



TRAFFIC PLANNING AND DESIGN, INC.

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November 15, 2022

Caernarvon Township
3307 Main Street
Morgantown, PA 19543

Attention: Board of Supervisors

RE: Trip Generation Evaluation
Magnolia Greene –Tentative Plan Submission
Caernarvon Township, Berks County, PA
TPD No. BEHO.00007

Dear Supervisors:

The purpose of this letter is to provide a trip generation evaluation in conjunction with the tentative plan submission for the Magnolia Greene development in Caernarvon Township, Berks County, PA. The project site is located on the northern side of Main Street (SR 0023), just east of Willow Glen Road, on the site of the Morgantown Airport.

TRIP GENERATION EVALUATION

Proposed Development Scenario:

The proposed development scenario for the ±56 acres located within the Industrial Office Park Residential Housing Overlay District consists of the following:

- » 135 single-family dwellings;
- » 86 townhomes;
- » 6,900 square foot (s.f.) automobile parts store;
- » 20,000 s.f. tractor supply store;
- » 2 – 7,500 s.f. sit-down restaurants; and
- » 10,000 s.f. office building.

The trip generation data for the proposed development scenario were obtained from the manual *Trip Generation*, Eleventh Edition, 2021, an Institute of Transportation Engineers (ITE) Informational Report. Land Use Code #210 (Single-Family Detached Housing) and #215 (Single-Family Attached Housing) were used to calculate the number of vehicular trips the development will generate during the following time periods: (1) average weekday; (2) weekday A.M. peak hour; and (3) weekday P.M. peak hour; and (4) Saturday midday peak hour.

Table 1 summarizes the trip generation of the proposed development scenario during the analyzed time periods. Detailed trip generation calculations are attached for reference.

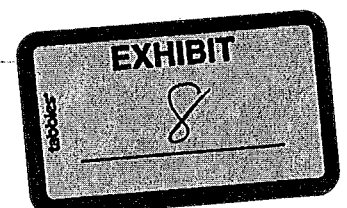


TABLE 1
TRIP GENERATION SUMMARY – PROPOSED DEVELOPMENT SCENARIO

Time Period	Total Trips			Pass-By Trips			New Trips		
	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Average Weekday	3,275	1,678	1,597	--	--	--	--	--	--
Weekday A.M. Peak Hour	285	125	160	42	22	20	243	103	140
Weekday P.M. Peak Hour	285	166	119	45	27	18	240	139	101
Saturday Midday Peak Hour	367	192	175	56	28	28	311	164	147

Potential By-Right Development Scenario:

Based on coordination with the Applicant, the following potential by-right development scenario was identified for the site based on permitted uses within the underlying Industrial Office Park District:

- » 150,000 s.f. of general retail space;
- » 40,000 s.f. grocery store;
- » 13,500 s.f. pharmacy;
- » 2 – 7,500 s.f. sit-down restaurants; and
- » 3,500 s.f. fast-food restaurant.

The trip generation data for the potential by-right development scenario were obtained from the manual *Trip Generation*, Eleventh Edition, 2021, an Institute of Transportation Engineers (ITE) Informational Report. Land Use Code #821 (Shopping Plaza), #850 (Supermarket), #881 (Pharmacy/Drugstore with Drive-Through Window), #932 (High-Turnover Sit-Down Restaurant), and #934 (Fast-Food Restaurant with Drive-Through Window) were used to calculate the number of vehicular trips the development will generate during the following time periods: (1) average weekday; (2) weekday A.M. peak hour; and (3) weekday P.M. peak hour; and (4) Saturday midday peak hour.

Table 2 summarizes the trip generation of the potential by-right development scenario during the analyzed time periods. Detailed trip generation calculations are attached for reference.

TABLE 2
TRIP GENERATION SUMMARY – POTENTIAL BY-RIGHT DEVELOPMENT SCENARIO

Time Period	Total Trips			Pass-By Trips			New Trips		
	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Average Weekday	16,508	8,380	8,128	--	--	--	--	--	--
Weekday A.M. Peak Hour	640	372	268	209	116	93	431	256	175
Weekday P.M. Peak Hour	1,365	690	675	516	262	254	849	428	421
Saturday Midday Peak Hour	1,776	925	851	530	273	257	1,246	652	594

TRIP GENERATION COMPARISON

Table 3 summarizes the comparison of site-generated trips for the proposed and potential by-right development scenarios for the ±56 acres located within the Industrial Office Park Residential Housing Overlay District.

