



TECHNICAL MEMORANDUM

Date: Monday, October 3, 2022

To: Meredith Gruber, PLA, AICP
Town of Rolesville
Planning Director

From: Brittany Chase, P.E.
Traffic Engineer
Exult Engineering

Subject: Proposed Rolesville Mixed-Use
Trip Generation Letter

BACKGROUND

Exult Engineering has been contracted by Toy Storage, Inc. to perform traffic engineering services for the proposed Rolesville Mixed-Use Site located at 503 South Main Street. The proposed site is located on the northeast quadrant of South Main Street (US 401) and Wall Creek Drive as shown on the Vicinity Map on Figure 1. As shown on the Site Plan on Figure 2, the proposed site consists of 13,500 square feet of retail at ground-level with 11 residential units on the second floor. The residential units will be contained within one floor of the building. Proposed access for the site consists of one full movement driveway on Wall Creek Drive as well as connectivity to the adjacent parcel to the east (Pete Smith Tire & Quick Lube and Storage Max). The site is currently zoned as a combination of Residential (R) and Residential & Planned Unit Development (R&PUD) and requires rezoning to General Commercial. The purpose of this letter, as requested by Town staff, is to discuss the trip generation for the proposed site.

TRIP GENERATION

The proposed development is to consist of 13,500 square feet of retail at ground-level with 11 residential units on the second floor. The residential units will be contained within one floor of the building. Therefore, Land Use Code (LUC) #215: Single Family Attached Housing was used as opposed to LUC #220: Multifamily Housing (Low-Rise) or LUC #230: Low-Rise Residential with Ground-Floor Commercial as these land uses require at two to three stories of residential units. The trip generation was based on rates and equations published in the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 11th Edition. The *NCDOT Congestion Management Rates vs. Equations Spreadsheet* was used for guidance. As shown in Table 1, the proposed development is expected to generate 834 daily trips, 40 AM peak hour trips (22 entering, 18 exiting), and 99 PM peak hour trips (50 entering, 49 exiting). It is important to note that while using the equations in accordance with NCDOT Congestion Management Guidelines for this land use, the AM Peak Hour site trip calculations result in a negative value. Therefore, the average rate was applied instead for the AM Peak Hour.

It is also important to note that because the proposed site is a redevelopment of a previous use (single-family residential home), there are trips associated with the previous use that were on the surrounding roadway network when the single-family home was occupied. Table 1 also shows the estimated trip

generation for the single-family home per rates and equations published in the ITE *Trip Generation Manual*, 11th Edition.

Table 1: Trip Generation for Proposed Site and Previous Use

Land Use			Daily	AM Peak Hour			PM Peak Hour		
				Total	Enter	Exit	Total	Enter	Exit
Proposed Site									
215: Single-Family Attached Housing	11	d.u.	34	5	1	4	3	2	1
822: Strip Retail Plaza (<40k)	13,500	s.f.	800	35	21	14	96	48	48
Total			834	40	22	18	99	50	49
Previous Use									
210: Single-Family Detached Housing	1	d.u.	-16	-1	0	-1	-1	-1	0
Total "New" Trips			818	39	22	17	98	49	49

References: *Trip Generation Manual*, 11th Edition, Institute of Transportation Engineers, September 2021

Reducing the anticipated trip generation for the proposed site by the number of trips associated with the previous use results in an estimated 818 new daily trips, 39 new AM Peak Hour Trips, and 98 new PM Peak Hour Trips. According to the *NCDOT Policy on Street and Driveway Access to North Carolina Highways*, the threshold for a Traffic Impact Analysis (TIA) to be required by NCDOT is 3,000 new vehicles per day. According to the Town of Rolesville's *Land Development Ordinance (LDO)*, the threshold for a TIA to be required by the Town is 1,000 new vehicles per day or 100 new vehicle trips during the peak hour. Therefore, a TIA is not required by either NCDOT or the Town for the proposed site.

