A. INTRODUCTION

Orange County has undergone a period of tremendous growth over the past thirty years as it has been transformed from a predominantly rural environment to a mixed suburban, rural and, in places, urban setting that has become a part of the greater New York metropolitan area. The Towns and Villages in the southeastern portion of the County are at the leading edge of the development cycle. These communities have become the logical place to settle for people and businesses moving away from the older, more densely developed areas of downstate New York. As more people move into this area, the demand for the roadways, schools, and infrastructure will also increase. One of the most visible impacts of this increased demand is traffic congestion. With segments of the main thoroughfares already operating at or above their design capacity, the growth projections and the subsequent effect on the transportation systems are major concerns for both the residents, businesses, and elected officials in these municipalities.

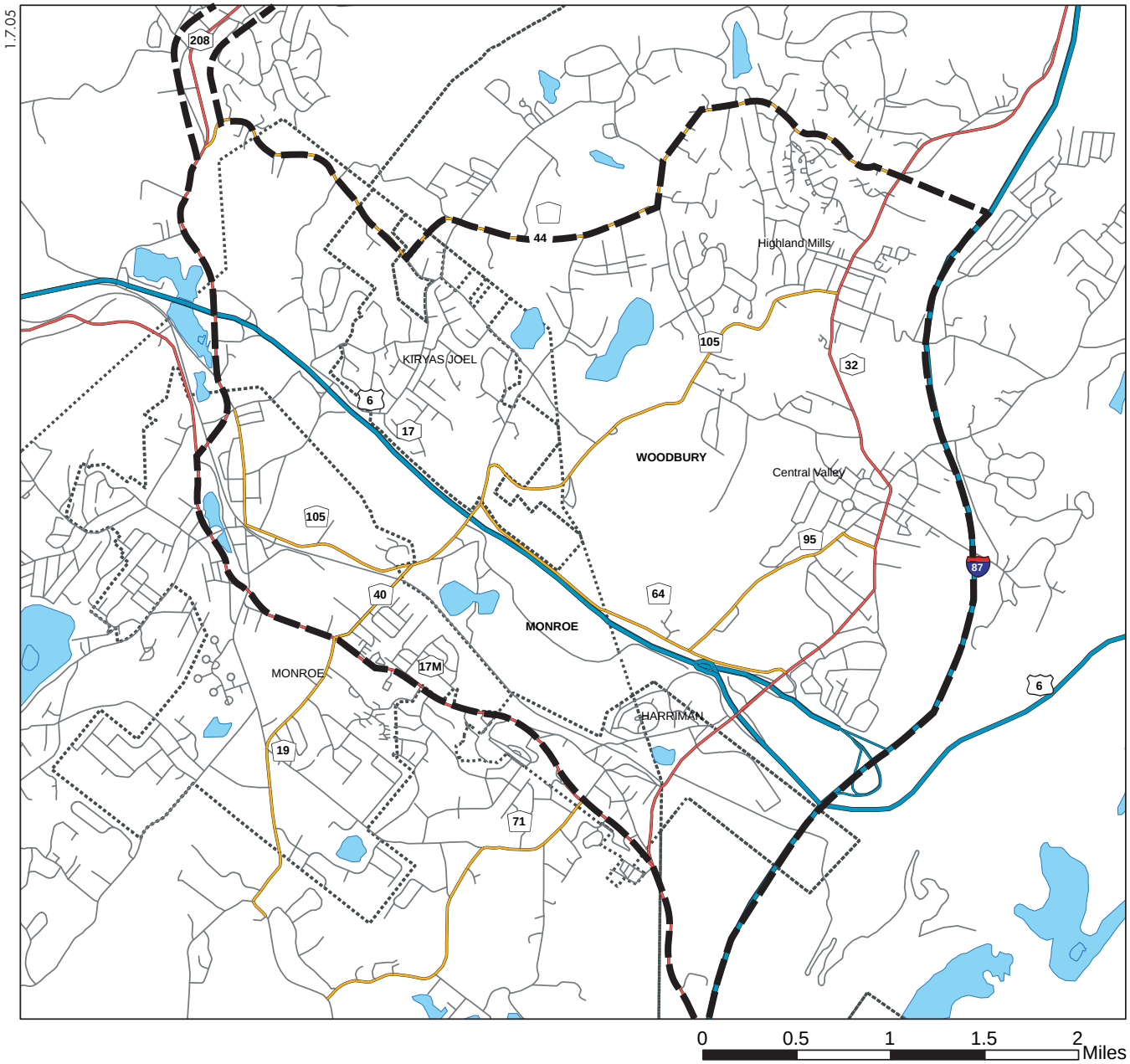
B. PROJECT EVOLUTION AND STAKEHOLDERS

In 1998 a grass roots Traffic Task Force was formed focusing on traffic congestion in the Monroe-Woodbury area and the types of regional, inter-municipal, solutions that could be advanced to address these issues. The Task Force consisted primarily of elected officials and planning and zoning board members representing the Towns of Monroe and Woodbury, as well as from the Villages of Harriman, Kiryas Joel, and Monroe. Meeting on a monthly basis, the Traffic Task Force discussed potential transportation improvement measures and land use controls that could be initiated to help preserve the area's unique character and maintain the quality of life that makes this portion of Orange County such an attractive place to live and do business. Responsible development and smart growth became important issues.

Building from the Task Force's work, Orange County and New York State Department of Transportation agreed to sponsor and fund unique, new research. The Southeastern Orange County Traffic and Land Use Study involves a detailed analysis of traffic conditions on the state-owned corridors in the area including Route 17, Route 17M, Route 208, Route 32, and the heavily traveled Route 17/6/32 interchange area (see Figure S-1). The study also evaluates potential solutions that include modifications to the New York State Thruway and County Route 105 as well as improvements to transit and pedestrian operations and the provision of multi-modal transportation centers.

A number of goals were established as part of this Federally funded study including:

- Determining the current operational characteristics and deficiencies of the transportation system;
- Forecasting future conditions of the transportation system;



Legend

- STUDY AREA BOUNDARY
- MUNICIPAL BOUNDARIES
- LAKES

ROADS

- INTERSTATES/ US HIGHWAYS
- STATE HIGHWAYS
- COUNTY HIGHWAYS
- OTHER ROADS

SOUTHEASTERN ORANGE COUNTY
TRAFFIC AND LAND USE STUDY

Study Area Location
Figure S-1

