

TRANSPORTATION, TRAFFIC IMPACT ANALYSIS AND SAFETY: KEEPING IT ALL IN PERSPECTIVE

FEATURING ERIC LAMB

Former City of Raleigh Transportation Planning Manager



Wednesday, July 26th | 6:30-8pm
Trophy Brewing & Taproom Maywood
656 Maywood Ave, Raleigh, NC

The background features a complex network diagram with numerous nodes and connecting lines. A semi-transparent red rectangular overlay covers the left and center portions of the image. The text is white and positioned within this red area.

Traffic

(Everybody Hates It)

Eric J. Lamb, PE, FITE

July 26, 2023



Let's Have a Beer Conversation!

What is traffic anyway?

Actually...



Traffic Is Good?

We are all traffic

Traffic is an indicator of success

Traffic is a side effect of commerce

Congestion means the street is a fully utilized asset

Traffic Is Bad?

Traffic generates pollution

Traffic is stressful

Traffic impedes me

Cars are expensive

Cars sometimes kill people

Congestion

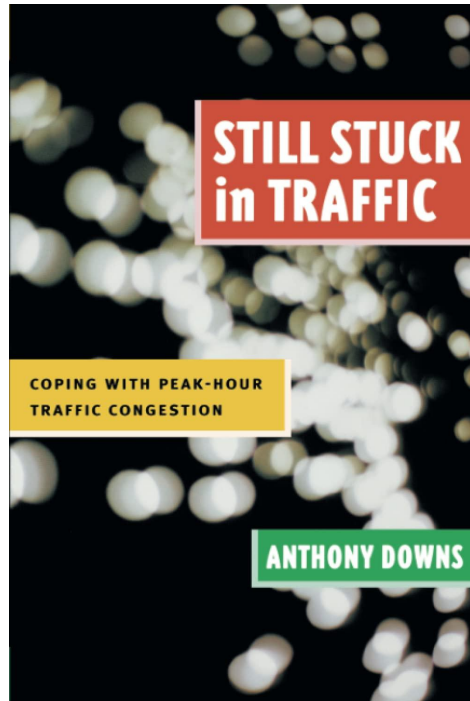
The confluence of:

- Time
- Space
- Mode Choice



(Mario Villafuerte/Getty Images)

Anthony Downs' Rx:



Charge peak hour tolls

Increase road/highway capacity

Increase transit capacity

Live with it

More specifically...

- Utilize incentives/disincentives
- Add infrastructure + capacity
- Create alternatives
- Grow our cities and towns in a manner that generates reasonable/sustainable amounts of it

Where Do Streets Come From?

NC Department of Transportation

Cities and Towns (but not Counties)

Private Development



Financial Tools for Transportation

State/Federal Funding

- ▶ TIP Funded Projects
- ▶ MPO Assistance Programs (LAPP)
- ▶ Powell Bill Allocations
- ▶ Federal Grant Programs

Local Options

- ▶ Property Tax Revenues
- ▶ Bond Revenues
- ▶ Impact Fees
- ▶ Sales Taxes



Impact Fees

Authority to levy is granted by NCGA

Assesses a cost per trip fee to all new development relative to its impact to the local street system

Must always be applied uniformly

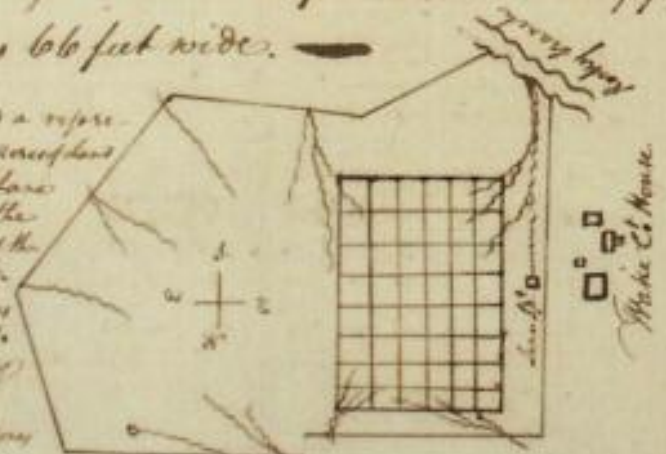
How do we predict
traffic?