TABLE 3
TRIP GENERATION COMPARISON

Land Use	Total Trips			Pass-By Trips			New Trips		
	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Average Weekday									
Proposed Development Scenario	3,275	1,678	1,597	--	--	--	--	--	--
Potential By-Right Development Scenario	16,508	8,380	8,128	--	--	--	--	--	--
Net Difference	-13,233	-6,702	-6,531	--	--	--	--	--	--
Weekday A.M. Peak Hour									
Proposed Development Scenario	285	125	160	42	22	20	243	103	140
Potential By-Right Development Scenario	640	372	268	209	116	93	431	256	175
Net Difference	-355	-247	-108	-167	-94	-73	-188	-153	-35
Weekday P.M. Peak Hour									
Proposed Development Scenario	285	166	119	45	27	18	240	139	101
Potential By-Right Development Scenario	1,365	690	675	516	262	254	849	428	421
Net Difference	-1,080	-524	-556	-471	-235	-236	-609	-289	-320
Saturday Midday Peak Hour									
Proposed Development Scenario	367	192	175	56	28	28	311	164	147
Potential By-Right Development Scenario	1,776	925	851	530	273	257	1,246	652	594
Net Difference	-1,409	-733	-676	-474	-245	-229	-935	-488	-447

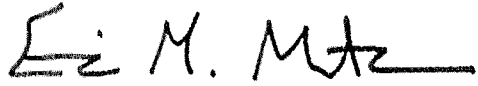
As summarized in **Table 3**, the proposed development scenario will generate significantly less traffic when compared to what could be generated by the potential by-right development scenario.

Based on the information presented in this evaluation, it is TPD's opinion the proposed development scenario for the site under Industrial Office Park Residential Housing Overlay District will have significantly less impact on the surrounding transportation network when compared to the potential by-right development scenario permitted under the underlying Industrial Office Park District.

If there are any questions or comments, please call any time.

Sincerely,

TRAFFIC PLANNING AND DESIGN, INC.

A handwritten signature in black ink, appearing to read "Eric M. Mountz". The signature is fluid and cursive, with a long horizontal stroke at the end.

Eric M. Mountz, P.E., PTOE

Regional Leader – Transportation Planning

Emountz@TrafficPD.com

Attachments: Detailed Trip Generation Calculations

Copy to: Berks Homes

Weekday A.M. Peak Hour

Land Use	Size (X)	Rate/Equation		Total Trips		Interception %		Int. Trips		External Trips		Pass-By Trips		New Trips	
		a	b	Total	Enter %	Enter	Exit	Enter	Exit	Total	Enter	Total	Enter	Total	Exit
Single Family Detached (LU #210)	135	DU	0.91	0.12	96	26%	73	8%	18%	2	13	83	23	60	60
Single Family Attached (LU #215)	86	DU	0.52	-5.7	39	31%	12	27	18%	1	5	33	11	22	22
Automobile Parts Store (LU #843)	6,900	SF	2.51	17	55%	9	17	18%	22%	2	3	13	2	9	4
Tractor Supply Store (LU #810)	20,000	SF	2.28	228	47%	135	155	18%	22%	2	3	23	11	12	12
Restaurant (LU #932)	7,500	SF	9.57	72	55%	39	33	26%	11%	10	4	58	29	39	19
Restaurant (LU #932)	7,500	SF	9.57	72	55%	39	33	26%	11%	10	4	58	29	39	19
Office (LU #710)	10,000	SF	0.86	1.16	23	88%	20	3	25%	5	2	16	15	1	1
Total				349		157	192			32	32	285	125	160	140

Weekday P.M. Peak Hour

Land Use	Size (X)	Rate/Equation		Total Trips		Interception %		Int. Trips		External Trips		Pass-By Trips		New Trips	
		a	b	Total	Enter %	Enter	Exit	Enter	Exit	Total	Enter	Total	Enter	Total	Exit
Single Family Detached (LU #210)	135	DU	0.94	0.27	132	63%	83	49	15%	19%	13	9	110	70	40
Single Family Attached (LU #215)	86	DU	0.6	-3.93	48	57%	27	21	15%	19%	4	4	40	23	17
Automobile Parts Store (LU #843)	6,900	SF	4.9	34	48%	16	18	66%	55%	10	10	14	6	8	3
Tractor Supply Store (LU #810)	20,000	SF	1.4	28	47%	13	15	65%	55%	9	8	11	4	11	4
Restaurant (LU #932)	7,500	SF	9.05	68	61%	41	27	24%	46%	10	12	46	31	15	7
Restaurant (LU #932)	7,500	SF	9.05	68	61%	41	27	24%	46%	10	12	46	31	15	7
Office (LU #710)	10,000	SF	0.83	1.29	25	17%	4	21	75%	14%	3	3	19	1	18
Total				403		225	178			59	59	285	166	119	101