- Recommending improvements to enhance the efficiency and safety of the transportation system;
- Developing and recommending sustainable development guidelines that are compatible with and help preserve the capacity of future transportation improvements;
- Building a consensus for proposed transportation improvements and sustainable development through public forums.

C. STUDY FINDINGS

LAND USE PATTERNS AND TRENDS

The most intense development in Orange County in recent years has been concentrated in the southeastern portion of the county, particularly near the New York State Thruway and Route 17. In addition, there has been a significant increase in residential subdivision and commercial development in the Towns of Monroe, Woodbury, and Blooming Grove although Monroe and Woodbury have seen significantly more recent development than Blooming Grove. The Villages of Monroe and Harriman are older centers, and although mostly built-out under current zoning rules, have experienced the impacts of increased traffic as a result of growth in the adjacent municipalities. The rapid growth of the Village of Kiryas Joel over the past two decades into a new community has also added new population to the area.

The growth in population that the southeastern portion of the county has experienced in recent decades has resulted in a substantial boom in commercial development along the Route 17 corridor. Woodbury Common is a regional retail center that has served as an anchor for other new retail construction around Routes 32 and 17. Subsequently, undeveloped land in this area has been increasingly developed for retail and commercial uses as market demand has increased. Southeastern Orange County still has large tracts of open space, as well as numerous tracts of undeveloped, forested, and wetland properties. Demand for residential property has led to new construction in the remaining countryside.

CURRENT TRAFFIC PATTERNS

The Southeastern Orange County study area is connected to other parts of Orange County and the rest of New York State via an established regional highway network that converges at its towns of Woodbury and Harriman. The New York State Thruway (I-87), as the primary north-south highway in the area, connects regionally to adjacent counties and points east of the Hudson River. Access to I-87 is provided via its Woodbury/Harriman toll interchange at Exit 16, which feeds west directly into the limited access Quickway (overlap of State Route 17 and US Route 6) and connects to State Route (SR) 17 and SR 32 via interchange ramps. Due to the rapid population and economic growth over recent years, travel to and from the area has increased, both in volume and in average distance. On a typical weekday, commuter travel generally peaks southbound in the morning and northbound in the evening. On the weekends, directional travel is more homogeneous, with significant peaking of traffic volumes along SR 17/32 near the Thruway interchange. This condition is attributed mainly to the continual growth of destination retail activities from Woodbury Common, the newly opened Woodbury Center and others in the area.

