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TRAFFIC IMPACT STUDY

Myrtle Plantation
Beaufort County, South Carolina

prepared for

Beaufort County

prepared by

TRANSYSTEMS CORPORATION

June 2000

TRANSYSTEMS CORPORATION

June 12, 2000

Mr. Robert Klink, P.E.
County Engineer
Engineering Department
Beaufort County Administration Building
100 Ribaut Road
Beaufort, SC 29902

Re: Proposed Myrtle Plantation Development
U.S. 278 and S.C. 46 Vicinity
Beaufort County, South Carolina

Dear Mr. Klink:

In accordance with your request and authorization, TranSystems Corporation has completed a traffic impact study update for the proposed Myrtle Plantation located in the vicinity of U.S. 278 and S.C. 46 in Beaufort County, South Carolina. The purpose of this study was to assess the impact of the proposed development on the surrounding transportation system.

Included in this study is a discussion of the anticipated impact of the proposed development on existing conditions, projected future conditions, analysis of the surrounding street system, and recommendations for improvements to the street system and site access to mitigate projected deficiencies.

DEVELOPMENT PLAN AND STUDY AREA

The proposed development consists of office, retail, industrial and residential developments located on several tracts of land south of U.S. 278. The majority of the development exists between or along S.C. 46 and Burnt Church Road between the town of Bluffton and U.S. 278. Additional retail development is also proposed along Foreman Hills Road, located farther to the east along U.S. 278. The location of the proposed development is illustrated on *Figure 1.*

U.S. 278 is a four-lane highway that provides the sole vehicular access to Hilton Head Island, located a few miles to the east of the development. To the west, U.S. 278 intersects S.C. 170 and, eventually, Interstate 95. S.C. 170 provides access to northern Beaufort County (and the City of Beaufort) and south to Savannah, Georgia. Burnt Church Road and S.C. 46 are both two-lane roadways that extend south into the town of Bluffton.

Included with the proposed development is a new collector road, commonly referred to as the East/West Connector, that will provide access to much of the development. This collector is proposed to be a four-lane divided roadway which will eventually extend west to S.C. 170.

2400 Pershing Road, Suite 400 • Kansas City, Missouri 64108 • Phone: (816) 329-8600 Fax: (816) 329-8602

ANALYSIS

The analysis of the proposed development's impact included estimates of vehicle trip generation, distribution of the trips onto the planned street network, discussion of potential driveway alignments, and an analysis of projected future peak hour operations. Each of these analysis techniques, and their results, are described below.

Trip Generation ... The number of vehicle trips estimated to be generated by the proposed development was calculated using the Institute of Transportation Engineers' (ITE) Trip Generation, 6th Edition. The daily, A.M. peak hour, and P.M. peak hour trip generation estimates for the proposed development are summarized on ***Table 1.***

370,000 / 160,000 = 21,321 / 9,220 — Traffic allowed

TABLE 1
Trip Generation

Parcel	Land Use	Intensity	ITE Code	Daily	A.M. Peak In	A.M. Peak Out	P.M. Peak In	P.M. Peak Out
A	Retail/Shopping Center	160,000 sf	820	9,220	129	82	411	445
B	Low-Rise Apartments	300 du	221	1,920	27	109	115	59
C	Office Building(s)	80,000 sf	710	1,120	137	19	29	140
D	Retail/Shopping Center	80,000 sf	820	5,910	85	55	260	282
E	Low-Rise Apartments	300 du	221	1,920	27	109	115	59
F	County Park	5 acres	*	1,000	0	0	50	50
G	Business Park	330,000 sf	770	4,290	391	75	101	340
H	Retail/Shopping Center	330,000 sf	820	14,690	198	127	663	718
I	Business Park	270,000 sf	770	3,650	322	61	84	283
J	Retail/Shopping Center	260,000 sf	820	12,600	172	110	566	614
K	Retail/Shopping Center	120,000 sf	820	7,660	109	69	340	368
L	Government Office	35,000 sf	733	590	71	10	20	99
M	Low-Rise Apartments	280 du	221	1,820	26	103	108	56
N	Single-Family Residential	175 du	210	1,730	33	99	114	64
O	Business Park	72,000 sf	770	1,520	88	17	25	84
P	Retail/Shopping Center	95,000 sf	820	6,600	95	60	291	316
Q	Retail/Shopping Center	280,000 sf	820	13,220	180	115	595	644
			Total Trips	**89,460**	**2,090**	**1,220**	**3,887**	**4,621**
			Pass-By Trips	**12,582**	**174**	**112**	**563**	**609**
			Interconnected Trips	**3,828**	**22**	**22**	**180**	**180**
			New Trips Generated	**73,050**	**1,894**	**1,086**	**3,144**	**3,832**

* - Insufficient data provided by ITE, Estimates Used

A development of this nature will generate several types of vehicle trips including pass-by trips, interconnected trips and new trips to the area. Pass-by trips are trips drawn from existing traffic in the area and do not represent new trips to the public street system. Interconnected trips are those trips that travel within the development, such as between an office and retail development, that do not travel on the public streets to do so. The Institute of Transportation Engineers' Trip Generation Handbook was used to estimate both the pass-by and interconnected trips. Details on

how these numbers were estimated have been included in the Myrtle Plantation Technical Appendix, a separate document.

Trip Distribution ... The estimated peak hour trips generated by the proposed development were distributed onto the street system based on the trip distributions listed in *Table 2*. Different travel patterns were used for existing and future conditions. These patterns were based on input from the South Carolina Department of Transportation.

TABLE 2
Trip Distribution

Direction To/From	Existing	Future
North on S.C. 170 via U.S. 278	15 percent	10 percent
South via Burnt Church Road or S.C. 46	30 percent	23 percent
West on U.S. 278	20 percent	15 percent
East on U.S. 278	35 percent	30 percent
West on East/West Connector	N/A	20 percent
North to/from The Crescent	0 percent	2 percent
Total	100 percent	100 percent

These trip distribution patterns have been illustrated in more detail in the Technical Appendix, including the specific disttribution patterns for each of the development parcels.

Peak Hour Operation ... The peak hour traffic volumes at the study intersections were analyzed to determine their operational characteristics during the peak hours of a typical weekday for the projected traffic volumes. The intersections were assessed using the methodologies outlined in the Transportation Research Board's Highway Capacity Manual, 1997 Edition.

The results of intersection operational analyses are typically assessed by the "Level of Service" experienced by drivers. Level of Service (LOS) describes the quality of traffic operating conditions and ranges from "A" to "F". LOS A represents the most desirable conditions with the free-flow movement of traffic and minimal delays. LOS F generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D and E reflect incremental increases in congestion. The delay thresholds for signalized and unsignalized intersections are included in *Table 3* with delay expressed in seconds per vehicle.

TABLE 3
Delay Thresholds of Level of Service

Level of Service (LOS)	Signalized Intersection	Unsignalized Intersection
A	< 10 Seconds	< 10 Seconds
B	< 20 Seconds	< 15 Seconds
C	< 35 Seconds	< 25 Seconds
D	< 55 Seconds	< 35 Seconds
E	< 80 Seconds	< 50 Seconds
F	> 80 Seconds	> 50 Seconds

The LOS rating deemed acceptable varies by community, facility type, and traffic control device. In many commercial areas LOS D had been identified as the minimum desirable goal for signalized intersections. However, at unsignalized intersections LOS E and above are often accepted for low to moderate traffic volumes where the installation of a traffic signal is not warranted by the conditions at the intersection or the location has been deemed undesirable for signalization for other reasons, e.g. the close proximity of an existing traffic signal or the presence of a convenient alternative path.

Existing Conditions ... The results of the signalized intersection analyses for the existing conditions have been summarized on Table 4 with the unsignalized intersection analysis summarized on Table 5. These intersections were evaluated with the existing peak hour traffic volumes shown on *Figure 2* and *Figure 3* and the traffic control and lane configurations shown on *Figure 4*.