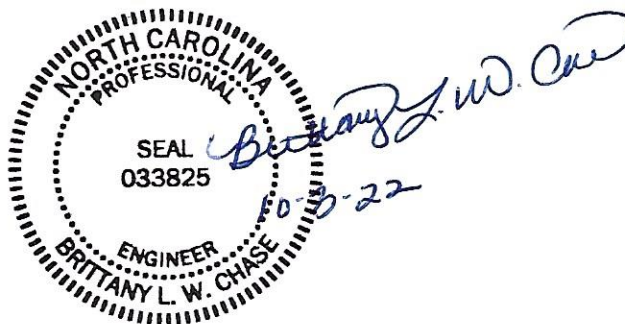
According to the Town's LDO, new vehicle trip calculations do not include reductions for pass-by and internal capture trips. However, internal capture can be expected between the retail and residential uses within the proposed building which would further reduce the trips added to the adjacent roadway network. Detailed internal capture calculations are included in the Attachments.

Due to the relatively low anticipated trip generation, the proposed site is expected to have minimal impact on the surrounding roadway network.

Please let me know if you have any questions or comments.

Sincerely,

Brittany Chase, P.E.
 Exult Engineering



cc: Keith Gettle, P.E., BGE, Inc.
 Allen Massey, Toy Storage, LLC
 Jeremy Warren, P.E., NCDOT Division 5, District 1