Saturday Midday Peak Hour

Land Use	Size (X)	Rate/Equation		Total Trips		Interception %		Int. Trips		External Trips		Pass-By Trips		New Trips	
		a	b	Total	Enter %	Enter	Exit	Enter	Exit	Total	Enter	Total	Enter	Total	Exit
Single Family Detached (LU #210)	135	DU	0.86	9.72	126	54%	68	58	19%	8	11	107	60	47	47
Single Family Attached (LU #215)	86	DU	0.82	0.43	59	48%	28	31	26%	19%	3	6	50	25	25
Automobile Parts Store (LU #843)	6,900	SF	11.53	80	51%	41	39	42%	39%	17	15	48	24	24	16
Tractor Supply Store (LU #810)	20,000	SF	3.17	63	48%	31	32	42%	39%	13	12	38	18	20	20
Restaurant (LU #932)	7,500	SF	11.19	84	51%	43	41	25%	29%	11	12	61	32	29	19
Restaurant (LU #932)	7,500	SF	11.19	84	51%	43	41	25%	29%	11	12	61	32	29	19
Office (LU #710)	10,000	SF	0.53	5	54%	3	2	50%	41%	2	1	2	1	1	1
Total				501		257	244			65	69	367	192	175	147

Average Weekday

Land Use	Size (X)	Rate/Equation		Total Trips		Interception %		Int. Trips		External Trips		Pass-By Trips		New Trips	
		a	b	Total	Enter %	Enter	Exit	Enter	Exit	Total	Enter	Total	Enter	Total	Exit
Single Family Detached (LU #210)	135	DU	0.92	2.68	1330	50%	665	665	19%	80	126	1124	585	585	539
Single Family Attached (LU #215)	86	DU	7.62	-50.48	605	50%	302	303	19%	36	58	511	266	245	245
Automobile Parts Store (LU #843)	6,900	SF	71.05	-127.72	363	50%	181	182	42%	105	71	216	105	111	111
Tractor Supply Store (LU #810)	20,000	SF	14	280	50%	140	140	42%	39%	59	55	166	81	166	81
Restaurant (LU #932)	7,500	SF	107.2	804	50%	402	402	25%	29%	101	117	586	301	586	301
Restaurant (LU #932)	7,500	SF	107.2	804	50%	402	402	25%	29%	101	117	586	301	586	301
Office (LU #710)	10,000	SF	0.87	3.05	157	50%	78	79	50%	39	32	86	47	86	47
Total				4,343		2,170	2,173			492	576	3,275	1,678	3,275	1,597

API Peak Data not available. Utilized published data for PM Peak Hour.
Internal Capture Data not available. Utilized average of AM & PM Peak hours.
Pass-By Data not available. Utilized 10% less than PM Peak hour.
Average Weekday Data not available. Calculated based on PM Peak hour. Factor of 1.0.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Magnolia Greene	Organization:	TPD		
Project Location:	Caernarvon Township	Performed By:	JZ		
Scenario Description:	Proposed Development	Date:	10/23/2022		
Analysis Year:	Build-Out	Checked By:	EMM		
Analysis Period:	AM Street Peak Hour	Date:	7/23/2022		

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	710	10	ksf	23	20	3
Retail	843/810	6.9/20	ksf	45	22	23
Restaurant	932	7.5/7.5	ksf	144	78	66
Cinema/Entertainment				0		
Residential	210/215	221	du	137	37	100
Hotel				0		
All Other Land Uses ²				0		
				349	157	192

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						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential	1.00	0%	0%	1.00	0%	0%
Hotel						
All Other Land Uses ²						

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 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		1	1	0	0	0
Retail	1		3	0	1	0
Restaurant	3	2		0	2	0
Cinema/Entertainment	0	0	0		0	0
Residential	1	1	16	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	349	157	192
Internal Capture Percentage	18%	20%	17%
External Vehicle-Trips ⁵	285	125	160
External Transit-Trips ⁵	0	0	0
External Non-Motorized Trips ⁵	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	26%	67%
Retail	18%	22%
Restaurant	26%	11%
Cinema/Entertainment	N/A	N/A
Residential	8%	18%
Hotel	N/A	N/A

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

⁷Indicates computation that has been rounded to the nearest whole number.