TABLE 4
Signalized Intersection Level-of-Service
Existing Conditions

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS[1]	Delay[2]	LOS[1]	Delay[2]
U.S. 278 and S.C. 46	E	71.6	D	47.6
U.S. 278 and Burnt Church Road	E	63.3	D	40.0
U.S. 278 and Factory Stores #1	C	29.9	D	45.9

1 - Level of Service
2 - Control Delay in Seconds per Vehicle

TABLE 5
Unsignalized Intersection Level-of-Service
Existing Conditions

Intersection / Movement	A.M. Peak Hour LOS[1]	A.M. Peak Hour Delay[2]	P.M. Peak Hour LOS[1]	P.M. Peak Hour Delay[2]
U.S. 278 and Kitties Crossing				
Westbound Left-Turn	E	35.6	D	25.2
Northbound Left-Turn	F	>120	F	>120
Northbound Right-Turn	F	93.4	D	29.3
U.S. 278 and Home Depot/Heritage				
Eastbound Left-Turn	B	11.8	E	45.5
Westbound Left-Turn	D	29.2	B	14.4
Northbound Left-Turn	F	>120	F	>120
Northbound Right-Turn	D	31.0	C	17.3
Southbound Left-Turn	F	>120	F	>120
Southbound Right-Turn	B	13.9	F	91.9
U.S. 278 and Foreman Hills Road				
Eastbound Left-Turn	B	12.9	D	33.3
Westbound Left-Turn	E	47.4	C	19.9
Northbound Left-Turn	F	>120	F	>120
Northbound Right-Turn	F	69.7	C	21.8
Southbound Left-Turn	F	>120	F	>120
Southbound Right-Turn	B	14.9	D	32.7
S.C. 46 and Kitties Crossing				
Southbound Left-Turn	B	10.5	A	8.4
Westbound Left-Turn	D	32.4	C	22.8
Westbound Right-Turn	C	15.9	B	11.7

1 - Level of Service
2 - Control Delay in Seconds per Vehicle

The intersections along U.S. 278 are, for the most part, currently operating near or at capacity.

Existing Plus Development Conditions ... The results of the signalized intersection analysis for the existing plus development conditions have been summarized on Table 6 with the unsignalized intersection analysis summarized on Table 7. These intersections were evaluated with the existing plus development traffic volumes shown on ***Figure 5*** and ***6*** and the traffic control and lane configurations shown on ***Figure 7***. These lane configurations were developed through an iterative process to identify the most effective and efficient improvements that will provide adequate operating conditions given the practical limitations on infrastructure improvements.

TABLE 6
Signalized Intersection Level-of-Service
Existing Plus Development Conditions

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS[1]	Delay[2]	LOS[1]	Delay[2]
U.S. 278 and S.C. 46	D	37.9	E	61.9
U.S. 278 and Kitties Crossing	C	22.2	C	31.3
U.S. 278 and Burnt Church Road	D	49.8	F	94.0
U.S. 278 and Factory Stores #1	D	38.5	D	43.8
U.S. 278 and Foreman Hills Road	C	34.9	F	90.5
S.C. 46 and Kitties Crossing	B	15.4	B	19.9
S.C. 46 and Kitties Landing Drive	B	17.2	C	21.0
S.C. 46 and East/West Connector	D	36.6	C	26.9
Burnt Church and East/West Connector	D	37.2	D	44.4

1 - Level of Service
2 - Control Delay in Seconds per Vehicle

To accommodate the full development of Myrtle Plantation, a significant investment in upgrading the surrounding infrastructure will need to be made. The most significant of these investments will need to be made on U.S. 278, S.C. 46 and Burnt Church Road. U.S. 278 will need, at a minimum, to be upgraded to a six-lane facility. Burnt Church Road and S.C. 46 both will need to be upgraded to five-lane roads with two through lanes in each direction and a center two-way left-turn lane. Further improvements will be needed at the intersections of U.S. 278 with Burnt Church Road and S.C. 46, however, even these improvements will not provide sufficient capacity to accommodate the projected traffic volumes.

With the increase in traffic volumes on U.S. 278 combined with the additional demand placed at the two median openings between S.C. 46 and Burnt Church Road (due to the proposed retail development; primarily Target), full median access at both of these locations will be difficult to maintain and a traffic signal will likely be needed. While it would be desirable to locate a traffic signal centrally between S.C. 46 and Burnt Church Road, the proposed Target store will prohibit a driveway from being placed in that location. This being the case, the most logical location for a full-access, signal-controlled median opening would be at the westernmost median opening at Kitties Crossing.

This location is desirable for two reasons – first, it provides a traffic signal in the more desirable location for traffic from the south to turn left onto U.S. 278. Installing a traffic signal at the Home Depot/Heritage Motors location would necessitate traffic "back-tracking" to reach a traffic signal to turn left (traveling east to reach a signal to travel west). Second, the Kitties Crossing location is the only location which can provide sufficient stacking distance back from the traffic signal. The Home Depot/Heritage Motors location is undesirable due to the close proximity of the frontage road to U.S. 278.

TABLE 7
Unsignalized Intersection Level-of-Service
Existing Plus Development Conditions

Intersection / Movement	A.M. Peak Hour LOS[1]	A.M. Peak Hour Delay[2]	P.M. Peak Hour LOS[1]	P.M. Peak Hour Delay[2]
S.C. 46 and North Collector				
Northbound Left-Turn	A	9.3	B	11.6
Eastbound Left-Turn	C	24.8	F	>120
Eastbound Right-Turn	B	10.1	B	13.5
S.C. 46 and Kitties Landing Way				
Southbound Left-Turn	B	10.5	B	11.2
Westbound	C	21.2	F	>120
S.C. 46 and South Collector				
Northbound Left-Turn	A	8.5	B	11.0
Eastbound	C	16.4	F	72.3
S.C. 46 and Industrial Drive				
Northbound Left-Turn	A	8.6	B	12.1
Eastbound	C	20.9	F	>120
East/West Conn. and Kitties Landing				
Eastbound Left-Turn	A	7.6	A	7.9
Southbound	A	9.1	B	10.5
East/West Conn. and West Apartment				
Eastbound Left-Turn	A	7.6	A	7.7
Westbound Left-Turn	A	7.4	A	7.8
Northbound	B	10.2	B	11.7
Southbound	A	9.8	A	9.8
East/West Conn. and East Apartment				
Eastbound Left-Turn	A	7.5	A	7.8
Westbound Left-Turn	A	7.5	A	7.9
Northbound	A	9.4	B	10.4
Southbound	B	10.6	C	16.3
East/West Conn. and Office/Commercial				
Eastbound Left-Turn	A	7.9	A	7.9
Westbound Left-Turn	A	7.8	A	8.6
Northbound	A	10.0	C	17.5
Southbound	B	14.1	F	>120
Burnt Church and North Collector				
Southbound Left-Turn	B	10.3	C	18.6
Westbound	C	17.0	F	>120
Burnt Church and South Collector				
Southbound Left-Turn	A	9.4	A	9.8
Westbound	C	18.5	F	111.9

1 - Level of Service
2 - Control Delay in Seconds per Vehicle

It is unlikely that full access will be able to be maintained at U.S. 278 and the Home Depot/Heritage Motors driveway. Restricting the left-turns from the driveway onto U.S. 278, while still allowing left-turns off of U.S. 278, may well provide safe and efficient movements for many years, if not indefinitely, without fully restricting the driveway.

New traffic signals will also be needed at the following locations:

- S.C. 46 and Kitties Crossing;
- S.C. 46 and Kitties Landing;
- S.C. 46 and East/West Connector;
- Burnt Church Road and East/West Connector; and
- Foreman Hills Road and U.S. 278.

In addition to the roadway improvements mentioned above, the location of the proposed driveways were evaluated to determine their ability to safely and efficiently accommodate existing and projected traffic volumes. ***Figure 8*** illustrates the proposed driveway and street locations in the area and highlights the distances between them. These distances are critical in evaluated where traffic signals could safely and efficiently operate without significant interference from adjacent intersections.

Of particular concern is the number of intersections along S.C. 46 between the East/West Connector and U.S. 278. While the installation of a traffic signal would be desirable on S.C. 46 to serve the proposed development on the west side of S.C. 46, the frequent spacing of the driveways makes the identification of a suitable location for a traffic signal rather difficult. The most desirable situation would be to relocate or add a driveway aligning with either Kitties Landing Drive or Kitties Landing Way.

We would recommend that the first driveway proposed on the East/West Connector, located approximately 250 feet east of S.C. 46, be closed. The close proximity of this driveway to the proposed signalized intersection at S.C. 46 and the East/West Connector will restrict this driveway's ability to operate safely and efficiently. Traffic would queue back from the signalized intersection to block this driveway on a regular basis. Furthermore, traffic desiring to turn right from this driveway and then immediately left onto S.C. 46 would not have room to do so without blocking more than one lane at a time.

