA recommends no improvements at this intersection.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA. It should be noted that the level of service for the northbound approach is projected to deteriorate to LOS E, mainly due to the addition of development traffic on the northbound left turn movement. However, the development is not projected to be more than 6% of overall traffic. The 95th percentile queues are projected to increase to 485 ft in the PM peak hour of the Build scenario. However, the existing dual left turn lane configuration provides sufficient storage, and queues are not projected to spill back and block access to Marco Drive. Per Section 13.19 of the UDO no improvements are recommended.

Apex Peakway and S Hughes Street

Table 13. A.M. / P.M. Signalized Peak Hour Levels of Service Apex Peakway and S Hughes Street			
	Existing 2023	No Build 2027	Build 2027
<u>Overall</u>	<u>B / A</u>	<u>A / B</u>	<u>A / B</u>
<i>Eastbound (S Hughes St)</i>	<i>D / D</i>	<i>D / D</i>	<i>D / D</i>
<i>Westbound (S Hughes St)</i>	<i>D / C</i>	<i>D / D</i>	<i>D / D</i>
<i>Northbound (Apex Peakway)</i>	<i>A / A</i>	<i>A / A</i>	<i>A / B</i>
<i>Southbound (Apex Peakway)</i>	<i>B / A</i>	<i>A / A</i>	<i>A / B</i>

TIA recommendations:

- The TIA recommends no improvements at this intersection.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA. The intersection is projected to operate at overall LOS A and B in the AM and PM peak hours in the Build scenario. All approaches are projected to operate at LOS D or better. The turn lane storage lengths are projected to meet future demand of the 95th percentile queues in the Build scenario.

Apex Peakway and Perry Road

Table 14. A.M. / P.M. Unsignalized Peak Hour Levels of Service Apex Peakway and Perry Road			
	Existing 2023	No Build 2027	Build 2027
<u>Overall</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
<i>Eastbound (Apex Peakway)</i>	<i>A / A²</i>	<i>A / A²</i>	<i>A / A²</i>
<i>Westbound (Apex Peakway)</i>	<i>A / A²</i>	<i>A / A²</i>	<i>A / A²</i>
<i>Northbound (Perry Road)</i>	<i>B / B¹</i>	<i>C / C¹</i>	<i>E / D¹</i>
<i>Southbound (Perry Road)</i>	<i>B / B¹</i>	<i>C / D¹</i>	<i>D / E¹</i>

1. Level of service for stop-controlled minor street approaches.
2. Level of service for left turn movements on free-flowing approaches.

TIA recommendations:

- The TIA recommends no improvements at this intersection.

Apex staff recommendations:

Apex staff recommends that this intersection be studied for traffic signal warrants and a signal installed when permitted by NCDOT. Future traffic patterns along Apex Peakway will increase delays on the minor streets approaches of Perry Road. The development is projected to increase traffic at the intersection by 19% and 18% in the AM, and PM peak hours respectively. This increase in traffic will cause levels of service to fall to LOS E on the minor street approaches. Staff considered converting this intersection to all-way stop control to improve operations, but Synchro analysis showed that all-way stop control will operate at LOS F due to high traffic volumes on Apex Peakway. It should be noted that this intersection has a relatively moderate (not high) crash history compared to other locations in Apex. With future changes in traffic patterns on Apex Peakway, a traffic signal may be warranted based on operational or safety warrants, subject to NCDOT review and approval.

Apex Peakway and Tingen Road

Table 15. A.M. / P.M. Peak Hour Levels of Service Apex Peakway and Tingen Road			
	Two-Way Stop	All-Way Stop	Signalized
	Existing 2023	No Build 2027	Build 2027
Overall	<u>NA</u>	<u>F / F</u>	<u>C / C</u>
Eastbound (Apex Peakway)	<i>B / B¹</i>	<i>C / F¹</i>	<i>C / C</i>
Westbound (Apex Peakway)	<i>B / B¹</i>	<i>F / F¹</i>	<i>C / C</i>
Northbound (Tingen Road)	<i>A / A²</i>	<i>C / C¹</i>	<i>C / B</i>
Southbound (Tingen Road)	<i>A / A²</i>	<i>B / C¹</i>	<i>C / D</i>

1. Level of service for stop-controlled street approaches.
2. Level of service for left turn movements on free-flowing approaches.