Macro-Scale Modeling

- Regional travel demand predicted and managed by MPO's
- Raleigh has been a planned community based on these projections

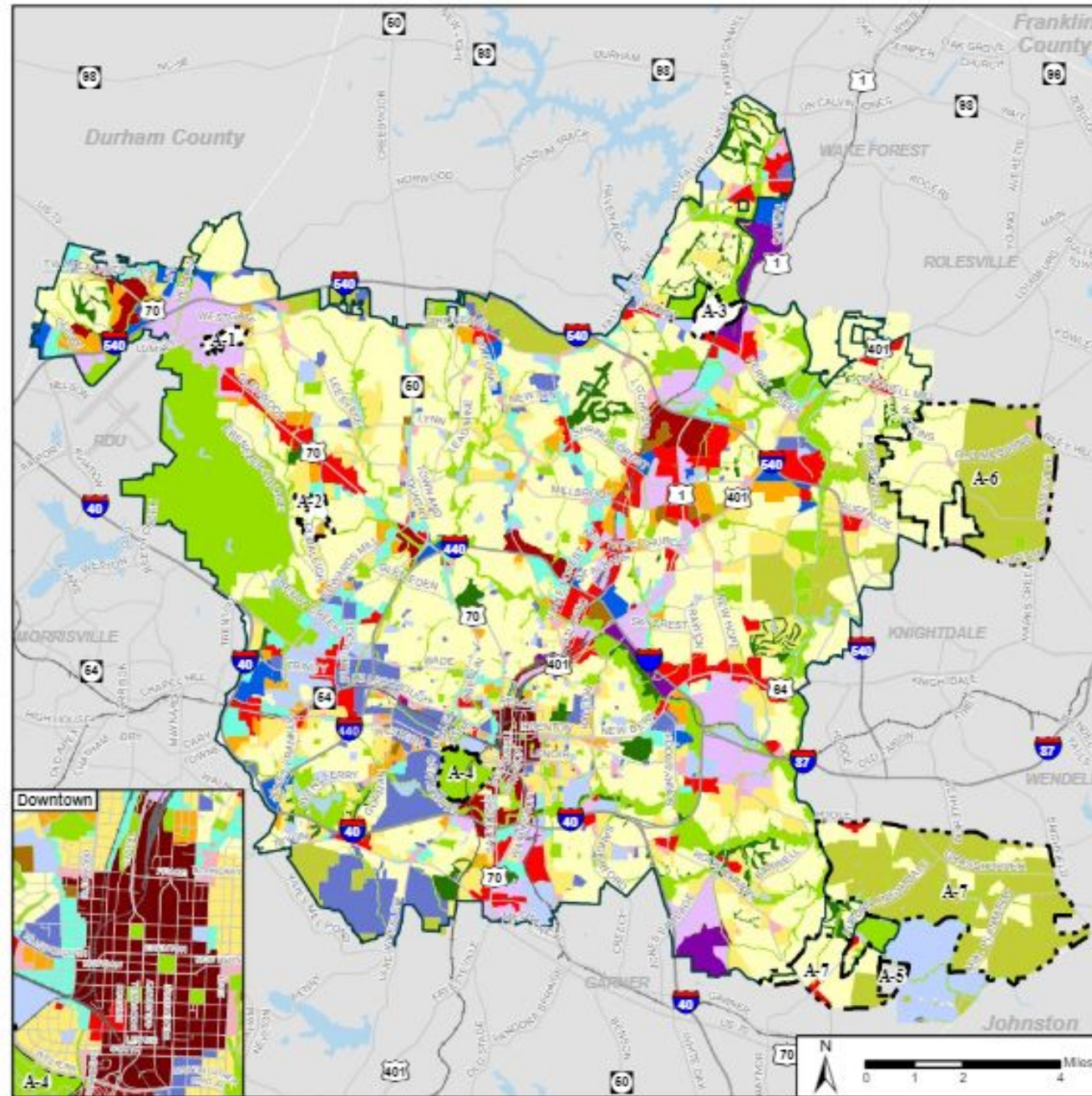
A Union Square, a beautiful eminence, which commands a view of the town, and a fine prospect of the surrounding country, in the centre of this square the State house will be placed. B. Four Groves of young oaks and Hickory containing an acre each, neatly trimmed & grubbed. C. four open squares reserved for Publick purposes, that in the N.E. corner is supposed to be a proper situation for the Governors House. a. b. c. d. Halifax, Newbern, Fayette & Millsborough Streets. e. f. g. Lane Jones & Edenton Streets. h. i. k. Morgan, Hargett & Martin St. l. m. n. Davie, Cabarrus & Leavitt Streets. o. p. q. r. Bloodworth Arson, Blount & Wilmington St. s. t. v. w. Salisbury, McDowell, Dawson & Harrington Streets. The four main Streets 99 feet and the others 66 feet wide.