Traffic data were collected along three key corridors in fall 2002 to assess existing traffic conditions within the study area. A combination of automatic traffic recorder (ATR) and manual

counts were conducted to formulate existing peak hour traffic volumes along SR 17/32 between SR 17M and Ridge Road, SR 17M between SR 17 and SR 208, and SR 208 and County Route (CR) 105 between CR 44 and Bakertown Road. Based on the collected data, the weekday 7:30 to 8:30 AM and 5:00 to 6:00 PM, and the Saturday noon to 1 PM peak hours were selected for analysis. These hours represent the typical peak commuter and weekend travel periods within the study area. The *Synchro 5 Traffic Signal Coordination Software*, which was developed based on the *2000 Highway Capacity Manual (HCM)* methodologies, was used to evaluate individual analysis locations and provide simulations of peak hour traffic flows along each of the above corridors.

Of the three study area corridors, traffic volumes are the highest along SR 17/32, with peak bi-directional hourly volumes nearing 2,800 vehicles, and lowest along SR 17M. On a typical weekday, directional peaking generally occurs southbound in the morning and northbound in the evening. Along SR 17M, which has more of an east-west alignment, weekday traffic is heavier eastbound towards SR 17 in the morning and westbound towards SR 208 in the evening. Weekend traffic is more homogeneous in both north-south and east-west directions.

Operational characteristics reflecting the travel conditions at individual intersections along the Route 17/32 corridor were summarized based on analysis results from the Synchro simulation of existing peak hour traffic. These results indicate how existing peak hour volumes compare to roadway capacities, the amount of average vehicle delays at intersection controls, and the levels of service of specific lane groups, approaches or intersections. Level of Service (LOS) is categorized from A through F. LOS A and B signify good operating conditions with minimal delay. At LOS C, the number of vehicles stopping is higher, but congestion is still fairly light. LOS D describes a condition at which congestion levels are more noticeable and individual cycle failures (motorists having to wait for more than one green phase to clear the intersection) at signalized intersections can occur or available gaps for minor street movements at unsignalized intersections are diminished. Conditions at LOS E and F reflect poor service levels, where cycle breakdowns are frequent or extended waits are needed for one or more turning movements. Under ideal suburban settings, the boundary between LOS C and LOS D is generally considered the threshold of acceptable operations.

Existing Levels of Service within each of the study area corridors are summarized in Tables S-1.