It would be desirable to relocate the office/commercial driveway on the East/West Connector further to the west by approximately 200 feet. This would allow the installation of a traffic signal, if the need should arise, serving this site.

Lastly, many of the unsignalized driveways were evaluated assuming a single outbound lane at the intersections with major streets. Considering the relatively high traffic

volumes on U.S. 278, S.C. 46 and Burnt Church Road, it would be desirable to provide two outbound lanes at each of these driveways. This would allow traffic to turn right onto the major streets (a relatively high capacity movement) without being impeded by vehicles turning left (typically a lower capacity movement).

Future Conditions ... The results of the signalized intersection analysis for the future conditions have been summarized on Table 8 with the unsignalized intersection analysis summarized on Table 9. These intersections were evaluated with the projected traffic volumes shown on ***Figure 9*** and ***10*** and the traffic control and lane configurations shown on ***Figure 11***. Due to the lack of a traffic demand model in this area to reliably project future traffic volumes, it was estimated that the existing traffic volumes would increase by approximately 25 percent.

TABLE 8
Signalized Intersection Level-of-Service
Future Conditions

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS[1]	Delay[2]	LOS[1]	Delay[2]
U.S. 278 and S.C. 46	D	54.5	F	93.5
U.S. 278 and Kitties Crossing	C	23.8	D	46.0
U.S. 278 and Burnt Church Road	F	81.9	F	115.9
U.S. 278 and Factory Stores #1	C	24.8	E	77.5
U.S. 278 and Foreman Hills Road	D	39.3	F	130.1
S.C. 46 and Kitties Crossing	B	16.5	C	21.6
S.C. 46 and Kitties Landing Drive	B	17.9	C	20.2
S.C. 46 and East/West Connector	D	36.5	D	46.5
Burnt Church and East/West Connector	D	38.1	D	45.7

1 - Level of Service
2 - Control Delay in Seconds per Vehicle

TABLE 9
Unsignalized Intersection Level-of-Service
Future Conditions

Intersection / Movement	A.M. Peak Hour LOS[1]	A.M. Peak Hour Delay[2]	P.M. Peak Hour LOS[1]	P.M. Peak Hour Delay[2]
S.C. 46 and North Collector				
Northbound Left-Turn	A	9.3	B	12.5
Eastbound Left-Turn	D	28.4	F	>120
Eastbound Right-Turn	B	10.2	B	14.6
S.C. 46 and Kitties Landing Way				
Southbound Left-Turn	B	11.0	B	11.8
Westbound	F	>120	F	>120
S.C. 46 and South Collector				
Northbound Left-Turn	A	8.8	B	12.2
Eastbound	C	21.6	F	>120
S.C. 46 and Industrial Drive				
Northbound Left-Turn	A	8.8	B	12.5
Eastbound	C	24.9	F	>120
East/West Conn. and Kitties Landing				
Eastbound Left-Turn	A	8.4	B	10.1
Southbound	B	11.9	F	>120
East/West Conn. and West Apartment				
Eastbound Left-Turn	A	7.9	A	8.9
Westbound Left-Turn	A	7.7	A	8.9
Northbound	B	12.4	D	26.0
Southbound	B	10.3	B	12.3
East/West Conn. and East Apartment				
Eastbound Left-Turn	A	7.8	A	8.8
Westbound Left-Turn	A	7.8	A	9.1
Northbound	B	11.1	C	19.6
Southbound	B	12.6	E	36.2
East/West Conn. and Office/Commercial				
Eastbound Left-Turn	A	8.1	A	8.7
Westbound Left-Turn	A	8.0	A	9.8
Northbound	B	12.1	F	>120
Southbound	B	14.9	F	>120
Burnt Church and North Collector				
Southbound Left-Turn	B	10.4	B	14.7
Westbound	C	22.1	F	>120
Burnt Church and South Collector				
Southbound Left-Turn	A	9.7	A	9.7
Westbound	C	15.5	F	53.0

1 - Level of Service
2 - Control Delay in Seconds per Vehicle

The analysis of future conditions continue to reflect significant capacity restraints along the U.S. 278 corridor.

DISCUSSION

Perhaps the most significant issue raised in this study is the capacity restraints along the U.S. 278 corridor. Simply put, the projected future traffic volumes along this corridor cannot be effectively accommodated with U.S. 278 operating with at-grade intersections. Widening this facility to eight lanes (four lanes in each direction) would still not provide the LOS D rating that is desirable. If the County and State desire to operate this corridor efficiently (below capacity), then a freeway should be considered along the entire corridor. Likely locations for interchanges would include S.C. 46, Burnt Church Road and Foreman Hills Road. Due to the close proximity of S.C. 46 and Burnt Church Road, which are located less than a mile apart, it may be desirable to construct a split-diamond interchange at this location. The conversion of U.S. 278 from it's current state to a freeway would have significant impacts both on existing and planned developments. Included among the developments likely affected by the conversion of U.S. 278 are the proposed Myrtle Plantation developments located off of Foreman Hills Road.

SUMMARY

This report summarizes the results of the traffic impact analysis study for the proposed Myrtle Plantation development in Beaufort County, South Carolina. Identified in this report are significant capacity enhancements to the major streets and highways in the area. These enhancements include the widening of U.S. 278, S.C. 46 and Burnt Church Road which, while providing much needed capacity for existing and development traffic, still do not fully provide sufficient capacity for U.S. 278.

We trust the information contained in this report will prove beneficial to you in your site planning. Please feel free to contact us with any questions and/or comments you may have regarding this report and study.