The annexed plan is a representation of the 1000 Acres of land purchased from Lord Saurin for the State, showing the relative situation of the City to the southward. The line on the west runs so near the N. River as to take in some of the best land in the County. The City contains 400 acres and each lot an acre. A little better than one third of the town on the west side of a clear

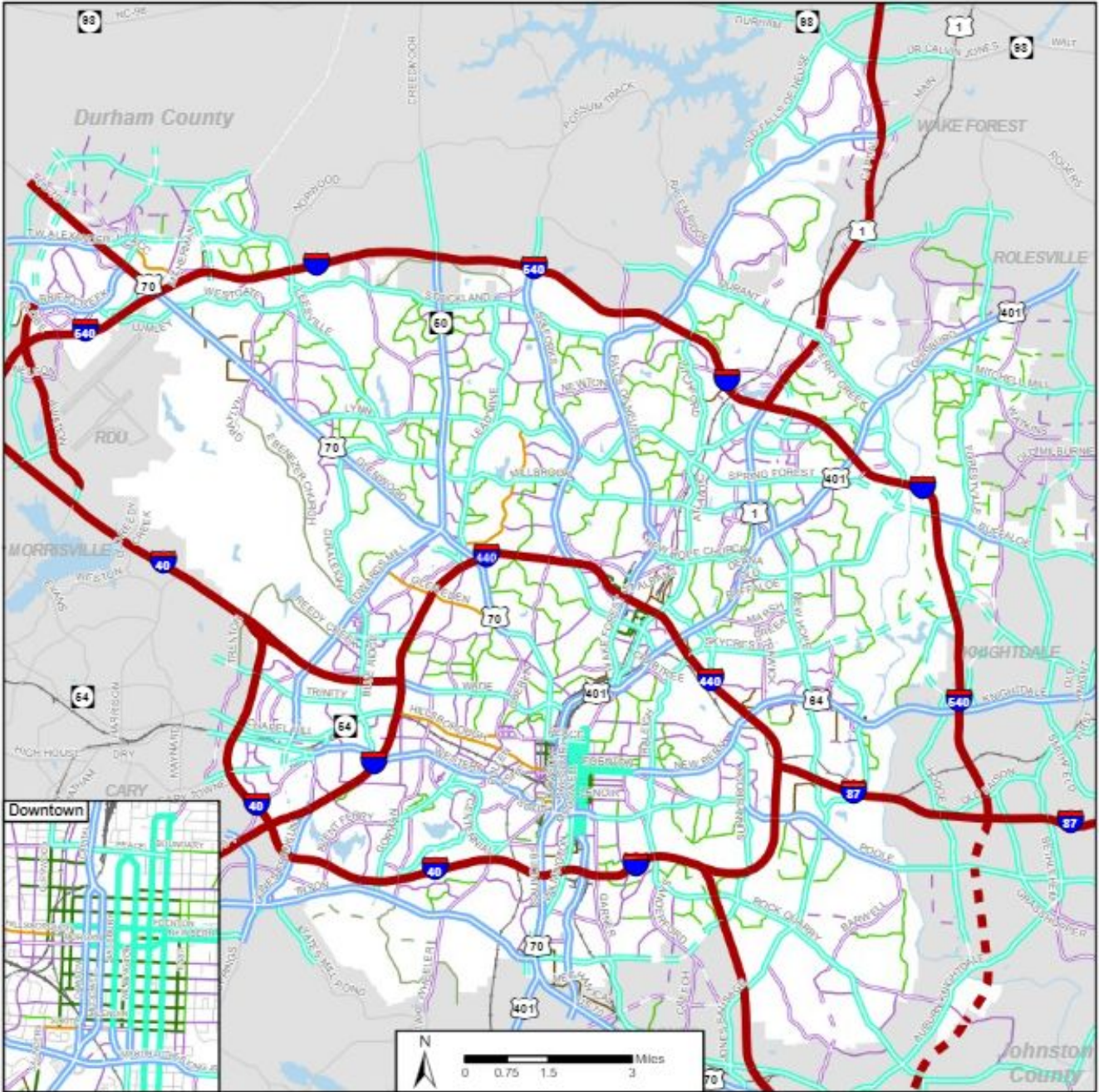


		South Street											
		1	2	3	4	5	6	7	8	9	10		
West Street	20	17 18	14 15	11 12	8 9	5 6	2 3	22 23	19 20	16 17	13 14	10 11	7 8
	21	24 25	21 22	18 19	15 16	12 13	9 10	26 27	23 24	20 21	17 18	14 15	11 12
East Street	22	29 30	26 27	23 24	20 21	17 18	14 15	31 32	28 29	25 26	22 23	19 20	16 17
	23	32 33	29 30	26 27	23 24	20 21	17 18	34 35	31 32	28 29	25 26	22 23	19 20
West Street	24	35 36	32 33	29 30	26 27	23 24	20 21	37 38	34 35	31 32	28 29	25 26	22 23
	25	38 39	35 36	32 33	29 30	26 27	23 24	40 41	37 38	34 35	31 32	28 29	25 26
East Street	26	41 42	38 39	35 36	32 33	29 30	26 27	43 44	40 41	37 38	34 35	31 32	28 29
	27	44 45	41 42	38 39	35 36	32 33	29 30	46 47	43 44	40 41	37 38	34 35	31 32
West Street	28	47 48	44 45	41 42	38 39	35 36	32 33	49 50	46 47	43 44	40 41	37 38	34 35
	29	50 51	47 48	44 45	41 42	38 39	35 36	52 53	49 50	46 47	43 44	40 41	37 38
East Street	30	53 54	50 51	47 48	44 45	41 42	38 39	55 56	52 53	49 50	46 47	43 44	40 41
	31	56 57	53 54	50 51	47 48	44 45	41 42	58 59	55 56	52 53	49 50	46 47	43 44
West Street	32	59 60	56 57	53 54	50 51	47 48	44 45	61 62	58 59	55 56	52 53	49 50	46 47
	33	62 63	59 60	56 57	53 54	50 51	47 48	64 65	61 62	58 59	55 56	52 53	49 50
East Street	34	65 66	62 63	59 60	56 57	53 54	50 51	67 68	64 65	61 62	58 59	55 56	52 53
	35	68 69	65 66	62 63	59 60	56 57	53 54	70 71	67 68	64 65	61 62	58 59	55 56
West Street	36	71 72	68 69	65 66	62 63	59 60	56 57	73 74	70 71	67 68	64 65	61 62	58 59
	37	74 75	71 72	68 69	65 66	62 63	59 60	76 77	73 74	70 71	67 68	64 65	61 62
East Street	38	77 78	74 75	71 72	68 69	65 66	62 63	79 80	76 77	73 74	70 71	67 68	64 65
	39	80 81	77 78	74 75	71 72	68 69	65 66	82 83	79 80	76 77	73 74	70 71	67 68
West Street	40	83 84	80 81	77 78	74 75	71 72	68 69	85 86	82 83	79 80	76 77	73 74	70 71
	41	86 87	83 84	80 81	77 78	74 75	71 72	88 89	85 86	82 83	79 80	76 77	73 74
East Street	42	89 90	86 87	83 84	80 81	77 78	74 75	91 92	88 89	85 86	82 83	79 80	76 77
	43	92 93	89 90	86 87	83 84	80 81	77 78	94 95	91 92	88 89	85 86	82 83	79 80