Table S-1
2002 Existing Levels of Service – SR32 Signalized Intersections

Cross Street	Dir	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		Move	Delay (sec)	LOS	Move	Delay (sec)	LOS	Move	Delay (sec)	LOS
CR 105	EB	LR	29.7	C	LR	29.4	C	LR	34.5	C
	NB	LT	4.2	A	LT	6.8	A	LT	8.7	A
	SB	TR	7.5	A	TR	4.8	A	TR	6.0	A
		Int.	**9.5**	**A**	**Int.**	**8.6**	**A**	**Int.**	**11.1**	**B**
Smith Clove Road	WB	LR	20.7	C	LR	35.6	D_a	LR	21.0	C
	NB	TR	8.0	A	TR	48.2	D_u	TR	12.1	B
	SB	LT	11.7	B	LT	53.7	D_u	LT	9.1	A
		Int.	**12.7**	**B**	**Int.**	**48.1**	**D_u**	**Int.**	**12.5**	**B**
Woodbury Common North	WB	LTR	55.3	E	LTR	52.2	D_u	LTR	55.5	E
	NB	LTR	2.0	A	LTR	2.9	A	LTR	24.4	C
	SB	LTR	4.2	A	LTR	6.7	A	LTR	15.2	B
		Int.	**4.3**	**A**	**Int.**	**10.4**	**B**	**Int.**	**23.2**	**C**
Woodbury Common South	EB	LR	49.6	D_u	LR	50.8	D_u	LR	52.8	D_u
	WB	LR	47.8	D_u	LR	45.8	D_u	LR	45.1	D_u
	NB	T	5.8	A	T	13.2	B	T	10.7	B
	SB	T	5.5	A	T	11.3	B	T	13.6	B
		Int.	**8.4**	**A**	**Int.**	**18.7**	**B**	**Int.**	**16.0**	**B**
SR 17 WB Off Ramp / Nininger Road	EB	LR	82.1	F	LR	76.5	E	LR	129.1	F
	WB	LTR	73.9	E	LTR	116.6	F	LTR	57.5	E
	NB	LT	11.9	B	LT	6.7	A	LT	16.4	B
	SB	TR	13.8	B	TR	20.9	C	TR	16.7	B
		Int.	**32.0**	**C**	**Int.**	**44.1**	**D_a**	**Int.**	**33.2**	**C**
SR 17 EB On/Off Ramps	EB	LTR	34.3	C	LTR	36.7	D_a	LTR	72.4	E
	NB	TR	44.4	D_a	TR	27.9	C	TR	14.1	B
	SB	LT	81.2	F	LT	62.7	E	LT	82.6	F
		Int.	**60.7**	**E**	**Int.**	**44.8**	**D_a**	**Int.**	**57.1**	**E**
Locey Lane / Woodbury Center	EB	LTR	50.4	D_u	LTR	55.4	E	LTR	92.1	F
	WB	LTR	51.6	D_u	LTR	49.9	D_u	LTR	89.9	F
	NB	LTR	4.1	A	LTR	7.0	A	LTR	7.1	A
	SB	LTR	16.3	B	LTR	27.5	C	LTR	32.2	C
		Int.	**12.6**	**B**	**Int.**	**19.3**	**B**	**Int.**	**28.0**	**C**
US Route 6 Off Ramp	WB	LR	75.0	E	LR	51.9	D_u	LR	74.7	E
	NB	T	0.2	A	T	1.0	A	T	3.3	A
	SB	T	0.7	A	T	5.3	A	T	3.0	A
		Int.	**7.9**	**A**	**Int.**	**10.3**	**B**	**Int.**	**18.9**	**B**
Larkin Drive / US Route 6 On Ramp	EB	LTR	55.6	D_u	LTR	61.5	E	LTR	70.7	E
	NB	LTR	25.2	C	LTR	29.3	C	LTR	21.6	C
	SB	LT	16.4	B	LT	12.1	B	LT	20.2	C
		Int.	**27.5**	**C**	**Int.**	**29.9**	**C**	**Int.**	**36.7**	**D_a**

Note: SR 32 is oriented NB/SB, while cross streets are oriented EB/WB.
D_a = marginally acceptable LOS (delay ≤ 45 seconds); D_u = marginally unacceptable LOS (delay > 45 seconds)

Table S-2
2002 Existing Levels of Service – SR 32 Unsignalized Intersections

Cross Street	Dir	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		Move	Delay (sec)	LOS	Move	Delay (sec)	LOS	Move	Delay (sec)	LOS
Ridge Road	EB	LR	16.0	C	LR	17.7	C	LR	15.6	C
	NB	LT	0.5	A	LT	1.2	A	LT	1.0	A
	SB	TR	--	--	TR	--	--	TR	--	--
		Int.	**2.1**	**A**	**Int.**	**1.8**	**A**	**Int.**	**1.7**	**A**
Dunderberg Road / Estrada Road	EB	LTR	26.7	D_a	LTR	391.1	F	LTR	44.2	E
	WB	LTR	327.4	F	LTR	332.2	F	LTR	49.2	E
	NB	LTR	0.2	A	LTR	1.1	A	LTR	0.6	A
	SB	LTR	0.5	A	LTR	1.1	A	LTR	0.5	A
		Int.	**21.9**	**C**	**Int.**	**25.0**	**C**	**Int.**	**3.0**	**A**

Note: SR 32 is oriented NB/SB, while cross streets are oriented EB/WB.
D_a = marginally acceptable LOS (delay $\leq$ 30 seconds); D_u = marginally unacceptable LOS (delay > 30 seconds)