TIA recommendations:

- The TIA recommends installation of a traffic signal at this intersection. Additionally, the TIA recommends construction of a northbound left-turn lane with approximately 100 feet of storage and appropriate deceleration and taper, a westbound left-turn lane with approximately 150 feet of storage and appropriate deceleration and taper, and restriping of the southbound approach to provide an exclusive left-turn lane with approximately 175 feet of storage and a shared through/right-turn lane.

Apex staff recommendations:

Apex staff concurs with the recommendations in the TIA, subject to NCDOT review and approval. **The traffic signal should be designed and installed based on the ultimate four-lane section, using metal strain poles.** It should be noted that the southbound approach will likely require more than just restriping in order to achieve an appropriate lane shift transition. It may require additional widening for the appropriate lane shift, as well as resurfacing. With these improvements the intersection is projected to operate at overall LOS C during both peak hours in the Build scenario.

Amendments to the Apex Comprehensive Transportation Plan

TIA recommendations:

- The TIA recommends the following amendments to the transportation plan:
 - Revise the designation of Tingen Road from a four-lane median divided roadway to a three-lane median divided roadway from Apex Peakway south to US Hwy 1 in the Transportation Plan.
 - Relocate the Major Collector Street east of Tingen Road from its current proposed location in the Transportation Plan to Site Drive 4 and designate that intersection as a roundabout in the Transportation Plan.

Apex staff recommendations:

- Apex staff concurs with the recommendation in the TIA to change Tingen Road from a four-lane median divided thoroughfare facility to a three-lane thoroughfare facility in the transportation plan. The TIA provided traffic forecasts from the 2050 TRMG2 (Triangle Regional Model Generation 2) which is a travel forecasting model that supports regional transportation planning. The model was modified for two scenarios. *Scenario 1* provided a traffic forecast for Tingen Road with the Tingen Road link severed at the CSX railroad to mirror future travel conditions post construction of Project U-5928 *Apex Peakway Southwest Connector*. *Scenario 2* provided additional alternative analysis modifying Perry Road at US 1 from the planned full access interchange to a four-lane bridge over US Hwy 1 with no ramps in case the bridge with no interchange ramps is constructed by 2050. Table 16 below presents daily traffic forecasts on Tingen Road for the two scenarios. The capacity of a three-lane road is typically between 18,000-19,000 vehicles per day per the Highway Capacity Manual. Based on the information presented in the traffic forecast model, Tingen Road is forecasted to operate below capacity for a three-lane facility in the 2050 forecast year.

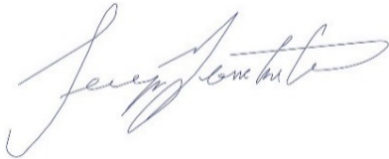
Table 16. Tingen Road 2050 Daily Traffic Forecast (veh/day)		
System Links	Scenario 1	Scenario 2
James Street to Apex Peakway	2,400	2,100
Apex Peakway to Widger Ln	15,000	14,600
Widger Ln to Prince Dead End Rd	10,600	11,700

- Town staff concurs with the recommendation for a roundabout to be added to the Transportation Plan at the intersection of Tingen Road and Site Drive 4/Major Collector Street, with the relocation of the Major Collector Street north to that location. The roundabout is projected to operate at LOS A in both peak hours in the Build Scenario. Further analysis was conducted by Town staff to determine operations of the roundabout with 2050 forecast year volumes. Daily volumes on Tingen Road from Scenario 1 were used to develop a design hourly volume on Tingen Road between Apex Peakway and Widger Lane. Likewise, traffic on the minor street approaches of Site Drive 4 and the Major Collector Street were grown assuming a 3.2% growth rate to the forecast year 2050. Traffic analysis showed that the roundabout is projected to operate at LOS C during both peak hours of operations with all approaches operating at LOS D or better in the forecast year. The highest volume/capacity ratio was 0.83 indicating that there is additional capacity at the roundabout intersection for accommodating growth beyond the forecast year.