Sincerely,

TranSystems Corporation

By: _____
Jeff D. McKerrow, EIT

By: _____
Thomas G. Swenson, PE, PTOE

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Attachments

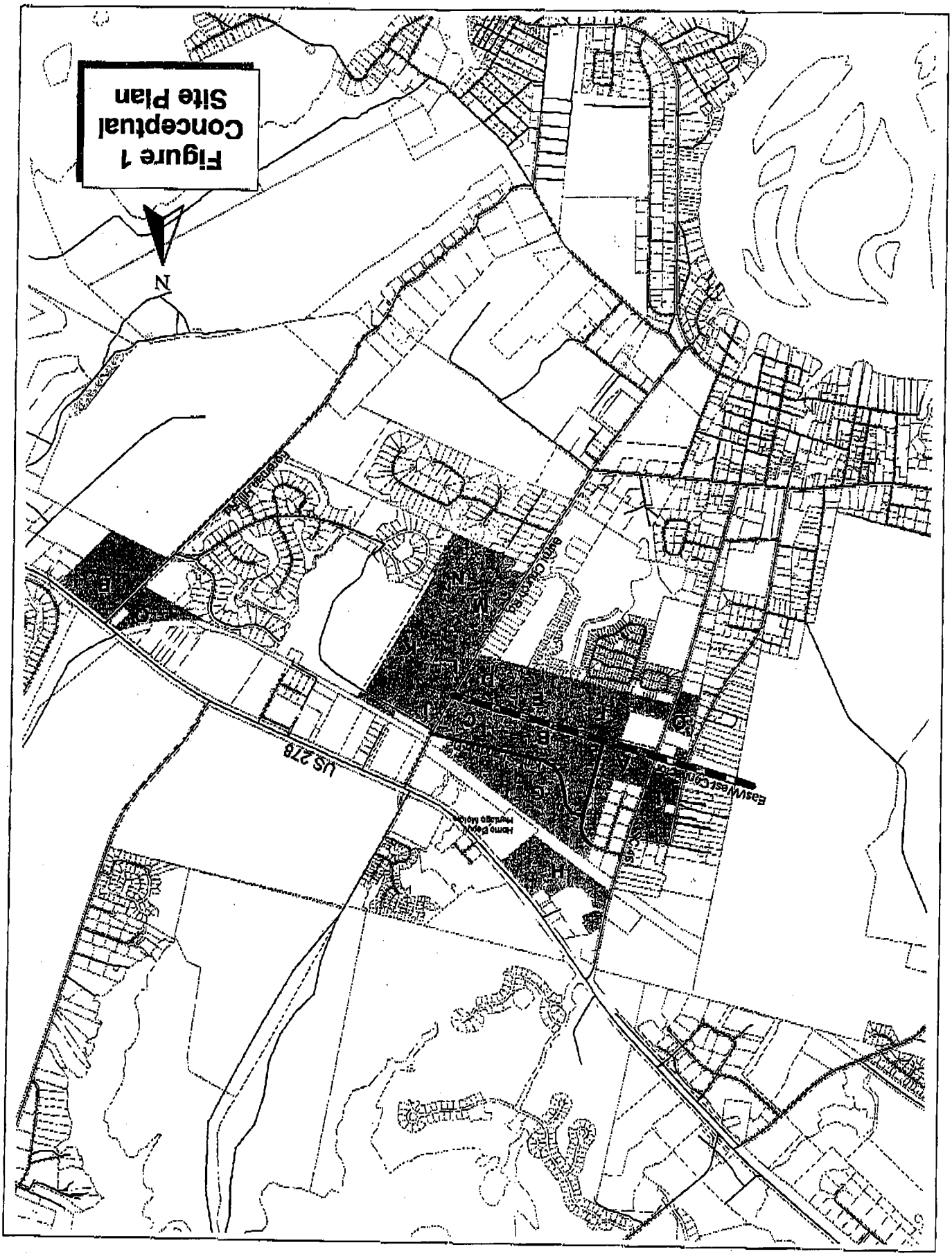
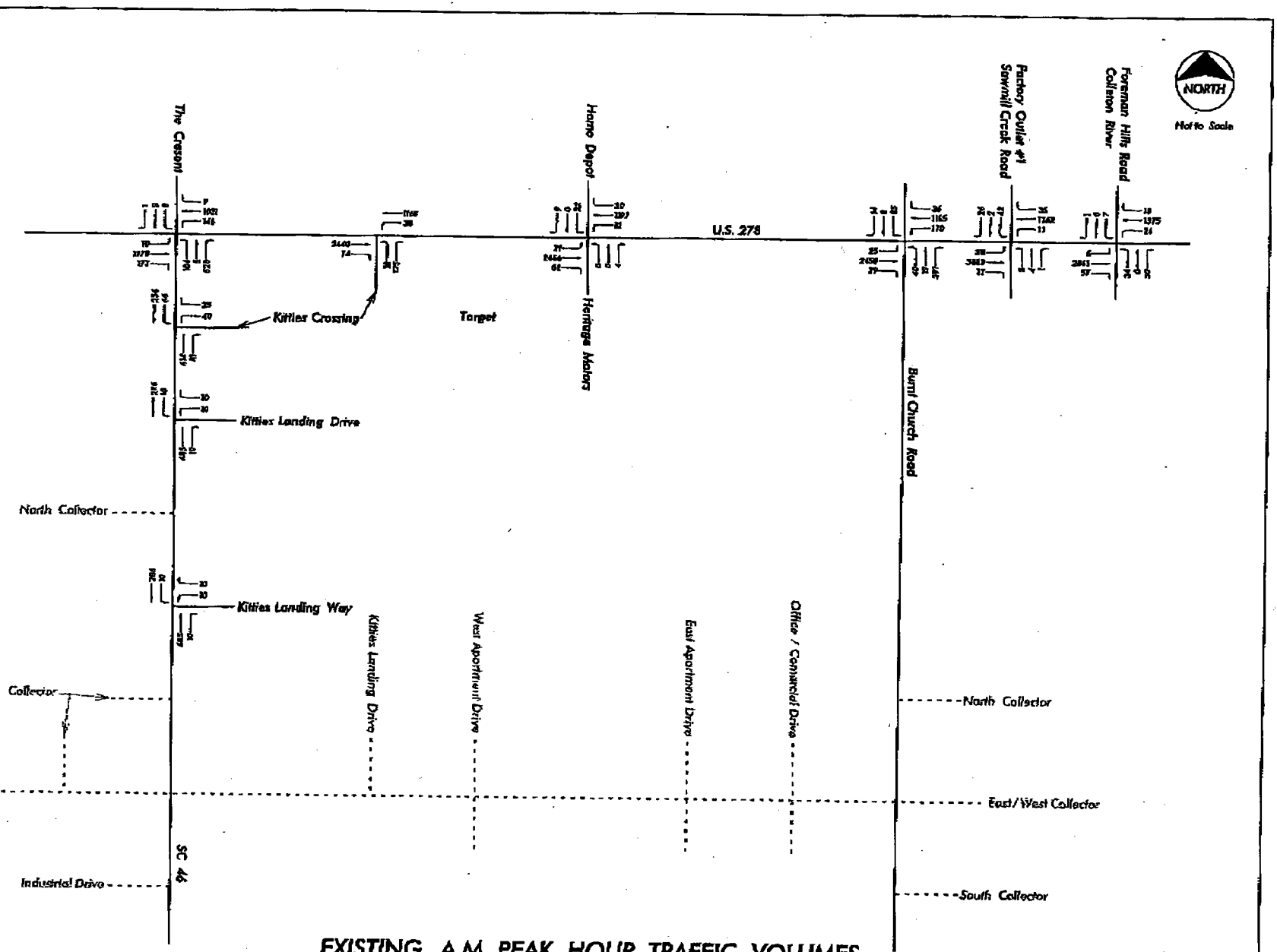


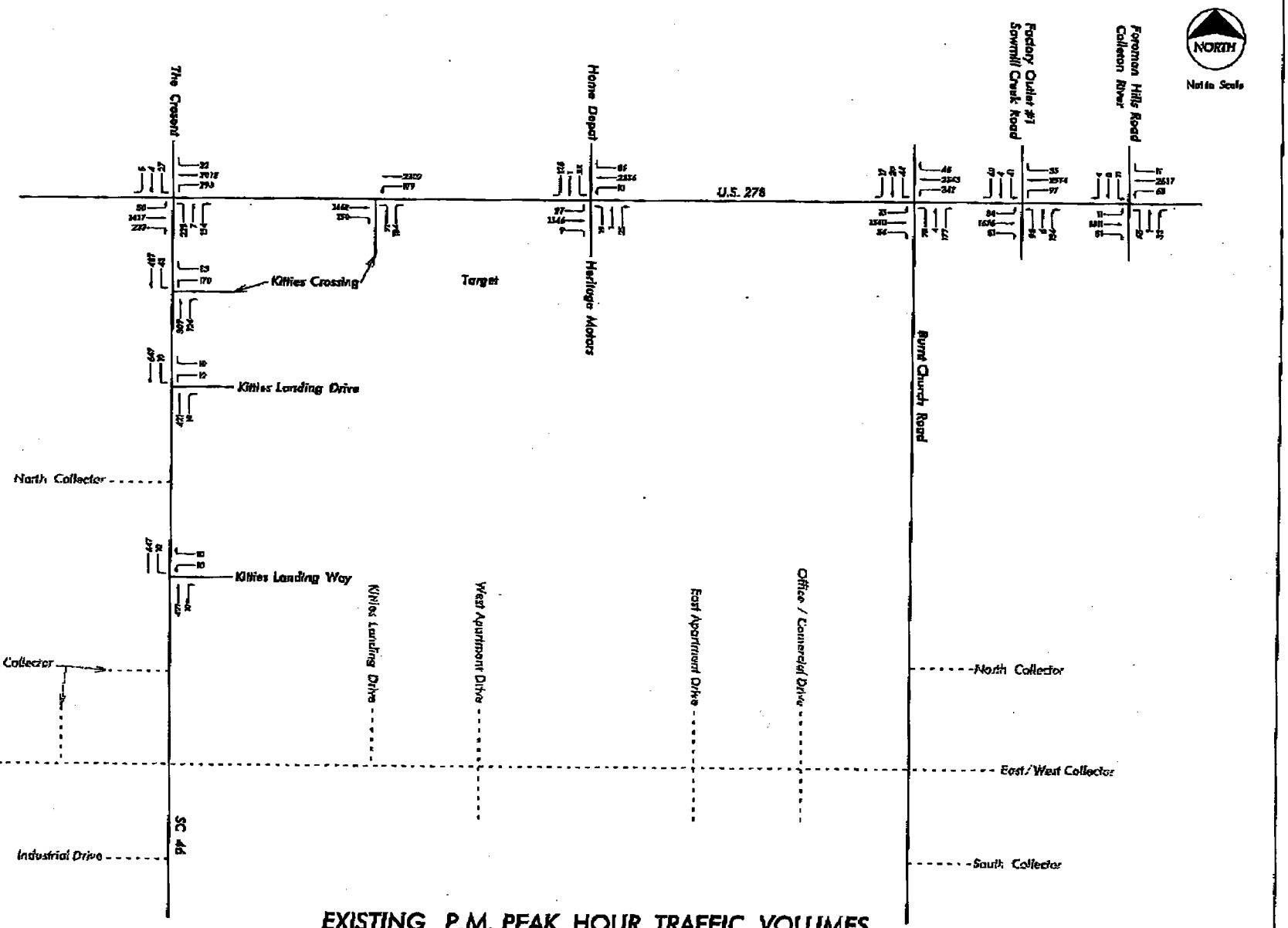
Figure 1
Conceptual
Site Plan
N
US 278



EXISTING A.M. PEAK HOUR TRAFFIC VOLUMES
Myrtle Plantation
Beaufort County, South Carolina