Attachments: Figures 1 & 2
Trip Generation Calculations

Rolesville Mixed Use

Vicinity Map

Town of Rolesville, NCDOT Division 5

Figure 1



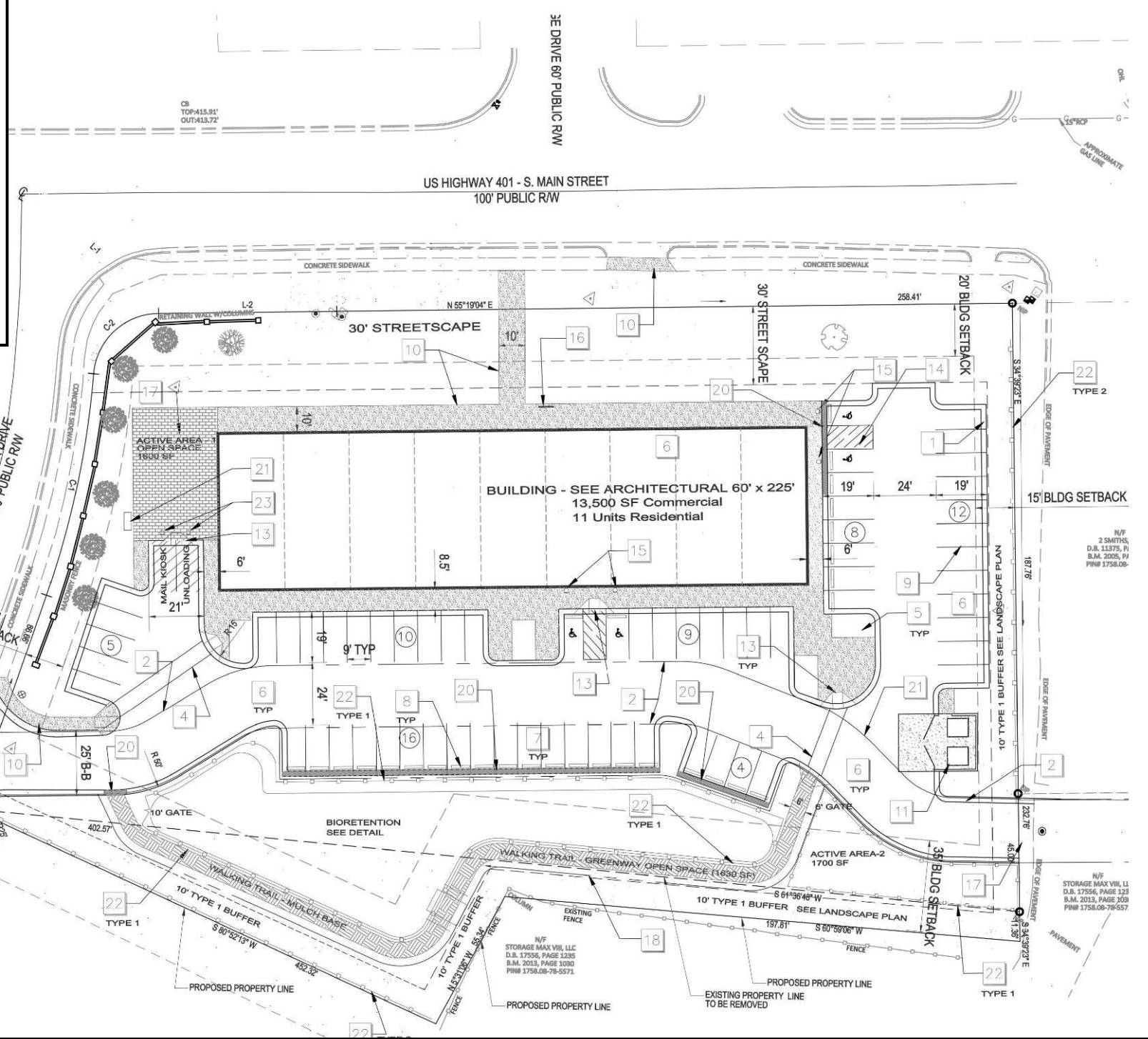
Rolesville Mixed Use

Proposed Site Plan

Prepared by Gettle Engineering and Design, PLLC

Town of Rolesville, NCDOT Division 5

Figure 2



N/F
2 SMITHS,
D.B. 11575, PJ
S.M. 2005, PJ
PIN# 1758.08

N/F
STORAGE MAX VIII, LL
D.B. 17556, PAGE 123
B.M. 2013, PAGE 109
PIN# 1758.08-78-557



**ITE Trip Generation (11th Edition)
Rolesville Mixed Use**

Site Trips

LUC	Land Use	Intensity	Units	Avg Rate or Equation?	Daily Trips			AM Peak Hour Trips			PM Peak Hour Trips			
					Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	
215	Single Family Attached	11	Dwelling Unit(s)	Eq	Daily Trips			AM Trips	AM Trips In	AM Trips Out	PM Trips	PM Trips In	PM Trips Out	
822	Strip Retail Plaza (<40K)	13.5	1,000 Sq Ft	Eq	34	17	17	5	1	4	3	2	1	
					800	400	400	35	21	14	96	48	48	
					Total	834	417	417	40	22	18	99	50	49

Internal Capture

Land Use Code(s)	Land Use	Daily Trips			AM Peak Hour Trips			PM Peak Hour Trips		
		Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
	Office	-	-	-	0	0	0	0	0	0
	Retail	-	-	-	0	0	0	1	0	1
	Restaurant	-	-	-	0	0	0	0	0	0
	Cinema/Entertainment	-	-	-	0	0	0	0	0	0
	Residential	-	-	-	0	0	0	1	1	0
	Hotel	-	-	-	0	0	0	0	0	0
	All Other Land Uses	-	-	-	0	0	0	0	0	0
	Total	20	10	10	0	0	0	2	1	1

External Trips

LUC	Land Use	Daily Trips			AM Peak Hour Trips			PM Peak Hour Trips		
		Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
215	Single Family Attached	-	-	-	5	1	4	2	1	1
822	Strip Retail Plaza (<40K)	-	-	-	35	21	14	95	48	47
	Total	814	407	407	40	22	18	97	49	48

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:		Organization:	
Project Location:		Performed By:	
Scenario Description:		Date:	
Analysis Year:		Checked By:	
Analysis Period:	AM Street Peak Hour	Date:	

Project Name:	0
Analysis Period:	AM Street Peak Hour

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office	#NAME?			0	0	0
Retail	#NAME?			35	21	14
Restaurant	#NAME?			0	0	0
Cinema/Entertainment	#NAME?			0	0	0
Residential	#NAME?			5	1	4
Hotel	#NAME?			0	0	0
All Other Land Uses ²	#NAME?			0	0	0
				40	22	18

Land Use	Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends					
	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips ⁴	Veh. Occ.	Vehicle-Trips	Person-Trips ⁴
Office	1.10	0	0	1.10	0	0
Retail	1.10	21	23	1.10	14	15
Restaurant	1.10	0	0	1.10	0	0
Cinema/Entertainment	1.10	0	0	1.10	0	0
Residential	1.10	1	1	1.10	4	4
Hotel	1.10	0	0	1.10	0	0