West Street	44	95 96	92 93	89 90	86 87	83 84	80 81	97 98	94 95	91 92	88 89	85 86	82 83
	45	98 99	95 96	92 93	89 90	86 87	83 84	100 101	97 98	94 95	91 92	88 89	85 86
East Street	46	101 102	98 99	95 96	92 93	89 90	86 87	103 104	100 101	97 98	94 95	91 92	88 89
	47	104 105	101 102	98 99	95 96	92 93	89 90	106 107	103 104	100 101	97 98	94 95	91 92
West Street	48	107 108	104 105	101 102	98 99	95 96	92 93	109 110	106 107	103 104	100 101	97 98	94 95
	49	110 111	107 108	104 105	101 102	98 99	95 96	112 113	109 110	106 107	103 104	100 101	97 98
East Street	50	113 114	110 111	107 108	104 105	101 102	98 99	115 116	112 113	109 110	106 107	103 104	100 101
	51	116 117	113 114	110 111	107 108	104 105	101 102	118 119	115 116	112 113	109 110	106 107	103 104
West Street	52	119 120	116 117	113 114	110 111	107 108	104 105	121 122	118 119	115 116	112 113	109 110	106 107
	53	122 123	119 120	116 117	113 114	110 111	107 108	124 125	121 122	118 119	115 116	112 113	109 110
East Street	54	125 126	122 123	119 120	116 117	113 114	110 111	127 128	124 125	121 122	118 119	115 116	112 113
	55	128 129	125 126	122 123	119 120	116 117	113 114	130 131	127 128	124 125	121 122	118 119	115 116
West Street	56	131 132	128 129	125 126	122 123	119 120	116 117	133 134	130 131	127 128	124 125	121 122	118 119
	57	134 135	131 132	128 129	125 126	122 123	119 120	136 137	133 134	130 131	127 128	124 125	121 122
East Street	58	137 138	134 135	131 132	128 129	125 126	122 123	139 140	136 137	133 134	130 131	127 128	124 125
	59	140 141	137 138	134 135	131 132	128 129	125 126	142 143	139 140	136 137	133 134	130 131	127 128
West Street	60	143 144	140 141	137 138	134 135	131 132	128 129	145 146	142 143	139 140	136 137	133 134	130 131
	61	146 147	143 144	140 141	137 138	134 135	131 132	148 149	145 146	142 143	139 140	136 137	133 134
East Street	62	149 150	146 147	143 144	140 141	137 138	134 135	151 152	148 149	145 146	142 143	139 140	136 137
	63	152 153	149 150	146 147	143 144	140 141	137 138	154 155	151 152	148 149	145 146	142 143	139 140
West Street	64	155 156	152 153	149 150	146 147	143 144	140 141	157 158	154 155	151 152	148 149	145 146	142 143
	65	158 159	155 156	152 153	149 150	146 147	143 144	160 161	157 158	154 155	151 152	148 149	145 146
East Street	66	161 162	158 159	155 156	152 153	149 150	146 147	163 164	160 161	157 158	154 155	151 152	148 149
	67	164 165	161 162	158 159	155 156	152 153	149 150	166 167	163 164	160 161	157 158	154 155	151 152