Table S-3
2002 Existing Levels of Service – SR 17M Intersections

Cross Street	Dir	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		Move	Delay (sec)	LOS	Move	Delay (sec)	LOS	Move	Delay (sec)	LOS
SR 17	EB	R	10.9	B	R	6.4	A	R	8.0	A
	NB	LT	3.8	A	LT	4.5	A	LT	3.7	A
	SB	TR	9.0	A	TR	8.9	A	TR	6.9	A
		Int.	**8.5**	**A**	**Int.**	**5.3**	**A**	**Int.**	**5.5**	**A**
Harriman Heights Road / Church Street	EB	LTR	6.9	A	LTR	5.8	A	LTR	6.1	A
	WB	LTR	5.6	A	LTR	7.3	A	LTR	5.7	A
	NB	LTR	15.5	B	LTR	19.8	B	LTR	13.4	B
	SB	LTR	14.4	B	LTR	16.5	B	LTR	13.3	B
		Int.	**10.2**	**B**	**Int.**	**10.8**	**B**	**Int.**	**8.7**	**A**
North Main Street (unsignalized)	EB	LT	4.1	A	LT	4.7	A	LT	3.7	A
	WB	TR	--	--	TR	--	--	TR	--	--
	SB	LR	10.8	B	LR	22.6	C	LR	16.9	C
		Int.	**4.0**	**A**	**Int.**	**7.3**	**A**	**Int.**	**5.5**	**A**
K-Mart / Vista Lane	EB	LTR	10.3	B	LTR	18.3	B	LTR	18.8	B
	WB	LTR	3.2	A	LTR	7.1	A	LTR	6.7	A
	NB	LTR	21.9	C	LTR	23.4	C	LTR	26.0	C
	SB	LTR	24.5	C	LTR	23.9	C	LTR	22.8	C
		Int.	**9.8**	**A**	**Int.**	**13.3**	**B**	**Int.**	**15.3**	**B**
Still Road / Freeland Street	EB	LTR	28.7	C	LTR	51.1	D_u	LTR	40.3	D_a
	WB	LTR	17.6	B	LTR	59.3	E	LTR	33.5	C
	NB	LTR	29.9	C	LTR	32.5	C	LTR	21.3	C
	SB	LTR	25.4	C	LTR	25.6	C	LTR	29.5	C
		Int.	**26.6**	**C**	**Int.**	**43.7**	**D_a**	**Int.**	**33.2**	**C**
Stage Road	EB	LTR	9.3	A	LTR	8.9	A	LTR	8.3	A
	WB	LTR	6.4	A	LTR	13.4	B	LTR	9.5	A
	NB	LTR	32.9	C	LTR	39.4	D_a	LTR	30.5	C
	SB	LTR	26.0	C	LTR	26.3	C	LTR	29.7	C
		Int.	**12.9**	**B**	**Int.**	**17.0**	**B**	**Int.**	**13.0**	**B**
Lakes Street/Road	EB	LTR	23.8	C	LTR	33.4	C	LTR	24.7	C
	WB	LTR	17.6	B	LTR	60.4	E	LTR	28.3	C
	NB	LTR	28.0	C	LTR	44.0	D_a	LTR	38.4	D_a
	SB	LTR	17.8	B	LTR	29.6	C	LTR	30.5	C
		Int.	**23.5**	**C**	**Int.**	**44.6**	**D_a**	**Int.**	**29.7**	**C**
Shop Rite	EB	TR	10.3	B	TR	16.2	B	TR	20.5	C
	WB	LT	3.2	A	LT	7.8	A	LT	13.5	B
	NB	LR	30.8	C	LR	33.3	C	LR	69.2	E
		Int.	**7.9**	**A**	**Int.**	**13.8**	**B**	**Int.**	**25.2**	**C**
SR 208	EB	LT	19.6	B	LT	30.7	C	LT	74.5	E
	WB	T	12.4	B	T	17.6	B	T	15.4	B
	SB	LR	18.8	B	LR	33.7	C	LR	30.6	C
		Int.	**18.2**	**B**	**Int.**	**29.1**	**C**	**Int.**	**41.2**	**D_a**

Note: SR 17M is oriented EB/WB, while cross streets are oriented NB/SB.