Table 17. Long Term A.M. / P.M. Roundabout Peak Hour Levels of Service Tingen Road and Site Driveway 4 / Major Collector Street	
	Forecast 2050
Overall	C / C
Eastbound (Site Driveway 4)	A / A
Westbound (Major Collector)	D / B
Northbound (Tingen Road)	C / C
Southbound (Tingen Road)	B / C

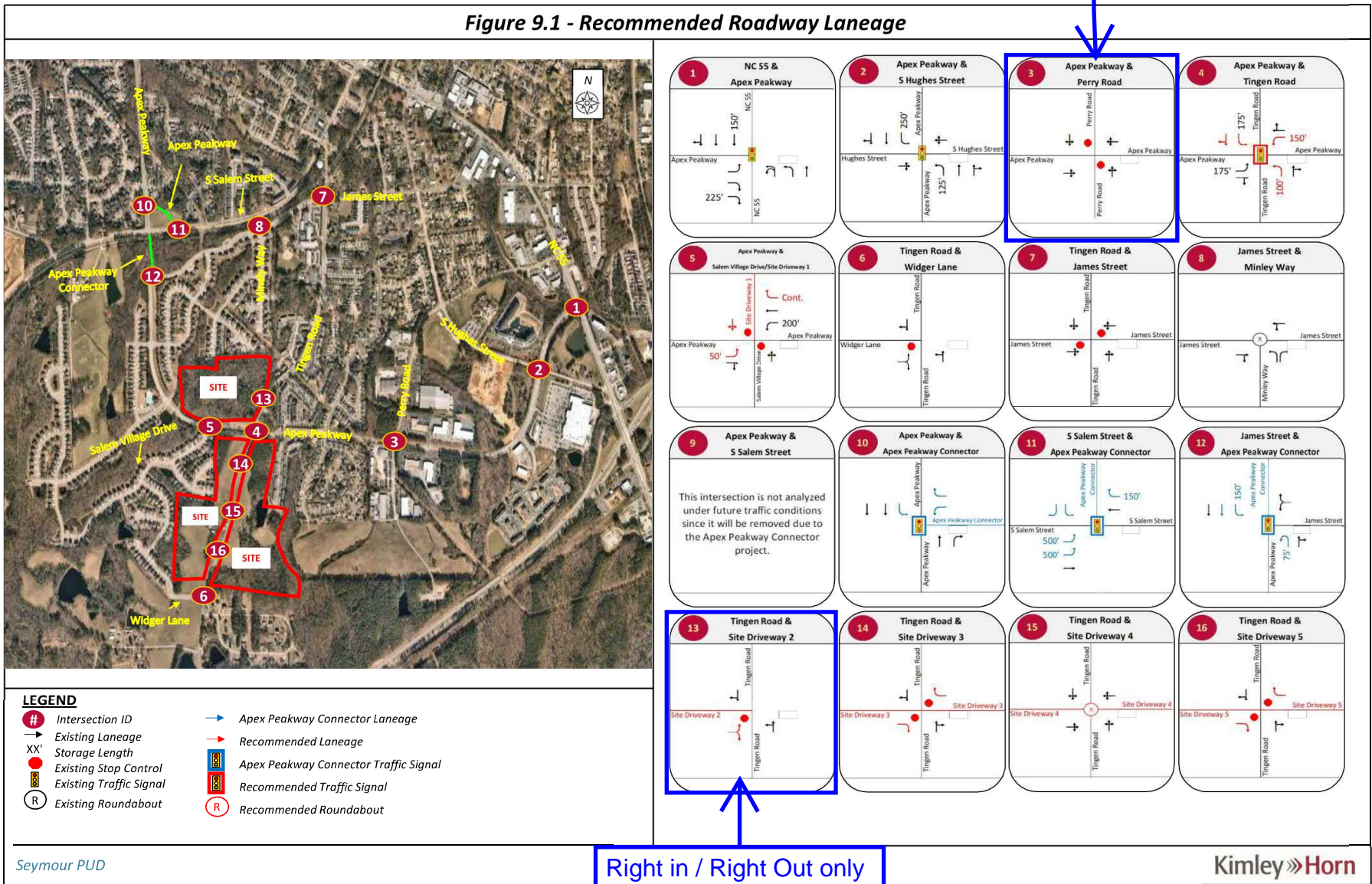
Please coordinate with the NCDOT District Engineer's Office concerning any recommendations on NCDOT facilities. Town staff will be available for meetings to discuss improvements on Town maintained roadways as needed.