Map LU-3: Future Land Use



Map T-1: Street Plan



Micro-Scale Modeling

- A.k.a., Traffic Studies or Traffic Impact Analyses
- Evaluations of direct impacts to the local transportation system during AM and PM peak periods

Predicting Traffic from Development

The Four Step Process:

Trip Generation	How many new trips will a proposed development create?
Trip Distribution	In which directions are those new trips likely to go?
Mode Choice	Cars · Walking · Bikes · Transit
Network Assignment	Add all new trips to the system and measure the impacts at intersections

How Many Trips?

Use	Daily Trip Generation
Single Family Homes	9.5 trips per dwelling unit
Apartments	6.7 trips per dwelling unit
Townhomes	5.8 trips per dwelling unit
Industrial	6.8 trips per 1,000 sq.ft.
Office	11.0 trips per 1,000 sq.ft.
Medical Office	36.1 trips per 1,000 sq.ft.
Discount Superstore	50.8 trips per 1,000 sq.ft.
Grocery Store	102.2 trips per 1,000 sq.ft.

Source: ITE Trip Generation Manual

Uses also have different rates for AM/PM peak trips
Peak hour impacts are used to determine traffic mitigation needs

Outliers

Chick-Fil-A versus other Fast Food
Drive-Thru Restaurants

Trader Joe's versus
other Grocery Stores



Raleigh, residents compromise on parking near Umstead Park

City officials have reached a compromise with people who live in a neighborhood near William B. Umstead State Park to limit parking by people headed to the park.

Posted 3:58 p.m. Apr 7, 2010 — Updated 6:19 p.m. Apr 7, 2010

Even not
developing
property can
generate
traffic!!!



Tt Tt Tt

RALEIGH, N.C. — City officials have reached a compromise with people who live in a neighborhood near William B. Umstead State Park to limit parking by people headed to the park.

Raleigh has already restricted parking along much of Reedy Creek Road at the southeast end of Umstead Park, which is the closest entrance to park for most local residents.