TRANSYSTEMS CORPORATION

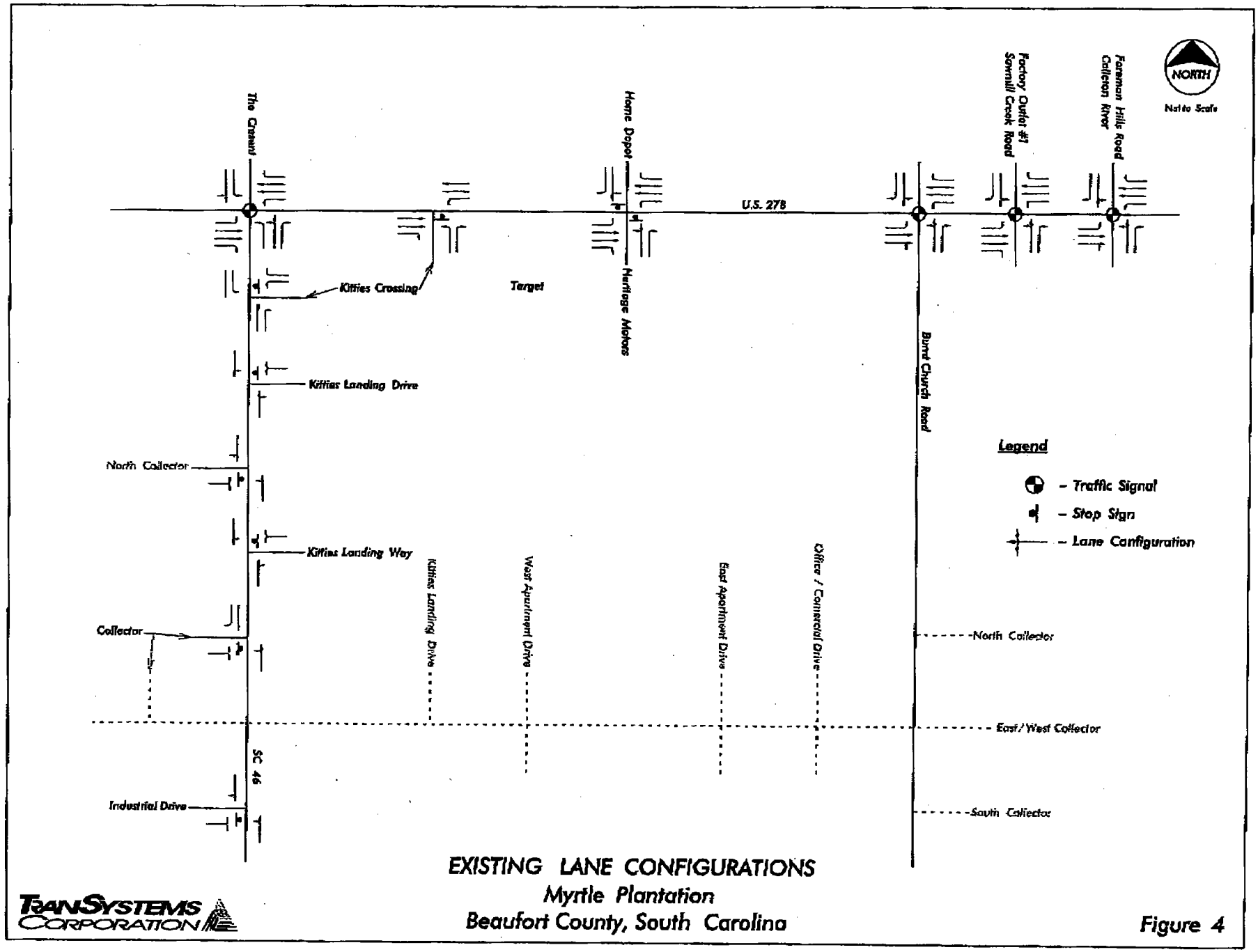
Figure 2



EXISTING P.M. PEAK HOUR TRAFFIC VOLUMES
Myrtle Plantation
Beaufort County, South Carolina