Project Name:	Magnolia Greene
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	20	20	1.00	3	3
Retail	1.00	22	22	1.00	23	23
Restaurant	1.00	78	78	1.00	66	66
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	37	37	1.00	100	100
Hotel	1.00	0	0	1.00	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		1	2	0	0	0
Retail	7		3	0	3	0
Restaurant	20	9		0	3	2
Cinema/Entertainment	0	0	0		0	0
Residential	2	1	20	0		0
Hotel	0	0	0	0	0	

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	18	0	0	0
Retail	1		39	0	1	0
Restaurant	3	2		0	2	0
Cinema/Entertainment	0	0	0		0	0
Residential	1	4	16	0		0
Hotel	1	1	5	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	5	15	20	15	0	0
Retail	4	18	22	18	0	0
Restaurant	20	58	78	58	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	3	34	37	34	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

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	2	1	3	1	0	0
Retail	5	18	23	18	0	0
Restaurant	7	59	66	59	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	18	82	100	82	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

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.

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Magnolia Greene	Organization:	TPD
Project Location:	Caernarvon Township	Performed By:	JZ
Scenario Description:	Proposed Development	Date:	10/23/2022
Analysis Year:	Build-Out	Checked By:	EMM
Analysis Period:	PM Street Peak Hour	Date:	7/23/2022

Table 1-P: 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	710	10	ksf	25	4	21
Retail	843/810	6.9/20	ksf	62	29	33
Restaurant	932	7.5/7.5	ksf	136	82	54
Cinema/Entertainment				0		
Residential	210/215	221	du	180	110	70
Hotel				0		
All Other Land Uses ²				0		
				403	225	178

Table 2-P: 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						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential	1.00	0%	0%	1.00	0%	0%
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Foot Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		800	800		950	
Retail					950	
Restaurant					950	
Cinema/Entertainment						
Residential		950	950			
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		2	1	0	0	0
Retail	0		10	0	8	0
Restaurant	1	15		0	9	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	2	9	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	403	225	178
Internal Capture Percentage	29%	26%	33%
External Vehicle-Trips ⁵	285	166	119
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	75%	14%
Retail	66%	55%
Restaurant	24%	46%
Cinema/Entertainment	N/A	N/A
Residential	15%	19%
Hotel	N/A	N/A

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-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made.

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

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

Project Name:	Magnolia Greene
Analysis Period:	

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	4	4	1.00	21	21
Retail	1.00	29	29	1.00	33	33
Restaurant	1.00	82	82	1.00	54	54
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	110	110	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		3	1	0	0	0
Retail	1		10	1	8	2
Restaurant	2	22		4	9	4
Cinema/Entertainment	0	0	0		0	0
Residential	3	23	11	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		2	1	0	4	0
Retail	1		24	0	51	0
Restaurant	1	15		0	18	0
Cinema/Entertainment	0	1	2		4	0
Residential	2	2	9	0		0
Hotel	0	1	4	0	0	

Table 9-P (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	3	1	4	1	0	0
Retail	19	10	29	10	0	0
Restaurant	20	62	82	62	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	17	93	110	93	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (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	3	18	21	18	0	0
Retail	18	15	33	15	0	0
Restaurant	25	29	54	29	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	13	57	70	57	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

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

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.