Sincerely,



Serge Grebenschikov, PE
Traffic Engineer
919-372-7448

Figure 9.1 - Recommended Roadway Laneage



Traffic Signal

Right in / Right Out only

Apex Recommendations

Triangle Regional Model *Generation 2*

Introduction

The Triangle Regional Model Generation 2 (TRMG2) is a **new travel forecasting model** that supports regional transportation planning.

What is the Triangle Regional Model?

The TRM is a mathematical computer model used by transportation planning agencies in the region to develop and evaluate strategies that support mobility, access, economic health and quality of life.

Area Covered by TRM

3,533 square miles

- Includes **40 jurisdictions**
- 2,965 analysis zones** include:

1,057,590 jobs

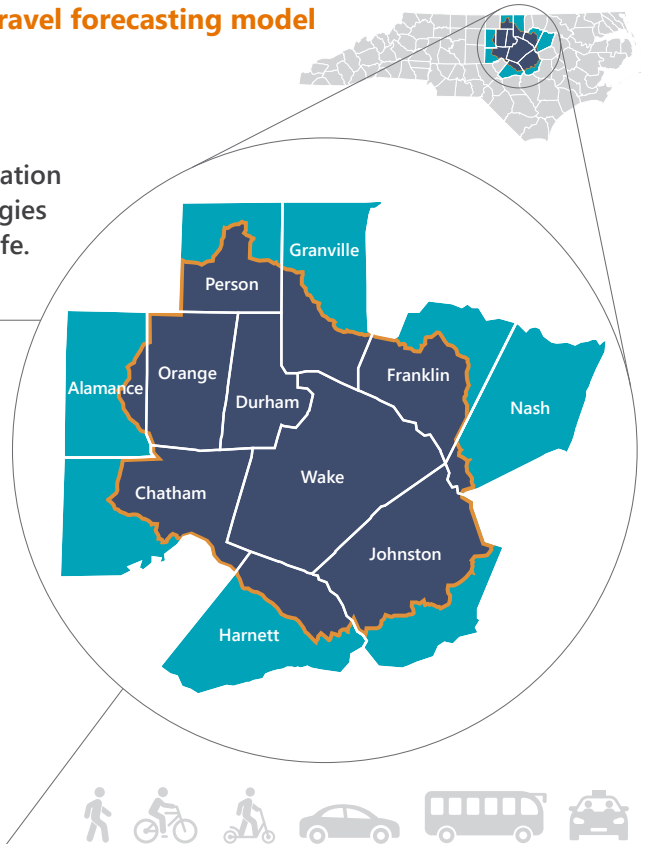
2,001,649 people

16,368 miles of roadway

121 transit routes

79,228 university students

10 transit agencies



What makes this a best practice model?

The design **better captures individual, household, and neighborhood characteristics** that influence travel choices and the way people make trips, including by car, bus, rail, bike or walk. These advances lead to improved decision making for regional transportation investments which ensures a more efficient and well-connected future.

The new model considers...