TRANSYSTEMS CORPORATION

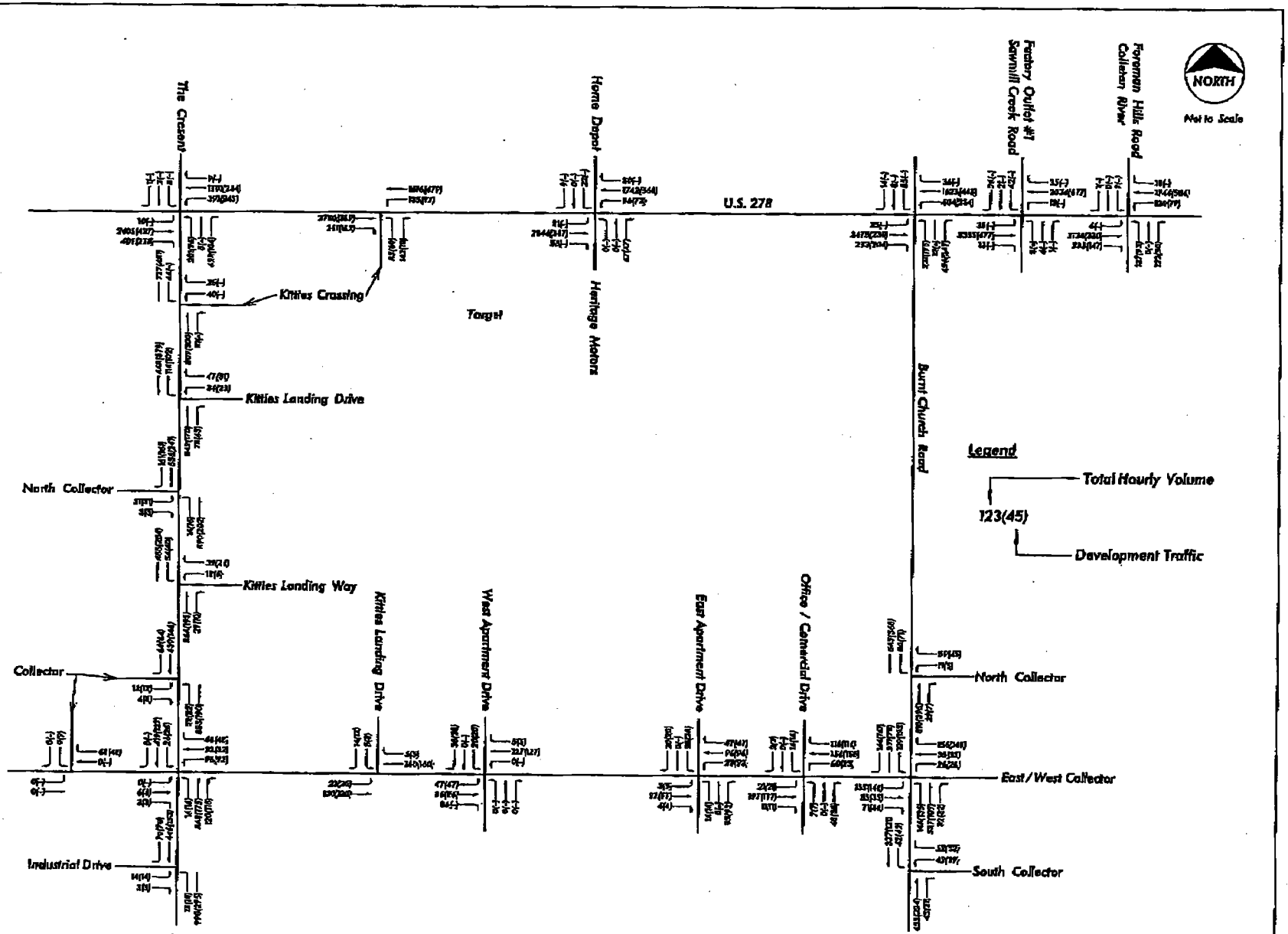
Figure 3



EXISTING LANE CONFIGURATIONS
Myrtle Plantation
Beaufort County, South Carolina

TRANSYSTEMS CORPORATION

Figure 4



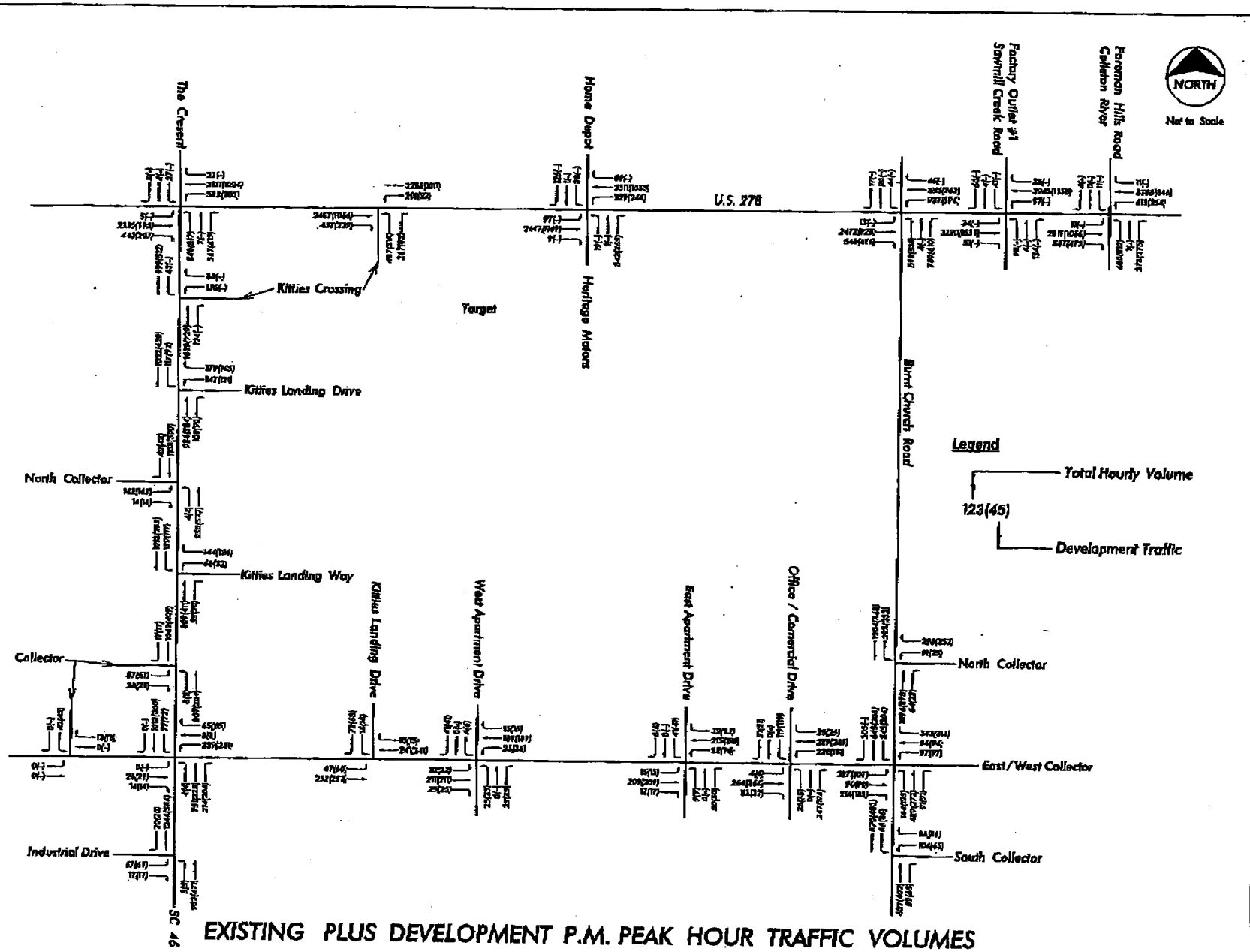
EXISTING PLUS DEVELOPMENT A.M. PEAK HOUR TRAFFIC VOLUMES

Myrtle Plantation

Beaufort County, South Carolina

TRANSYSTEMS CORPORATION

Figure 5



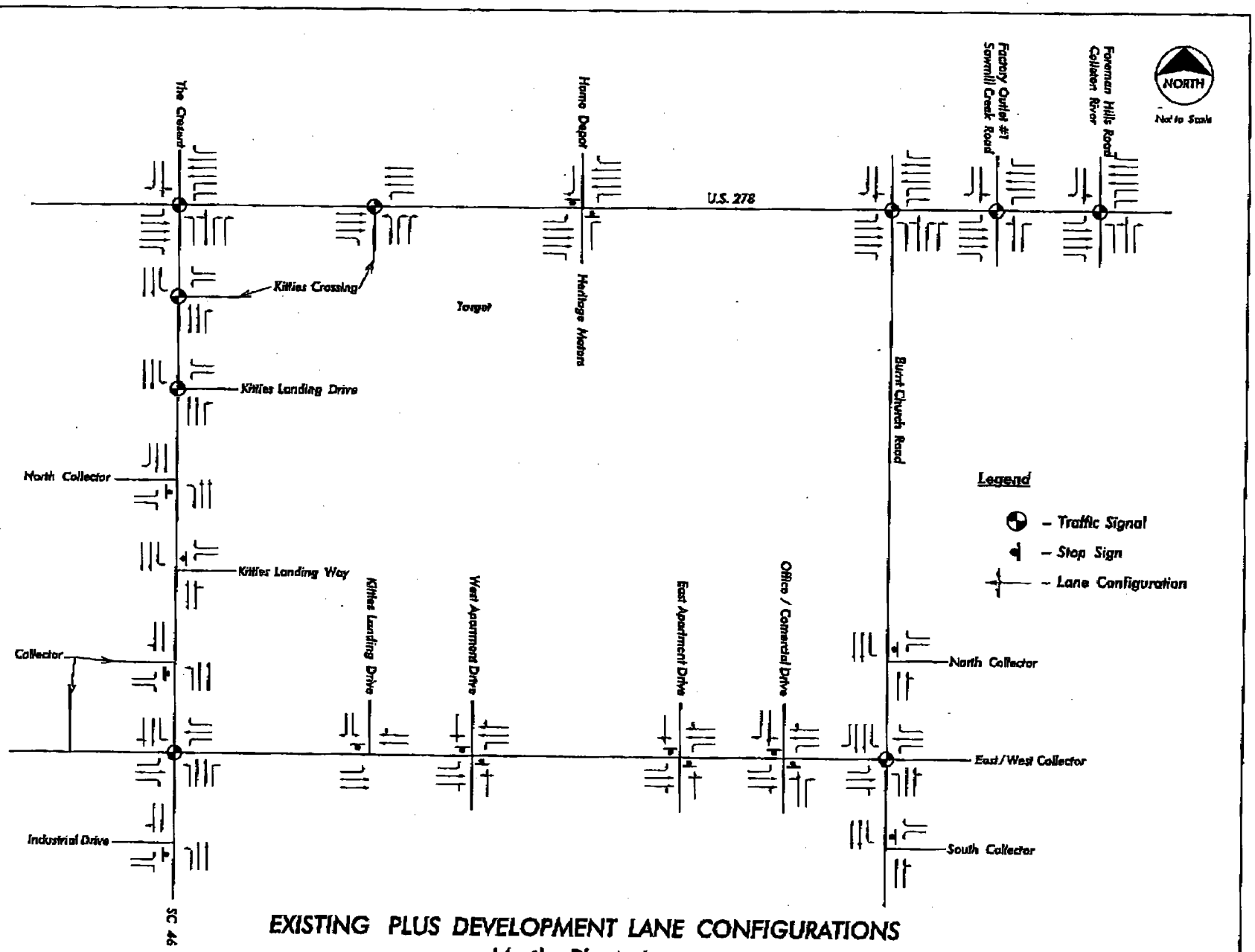
EXISTING PLUS DEVELOPMENT P.M. PEAK HOUR TRAFFIC VOLUMES