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Nuances in AM/PM Trip Generation

Residential uses are mostly outbound in the AM peak and inbound in the PM peak

Office uses are the opposite: inbound in the AM peak and outbound in the PM peak

Retail uses generate very little AM traffic

Reductions

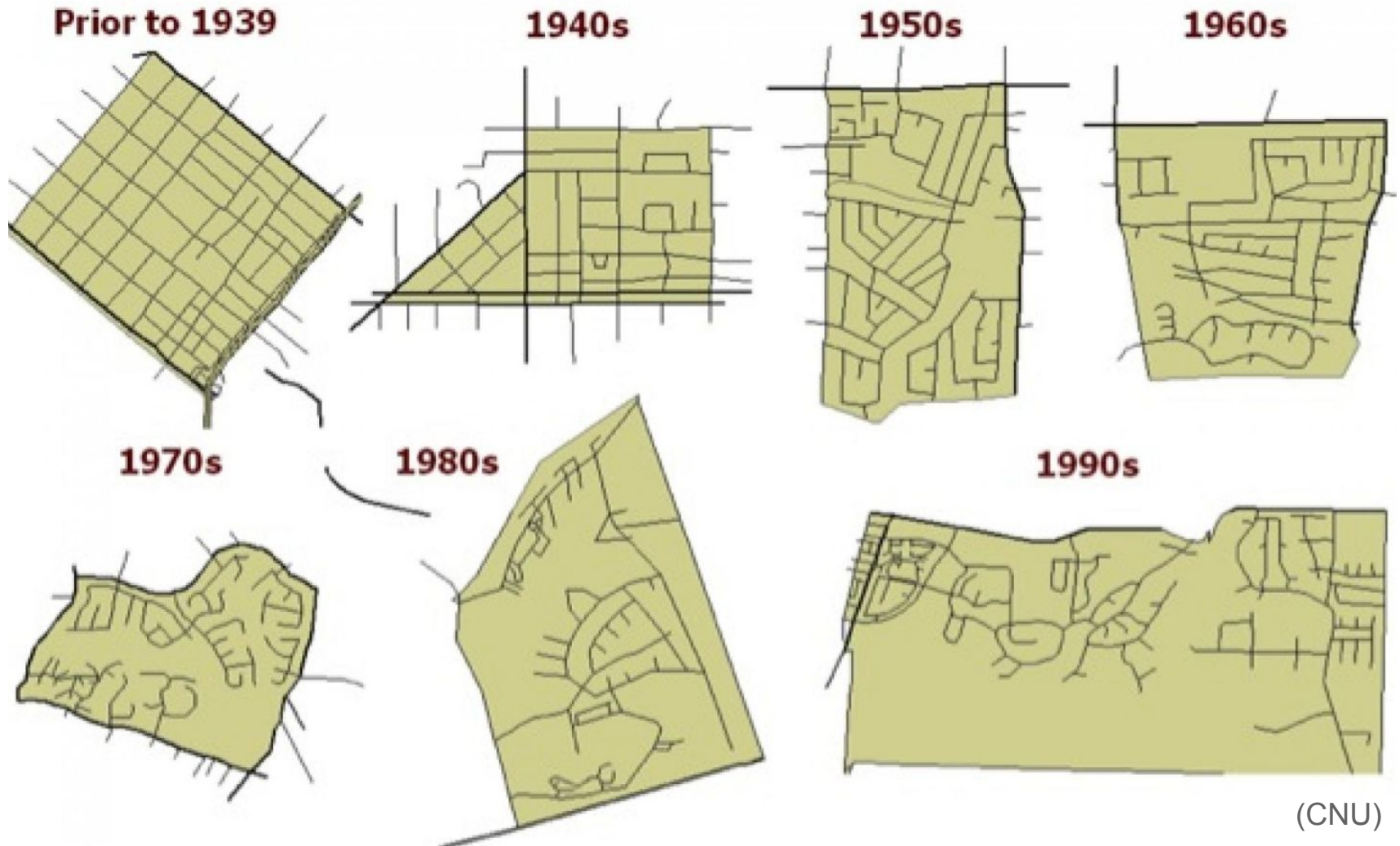
Pass-by Trips

- A trip that is already on the network that is temporarily diverting to a proposed use (“Stopping for gas or milk on the way home”)