- Family Characteristics** — Children, workers, and seniors
- Neighborhood Characteristics** — Walkability, mix of land uses
- Trip Connectivity** — Trips are modeled not as individual segments, but as connections to anchor activities such as work.
- The Triangle Region Characteristics** — The Triangle region is complex with many large and small city centers.
- Cost and Availability of Parking**
- Mobility Services**

...to better represent:

- Auto Ownership** — The number of autos owned by a family influences their choice of mode and number of trips they make.
- Walk and Bike Trips** — An important planning factor for Triangle communities
- How People Travel**
 - 36% work tour trips** (Home → Coffee → Bag → Shopping → Home)
 - 64% non-work tour trips** (Home → Park → Restaurant → Home)

People tend to favor destinations within their own community.
- People's Choices** — Parking constraints influence people's choice of mode and destination. The model also forecasts mobility services such as Uber and Lyft.

Triangle Regional Model *Generation 2*

Advanced Components



Explainable Artificial Intelligence (XAI)

The **number of trips** made by residents in the region is estimated using explainable artificial intelligence (XAI) that fully utilizes Triangle Travel Survey data and allows for a greater number of variables such as age, access, income, worker status, vehicle ownership and household composition.



Nested Destination Choice Model

The destinations that residents **travel to** is estimated using a nested destination choice model that is first informed by the activities available to them in their own community/city, and then to the broad array of activities available throughout the region.



The Influence of Parking Cost and Availability

The **choice of mode** for travel in the Triangle is influenced by parking cost and availability and includes the option of traveling by Uber or Lyft in addition to the traditional auto and transit modes.



Mode and Destination Consistency

Resident trips that start and end at locations other than home are informed by the destination of the original home-based trip and the travel mode used to reach that destination.



Synthetic Population

A synthetic population of over 1.8 million people is generated in roughly two minutes. Household level data includes household size, number of workers and income. Person level data includes age groups for children, adults and seniors.



Accessibility

Zonal socioeconomic data and network travel times are used together to calculate several accessibility variables for roadway, transit and non-motorized modes. These accessibilities are used to capture sensitivity to behavioral responses to development patterns, area type, and proximity of attractions nearby.



Time of Day

Individual level home-based trips are apportioned to four time-of-day periods (AM: 7:00 AM – 9:00 AM, MD: 9:00 AM – 3:30 PM, PM: 3:30 PM – 6:15 PM, NT: 6:15 PM – 7:00 AM) based on fixed factors from the survey for each trip type. The choice of trip mode and destination use these same time periods providing better representation of the travel choices people actually experience over the course of a day.