Table S-4
2002 Existing Levels of Service – SR 208/CR105 Intersections

Cross Street	Dir	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		Move	Delay (sec)	LOS	Move	Delay (sec)	LOS	Move	Delay (sec)	LOS
CR 44 (unsignalized)	WB	LR	35.1	E	LR	54.7	F	LR	42.7	E
	NB	TR	--	--	TR	--	--	TR	--	--
	SB	LT	0.9	A	LT	1.0	A	LT	1.0	A
		Int.	**2.3**	**A**	**Int.**	**3.8**	**A**	**Int.**	**1.7**	**A**
SR 17 WB Ramps	EB	LTR	42.8	D_a	LTR	27.5	C	LTR	43.0	D_a
	WB	LT	53.2	D_u	LT	96.2	F	LT	65.1	E
	NB	LT	0.6	A	LT	7.1	A	LT	0.7	A
	SB	LTR	28.0	C	LTR	8.2	A	LTR	6.6	A
		Int.	**25.7**	**C**	**Int.**	**29.3**	**C**	**Int.**	**13.1**	**B**
SR 17 EB Ramps	WB	L	52.7	D_u	L	50.3	D_u	L	51.5	D_u
	NB	T	36.1	D_a	T	82.2	F	T	79.8	E
	SB	LT	39.4	D_a	LT	12.5	B	LT	30.8	C
		Int.	**38.9**	**D_a**	**Int.**	**50.1**	**D_u**	**Int.**	**53.5**	**D_u**
Schunnemunk Street / SR 208 Extension	EB	LTR	25.6	C	LTR	30.4	C	LTR	23.6	C
	WB	LTR	29.3	C	LTR	42.0	D_a	LTR	27.4	C
	NB	LTR	26.1	C	LTR	31.7	C	LTR	26.9	C
	SB	LT	23.3	C	LT	30.4	C	LT	22.9	C
		Int.	**25.5**	**C**	**Int.**	**31.7**	**C**	**Int.**	**24.4**	**C**
Freeland Street (unsignalized)	WB	R	--	--	R	--	--	R	--	--
	NB	L	33.7	D_u	L	171.7	F	L	504.8	F
	SB	LT	--	--	LT	--	--	LT	--	--
		Int.	**8.3**	**A**	**Int.**	**23.8**	**C**	**Int.**	**100.3**	**F**
Larkin Drive	WB	LR	11.3	B	LR	13.1	B	LR	16.9	B
	NB	TR	9.1	A	TR	9.9	A	TR	12.2	B
	SB	LT	7.2	A	LT	12.6	B	LT	22.3	C
		Int.	**8.7**	**A**	**Int.**	**11.6**	**B**	**Int.**	**17.2**	**B**
Dunderberg Road (unsignalized)	WB	LR	31.5	D_u	LR	129.0	F	LR	94.6	F
	NB	TR	--	--	TR	--	--	TR	--	--
	SB	LT	2.8	A	LT	3.6	A	LT	0.7	A
		Int.	**8.6**	**A**	**Int.**	**22.0**	**C**	**Int.**	**28.8**	**D_a**
CR 105 Extension / Bakertown Road (unsignalized)	NEB	LT	1.8	A	LT	3.3	A	LT	1.5	A
	SWB	TR	--	--	TR	--	--	TR	--	--
	SB	LR	10.1	B	LR	48.1	E	LR	11.6	B
		Int.	**2.9**	**A**	**Int.**	**15.9**	**C**	**Int.**	**3.4**	**A**

Note: SR 208 and CR 105 are oriented NB/SB, while cross streets are oriented EB/WB.

D. TRAFFIC AND LAND USE FORECASTING

Projections of traffic conditions on the study area corridors for the horizon year 2020 and for full build-out (maximum development permitted by current zoning) were developed by the Orange County Department of Planning utilizing a four-step travel demand model for several future scenarios and a No-Build Scenario, which assumes that no significant changes to land use regulations or the current transportation system are made beyond those currently committed to by the transportation providers and local municipalities. Potential visions for future development, building off comments and recommendations from the public visioning sessions, were developed. These scenarios were then assembled into a matrix for comparative purposes using the County's four-step travel demand model (see Figure S-2).

LAND USE SCENARIOS

- ***Existing Zoning –*** Development of existing vacant or underdeveloped parcels according to existing zoning codes.
- ***Village Center Scenario –*** Changing land use patterns to increase densities and expand the limits of the villages and hamlets in the study area while reducing the amount of developable land in the outlying areas.
- ***Reduced Density Scenario –*** Limit commercial development to the established business zones with no expansions allowed beyond the existing commercial boundaries. Reduce residential development by increasing required lot sizes.
- ***Infrastructure-Based Zoning Scenario*** – Concentrate both commercial and residential development in the areas that contain sufficient sewer infrastructure. Development outside of these areas would be required to install, and/or make financial provisions for, the utilities and services necessary to support the additional expansion.

TRANSPORTATION SCENARIOS

- ***No Action- Current Improvements Only*** – The existing transportation network supplemented with improvement projects currently under consideration or in construction.
- ***Transportation Management Strategies*** – Maximize the effectiveness of the existing transportation network without major changes or construction. Key elements include small improvements to the transit system (i.e. better interconnections to and from existing bus and rail), signal optimization, bikeways and other bicycle-use incentives, pedestrian safety and circulation improvements.
- ***Roadway Focused Investment*** – Invest in roadway improvements designed to alleviate congestion using a range of roadway capacity enhancements and new roadway links, such as roadway improvements to circumvent key congestion points and adding travel lanes on major corridors.
- ***Transit Focused Investments*** – Increase the efficiency and frequency of the transit systems along with improvements that would facilitate multi-modal transit connections. A system of regional park-and-ride facilities would be coordinated with new regional and intra-county transit services.