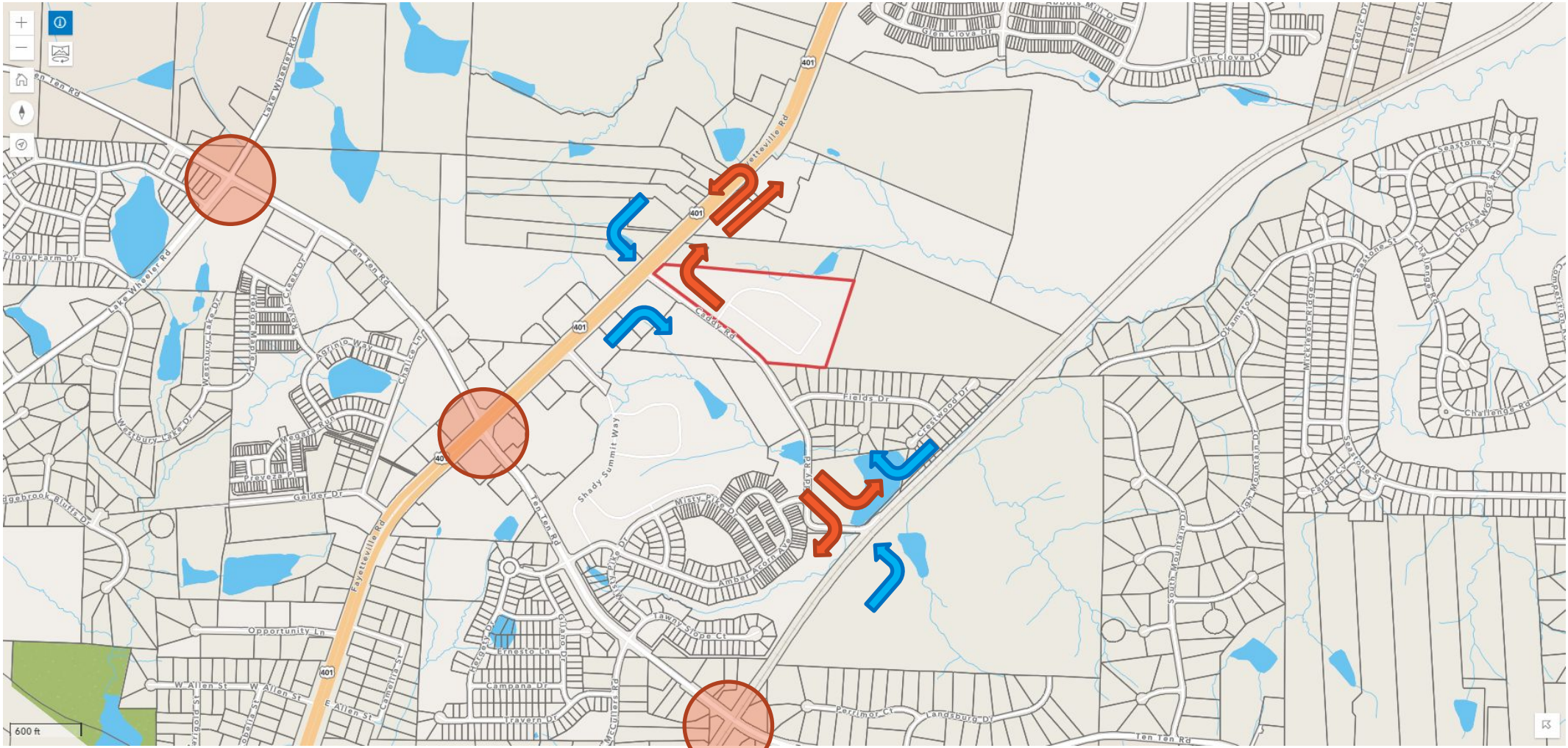
Replacing trips generated by a previous use

Where Will They Go?

(And Why Street Networks Matter)