Run Time



The 2020 model takes **2.5 hours** to run.*



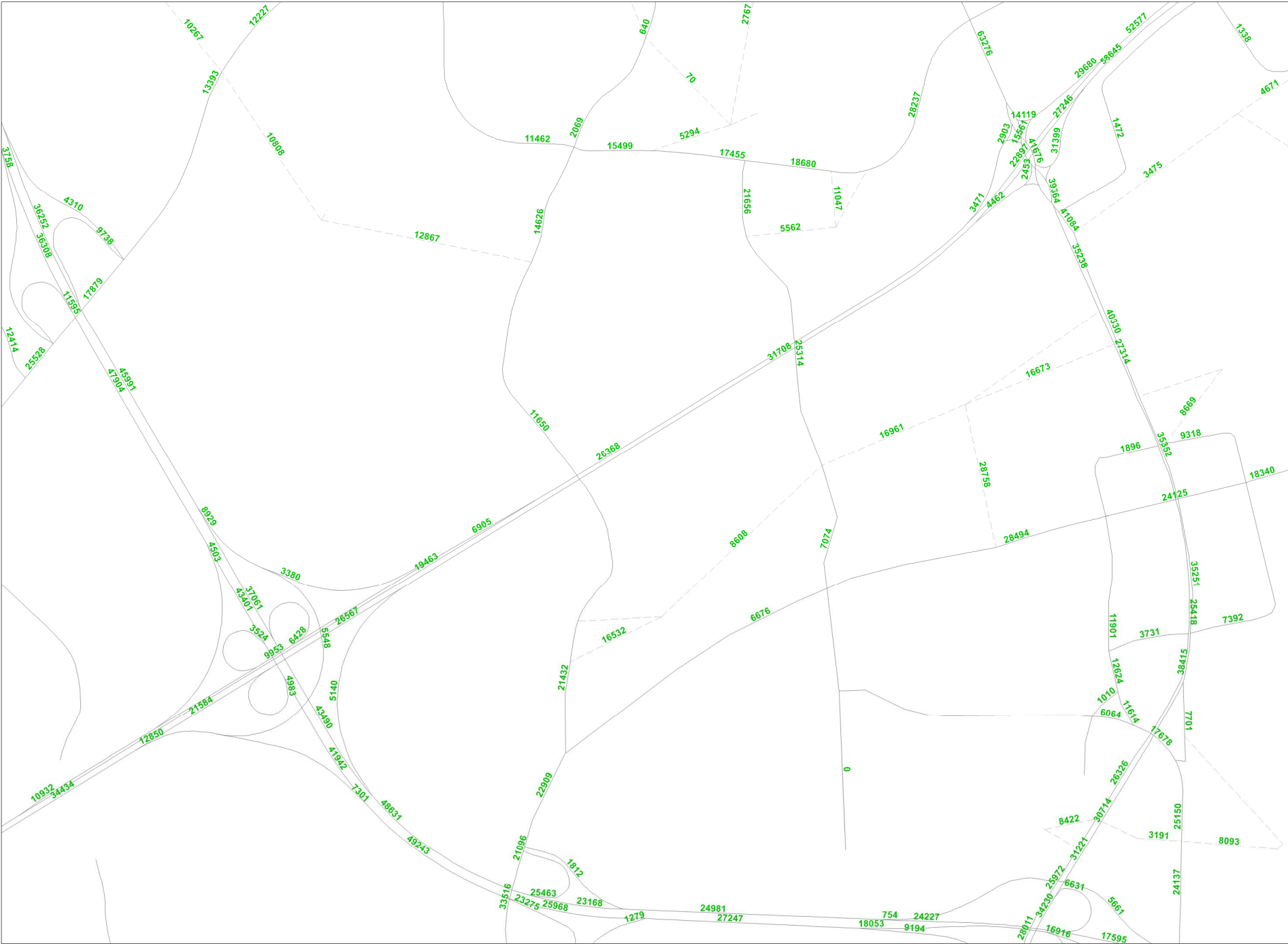
The 2050 model takes **10 hours** to run.*