Table 7.1a Adjusted Internal Trip Capture Rates for Trip Origins within a Multi-Use Development			
Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Office	0.0%	0.0%
	To Retail	28.0%	16.4%
	To Restaurant	63.0%	3.3%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	1.0%	1.9%
	To Hotel	0.0%	0.0%
From RETAIL	To Office	29.0%	2.0%
	To Retail	0.0%	0.0%
	To Restaurant	13.0%	29.0%
	To Cinema/Entertainment	0.0%	4.0%
	To Residential	14.0%	24.6%
	To Hotel	0.0%	5.0%
From RESTAURANT	To Office	31.0%	3.0%
	To Retail	14.0%	41.0%
	To Restaurant	0.0%	0.0%
	To Cinema/Entertainment	0.0%	8.0%
	To Residential	4.0%	17.0%
	To Hotel	3.0%	7.0%
From CINEMA/ENTERTAINMENT	To Office	0.0%	2.0%
	To Retail	0.0%	21.0%
	To Restaurant	0.0%	31.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	8.0%
	To Hotel	0.0%	2.0%
From RESIDENTIAL	To Office	2.0%	4.0%
	To Retail	1.0%	32.6%
	To Restaurant	20.0%	16.3%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	0.0%
	To Hotel	0.0%	3.0%
From HOTEL	To Office	75.0%	0.0%
	To Retail	14.0%	16.0%
	To Restaurant	9.0%	68.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	2.0%
	To Hotel	0.0%	0.0%

Table 7.2a Adjusted Internal Trip Capture Rates for Trip Destinations within a Multi-Use Development

Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Office	0.0%	0.0%
	From Retail	4.0%	31.0%
	From Restaurant	14.0%	30.0%
	From Cinema/Entertainment	0.0%	6.0%
	From Residential	3.0%	57.0%
	From Hotel	3.0%	0.0%
To RETAIL	From Office	32.0%	6.6%
	From Retail	0.0%	0.0%
	From Restaurant	8.0%	50.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	17.0%	7.8%
	From Hotel	4.0%	2.0%
To RESTAURANT	From Office	23.0%	1.6%
	From Retail	50.0%	29.0%
	From Restaurant	0.0%	0.0%
	From Cinema/Entertainment	0.0%	3.0%
	From Residential	20.0%	10.9%
	From Hotel	6.0%	5.0%
To CINEMA/ENTERTAINMENT	From Office	0.0%	1.0%
	From Retail	0.0%	26.0%
	From Restaurant	0.0%	32.0%
	From Cinema/Entertainment	0.0%	0.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To RESIDENTIAL	From Office	0.0%	4.0%
	From Retail	2.0%	46.0%
	From Restaurant	5.0%	16.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To HOTEL	From Office	0.0%	0.0%
	From Retail	0.0%	17.0%
	From Restaurant	4.0%	71.0%
	From Cinema/Entertainment	0.0%	1.0%
	From Residential	0.0%	12.0%
	From Hotel	0.0%	0.0%

Weekday A.M. Peak Hour																			
Land Use	Size (K)	Rate/Equation		Total Trips		Interaction %		Int. Trips		External Trips		Pass-By Trips		New Trips					
		a	b	Enter	Exit	Enter	Exit	Enter	Exit	Total	Enter	Total	Enter	Total	Enter	Exit			
Shopping Plaza (LU #821)	150,000	SF	1.73	260	62%	161	99	13%	13	13	234	148	86	33	106	59	105		
Supermarket (LU #850)	40,000	SF	2.86	114	55%	67	47	8%	5	6	103	62	41	8	99	54	35		
Pharmacy (LU #881)	13,500	SF	3.74	50	52%	26	24	8%	3	4	45	24	21	9	27	15	12		
Restaurant (LU #932)	7,500	SF	9.57	72	55%	40	32	14%	6	4	62	34	28	11	5	42	19		
Restaurant (LU #932)	7,500	SF	9.57	72	55%	40	32	14%	6	4	62	34	28	11	5	42	19		
Restaurant (LU #934)	3,500	SF	44.61	156	51%	80	76	14%	12	12	134	70	64	34	33	67	36		
Total				724		414	310	14%	42	42	640	372	268	209	111	431	256		

Weekday P.M. Peak Hour																			
Land Use	Size (K)	Rate/Equation		Total	Total Trips		Interaction %		Int. Trips		External Trips		Pass-By Trips		New Trips				
		a	b		Enter %	Exit	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit					
Shopping Plaza (LU #821)	150,000	SF	5.19	779	49%	381	398	7%	721	354	281	148	436	211	225				
Supermarket (LU #850)	40,000	SF	0.81	368	50%	184	184	7%	343	171	172	41	261	130	131				
Pharmacy (LU #881)	13,500	SF	10.25	138	50%	69	69	6%	4	129	64	65	32	34	34				
Restaurant (LU #932)	7,500	SF	9.05	68	61%	41	27	29%	41%	12	11	45	19	12	8				
Restaurant (LU #932)	7,500	SF	9.05	68	61%	41	27	29%	41%	12	11	45	19	12	7				
Restaurant (LU #934)	3,500	SF	33.03	116	52%	60	56	29%	41%	17	23	67	22	20	13				
Total				1,537		776	761		86	1,365	690	675	254	849	421				