Myrtle Plantation

Beaufort County, South Carolina

TRANSYSTEMS CORPORATION

Figure 6



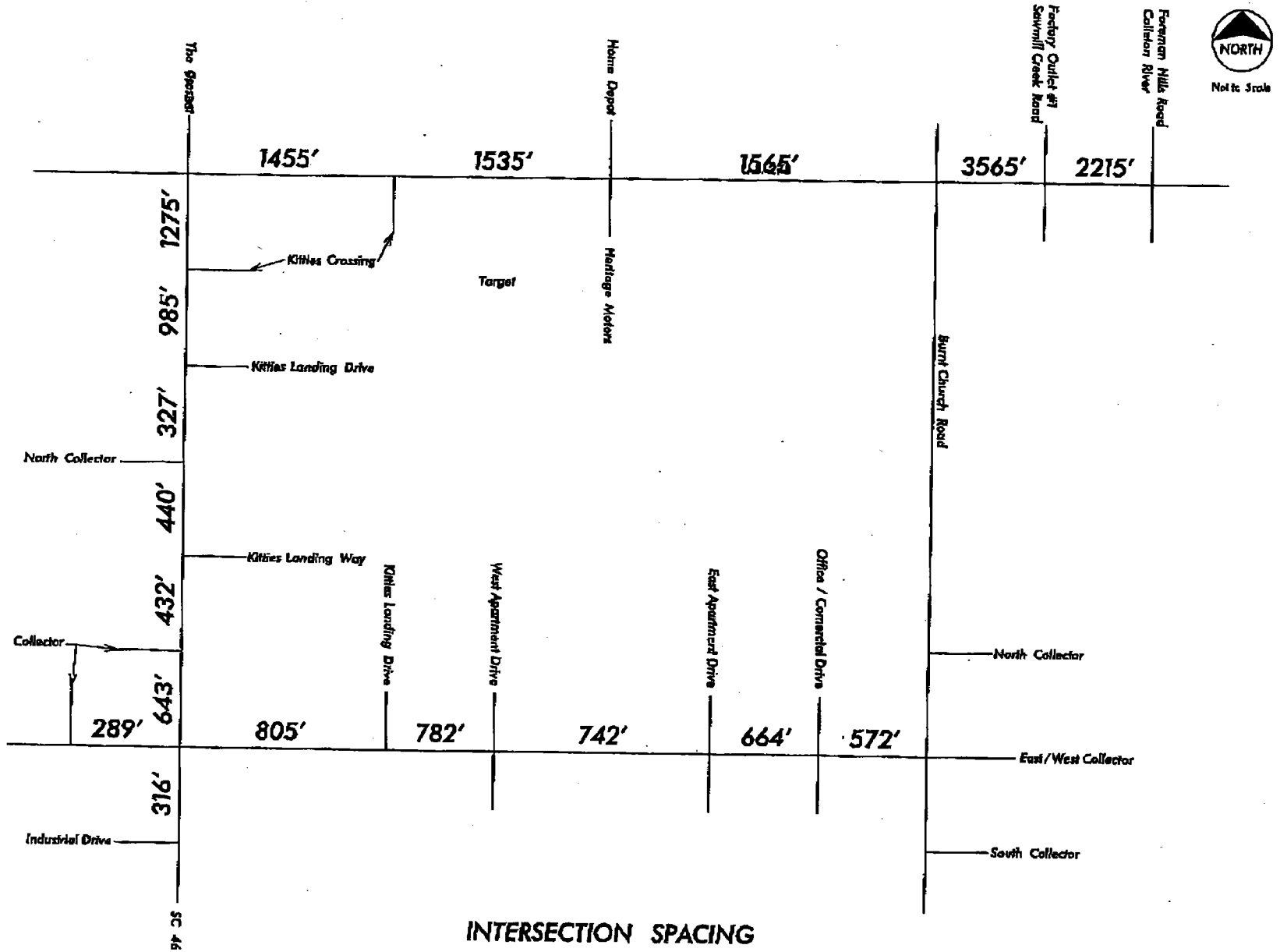
EXISTING PLUS DEVELOPMENT LANE CONFIGURATIONS

Myrtle Plantation

Beaufort County, South Carolina

TRANSYSTEMS CORPORATION

Figure 7



INTERSECTION SPACING
Myrtle Plantation
Beaufort County, South Carolina

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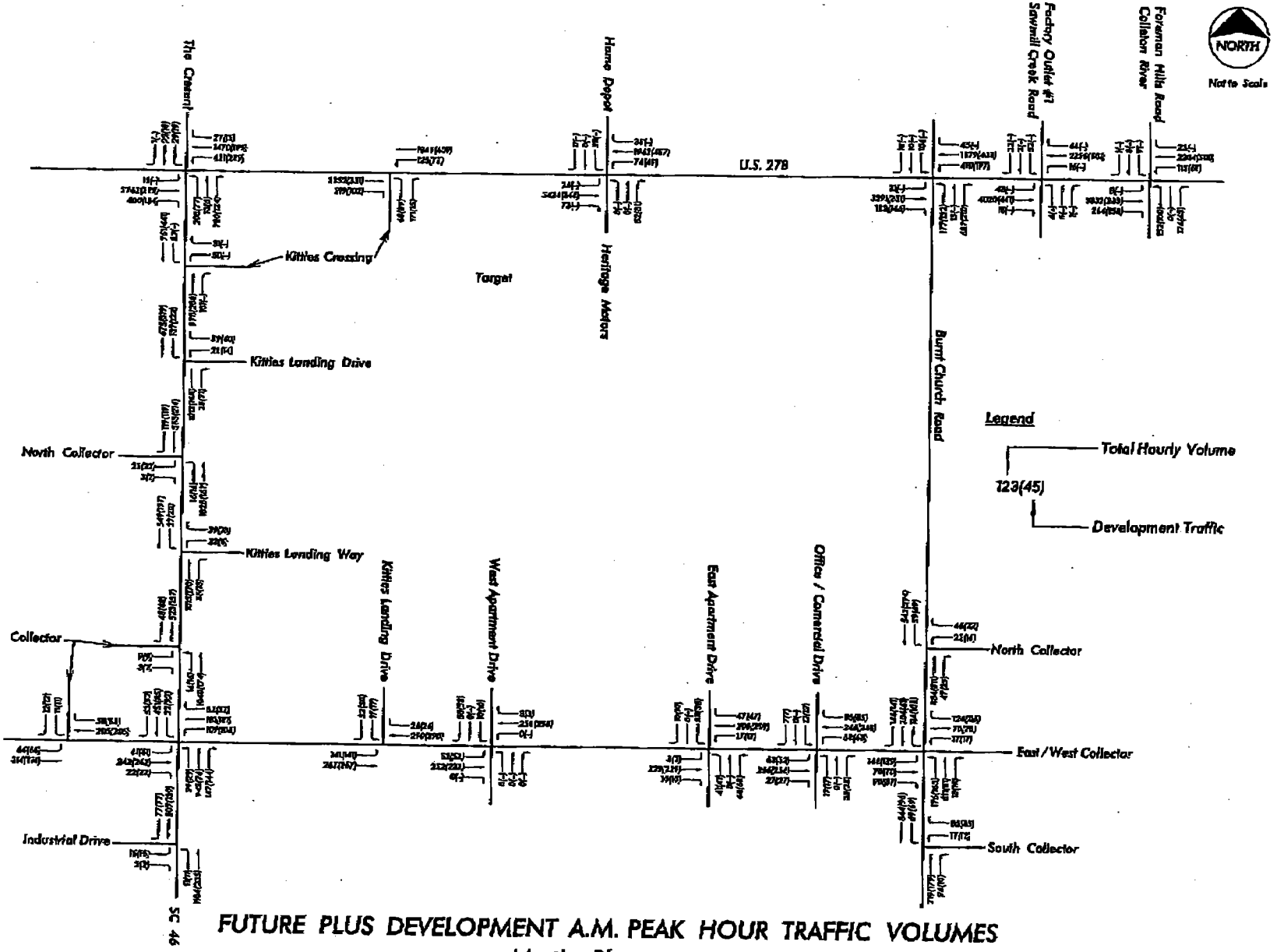
Figure 8