*Using recommended computer specs

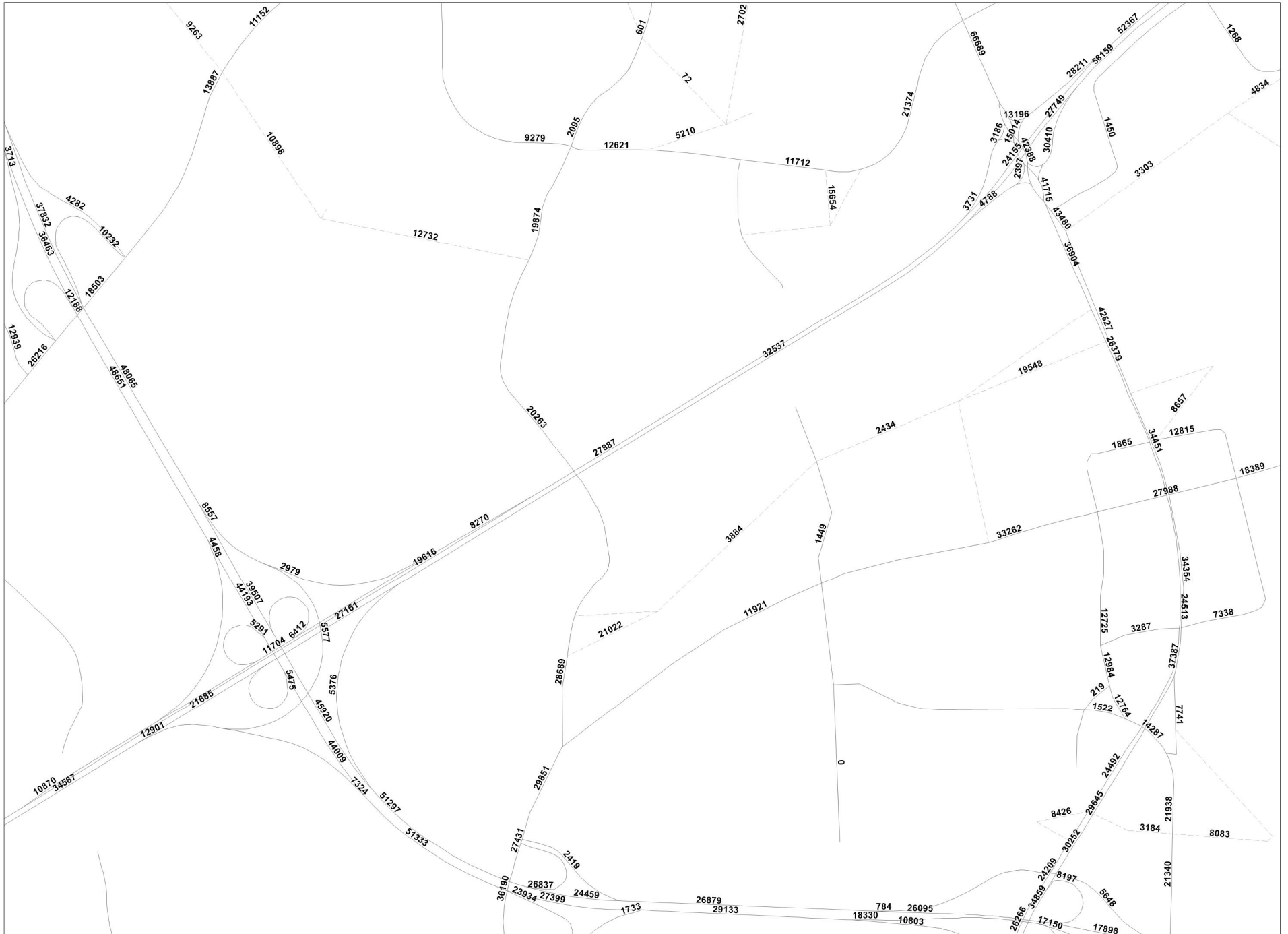


The model was developed by Caliper Corporation and is maintained by ITRE@NCSU and four stakeholders: NC Department of Transportation, Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, Capital Area Metropolitan Planning Organization, and GoTriangle.

2050 TRMG2 Model Volumes - With Perry Road Bridge



2050 TRMG2 Model Volumes - Without Perry Road Extension



MOVEMENT SUMMARY

 Site: 101 [Future (2050) AM (Site Folder: General)]