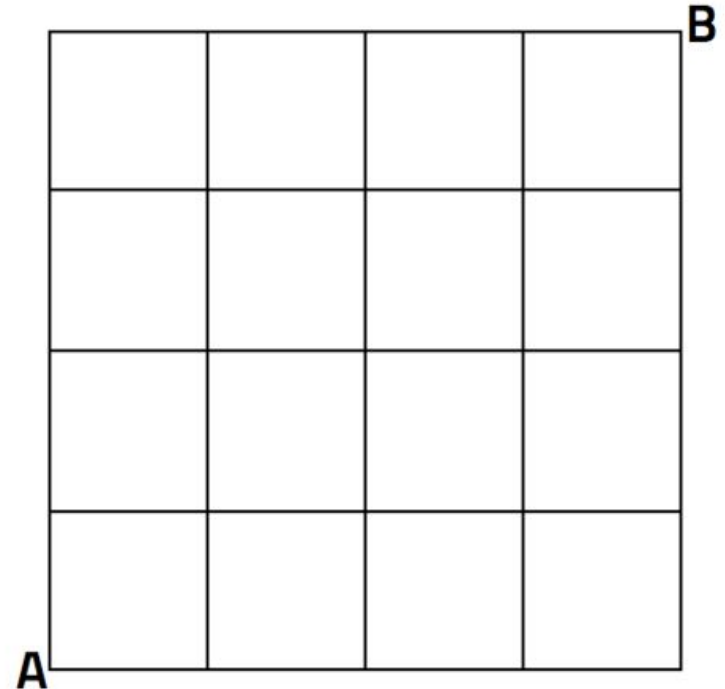
Assigning Trips



Interconnectivity

An interconnected grid of streets is superior to a network of disconnected dead-end streets:

- Emergency response
- Sanitation service
- Mail delivery
- Distribution of traffic



Mode Choices

Cars

Trucks/Freight

Bicycles

- Conventional
- E-Bikes
- Bikeshare

Pedestrians

Scooters

Pedicab

Buses

- Local
- Circulator
- Bus Rapid Transit (BRT)
- Regional (GoTriangle)
- Long Haul (Greyhound)

Rail

- Freight
- Long Haul Passenger (Amtrak, High Speed)
- Commuter
- Light Rail
- Streetcar

Marine

- Shipping/Freight
- Ferries

TIA Mode Choices

Cars | Bicycles | Pedestrians | Transit

Percentage allocations based on availability of facilities

Raleigh allows trip reductions along planned major transit corridors (BRT + high freq)

Network Assignment

Vehicular trips assigned to the street network

Impacts at each intersections analyzed:

- Delay/LOS at each approach
- Queuing
- Adequacy of lane configurations
- Adequacy of signal timing

Why Good Land Use Matters

Density fosters “Trip Capture”

Multiple uses in close proximity that are convenient and walkable generate less trips than segregated/isolated uses

Such development patterns are greener relative to emissions from vehicles and healthier by providing opportunities for walking

Large homogenous land uses are exclusively auto-oriented

Oberlin



Stanhope



Midtown (North Hills)

Mall and other low-density commercial uses replaced by very large mixed-use development





Midtown (North Hills)

Initial traffic projections reflected traditional engineering practices, required extensive traffic analysis and consideration of mitigations

In reality...



Table 3			
Combined AM and PM Peak Hour Traffic Volume Comparisons			
Intersection	Highest Observed Count (Date)	Projected from North Hills East TIA	Difference (Projected – Highest Observed Count)
Six Forks Road at Rowan Street	8,854 (1/21/2016)	10,837	+1,983
Six Forks Road at Lassiter Mill Road	9,892 (3/16/2005)	11,963	+2,071
Six Forks Road at Dartmouth Road/Main Street	9,677 (3/16/2005)	12,287	+2,610
Six Forks Road at Front at North Hills Street/I-440 Westbound Ramps	11,184 (5/29/2019)	13,893	+2,709
Six Forks Road at Ramblewood Drive/I-440 Eastbound On-Ramps	9,025 (5/29/2019)	10,679	+1,654
Six Forks Road at I-440 Westbound to Northbound Off-Ramp	7,193 (12/13/2012)	8,769	+1,576
Lassiter Mill Road at Currituck Drive	3,361 (5/29/2019)	N/A*	N/A
Wake Forest Road at St Albans Drive	9,801 (1/28/2016)	10,959	+1,158

*Intersection not included in North Hills East TIA, so no combined AM and PM peak hour projection is available

New VMT Approach

Land use patterns influence the total vehicle miles travelled (VMT) for traffic generated by a site

Large homogenous land uses (big residential subdivisions, office parks) generate more VMT than mixed-use developments

California has added VMT to their TIA process to determine appropriateness of development

Does More Traffic Mean Less Safety?

Tradeoffs in Safety versus Efficiency:

- More congestion = slower speeds
- Slower speeds = less severe crashes

Summary

Traffic will always be a concern for every development case

Multimodal solutions should remain at the forefront

We should grow our region in a manner that generates the outcomes we want

thanks!

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