Saturday Midday Peak Hour																			
Land Use	Size (K)	Rate/Equation		Total Trips		Interaction %		Int. Trips		External Trips		Pass-By Trips		New Trips					
		a	b	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit						
Shopping Plaza (LU #821)	150,000	SF	7.75	1,064	52%	553	511	8%	969	509	460	300	156	144	669	316			
Supermarket (LU #850)	40,000	SF	0.74	341	46%	232	232	8%	428	219	203	81	41	40	347	178			
Pharmacy (LU #881)	13,500	SF	8.75	118	49%	58	60	8%	106	53	54	21	21	65	32	33			
Restaurant (LU #932)	7,500	SF	11.19	84	51%	43	41	22%	64	34	30	11	11	43	23	20			
Restaurant (LU #932)	7,500	SF	11.19	84	51%	43	41	22%	64	34	30	11	11	43	23	20			
Restaurant (LU #934)	3,500	SF	55.25	193	51%	98	95	22%	144	76	68	33	32	79	43	36			
Total				2,007		1,027	980		1,776	925	851	530	273	257	1,246	652			

Average Weekday																			
Land Use	Size (K)	Rate/Equation		Total Trips		Interaction %		Int. Trips		External Trips		Pass-By Trips		New Trips					
		a	b	Total	Enter %	Exit	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit					
Shopping Plaza (LU #821)	150,000	SF	67.52	10128	50%	5064	8%	300%	405	506	9217	659	4558	0	9217	4659	4558		
Supermarket (LU #850)	40,000	SF	83.39	3387	50%	1937	1938	8%	150%	155	194	3526	1724	1724	0	3526	1782	1744	
Pharmacy (LU #881)	13,500	SF	108.4	1463	50%	731	732	8%	100%	58	73	1332	673	653	0	1332	673	659	
Restaurant (LU #932)	7,500	SF	107.2	804	50%	402	402	22%	28%	88	113	603	314	289	0	603	314	289	
Restaurant (LU #933)	7,500	SF	107.2	804	50%	402	402	22%	28%	88	113	603	314	289	0	603	314	289	
Restaurant (LU #934)	3,500	SF	467.48	1636	50%	818	818	22%	26%	170	225	1227	638	589	0	1227	638	589	
Total				18710		9356				984	1228	16508	8360	8128	0	16508	8380	8128	

Internal Capture Data not available. Utilized average of AM/PM peak hours.
Pass-By Data not available. Utilized 10% less than PM peak hour.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Magnolia Greene			Organization:	TPD
Project Location:	Caernarvon Township			Performed By:	EMM
Scenario Description:	Potential By-Right Development			Date:	11/15/2022
Analysis Year:	Build-Out			Checked By:	
Analysis Period:	AM Street Peak Hour			Date:	

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				0		
Retail	821/850/881	203.5	ksf	424	254	170
Restaurant	932/934	18.5	ksf	300	160	140
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses ²				0		
				724	414	310

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						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential	1.00	0%	0%	1.00	0%	0%
Hotel						
All Other Land Uses ²						

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 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		22	0	0	0
Restaurant	0	20		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	724	414	310
Internal Capture Percentage	12%	10%	14%
External Vehicle-Trips ⁵	640	372	268
External Transit-Trips ⁶	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	8%	13%
Restaurant	14%	14%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

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

Project Name:	Magnolia Greene
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	254	254	1.00	170	170
Restaurant	1.00	160	160	1.00	140	140
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	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	49		22	0	24	0
Restaurant	43	20		0	6	4
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

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		81	37	0	0	0
Retail	0		80	0	0	0
Restaurant	0	20		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	43	32	0		0
Hotel	0	10	10	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	20	234	254	234	0	0
Restaurant	22	138	160	138	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

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	22	148	170	148	0	0
Restaurant	20	120	140	120	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