Tingen Road at Site Driveway 4
 Site Category: (None)
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] ft				
South: Tingen Road														
3	L2	8	2.0	9	2.0	0.444	8.5	LOS A	2.6	66.2	0.56	0.45	0.56	30.8
8	T1	361	2.0	401	2.0	0.444	8.5	LOS A	2.6	66.2	0.56	0.45	0.56	30.6
18	R2	39	2.0	43	2.0	0.444	8.5	LOS A	2.6	66.2	0.56	0.45	0.56	29.8
Approach		408	2.0	453	2.0	0.444	8.5	LOS A	2.6	66.2	0.56	0.45	0.56	30.5
East: Site Driveway 4														
1	L2	111	2.0	123	2.0	0.517	11.7	LOS B	3.8	97.1	0.72	0.88	1.01	22.9
6	T1	4	2.0	4	2.0	0.517	11.7	LOS B	3.8	97.1	0.72	0.88	1.01	22.4
16	R2	262	2.0	291	2.0	0.517	11.7	LOS B	3.8	97.1	0.72	0.88	1.01	21.9
Approach		377	2.0	419	2.0	0.517	11.7	LOS B	3.8	97.1	0.72	0.88	1.01	22.2
North: Tingen Road														
7	L2	165	2.0	183	2.0	0.414	7.3	LOS A	2.6	65.3	0.41	0.25	0.41	30.5
4	T1	233	2.0	259	2.0	0.414	7.3	LOS A	2.6	65.3	0.41	0.25	0.41	30.3
14	R2	39	2.0	43	2.0	0.414	7.3	LOS A	2.6	65.3	0.41	0.25	0.41	29.5
Approach		437	2.0	486	2.0	0.414	7.3	LOS A	2.6	65.3	0.41	0.25	0.41	30.3
West: Site Driveway 4														
5	L2	74	2.0	82	2.0	0.175	6.7	LOS A	0.7	18.4	0.59	0.55	0.59	23.8
2	T1	4	2.0	4	2.0	0.175	6.7	LOS A	0.7	18.4	0.59	0.55	0.59	23.3
12	R2	40	2.0	44	2.0	0.175	6.7	LOS A	0.7	18.4	0.59	0.55	0.59	22.8
Approach		118	2.0	131	2.0	0.175	6.7	LOS A	0.7	18.4	0.59	0.55	0.59	23.4
All Vehicles		1340	2.0	1489	2.0	0.517	8.8	LOS A	3.8	97.1	0.56	0.52	0.64	26.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: K:\RAL_TPTO_Traffic\011483010 Seymour Property\T4 - Analysis\SIDRA\Tingen Road at Site Driveway 4.sip9

MOVEMENT SUMMARY

 Site: 101 [Future (2050) PM (Site Folder: General)]

Tingen Road at Site Driveway 4
 Site Category: (None)
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] ft				
South: Tingen Road														
3	L2	14	2.0	16	2.0	0.486	10.1	LOS B	3.4	85.6	0.66	0.67	0.81	30.1
8	T1	311	2.0	346	2.0	0.486	10.1	LOS B	3.4	85.6	0.66	0.67	0.81	29.9
18	R2	70	2.0	78	2.0	0.486	10.1	LOS B	3.4	85.6	0.66	0.67	0.81	29.1
Approach		395	2.0	439	2.0	0.486	10.1	LOS B	3.4	85.6	0.66	0.67	0.81	29.8
East: Site Driveway 4														
1	L2	80	2.0	89	2.0	0.349	8.1	LOS A	1.7	43.8	0.60	0.55	0.60	23.7
6	T1	4	2.0	4	2.0	0.349	8.1	LOS A	1.7	43.8	0.60	0.55	0.60	23.3
16	R2	190	2.0	211	2.0	0.349	8.1	LOS A	1.7	43.8	0.60	0.55	0.60	22.7
Approach		274	2.0	304	2.0	0.349	8.1	LOS A	1.7	43.8	0.60	0.55	0.60	23.0
North: Tingen Road														
7	L2	291	2.0	323	2.0	0.647	11.5	LOS B	6.0	153.2	0.54	0.32	0.54	28.8
4	T1	345	2.0	383	2.0	0.647	11.5	LOS B	6.0	153.2	0.54	0.32	0.54	28.6
14	R2	67	2.0	74	2.0	0.647	11.5	LOS B	6.0	153.2	0.54	0.32	0.54	27.9
Approach		703	2.0	781	2.0	0.647	11.5	LOS B	6.0	153.2	0.54	0.32	0.54	28.6
West: Site Driveway 4														
5	L2	54	2.0	60	2.0	0.160	8.0	LOS A	0.6	15.8	0.65	0.65	0.65	23.4
2	T1	4	2.0	4	2.0	0.160	8.0	LOS A	0.6	15.8	0.65	0.65	0.65	23.0
12	R2	27	2.0	30	2.0	0.160	8.0	LOS A	0.6	15.8	0.65	0.65	0.65	22.5
Approach		85	2.0	94	2.0	0.160	8.0	LOS A	0.6	15.8	0.65	0.65	0.65	23.1
All Vehicles		1457	2.0	1619	2.0	0.647	10.3	LOS B	6.0	153.2	0.59	0.48	0.63	27.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.