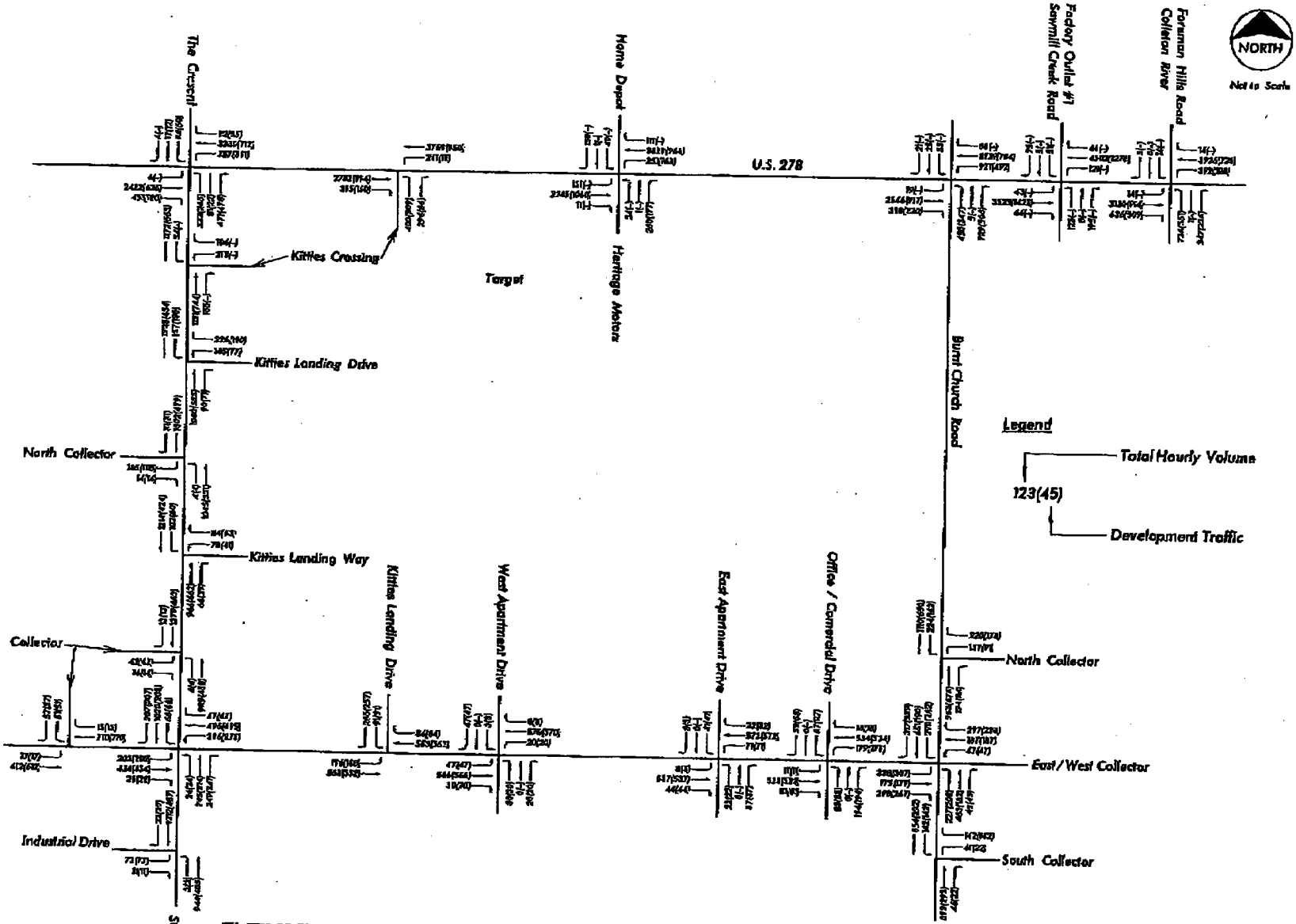
FUTURE PLUS DEVELOPMENT A.M. PEAK HOUR TRAFFIC VOLUMES

Myrtle Plantation

Beaufort County, South Carolina

TRANSYSTEMS CORPORATION

Figure 9



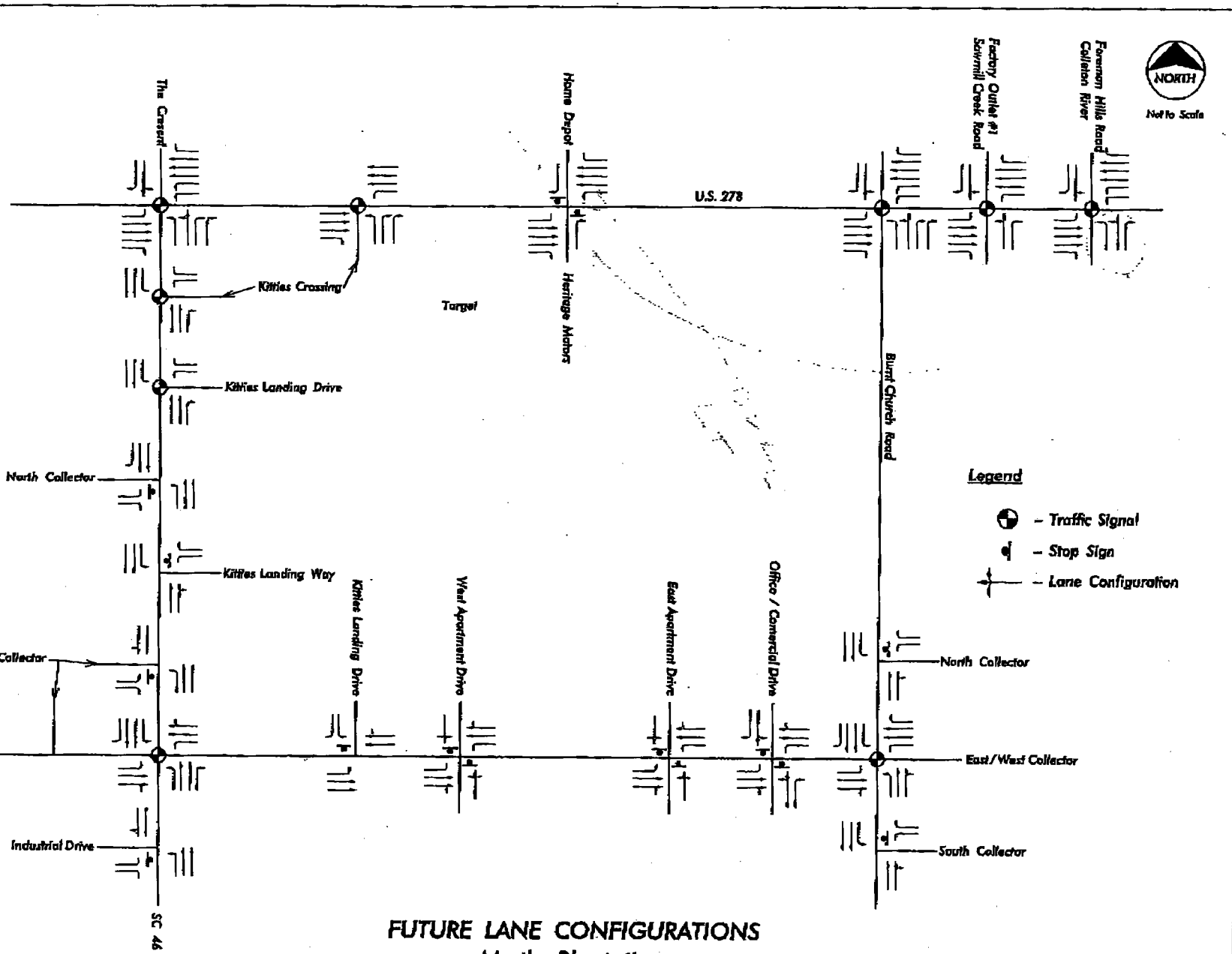
FUTURE PLUS DEVELOPMENT P.M. PEAK HOUR TRAFFIC VOLUMES

Myrtle Plantation

Beaufort County, South Carolina

TRANSYSTEMS CORPORATION

Figure 10



TRANSYSTEMS CORPORATION

FUTURE LANE CONFIGURATIONS
Myrtle Plantation
Beaufort County, South Carolina

Figure 11