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.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Magnolia Greene			Organization:	TPD
Project Location:	Caernarvon Township			Performed By:	EMM
Scenario Description:	Potential By-Right Development			Date:	11/15/2022
Analysis Year:	Build-Out			Checked By:	
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: 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				0		
Retail	821/850/881	203.5	ksf	1,285	634	651
Restaurant	932/934	18.5	ksf	252	142	110
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses ²				0		
				1,537	776	761

Table 2-P: 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						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential	1.00	0%	0%	1.00	0%	0%
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		800	800		950	
Retail					950	
Restaurant					950	
Cinema/Entertainment						
Residential		950	950			
Hotel						

Table 4-P: 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		41	0	0	0
Restaurant	0	45		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,537	776	761
Internal Capture Percentage	11%	11%	11%
External Vehicle-Trips ⁵	1,365	690	675
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	7%	6%
Restaurant	29%	41%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

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-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made.

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

⁶Person-Trips

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

Project Name:	Magnolia Greene
Analysis Period:	

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	634	634	1.00	651	651
Restaurant	1.00	142	142	1.00	110	110
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (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	13		189	26	160	33
Restaurant	3	45		9	19	8
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		42	2	0	0	0
Retail	0		41	0	0	0
Restaurant	0	317		0	0	0
Cinema/Entertainment	0	25	4		0	0
Residential	0	49	15	0		0
Hotel	0	13	7	0	0	

Table 9-P (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	45	589	634	589	0	0
Restaurant	41	101	142	101	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (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	41	610	651	610	0	0
Restaurant	45	65	110	65	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

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

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.

Table 7.1a Adjusted Internal Trip Capture Rates for Trip Origins within a Multi-Use Development			
Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Office	0.0%	0.0%
	To Retail	28.0%	16.4%
	To Restaurant	63.0%	3.3%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	1.0%	1.9%
	To Hotel	0.0%	0.0%
From RETAIL	To Office	29.0%	2.0%
	To Retail	0.0%	0.0%
	To Restaurant	13.0%	29.0%
	To Cinema/Entertainment	0.0%	4.0%
	To Residential	14.0%	24.6%
	To Hotel	0.0%	5.0%
From RESTAURANT	To Office	31.0%	3.0%
	To Retail	14.0%	41.0%
	To Restaurant	0.0%	0.0%
	To Cinema/Entertainment	0.0%	8.0%
	To Residential	4.0%	17.0%
	To Hotel	3.0%	7.0%
From CINEMA/ENTERTAINMENT	To Office	0.0%	2.0%
	To Retail	0.0%	21.0%
	To Restaurant	0.0%	31.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	8.0%
	To Hotel	0.0%	2.0%
From RESIDENTIAL	To Office	2.0%	4.0%
	To Retail	1.0%	32.6%
	To Restaurant	20.0%	16.3%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	0.0%
	To Hotel	0.0%	3.0%
From HOTEL	To Office	75.0%	0.0%
	To Retail	14.0%	16.0%
	To Restaurant	9.0%	68.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	2.0%
	To Hotel	0.0%	0.0%

Table 7.2a Adjusted Internal Trip Capture Rates for Trip Destinations within a Multi-Use Development

Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Office	0.0%	0.0%
	From Retail	4.0%	31.0%
	From Restaurant	14.0%	30.0%
	From Cinema/Entertainment	0.0%	6.0%
	From Residential	3.0%	57.0%
	From Hotel	3.0%	0.0%
To RETAIL	From Office	32.0%	6.6%
	From Retail	0.0%	0.0%
	From Restaurant	8.0%	50.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	17.0%	7.8%
	From Hotel	4.0%	2.0%
To RESTAURANT	From Office	23.0%	1.6%
	From Retail	50.0%	29.0%
	From Restaurant	0.0%	0.0%
	From Cinema/Entertainment	0.0%	3.0%
	From Residential	20.0%	10.9%
	From Hotel	6.0%	5.0%
To CINEMA/ENTERTAINMENT	From Office	0.0%	1.0%
	From Retail	0.0%	26.0%
	From Restaurant	0.0%	32.0%
	From Cinema/Entertainment	0.0%	0.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To RESIDENTIAL	From Office	0.0%	4.0%
	From Retail	2.0%	46.0%
	From Restaurant	5.0%	16.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To HOTEL	From Office	0.0%	0.0%
	From Retail	0.0%	17.0%
	From Restaurant	4.0%	71.0%
	From Cinema/Entertainment	0.0%	1.0%
	From Residential	0.0%	12.0%
	From Hotel	0.0%	0.0%