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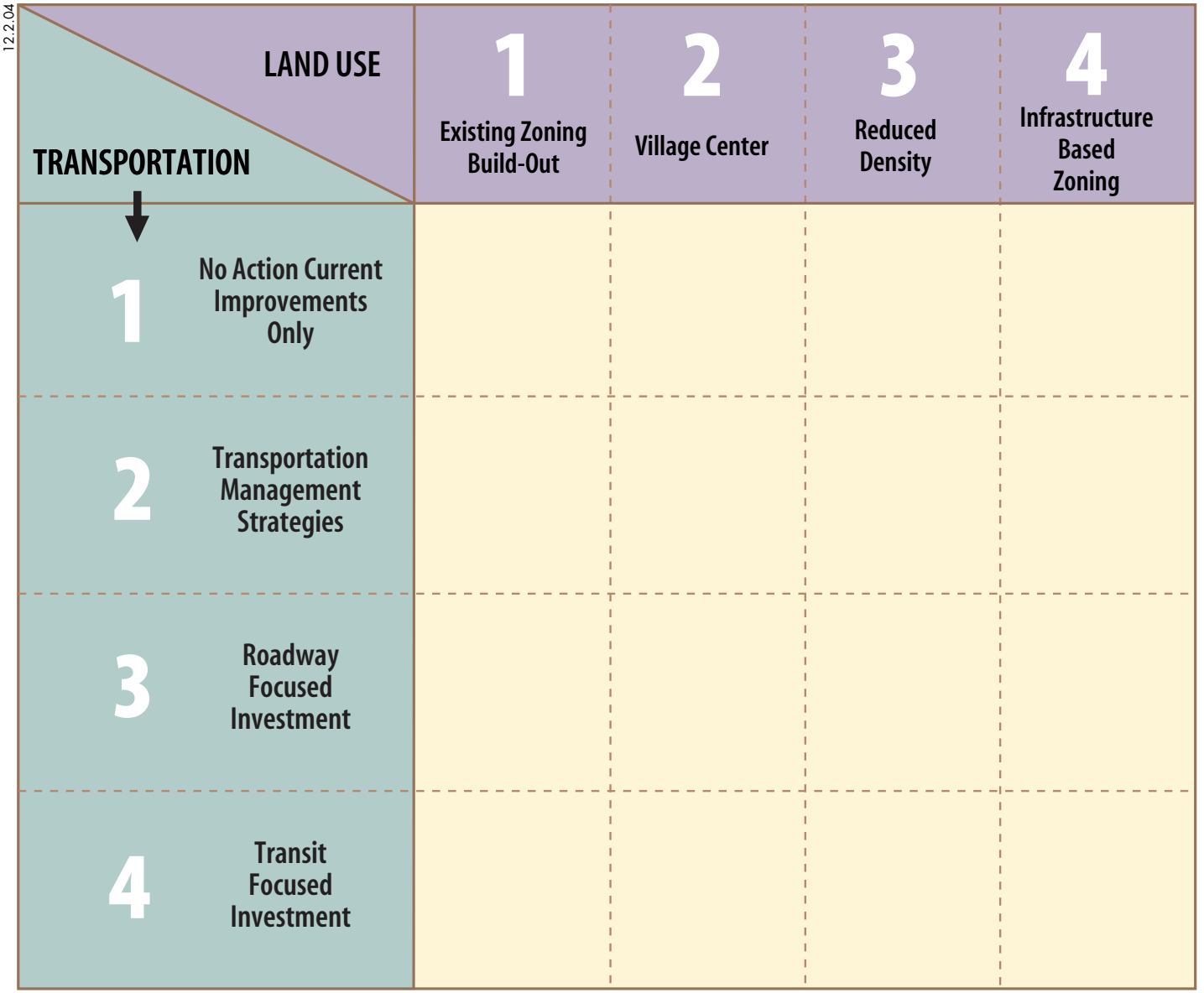

SOUTHEASTERN ORANGE COUNTY
TRAFFIC AND LAND USE STUDY

Scenario Matrix
Figure S-2