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office	1.10	0%	0%	1.10	0%	0%
Retail	1.10	0%	0%	1.10	0%	0%
Restaurant	1.10	0%	0%	1.10	0%	0%
Cinema/Entertainment	1.10	0%	0%	1.10	0%	0%
Residential	1.10	0%	0%	1.10	0%	0%
Hotel	1.10	0%	0%	1.10	0%	0%
All Other Land Uses ²	1.10	0%	0%	1.10	0%	0%

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	4		2	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	1	0		0
Hotel	0	0	0	0	0	

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		7	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	2		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	4	0	0		0
Hotel	0	1	0	0	0	

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	23	23	21	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	1	1	1	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	43	24	19
Internal Capture Percentage	0%	0%	0%
External Vehicle-Trips ⁵	40	22	18
External Transit-Trips ⁵	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	0%	0%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	0%	0%
Hotel	N/A	N/A

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	15	15	14	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	4	4	4	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Land Use Codes (LUCs) from Trip Generation Manual, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE Trip Generation Manual).

⁴Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

*Indicates computation that has been rounded to the nearest whole number.

EXULT ADDED TABLE: TOTAL INTERNAL CAPTURE VEHICULAR TRIPS						
Origin Land Use	ENTERING TRIPS			EXITING TRIPS		
	Internal	External	Total	Internal	External	Total
Office	0	0	0	0	0	0
Retail	0	21	21	0	14	14
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	1	1	0	4	4
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:		Organization:	
Project Location:		Performed By:	
Scenario Description:		Date:	
Analysis Year:		Checked By:	
Analysis Period:	PM Street Peak Hour	Date:	

Project Name:	0
Analysis Period:	PM Street Peak Hour

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office	#NAME?			0	0	0
Retail	#NAME?			96	48	48
Restaurant	#NAME?			0	0	0
Cinema/Entertainment	#NAME?			0	0	0
Residential	#NAME?			3	2	1
Hotel	#NAME?			0	0	0
All Other Land Uses ²	#NAME?			0	0	0
				99	50	49

Land Use	Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends					
	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips ⁴	Veh. Occ.	Vehicle-Trips	Person-Trips ⁴
Office	1.10	0	0	1.10	0	0
Retail	1.10	48	53	1.10	48	52.8
Restaurant	1.10	0	0	1.10	0	0
Cinema/Entertainment	1.10	0	0	1.10	0	0
Residential	1.10	2	2	1.10	1	1.1
Hotel	1.10	0	0	1.10	0	0

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office	1.10	0%	0%	1.10	0%	0%
Retail	1.10	0%	0%	1.10	0%	0%
Restaurant	1.10	0%	0%	1.10	0%	0%
Cinema/Entertainment	1.10	0%	0%	1.10	0%	0%
Residential	1.10	0%	0%	1.10	0%	0%
Hotel	1.10	0%	0%	1.10	0%	0%
All Other Land Uses ²	1.10	0%	0%	1.10	0%	0%

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	1		15	2	14	3
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		4	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	27		0	0	0
Cinema/Entertainment	0	2	0		0	0
Residential	0	5	0	0		0
Hotel	0	1	0	0	0	

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	53	53	48	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	1	2	1	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	109	55	54
Internal Capture Percentage	2%	2%	2%
External Vehicle-Trips ⁵	97	49	48
External Transit-Trips ⁵	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use			
Land Use	Entering Trips	Exiting Trips	
Office	N/A	N/A	
Retail	0%	2%	
Restaurant	N/A	N/A	
Cinema/Entertainment	N/A	N/A	
Residential	50%	0%	
Hotel	N/A	N/A	

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	1	52	53	47	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	1	1	1	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Land Use Codes (LUCs) from Trip Generation Manual, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE Trip Generation Manual).

⁴Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

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¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

*Indicates computation that has been rounded to the nearest whole number.

EXULT ADDED TABLE: TOTAL INTERNAL CAPTURE VEHICULAR TRIPS						
Origin Land Use	ENTERING TRIPS			EXITING TRIPS		
	Internal	External	Total	Internal	External	Total
Office	0	0	0	0	0	0
Retail	0	48	48	1	47	48
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	1	2	0	1	1
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0